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U.S. ARMY

HUMAN FACTORS ENGINEERING

BIBLIOGRAPHIC SERIES

VOLUME 4

1966 LITERATURE

1018D

Prepared by

THE PROJECT STAFF
DEPARTMENT OF DEFENSE
HUMAN FACTORS ENGINEERING INFORMATION ANALYSIS CENTER

Institute for Psychological Research
Tufts University

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December 1967

HUMAN ENGINEERING LABORATORIES

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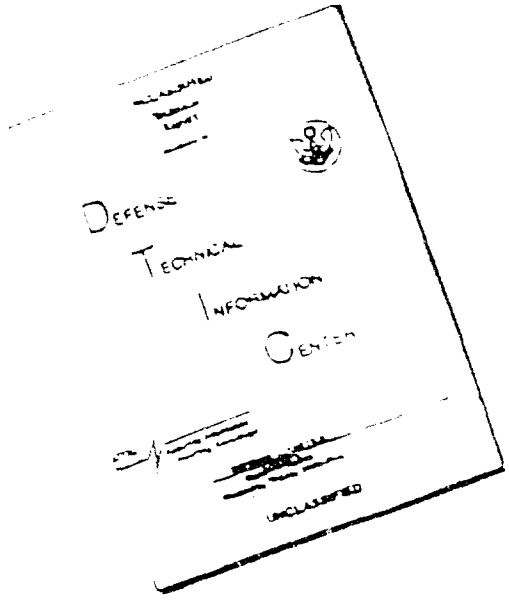

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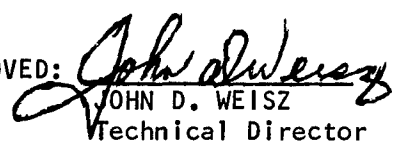
APPROVED: 

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U. S. ARMY HUMAN ENGINEERING LABORATORIES
Aberdeen Proving Ground, Md.

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FOREWORD

The Department of the Army was assigned responsibility, effective 1 October 1965, for the development and maintenance of a Human Factors Engineering Information Analysis Center in accordance with the provisions of the Department of Defense Scientific and Technical Information program (DoD Instruction 5100.45). At present the Information Analysis Center is located at Tufts University under the technical guidance of the U. S. Army Human Engineering Laboratories.

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Introduction

This document is the fourth in a series of bibliographies covering the human factors engineering literature. The first volume, HEL BIB VOL 1, covered the 1940 through 1959 literature. The second bibliography contained material, for the most part, from the time period 1960 through 1964. The third volume dealt primarily with the 1965 literature. This volume covers the 1966 literature. It should also be mentioned that a number of pre 1966 documents have been included in this volume. These are documents which for various reasons have not appeared in the previous volumes, or recently became available to the HEIAS.

As in the past, the project staff was influenced by several considerations in the selection of references for inclusion in the bibliography. First, there was an attempt to select those references which reflected the broad spectrum of revealed interests of human factors personnel. Second, the documents had to be available to the project staff for examination prior to coding and abstracting. If the document was not among the acquisitions of the project, it was not included in the bibliography.

The present volume should provide a useful compilation of references to the human factors engineering literature along with the previous volumes which reflect the cumulative (through 1966) acquisitions of the HEIAS.

This and future volumes will be published in punched loose leaf page format, thus permitting additions of new material and modification of old. Additions will be in the form of new acquisitions. Modifications will be primarily in the form of changes to the index and the resulting changes in the coding of the accessions involved. A cumulative coded index covering all four volumes is being prepared. An author index which is now in preparation at HEL will also be published. It is suggested that the user place the present volume in a notebook (or notebooks) or whatever form he finds convenient for use and future modifications.

Instruction in the Use of the Present Bibliography

General

The user should examine the index (Part I) thoroughly before attempting to locate references on a specific topic. Familiarization with the terms is essential if effective retrieval is to be realized. After examining its content, the user should be able to enter the index with the terms which are descriptive of, or synonymous with his query. Documents have been coded only to those terms or descriptors which are underlined. Having noted the terms of interest he should then go to Part II (Facsimile of Subject Matter File) and under the appropriate terms find the accession numbers of those documents which have been coded to that term. Noting these numbers he can then go to Part III (Citations and Abstracts) to find the actual references.

Index Changes

There have been some slight modifications in the index published in the first two volumes of this series. These changes are reflected in the present index. However, no major changes have been made and the user should have no trouble going from the index in Volume III to the present one. As mentioned previously, an updated and cumulative Part I and II will be published in the near future.

The Index and Its Use

The accessions are only coded to those terms which are underlined and in the cases of subheading, are coded to the lowest subcategory (i.e., to the secondary or tertiary heading, if there is one). For example, if the reader will note the category Aging, Effects of, he will find a number of secondary categories, such as vision; motor performance; etc. No references have been coded to Aging, Effects of, as such, but only to the secondary

headings. In the case of Radar and other CRT Displays the reader will note the secondary heading screen and under this, various tertiary headings, such as size and shape. Relevant documents, for example those dealing with the shape of radar screens or scope faces, have been coded to the lowest subcategory, in this case size and shape. No references will have been coded to screen alone.

The index can, of course, be used as a hierarchical system or a coordinate index. For example, if a user were interested in articles dealing with drugs and their effects, he would examine the references listed in the category Drugs. Similarly, if he were interested in articles dealing with man's tolerance to acceleration, he would go to the category Motion, Effects of/acceleration and deceleration/tolerance. However, if he were interested in the effects of drugs on man's tolerance to acceleration forces, rather than go through all the references in the above mentioned categories, the reader should note only those accession numbers common to both categories. The loose leaf notebook form should facilitate this coordinate search.

The reader is advised to look through the various general categories in making a search. These categories contain not only references of a general nature, books, bibliographies, etc., but in some cases miscellaneous articles which could not be readily coded elsewhere. Occasionally, the reader will note a secondary heading "other." These categories contain references to equipment, methods, topics, etc., not specifically listed under the main heading.

An index of this nature develops through use. All relevant terms and descriptors cannot be anticipated in its initial development and are often incorporated only after the index has been in use for some time. Therefore, if the user cannot find terms specifically descriptive of his problem he should attempt to find synonymous terms. As mentioned previously, the user should examine the whole index thoroughly before attempting to locate specific topics.

Facsimile of Subject Matter File

Part II contains those categories to which documents have been coded along with the accession numbers of the documents. In essence, it represents the index stripped to the bare essentials, i.e., minus all cross headings and notes. The user will note that there are several categories with only a few or no references coded to them. These categories were left in the index because it is known that in the later bibliographies, there will be a number of references coded to them.

Citations and Abstracts

Part III contains the actual citations and abstracts listed in numerical order by accession number. This section was compiled by filming the actual 5 x 8 citation and abstract cards from the files of the HEIAS.

The format of the citations is generally in keeping with the recommendations of the Publication Manual of the American Psychological Association. In some instances, however, variation in the amount and type of information in the original document has introduced some variation in the final citation. The content of the citation tries to maximize the amount of information to assist the user in acquiring a copy of the document.

The letter code R found at the end of the abstract refers to the number of references found in the articles (e.g., R-7 means that 7 references were cited). A list of abbreviations used in the abstracts is given on the next page.

The documents cited are not available from Tufts University, but are held in repository at the HEIAS and may be examined on the project's premises.

KEY TO ABBREVIATIONS

a.c.	alternating current
AD	average deviation
AFGCT	Armed Forces General Classification Test
AGCT	Army General Classification Test
AIAA	American Institute of Aeronautics & Astronautics
AL	adaptation level
amp.	ampere
ANIP	Army-Navy Instrument Program
ANOVA	analysis of variance
AP	action potentials
AR	acoustic reflex
AVID	Advanced Visual Information Display
bit	unit of information
BMR	basal metabolic rate
C	centigrade
ca	about or approximately
cc	cubic centimeter
CCC	Combat Control Center
cff	critical flicker frequency
CIC	Combat Information Center
clo	measure of protective value of fabrics
cm	centimeter
CNS	central nervous system
CO	carbon monoxide
CO_2	carbon dioxide
cpm	cycles per minute
cps	cycles per second
CR	critical ratio
CRT	cathode ray tube
cu ft	cubic foot
db	decibel
d.c.	direct current
df	degrees of freedom
DL	difference limen
E, Es.	experimenter, experimenters
EEG	electroencephalogram
e.g.	for example
EKG or ECG	electrocardiogram
EMG	electromyogram
ERG	electroretinogram
et al	and others
etc.	and so forth
Exp.	experiment
f	frequency
F	fahrenheit, F-ratio
ft	foot
ft-c	foot-candle
ft-L	foot-Lambert
ft-lbs	foot-pounds
ft/sec	feet per second
g	acceleration of normal pull of gravity
G	gravitational force acting upon an object
GCA	Ground Control Approach
GSR	galvanic skin response
Hg	mercury
hr.	hour
i	intensity
IBM	International Business Machine
i.e.	that is
ILS	Instrument Landing System
in.	inch
IQ	Intelligence Quotient
j.n.d.	just noticeable difference
kc	kilocycle
kg	kilogram
KR	knowledge of results
L	lambert
LL	loudness level
lb	pound
m	meter
M	mean
Ma	milliampere
Mc	megacycle
Mdn	median
mg	milligram
mi	mile
min.	minute
mL	millilambert
mm	millimeter
MOS	Military Occupational Specialty
mph	miles per hour
msec	millisecond
mμ	millimicron
μsec.	microsecond
N	number of
°	degree
O, Os.	observer, observers
O_2	oxygen
OCS	Officers' Candidates School
OR	Operations Research
p	probability level
PB	phonetically balanced
PERT	Program Evaluation and Review Technique
PGR	psychogalvanic skin response
PI	photo interpretation
PPI	Planned Position Indicator

KEY TO ABBREVIATIONS (Cont'd)

pps	pulses per second
psi	pounds square inch
PSS	Personnel Subsystem concept (USAF)
PED	Personnel and Equipment Data file
HE	verifying Human Engineering Design Standards
QQPRI	Qualitative and Quantitative Personnel Requirements Information
PSTE	Personnel Subsystem Test and Evaluation
TC	Training concepts
TED	Training Equipment Development program
TEPI	Training Equipment Planning Information
TOTM	Technical Orders and Manuals
TP	Training Plans
r	roentgen, correlation coefficient
rad	absorbed dose of radiation
REM	rapid eye movement
RBE	relative biological effectiveness
ROTC	Reserve Officers Training Corps
rpm	revolutions per minute
RT	reaction time
S, Ss	subject, subjects
SAGE	Semi Automatic Ground Environment
SD	standard deviation
SDT	signal detection theory
sec.	second
S/N	signal-to-noise ratio
SPL	sound pressure level
S-R	stimulus-response
SUBIC	Submarine Integrated Control
t	t-test
TTS	temporary threshold shift
vs	versus
VTOL	Vertical Takeoff and Landing Aircraft

SYMBOLS:

x^2	chi square
%	per cent
>	more than
<	less than
=	equal
ΔI	change in intensity
μ	micron
$\sigma 2$	variance

A

Ability Testing--see Tests and Testing (proficiency)
Absolute Judgments--see Psychophysics; specific sensory categories
Absolute Pitch--see Audition (stimulus characteristics)
Acceleration and Deceleration--see Motion, Effects of
Acceptability of Equipment and Tasks--see Individual Factors Affecting Performance
Accessibility--see Maintenance (design for); Work Place Design (area requirements)
Accidents--see Safety
Acclimatization--see Environmental Conditions and Effects (tolerance, adaptation, acclimatization); Physiological Capacities and Indices
Accommodation and Convergence--see Visual
Accuracy of Movement--see Motor Performance and Skills (speed and precision)
Acoustic
  design--see also Ambient Noise (reduction and control); Work Place Design (acoustics)
  engineering--see design, above
  measurement--see Ambient Noise (measurement)
  reflex--see Audition (aftereffects of stimulation)
  shielding--see Ambient Noise (reduction and control)
Action Potential--for data, see Physiological Capacities and Indices; for methods, see Physiological Equipment and Methods
Acitivity Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Acuity
  auditory--see Audition (thresholds)
  sensory, other--see specific sensory categories
  visual--see Visual
Adaptation
  auditory--see Audition (aftereffects of stimulation)
  perceptual--see Perception (general)
  theory--see Perception (theory)
  visual--see Visual (adaptation, pre-adaptation, and pre-exposure)
Adaptive Systems--see also Artificial Intelligence; Controls (automatic)
Adjustment, Method of--see Psychophysics (methods)
Aerial Observations--see Visual (search and detection)
Aerospace Medicine, general--see Environmental Conditions and Effects (general); Space Travel
A-Frames--see Packs and Carriers
Afterimages--see Audition (aftereffects of stimulation); Visual (aftereffects, afterimages)
Aging, Effects of
  audition
  general
  intellectual performance--see work capacity, below
  motor performance
  vision
  work capacity
Aiding--see Tracking
Aiming--see Motor Performance and Skills
Airblast--see Environmental Conditions and Effects (windblast, airblast, windchill)
Airborne Equipment--see Aircraft (related equipment)
Air Conditioning--see Work Place Design (atmospheric control)
Aircraft
  accidents--see Safety
  collision--see Safety
  communication systems--see Speech (communication systems)
  controls--see Controls
  design--see also Helicopters; VTOL, STOL Aircraft
  escape from--see Escape from

Aircraft (cont'd)
general
Instrument panel arrangement--see Panel and Console Design
landing and landing systems
lighting, exterior
lighting, interior--see Work Place Design (illumination)
noise--see Ambient Noise (level)
related equipment
visibility and recognition--see Visual (search and detection)
Air Crews--see Groups
Air Defense--see Command and Control Systems; Surveillance Systems
Airport (airfields)
facilities--see also Air Traffic Control Systems
lighting--see Lighting Systems (outdoors)
noise--see Ambient Noise (level)
runway design--see Aircraft (landing and landing systems)
Air Reconnaissance--see Visual (search and detection)
Air Sickness--see Motion, Effects of
Airspeed Indicators--see Displays (type)
Air Traffic Control Systems
communication and information flow--see also Language Design; Speech (communication systems)
control problems
equipment (displays, etc.)
general
layout and workplace design
operator variables
traffic flow
training and simulation
Alarms and Auditory Warning Devices--see Auditory (displays, nonverbal)
Alcohol--see Drugs
Alertness--see Individual Factors Affecting Performance
Allocation of Functions--see Assignment of Functions to Men and Machines in Systems
Alphanumeric Displays--see Displays (type); Radar and other CRT Displays (types)
Altimeters--see Displays (type)
Altitude Chamber--see Environmental Conditions and Effects (equipment and methods)
Altitude, Effects of--see Environmental Conditions and Effects
Ambient Noise
accidents--see effects on performance, below
composition--see measurement, below
control--see reduction and control, below
criteria for buildings--see Acoustic (design); reduction and control, below; Work Place Design (acoustics)
deafness--see hearing loss, below
effects on performance (includes industrial efficiency)
general
hearing loss--see also Audition (aftereffects of stimulation)
injury--see hearing loss, above
level
aircraft
airport
equipment, general
industrial environments
office, home, and general background
rockets, missiles, and launch facilities
ships and submarines

Ambient Noise
level (cont'd)
vehicle (motor)
weapons
measurement (e.g., spectral analysis, critical band analysis)
reduction and control--see also Acoustic (design); Work Place Design (acoustics)
acoustic shielding
general
hearing conservation program
noise reducing devices and systems
personal equipment (e.g., earplugs)--see Auditory (devices)
standards of tolerance and annoyance
speech interference level--see Speech (masking)
tolerable level--see reduction and control, above
Amplifiers--see Auditory (equipment)
Anchoring Effects--see Perception (general); Psychophysics
Anechoic Chambers--see Audition (equipment and methods)
Angle, Perception of--see Visual (perception)
Ankle Dimensions--see Anthropometric Measures
Anomalies
auditory--see Audition
sensory, other--see specific sensory categories
visual--see Visual
Anoxia--see Environmental Conditions and Effects (oxygen requirements)
Anthropometric Measures
arm and leg dimensions
biomechanical analysis
body density and centers of gravity
body size and dimensions
equipment and methods
extent and flexibility of limb movement
general
hand and foot dimensions
head dimensions
locomotion
muscular strength and endurance
posture
somatotyping
space requirements--see also Work Place Design (area requirements)
Anti-g-Suits--see Clothing (high altitude and anti-g)
Anxiety--see Individual Factors Affecting Performance (emotion)
Anxiety, Tests of--see Tests and Testing (personality and sociometric)
Apparent Movement--see Visual (perception)
Aptitude--see Individual Factors Affecting Performance
Aptitude Testing--see Tests and Testing
Aqua Lung--see Underwater (breathing apparatus)
Arctic Climate Clothing--see Clothing (Arctic ensembles and cold weather)
Arm
dimensions--see Anthropometric Measures
movement--see Anthropometric Measures; Motor Performance and Skills
strength--see Anthropometric Measures (muscular strength and endurance)
Armored Vehicle--see Vehicle
Armored Vests--see Clothing (body armor)
Articulation Testing--see Communications Systems (techniques for evaluation); Speech
Artificial Intelligence (biosimulation)

Artificial Limbs--see Prosthetics

Asbestos Suits--see Clothing (thermal protection)

Aspiration, Level of--see Individual Factors Affecting Performance (motivation and morale)

Assignment of Functions to Men and Machines in Systems

Assignment of Personnel--see Personnel

Atmosphere--see Environmental Conditions and Effects

Attention--see Individual Factors Affecting Performance (set and attention); Perception; Training (basic learning data); Vigilance and Monitoring

Attenuators--see Auditory (equipment)

Attitude Indicators--see Displays (type)

Attitude Toward Task--see Individual Factors Affecting Performance (acceptability of and attitude toward equipment and tasks)

Audiogyric Effects--see Orientation in Space, Factors Determining; Perception (illusions)

Audiometry--see Audition (equipment and methods); Speech

Audio-Visual Aids--see Training Aids and Devices

Audio-Visual Interaction--see Sensory (interaction)

Audio-Visual Monitoring--see Vigilance and Monitoring (performance)

Audio-Warning Devices--see Auditory (displays, nonverbal); Warning Devices

Audition

- aftereffects of stimulation (e.g., acoustic reflex, fatigue, pitch shifts, time errors, etc.)
- aging--see Aging, Effects of; norms, below
- anomalies and individual differences
- auditory patterns and meaning (e.g., flutter discrimination, melodic and temporal)
- binaural vs. monaural
- equipment and methods (e.g., anechoic chambers, audiometric devices, communication simulators, techniques of audiometry)
- general
- norms
- physiological mechanisms
- psychophysical scales (e.g., mel scale, sone scale)
- recruitment
- repetitive stimulation
- sound localization
- standards and specifications
- stimulus characteristics
  - frequency and pitch
  - intensity and loudness
  - other (e.g., brightness, duration, timbre, vocality)
- stimulus mixtures (e.g., harmonics, beats, combination tones, modulations)
- thresholds
- training, nonverbal--see Training (specific types)

Auditory

- acuity--see Audition (thresholds)
- adaptation--see Audition (aftereffects of stimulation)
- detection--see skills, below
- devices
  - ear defenders (e.g., plugs, pads, etc.)
  - enhancement devices (e.g., hearing aids, guidance for blind, etc.)
- displays, nonverbal--for systems utilizing verbal communication, see Speech (communication systems)
  - flight guidance systems (flybar)
  - intermittent warning and signaling devices (e.g., sirens, bells, radio range)
  - multi-channel
  - sonar and other underwater sound systems
  - telegraphic systems

Auditory (cont'd)
- equipment
  - input devices (e.g., microphones, vibration pickups)
  - output devices (e.g., earphones, loudspeakers)
  - transmission devices (e.g., amplifiers, attenuators, frequency modulators, scramblers)
- fatigue--see Audition (aftereffects of stimulation)
- feedback--see signals, below
- flight guidance systems--see displays, above
- localization--see Audition (sound localization)
- masking--for speech masking, see Speech
- noise--see Ambient Noise
- numerousness--see signals, below
- patterns--see Audition
- reaction time--see Reaction Time and Refractory Period
- search--see skills, below
- signals
  - channel capacity
  - coding
  - detection--see skills, below
  - feedback
  - general characteristics
  - to-noise ratio
- skills
  - discrimination
  - monitoring
  - search and detection
  - sonar listening--see monitoring, above
  - tracking--see Tracking
  - training--see Training (specific types)
- vs. visual presentation--see Sensory (comparison)

Aural Harmonics--see Audition (stimulus mixtures)
Aural Reading Devices--see Auditory (devices)
Auto-Correlation Function--see Mathematical and Statistical Methods
Autoinstruction--see Programmed Instruction; Training Aids and Devices (teaching machines)
Autokinetic Effects--see Visual (perception)
Automatic
- checkout systems--see Maintenance (systems)
- control systems--see Controls
- learning devices--see Training Aids and Devices (teaching machines)
- maintenance--see Maintenance (systems)

Automation
Automobile Accidents--see Safety
Automobile Design--see Vehicle
Automobiles--see Vehicle
Aviation Medicine--see Environmental Conditions and Effects (general)

B

Backlighting--see Instrument Lighting (rear)
Back Rests--see Seats and Seating (body supports)
Ballistic Vests--see Clothing (body armor)
Band Compression Speech--see Speech (distortion)
Barometric Pressure--see Environmental Conditions and Effects
Basic Training--see Training (specific types)

Beacon Lights--see Warning and Signal Lights
Bearing Information Aids--see Radar and other CRT Displays (range and bearing scales and aids)
Beats--see Audition (stimulus mixtures)
Bells--see Auditory (displays, nonverbal)
Belts, Harnesses, and other Restraining Devices--see also Clothing (belts and fasteners)
Bends--see Environmental Conditions and Effects (decompression)
Betting Behavior--see Subjective Probability
Bibliographies--see General and Comprehensive References in Human Factors Engineering; bibliographies also are included under general in major topics
Binaural Discrimination--see Audition (binaural vs. monaural)
Binocular Disparity--see Visual (perception)
Binocular Field--see Visual (field)
Binoculars--see Optical Aids
Biodynamics--see also Anthropometric Measures; Motor Performance and Skills
Bioelectric Methods and Equipment--see Physiological Equipment and Methods
Bio-instrumentation--see Physiological Equipment and Methods
Bio-kinetic Analysis--see Anthropometric Measures; Motor Performance and Skills
Biomechanical Analysis--see Anthropometric Measures; Motor Performance and Skills
Bionics
Biosimulation--see Artificial Intelligence
Bisectioning Movements--see Motor Performance and Skills
Black Light--see Light (special types)
Blackout--see Motion, Effects of (acceleration and deceleration)
Blindness-see Visual (anomalies and individual differences)
Blindness, Flash--see Flash
Blinking--see Motor Performance and Skills (involuntary reflexes)
Blinking Signal Lights--see Flash (rate); Traffic (signs and signals); Warning and Signal Lights
Blink Rate--see Flash; Motor Performance and Skills (involuntary reflexes)
Body
    armor--see Clothing
    build--see Anthropometric Measures
    density--see Anthropometric Measures
    movement, perception of--see Perception
    size and dimensions--see Anthropometric Measures
    supports--see Belts, Harnesses, and other Restraining Devices
    temperature--see Physiological Capacities and Indices
Bone Conduction--see Audition (physiological mechanisms)
Books in Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering
Boredom--see Individual Factors Affecting Performance (motivation and morale)
Braille Systems--see Tactile Coding
Breathing Capacity--see Physiological Capacities and Indices
Breathing Devices and Equipment--see also Masks; Underwater
Brightness
    comfort relation--see Visual (comfort and fatigue)
    discrimination--see Visual
    sky--see Light (natural)
Broad Band Blue Illumination--see Light (special types)
Buffeting--see Vibration (whole body)

C

Cabs, Truck--see Vehicle
Caffeine, Effects of--see Drugs
Caloric Intake--see Diet, Food, and Nutrition

Calorimetry--see Physiological Equipment and Methods (metabolic measurement)

Camouflage and Concealment

Canal Sickness--see Motion, Effects of (sickness)

Cardio-vascular Indices--see Physiological Capacities and Indices

Cards, Design of (e.g., data processing cards, E-Z Sort, etc.)

Cargo Handling Systems--see Supply Systems

Carrier Approach Light Systems--see Aircraft (landing and landing systems); Lighting Systems (outdoors)

Carriers--see Packs and Carriers

Cathode-Ray-Tube Displays--see Radar and other CRT Displays

Centers of Gravity--see Anthropometric Measures

Centrifuge--see Motion, Effects of (equipment and methods)

Channel Capacity--see Auditory (signals); Sensory (comparison); Visual (information processing)

Characters and Symbols, Design of--see Numerals, Letters, and Characters, Design of

Charts, Design of--see Maps and Charts, Design of

Check Lists--see Job Performance Aids

Chest Measurement--see Anthropometric Measures (body size and dimensions)

Choice Behavior--see Individual Factors Affecting Performance (thought processes)

Chopping--see Speech (distortion)

Chronophotography--see Motor Performance and Skills (equipment and methods)

Cinematography--see Films; Training Aids and Devices

Click-Pitch Threshold--see Audition (stimulus characteristics); Auditory (signals)

Climatic Chamber--see Environmental Conditions and Effects (equipment and methods)

Clipping--see Speech (distortion)

Closed Ecological Systems--see Space Flight Systems (sealed cabins)

Clothing

- Arctic ensembles and cold weather
- belts and fasteners
- body armor
- equipment and methods
- fabrics
- flight
- footgear
- general
- handgear
- headgear
- high altitude and anti-g
- noxious agents, protection (e.g., rocket fuel, liquid oxygen, etc.)
- radiation protection
- restrictive effects
- sizing, techniques of measurement
- space suits
- tests of--see equipment and methods, above
- thermal protection
- tropical ensembles
- underwater ensembles--see Underwater

Cochlear Response--see Audition (physiological mechanisms)

Cockpit Lighting--see Work Place Design (illumination)

Cockpits--see Aircraft (design)

Coding

- auditory signals--see Auditory (signals)
- color--see Color
- controls--see Controls
- kinesthetic--see Kinesthesis
- lights--see Light
- tactile--see Tactile Coding
- visual--see Visual

Cognitive Processes--see Individual Factors Affecting Performance (thought processes)
Cold Environments--see Environmental Conditions and Effects
Cold Weather Protective Clothing--see Clothing (Arctic ensembles and cold weather)
Collision, Mid-Air--see Safety
Color--see also Vision (color vision)
coding--see also Light; Visual
filters--see Optical Aids; Vision (equipment and methods)
lights--see Light
paints and finishes--see Paints, Finishes, and Surfaces
phenomena--see Vision (color vision)
preference--see Vision (color vision)
smokes--see Signaling Systems, Visual
systems (e.g., abridged systems, international XYZ system, etc.)--see Visual (standards and specifications)
Colorimetry--see Vision (equipment and methods)
Combat Information Centers, CIC--see Command and Control Systems
Combination Tones--see Audition (stimulus mixtures)
Comfort--see also Seats and Seating; Visual (comfort and fatigue)
Command and Control Systems
Communication and Information Theory
general
information assessment and processing
redundancy, uncertainty
Communication Systems
general
group--see Groups
nonverbal--see Auditory (displays, nonverbal); Tactile Coding
speech--see Speech
techniques for evaluation
Comparison of Sensory Channels--see Sensory (comparisons)
Compatibility, Stimulus-Response--see Control-Display Dynamics; Sensory (general)
Compensatory Tracking--see Tracking
Complexity of Work or Task--see Work and Task Performance
Complex Tones--see Audition (stimulus mixtures)
Compression and Expansion, Speech--see Speech (distortion)
Computers
data processing systems
design
general
man interaction
models and programs
simulation--see also Simulation and Simulators
systems component
Concept Formation-see Individual Factors Affecting Performance (thought processes); Training (basic learning data)
Confinement--see Prolonged Confinement
Console Design--see Panel and Console Design
Contact Analog Displays--see Displays (type)
Containers and Packaging
Contaminated Environments--see Environmental Conditions and Effects
Control-Display Dynamics
compatibility and motion stereotypes
feedback--see Tracking
general
integration
movement ratios
quickening--see also Tracking

Controller, Human--see Human
Controls
adjustments--see setting, precision, below
aided--see Tracking
aircraft
automatic
backlash, deadspace, and response lag
coding
combined (e.g., pushbutton on stick, ganged controls)
comparison of types
eye (as control mechanism)
force and time to activate
general
handgrips and handles
industrial (e.g., on machinery or equipment)
labeling--see Labels, Design of
linear movement
levers and sticks
pedals and rudder bars
push buttons and toggle switches
loading--see resistance, below
location and positioning
multiple-axis
remote handling
resistance (damping, inertia, friction, torque, etc.)
rotary movement
cranks and wheels
knobs
sensitivity and amplification--see Control-Display Dynamics (movement ratios)
setting, precision
ship and submarine controls--see Ship and Submarine
spacecraft--see Space Flight Systems
three-axis--see multiple-axis, above
vehicle controls (e.g., automobiles, tanks, etc.)--see Vehicle
Control Tower
design of workspace--see Air Traffic Control Systems
language--see Language Design
speech--see Speech (communication systems)
systems--see Air Traffic Control Systems
Convergence (of eyes)--see Visual (accommodation and convergence)
Correlation Techniques--see Mathematical and Statistical Methods
Cost Effectiveness Analysis--see Systems Design (techniques of analysis)
Counters--see Displays (type)
Crane Cabs--see Controls (industrial); Industrial (equipment, design of)
Cranking Movement--see Motor Performance & Skills (repetitive movements)
Cranks--see Controls (rotary movement)
Crash Impact and Survival--see Safety
Creativity--see Individual Factors Affecting Performance (thought processes)
Crews--see Groups
Critical
band analysis--see Ambient Noise (measurement); Speech (basic characteristics)
flicker frequency--see Flicker
incident technique--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Cross Modality Matching--see Psychophysics (methods); Sensory (interaction)
CRT Displays--see Radar and other CRT Displays

Cursors--see Radar and other CRT Displays (range and bearing scales and aids)

Cushions--see Seats and Seating

Cutaneous Communication Systems--see Tactile Coding

Cutaneous Sense--see Touch

Cybernetics

D

Damping--see Ambient Noise (reduction and control); Controls (resistance)

Dark Adaptation--see Visual (adaptation, pre-adaptation, and pre-exposure)

Data

- analysis--see Mathematical and Statistical Methods
- processing systems--see Computers

Daylight--see Light (natural)

Dazzle--see Flash (blindness); Visual (comfort and fatigue)

Deafness--see Ambient Noise (hearing loss)

Deceleration--see Motion, Effects of (acceleration and deceleration)

Decision Analysis--see Game and Decision Theory; Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Decision Making--see Command and Control Systems; Individual Factors Affecting Performance (thought processes)

Decision Theory--see Game and Decision Theory

Decompression Sickness--see Environmental Conditions and Effects (decompression)

Depth Perception--see Visual (perception)

Desert--see Clothing; Environmental Conditions and Effects (hot)

Detection, Auditory--see Auditory (skills)

Detection Theory--see also Psychophysics

Detection, Visual--see Visual (search and detection)

Dial and Scale Design--see Displays

Dial Setting--see Motor Performance and Skills (positioning movements)

Diet, Food, and Nutrition

Difference and Summation Tones--see Audition (stimulus mixtures)

Digital Displays--see Displays (type)

Dimensions

- body--see Anthropometric Measures
- furniture--see Furniture Design
- work place--see Work Place Design

Discriminability Scaling--see Psychophysics

Disorientation--see Orientation in Space, Factors Determining

Display-Control Dynamics--see Control-Display Dynamics

Displays

- auditory--see Auditory (displays, nonverbal)
- dial and scale design
- general
- location--see Panel and Console Design
- pointer design
- quickened--see Control-Display Dynamics; Tracking
- reading and interpretation problems
- size and shape
- type
  - airspeed indicators
  - altimeters
  - attitude indicators
  - combined displays (integrated)
  - comparison of types (e.g., outside-in vs. inside-out)
  - heading indicators
  - indicator and warning--see also Warning Devices
  - integrated displays--see combined displays, above

Displays

type (cont'd)

large displays (for viewing by more than one person, e.g., plot boards)

other (e.g., digital, kinalog, matrix, etc.)

polar coordinate

radar--see Radar and other CRT Displays

television--see Television

Distance Perception--see Visual (perception)

Distorted Vision--see Visual (field)

Diurnal Cycles

Door Handles--see Controls

Doors and Doorways--see Work Place Design (passageways)

Doppler Displays--see Auditory (displays, nonverbal)

Driving

analysis of

performance and skills

safety--see Safety

Drugs

Dummy and Mannikin Design

Dye Markers--see Signaling Systems, Visual

Dynamic Acuity--see Visual (acuity)

E

Ear

damage--see Ambient Noise (hearing loss)

defenders--see Auditory (devices)

muffs--see Auditory (devices)

plugs--see Auditory (devices)

protectors--see Auditory (devices)

EEG--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Ego-involvement--see Individual Factors Affecting Performance (motivation and morale)

Ejection Capsule--see also Escape from; Seats and Seating

Ejection Seats--see Escape from; Seats and Seating (ejection)

Elastic Resistance--see Controls (resistance)

Electrocardiogram--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Electroencephalogram--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Electroluminescence--see Instrument Lighting

Electromyograph--see Physiological Equipment and Methods (electrophysiological techniques)

Electronic Equipment--see Equipment (design and evaluation)

Electroretinogram--see Physiological Equipment and Methods (electrophysiological techniques); Vision (physiological mechanisms)

Emergency Lights--see Warning and Signal Lights

Emotion--see Individual Factors Affecting Performance

Empty Field Myopia--see Vision (effects of unusual environments)

Energy Expenditure--see Physiological Capacities and Indices

Engine Mufflers--see Ambient Noise (reduction and control)

Engine Noise--see Ambient Noise

Entrances--see Work Place Design (passageways)

Environmental Conditions and Effects--see also Stress

acclimatization--see tolerance, below

air conditioning--see Work Place Design (atmospheric control)

air velocity

atmospheric pressure (high altitude)

Environmental Conditions and Effects (cont'd)
climatic chamber--see equipment and methods, below
cold
decompression
equipment and methods
evaporative cooling
general
heating
hot (includes both desert and tropical environments)
humidity
ionized air
oxygen requirements
radiation
space--see Space Travel
temperature (room)
thermal radiation
tolerance, adaptation, acclimatization
altitude and pressure
cold
heat
weightlessness--see Space Travel; Weightlessness
toxic environments
ventilation
water--see also Underwater
windblast, airblast, windchill
Equipment
arrangement--see Work Place Design
design and evaluation (includes equipment not covered elsewhere, e.g., electronic equipment)
noise--see Ambient Noise
Equipment Used in Human Factors Research
Ergonomics--see General and Comprehensive References in Human Factors Engineering
Error
analysis--see Mathematical and Statistical Methods
equipment--see also Maintenance
human
Escape from
aircraft and spacecraft--see also Ejection Capsules; Seats and Seating (ejection)
other places
submarines--see Ship and Submarine
Exercise and Performance--see also Physical Fitness and Performance
Exits and Entrances--see Work Place Design (passageways)
Experimental Method--see Research Techniques in Human Factors Engineering
Explosive Decompression--see Environmental Conditions and Effects (decompression)
Eye
as Control Mechanism--see Controls
blink--see Motor Performance and Skills (involuntary reflexes)
dominance
fixation--see Panel and Console Design (spatial dynamics, frequency of use of components, and order of use); Printed Material, Legibility, and Readability
movement

F

Face Masks--see Masks
Face-to-Face Communication--see Speech (communication systems)
Facial Measurements--see Anthropometric Measures
Facilitation of Reception--see Sensory (interaction)

Facilities (Human Engineering)
Factor Analysis--see Mathematical and Statistical Methods
Factory Lighting--see Work Place Design (illumination)
Fallout, Radioactive--see Environmental Conditions and Effects (radiation)
Fatigue--see Auditory (aftereffects of stimulation); Exercise and Performance; Sleep and Performance; Visual (comfort and fatigue); Work and Task Performance
Fear--see Individual Factors Affecting Performance (emotion)
Feedback
    delayed auditory--see Auditory (signals)
    delayed speech--see Speech (distortion)
    sensory feedback--see Sensory (feedback)
    theory--see Cybernetics
    tracking--see Tracking (feedback)
    training--see Training (basic)
Field of View, Work Place--see Work Place Design (visibility, field of view)
Figural Aftereffects--see Visual (aftereffects, afterimages); Kinesthesis
Films
    display use
    general, human factors--see General and Comprehensive References in Human Factors Engineering
    research, use in--see Research Techniques in Human Factors Engineering
    training--see Training Aids and Devices
Filters
    auditory--see Auditory (equipment)
    optical--see Optical Aids; Vision (equipment and methods)
Fire Fighting
    clothing--see Clothing (thermal protection)
    equipment--see also Vehicle
Fitness, Physical--see Physical Fitness and Performance
Fixtures, Lighting--see Work Place Design (illumination)
Flares--see Lighting Systems (outdoors); Signaling Systems, Visual; Warning and Signal Lights
Flash
    blindness
    rate--see also Repetitive Stimulation (visual)
    visibility--see also Warning and Signal Lights
Flesch Reading Ease Formulas--see Printed Material, Legibility, and Readability
Flexibility of Movement--see Anthropometric Measures
Flicker
Flight
    control systems--see Controls
    guidance systems
    performance and skills--see also Low Level, High Speed Flight
    safety--see Safety (air)
    simulation (includes spaceflight)
    testing
    training--see Training (specific types)
Floodlights--see Lighting Systems (outdoors)
Flow Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; Work Place Design
Fluorescent and Luminous Materials
Flybar--see Auditory (displays, nonverbal)
Fog, Haze, Smog, and Smoke
Food--see Diet, Food, and Nutrition
Foot
    dimensions--see Anthropometric Measures
    gear--see Clothing
Form Perception--see Visual (perception)
Free Fall--see Motion, Effects of (acceleration and deceleration)
Frequency
    distortion--see Speech (distortion)
    modulators--see Auditory (equipment)

Frictional Resistance--see Controls (resistance)

Frostbite--see Environmental Conditions and Effects (cold)

Function Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Furniture Design--see also Seats and Seating

G

G Forces--see Motion, Effects of (acceleration and deceleration)

Gain--see Control-Display Dynamics (movement ratios)

Galvanic Skin Response--see Physiological Capacities and Indices

Galvanometer--see Physiological Equipment and Methods (other methods and equipment)

Game and Decision Theory

Gases--see Environmental Conditions and Effects

Gas Masks--see Masks

General and Comprehensive References in Human Factors Engineering

- articles and reports
- bibliographies
- books
- films
- handbooks
- symposia and conferences

Glare--see Flash (blindness); Visual (comfort and fatigue)

Glasses--see Optical Aids

Gloves--see Clothing (handgear)

Goggles--see Optical Aids

Graphs and Tables, Design of

Gravitational Forces--see Motion, Effects of (acceleration and deceleration)

Gravity, Centers of--see Anthropometric Measures

Grenades--see Weapons Systems, Design of (handheld)

Grips--see Controls

Grip Strength--see Anthropometric Measures (muscular strength)

Ground Support Equipment--see also Space Flight Systems; Weapons Systems, Design of

Grouping of Components--see Panel and Console Design (layout)

Groups

- air crews
- communication
- evaluation
- general
- infantry squads
- interaction
- leadership
- missile crews
- morale
- performance
- research techniques
- selection
- ship and submarine crews
- size and structure
- space crews
- tank crews
- theory
- training--see Training

Gunnery Training--see Training (specific types)

Gustation--see Smell and Taste

Gust scale--see Smell and Taste

H

Habitability--see Prolonged Confinement; Ship and Submarine; Space Flight Systems (sealed cabins)
Hand
- dimensions--see Anthropometric Measures
- grips--see Controls
- signals--see Signaling Systems, Visual
- strength--see Anthropometric Measures
- tools, design of--see Tools, Design of
- wheels--see Controls (rotary movement)

Handbooks--see General and Comprehensive References in Human Factors Engineering
Handbooks, Manuals, Texts, Design of
Handedness--see Motor Performance and Skills
Hand Grenades--see Weapons Systems, Design of (handheld)
Handgear--see Clothing
Handles--see Controls
Harnesses--see Belts, Harnesses, and other Restraining Devices
Hats--see Clothing (headgear)
Headphones--see Auditory (equipment)
Head Size--see Anthropometric Measures
Hearing
- aids--see Auditory (devices)
- conservation program--see Ambient Noise (reduction and control)
- loss--see Ambient Noise; Audition (anomalies and individual differences); Speech (audiometric testing)

Heart Rate--see Physiological Capacities and Indices
Heat--see Environmental Conditions and Effects
Heated Suits--see Clothing (thermal protection)
Heating--see Environmental Conditions and Effects
Heat Loss--see Physiological Capacities and Indices (temperature, body)
Helicopters
Helmets--see Clothing (headgear)
High Altitude--see Environmental Conditions and Effects (atmospheric pressure)
Highway Lighting--see Lighting Systems (outdoors)
Highway Research--see also Safety (motor vehicle and highway); Traffic
Hot Weather Clothing--see Clothing (tropical ensembles)
Hot Weather Environments--see Environmental Conditions and Effects
Houses, Dwellings, and Shelters, Design of
Hue--see Vision (color vision)
Human
- controller (general discussion of man as a control mechanism)
- error--see Error
- information processing capabilities (includes reception and transmission)
- transfer functions

Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering
Humidity--see Environmental Conditions and Effects
Hyperopia--see Visual (anomalies and individual differences)
Hypodynamics--see Sensory (deprivation); Weightlessness
Hypoxia--see Environmental Conditions and Effects (oxygen requirements)

I

ICAO Phonetic Alphabet--see Language Design
Ideal Observer--see Detection Theory; Psychophysics (theory)
Illumination--see Instrument Lighting; Light; Lighting Systems; Vision; Visual; Work Place Design
Illusions, Perceptual--see Perception (illusions)
Image Interpretation, Photographic--see Photographs, Photography, and Photointerpretation

Immersion Suits--see Underwater (clothing and equipment)

Impaired Hearing--see Ambient Noise (hearing loss); Audition (anomalies and individual differences)

Incentives--see Individual Factors Affecting Performance (motivation and morale)

Indicator and Warning Lights--see Displays (type); Warning and Signal Lights

Indicators and Scales--see Displays (dial and scale design)

Individual Factors Affecting Performance

- acceptability of and attitude toward equipment and tasks
- alertness
- aptitude and intelligence
- emotion
- fatigue and behavior decrement--see Work and Task Performance
- general
- motivation and morale
- personality
- set and attention
- thought processes

Industrial

- deafness--see Ambient Noise (hearing loss)
- equipment, design of
- noise--see Ambient Noise (level)
- safety--see Safety (industrial)

Industry and Business, Human Factors Oriented Studies

Inertial Resistance--see Controls (resistance)

Infantry

- squads--see Groups
- training--see Training (specific types)

Information--see also Communication Systems

- analysis--see Communication and Information Theory
- processing, human--see Human
- reception, human--see Human
- storage and retrieval systems
- theory--see Communication and Information Theory
- transmission, human--see Human

Infrared Devices--see Light (special types)

Inhibition of Reception--see Sensory (interaction)

Injuries, Analysis of--see Safety

Input Channel, Comparison--see Sensory (comparison)

Input Channel, Interaction--see Sensory (interaction)

Instructions, Effects on Task Performance--see Individual Factors Affecting Performance (set and attention); Training (basic learning data)

Instrument Lighting--see also Light; Work Place Design (illumination)

- color and intensity of illumination
- direct lighting and floodlighting
- edge and ring
- electroluminescent
- general
- rear (transillumination)

Intelligence--see Individual Factors Affecting Performance

Intelligence Testing--see Tests and Testing

Intelligibility--see Speech

Interaural Phase Cues--see Audition (sound localization)

Intercom Systems--see Speech (communication systems)

International Language--see Language Design

Interpersonal Behavior--see Social Interaction; Groups (interaction)

Intersensory Effects--see Sensory (interaction)

Interval Scaling--see Psychophysics (scaling)

Interview Technique--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems (other methods)

Involuntary Reflexes--see Motor Performance and Skills

Ionized Air--see Environmental Conditions and Effects

Irradiation, Cosmic and Nuclear--see Environmental Conditions and Effects (radiation)

Isolation--see Prolonged Confinement; Sensory (deprivation)

J

Job Description and Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Job Performance Aids

Judgment--see Individual Factors Affecting Performance (thought processes)

Judgment, Psychophysical--see Psychophysics

K

Keyboard Design--see Panel and Console Design

Kinesiology--see Anthropometric Measures

Kinesthesis

- coding
- feedback--see Sensory (feedback)
- general

Knapsacks--see Packs and Carriers

Knobs--see Controls (rotary movement)

Knowledge of Results--see Individual Factors Affecting Performance (motivation and morale); Training (basic learning data)

L

Labels, Design of

Landing Systems--see Aircraft

Language Design (includes special alphabets and languages, context, synthetic speech and equipment)--see also Speech (basic characteristics)

Lasers--see Environmental Conditions and Effects (radiation); Light (special types)

Lateral G--see Motion, Effects of (acceleration and deceleration)

Layout, Panels and Consoles--see Panel and Console Design; Work Place Design (arrangement of equipment and men)

Leadership--see Groups

Learning--see Training

Legibility--see Numerals, Letters, and Characters, Design of; Printed Materials, Legibility, and Readability; Signs, Design of

Leg Measurement--see Anthropometric Measures

Lenses--see Optical Aids; Vision (equipment and methods)

Letter Design--see Numerals, Letters, and Characters, Design of

Levers--see Controls (linear movement)

Life Jackets--see Controls (linear movement)

Life Support Systems--see Ship and Submarine (habitability); Space Flight Systems

Lifting--see Anthropometric Measures (muscular strength and endurance)

Light

- adaptation--see Visual (adaptation, pre-adaptation, and pre-exposure)
- coding--see also Aircraft (lighting, exterior); Ship and Submarine; Warning and Signal Lights
- colored
- general
- low level--see Vision (low level illumination)
- measurement and specification--see also Visual (standards and specifications)
- natural (i.e., daylight, high altitude, sky brightness, etc.)--see also Vision (effects of unusual environments)

Light (cont'd)
physical characteristics
signal--see Warning and Signal Lights
special types (i.e., black, broad band blue, infrared, polarized, ultraviolet)
Lighting Systems
aircraft--see Aircraft
indoors--see Work Place Design (illumination)
instrument--see Instrument Lighting
outdoors
airport
flares
floodlights and searchlights
general
highway and street
ships and summarines--see Ship and Submarine
workplace--see Work Place Design (illumination)
vehicle--see Vehicle
Limb Coordination--see Motor Performance and Skills
Limb Flexibility--see Anthropometric Measures
Linearity of Human Operator--see Human (transfer functions)
Linguistics--see Language Design; Speech (basic characteristics)
Link Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Listening--see Speech (perception)
Load Carrying--see Anthropometric Measures (muscular strength and endurance); Work and Task Performance (capacity for production)
Load Stress--see Work and Task Performance (complexity)
Localization, Auditory--see Audition (sound localization)
Logistics--see also Game and Decision Theory
Loudness--see Audition (stimulus characteristics)
adaptation--see Audition (aftereffects of stimulation)
binaural vs. monaural--see Audition
coding--see Auditory (signals)
recruitment phenomena--see Audition (recruitment)
scales--see Audition (psychophysical scales)
summation--see Audition (stimulus characteristics)
Loudspeakers--see Auditory (equipment)
Low Level, High Speed Flight
Low Level Illumination--see Vision
Luminosity Curves--see Visual (thresholds)

M

Machine Noise--see Ambient Noise (level)
Machine Recognition (includes pattern and character recognition)--see also Computers
Machine Translation--see Translating Devices
Magnitude Estimation--see Psychophysics (methods)
Maintenance
behavior, strategies
design for
diagrams--see Job Performance Aids
equipment
general
systems
training--see Training (specific types)
Management--see Personnel; Systems Design (techniques of analysis)
Man-Assist

Mannikin Design--see Dummy and Mannikin Design
Manual Controls--see Controls
Manual Dexterity--see Motor Performance and Skills
Manuals, Design of--see Handbooks, Manuals, Texts, Design of
Maps and Charts, Design of
Marksmanship--see also Training (specific types)
Masking
    auditory--see Auditory; Speech
    odor--see Environmental Conditions and Effects; Smell and Taste
    visual--see Visual (masking and interference)
Masks
Master Slave Manipulator--see Controls (remote handling)
Mathematical and Statistical Methods
Mathematical Models--see Computers; Mathematical and Statistical Methods
Melodic Patterns--see Audition (auditory patterns and meaning)
Mel Scale--see Audition (psychophysical scales)
Memory--see Retention; Training (basic learning data)
Men vs. Machines--see Assignment of Function to Men and Machines in Systems
Message Transmission--see Communications Systems; Speech (communication systems)
Metabolic Rate--see Physiological Capacities and Indices
Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
    critical incident technique
    decision analysis
    experimental methods--see Research Techniques in Human Factors Engineering
    general
    job and task description and analysis
    operations research
    other methods
    photographic techniques
    queueing
    system analysis--see System Design (techniques of analysis)
    task description and analysis--see job, above
    time and motion study
Micro Motion Study--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Microphones--see Auditory (equipment)
Mid-Air Collision--see Safety
Military Standards and Specifications
Miniaturization, Equipment--see also Equipment (design and evaluation)
Missile Noise--see Ambient Noise (level)
Missiles--see Weapons Systems, Design of (large-scale)
Mittens--see Clothing (handgear)
Mock-Ups--see Simulation and Simulators; Training Aids and Devices (mock-ups and models)
Models--see Computers; Mathematical and Statistical Methods
Monaural Stimulation--see Audition (binaural vs. monaural)
Monitoring Performance--see Vigilance and Monitoring (performance)
Monotonous Environments--see Sensory (deprivation)
Monte Carlo Methods--see Mathematical and Statistical Methods
Morale--see Individual Factors Affecting Performance (motivation and morale)
Morse Code Training--see Training (specific types)
Motion, Effects of
    acceleration and deceleration
        general
        protection
        tolerance
        types

Motion, Effects of (cont'd)
equipment and methods
general
perception of--see Perception
rotation and oscillation (includes amplitude and frequency)
sickness
vestibular functioning--see also Vestibular Function
vibration, whole body--see Vibration
Motion Pictures--see Films; Training Aids and Devices
Motivation--see Individual Factors Affecting Performance; Training (basic learning data)
Motor Performance and Skills
aiming
coordination of limbs
dimensional analysis
equipment and methods
general
handedness
involuntary reflexes
learning--see Training (specific types)
manual dexterity
positioning movements
reaction time--see Reaction Time and Refractory Period
repetitive movements (includes cranking and tapping)
serial movements
speed and precision
steadiness and tremor
tests of--see Tests and Testing
throwing
tracking--see Tracking
Motor Vehicle--see Vehicle
Movement
perception
bodily--see Perception
visual--see Visual (perception)
ratio, controls--see Control-Display Dynamics
restrictive effects of clothing--see Clothing (restrictive effects)
stereotypes--see Control-Display Dynamics
Multi-Channel Listening--see Auditory (displays, nonverbal); Speech
Multiple Image Photography--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Muscle Potential--see Physiological Capacities and Indices
Muscular Endurance--see Anthropometric Measures; Work and Task Performance
Muscular Strength--see Anthropometric Measures
Myopia--see Visual (anomalies and individual differences)

N

Narcosis, Deep Sea Divers--see Underwater (oxygen and pressure requirements)
NATO Phonetic Alphabet--see Language Design
Natural Ambient Illumination (daylight)--see Light (natural)
Navigational Aids and Systems--see also Space Flight Systems
Negative G--see Motion, Effects of (acceleration and deceleration)
Neural Theory
Night Blindness--see Visual (anomalies and individual differences)
Night Vision--see Vision (low level illumination)

Noise

auditory--see Ambient Noise

field--see Ambient Noise (measurement)

masking--see Auditory; Speech

meters--see Ambient Noise (equipment and methods)

reduction--see Ambient Noise

visual--see Visual (masking and interference)

Noxious Odors--see Environmental Conditions and Effects; Smell and Taste

Nuclear Operated Equipment and Systems, Problems of

Numerals, Letters, and Characters, Design of--see also Printed Material, Legibility, and Readability

Nutrition--see Diet, Food, and Nutrition

Nystagmus--see Eye (movement); Vision (effects of unusual environments)

O

Obstacle Perception by Blind--see Audition (sound localization)

Oculogravic Effect--see Orientation in Space, Factors Determining; Perception (illusions)

Oculogyral Illusion--see Orientation in Space, Factors Determining; Perception (illusions)

Odorants--see Smell and Taste

Office Lighting--see Work Place Design (illumination)

Olfaction--see Smell and Taste

Operations Research--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; Systems Design

Operator Opinion--see Individual Factors Affecting Performance (acceptability of and attitude toward equipment and tasks); Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Operator Position, Effects on Work Space Design--see Work Place Design

Opinion Survey--see Tests and Testing (motivation and opinion)

Optical Aids

binoculars

general

glasses, spectacles, and goggles (includes contact lenses)

lenses and filters

periscopes

range finders

sights and reticles

telescopes

visors

Orientation in Space, Factors Determining

Outdoor Lighting Systems--see Lighting Systems (outdoor)

Overlays--see Radar and other CRT Displays

Oxygen

consumption--see Physiological Capacities and Indices

devices--see Breathing Devices and Equipment

masks--see Masks

requirements--see Environmental Condtions and Effects

toxicity--see Environmental Conditions and Effects

P

Paced Work--see Work and Task Performance (pacing)

Packaging--see Containers and Packaging; for food--see Diet, Food, and Nutrition

Packboards--see Packs and Carriers

Packs and Carriers

Pain

Paints, Finishes, and Surfaces

Palmar Resistance--see Physiological Capacities and Indices (galvanic skin response)

Panel and Console Design

aircraft and spacecraft

general

keyboard design

layout (includes grouping of components, orientation to operator, visual factors, limits of work area, etc.)

ships and submarines--see Ship and Submarine (controls, displays, and instrument panel design)

spacing between components--see layout, above

spatial dynamics, frequency of use of components, and order of use

vehicles--see Vehicle (controls, displays, and instrument panel design)

Parachutes

Parallax--see Displays (reading and interpretation problems)

Passageways--see Work Place Design

Pattern Perception--see Machine Recognition; Visual (perception)

Patterns of Communication--see Communication Systems; Groups (communication)

Pedals--see Controls (linear movement)

Peer Rating--see Personnel (assessment)

Perception--see also specific sensory categories

general

illusions

isolation--see Sensory (deprivation)

of body movement and position--see also Orientation in Space, Factors Determining

theory

time--see Time (perception)

Performance Aids--see Job Performance Aids

Peripheral Vision--see Visual (field)

Periscopes--see Optical Aids

Personality and Performance--see Individual Factors Affecting Performance

Personnel--see also Tests and Testing; Training

assessment

classification and assignment

evaluation--see assessment

general

management

selection

subsystem concepts

PERT (Program Evaluation and Review Technique)--see Systems Design (techniques of analysis)

Pharmacology--see Drugs

Phonetic Alphabet--see Language Design

Phonetic Analysis--see Speech (basic characteristics)

Phorias--see Visual (anomalies and individual differences)

Photic driving--see Physiological Equipment and Methods (electrophysiological techniques); Repetitive Stimulation, Effects of (visual)

Photographs, Photography, and Photo Interpretation

Photometry--see Vision (equipment and methods)

Physical Fitness and Performance--see also Exercise and Performance

Physical Stress--see Stress

Physiological Capacities and Indices

acclimatization--see also Environmental Conditions and Effects

breathing

cardio-vascular indices

electroencephalogram

electroretinogram--for technique, see Physiological Equipment and Methods; for data, see Vision (physiological mechanisms)

energy expenditure

galvanic skin response

general

Physiological Capacities and Indices (cont'd)

heart rate

metabolic rate

muscle potential

oxygen consumption

physical fitness

temperature, body (also includes thermal sensitivity, heat loss)

Physiological Equipment and Methods

electrophysiological techniques

general

metabolic measurement (includes calorimetry, respiratory, pulmonary, blood composition, heat balance, etc.)

other equipment and methods

telemetry--see also Space Flight Systems

Physique--see Anthropometric Measures

Pictorial Displays--see Displays

Pilot--see Flight

Pitch--see Audition (stimulus characteristics)

coding--see Auditory (signals)

shifts--see Audition (aftereffects of stimulation)

Plane of Controls Relative to Operator--see Panel and Console Design (layout)

Plotting Boards, Design of--see Displays (type)

Pointer Design--see Displays

Polar Coordinate Displays--see Displays (type)

Polarization, Light--see Light (special types)

Portability, Design for

Positioning Movements--see Motor Performance and Skills

Positioning of Components on Panels and Consoles--see Panel and Console Design (layout)

Positive G--see Motion, Effects of (acceleration and deceleration)

Posture--see Anthropometric Measures

PPI Display--see Radar and other CRT Displays

Predictor Instrument--see Displays (type)

Preferences--see Individual Factors Affecting Performance (acceptability of and attitude toward equipment and tasks)

Preference Testing--see Tests and Testing

Pressure Chambers--see Environmental Conditons and Effects (equipment and methods)

Pressure Suits--see Clothing

Printed Material, Legibility, and Readability--see also Numerals, Letters, and Characters, Design of; specific types (e.g., cards, graphs, maps)

Probabilistic Model--see Mathematical and Statistical Methods

Probability Learning--see Training (basic learning data)

Probability Theory--see Mathematical and Statistical Methods

Problem Solving Behavior--see Group (performance); Individual Factors Affecting Performance (thought processes)

Process Charts--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Proficiency Testing--see Tests and Testing

Programmed Instruction--see also Training Aids and Devices (teaching machines)

Prolonged Confinement--see also Sensory (deprivation)

Prolonged Performance--see Work and Task Performance

Prolonged Performance, Visual--see Vigilance and Monitoring (performance); Visual (comfort and fatigue)

Prone Position, Effects on Work Space Design--see Work Place Design

Proprioception--see Kinesthesis

Prosthetics

Protective Clothing--see Clothing

Protective Devices, Visual--see Optical Aids

Pseudophones--see Audition (equipment and methods)

Psychogalvanic Response--see Physiological Capacities and Indices

Psychogalvanometer--see Physiological Equipment and Methods (electrophysiological techniques)

Psycholinguistics--see Language Design; Speech (basic characteristics)

Psychological Stress--see Stress

Psychometrics--see Tests and Testing

Psychomotor Skills--see Motor Performance and Skills

Psychopharmacology--see Drugs

Psychophysical Scaling--see Psychophysics

Psychophysics--see also Detection Theory

- general
- methods
- scaling
- theory

Public Address Systems--see Speech (communication systems)

Punch Cards, Design of--see Cards, Design of

Pursuit Apparatus--see Motor Performance and Skills (equipment and methods); Tracking (equipment and methods)

Push Buttons--see Controls (linear movement)

Q

Q-Sort--see Tests and Testing (personality and sociometric)

Quality Control

Quantitative and Qualitative Personnel Requirements Information (QQPRI)--see Personnel (subsystems concepts)

Questionnaires--see Tests and Testing

Queueing Theory--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Quickening--as a principle--see Control-Display Dynamics; used for Tracking--see Tracking

R

Radar and other CRT Displays

- fatigue--see Visual (comfort and fatigue)
- general
- noise and clutter
- operator performance--see also Vigilance and Monitoring (performance); Visual (search and detection)
- overlays
- range and bearing scales and aids
- screen
  - brightness
  - orientation and angle of mounting
  - size and shape
- signal characteristics (e.g., pip brightness)
- signal detectability
- simulation
- symbology
- television--see Television Displays
- types (e.g., three dimensional, alphanumeric, etc.)

Radar Room Lighting--see Light (special types); Work Place Design (illumination)

Radar Training--see Training (specific types)

Radial Acceleration--see Motion, Effects of (acceleration and deceleration)

Radiation--see Environmental Conditions and Effects

Radiation Protective Clothing--see Clothing

Radio Range--see Auditory (displays, nonverbal)

Radio Systems--see Speech (communication systems)

Railroads--see Transportation Systems

Range Finder--see Optical Aids

Rate-Aided Controls--see Tracking

Rating Scales--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; as a psychophysical technique--see Psychophysics (scaling)

Rations--see Diet, Food, and Nutrition

Ratio Scales--see Psychophysics (scaling)

Reach--see Anthropometric Measures (extent and flexibility of limb movement)

Reaction Time and Refractory Period

Readability, Assessment of--see Printed Material, Legibility, and Readability

Reading

Reading Devices for Blind--see Auditory (devices)

Reconnaissance--see Surveillance Systems; Visual (search and detection)

Recruitment Phenomena--see Audition

Red Illumination--see Light (special types)

Redout--see Motion, Effects of (acceleration and deceleration)

Redundancy--see Communication and Information Theory

Refractory Period--see Reaction Time and Refractory Period

Reliability

- equipment
- human
- systems

Remote Handling--see Controls

Repetitive and Rhythmic Movements--see Motor Performance and Skills

Repetitive Stimulation, Effects of

- auditory--see Audition (repetitive stimulation)
- other
- visual--see also Flash; Flicker

Repetitive Work--see Work and Task Performance

Rescue Equipment--see also Sea (rescue)

Research Techniques in Human Factors Engineering

Respiration--see Physiological Capacities and Indices

Respiratory Measurement Devices--see Physiological Equipment and Methods (metabolic measurement)

Rest Periods--see Work and Task Performance (length and distribution of work and rest periods)

Restraining Devices--see Belts, Harnesses, and other Restraining Devices

Retention--see also Training (basic learning data)

- long-term
- short-term

Reward--see Individual Factors Affecting Performance (motivation and morale); Training (basic learning data)

Rifle Recoil--see Stress; Weapons Systems, Design of (handheld)

Rifles--see Weapons Systems, Design of (handheld)

Risk-Taking Behavior--see Game and Decision Theory; Individual Factors Affecting Performance (thought processes); Subjective Probability

Rocket Noise--see Ambient Noise (level)

Rotary Movement Controls--see Controls

Runway Design--see Aircraft (landing and landing systems)

S

Safety--see also Escape from

- accidents, analysis of
- air
- crash impact
- general
- industrial

Safety (cont'd)
motor vehicle and highway
sea--see also Sea (rescue)
shielding
Sampling Theory--see Mathematical and Statistical Methods
Satellites--see Space Flight Systems
Scale Design--see Displays (dial and scale design)
Scaling, Psychological--see Psychophysics (scaling)
Scheduling--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Scotopic Vision--see Vision (low level illumination)
Scramblers--see Auditory (equipment)
Sea
craft, design of--see Ship and Submarine
markers--see Signaling Systems, Visual
rescue (includes equipment)--see also Rescue Equipment; Visual (search and detection)
sickness--see Motion, Effects of
Search, Auditory--see Auditory (skills)
Searchlights--see Lighting Systems (outdoors)
Search, Visual--see Visual
Seats and Seating
belts--see Belts, Harnesses, and other Restraining Devices
body supports (includes bedding)
comfort
ejection--see also Ejection Capsules; Escape from (aircraft)
general
Selection--see Personnel (selection)
Self-Paced Work--see Work and Task Performance (pacing)
Sensation Scales--see Psychophysics
Sensory
comparison (i.e., comparison of one input channel with another)
deprivation--see also Prolonged Confinement
feedback
general
interaction (i.e., effects of stimulation in one modality on perception in another; includes facilitation and inhibition)
overload--see comparison, above
Sequence Diagrams--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Serial Movements--see Motor Performance and Skills
Servo Theory--see Cybernetics
Set--see Individual Factors Affecting Performance; Perception; Training (basic learning data); Vigilance and Monitoring
Sex Comparisons
Shape Coding--see Controls (coding); Tactile Coding
Shelters--see Houses, Dwellings, and Shelters, Design of
Shielding--see Ambient Noise (reduction and control); Safety
Ship and Submarine
communication systems--see Auditory (displays, nonverbal); Speech
controls, displays, and instrument panel design
crews--see Groups
escape systems
general
habitability (includes life support systems)
lighting systems
noise--see Ambient Noise (level)
Shivering--see Motor Performance and Skills (involuntary reflexes)
Shoes--see Clothing (footgear)

Sickness, Motion--see Motion, Effects of

Sidetones--see Speech (distortion)

Sights and Reticles, Design of--see Optical Aids

Signal Detection Theory--see Detection Theory

Signaling Systems, Visual (e.g., hand signals, flags, smokes, dyes, flares)

Signal Lights--see Warning and Signal Lights

Signal-to-Noise Ratio--see Auditory (signals); Speech (distortion)

Signs, Design of--see also Traffic (signs and signals)

Simulation and Simulators--see also Computers

Sirens--see Auditory (displays, nonverbal)

Size Perception--see Visual (perception)

Skin Temperature--see Physiological Capacities and Indices (temperature, body)

Slave Manipulator--see Controls (remote handling)

Sleep

- physiological indices
- work and performance

Sleep Deprivation--see Sleep

Sleeping Bags

Small Groups--see Groups

Smell and Taste

Smoke

- concealment--see Fog, Haze, Smog, and Smoke
- signaling devices--see Signaling Systems, Visual

Smoking, Effects of--see Drugs

Social Interaction--see also Groups (interaction)

Sociometric Assessment--see Personnel (assessment)

Somatotyping--see Anthropometric Measures

Somesthetic Sense--see Kinesthesis; Pain; Physiological Capacities and Incides (temperature, body); Touch

Sonar--see Auditory (displays, nonverbal)

- listening--see Auditory (skills)
- training--see Training (specific types)

Sone Scale--see Audition (psychophysical scales)

Sonic Vibrations, Effects on Man--see Ambient Noise (effects on performance)

Sorting Systems--see Information (storage and retrieval systems); Mathematical and Statistical Methods

Sound

- absorbers--see Ambient Noise (reduction and control)
- localization--see Audition (sound localization)

Space Flight Systems

- capsule design
- closed ecological system--see sealed cabin, below
- communication
- control and display systems
- crews--see Groups
- general
- ground support
- life support--see sealed cabin, below
- navigation
- panel and console design--see Panel and Console Design
- sealed cabin
- simulation--see Flight
- suits--see Clothing
- telemetry--see also Physiological Equipment and Methods
- training--see Training (specific types)

Space Travel--see also Motion, Effects of; Weightlessness

- behavioral effects

Space Travel (cont'd)
- biomedical problems
- equipment and tools (includes feeding)
- general
- maneuvers and performance (docking, controlled flight, re-entry, work, etc.)
- physiological effects
- visual problems--see also Vision (effects of unusual environments)

Span of Attention--see Individual Factors Affecting Performance (set and attention)
Spatial Orientation--see Orientation in Space, Factors Determining
Speaking, Individual Differences
- general
- nationality
- sex

Speech
- articulation and intelligibility tests
- audiometric testing
- basic characteristics
  - information analysis
  - phonetic and phonemic analysis
  - spectral analysis
- communication systems
  - aircraft
  - face-to-face
  - general
  - intercom, radio, and telephone
  - multi-channel
  - other
  - ship and submarine
  - spacecraft--see Space Flight Systems
  - vehicle
- distortion
  - amplitude modulation
  - chopping, clipping
  - compression and expansion
  - delayed feedback
  - environmental effects (e.g., high altitude)
  - equipment, effects on (e.g., masks)
  - frequency
  - other
  - sidetones
  - signal-to-noise
- equipment and methods
- general
- intelligibility--see articulation and intelligibility testing, above; perception, below
- masking
  - noise
  - pure tone
  - simultaneous speech
- perception
- recognizers
- training--see Training (specific types)

Speed and Acceleration--see Motion, Effects of
Speed of Movement--see Motor Performance and Skills
Speed Stress--see Work and Task Performance (accuracy and speed requirements)
Statistical Methods--see Mathematical and Statistical Methods

Stature--see Anthropometric Measures

Steadiness--see Motor Performance and Skills

Stereophonic Sound--see Audition (sound localization)

Stereoscopic Acuity--see Visual (acuity)

Stereoscopic Vision--see Visual

Sterotypes, Motion--see Control-Display Dynamics

Stick Controls--see Controls (linear movement)

Stick Forces--see Controls (resistance)

Stochastic Methods and Models--see Mathematical and Statistical Methods

Stowage, Design for--see Work Place Design (area requirements)

Strategies--see Game and Decision Theory

Street Lighting--see Lighting Systems (outdoors)

Strength--see Anthropometric Measures

Stress

- general
- physiological indices
- psychological indices

Subjective Magnitude--see Psychophysics

Subjective Probability--see also Game and Decision Theory

Sublingual Stimulation--see Perception

Submarine--see Ship and Submarine

Suits--see Clothing

Supine Position, Effects on Work Space Design--see Work Place Design

Supply Systems

Supports, Body--see Belts, Harnesses, and other Restraining Devices; Seats and Seating

Surveillance Systems--see also Visual (search and detection)

Survey Methods--see Tests and Testing

Survival

- equipment
- in unusual environments
- rations--see Diet, Food, and Nutrition

Sweating--see Physiological Capacities and Indices (temperature, body)

Swing Test--see Motion, Effects of (equipment and methods)

Switches--see Controls (linear movement)

Symbolic Displays--see Displays

Symbols, Design of--see Numerals, Letters, and Characters, Design of; Printed Material, Legibility, and Readability

Symposia and Conferences--see General and Comprehensive References in Human Factors Engineering

Synthetic Speech--see Language Design

Systems Design

- components--see specific categories, (e.g., Aircraft, Computers, Communication Systems, Radar and other CRT Displays, etc.)
- general
- techniques of analysis--see also Mathematical and Statistical Methods; Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
  - evaluation
  - general
  - management and cost
  - reliability--see Reliability (systems)
  - simulation--see Simulation and Simulators
- theory--see also specific categories, (e.g., Communication and Information Theory, Game and Decision Theory, etc.)

Tables and Graphs--see Graphs and Tables
Tactile Coding
Tank Crews--see Groups
Tanks--see Vehicle
Tapping Movements--see Motor Performance and Skills (repetitive movements)
Target Detection
    auditory--see Auditory (skills)
    visual--see Visual (search and detection)
Task Description and Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
Task Performance--see Work and Task Performance
Taste--see Smell and Taste
Teaching Machines--see Programmed Instruction; Training Aids and Devices
Teams--see Groups
Telegraphic Systems--see Auditory (displays, nonverbal)
Telemetry--see Physiological Equipment and Methods; Space Flight Systems
Telephone Systems--see Speech (communication systems)
Telescopes--see Optical Aids
Television Displays--see also Training Aids and Devices
Temperature--see Environmental Conditions and Effects
    body--see Physiological Capacities and Indices
    sensitivity--see Physiological Capacities and Indices
Temporal Characteristics of Light--see Flash; Flicker; Light
Temporal Discrimination--see Time (perception)
Temporal Patterns, Sound--see Audition (auditory patterns and meaning)
Tents--see Houses, Dwellings, and Shelters, Design of
Tests and Testing
    ability--see proficiency, below
    aptitude and intelligence
    construction
    general
    motivation and opinion
    personality and sociometric
    preference
    proficiency (e.g., job skill tests)
    psychomotor abilities
    selection
Textbooks in Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering
Texts, Design of--see Handbooks, Manuals, Texts, Design of
Texture Coding--see Tactile Coding
Thermal
    environments--see Environmental Conditions and Effects
    protective ensembles--see Clothing
    radiation--see Environmental Conditions and Effects
    sensitivity--see Physiological Capacities and Indices (temperature, body)
Thought Processes--see Individual Factors Affecting Performance
Throwing--see Motor Performance and Skills
Tilt, Perception of--see Orientation in Space, Factors Determining; Vestibular Function
Timbre--see Audition (stimulus characteristics)
Time
    delay constants--see Controls (backlash, deadspace, and response lag)
    error (audition)--see Audition (aftereffects of stimulation)
    motion study--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Time (cont'd)
perception
sharing
Tinnitus--see Audition (aftereffects of stimulation)
Tobacco--see Drugs
Toggle Switches--see Controls (linear movement)
Tones (pure and complex)--see Audition
Tools, Design of
Torque--see Controls (resistance)
Touch
coding--see Tactile Coding
general
Toxic Environments--see Environmental Conditions and Effects
Tracking
aided controls
auditory
compensatory
controls
display factors
effects of environmental factors
equipment and methods--see also Motor Performance and Skills
feedback (augmented, delayed, etc.)
general
operator performance
pursuit
quickened display
signal characteristics
training--see Training (specific types)
transfer function--see Human (transfer functions)
visual vs. auditory
Traffic--see also Highway Research
air--see Air Traffic Control Systems
lights--see Warning and Signal Lights
motor vehicle
safety--see Safety (motor vehicle and highway)
signs and signals--see also Signs, Design of; Warning and Signal Lights
Training
basic learning data
characteristics of the learner
characteristics of material or task (includes degree of simulation)
distribution of practice
general
knowledge of results (includes reinforcement, feedback)
length of training
motivation
retention
set and attention (includes effects of instructions)
theories of learning
transfer
whole vs. part
comparison of methods
evaluation of programs
general
instructor behavior
specific types
air traffic control--see Air Traffic Control Systems

Training
specific types (cont'd)
basic (military)
code
flight
gunnery and marksmanship
infantry
maintenance
other
radar
sonar
space
tracking and motor skills
voice communication and language
Training Aids and Devices
audio-visual
auditory
computers
display boards and other graphic materials
films
flight--see Flight (simulation); trainers and simulators, below
general
manuals--see also Handbooks, Manuals, Texts, Design of
mock-ups and models
other
slides and transparencies
teaching machines--see also Programmed Instruction
television
trainers and simulators
Tranquillizers--see Drugs
Transfer Function--see Human transfer functions)
Translating Devices
Transmission Lag--see Controls (backlash, deadspace, and response lag)
Transportation Systems
Transverse G--see Motion, Effects of (acceleration and deceleration)
Tremor--see Motor Performance and Skills (steadiness and tremor)
Troubleshooting--see Maintenance (behavior, strategies)
Trucks--see Vehicle
Tumbling--see Motion, Effects of (acceleration and deceleration)
Twilight Conditions--see Vision (low level illumination)
Type Face and Legibility--see Numerals, Letters, and Characters, Design of; Printed Material, Legibility, and Readability
Typewriter Design--see Panel and Console Design (keyboard design)
Typewriting--see Motor Performance and Skills (serial movements)

U

Ultraviolet Light--see Light (special types)
Underwater
breathing apparatus
clothing and equipment
operational efficiency
oxygen and pressure requirements
sound systems (e.g., ASDIC and Sonar)--see Auditory (displays, nonverbal)
speech--see Speech (distortion)
targets, visual detection--see Visual (search and detection)

Veg Scale, Apparent Weight--see Kinesthesis; Psychophysics (scaling)
Vehicle (automobile, tank, truck, etc.)
accidents--see Safety (motor vehicle and highway)
communication systems--see Speech
controls, displays, and instrument panel design
design
general
handling qualities--see also Driving
lighting systems
safety--see Safety (motor vehicle and highway)
Velocity--see Visual (perception)
Ventilated Clothing--see Clothing (thermal protection)
Ventilation--see Environmental Conditions and Effects
Vernier Acuity--see Visual (acuity)
Vertigo--see Orientation in Space, Factors Determining
Vestibular Function
general
motion, effects on--see Motion, Effects of; Orientation in Space, Factors Determining
Vests
ballistic--see Clothing (body armor)
life--see Rescue Equipment
Vibration
effects on visual performance--see Vision (effects of unusual environments); for tracking, see Tracking (effects of environmental factors)
general
whole body
Vibratory Communication Systems--see Tactile Coding
Vigilance and Monitoring
general
performance--see also Auditory (skills)
theory
Visibility Threshold--see Visual (thresholds)
Vision
color vision
effects of unusual environments--see also Space Travel (visual problems); Visual (search and detection)
acceleration
high altitude
other
vibration
zero "g"
equipment and methods
general
illumination level
low level illumination
physiological mechanisms
psychophysical scales (e.g., brill scale)
signal characteristics (e.g., exposure time, duration)
tests
theories
Visors--see Clothing (headgear); Optical Aids

Visual
- accommodation and convergence
- acuity
  - adaptation level
  - brightness contrast
  - dynamic
  - general
  - illumination (includes colored)
- adaptation, pre-adaptation, and pre-exposure
- aftereffects, afterimages
- aging--see Aging, Effects of
- anomalies and individual differences (e.g., color blindness, presbyopia, night blindness, etc.)
- brightness discrimination
- coding--see also Color
- comfort and fatigue (includes glare)
- defects--see anomalies and individual differences, above
- enhancement devices--see Optical Aids
- eye movement--see Eye
- field
  - binocular
  - distorted
  - monocular
  - peripheral (includes comparisons of peripheral and foveal)
- flicker--see Flicker
- illusions--see Perception
- information processing (includes channel capacity)
- masking and interference
- perception
  - angle
  - depth and distance
  - form and contour
  - movement (real and apparent)
  - number
  - pattern
  - size
  - velocity
- protective devices--see Optical Aids
- reaction time--see Reaction Time and Refractory Period
- requirements (for industry, military, space flight, etc.)
- search and detection
  - air to air
  - air to ground
  - air to sea--see also Sea (rescue)
  - general
  - ground to air
  - target detection
  - underwater targets
- standards and specifications (includes Munsell, CIE diagram, etc.)
- thresholds (e.g., visibility, recognition)
- tracking--see Controls (eye); Tracking (visual vs. auditory)

Visual vs. Auditory Channel--see Sensory (comparison)
Vocality--see Audition (stimulus characteristics)
Vocoder--see Speech (recognizers); Translating Devices
Voice Communication--see Speech (communication systems)
Voice Communication Training--see Training (specific types)
VTOL, STOL Aircraft

War Games--see Game and Decision Theory

Warmth Discrimination--see Physiological Capacities and Indices (temperature, body)

Warning and Signal Lights

Warning Devices--see also Auditory (displays, nonverbal)

Watchkeeping Performance--see Vigilance and Monitoring

Water Environments--see Environmental Conditions and Effects; Underwater

Weapons Noise--see Ambient Noise (level)

Weapons Systems, Design of

- general
- handheld
- intermediate-sized (e.g., turrets, anti-aircraft, machine guns)
- large-scale (e.g., missile)

Weight, Body--see Anthropometric Measures (body size and dimensions)

Weight Discrimination--see Kinesthesis

Weight Lifting--see Anthropometric Measures (muscular strength and endurance); Exercise and Performance

Weightlessness--see also Motion, Effects of; Space Travel

Whiteout--see Vision (effects of unusual environments)

Whole Body Vibration--see Vibration (whole body)

Windblast--see Environmental Conditions and Effects

Windshields--see also Aircraft (design); Vehicle (design)

Work and Task Performance

- accuracy and speed requirements
- capacity for production
- complexity (e.g., load, rate, and difficulty)
- fatigue and behavior decrement
- general
- length and distribution of work and rest periods
- method of study and measurement--see also Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
- motion analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems (time and motion study); Motor Performance and Skills (dimensional analysis)
- pacing
- physiological measures
- space requirements--see Work Place Design
- work-rest cycle--see length and distribution, above

Work Place Design

- acoustics
- area requirements (e.g., accessibility, clearances)
- arrangement of equipment and men
- atmospheric control
- general
- humidity and temperature--see atmospheric control, above
- illumination--see also Instrument Lighting
  - aircraft lighting (cockpits, cabins)
  - command centers--see other facilities, below
  - factory, office, and home
  - general
  - lighting fixtures
  - other facilities requiring special lighting conditions
  - radar room
  - ship and submarine--see Ship and Submarine
  - specifications--see Light (measurement and specifications)
  - vehicle--see Vehicle

Work Place Design (cont'd)

passageways

seating arrangements

visibility, field of view

Work Place Evaluation (specific place)

A

ACOUSTIC
DESIGN
30,938
ADAPTIVE SYSTEMS
28,960 29,009 30,704 31,301 31,542
AGING, EFFECTS OF
AUDITION
30,144
GENERAL
28,782 29,449 29,585 29,588 29,607 29,615 29,616 29,637 29,644 29,848
31,017 31,021 31,044 31,906
MOTOR PERFORMANCE
29,450 29,846 29,875 29,884 30,671
VISION
29,321 29,397 29,822 30,535 30,627 30,737
WORK CAPACITY
28,813 29,211 29,847 29,874 29,875 29,888 31,015 31,016 31,880 31,881
AIRCRAFT
DESIGN
28,279 28,399 28,585 28,610 30,851 30,862 30,893 30,895 30,910 30,914
30,968 31,167 31,208 31,347 31,394 31,410 31,452 31,462 31,491 31,603
31,638 31,700 31,726 31,727 31,728 31,729 31,751 31,755 31,756 31,766
31,790 31,842 31,843 31,844 31,845 31,846 31,847 31,848 31,849 31,915
31,937 31,945 31,950 31,953
GENERAL
28,433 28,962 28,975 30,893 30,968 31,167 31,263 31,727 31,728 31,731
31,766 31,932
LANDING AND LANDING SYSTEMS
28,295 28,399 28,417 28,475 28,523 28,928 28,929 28,946 28,959 28,970
30,893 31,318 31,399 31,438 31,481 31,484 31,528 31,593 31,629 31,672
31,725 31,780 31,819 31,828 31,829 31,927 31,938
RELATED EQUIPMENT
28,928 31,790
AIRPORT (AIRFIELDS)
FACILITIES
28,300 28,573 31,760
AIR TRAFFIC CONTROL SYSTEMS
COMMUNICATION AND INFORMATION FLOW
28,955 29,023
CONTROL PROBLEMS
28,929
EQUIPMENT
28,955
OPERATOR VARIABLES
29,235
TRAFFIC FLOW
31,753
TRAINING AND SIMULATION
28,929 30,897 31,756

AMBIENT NOISE
EFFECTS ON PERFORMANCE
28,615 28,792 29,252 29,974 30,025 30,041 31,431 31,597 31,905
GENERAL
28,339 29,957 29,974 30,432 31,095 31,475
HEARING LOSS
28,934 30,039 30,040 30,054 30,154 30,198 31,083 31,794
LEVEL
AIRCRAFT
28,328 28,423 29,030 29,031 29,041 29,947 30,011 30,022 30,937 31,410
31,488 31,554 31,615 31,700 31,711 31,757
AIRPORT
29,030 29,031 29,036 30,011 31,711
EQUIPMENT, GENERAL
30,199
INDUSTRIAL ENVIRONMENTS
30,039 30,054 30,154 30,198 30,199 31,083 31,095
OFFICE, HOME, AND GENERAL BACKGROUND
28,423 29,249 29,969 30,011 30,024 30,040 30,199
ROCKETS, MISSILES, AND LAUNCH FACILITIES
31,606
SHIPS AND SUBMARINES
30,835 31,313
WEAPONS
31,575 31,597
MEASUREMENT
28,069 28,423 29,949 29,963 31,582
REDUCTION AND CONTROL
ACOUSTIC SHIELDING
29,041 30,784
GENERAL
29,030 29,031 29,949 31,103 31,696
HEARING CONSERVATION PROGRAM
30,199 31,600 31,606
NOISE REDUCING DEVICES AND SYSTEMS
28,147
STANDARDS OF TOLERANCE AND ANNOYANCE
29,030 30,011 31,606
ANTHROPOMETRIC MEASURES
BIOMECHANICAL ANALYSIS
28,337 28,358 28,510 28,608 29,876 31,229 31,706 31,793
BODY DENSITY AND CENTERS OF GRAVITY
28,510 29,450 29,596 29,644 29,667 29,676 31,143
BODY SIZE AND DIMENSIONS
28,317 28,358 28,544 29,364 29,450 29,596 29,667 29,675 29,676 29,828
29,859 29,865 30,515 30,519 30,588 31,296 31,310 31,504 31,571 31,572
EQUIPMENT AND METHODS
28,317 29,650 29,663 31,141 31,143 31,572
EXTENT AND FLEXIBILITY OF LIMB MOVEMENT
29,650 29,876 29,887 31,291 31,292 31,818
GENERAL
28,767 29,364 29,691 31,139 31,142 31,610
HAND AND FOOT DIMENSIONS
29,451
HEAD DIMENSIONS
28,498 31,678

ANTHROPOMETRIC MEASURES (CONT'D)

LOCOMOTION

28,166 28,196 28,223 28,267 28,274 28,275 28,360 28,608 29,599 29,880
31,547 31,793 31,864 31,868

MUSCULAR STRENGTH AND ENDURANCE

28,317 28,587 28,794 29,661 29,879 29,887 29,888 31,547 31,706 31,793
31,864

POSTURE

28,405 28,412 29,871 29,877 29,887 31,531

SOMATOTYPING

31,141 31,571 31,864

SPACE REQUIREMENTS

28,317 28,544 31,292 31,818

ARTIFICIAL INTELLIGENCE

28,470 28,949 31,631 31,719 31,791

ASSIGNMENT OF FUNCTIONS TO MEN AND MACHINES IN SYSTEMS

28,989 31,507 31,650

AUDITION

AFTEREFFECTS OF STIMULATION

28,333 28,934 29,516 29,811 29,818 29,826 29,944 30,051 30,135 30,142
31,199 31,443 31,794

ANOMALIES AND INDIVIDUAL DIFFERENCES

28,073 28,931 29,321 29,942 30,006 30,009 30,129 30,134 30,139 30,140
30,144 30,191 30,194 31,658

AUDITORY PATTERNS AND MEANING

28,858 29,953 30,015 30,018 30,028

BINAURAL VS. MONAURAL

28,860 29,941 29,946 29,950 30,006 30,057 30,188 30,189 31,443 31,658

EQUIPMENT AND METHODS

29,028 29,217 29,953 29,958 29,970 29,995 29,996 29,997 30,017 30,132
30,134 30,137 30,140 30,143 30,144 30,145 30,188 30,189 30,190 30,192
30,195

GENERAL

28,939 29,505 29,687 29,961 31,213

NORMS

28,931 30,189 30,190

PHYSIOLOGICAL MECHANISMS

28,811 29,022 29,133 29,942 29,943 29,986 30,007 30,023 30,045 30,050
30,056 30,058 30,192 31,034 31,036 31,794

PSYCHOPHYSICAL SCALES

28,902 28,924 29,056 29,317 29,492 30,017 30,047 30,426 31,390

REPETITIVE STIMULATION

29,050 30,004

SOUND LOCALIZATION

29,317 29,936 29,950 29,964 30,003 30,141 31,261

STANDARDS AND SPECIFICATIONS

30,421 30,423

STIMULUS CHARACTERISTICS

FREQUENCY AND PITCH

28,811 28,890 29,056 29,317 29,951 29,971 30,004 30,005 30,006 30,010
30,015 30,018 30,049 31,041 31,443 31,774

INTENSITY AND LOUDNESS

28,338 28,755 28,789 28,811 30,006 30,009 30,017 30,044 30,047 30,426
31,019 31,020

OTHER

28,789 28,814 29,496 29,516 29,751 29,944 30,018 30,023 30,028 30,046
30,057 31,680 31,882

AUDITION (CONT'D)

STIMULUS MIXTURES

30,003 30,015 30,017

THRESHOLDS

28,781 29,496 29,527 29,811 29,826 29,941 29,944 29,966 29,967 29,987
30,021 30,028 30,029 30,044 30,048 30,054 30,055 30,140 30,145 30,188
30,195 31,284

AUDITORY

DEVICES

EAR DEFENDERS

31,087

ENHANCEMENT DEVICES

30,129 30,139 31,797

DISPLAYS, NONVERBAL

FLIGHT GUIDANCE SYSTEMS

28,332

SONAR AND OTHER UNDERWATER SOUND SYSTEMS

29,936 29,937 29,938 29,939 30,018 30,027 31,284 31,388 31,515

EQUIPMENT

INPUT DEVICES

29,940 30,014 30,427 31,797

OUTPUT DEVICES

28,377 29,937 29,945 29,959 29,960 29,998 30,014 30,031 30,032 30,033
30,035 30,037 30,514 31,797

TRANSMISSION DEVICES

30,419

MASKING

29,029 29,826 29,941 29,942 29,946 29,963 29,965 30,002 30,005 30,008
30,019 30,030 30,038 30,052 30,055 30,057 30,122 31,443

SIGNALS

CODING

30,023 31,443

FEEDBACK

28,377 29,496

GENERAL CHARACTERISTICS

28,678 28,811 28,814 29,494 31,390 31,416

TO-NOISE RATIO

28,789 29,939 29,952 30,038

SKILLS

DISCRIMINATION

28,890 29,280 29,506 29,527 29,811 29,826 29,951 29,952 30,018 30,027
31,652 31,774

MONITORING

28,380 28,765 28,813 29,140 29,192 29,198 29,211 29,319 31,371 31,652
31,906

SEARCH AND DETECTION

28,525 28,862 29,510 29,885 29,952 29,989 30,020 30,025 30,027 30,048
31,388 31,391 31,416 31,497 31,886

AUTOMATION

28,452 28,453 28,974 30,833 31,618 31,619 31,714

BELTS, HARNESSES AND OTHER RESTRAINING DEVICES
29,648 31,362
BIODYNAMICS
28,261 28,531 28,535 30,872 31,229
BIONICS
28,334 29,902
BREATHING DEVICES AND EQUIPMENT
28,546 28,594 31,148 31,151 31,153 31,160 31,851
CLOTHING
ARCTIC ENSEMBLES AND COLD WEATHER
30,975 31,148 31,334 31,587
BODY ARMOR
31,795
EQUIPMENT AND METHODS
30,911
FABRICS
28,700 31,420
FLIGHT
31,818
FOOTGEAR
31,086 31,088 31,091 31,241 31,681 31,836 31,957
GENERAL
31,102 31,155 31,572 31,641 31,818
HANDGEAR
29,595 31,097 31,483 31,818
HEADGEAR
28,147 28,210 28,512 31,090 31,093 31,365 31,383 31,384 31,385 31,489
31,600 31,678 31,818 31,945
HIGH ALTITUDE AND ANTI-G
28,410 30,987 31,818 31,945
NOXIOUS AGENTS, PROTECTION
29,889 31,155 31,226
RADIATION PROTECTION
31,155
RESTRICTIVE EFFECTS
28,196 28,249 28,267 28,584 29,889 31,818
SIZING, TECHNIQUES OF MEASUREMENT
31,678
SPACE SUITS
28,147 28,155 28,171 28,173 28,196 28,210 28,232 28,249 28,254 28,267
28,272 28,274 28,281 28,288 28,360 28,363 28,389 28,445 28,570 28,578
28,584 29,026 29,435 29,442 30,911 30,931 31,428 31,493 31,572 31,945
THERMAL PROTECTION
28,414 28,539 28,543 28,612 29,435 29,595 31,101 31,155 31,170 31,489
31,506 31,572 31,641
TROPICAL ENSEMBLES
31,679
COLOR
CODING
28,517 28,677 28,719 29,248 31,426 31,432
COMFORT
28,460 28,612 31,151
COMMAND AND CONTROL SYSTEMS
28,972 29,025 29,043 29,044 29,918 30,849 30,864 30,877 30,897 31,346
31,382 31,522 31,761 31,788

COMMUNICATION AND INFORMATION THEORY
GENERAL
28,753 29,024 29,537 30,940 31,071
INFORMATION ASSESSMENT AND PROCESSING
28,346 28,347 28,991 28,992 29,816 29,827 29,838 30,946
REDUNDANCY, UNCERTAINTY
29,725
COMMUNICATION SYSTEMS
GENERAL
28,242 28,461 28,462 28,518 28,613 28,939 30,514 31,050 31,096 31,134
31,144 31,346 31,646 31,797
TECHNIQUES FOR EVALUATION
28,377 28,381 28,519 28,957 29,972 30,041 30,574 31,050 31,144 31,646
COMPUTERS
DATA PROCESSING SYSTEMS
28,120 28,198 28,820 28,938 29,265 30,112 30,846 30,874 30,885 31,081
31,269 31,368 31,505 31,672 31,702 31,931
DESIGN
31,500 31,698
GENERAL
28,350 28,597 28,974 30,880 31,072 31,289 31,336 31,632 31,716 31,721
MAN INTERACTION
28,315 28,848 30,905 31,368 31,382 31,623 31,632 31,643 31,710
MODELS AND PROGRAMS
28,889 29,027 29,031 30,113 30,739 30,879 30,899 30,928 30,929 31,270
31,297 31,300 31,389 31,565 31,567 31,620 31,623 31,631 31,632 31,635
31,661 31,673
SIMULATION
28,469 29,011 29,031 29,107 29,120 29,688 30,123 30,928 30,929 31,060
SYSTEMS COMPONENT
31,674 31,720
CONTAINERS AND PACKAGING
28,502
CONTROL-DISPLAY DYNAMICS
COMPATABILITY AND MOTION STEREOTYPES
28,123 28,526 29,886
GENERAL
28,513 31,782
INTEGRATION
30,895 31,552
MOVEMENT RATIOS
28,530 31,363 31,528
QUICKENING
29,910 29,919
CONTROLS
AIRCRAFT
28,082 28,945 30,895 31,528 31,628 31,672 31,751 31,782 31,832 31,842
31,843 31,844 31,935 31,936 31,938 31,940
AUTOMATIC
28,452 28,453 29,436 29,922 30,879 30,898 31,672 31,935 31,936 31,938
BACKLASH, DEADSPACE, AND RESPONSE LAG
28,516
COMPARISON OF TYPES
28,482 29,001 29,862 29,919 31,411 31,844
EYE (AS CONTROL MECHANISM)
28,642 29,574 31,418

CONTROLS (CONT'D)
FORCE AND TIME TO ACTIVATE
28,483
GENERAL
28,482 28,982 28,987 29,914 29,917 30,905 31,752 31,782
HANDGRIPS AND HANDLES
28,082 28,483
INDUSTRIAL
28,483 28,498
LINEAR MOVEMENT
PEDALS AND RUBBER BARS
31,295
PUSH BUTTONS AND TOGGLE SWITCHES
28,479 29,258
MULTIPLE AXIS
31,398 31,781 31,835
REMOTE HANDLING
28,455 28,516 28,530 31,689
RESISTANCE
28,483 31,363
ROTARY MOVEMENT
KNOBS
28,493 28,526
CYBERNETICS
28,452 28,453 30,704 30,888 31,065

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DETECTION THEORY
28,525 28,862 29,116 29,121 29,131 29,470 29,792 29,921 29,989 30,048
30,989 31,140 31,391 31,675 31,769 31,884 31,911
DIET, FOOD AND NUTRITION
28,244 28,246 28,592 29,106 29,364 29,587 29,625 29,632 29,638 29,667
29,843 31,296 31,352 31,576 31,611 31,679 31,732 31,733 31,737 31,738
31,776 31,893
DISPLAYS
DIAL AND SCALE DESIGN
28,521 29,856 31,694
GENERAL
28,331 28,805 28,827 28,937 28,954 31,320 31,321 31,394 31,566 31,722
READING AND INTERPRETATION PROBLEMS
28,495 28,496 28,511 28,586 28,679 28,951 29,230 29,305 29,684 29,920
31,322 31,323 31,324 31,325 31,326 31,328 31,329 31,330 31,331 31,332
SIZE AND SHAPE
31,541
TYPE
ALTIMETERS
28,299 28,644 31,502 31,633
ATTITUDE INDICATORS
31,569 31,827
COMBINED DISPLAYS
31,456 31,481 31,629
COMPARISON OF TYPES
31,552 31,655 31,778
LARGE DISPLAYS
28,354 28,973 29,230 31,541

DISPLAYS
TYPE (CONT'D)
OTHER
28,120 28,451 28,497 28,660 28,779 29,259 29,428 30,896 31,269 31,348
31,444 31,491 31,583 31,628 31,630 31,720 31,778 31,952
POLAR COORDINATES
31,655
DIURNAL CYCLES
28,324 28,369 28,395 28,509 28,540 28,564 28,596 28,617 29,134 29,613
29,620 30,978 30,980 31,536
DRIVING
ANALYSIS OF
28,484 28,485 28,515 28,668 28,750 28,760 29,857 29,866 29,867 29,892
30,510 30,511 30,512 30,513 30,514 30,515 30,520 30,521 30,526 30,528
30,530 30,536 30,538 30,539 30,540 30,542 30,543 30,544 30,545 30,546
30,547 30,550 30,552 30,556 30,564 30,568 30,570 30,571 30,574 30,579
30,580 30,581 30,582 30,583 30,584 30,585 30,586 30,587 30,588 30,599
30,613 30,614 30,616 30,617 30,627 30,628 30,629 30,630 30,631 30,632
30,633 30,671 30,916 30,918 30,919 30,920 30,921 30,928 30,929 31,402
31,494 31,574 31,777
PERFORMANCE AND SKILLS
28,370 28,484 28,485 28,515 29,857 29,919 30,111 30,516 30,524 30,525
30,528 30,532 30,534 30,535 30,537 30,541 30,567 30,571 30,590 30,591
30,597 30,600 30,622 30,625 30,636 30,736 30,737 30,738 30,739 30,740
30,741 30,744 30,918 30,926 30,927 30,929 31,276 31,494 31,495
DRUGS
28,335 28,336 28,380 28,382 28,420 28,580 28,601 28,602 28,729 28,813
29,000 29,016 29,017 29,156 29,607 29,610 29,641 29,683 29,739 29,828
29,877 29,918 30,145 30,250 30,265 30,977 31,018 31,027 31,040 31,544
31,640 31,669
DUMMY AND MANNIKIN DESIGN
28,538 28,539

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EJECTION CAPSULE
28,141 28,142 28,167 29,013 31,315 31,945
ENVIRONMENTAL CONDITIONS AND EFFECTS
AIR VELOCITY
30,156
ATMOSPHERIC PRESSURE
28,326 28,532 28,533 28,534 28,536 28,588 28,593 28,619 28,708 29,461
29,584 29,604 29,616 29,639 29,640 29,641 29,667 30,060 30,930 31,162
31,183 31,304 31,372 31,576 31,603 31,639 31,659 31,680 31,739 31,740
31,850
COLD
28,226 29,223 29,668 30,361 30,836 30,837 30,975 31,135 31,148 31,532
31,572 31,621 31,665 31,736 31,738 31,772
DECOMPRESSION
28,303 28,304 28,527 28,562 28,588 30,109 30,149 31,392
EQUIPMENT AND METHODS
28,320 30,108 31,145 31,156 31,157 31,164 31,169 31,480 31,603
EVAPORATIVE COOLING
29,435 29,631 29,674

ENVIRONMENTAL CONDITIONS AND EFFECTS (CONT'D)

GENERAL

28,320 28,323 28,394 28,396 28,975 30,014 30,022 30,060 30,433 30,844
30,907 31,210 31,346 31,480 31,603

HEATING

28,361 28,534 31,060 31,572 31,736 31,737 31,738

HOT

28,612 29,150 29,156 29,406 29,435 29,587 29,589 29,590 29,593 29,616
29,621 29,625 29,642 29,813 29,859 29,865 29,870 30,960 31,135 31,170
31,446 31,500 31,679

HUMIDITY

29,150 31,135 31,679

IONIZED AIR

30,808

OXYGEN REQUIREMENTS

28,380 28,532 28,533 28,534 28,593 29,581 29,586 29,603 30,149 30,838
31,148 31,237 31,532 31,639 31,659

RADIATION

28,169 28,190 28,191 28,192 28,221 28,266 28,297 28,366 28,373 28,385
28,387 28,389 28,442 28,443 28,445 28,471 28,514 28,538 29,434 29,438
29,455 30,105 30,150 30,151 30,152 30,786 30,850 31,152 31,173 31,239
31,316 31,346 31,434 31,447 31,820 31,863

TEMPERATURE

29,619 30,156

THERMAL RADIATION

29,455 29,859 29,865 31,489

TOLERANCE, ADAPTATION, ACCLIMATIZATION

ALTITUDE AND PRESSURE

28,533 28,536 28,541 29,618 29,639 29,640 29,641 29,658 29,666 29,677
31,162 31,304 31,441 31,639 31,739 31,741 31,742

COLD

30,976 30,977 31,135 31,734

HEAT

28,534 29,150 29,156 29,622 29,624 29,632 29,657 29,664 29,674 29,679
29,870 30,957 31,135

TOXIC ENVIRONMENTS

28,172 29,460 29,463 30,084 30,085 30,086 30,087 30,088 30,089 30,090
30,091 30,148 30,156 30,197 30,200 30,783 30,789 31,084 31,092 31,149
31,150 31,154 31,156 31,157 31,161 31,164 31,166 31,169 31,171 31,172
31,174 31,226 31,514 31,852 31,862

VENTILATION

28,612 28,787 30,156 31,392 31,434 31,603

WATER

28,365 28,491 29,457 29,582 30,146 31,392 31,423

WINDBLAST, AIRBLAST, WINDCHILL

28,386 29,458 31,606

EQUIPMENT

DESIGN AND EVALUATION

28,320 28,354 28,433 28,462 28,504 28,760 29,245 30,105 30,873 30,908
30,909 30,912 30,913 30,914 31,281 31,486 31,685 31,768

EQUIPMENT USED IN HUMAN FACTORS RESEARCH

28,341 28,772 29,053 29,892 31,054 31,685

ERROR

HUMAN

29,868 31,230 31,454

ESCAPE FROM
AIRCRAFT AND SPACECRAFT
28,141 28,142 28,167 28,231 28,454 29,407 31,564 31,571 31,594 31,726
31,945
OTHER PLACES
31,560
EXERCISE AND PERFORMANCE
28,589 28,604 28,739 28,757 28,782 28,835 29,190 29,417 29,580 29,583
29,591 29,593 29,594 29,616 29,621 29,624 29,626 29,628 29,629 29,630
29,634 29,635 29,637 29,638 29,645 29,646 29,668 29,669 29,670 29,671
29,672 29,673 29,864 29,875 29,889 29,890 31,177 31,182 31,185 31,242
31,580 31,744 31,745 31,793
EYE
DOMINANCE
28,830 29,341
MOVEMENT
28,202 28,376 28,523 28,574 28,577 28,642 28,703 28,711 28,727 28,760
28,786 28,823 28,828 28,830 28,854 29,146 29,293 29,338 29,560 29,728
29,812 29,918 29,923 30,275 30,852 30,854 30,855 30,944 31,039 31,048
31,308 31,374 31,748 31,876

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FACILITIES
30,126
FIRE FIGHTING
EQUIPMENT
28,406 31,099 31,240 31,307 31,346 31,553 31,626 31,822 31,840
FLASH
BLINDNESS
28,371 29,900 30,556 30,564 30,579 30,582 30,589 30,932 31,225 31,424
RATE
31,575
28,529 28,625
VISIBILITY
28,625 28,711
FLICKER
28,633 28,639 28,655 28,658 28,694 29,054 29,116 29,308 29,309 29,384
29,813 29,819 29,925 30,245 30,563 30,582 30,585 30,959
FLIGHT
GUIDANCE SYSTEMS
28,465 29,427 31,628 31,819 31,832 31,934 31,938
PERFORMANCE AND SKILLS
28,310 28,406 28,419 28,421 28,422 28,520 28,562 28,576 28,596 28,603
28,942 28,962 28,998 28,999 29,415 30,981 31,414 31,432 31,433 31,484
31,528 31,819 31,826 31,939 31,955 31,956
SIMULATION
28,139 28,140 28,156 28,161 28,166 28,197 28,207 28,216 28,232 28,262
28,268 28,273 28,276 28,285 28,293 28,296 28,364 28,447 28,465 28,520
28,548 28,549 28,550 28,551 28,552 28,553 28,554 28,555 28,556 28,557
28,558 28,559 28,560 28,580 28,591 28,799 28,929 28,979 29,011 29,420
29,423 29,424 29,426 29,428 29,429 29,431 29,440 29,441 29,920 30,862
30,879 31,133 31,265 31,274 31,293 31,425 31,437 31,508 31,653 31,691
31,780 31,934 31,939 31,940
TESTING
30,862 31,394 31,528 31,928 31,935 31,936

FLUORESCENT AND LUMINOUS MATERIALS
28,283 31,116 31,121 31,337
FOG, HAZE, SMOG, AND SMOKE
28,327 30,524 30,534 30,576 30,603 30,612 31,117 31,118 31,821

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GAME AND DECISION THEORY
28,315 28,353 28,477 28,478 28,940 28,941 28,954 29,006 29,230 29,287
29,327 29,513 29,517 29,769 29,804 29,810 29,851 29,903 29,904 29,905
29,906 29,907 29,908 29,927 30,120 30,411 30,528 30,806 30,807 30,892
31,051 31,052 31,053 31,063 31,064 31,066 31,067 31,068 31,076 31,079
31,288 31,375 31,382 31,461 31,513 31,546 31,643 31,853 31,859 31,860
GENERAL AND COMPREHENSIVE REFERENCES IN HUMAN FACTORS ENGINEERING
ARTICLES AND REPORTS
28,374 28,473 28,480 28,507 28,790 28,968 30,572 30,847 30,888 31,012
31,065 31,210 31,212 31,263 31,384 31,570 31,576 31,612 31,633 31,637
31,647 31,682 31,699 31,723
BIBLIOGRAPHIES
28,133 28,134 28,137 28,200 28,225 28,226 28,264 28,290 28,291 28,292
28,323 28,430 28,433 28,437 28,438 28,441 28,452 28,453 28,460 28,670
28,674 28,675 28,682 28,716 28,718 28,725 28,731 28,737 28,742 28,745
28,748 28,762 28,764 28,766 28,774 28,783 28,800 28,812 28,821 28,832
28,838 28,841 28,922 28,948 28,952 28,958 28,975 30,420 30,547 30,850
30,932 31,279 31,351 31,518 31,596 31,617 31,638 31,644 31,686 31,796
31,798 31,817
BOOKS
28,341 28,448 28,470 28,472 28,494 29,687 29,688 29,689 29,690 29,691
30,305 30,432 30,433 30,734 31,768 31,769 31,770 31,771
HANDBOOKS
28,425
SYMPOSIA AND CONFERENCES
28,192 28,223 28,241 28,309 28,324 28,432 28,982 29,012 29,974 30,904
30,905 31,689 31,863
GRAPHS AND TABLES, DESIGN OF
31,269
GROUND SUPPORT EQUIPMENT
31,754
GROUPS
AIRCREWS
28,962 30,876 30,893 31,625 31,657 31,683
COMMUNICATION
28,342 28,753 28,957 29,268 29,932 30,893 30,897 30,994 31,052
EVALUATION
29,247 31,260
GENERAL
28,494 29,127 30,121 31,073 31,075 31,260 31,503 31,664 31,683
INFANTRY SQUADS
31,512
INTERACTION
29,810 30,411 30,437 30,893 31,052 31,059 31,288 31,340 31,636 31,695
LEADERSHIP
29,251 29,261 29,521 29,935 30,365 30,366 30,367 31,260 31,290 31,764
31,812 31,913
MISSILE CREWS
31,492

GROUPS (CONT'D)
MORALE
29,264 31,503 31,550 31,657 31,948
PERFORMANCE
28,765 29,267 29,268 29,539 29,541 29,694 29,931 29,933 29,935 30,361
30,411 30,897 31,069 31,280 31,345 31,386 31,550 31,636 31,695 31,764
31,913
RESEARCH TECHNIQUES
29,085 31,406 31,695
SELECTION
30,361 30,876 31,503
SHIP AND SUBMARINE CREWS
31,550 31,604 31,693 31,773
SIZE AND STRUCTURE
28,753 29,932 31,064
SPACE CREWS
28,582 29,026 29,431 31,551
THEORY
28,753 29,695 29,810 31,052

-H-

HANDBOOKS, MANUALS, TEXTS, DESIGN OF
28,322 28,374 31,556 31,815
HELICOPTERS
28,400 28,451 28,465 28,944 28,947 28,964 28,970 30,703 31,363 31,538
31,558 31,566 31,569 31,624 31,629 31,630 31,804 31,830 31,937 31,940
HIGHWAY RESEARCH
28,484 28,907 29,858 30,153 30,515 30,527 30,528 30,529 30,530 30,531
30,540 30,541 30,552 30,554 30,557 30,558 30,559 30,560 30,561 30,562
30,565 30,591 30,593 30,595 30,596 30,599 30,600 30,601 30,602 30,607
30,610 30,611 30,621 30,626 30,629 30,632 30,633 30,741 30,743 30,746
30,747 30,748 30,899 30,915 30,917 30,923 30,924 30,925 30,929 31,268
31,300 31,692 31,701
HOUSES, DWELLINGS, AND SHELTERS, DESIGN OF
28,950 30,884 30,913 30,914 31,434 31,504 31,703 31,724 31,948 31,954
HUMAN
CONTROLLER
28,302 28,982 28,985 28,986 28,987 28,988 28,989 28,990 28,992 28,993
28,994 28,995 28,998 29,002 29,003 29,004 29,005 29,006 29,007 29,008
29,010 29,922 30,981 31,301 31,398 31,411 31,419 31,781
INFORMATION PROCESSING CAPABILITIES
28,146 28,409 28,511 28,680 28,756 28,797 28,824 28,827 28,859 28,891
28,917 28,954 29,051 29,294 29,329 29,464 29,477 29,478 29,497 29,501
29,504 29,536 29,692 29,710 29,795 29,855 29,885 29,913 29,923 31,193
31,205 31,567 31,762 31,873 31,875 31,888 31,889
TRANSFER FUNCTIONS
28,572 29,912 29,914 29,915 31,397 31,427 31,826 31,835

INDIVIDUAL FACTORS AFFECTING PERFORMANCE

ACCEPTABILITY OF AND ATTITUDE TOWARD EQUIPMENT AND TASKS

28,299 28,473 28,480 28,491 28,571 29,262 29,269 30,520

ALERTNESS

28,710 28,727 28,815 29,820 31,147

APTITUDE AND INTELLIGENCE

29,330 29,933 31,895 31,920

EMOTION

28,419 28,623 28,691 28,785 28,804 28,826 29,612 29,727 29,929 29,934
30,257 30,520 31,299 31,560 31,647

GENERAL

28,069 29,764 30,521 31,220

MOTIVATION AND MORALE

28,467 28,724 28,940 29,084 29,106 29,122 29,224 29,232 29,236 29,239
29,240 29,250 29,254 29,264 29,269 29,511 29,830 29,878 30,120 30,945
31,058 31,062 31,075 31,387 31,503 31,608 31,874 31,875 31,916 31,917
31,922

PERSONALITY

28,421 28,569 28,691 28,741 28,796 28,799 28,914 28,927 28,933 29,211
29,878 30,263 30,272 30,520 30,522 30,614 31,063 31,387 31,764 31,905
31,955

SET AND ATTENTION

28,715 28,734 28,763 28,808 28,850 28,869 28,875 29,201 29,276 29,284
29,446 29,447 29,477 29,478 29,482 29,493 29,494 29,923 30,255 30,268
30,543 30,998 31,058 31,195 31,211 31,216 31,879 31,901

THOUGHT PROCESSES

28,473 28,495 28,662 28,680 28,691 28,710 28,795 28,797 28,803 28,856
28,859 28,872 28,914 28,922 28,954 29,005 29,106 29,120 29,209 29,233
29,287 29,290 29,291 29,294 29,445 29,466 29,515 29,517 29,734 29,747
29,812 29,827 29,903 29,904 29,905 29,906 29,907 29,908 29,926 30,244
30,245 30,253 30,259 30,806 30,807 30,945 30,956 30,991 30,994 31,003
31,051 31,052 31,055 31,070 31,209 31,210 31,387 31,389 31,544 31,761
31,763 31,873 31,874 31,879 31,884 31,890 31,891 31,920

INDUSTRIAL

EQUIPMENT, DESIGN OF

28,493 28,498 28,499 28,500 28,501 28,503 28,504 28,505 28,506 28,507

INDUSTRY AND BUSINESS, HUMAN FACTORS ORIENTED STUDIES

29,122 29,127 29,239 29,240 29,254 29,255 29,262 30,305 30,707 30,884

INFORMATION

STORAGE AND RETRIEVAL SYSTEMS

28,198 28,597 28,978 29,265 29,462 31,050 31,081 31,278 31,317 31,522
31,596 31,713 31,714 31,717 31,823

INSTRUMENT LIGHTING

COLOR AND INTENSITY OF ILLUMINATION

31,311 31,367

ELECTROLUMINESCENT

31,583 31,952

J

JOB PERFORMANCE AIDS

28,479 28,524 31,082 31,094 31,227 31,231 31,236 31,281

K

KINESTHESIS
CODING
28,839
GENERAL
28,669 28,715 28,722 28,768 28,803 28,845 28,865 28,923 28,980 29,191
29,202 29,285 29,311 31,204 31,214

L

LABELS, DESIGN OF
28,479
LANGUAGE DESIGN
28,855 28,935 28,953 29,027 29,034 29,043 29,209 29,295 29,310 29,693
29,787 30,830 30,839 30,994 31,246 31,247 31,248 31,249 31,250 31,251
31,254 31,257 31,259 31,306 31,333 31,561 31,661 31,823 31,874
LIGHT
COLORED
31,128
MEASUREMENT AND SPECIFICATION
28,654 31,110 31,112 31,113 31,114 31,115 31,119 31,121 31,122 31,123
31,127 31,128 31,131 31,132 31,342
NATURAL
28,659 31,109 31,282
PHYSICAL CHARACTERISTICS
30,105
SPECIAL TYPES
28,654 30,105 31,116 31,117 31,133 31,134 31,161 31,239 31,439
LIGHTING SYSTEMS
OUTDOORS
AIRPORT
28,970 30,534 31,616
FLARES
31,677
GENERAL
31,129 31,813
HIGHWAY AND STREET
30,513 30,523 30,534 30,552 30,553 30,557 30,561 30,563 30,564 30,566
30,569 30,576 30,577 30,578 30,581 30,583 30,584 30,586 30,592 30,603
30,606 30,608 30,615 31,104 31,105 31,106 31,118
LOGISTICS
31,165
LOW LEVEL, HIGH SPEED FLIGHT
31,404 31,934

MACHINE RECOGNITION
28,981 29,027 29,035 29,039 29,040 31,479 31,505 31,559 31,563
MAINTENANCE
BEHAVIOR, STRATEGIES
28,194 28,508 28,524 28,696 28,713 28,771 29,245 30,125 31,286 31,350
31,451 31,549 31,933
DESIGN FOR
28,458 29,433 31,292 31,355 31,380 31,449 31,451 31,452 31,516 31,517
31,581 31,689 31,807 31,808 31,816 31,932 31,933 31,941
EQUIPMENT
28,524 31,459 31,941
GENERAL
28,247 29,685 30,124 30,863 31,007 31,264 31,356
SYSTEMS
28,171 28,287 28,489 31,380 31,455 31,462 31,463 31,464 31,470 31,471
31,562 31,689 31,932
MAN-ASSIST
29,902 31,546
MAPS AND CHARTS, DESIGN OF
28,314 31,331 31,413 31,432 31,433 31,655
MASKS
28,546 28,594 28,927 31,150 31,151 31,153 31,160 31,602 31,678 31,851
MATHEMATICAL AND STATISTICAL METHODS
28,282 28,311 28,312 28,315 28,318 28,319 28,343 28,344 28,347 28,348
28,349 28,350 28,351 28,352 28,472 28,478 28,482 28,485 28,508 28,510
28,542 28,543 28,597 28,604 28,723 28,758 28,914 28,939 28,984 28,986
28,987 28,988 28,990 28,994 28,995 29,003 29,005 29,007 29,090 29,110
29,118 29,119 29,123 29,128 29,129 29,130 29,132 29,137 29,230 29,237
29,256 29,339 29,449 29,678 29,769 29,781 29,920 29,924 29,962 30,007
30,008 30,050 30,113 30,115 30,587 30,634 30,704 30,952 30,982 30,999
31,001 31,038 31,054 31,055 31,061 31,069 31,072 31,073 31,077 31,165
31,218 31,228 31,374 31,494 31,546 31,559 31,563 31,593 31,605 31,634
31,673 31,690 31,692 31,782 31,792 31,800 31,854 31,856 31,857 31,861
31,910 31,912 31,922 31,928
METHODS AND TECHNIQUES FOR STUDY AND ANALYSIS OF TASKS, OPERATIONS, AND SYSTEMS
DECISION ANALYSIS
28,477 30,946
GENERAL
28,961 30,362 30,363 30,364 30,365 30,368 31,074 31,210 31,664 31,683
JOB AND TASK DESCRIPTION AND ANALYSIS
28,198 28,693 28,696 28,956 28,971 29,228 29,271 29,539 29,541 30,112
30,117 30,119 30,885 31,080 31,287 31,302 31,380 31,454 31,656 31,785
OTHER METHODS
28,582 28,738 28,961 31,406 31,512 31,633
QUEUING
30,884
MILITARY STANDARDS AND SPECIFICATIONS
28,306
MOTION, EFFECTS OF
ACCELERATION AND DECELERATION
GENERAL
28,138 28,191 28,195 28,261 28,384 28,393 28,437 28,531 28,535 28,608
28,727 28,998 28,999 29,627 31,369 31,381

MOTION, EFFECTS OF
ACCELERATION AND DECELERATION (CONT'D)
PROTECTION
29,459 30,872 31,362 31,365 31,383 31,384 31,385
TOLERANCE
28,179 28,181 28,250 28,277 28,362 28,411 28,415 28,563 29,014 29,459
29,665 30,719 31,309
TYPES
28,267 28,274 28,275 28,360 28,375 28,563 29,522
EQUIPMENT AND METHODS
28,383 28,531 28,535 31,548 31,809
ROTATION AND OSCILLATION
28,154 28,178 28,179 28,375 28,376 28,411 28,563 28,574 28,577 28,586
28,616 29,331 29,522 31,308 31,365 31,637
SICKNESS
28,149 28,154 28,178 28,179 28,420 28,429 29,016 29,017 31,487 31,637
31,649 31,669
VESTIBULAR FUNCTIONING
28,149 28,154 28,177 28,178 28,202 28,223 28,375 28,568 28,574 28,577
28,586 31,637 31,666
MOTOR PERFORMANCE AND SKILLS
AIMING
28,512 28,708
COORDINATION OF LIMBS
28,491 29,208 29,671 31,865
EQUIPMENT AND METHODS
28,589 28,708 28,739 28,751
GENERAL
28,670 28,716 28,718 28,745 28,748 28,757 28,764 28,774 28,782 28,790
28,794 28,812 28,815 28,821 28,838 28,982 28,984 28,985 28,986 28,988
29,610 29,699 29,760 30,973 31,531
HANDEDNESS
28,673 28,868
INVOLUNTARY REFLEXES
30,970
MANUAL DEXTERITY
28,491 28,757 29,223 30,808 31,421
POSITIONING MOVEMENTS
28,491 28,751 29,884 31,291
REPETITIVE MOVEMENTS
29,191 29,881 30,973
SERIAL MOVEMENTS
29,884 31,421
SPEED AND PRECISION
28,512 28,708 28,757 29,469 29,881 29,884 30,973 31,865
STEADINESS AND TREMOR
28,708 31,264
THROWING
28,739

NAVIGATIONAL AIDS AND SYSTEMS
28,433 28,476 28,579 28,943 31,432 31,433 31,931
NEURAL THEORY
28,470 29,137 29,175 30,995 31,002
NUCLEAR OPERATED EQUIPMENT AND SYSTEMS, PROBLEMS OF
31,620 31,670
NUMERALS, LETTERS, AND CHARACTERS, DESIGN OF
28,679 29,486 30,525 31,322 31,323 31,324 31,325 31,326 31,327 31,328
31,329 31,330 31,332 31,577 31,578
OPTICAL AIDS
BINOCULARS
28,810
GENERAL
28,652 28,660
GLASSES, SPECTACLES, AND GOGGLES
28,692 29,385 28,396 30,932 31,085 31,089 31,225
LENSES AND FILTERS
28,635 30,613
PERISCOPES
28,475
TELESCOPES
28,512 28,659
VISORS
31,225 31,609
ORIENTATION IN SPACE, FACTORS DETERMINING
28,178 28,217 28,257 28,375 28,398 28,400 28,565 28,599 28,839 29,304
29,331 29,410 29,514 29,584 29,585 29,648 29,733 30,954 31,570 31,637
31,666

PACKS AND CARRIERS
31,953
PAIN
28,466 28,566 28,669 28,715 28,796 28,837 28,912 28,948 28,963 29,049
29,200 29,814 29,934 30,250 31,045 31,078 31,214 31,396
PANEL AND CONSOLE DESIGN
AIRCRAFT AND SPACECRAFT
28,152 28,937 30,895 31,394 31,638
GENERAL
31,409
KEYBOARD DESIGN
28,500 28,936 29,253 29,913 31,210 31,900
LAYOUT
28,521 28,526 31,638
PARACHUTES
29,407 30,865 31,503 31,564 31,588 31,660 31,930
PERCEPTION
GENERAL
28,529 28,662 28,674 28,675 28,682 28,706 28,719 28,725 28,731 28,737
28,742 28,762 28,766 28,783 28,797 28,798 28,800 28,832 28,841 28,869
28,871 28,874 28,885 28,900 28,918 29,106 29,107 29,121 29,300 29,317
29,525 29,823 29,829 30,998 31,006 31,175 31,211 31,212 31,686 31,767
31,871 31,912

PERCEPTION (CONT'D)

ILLUSIONS

28,643 28,672 28,707 28,728 28,730 28,777 28,786 28,787 28,793 28,831
28,920 29,108 29,193 29,286 29,328 29,330 29,394 29,538 29,543 29,544
29,546 29,703 29,756 29,762 29,775 31,201 31,613 31,897 31,902 31,908

OF BODY MOVEMENT AND POSITION

28,803 29,304 29,331 29,514 30,512

THEORY

28,467 28,665 28,666 28,770 28,865 28,976 29,107 29,311 29,746 30,991
30,996 31,175 31,430 31,886

PERSONNEL

ASSESSMENT

28,778 29,314 31,056 31,366 31,524 31,562 31,621 31,625 31,772

CLASSIFICATION AND ASSIGNMENT

28,569 29,815 30,903 31,279 31,620 31,682 31,792

GENERAL

30,705 31,217 31,400 31,619 31,664

MANAGEMENT

29,086 29,127 30,904 31,520 31,608 31,792

SELECTION

28,416 28,419 28,569 29,815 30,837 30,890 31,007 31,011 31,272 31,279

SUBSYSTEM CONCEPTS

31,401 31,524 31,562 31,779

PHOTOGRAPHS, PHOTOGRAPHY, AND PHOTO INTERPRETATION

28,313 28,357 28,433 28,652 28,653 28,695 29,338 30,237 31,244 31,277
31,501 31,655 31,688 31,718 31,927

PHYSICAL FITNESS AND PERFORMANCE

28,545 28,563 28,604 28,614 28,617 28,767 28,782 29,018 29,452 29,853
29,854 29,864 29,870 29,875 29,888 30,861 31,176 31,178 31,179 31,180
31,181 31,183 31,184 31,186 31,187 31,188 31,189 31,190 31,191 31,192
31,296 31,557 31,687 31,734 31,736 31,737 31,739 31,741 31,793 31,864
31,866 31,867

PHYSIOLOGICAL CAPACITIES AND INDICES

ACCLIMATIZATION

28,208 28,509 28,564 28,588 29,150 29,156 29,461 29,589 29,618 29,621
29,624 30,976 30,977 31,135 31,441 31,733 31,736 31,741 31,742 31,951

BREATHING

28,520 28,533 28,545 28,554 28,575 28,588 28,594 28,607 28,847 29,461
29,594 29,597 29,598 29,600 29,604 29,605 29,606 29,607 29,608 29,609
29,610 29,617 29,627 29,628 29,629 29,634 29,640 29,652 29,664 29,675
29,677 29,678 29,683 29,889 30,147 30,156 30,259 30,896 30,930 30,961
30,962 30,963 30,964 30,965 30,978 30,984 31,369 31,493 31,532 31,740
31,741 31,742 31,743

CARDIO-VASCULAR INDICES

28,379 28,412 28,531 28,536 28,545 28,567 28,588 28,604 28,606 28,618
28,750 28,815 28,966 29,028 29,418 29,419 29,582 29,583 29,584 29,585
29,586 29,590 29,591 29,593 29,602 29,612 29,613 29,615 29,616 29,617
29,618 29,621 29,626 29,627 29,628 29,629 29,630 29,634 29,635 29,636
29,637 29,638 29,640 29,645 29,648 29,664 29,665 29,667 29,669 29,672
29,673 29,675 29,676 29,679 30,254 30,255 30,264 30,266 30,267 30,272
30,277 30,278 30,853 30,896 30,900 30,984 31,139 31,309 31,391 31,393
31,573 31,867

ELECTROENCEPHALOGRAM

28,595 28,603 28,678 28,710 28,714 28,811 28,835 29,277 29,820 29,943
30,244 30,245 30,251 30,253 30,259 30,268 30,274 30,276 31,017 31,018
31,019 31,020 31,021 31,022 31,023 31,024 31,025 31,027 31,028 31,029

PHYSIOLOGICAL CAPACITIES AND INDICES

ELECTROENCEPHALOGRAM (CONT'D)

31,030 31,031 31,032 31,033 31,034 31,036 31,037 31,039 31,040 31,041
31,042 31,043 31,044 31,045 31,046 31,047 31,048 31,049 31,389 31,685

ENERGY EXPENDITURE

28,246 28,545 28,583 28,584 29,190 29,593 29,594 29,599 29,602 29,628
29,629 29,630 29,634 29,635 29,636 29,666 29,668 29,669 29,670 29,671
29,672 29,673 29,675 29,676 29,889 29,891 30,785 30,960 30,975 31,135
31,512 31,641

GALVANIC SKIN RESPONSE

28,714 28,776 28,780 28,785 28,809 28,814 28,815 28,843 29,109 29,115
29,243 29,319 29,835 30,250 30,255 30,256 20,257 30,259 30,262 31,020
31,197 31,357 31,391

GENERAL

28,378 28,509 28,588 28,767 28,846 28,952 28,975 29,416 29,417 29,643
29,651 30,834 30,956 31,381 31,504 31,534 31,647 31,687 31,744 31,796
31,817

HEART RATE

28,520 28,536 28,589 28,596 28,601 28,815 29,112 29,617 29,624 29,625
29,630 29,636 29,664 29,665 29,669 29,853 30,785 31,580

METABOLIC RATE

29,190 29,588 29,590 29,631 29,634 29,635 29,666 29,673 29,869 30,960
31,135 31,297 31,732 31,733 31,735 31,742 31,743 31,866

MUSCLE POTENTIAL

28,780 28,784 28,815 29,511 29,871 30,259 31,026 31,029

OXYGEN CONSUMPTION

28,554 28,600 29,190 29,416 29,594 29,597 29,606 29,617 29,622 29,625
29,629 29,637 29,638 29,640 29,641 29,645 29,646 29,664 29,665 29,666
29,668 29,669 29,671 29,672 29,673 29,676 29,853 29,854 29,889 31,532
31,540 31,735 31,736 31,741 31,866

PHYSICAL FITNESS

28,208 28,535 28,536 28,578 28,611 28,614 28,616 29,617 29,622 29,635
29,671 29,672 29,853 29,854 29,861 29,864 29,888 31,441 31,732 31,866
31,867

TEMPERATURE, BODY

28,361 28,414 28,540 28,596 29,150 29,156 29,223 29,320 29,588 29,589
29,590 29,593 29,601 29,619 29,620 29,621 29,624 29,625 29,631 29,632
29,642 29,656 29,670 29,674 30,250 30,254 30,936 30,967 30,997 31,135
31,423 31,500 31,641 31,951

PHYSIOLOGICAL EQUIPMENT AND METHODS

ELECTROPHYSIOLOGICAL TECHNIQUES

28,378 28,595 28,603 28,606 28,710 28,837 28,966 29,109 29,170 29,342
29,547 29,569 29,577 29,660 29,679 29,680 29,681 29,690 30,249 30,270
30,271 30,275 30,853 30,896 30,900 31,022 31,035 31,436 31,536 31,580
31,591 31,622 31,865

GENERAL

28,337 28,477 31,647

METABOLIC MEASUREMENT

28,378 28,383 28,537 28,540 28,589 28,607 28,966 29,150 29,190 29,336
29,600 29,601 29,647 29,648 29,678 29,853 29,854 29,875 29,879 29,891
30,147 30,149 30,156 30,785 30,966 31,151 31,153 31,369 31,381 31,446
31,665 31,745

OTHER EQUIPMENT AND METHODS

28,368 28,407 28,531 28,594 28,604 28,614 29,191 30,099 31,054 31,310
31,557

PHYSIOLOGICAL EQUIPMENT AND METHODS (CONT'D)

TELEMETRY

28,175 28,261 28,369 28,431 29,416 29,417 29,418 29,419

PRINTED MATERIAL, LEGIBILITY, AND READABILITY

28,374 29,149 30,904 31,496 31,810

PROGRAMMED INSTRUCTION

28,163 28,355 28,391 28,468 28,802 28,954 29,129 29,219 29,234 29,238
29,260 30,843 31,057 31,378 31,407 31,408 31,519 31,523 31,565 31,617
31,674 31,704 31,715 31,811

PROLONGED CONFINEMENT

28,150 28,207 28,227 28,243 28,290 28,292 28,550 28,551 28,552 28,553
28,554 28,555 28,556 28,557 28,559 28,560 28,578 28,582 28,589 28,601
28,741 28,781 28,799 28,833 30,361 31,352 31,536 31,579 31,773 31,954

PROSTHETICS

29,902 30,840 31,642

PSYCHOPHYSICS

GENERAL

28,829 28,903 29,121 29,132 29,752 29,753 29,801 30,933 31,435 31,647
31,882

METHODS

28,486 28,493 28,515 28,676 28,687 28,693 28,735 28,736 28,747 28,861
28,863 28,865 28,874 29,131 29,132 29,200 29,312 29,325 29,777 29,782
29,783 29,803 30,044 30,047 31,054 31,589 31,590

SCALING

28,345 28,356 28,480 28,676 28,677 28,693 28,696 28,747 28,778 28,851
28,853 28,864 28,874 28,912 28,924 29,290 29,297 29,300 29,311 29,323
29,492 29,522 29,730 29,821 30,734 30,871 31,350 31,357 31,507 31,854
31,856 31,914

THEORY

28,829 29,851 29,116 29,802 29,885 31,175

Q

QUALITY CONTROL

30,120

R

RADAR AND OTHER CRT DISPLAYS

GENERAL

28,301 28,754 28,947 31,821

OPERATOR PERFORMANCE

31,584

SCREEN

SIZE AND SHAPE

31,499

SIGNAL CHARACTERISTICS

31,584

SYMBOLOGY

31,322 31,323 31,324 31,325 31,326 31,328 31,329 31,330 31,331 31,332

TYPES

28,964

REACTION TIME AND REFRACTORY PERIOD

28,485 28,486 28,487 28,497 28,520 28,593 28,734 28,756 28,759 28,784
28,814 28,825 28,826 28,843 28,893 28,897 28,911 28,913 28,917 29,969
29,047 29,051 29,111 29,196 29,198 29,201 29,208 29,276 29,277 29,279
29,289 29,313 29,319 29,324 29,329 29,445 29,446 29,447 29,464 29,478

REACTION TIME AND REFRACTORY PERIOD (CONT'D)
29,482 29,493 29,497 29,500 29,501 29,504 29,513 29,517 29,533 29,540
29,576 29,702 29,716 29,717 29,722 29,737 29,759 29,764 29,785 29,805
29,846 29,852 29,855 29,910 29,918 30,266 30,274 30,518 30,532 30,631
30,808 30,941 31,023 31,032 31,037 31,194 31,195 31,199 31,205 31,762
31,873 31,891
READING
28,374 28,673 29,149 29,263 29,305 29,310 29,872 30,302 30,883 31,709
31,765 31,870 31,872
RELIABILITY
EQUIPMENT
31,459 31,474
HUMAN
28,146 28,160 28,212 28,409 31,456 31,474 31,761
SYSTEMS
28,160 28,212 28,932 31,449 31,459 31,469 31,470 31,471 31,472 31,474
31,562 31,799
REPETITIVE STIMULATION, EFFECTS OF
OTHER
29,049
VISUAL
28,908 29,048 29,052 29,324 29,384 29,528 29,819 29,925 31,784
RESCUE EQUIPMENT
28,231 28,232 31,275 31,405
RESEARCH TECHNIQUES IN HUMAN FACTORS ENGINEERING
28,341 28,597 28,933 29,011 29,845 30,412 30,923 30,924 30,925
RETENTION
LONG-TERM
29,105 29,204 30,993 31,137 31,661 31,892
SHORT-TERM
28,581 28,749 28,824 28,891 28,895 29,057 29,091 29,105 29,138 29,142
29,144 29,194 29,199 29,212 29,225 29,282 29,321 29,448 29,503 29,507
29,509 29,524 29,534 29,697 29,698 29,700 29,711 29,713 29,714 29,715
29,718 29,748 29,749 29,761 29,765 29,766 29,767 29,768 29,773 29,780
29,784 29,884 29,955 30,947 30,993 31,137 31,198 31,252 31,253 31,255
31,258 31,482 31,814 31,855 31,858 31,861 31,880 31,881 31,883 31,885
31,888 31,889 31,899 31,909

SAFETY
ACCIDENTS, ANALYSIS OF
28,382 28,390 28,544 28,602 30,521 30,522 30,671 30,752 31,223 31,347
31,429 31,607 31,627 31,730 31,783
AIR
28,373 28,382 28,390 28,527 28,575 28,602 28,937 28,975 30,752 30,832
31,223 31,347 31,383 31,384 31,385 31,571 31,588 31,593 31,607 31,627
31,659 31,671 31,726 31,730 31,751 31,796 31,945 31,950
CRASH IMPACT
28,277 28,384 28,390 29,459 29,643 31,347 31,362 31,365 31,383 31,384
31,385 31,726 31,783 31,915 31,950
GENERAL
28,245 28,458 28,546 29,458 29,868 30,743 30,746 30,747 30,748 30,906
31,233 31,234 31,235 31,238 31,465 31,466 31,467 31,468 31,555 31,942
INDUSTRIAL
29,064 29,887 30,110 31,082 31,083 31,084 31,085 31,086 31,087 31,088
31,089 31,090 31,091 31,092 31,093 31,094 31,095 31,096 31,097 31,098
31,099 31,100 31,101 31,102 31,103 31,168 31,225 31,226 31,227 31,228
31,230 31,231 31,234 31,235 31,236 31,237 31,238 31,239 31,240 31,241
31,242 31,671 31,840 31,942
MOTOR VEHICLE AND HIGHWAY
28,277 30,510 30,511 30,528 30,532 30,545 30,546 30,547 30,549 30,551
30,552 30,553 30,554 30,556 30,567 30,570 30,571 30,573 30,574 30,581
30,611 30,616 30,623 30,738 30,741 30,743 30,746 30,747 30,748 30,929
31,224 31,238 31,485 31,701 31,783
SEA
31,684
SHIELDING
30,150
SEA
RESCUE
31,232
SEATS AND SEATING
BODY SUPPORTS
28,460 31,624
COMFORT
28,460 31,624
EJECTION
28,460 28,544 31,594
GENERAL
28,460 29,863 31,795 31,915
SENSORY
COMPARISON
28,461 28,671 28,689 28,747 28,806 28,851 28,853 28,861 28,884 28,902
28,924 29,194 29,312 29,328 29,335 29,506 29,793 31,204 31,298 31,903
DEPRIVATION
28,243 28,290 28,292 28,714 28,741 28,781 28,833 31,773
FEEDBACK
28,516 28,768 28,872 29,221 29,510 31,203
GENERAL
28,781
INTERACTION
28,486 28,669 28,671 28,755 28,811 28,839 28,883 29,723 29,779 29,792
29,834 29,837 30,969 31,515 31,887 31,903

SEX COMPARISONS

28,709 28,792 28,813 29,607 29,846 30,021 30,671 30,861 31,025 31,504
31,864

SHIP AND SUBMARINE

CONTROLS, DISPLAYS, AND INSTRUMENT PANEL DESIGN

28,997 31,412

ESCAPE SYSTEMS

31,273 31,341 31,405

GENERAL

28,705 30,718 30,844 31,272 31,355 31,380 31,593 31,601 31,693 31,770
31,771 31,785 31,819 31,929 31,931 31,947

HABITABILITY

31,158 31,335 31,557

LIGHTING SYSTEMS

31,521

SIGNALING SYSTEMS, VISUAL

28,517 30,517 30,531 30,533 30,563 31,098

SIGNS, DESIGN OF

30,514 30,525 30,526 30,531 30,546 30,548 30,554 30,555 30,562 30,574
30,593 30,602 30,604 30,605 30,609 31,942

SIMULATION AND SIMULATORS

28,413 28,506 28,586 28,610 28,760 28,771 28,948 29,092 29,437 29,688
29,892 29,907 30,113 30,123 30,564 30,574 30,587 30,915 30,916 30,917
30,918 30,919 30,920 30,921 30,922 30,923 30,924 30,925 30,926 30,927
30,928 30,929 30,965 30,973 31,053 31,276 31,356 31,379 31,480 31,485
31,518 31,541 31,542 31,659 31,706 31,756 31,790 31,800 31,802

SLEEP

PHYSIOLOGICAL INDICES

28,595 28,603 28,617 28,678 28,710 28,794 28,835 29,620 29,701 30,251
30,267 30,276 30,834 31,004 31,005 31,018 31,019 31,020 31,025 31,031
31,033 31,037 31,216 31,591

WORK AND PERFORMANCE

28,617 28,667 28,788 28,794 28,842 29,788 30,246 30,262 30,276 30,882
31,216 31,442

SMELL AND TASTE

28,578 28,747 28,849 28,878 28,910 29,135 29,220 29,578 29,579 29,743
31,200 31,581

SOCIAL INTERACTION

28,582 29,539 29,541 29,772 29,878 30,992 31,068 31,069 31,288 31,529
31,530

SPACE FLIGHT SYSTEMS

CAPSULE DESIGN

28,135 28,141 28,142 28,144 28,156 28,166 28,167 28,174 28,193 28,199
28,203 28,207 28,221 28,232 28,235 28,241 28,262 28,278 28,279 28,284
28,288 28,321 28,322 28,366 28,387 28,432 28,442 28,506 29,424 29,432
29,437 29,438 30,908 30,912 30,913 30,914 31,266 31,267 31,395 31,486
31,749 31,750

COMMUNICATION

28,174 28,230 28,242 28,270 28,288 28,519 31,377

CONTROL AND DISPLAY SYSTEMS

28,139 28,152 28.174 28,182 28,184 28,218 28,219 28,280 28,283 28,285
28,286 28,321 28,413 29,423 29,428 30,898 31,535 31,552 31,568 31,749
31,752

GENERAL

28,136 28,138 28,148 28,159 28,160 28,183 28,191 28,201 28,212 28,225
28,231 28,234 28,236 28,240 28,241 28,248 28,250 28,252 28,254 28,258
28,269 28,281 28,288 28,322 28,432 28,449 28,463 29,012 29,425 29,432

SPACE FLIGHT SYSTEMS

GENERAL (CONT'D)

29,433 29,440 29,443 29,444 31,133 31,263 31,265 31,275 31,307 31,457
31,458 31,486 31,553 31,754 31,755 31,801 31,805 31,806 31,824

GROUND SUPPORT

28,140 28,166 28,288 29,430 31,409 31,754

NAVIGATION

28,184 28,191 28,209 28,271 29,423 29,436 31,541

SEALED CABIN

28,137 28,172 28,200 28,201 28,206 28,220 28,232 28,265 28,288 28,321
28,361 28,408 28,426 28,427 28,446 28,447 28,532 28,533 28,534 28,548
28,549 28,550 28,551 28,552 28,553 28,554 28,555 28,556 28,557 28,558
28,559 28,560 28,570 28,578 28,599 28,609 28,791 29,019 29,026 29,437
29,442 30,060 30,930 31,266 31,294 31,393 31,395 31,415 31,486 31,553
31,555 31,579 31,611 31,697

TELEMETRY

28,169 28,175 28,242 28,261 28,270 28,308 28,367 28,378 28,591 28,598
31,271

SPACE TRAVEL

BEHAVIORAL EFFECTS

28,146 28,150 28,169 28,190 28,207 28,227 28,248 28,290 28,560 28,799
30,033 30,034 30,060 31,395 31,747

BIOMEDICAL PROBLEMS

28,151 28,169 28,173 28,181 28,192 28,221 28,226 28,228 28,229 28,250
28,264 28,385 28,443 28,459 28,532 28,533 28,534 28,568 28,578 28,590
28,591 28,598 28,599 28,601 28,611 29,018 29,434 30,853 31,266 31,352
31,393 31,395 31,551 31,576 31,611 31,747 31,820

EQUIPMENT AND TOOLS

28,155 28,157 28,166 28,169 28,173 28,185 28,193 28,203 28,205 28,206
28,214 28,216 28,240 28,244 28,246 28,248 28,250 28,284 28,287 28,322
28,372 28,555 28,556 28,592 28,598 28,599 29,021 29,422 29,443 29,648
31,266 31,353 31,422 31,579

GENERAL

28,136 28,137 28,138 28,143 28,145 28,151 28,159 28,160 28,164 28,170
28,183 28,186 28,188 28,189 28,190 28,191 28,200 28,201 28,213 28,215
28,224 28,226 28,228 28,233 28,237 28,238 28,239 28,251 28,252 28,253
28,254 28,255 28,256 28,258 28,261 28,263 28,269 28,281 28,290 28,291
28,409 28,428 28,430 28,434 28,435 28,449 28,450 28,456 28,459 29,012
29,020 30,433 31,222 31,450 31,697 31,945

MANEUVERS AND PERFORMANCE

28,135 28,144 28,146 28,148 28,152 28,155 28,156 28,157 28,158 28,166
28,169 28,171 28,173 28,174 28,180 28,182 28,184 28,203 28,205 28,209
28,211 28,212 28,214 28,216 28,218 28,219 28,231 28,232 28,235 28,236
28,240 28,245 28,247 28,248 28,261 28,262 28,268 28,271 28,273 28,284
28,287 28,288 28,289 28,294 28,322 28,360 28,389 28,413 28,415 28,418
28,436 28,454 28,458 28,552 28,553 28,560 28,584 28,599 28,600 29,020
29,026 29,420 29,422 29,423 29,424 29,425 29,426 29,431 29,433 29,685
30,908 30,911 30,914 31,274 31,275 31,422 31,437 31,442 31,533 31,535
31,552 31,689 31,868

PHYSIOLOGICAL EFFECTS

28,150 28,169 28,181 28,187 28,190 28,191 28,192 28,196 28,207 28,223
28,227 28,228 28,229 28,248 28,250 28,266 28,415 28,439 28,443 28,459
28,550 28,551 28,552 28,553 28,554 28,557 28,559 28,568 28,578 28,584
28,586 28,589 28,590 28,591 28,595 28,600 28,601 28,611 29,018 31,393
31,395 31,555 31,573 31,666 31,747

VISUAL PROBLEMS

28,204 28,217 28,223 31,370

SPEAKING, INDIVIDUAL DIFFERENCES

GENERAL

28,930 29,242 29,609

NATIONALITY

29,948 29,954 30,043

SPEECH

ARTICULATION AND INTELLIGIBILITY TESTS

29,032 29,033 29,045 29,947 29,956 30,033 30,034 30,059 30,187 30,943
31,646 31,651 31,658 31,765

AUDIOMETRIC TESTING

28,073 29,945 29,995 29,996 29,997 30,136 30,191 30,194 30,195

BASIC CHARACTERISTICS

INFORMATION ANALYSIS

30,018 30,036 30,042 31,246 31,257 31,924

PHONETIC AND PHONEMIC ANALYSIS

29,042 29,850 29,954 29,955 29,973 30,012 30,013 30,036 30,043 30,059
30,061 31,605 31,646 31,676 31,786

SPECTRAL ANALYSIS

29,948 30,013 31,644 31,646

COMMUNICATION SYSTEMS

GENERAL

29,215 29,216 31,377

INTERCOM, RADIO, AND TELEPHONE

28,519 29,028 30,425 30,428 31,358

OTHER

29,033 30,060 30,422 30,424 30,425 30,429

VEHICLE

30,428

DISTORTION

AMPLITUDE MODULATION

30,422

CHOPPING, CLIPPING

29,028 30,430 30,431

COMPRESSION AND EXPANSION

31,539 31,667

DELAYED FEEDBACK

28,519

ENVIRONMENTAL EFFECTS

29,033 30,060 30,424

FREQUENCY

30,187

OTHER

30,061 31,786

SIDETONES

29,991 30,138

SIGNAL-TO-NOISE

28,789 29,712

EQUIPMENT AND METHODS

28,072 29,028 29,032 29,042 29,999 30,013 30,042 30,131 31,646 31,667

GENERAL

28,818 29,028 29,032 29,037 29,042 29,609 29,955 30,420 31,219

MASKING

NOISE

28,072 28,818 29,947 29,956 29,988 30,000 30,041 30,194 30,431

SIMULTANEOUS SPEECH

29,197

SPEECH (CONT'D)

PERCEPTION

28,074 28,075 28,789 28,855 28,919 28,930 29,032 29,197 29,198 29,954
30,018 30,042 30,059 30,131 30,133 30,195 30,430 30,431 31,358 31,561
31,605 31,658 31,667 31,923

RECOGNIZERS

28,930 29,028 29,037 29,038 29,216 30,042 31,592 31,605 31,635 31,676
31,786

STRESS

GENERAL

28,146 28,180 28,200 28,329 28,750 28,942 28,948 29,087 29,812 30,927
31,290 31,584

PHYSIOLOGICAL INDICES

28,406 28,520 28,542 28,576 28,750 29,243 29,320 29,612 31,078 31,495
31,775 31,825 31,838

PSYCHOLOGICAL INDICES

28,305 28,340 28,520 28,522 28,542 28,799 28,948 31,063 31,078 31,299
31,435 31,550 31,585 31,621 31,772

SUBJECTIVE PROBABILITY

28,492 28,522 28,542 28,862 28,872 28,917 28,922 29,055 29,089 29,093
29,287 28,294 28,295 28,327 28,499 28,542 28,778 28,903 28,904 28,905
28,906 28,907 28,908 30,528 30,807 30,892 31,873

SURVEILLANCE SYSTEMS

31,280

SURVIVAL

EQUIPMENT

31,232 31,558 31,571 31,594

IN UNUSUAL ENVIRONMENTS

28,583 31,423 31,560

SYSTEMS DESIGN

GENERAL

28,961 29,127 31,361 31,402 31,599 31,721

TECHNIQUES OF ANALYSIS

EVALUATION

28,956 31,412 31,449 31,455 31,457 31,458 31,474 31,524 31,692

GENERAL

28,961 30,114 31,009 31,053 31,450 31,465 31,466 31,467 31,468

MANAGEMENT AND COST

28,381 30,116 30,119 30,126 30,833 31,319 31,452 31,453 31,457 31,458
31,460 31,464 31,473 31,474 31,650

THEORY

28,961 29,127

TACTILE CODING
28,461 28,462 28,486 28,493 28,518 28,719 28,733 28,756 28,837 28,840
28,845 28,873 28,886 28,888 28,895 28,915 28,963 29,471 29,479 29,911
29,919 30,949 30,997 31,008 31,254 31,349 31,668 31,686 31,709 31,886
TELEVISION DISPLAYS
28,464 28,626 31,128 31,321 31,379 31,510 31,541 31,545 31,578 31,688
31,784
TESTS AND TESTING
APTITUDE AND INTELLIGENCE
30,883
GENERAL
28,933 29,237 29,256 29,257 29,273 29,790
MOTIVATION AND OPINION
28,785
PERSONALITY AND SOCIOMETRIC
29,314 31,527 31,621 31,772
PREFERENCE
28,493 28,700 31,502 31,625
PROFICIENCY
31,069 31,705
PSYCHOMOTOR ABILITIES
30,876
SELECTION
30,876 30,890 30,903 31,527
TIME
PERCEPTION
28,689 28,709 28,743 28,806 29,210 29,320 29,325 29,335 29,496 29,505
29,724 29,848 30,941
SHARING
29,241 31,714
TOOLS, DESIGN OF
29,856 31,008 31,229
TOUCH
GENERAL
28,719 28,803 28,837 28,840 28,873 28,877 28,884 28,886 28,888 28,895
28,911 28,915 28,963 29,244 29,312 29,471 29,479 29,485 29,506 29,512
29,732 29,758 29,943 30,250 30,951 30,997 31,036 31,214
TRACKING
AIDED CONTROLS
28,513
AUDITORY
31,787
COMPENSATORY
28,528 29,004 29,008 29,010 29,222 29,911 31,543 31,826
CONTROLS
28,082 28,513 29,222
DISPLAY FACTORS
28,513 28,997 29,910 29,911 29,912 31,354
EFFECTS OF ENVIRONMENTAL FACTORS
28,176 29,001
EQUIPMENT AND METHODS
31,543
FEEDBACK
29,241 31,376 31,543 31,787

TRACKING (CONT'D)
GENERAL
28,977 28,991 28,992 28,993 29,000 29,914 29,917 31,210 31,398 31,781
31,782
OPERATOR PERFORMANCE
28,380 28,482 28,513 28,523 28,983 28,996 29,196 29,222 29,487 29,519
29,915 29,918 31,354 31,427 31,782
PURSUIT
29,207 29,490 31,376 31,684
QUICKENED DISPLAY
28,997
SIGNAL CHARACTERISTICS
28,513 29,196 29,487
TRAFFIC
MOTOR VEHICLE
28,907 30,559 30,560 30,561 30,562 30,570 30,571 30,594 30,598 30,624
30,633 30,634 30,635 30,899 30,915 30,917 30,928 30,929 31,268 31,300
SIGNS AND SIGNALS
28,630 30,517 30,523 30,526 30,531 30,573 30,915 31,663
TRAINING
BASIC LEARNING DATA
CHARACTERISTICS OF THE LEARNER
28,815 29,290 30,882 31,350 31,463
CHARACTERISTICS OF MATERIAL OR TASK
28,474 28,488 28,662 28,699 28,826 28,892 28,919 29,204 29,212 29,225
29,282 29,290 29,299 29,302 29,448 29,502 29,507 29,509 29,524 29,534
29,873 30,806 30,988 31,196 31,198 31,350 31,857 31,876 31,904
DISTRIBUTION OF PRACTICE
31,869 31,894
GENERAL
28,488 28,697 29,119 29,760 31,857 31,910
KNOWLEDGE OF RESULTS
28,474 28,702 28,770 28,843 29,141 29,147 29,232 29,469 29,503 29,808
29,823 31,062 31,197 31,497 31,652 31,774 31,789 31,860 31,904
LENGTH OF TRAINING
28,755 29,534 31,196
MOTIVATION
28,724 29,105 29,122 29,823 31,062 31,138 31,893 31,895
RETENTION
28,667 28,699 28,798 28,808 28,824 28,842 28,892 28,919 29,057 29,105
29,147 29,194 29,195 29,199 29,204 29,212 29,282 29,299 29,302 29,332
29,448 29,469 29,477 29,507 29,509 29,524 29,696 30,988 30,989 31,002
31,193 31,196 31,247 31,248 31,249 31,251 31,258 31,861 31,871 31,880
31,892
SET AND ATTENTION
28,662 28,734 28,795 28,808 28,825 28,836 29,225 29,480 29,806 29,841
29,873 30,806 31,894 31,901 31,907 31,908
THEORIES OF LEARNING
28,488 28,770 28,795 29,141 29,302 29,704 29,709 29,719 29,745 29,794
29,832 29,833 29,836 29,844 30,410 30,947 30,989 30,994 30,999 31,216
TRANSFER
28,836 29,207 29,229 29,231 29,232 29,241 29,299 29,467 29,480 29,490
30,410 30,897 31,010 31,568 31,774 31,787 31,869
COMPARISON OF METHODS
28,391 28,468 28,713 28,779 29,219 29,229 29,231 29,234 29,255 29,260
29,272 29,807 30,891 31,016 31,529 31,537 31,652 31,704

TRAINING (CONT'D)
EVALUATION OF PROGRAMS
28,402 28,524 31,011 31,654 31,674
GENERAL
28,834 29,689 30,704 30,847 31,469 31,470 31,471 31,472 31,716
INSTRUCTOR BEHAVIOR
29,873
SPECIFIC TYPES
FLIGHT
28,416 28,490 28,881 28,882 30,868 30,890 31,338 31,359 31,403 31,445
31,508 31,527 31,538 31,568 31,958
GUNNERY AND MARKSMANSHIP
28,405
MAINTENANCE
28,489 28,508 28,771 31,463 31,612 31,614
OTHER
28,261 28,474 28,507 28,685 29,238 29,318 29,467 29,857 30,264 30,272
30,277 30,278 30,904 31,272 31,273 31,529 31,530 31,601 31,636 31,660
31,688
RADAR
29,229 29,231
SONAR
31,652
SPACE
28,138 28,161 28,162 28,163 28,166 28,190 28,197 28,288 28,440 28,979
31,552
TRACKING AND MOTOR SKILLS
28,739 29,207 29,487 29,490 29,519 29,699 29,873 30,738 31,314 31,376
31,787 31,900
VOICE COMMUNICATION AND LANGUAGE
29,955 30,839 31,892 31,923
TRAINING AIDS AND DEVICES
COMPUTERS
28,354 29,255
FILMS
28,664 28,717
GENERAL
28,717 31,448
TEACHING MACHINES
28,163 28,355 28,561 28,605 31,057 31,378 31,674
TRAINERS AND SIMULATORS
28,402 29,429 30,738 31,314 31,354 31,359 31,958
TRANSLATING DEVICES
28,935 29,027 29,034 29,039 31,676
TRANSPORTATION SYSTEMS
28,505 28,564 29,868 30,968 31,165 31,167 31,270 31,402 31,727 31,729
31,731 31,847

U

UNDERWATER
BREATHING APPARATUS
30,424 31,136 31,758 31,770 31,771
CLOTHING AND EQUIPMENT
28,539 28,543 29,457 30,425 30,429 31,136 31,506 31,558 31,587 31,684
31,758 31,759 31,770 31,771 31,797

UNDERWATER (CONT'D)

OPERATIONAL EFFICIENCY

28,491 28,522 28,583 29,226 29,320 29,686 29,936 30,146 30,155 31,136
31,377 31,550 31,758 31,770 31,771 31,803

OXYGEN AND PRESSURE REQUIREMENTS

29,598 31,136 31,392 31,758 31,759 31,770 31,771

V

VEHICLE

CONTROLS, DISPLAYS, AND INSTRUMENT PANEL DESIGN

30,744

DESIGN

28,325 28,503 28,505 30,513 30,519 30,527 30,529 30,540 30,612 30,630
30,711 30,713 30,716 30,745 31,494 31,525 31,783

GENERAL

30,532 30,929 31,149 31,480 31,526

HANDLING QUALITIES

30,918 30,922 30,929 31,276 31,363 31,494

LIGHTING SYSTEMS

30,513 30,579 30,581 30,583 30,584 30,586 30,615 30,618 30,619 30,620
30,623 30,736

VESTIBULAR FUNCTION

GENERAL

28,223 28,398 28,401 28,568 28,574 28,577 28,586 29,409 29,729 29,839
31,039 31,214 31,343 31,351 31,440 31,637 31,649 31,666 31,687 31,747

VIBRATION

GENERAL

28,165 28,176 28,200 28,201 28,278 28,279 28,510 28,965 29,729 30,238
30,970 31,008 31,645

WHOLE BODY

28,176 28,392 28,510 28,520 28,566 29,001 29,604 29,605 29,665 29,684
31,030 31,264 31,645

VIGILANCE AND MONITORING

GENERAL

28,441 28,813 28,843 29,111 31,147

PERFORMANCE

28,370 28,474 28,525 28,765 28,779 28,780 28,813 28,871 28,897 29,047
29,083 29,140 29,210 29,211 29,221 29,246 29,279 29,493 29,510 29,532
29,822 29,868 29,909 30,122 30,254 30,636 30,879 31,063 31,371 31,584
31,905 31,906

THEORY

28,525 28,738 28,780 28,843 29,111 29,192 29,738 29,860 29,882 29,883
31,595 31,675 31,911

VISION

COLOR VISION

28,514 28,630 28,631 28,633 28,634 28,635 28,641 28,646 28,651 28,657
28,661 28,679 28,686 28,809 28,819 28,861 28,894 28,967 29,170 29,384
29,508 29,535 29,553 29,563 29,566 29,572 30,517 30,533 30,575 30,958
30,959 30,971 30,979 31,206 31,215

EFFECTS OF UNUSUAL ENVIRONMENTS

ACCELERATION

28,727 29,015

HIGH ALTITUDE

28,204 28,652

VISION

EFFECTS OF UNUSUAL ENVIRONMENT (CONT'D)

OTHER

28,217 28,491 28,522 28,714 28,787 28,803 29,686 30,524 30,983 31,262
31,670

ZERO "G"

28,202 28,204

EQUIPMENT AND METHODS

28,621 28,622 28,636 28,638 28,645 28,717 28,760 29,108 29,170 29,203
29,322 29,338 29,551 29,555 29,562 29,563 29,569 29,570 29,892 30,238
30,301 31,111 31,112 31,115 31,244 31,245 31,426 31,541

GENERAL

28,448 28,875 29,334 30,590 30,741 30,934 31,509 31,837

ILLUMINATION LEVEL

28,622 28,629 28,807 30,511 30,516 30,534 30,545 30,552 30,553 30,563
30,564 30,576 30,580 30,581 30,584 30,586 30,617 30,627 30,671 31,323
31,648 31,949

LOW LEVEL ILLUMINATION

28,330 28,491 28,629 30,510 30,534 30,547 30,576 30,627 30,737 30,958
30,971 31,311

PHYSIOLOGICAL MECHANISMS

28,620 28,621 28,624 28,632 28,650 28,657 28,726 28,744 28,746 28,759
28,761 28,804 28,830 29,170 29,175 29,213 29,382 29,547 29,550 29,558
29,559 29,561 29,564 29,567 29,568 29,573 29,577 29,690 29,705 29,750
29,824 30,939 30,974 30,979 31,034 31,207 31,498 31,943

PSYCHOPHYSICAL SCALES

28,853 28,861 28,864 28,867 28,876 28,894 28,902 28,905 28,924 29,821
31,202

SIGNAL CHARACTERISTICS

28,547 28,649 28,732 28,759 28,805 28,867 28,869 28,875 29,277 29,472
29,481 29,484 29,571 29,730 29,877 30,534 30,563 30,941 31,037 31,043
31,323 31,648 31,949

TESTS

28,631 28,634 28,805 29,383 31,598

THEORIES

28,620 28,643 28,650 28,657 28,663 28,759 28,786 28,819 28,830 28,889
29,108 29,125 29,170 29,334 29,489 29,572 29,705 29,893 28,895 31,000
31,707 31,708

VISUAL

ACCOMODATION AND CONVERGENCE

28,523 28,647 28,648 29,375 29,893 29,894 29,899 30,631 31,262 31,305
31,839

ACUITY

ADAPTATION LEVEL

29,468 29,899 29,901 30,589 30,627 30,631 31,648

BRIGHTNESS CONTRAST

28,624 28,625 28,721 28,732 29,171 29,543 29,548 30,627 30,631 30,985
31,323

DYNAMIC

29,266 29,293 29,543 30,631 30,671

GENERAL

28,632 28,805 29,402 29,415 29,457 29,885 30,627 30,631 30,985 31,262
31,264 31,841

ILLUMINATION

29,468 29,707 29,736 29,774 29,900 30,524 30,627 30,631 30,942 31,648

VISUAL (CONT'D)

ADAPTATION, PRE-ADAPTATION, AND PRE-EXPOSURE

28,622 28,641 28,661 28,720 28,744 28,803 28,804 28,807 28,819 28,916
29,048 29,125 29,309 29,316 29,573 30,099 30,544 30,580 30,582 30,589
30,627 30,631 30,955 30,958 31,311

AFTEREFFECTS, AFTERIMAGES

28,637 28,656 28,684 28,701 28,721 28,726 28,786 28,787 28,788 28,817
28,819 28,831 28,870 28,871 28,880 29,125 29,205 29,206 29,315 29,333
29,399 29,475 29,518 29,740 29,742 29,789 30,265 30,954 30,990 31,204
31,206 31,878

ANOMALIES AND INDIVIDUAL DIFFERENCES

28,630 28,631 28,634 28,687 28,740 29,244 29,383 29,549 29,552 29,575
29,893 29,894 29,895 29,896 29,897 29,898 29,899 29,901 30,099 30,360
31,765 31,837 31,841 31,943 31,944

BRIGHTNESS DISCRIMINATION

28,356 28,547 28,624 28,625 28,627 28,628 28,639 28,653 28,694 28,807
28,853 28,867 28,876 28,905 28,906 28,916 29,278 29,489 29,528 29,565
29,571 29,817 30,555 31,243 31,586

CODING

28,260 28,511 28,712 28,901 29,028 29,225 29,259 29,536 31,256 31,883

COMFORT AND FATIGUE

28,621 29,817 29,895 30,569 30,582 30,613 30,616 30,671 30,927 31,109
31,123 31,127 31,130 31,131 31,132

FIELD

BINOCULAR

28,475 28,528 28,663 28,740 28,801 28,857 28,887 28,921 29,306 29,334
29,341 29,771 30,098 30,263 30,535 30,671 30,948 31,566 31,574 31,662
31,878 31,898

DISTORTED

28,487 28,683 28,684 28,685 28,692 28,720 28,744 28,803 28,819 28,909
28,926 29,288 29,307 29,316 29,518 29,523 29,529 29,530 29,720 29,757
29,798 31,203 31,903

MONOCULAR

28,476 28,701 28,711 28,740 28,744 28,752 28,801 28,921 29,283 29,306
29,495 29,565 29,576 30,948 31,878

PERIPHERAL

28,522 28,523 28,729 28,905 29,206 29,901 30,098 30,518 30,944

INFORMATION PROCESSING

28,484 28,485 28,496 28,712 28,827 28,852 28,856 28,883 28,893 28,900
28,913 29,145 29,225 29,277 29,279 29,284 29,488 29,498 29,726 29,730
31,870 31,872

MASKING AND INTERFERENCE

28,625 28,626 28,866 28,870 28,880 28,896 29,206 29,278 29,468 29,472
29,473 29,486 29,525 29,921 30,950 30,986 31,878 31,884

PERCEPTION

ANGLE

28,681 28,690 28,698 28,701 28,761 28,775 28,879 29,281 29,283 29,304
29,331 29,341 29,470 29,491 29,741 30,954 31,000 31,326

DEPTH AND DISTANCE

28,484 28,629 28,640 28,698 28,711 28,752 28,763 28,777 28,801 28,822
28,904 29,046 29,139 29,148 29,318 29,326 29,511 29,531 29,554 29,706
29,731 29,796 29,797 29,799 30,542 30,543 30,545 30,555 30,571 30,575
30,589 30,617 31,006 31,598 31,613 31,662 31,897

FORM AND CONTOUR

28,662 28,681 28,686 28,695 28,717 28,735 28,775 28,798 28,844 28,866
28,879 28,899 28,900 28,908 28,918 28,921 29,292 29,303 29,321 29,481
29,483 29,484 29,526 29,537 29,721 29,755 29,763 30,912 30,935 30,939

VISUAL

PERCEPTION (CONT'D)

MOVEMENT

28,424 28,485 28,643 28,672 28,687 28,688 28,703 28,704 28,707 28,711
28,720 28,726 28,769 28,816 28,817 28,823 28,828 28,854 28,925 29,048
29,052 29,108 29,205 29,206 29,315 29,333 29,475 29,476 29,531 29,728
29,754 29,800 29,849 30,742 30,869 31,784 31,877 31,912

NUMBER

28,712 28,896 30,787 31,003

PATTERN

28,484 28,487 28,695 28,712 28,717 28,736 28,850 28,856 28,870 28,880
28,896 28,898 28,970 29,146 29,149 29,466 29,467 29,486 28,495 28,786
29,921 30,268 30,948 30,953 31,058 31,256 31,322 31,324 31,563 31,874
31,875

SIZE

28,514 28,517 28,528 28,647 28,648 28,677 28,732 28,777 28,795 28,868
28,879 29,046 29,148 29,193 29,213 29,283 29,301 29,306 29,312 29,326
29,543 30,996 31,000 31,326 31,613

VELOCITY

28,289 28,704 28,864 30,542 30,545 30,550 30,571 30,735 31,417 31,418

REQUIREMENTS

30,737 30,741 31,082 31,574 31,693

SEARCH AND DETECTION

AIR TO AIR

29,421 31,476 31,477

AIR TO GROUND

28,475 28,652 30,703 31,360 31,476 31,477 31,822

GENERAL

28,773 30,986 31,373

GROUND TO AIR

28,810 29,421

TARGET DETECTION

28,289 28,307 28,433 28,464 28,512 28,626 28,711 28,729 28,779 28,805
28,810 28,852 28,883 28,901 28,913 29,145 29,421 29,465 29,476 29,532
29,534 29,817 29,822 31,277 31,303 31,344 31,360 31,373 31,478 31,688

UNDERWATER TARGETS

28,522 29,392

STANDARDS AND SPECIFICATIONS

28,635 28,636 28,646 28,651 29,248 30,509 30,513 30,533 30,583 31,109
31,120 31,124 31,125 31,574

THRESHOLDS

28,621 28,629 28,649 28,661 28,686 28,694 28,759 29,116 29,171 29,293
29,472 29,528 29,811 29,901 30,524 30,581 30,955 31,870 31,872

VTOL, STOL AIRCRAFT

28,451 28,465 28,944 31,221 31,285 31,293 31,339 31,831 31,842 31,843
31,844 31,845 31,846 31,847 31,848 31,849 31,927 31,937 31,940

WARNING AND SIGNAL LIGHTS
28,630 28,635 30,563 30,614 30,618 30,736
WARNING DEVICES
30,585 31,096
WEAPONS SYSTEMS, DESIGN OF
GENERAL
28,302 30,842 31,378 31,511
HANDHELD
28,499 30,889
LARGE-SCALE
28,403 28,433 31,264 31,601
WEIGHTLESSNESS
28,138 28,149 28,151 28,171 28,177 28,190 28,200 28,201 28,202 28,223
28,229 28,247 28,248 28,250 28,259 28,267 28,274 28,275 28,287 28,298
28,308 28,379 28,397 28,429 28,574 28,595 28,599 28,600 28,614 28,616
29,018 29,411 29,412 29,413 31,222 31,274 31,533 31,570 31,689 31,712
31,746 31,748 31,827 31,833 31,868
WINDSHIELDS
30,745
WORK AND TASK PERFORMANCE
ACCURACY AND SPEED REQUIREMENTS
31,016
CAPACITY FOR PRODUCTION
29,639 29,640 29,879 31,147 31,176 31,187 31,526 31,735
COMPLEXITY
28,380 28,996 29,493 29,532
FATIGUE AND BEHAVIOR DECREMENT
28,406 28,422 28,509 28,576 28,580 28,708 28,757 28,842 28,942 29,274
29,809 30,975 31,159 31,163 31,544
GENERAL
28,724 28,738 29,088 29,254 29,269 29,270 29,408 31,013 31,507
LENGTH AND DISTRIBUTION OF WORK AND REST PERIODS
28,357 28,509 31,014
METHOD OF STUDY AND MEASUREMENT
28,444 29,649 29,650 29,879 30,115 31,146 31,159 31,511 31,544 31,779
PACING
30,118
PHYSIOLOGICAL MEASURES
28,509 28,815 29,594 29,602 29,618 29,625 29,632 29,634 29,635 29,666
29,668 29,669 29,670 29,676 29,879 30,960 30,972 31,146 31,163 31,735
31,736 31,739
WORK PLACE DESIGN
AREA REQUIREMENTS
28,358 28,499 28,501 28,503 28,506 29,636 29,863 31,229 31,292 31,428
ARRANGEMENT OF EQUIPMENT AND MEN
28,501 28,505 28,506 30,893 31,412
ATMOSPHERIC CONTROL
28,361 31,107 31,108 31,145 31,146 31,150 31,170 31,172 31,174
GENERAL
28,809 28,448 30,893 30,908 30,909 30,913 30,914 31,147 31,171 31,766
ILLUMINATION
GENERAL
31,107 31,108 31,109 31,110 31,113 31,114 31,120 31,123 31,124 31,125
31,127 31,128 31,132

WORK PLACE DESIGN (CONT'D)

PASSAGEWAYS

29,863 30,908 30,914

SEATING ARRANGEMENTS

28,501 28,506 29,583 29,863

WORK PLACE EVALUATION

30,851 31,504

28,069
Klumpp, R.G. & Leonard, J.L. OBSERVER VARIABILITY IN READING NOISE LEVELS WITH METERS. Sound, July-Aug. 1963, 2(4), 25-29. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.). (Reprint) (Report from: "Speech Interference Aspects of Navy Noises, NEL Rep. 1314, Sept. 1965, Sec. IV.")

This experiment was conducted to determine the dispersion among observers estimating the average level of samples of steady state and fluctuating noises. Each of 9 observers estimated the average level of each of 16 different noise samples displayed on 3 different moving coil meters. An analysis of variance was made on the data. For 14 of the 16 noises the range of estimations was 2 db or less and the standard deviation less than 0.5 db. Since several noise samples contained wide variations in level, the agreement was considered good. The data suggest that the error contributed by the observer, provided the averaging procedure is specified, is small enough to ignore in routine noise measurements.

28,072
Webster, J.C. GENERALIZED SPEECH INTERFERENCE NOISE CONTOURS. J. speech hear. Res., June 1964, 7(2), 133-140. (USN Electronics Lab., Bureau of Shps, San Diego, Calif.). (Reprint) (Report from: "Speech Interference Aspects of Navy Noises, NEL Rep. 1314, Sept. 1965, Sec. VIII.")

Based on an extensive literature review of the effects of noise on speech intelligibility, a series of noise rating curves are developed. These Speech Interference (SI) contours are intended to bridge the gap between: a) Noise Criteria (NC) and Alternate Noise Criteria (NCA) curves used to rate the suitability of offices; and b) a Speech Interference (SI) noise rating curve that predicts the effects of higher level noises on speech intelligibility. The highest SI contour (SI-80) has a minimum at an octave level of 80 dB at 800 cps and is steeply sloped both above and below 800 cps. The lower level SI contours have minima at increasingly higher frequencies and have steep slopes for frequencies below the minima but gradually level off at the frequencies above the minima.
R 15

28,073
Webster, J.C. IMPORTANT FREQUENCIES IN NOISE-MASKED SPEECH. Arch. Otolaryng., Nov. 1964, 80, 494-504. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.). (Reprint) (Report from: "Speech Interference Aspects of Navy Noises, NEL Rep. 1314, Sept. 1965, Sec. X.")

This paper discusses Kryter's hypotheses and rationale regarding the best method for measuring and quantifying the degree of hearing impairment for speech plus the author's experimental data and other findings relevant to the problem. The determination of the most efficient combination of pure-tone losses to predict ability to hear speech was felt to hinge on finding "a point that defines some compensable or otherwise adequately defined handicap in the impairment--handicap--disability scale."
R 23

28,074
Thompson, P.O. & Webster, J.S. THE EFFECT OF TALKER-LISTENER ANGLE ON WORD INTELLIGIBILITY. Acustica, 1963, 13(5), 319-323. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.). (Reprint) (Report from: "Speech Interference Aspects of Navy Noises, NEL Rep. 1314, Sept. 1965, Sec. XI, Appendix B.")

A series of experiments were conducted in a sound-treated studio to study the effects of talker angle and listener angle on speech intelligibility. Background noise was introduced through 2 loudspeakers to control the general intelligibility level in the vicinity of the listeners. The noise also served to neutralize the effects of speech reflections in the room. 70 word-tests were run in 3 sub-experiments. The talker read a list of 50 C-V-C words for each test. The results indicated that speech intelligibility varies more with listener angle than with talker angle, at least within 45° on either side of the talker. However, the relationship between intelligibility and listening angle may have been influenced by the directionality of the noise source relative to the talker and the listeners.
R 4

28,075
Thompson, P.O. & Webster, J.C. THE EFFECT OF TALKER-LISTENER ANGLE ON WORD INTELLIGIBILITY. II. IN AN OPEN FIELD. Acustica, 1964, 14(1), 44-49. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.). (Reprint) (Report from: "Speech Interference Aspects of Navy Noises, NEL Rep. 1314, Sept. 1965, Sec. XI, Appendix C.")

Two experiments were conducted to study the effects on speech intelligibility of talker angle and listener angle and the distance between talker and listener under free-field conditions. Some findings were that: a) speech intelligibility falls off with distance in a manner consistent with a 3 dB per distance doubled fall-off in speech sound pressure level; b) the intelligibility in a broad arc from -45° to +45° in front of the talker was essentially equal; c) the effect of turning the listener 15° to 75° away from the talker was a mean gain of about 4% or a gain equivalent to about 3.5 m in distance; d) the observed directional aspect of intelligibility agreed quite well with SPL measurements made by other investigators around the heads of a model and a human; and e) the effects of distance and wind in this study were in general agreement with the results of previous studies.
R 13

28,082
Craig, D.R. & Ellson, D.G. A COMPARISON OF A TWO-HANDED AND SEVERAL ONE-HANDED CONTROL TECHNIQUES IN A TRACKING TASK. MEMORANDUM REPORT. Rep. MCREXD 694 2L, July 1948, 21pp. USAF Aero Medical Lab., Wright-Patterson AFB, Ohio. (Indiana University, Bloomington, Ind.). (AD 34069)

Results are given of an experiment comparing various manipulative techniques in tracking with the Pedestal Sight Manipulation Test. The sight of the PSMT was fitted with a set of 3 extended handgrips and operators tracked 3 trials daily for 8 days. 5 positions of hands, both hands as grips, preferred hand on various grips, and non-preferred hand on various grips, were used during the tests. Tracking performance using the preferred hand was superior to performance using the non-preferred hand. Performance using the offset handgrips was superior to performance using centered hand-grip except in elevation. This superiority in azimuth and combined azimuth and elevation may be related to a greater operating radius for that handgrip in the azimuth dimension.
R 2

28,120
O'Brien, J.A. SWITCHING FUNCTIONS FOR SIMPLIFIED DATA RETRIEVAL AND DISPLAY DEVICES. Contract AF19(628) 2390, Proj. 481, EST TDR 63 442, Rep. W 6160, Sept. 1963, 25pp. USAF Electronic Systems Div., L.G. Hanscom Field, Bedford, Mass. (Mitre Corporation, Bedford, Mass.). (AD 424796)

Equivalence or inequality functions form the comparison logic of retrieval devices and require logical complements to be processed. Coding rules are described which permit subsets of these functions (which do not require complements) to act as the original functions. Savings in cost of up to 50% may be realized. Electronic, optical, and mechanical forms of these concepts are possible. In particular, words of an associative or content-addressed memory may be organized into fields where the number of bits to encode each field is minimum. A display device which uses a deck of punched cards between a light source and a human observer to simulate combinational circuits with manual switch input and indicator output is described. Light from cells and fields of cells may be interpreted to correspond to the response of the first and second stage respectively of circuits using AND, OR, NAND, or NOR gates. This concept may be generalized to a class of devices where many parallel planes control the flow of electromagnetic waves through aligned apertures.

28,123
Narva, M.A. DISPLAY-CONTROL RELATIONSHIPS IN A SIMULATED SIMULTANEOUS AIRCRAFT-MISSILE CONTROL TASK. Contract AF 33(616) 5472, Proj. 6190, Engng. Rep. 10,850, Aug. 1959, 138pp. Martin Company, Denver, Colo. (AD 613313)

The purpose of this study may be summarized as being twofold: a) the obtaining of information concerning the optimal plane of movement and control sensing for an auxiliary missile stick control to be used simultaneously with the primary flight control; and b) the obtaining of information concerning performance as a function of the degree of correspondence of control and environmental variables to specific pilot pre-experimental flight experience. 36 pilot Ss positioned a spot of light on a scope face by use of a small stick control. This control was used in 3 planes: vertical, oblique, and horizontal. In each of the 3 planes, 2 control sensings were studied. One sensing designated as "natural" was based on congruency between control and display movement (up-for-up in the vertical plane) and the other sensing designated as "acquired" was based on correspondence with the characteristice of a flight control stick (backwards-for-up in the horizontal plane). Half of the Ss performed the experimental task alone, while the other half performed this task while simultaneously maintaining a link trainer lined up on the target area. Superior performance was obtained when the control moved in the same plane and in the same direction as the display element. Performance with the natural sensing and the vertical plane was consistently superior.
R 107

28,133
Ronco, P.G., et al. HUMAN FACTORS ENGINEERING BIBLIOGRAPHY. 1940-1959 LITERATURE. VOLUME I. Contract DA 18 001 AMC 1004(x), May 1966, 1641pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (Institute for Psychological Research, Tufts University, Medford, Mass.).

This bibliography is the first in a planned series of bibliographies of literature pertinent to the field of human factors engineering. It covers literature from the time period of 1940 through 1959. This bibliography consists primarily of: a) an index to the human factors literature; and b) the annotated bibliography.

28,134
Ronco, P.G., et al. HUMAN FACTORS ENGINEERING BIBLIOGRAPHY. 1960-1964 LITERATURE. VOLUME 2. Contract DA 18 001 AMC 1004(x), Oct. 1966, 1311pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (Institute for Psychological Research, Tufts University, Medford, Mass.).

This bibliography is the second in a planned series of bibliographies of literature pertinent to the field of human factors engineering. It covers literature from 1960-through 1964. This bibliography consists primarily of: a) an index to the human factors literature; and b) the annotated bibliography.

28,135
Rochon, R. & Peterson, C.R. AEROSPACE EXPANDABLE STRUCTURES AND MAINTENANCE SUPPORT DEVICES: VOLUME II. EVALUATION OF ADHESIVES SYSTEMS FOR ANCHORING ASTRONAUTS TO A WORK SITE IN SPACE. Contract AF33(615) 1243, Proj. 8170, Task 817008, July 1965, 15pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (GCA Corporation, Minneapolis, Minn. & Archer-Daniels-Midland Company, Minneapolis, Minn.). (AD 474088)

The feasibility of utilizing a thermally initiated adhesive as a space maintenance support device was demonstrated under a number of simulated space conditions. As end items of this study, 300 adhesive patches were fabricated and delivered to the Air Force for evaluation.
R 8

28,136
Lyapunov, B.V. STATION OUTSIDE THE EARTH. FTD MT 64 531, TT66 61 106, Jan. 1966, 161pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Voyennoye Izdatel'stvo Ministerstva Oborony SSSR, Moscow, Russia, 1963, 1-47). (AD 631585)

Translation of a 1963 Russian publication on space stations, satellites, interplanetary routes, and their value for science and practical use. (DDC)
R 31

28,137
US Aerospace Technology Division. SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. PART A. BIOSCIENCES. TT 65 60593, ATD Rep. P 64 66, Rep. 21., Dec. 1964, 14pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 609827)

Abstracts of items in the following fields are given: space medicine and biology, space physiology, and space vehicle ecology. (DDC)
R 8

28,138
US Aerospace Technology Division. SOVIET BIOASTRONAUTICS AND MANNED SPACE FLIGHT. ATD Rep. P 65 14, March 1965, 123pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 459096)

The purpose of this report is to provide information obtained from Soviet open source literature on organizations, facilities, and personalities of the Soviet bioastronautics and manned spaceflight programs. The majority of the 700-odd bibliographic entries listed at the end of the report consist of articles from Soviet scientific and technical periodicals. A large number of articles come from special collections, such as the "Problems of Space Biology" series, published by The Academy of Sciences USSR, and "Aviation and Space Medicine," published jointly by the Allunion Physiological Society of the USSR and the Academy of Medical Sciences USSR. In addition, the materials on which this report is based include papers presented by Soviet scientists at various international space meetings, such as the congresses of the I.A.F. (International Astronautical Federation), COSPAR, and others. Newspaper articles, some from non-Soviet sources, make up a small minority of the references.
R 769

28,139
Boeing Company. SPECIFICATION, X-20 (MARK II-A) SIMULATOR CREW STATION AND REPEATER CONSOLE. Contract AF33(657) 7132, June 1963, 45pp. Boeing Company, Seattle, Wash. (AD 444156)

The crew station, repeater console, and interconnecting cables for the Mark IIA simulator are defined. The new simulator includes changes as of May 1, 1963.

28,140
Thompson, G.O. SATURN V/APOLLO LAUNCH SYSTEM SIMULATION PROGRAM PLAN. VOLUME I. Rep. D5, 13067, Dec. 1964, 42pp. Aero-Space Div., Boeing Company, Seattle, Wash. (AD 479057)

This document defines the Saturn V/Apollo Launch Systems simulation development and outlines the study program to be followed during 1965 and the first quarter of 1966 for investigation of system requirements for automatic and manual modes of booster flight. A real-time hybrid computer launch vehicle simulation is being developed, and a fixed base Apollo Command Module mockup is being constructed. The major elements to be simulated are: six-degree-of-freedom Launch Vehicle Dynamics, Guidance Computer, Flight Control System, Thrust Vector Control, Propulsion System, Staging Sequencer, Launch Vehicle Mission Computer, Emergency Detection System, Malfunction Prediction and Status System, and Crew Displays and Controls. The studies shall be grouped into 2 phases. During Phase I, the capabilities of the current automatic concept of Saturn V flight shall be assessed. In Phase II, criteria for increasing the vehicle's mission reliability through equipment modifications shall be established. Alternate mission capabilities shall be defined and emphasized and the astronaut's ability to provide overall mission control shall be investigated.
R 8

28,141
USA Frankford Arsenal. PROPELLANT ACTUATED DEVICES PROGRESS REPORT ON U.S. AIR FORCE PROJECTS. PAD Progress Rep. 94 1, May-June, 1964, 91pp. PAD Div., USA Frankford Arsenal, Philadelphia, Penn. (AD 449223)

This report is one of a continuing series describing the progress of certain development programs relating to propellant actuated devices (pad) being conducted by Frankford Arsenal. The work covered includes the design and development of specific devices, such as thrusters, catapults, and initiators; investigations of related subjects, including propellants and structural materials; and feasibility studies, aimed at improving the performance of propellant actuated devices and extending their application. (DDC)

28,142
USA Frankford Arsenal. PROPELLANT ACTUATED DEVICES PROGRESS REPORT ON U.S. AIR FORCE PROJECTS. PAD Progress Rep. 93 1, March-April, 1964, 85pp. PAD Div., USA Frankford Arsenal, Philadelphia, Penn. (AD 449221)

This report is one of a continuing series describing the progress of certain development programs relating to propellant actuated devices (PAD) being conducted by Frankford Arsenal. The work covered includes the design and development of specific devices, such as thrusters, catapults, and initiators; investigations of related subjects, such as propellants and structural materials; and feasibility studies, aimed at improving the performance of propellant actuated devices and extending their application.

28,143
Jethon, Z. LATEST ACHIEVEMENTS OF SOVIET SCIENCE IN THE CONQUEST OF SPACE. FTD TT 65 1704/1+2+3+4, Jan. 1966, 18pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: Wojskowy Przeglad Lotniczy, 1965, 19(8), 48-59). (AD 630879)

This paper discusses some of the latest Soviet achievements in their space program. These include manned space flight studies on the effects of acceleration, vibration, weightlessness, and cosmic radiation; muscular coordination; hypersensitivity of the vestibular organ; alimentation; isolation; physiological and psychological stress; telemetry systems; and extravehicular activity. (STAR)

28,144
Dolgich, A. SPACECRAFT UTILIZING THE LIFTING REENTRY TECHNIQUE. PART I. REENTRY AND RECOVERY OF THE SOVIET MANNED SPACE VEHICLES. AID WA 52, Feb. 1964, 87pp. US Aerospace Information Div., Library of Congress, Washington, D.C. (AD 622694)

The contents of this report are as follows: a) Brief discussion and analyst's conclusions and conjectures; b) General data on the structure of the Vostok-type spaceships; c) Descent of a spaceship from orbit to the sensible atmosphere; d) Descent of a spaceship through the sensible atmosphere; e) Protection of aerospace vehicles from overheating; f) Landing systems; g) Lunar flights. (DDC)
R 99

28,145
Mutschall, V. SOVIET LONG-RANGE SPACE-EXPLORATION PROGRAM. ATD WA 57, Part 2, Rep. A, ATD Rep. 65 94, Dec. 1965, 29pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 625661)

The report contains a selection of Soviet technical papers and attempts to give the Soviet view of some space exploration problems as they existed in mid 1965. The problems treated here are divided into 4 sections: a) Interplanetary space travel; b) Lunar expedition; c) Power sources; and d) Extraterrestrial contracts. (DDC)
R 16

28,146
Bobneva, M.I. STUDYING THE PSYCHOLOGICAL ASPECTS OF MAN'S RELIABLE FUNCTIONING IN COSMIC FLIGHT. FTD TT 63 761/1+2, Aug. 1963, 21pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: Voprosy Psikhologii, (Russian), 1963, 2, 173-180). (AD 420604)

This paper reports on largely American work in psychological aspects of space flight under such headings as: a) General arrangements and approaches, see esp. Flaherty (HEIAS 21,009); b) Problems of stress and dependability; c) Operator tasks; d) Work under stressful conditions such as insufficient time to perform and information overload; e) Reliability and information; f) Information underload; g) Compensatory processes; h) Dependability and distribution functions between man and machine.
R 15

28,147
Snow, W.B. & Tatch, M.S. ACOUSTIC NOISE CANCELLING TECHNIQUES FOR DOMED HELMETS. Contract AF33(657) 8567, Proj. 4335, Task 433506, ASD TDR 63 855, Aug. 1963, 135pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Bissett-Berman Corporation, Santa Monica, Calif.). (AD 424179)

The specific objective was study of the feasibility of noise cancelling devices for producing a quiet zone within the confines of a dome-shaped space suit helmet. Little practical use has been made of the noise-cancelling principle because of the difficulty of constructing adequate equipment, and because operation is possible only for limited frequency ranges and small space volumes. The conclusion from both theory and experiment was that the complex sound field inside of a helmet makes it impossible to secure effective noise reduction by noise cancellation. Some alternate noise reduction methods are discussed. The tests involved construction of an artificial head featuring binaural pickup through microphones in the ear positions. Construction and calibration of the head are described.
R 13

28,148
Shebalin, O. SCIENTIST'S LABORATORY IN SPACE. FTD TT 65 709/1+4, Nov. 1965, 4pp., USAF Foreign Technology Div., Wright-Patterson AFB, Ohio., (Transl: Tekhnika-Molodezhi (Russian), 1964, 11, p21).

A generalized discussion is presented of some Russian accomplishments in space flight. (DDC)

28,149
Yuganov, Ye.M., Sidel'nikov, I.A., Gorshkov, A.I. & Kas'yan, I.I. SENSORY REACTIONS OF MAN AND SENSITIVITY OF THE VESTIBULAR ANALYZER UNDER SHORT-TERM WEIGHTLESSNESS. FTD TT 64 1052/1+2+4, Dec. 1964, 13pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: AN SSSR. Izvestiya, Seriya Biologicheskaya (Russian), 1964, 3, 369-375). (AD 610348)

The character and degree of manifestation of sensor reactions under short-term weightlessness depend basically on the dissimilar vestibular sensitivity of persons. The results of ground, vestibular testing permit prediction of man's capacity to work in short-term weightlessness. The functional stability of a vestibular analyzer to weightlessness for persons who show no adverse effects (Group I) is determined by a low sensitivity of the vestibular analyzer to an adequate stimulant and by a rather high level of inhibiting effects on the vestibular analyzer as compared to other afferent systems; for persons experiencing illusions in weightlessness (Group II), by an increased sensitivity of the vestibular analyzer to adequate stimulants and by manifesting the effect of inhibition processes as compared to other analyzers; for persons experiencing motion sickness in weightlessness (Group III), by a high sensitivity of the vestibular apparatus to adequate stimulants and by a weak inhibition effect of other afferent systems on the vestibular apparatus.
R 7

28,150
Agadzhanyan, N.A., Bizin, Yu.P., et al. CHANGES IN HIGHER NERVOUS ACTIVITY AND IN CERTAIN VEGETATIVE REACTIONS DURING LONG PERIODS OF RELATIVE ADYNAMIA AND ISOLATION. FTD TT 64 635/1+2+4, Nov. 1964, 17pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: Zhurnal Vysshey Nervnoy Deyatel'nosti (Russian), 1963, 13(6), 953-962). (AD 609152)

Under long exposure to relative adynamia and isolation where there is a reduction in afferent pulses, a person experiences a significant loss of the normal functioning of the central nervous system. In the laboratory of I.P. Pavlov it was demonstrated that when the peripheral ends of the three distance analysers (vision, hearing and olfactory) are simultaneously severed in a mature animal he will go into a deep sleep lasting 23-23.5 hours of the day. In later works it was noted that sequential severing of peripheral receptors sharply reduces motor activity and leads to a profound change in higher nervous activity. Consequently, in order to maintain the normal work capability of an organism, a minimum influx of extra- and interoceptive pulses is absolutely necessary. This article deals with the nature of the change of the higher nervous activity in man during long exposure to relative adynamia and isolation. (DDC)
R 11

28,151
Borisov, V. & Gorlov, O. LIFE AND SPACE. FTD MT 63 200, Aug. 1964, 279pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: Izdatel'stvo, Moscow, Russia, 1963, T-200). (AD 608650)

Soviet biological experiments carried out with great thoroughness, embraced different sides of the problem of guaranteeing safety of a man's flight in space. In essence they provided a "visa" for the first flight. This book relates, in popular form, the problems and achievements of space biology and medicine. Its authors are Soviet physician-physiologists. Therefore, it is natural that in the book much scientific information is given, from the physiological point of view, concerning questions of preparing future cosmonauts for flights. (DDC)

28,152
USAF Control Display Systems Department. PROPULSION SYSTEM MEASUREMENT AND CONTROL DISPLAY INVESTIGATION FOR THE WHOLE PANEL CONCEPT. VOLUME I. PARAMETRICS AND DISPLAY INVESTIGATIONS. Contract AF33(657) 8739, Proj. 6190, Task 619005, RTD TDR 63 4040, Engnr. Rep. GR 1435 I, Nov. 1963, 117pp. USAF Flight Control Div., Wright-Patterson AFB, Ohio. (Instrument Div., Lear Siegler, Inc., Grand Rapids, Mich.). (AD 425396)

An analysis of liquid rocket propulsion systems was undertaken to determine the essential parameters related to this subsystem which must be sensed, displayed, recorded, or telemetered for adequate display and control during advanced aerospacecraft earth-orbital missions. A system capable of orbiting an integrated four-man crew station was selected for analysis. Investigation included engine performance monitoring, malfunction detection, and compensational control during missions involving advanced orbital plane-change maneuvers, rendezvous, and docking with other spacecraft. Based on this analysis, determinations were made of the probability and consequences of individual malfunction occurrences. Parameters were specified for recording, telemetering, and display, and a control-display panel and console were designed to fulfill the resulting control-display requirements. A report by Rocketdyne, Division of NAA, Inc., on propulsion systems and sensors was used as a basis for this program. A companion volume, Vol. II: Propulsion System Details (Confidential)

28,154
Crews, H.C., Jr. PHYSIO-MECHANICAL EFFECTS OF ACCELERATIONS ON HUMAN BEINGS WORKING IN A ROTATING ENVIRONMENT. Tech. Note R 63, Aug. 1963, 33pp. Research Lab., Brown Engineering Company, Inc., Huntsville, Ala. (AD 610132)

The mechanical forces acting upon personnel and equipment in a rotating environment are described. These forces are used to explain the observed physiological and psychological reactions of personnel. Procedures and practices are recommended to hold adverse reactions to an acceptable minimum.
R 11

28,155
Swope, R.S. MOL EXTRAVEHICULAR SPACE SUIT DATA BOOK. Contract AF04(695) 469, TOR 469 (5107 45) 1, Nov. 1964, 28pp. USAF Commander Space Systems Div., Los Angeles, Calif., (Aerospace Corporation, El Segundo, Calif.). (AD 484213)

Design and performance data are presented for the MOL Extravehicular Space Suit. Interface areas and related hardware are included for the Gemini B, laboratory vehicle, and subsystems, where applicable. The space suit assembly described is capable of providing MOL crew members with ventilation distribution and environmental protection for all MOL missions requiring limited mobility when using the suit in an inflated condition. (DDC)

28,156
Tweeddale, A.D. SPECIFICATION, X-20 SIMULATOR (MARK I-C) CREW STATION. Contract AF33(657) 7132, Rep. D2 80414 2, June 1963, 28pp. Boeing Company, Seattle, Wash. (AD 444183)

The performance of the Mark I-C Crew Station displays and controls defined by this specification, in terms of pilot physical inputs to controls and visual response to displays, shall be the equivalent of the Air Launch Glider Crew Station. The Mark I-C Crew Station shall be mounted on a fixed (non-moveable) base and shall provide no outside visual simulation.

28,157
Starkey, D.G. & Croston, R.C. MMU MISSION ANALYSIS. Contract AF04(695) 592, Rep. 335.38, June 1965, 71pp. LTV Astronautics Div., Ling-Temco-Vought, Inc., Dallas, Texas. (AD 478164)

This report defines the extravehicular procedures, both manual tasks and powered flight maneuvers, to be performed by the Gemini Astronaut in evaluating the MMU and its related equipment. All procedures are shown in a step-by-step sequence as they will occur during implementation of the mission. Procedures are included for 2 Gemini-MMU evaluation flights. Flight No. 1 will be used to evaluate the performance and functioning of the MMU and to provide a preliminary demonstration of the astronaut's ability to maneuver and control himself as a part of the MMU system. The astronaut will remain tethered to the spacecraft throughout this flight. Flight No. 2 will expand the mission profile to emphasize man's ability to perform more flexible tasks in space such as rendezvous and docking from ranges up to 200 feet. He will remove the tether for a portion of this flight. Total time estimates for Flights 1 and 2, including all manual inspection, donning and doffing tasks, are given as 50 min. 24.6 sec. and 51 min. 10.9 sec. respectively. Although further simulation studies are needed to refine these estimates, it is anticipated that future changes will revise these totals downward. In any case, it should be possible to perform both flights during the 52 minutes of daylight available per orbit.
R 5

28,158
Parsons, E., Mahaffey, P.T., Yarbrough, J.L. & Lang, A.L., Jr. SUMMARY OF MMU TETHER STUDY RESULTS FOR PERIOD 15 OCTOBER TO 1 DECEMBER 1964. Contract AF 04(695) 592, Rep. 335.19, Dec. 1964, 257pp. LTV Astronautics Div., Ling-Temco-Vought, Inc., Dallas, Texas. (AD 800257)

The purpose of this report is to summarize the results of MMU tether studies. The principal objective of the program was investigation of the 3-body retrieval concept using the MMU back pack as the third body. The results of the investigation are summarized and discussed in the main body of the report, while plots of the detailed runs are given in Appendix A. (DDC)

28,159
Baer, R.A., Celentano, J.T., Amorelli, D. & Jensen, L.V. SAFETY MEASURES FOR MANNED SPACE FLIGHT. Report from: "National Safety Council, Aerospace Section Meeting, Chicago, Illinois, 31 October 1963." NAA S&ID F1153, Oct. 1963, 25pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 459109)

A study was made on the safety of man in space; specifically the methods to be utilized in providing a livable environment for man in space over protracted periods, and how these methods are being developed by engineers and scientists. There is, however, an implied theme running through this presentation that extends beyond the enthusiasm for succeeding in our space ventures. As a result of the cooperation of engineering, the physical sciences, and the life sciences in promoting safety for man in space, we should ultimately see improved devices and techniques making possible more reliable vehicles, more livable homes, better medical diagnosis and treatment, and contributions to the fundamental understanding of man and toward the fulfilling of his requirements for a full and wholesome life. The nation will benefit, but the primary benefactor of the space effort eventually will be mankind.
R 12

28,160
Amorelli, D., Peters, B.G. & Celentano, J.T. MAN AND MISSION SUCCESS. Report from: "1964 Society of Automotive Engineers - American Society of Mechanical Engineers - American Institute of Aeronautics and Astronautics - Aerospace Reliability and Maintainability Conference, Washington, D.C., June 29-July 1, 1964." NAA S&ID F2173, April 1964, 25pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457785)

This paper discusses a concept of reliability, which includes the relationship of man to total system reliability, and the techniques and controls used to insure spacecraft mission success through reliability. Former maintainability concepts for weapon systems are reviewed briefly, pointing out their inadequacies for manned spacecraft. The reliability concepts for manned spacecraft which require that all systems function during a mission are examined. Examples of man's contribution to the reliability of aircraft and spacecraft systems are discussed. These concepts will permit achievement of mission success that approaches 100 percent, using hardware with a reliability of 80 percent. The method of integrating reliability concepts, step by step, into design analysis and review is discussed in detail as is the subsequent extension into test and redesign activities. The method for integrating man into the space system reveals his capability to manually override, maintain, and repair. This upgrades reliability and provides the means to assure mission success.
R 3

28,161
Wolfe, D.L., Pounds, L.H. & Amorelli, D. PURPOSES FOR EVALUATING, MEASURING AND SCORING ASTRONAUT PERFORMANCES IN TRAINING MISSIONS. Report from: "American Society of Training Directors, Pacific-Riviera Chapter, Santa Monica, California, September 1962." NAA S&ID F358, Jan. 1963, 7pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457788)

This paper examines some potential purposes and uses of performance evaluation in astronaut spacecrew training programs. It presents some benefits of continuous evaluation of performances-from the time of preliminary training plans, through development, achievement of successive spaceflight missions, and through the comparison of results of the missions.
R 11

28,162
Wolfe, D.L. & Rabideau, G.F. PROBLEMS FOR TRAINING FOR SPACECREW PERFORMANCE. NAA S&ID F338, Dec. 1962, 9pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457774)

This paper is concerned with outlining spacecrew training philosophy, examining the current schools of thought toward astronaut training, and raising some critical problems to be resolved in training astronaut crews for deep and distant space probes.

28,163
Kirkpatrick, C.F. PROGRAMMED LEARNING FOR SPACECREW PERFORMANCE. Report from: "Annual Conference of the California State Psychological Association Symposium on Psychological Problems in Manned Space Flight, Los Angeles, Calif., 14 & 15 December, 1962." NAA S&ID D923, Dec. 1962, 23pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457797)

Background and growth of the various types of teaching machines and their attendant programming problems are presented. The results of several research projects in automated instruction are summarized. Conclusions are drawn to indicate programmed learning applications offering potential advantages for use in space programs.
R 35

28,164
Kirkpatrick, C.F. SPACE SURGEONS DILEMMA. NAA S&ID, E423, March 1963, 9pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457794)

Seen as a long range, continuously self-correcting and developing program, Space Medicine is simply a continuation of Aviation Medicine. The ideal aerospace surgeon is not some kind of superman with a digital computer brain and IBM fingers, nor a board-man qualified in seventeen specialties including Parasitology, Psycho-pathology, and Astrology, but a natural extension of the Aviation Flight Surgeon. The classic concept of the Flight Surgeon as Man, Officer, and Physician is expressed in Major General Harry G. Armstrong's words: "He must be courageous and reasonable in propounding his opinions and advice and prepared to defend them with facts and logic. The integrity of the individual must be unquestioned and his loyalty to duty and to those to whom he is responsible must be above reproach. Finally the Flight Surgeon must have that depth of human understanding which will naturally cause those for whom he is responsible to turn to him for guidance and advice in time of stress or need." It is self-evident that the Aerospace Surgeon must have a working knowledge of the many disciplines and departments reporting to him, that administrative experience such as hospital command will be extremely useful, and finally that he satisfy certain professional requirements. But the things that are going to really count are his integrity and resourcefulness in a new and rapidly changing field, his ability to win the trust of the men for whose lives he is responsible, and his sense of dedication to one of the boldest ventures in human history.

28,165
Chiles, W.D. & Custer, Carolyn L. SUMMARIES OF RESEARCH ON THE HUMAN PERFORMANCE EFFECTS OF VIBRATION. Contract AF 33(616) 7279, S2 (61 1519), Projs. 1 (8 7350) & 1 (8 7360), Tasks 73520 & 73606, AMRL MEMO P 60, Nov. 1963, 25pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The effects of vibration on human performance are reviewed in two ways. First, references in the literature are annotated according to a common format. Second, a tabulation of research results is made with the vibration parameters and tasks stated for each reference. The tasks listed are tracking, vision, and reaction time. (HEIAS)

28,166
Garnett, R.J. & Walker, R.C. PRE-PHASE I STUDY FOR THE MOL. P-6 EXTRAVEHICULAR ACTIVITY (EVA) EXPERIMENT. VOLUME I. TECHNICAL REPORT. Contract AF33(615) 2140, AFAPL TR 64 145, Dec. 1964, 306pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (LTV Astronautics Div., Ling-Temco-Vought, Inc., Dallas, Tex.). (AD 463444)

Man's capability to perform extravehicular military missions will be determined through experimentation and demonstration during the Manned Orbital Laboratory (MOL) P-6 Extravehicular Acitvity (EVA) Experiment. For the EVA experiment, a study has been performed during the Pre-Phase I period to define the experiment design, equipment design and procedures for its use, interfaces and integration of the experiment into the MOL, and program planning for subsequent phases. In the experiment design, recommendations are made for both non-powered and powered sub-experiments; and for each, conceptual designs for the required equipment are presented. For the non-powered sub-experiments, equipment consisting basically of handrails, Volcro material, and extensible tapes, will be provided for crewman locomotion and anchoring while performing tasks in the airlock and on the MOL outer surface. For the powered sub-experiments, the crewman will be provided maneuvering capability through use of an Astronaut Maneuvering Unit (AMU). Parametric presentation of tradeoff study results provides a basis for further tailoring the experiment and the equipment selected. The general conclusion was reached that the EVA/MOL program could be completed within the time required by the MOL program, and that only engineering and not experimental development will be required for the equipment.
R 22

28,167
Bielkamp, R.H., Lake, E.R. & McGovern, D.R. INVESTIGATION OF PROPELLANT ACTUATED DEVICES FOR USE IN EMERGENCY CREW ESCAPE SYSTEMS FOR ADVANCED AEROSPACE VEHICLES. PHASE III-DESIGN STUDY. Contract AF 33(615) 1292, Proj. 1362, Task 136205, AFFDL TR 65 26, Part II, April 1965, 180pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (McDonnell Aircraft Corporation, St. Louis, Mo.). (AD 464738)

This report describes the results of the third and final phase of a study related to the design of PAD (Propellant Actuated Devices) for use in a separable crew escape module applicable to a lift/glide re-entry vehicle. Based on results of Phases I and II, preliminary designs have been established for each PAD as a function of component performance criteria. Prime consideration was given to successful abort at any point during the mission profile. It was found possible throughout the entire Phase III effort to evolve component designs for each PAD function without exceeding to any great extent the present state of the art. As a result, the areas mentioned for future research and development are generally concerned with characterization of the more promising new explosives and propellants, and the presentation of several concepts, which, if developed, would offer secondary improvements in the overall system weight, reliability, or cost.

28,169
Pickering, J.C., Lifton, S.E., Stapp, J.P. & Parris, H.L., et al. BIOASTRONAUTICS (BIOMEDICAL PARAMETERS). AFBMD TN 61 10, Rep. WDZB60 58, Dec. 1960, 75pp. USAF Ballistic Missile Div., ARDC, Inglewood, Calif. (AD 452223)

The purpose of this document is to provide data on basic human psychophysiological requirements and capabilities in relation to bioastronautics and to offer a broad look at the current and future state of the art in associated hardware technology.

28,170
Freedman, T. BIOASTRONAUTICS CONSIDERATIONS OF EARLY MANNED SPACE FLIGHT. Contract NAA S&ID E421, Feb. 1963, 7pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457795)

The term bioastronautics often used synonymously with space medicine refers to that field of medical and related biological sciences concerned with all aspects of manned space flight. It is the logical extension of aviation medicine. Included therein are a broad spectrum of disciplines, such as: aerospace medicine, physiology, human factors, biophysics, bioengineering, radiobiology, psychology and life support and protection. The last decade has been the most vigorous era in all human history regarding the study of the human responses to stress and the maintainence of man in hostile environments. Accordingly, the ultimate end of any bioastronautic endeavor is the safe and successful return of the crew. Provision will be made for atmosphere, temperature control, radiation and acceleration protection, zero-g, nutrition, sanitation, prevention and management of illness and injury.

28,171
Seeman, J.S., Smith, F.H. & Mueller, D.D. A TECHNIQUE TO INVESTIGATE SPACE MAINTENANCE TASKS. Contract NASA PR T 18811 G, Proj. 7184, Task 718405. AMRL TR 66 32, April 1966, 11pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio. (George C. Marshall Space Flight Center, NASA, Huntsville, Ala.).

A series of preliminary studies was performed to determine if a high-fidelity ground-based simulation of zero gravity is necessary to obtain valid information about zero-G maintenance performance. Removal and replacement of a prestart solenoid valve on a rocket engine was selected as the basic maintenance task to be studied. Time scores for laboratory performance of the task were compared with scores obtained from Ss operating on the task during periods of transient weightlessness in a K-135 aircraft. Modified hand tools, a tool box, and a worker tethering system were developed for use in the experiment. Major conclusions were: a) the factor contributing most to performance decrement in space maintenance was space suit pressurization level; b) in this study, the effect of weightlessness on performance was less than the effect of suit pressure level, and, in this instance, it would not have been necessary to introduce zero-G conditions to conduct a meaningful study of space maintenance performance.
R 1

28,172
Back, K.C. TOXICOLOGICAL EVALUATION OF MATERIALS ASSOCIATED WITH SPACECRAFT. Report from: "AIAA/ASME Seventh Structures and Materials Conference, Cocoa Beach, Florida, April 1966." Proj. 6302, Task 630201, AMRL TR 66 69, June 1966, 8pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.

The Air Force has pursued research in areas of ground support and space cabin toxicology for the past 5 years. Comprehensive treatment of toxicological problems in both areas has revealed the necessity to define human tolerance limits to propellants and other toxic materials for various durations of exposure. Hence, an integrated input of propellant and space cabin material toxicology provides the basis for selection of habitable cabin atmospheres and materials selection criteria. Since such selection procedures are based on both biological and engineering considerations, one cannot disregard the materials selection aspect or evaluate closed system toxicology without consideration of source. The toxic materials in space system atmospheres are determined primarily by the qualitative and quantitative composition of space cabin equipment and the contribution of contaminants by the crew. Materials selection and analytical studies on gas-off products are key considerations in controlling toxic contaminants in a space cabin. Methods are described to determine the composition of cabin materials gas-off products and to biologically test these compounds for their toxicological effects. An attempt is made to correlate the roles of the materials analytical chemist and the toxicologist as a working team to provide meaningful and useful materials selection criteria.
R 7

28,173
Parry, D.G., Curry, L.R., Jr., Hanson, D.B. & Towle, G.B. A STUDY OF TECHNIQUES AND EQUIPMENT FOR THE EVALUATION OF EXTRAVEHICULAR PROTECTIVE GARMENTS. Contract AF 33(615) 1780, Proj. 6301, Task 630104, AMRL TR 66 4, HSER 3671, Feb. 1966, 425pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio. (Hamilton Standard, United Aircraft Corporation, Windsor Locks, Conn.).

The purpose of this study was to establish a test methodology and a test system for objective, quantitative, and accurate evaluation of extravehicular space protective garments. Areas of testing studied include functional performance, life support, and environmental protection. Emphasis is placed on the problem of suit torque restraints, i.e., mobility. Concepts for appropriate evaluation criteria are discussed. The information presented and conclusions reached are the results of experience in suit testing, technical analysis, search of the literature, and discussions with experts. The nature and causes of suit torque restraint are discussed and a pin jointed model is developed for precise description of suit torques and body interlink angles. Various techniques for torque vector and body angle measurement are explored and it is concluded that a powered articulated dummy and an intrasuit exoskeletal electrogoniometer with off-line computer coupling are required to produce accurate data and useful figures of merit. Measurement techniques for reach envelope, glove evaluation, and comfort are also discussed. Various approaches to thermal and respiratory system evaluation were studied and steady state manned tests at moderate altitudes with minimum suit-wall heat transfer are recommended. The meteoroid, vacuum, thermal, and radiation hazards of space are reviewed and direction for further study in these fields is suggested. Overall facility requirements for suit evaluation are discussed and a digital data acquisition system for conditioning, editing, recording, and processing of functional and life support data is described.
R 116

28,174
USAF Aerospace Technology Division. SPACECRAFT UTILIZING LIFTING REENTRY TECHNIQUE. PART I. REENTRY AND RECOVERY OF SOVIET MANNED SPACE VEHICLES. ATD WA 52, ATD Rep. P 64 60, Oct. 1964, 82pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 608504)

This comprehensive report is based on Soviet and Soviet-bloc open literature published in connection with the launchings of Soviet space vehicles. The analyst's conjectures on possible design principles utilized in the Vostok reentry systems are also contained in the report. (DDC)
R 100

28,175
Akulinichev, I.T., Bayevskiy, R.M., et al. RADIOELECTRONICS IN SPACE MEDICINE. FTD TT 64 836/1+2, Nov. 1964, 63pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: Izdatel'stvo Energiya, Russia, 1964, 3-45). (AD 609140)

Instruments and research methods used in space medicine are described. Brief outlines are given concerning the operating principles and construction of the sensing, amplifying and other apparatus designed for use on spacecraft. The booklet is intended for radio engineers, medical technicians and radio amateurs who build their own equipment.
R 13

28,176
Holland, C.L., Jr. PERFORMANCE AND PHYSIOLOGICAL EFFECTS OF LONG TERM VIBRATION. Contract AF 33(615) 2921, Proj. 7231, Task 723101, AMRL TR 66 145, Rep. ER 7979 12, Oct. 1966, 51pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio. (Lockheed-Georgia Company, Lockheed Aircraft Corporation, Marietta, Ga.).

The present study was designed to investigate human performance as a function of selected parameters of simulated, random, vertical vibration environments. Twelve volunteers were subjected to 4 different vertical vibration environments for 6 hours at a session. The vibration environments varied with respect to acceleration level (0.12G RMS and 0.16G RMS) and with respect to the frequency distribution of acceleration power. Both acceleration power density spectra employed had significant frequency components in the frequency range of 1 to 6 cycles per second, but differed in the location of peak acceleration power. During vibration and control sessions, subjects were required to perform a task complex that included two-dimensional, compensatory tracking and secondary visual and auditory loading tasks. Performance measures were taken for 45 minutes of each hour. Heart rate, respiration rate, and skin temperature measures were also recorded. Tracking error scores on both axes were significantly larger under all vibration conditions than those scores obtained during static test sessions. The two acceleration levels investigated did not differentially affect tracking error. The results of a supplemental investigation indicated that tracking performance was degraded more by a spectrum that had peak power at 5 cps than one with a similar frequency content but with a peak power at 2 cps.
R 14

28,177
Graybiel, A. & Kellogg, R.S. THE INVERSION ILLUSION IN PARABOLIC FLIGHT: ITS PROBABLE DEPENDENCE ON OTOLITH FUNCTION. Contract NASA Order R 93, BuMed. Proj. MR005.04 0021, NAMI 974, Rep. 134, July 1966, 12pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The two-fold purpose of this report is to describe brief experiments carried out in parabolic flight and to discuss the findings in the light of their possible implications for space flight. Observations were made on normal Ss and deaf persons with bilateral labyrinthine defects (L-D Ss) under 3 different conditions in parabolic flights: a) free-floating; b) restrained in a Fiberglas mold; and c) "standing" on the overhead during a modified parabola generating about -0.05 G unit. There were interindividual differences in the reactions among the normal but not among the L-D Ss. Some normal but none of the L-D Ss experienced a reversal of their personal orientation with regard to up-down under all 3 conditions. This "reversal" was considered to have its genesis in the vestibular organs probably the otolith apparatus. Our findings are in accord with Russian reports describing feelings of inversion among cosmonauts in orbital flight. Attention is called to the necessity of distinguishing between information furnished by touch-pressure, kinesthesis, and stereagnosis under ordinary conditions and agravic touch-pressure, agravic kinesthesis, and agravic stereagnosis.
R 12

28,178
Correia, M.J. & Guedry, F.E., Jr. MODIFICATION OF VESTIBULAR RESPONSES AS A FUNCTION OF RATE OF ROTATION ABOUT AN EARTH-HORIZONTAL AXIS. Contract NASA Order R 93, BuMed. Proj. MR005.13 6001.1, NAMI 957, Rep. 129, March 1966, 13pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Eight men were rotated about an Earth-horizontal axis at velocities of 10 and 30 RPM. Both nystagmus and subjective estimates of body position in space were modified by the high rate of rotation. Ss who gave essentially veridical estimates of body position at 10 RPM became disoriented at 30 RPM and gave responses closely resembling those of Ss with labyrinthine dysfunction. Ss who produced sustained unidirectional horizontal nystagmus during constant velocity rotation at 10 RPM produced a reversing horizontal nystagmus during comparable intervals of rotation at 30 RPM. Nystagmus slow phase velocity for both 10 and 30 RPM exhibited a cyclic modulation which was related to orientation relative to gravity. As in previous studies, sickness was produced by rotation about a horizontal axis, and a relationship between mental task and incidence of sickness was again noted.
R 6

28,179
Colehour, J.K. & Graybiel, A. BIOCHEMICAL CHANGES OCCURRING WITH ADAPTATION TO ACCELERATIVE FORCES DURING ROTATION. Contract NASA R 93, BuMed. Proj. MR005 13 0004.2, NAMI 959, Rep. 3, April 1966, 10pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla. (Aerospace Med., Dec. 1966, 37(12), 1205-1207).

To observe biochemical and associated changes attributable to living in a rotating environment at varying rates of rotation. Accute exposure to a rotational velocity of 6.4 RPM in a room 15 feet in diameter resulted in mild stress effects presumably due to Coriolis acceleration produced by head movements out of the plane of rotation. However, adaptation was rapid, and no further stress effects were observed when the rotational velocity was increased to 10.0 RPM and later decreased to 3.2 RPM. It was further observed that rotational-environment recumbency results in mild degrees of hypercalciuria, hypercapnia, and reduced excretion rates of norpinephrine.
R 9

28,180
Chiles, W.D. ASSESSMENT OF THE PERFORMANCE EFFECTS OF THE STRESSES OF SPACE FLIGHT. Proj. 1710, Task 171003, AMRL TR 66 192, Dec. 1966, 29pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.

The performance capabilities of the aerospace vehicle operator must be measured so that the possible deleterious effects of the space environment can be detected at the earliest possible point in a space mission. The information obtained from such measures can also be used to delineate the quality of man's contribution to system effectiveness and the data may also be generalizable to other potential space vehicle missions. It is argued that optimal generality and sensitivity of such performance measures will result from the use of a synthetic task complex. This complex should require the operator to time-share among tasks representative of the psychological functions to be exercised by the man in the kinds of systems to which generalizations are to be made. The criteria to be met by such tasks are listed, and a particular synthetic task complex is described. Some evidence regarding the sensitivity of these tasks to changes in operator functioning is offered.
R 14

28,181
Piemme, T.E., Hyde, A.S., McCally, M. & Potor, G. Jr. HUMAN TOLERANCE TO Gz 100 PERCENT GRADIENT SPIN. Aerospace Med., Jan. 1966, 37(1), 16-21. (USAF Aerospace Medical Research Laboratories, AFSC, Wright-Patterson AFB, Ohio).

Seven Air Force volunteers have been studied on a short radius (4 foot, 9 inch) spin table with the S restrained in the supine position, the Z-axis along the radius. Zero Gz was effectively achieved at eye level; maximum G at the feet. At two arbitrarily selected rates of onset (0.10 G per second and 0.05 per second) the tolerance to levels up to 7G maximum at the feet has been determined. Electrocardiogram and respiration were monitored. Tolerance end-points were defined as peripheral light loss, cardiac rates in excess of 170 per minute, or the onset of such subjective symptoms as nausea, sweating, or lightheadedness. A logarithmic time duration curve may be constructed from 7 G, tolerable for 2 min. 41 sec., through 1 G, tolerable in excess of two hours (at which experiments were arbitrarily terminated). This clearly exceeds tolerance to standard long arm centrifuge acceleration. At high G levels, grey-out and tachycardia were found to be limiting; in the mid-zone range musculoskeletal discomfort of the back and lower extremities was prominent, but not as limiting as in standard low gradient +Gz profiles. Coriolis phenomena were marked, and demanded fixation of head position. Hematocrits and free fatty acids did not change as a function of G load. With these background data, one is now in a position to study the high gradient spin system as a countermeasure to adverse effects of "deconditioning" due to bed rest, water immersion, etc.
R 13

28,182
McCoy, W.K., Jr. & Frost, G.G. PREDICTOR DISPLAY TECHNIQUES FOR ON-BOARD TRAJECTORY OPTIMIZATION OF RENDEZVOUS MANEUVERS. FINAL REPORT. Contract AF 33(615) 2353, Proj. 7184, Task 718402, AMRL TR 66 60, April 1966, 44pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio. (Ritchie, Inc., Dayton, Ohio).

Predictor displays for orbital rendezvous present to the pilot target position, interceptor position, and a continuous prediction of the interceptor trajectory relative to the target. Two experiments using rendezvous predictor displays are reported: a) a comparison of on-line and off-line predictor techniques; and b) a comparison of intermittent versus continuous updating of the prediction. All conditions tested yielded successful rendezvous performance. Off-line prediction, where the pilot could, at will, interrogate the predictor without expending fuel, was demonstrated to be significantly better than on-line prediction where the pilot could see only his actual predicted path. Intermittent updating produced no significant degradation of performance with update rates as low as once per 50 seconds.
R 6

28,183
USAF Translation Division. NEW ACHIEVEMENTS IN STUDY OF THE COSMOS. (SELECTED ARTICLES). FTD MT 63 256, March 1964, 49pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: AN SSSR, Vestnik, 1963, 9, 9-16). (AD 602594)

The following 4 articles are contained in this report: a) Investigations of Cosmic Space and the Upper Layers of Atmosphere; b) Flights of Ships 'Vostok-5' and 'Vostok-6'; c) Cosmos and Life; d) Aurora Polaris and Radiation of the Night Sky.

28,184
Clark, H.J. OPTIMUM ANGULAR ACCELERATIONS FOR CONTROL OF A REMOTE MANEUVERING UNIT. Proj. 7184, Task 718401, AMRL TR 66 20, March 1966, 28pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

6 Ss successfully reoriented the attitude of a simulated remote maneuvering unit (RMU) using an on-off acceleration command control system. RMU attitude was determined solely by viewing the space scene being televised by the RMU. That scene consisted of a spherical target, the earth horizon, and a star background, all of which interacted realistically as a function of the S's RMU control inputs. The RMU was controlled under 3 conditions of angular acceleration: 4, 8, and 12°/sec^2. 4°/sec^2 resulted in least expenditure of fuel and most accurate rate control without a sacrifice in time. These results and Ss' preference data recommended pitch, yaw, and roll accelerations of 4°/sec^2 when using an on-off acceleration command control system. Ss relied primarily on the orientation of the earth horizon for RMU roll reference. Because the horizon was not always in view, errors in roll were significantly greater than those in pitch and yaw. This result may have been an artifact of the simulation; too few stars were simulated to allow their use as an adequate roll reference. Simultaneous or separate attitude control resulted in equally effective RMU reorientation. Similarly, pilots and nonpilots performed equally well. However, pilots can usually be trained faster than nonpilots.
R 7

28,185
Ferguson, J.H. & Hartley, J.L. AN EMERGENCY DENTAL KIT ENCASEMENT FOR USE ON EXTRA-TERRESTRIAL MISSIONS. Contract AF 41(609) 2724, Task 775303, SAM TR 66 34, April 1966, 5pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Systems Research Laboratories, Inc., San Antonio, Tex.). (AD 634466)

Steps have been taken to construct an emergency dental kit for "buddy" or self-care during prolonged space flight. Initial steps taken included a material study, material selection, a design study, prototype design, and destructive testing of a model. Also included is an explanation of the properties of Lexan and Nopcofoam, the materials selected, as well as of the other materials considered. A design based on sandwich construction has been developed and the characteristics of this design are summarized.

28,186
US Aerospace Information Division. BIOLOGICAL DATA ON THE NIKOLAYEV AND POPOVICH FLIGHTS. AID WA 22, Rep. 5, Sept. 1962, 2pp. US Aerospace Information Div., Library of Congress, Washington, D.C. (AD 621810)

Preliminary biological data show that Nikolayev and Popovich suffered no adverse effects from the powered-flight portion (the launching phase) of their joint flights. The data indicate that all the physiological systems functioned completely satisfactorily and that it is possible for man to remain for a long period of time in a state of sustained weightlessness. The physiological and psychological reactions of the men are very briefly discussed.

28,187
USAF Aerospace Information Division. BIOLOGICAL DATA ON THE NIKOLAYEV AND POPOVICH FLIGHTS. AID WA 22, Rep. 3, AID Rep. 62 147, Sept. 1962, 6pp. USAF Aerospace Information Div., Library of Congress, Washington, D.C. (AD 621809)

On the basis of the preliminary data, it can be reported that Nikolayev and Popovich had no difficulties during the powered-flight portion. Their physiological reactions differed very little from those of Gagarin and Titov. Nikolayev's pulse rate rose to 120 and Popovich's to 130. Their respiration rates were 10 and 20, respectively. In orbit under conditions of weightlessness, their pulse and respiration rates rapidly returned to normal. After the sixth orbit, the pulse rates of Nikolayev and Popovich were about 60 to 70 and the respiration rates, 10 to 15. No pathological changes were noted on the ECG's of either cosmonaut, and there were no noticeable disturbances in the records of the EEG, the electro-oculograms, or in records of the skin-galvanic reactions. Much attention was paid to the functional state of the vestibular apparatus in coordination with other closely connected analyzers. The highly developed resistance of the cosmonauts to weightlessness was the result of their special training. Nonetheless, additional studies are necessary to elucidate the effects of weightlessness, particularly reactions of other organs and systems of the human body.
R 6

28,188
USAF Translation Division. LABOR (SELECTED ARTICLES). FTD TT 63 1045/1, Dec. 1963, 15pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Trud (Russian), April 1962, 1-2). (AD 426671)

This report contains 3 articles which present some general observations and comments on the first 2 Soviet space flights: "A year after the first flight," "The first passer along interplanetary paths," "Beyond the limits of the atmosphere."

28,189
USAF Translation Division. IN SPACE NIKOLAYEV AND POPOVICH (SELECTED ARTICLES). FTD MT 63 196, Nov. 1963, 91pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Izdaniye Gazety "Pravda", 1963, 147-155, 162-163, 164-167, 168-188). (AD 619547)

This document contains selections of articles on the Nikolayev and Popovich flight preparation of the astronauts, their problems and duties, mission objectives and biomedical activities.

28,190
USAF Foreign Technology Division. SOVIET AEROSPACE LIFE SUPPORT SYSTEMS, SELECTED ARTICLES FROM: "AVIATION AND COSMONAUTICS (AVIATSIA I COSMONAVTIKE) 1-12, 1962." FTD ST 62 13, 1962, 80pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (AD 419715)

This collection of selected articles in the field of Aerospace Life Support Systems covers the following areas of interest: a) Space biology; b) Space Medicine (Physiological and Psychological); c) Radiation Protection; d) Selection and training of Soviet Cosmonauts; e) Detailed reports of the experiences of 3 of the original Soviet Cosmonauts in orbiting spacecraft. This collection of articles has been assembled from translations of the monthly publication, Aviation and Cosmonautics (Aviatsiya i Kosmonavtika) formerly Herald of the Air Fleet, a journal of the Soviet Army Air Force published by the Military Publishing House, Ministry of Defense, USSR.

28,191
USAF Translation Division. COSMIC RESEARCH. VOLUME 3 NUMBER 5. FTD TT 65 1702/1+2, Jan. 1966, 234pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Izdatel'stvo Nauka, Russia, 1965, 3(5), 667-809.). (AD 627587)

A collection of articles by different authors. Of possible interest to human factors specialists is the article by Ye. Ye. Kovalev and others (pp 192-202) on radiation; B. I. Davydov and others (pp 203-215) on radiation and acceleration; and M. A. Arsenyeva and others (pp 216-234) on the indifference of spaceflight and factors on hereditary structures in animals.
R scattered

28,192
Reetz, A. Jr. (Ed.). SECOND SYMPOSIUM ON PROTECTION AGAINST RADIATIONS IN SPACE. GATLINBURG, TENNESSEE, OCTOBER 12-14, 1964. NASA SP 71, 1965, 551pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C.

Many groups are engaged in research on the attenuation and penetration of high-energy space radiation and on the development of methods for the design of shielding which affords protection against the radiation. The purpose of the Second Symposium on Protection Against Radiations in Space, like that of the First, was to bring these groups together to exchange information and share ideas. The sessions are organized under the following headings: a) Radiation environment in space; b) Biological effects of space radiation; c) The effects of space radiation on materials; d) Shielding against space radiation; e) Symposium summary. R many scattered

28,193
Hoffman, T.L. THIRD BI-MONTHLY PROGRESS REPORT. 1 MARCH 1965-1 MAY 1965. EXPANDABLE GEMINI TO MOL CREW TRANSFER TUNNEL. Contract AF 33(615) 2114, Rep. SP 4014, April 1965, 45pp. Langley Research Center, NASA, Hampton, Va. (Goodyear Aerospace Corporation, Akron, Ohio). (AD 468579)

The program effort is now directed toward the design and fabrication of the modular concept crew transfer tunnel. Phase II detail design, analysis and test has been in progress for 4 months with work proceeding satisfactorily in all 3 areas. Details of the present state of the design, including structural design details, material properties and test results are shown in appendix A, summary presentation, which was presented at SSD on 20 April 1965. The detail design is approximately 90% complete at this time, and definite design requirements have been established for the remaining 10 %. Detail analyses including structural, thermal, meteoroid impact, and radiation are being performed, and all except the thermal analysis are virtually completed. Specimen testing for vacuum, ultraviolet, toxicity, and permeability, thermal, micrometeoroid impact, and radiation is being conducted but is not completed. Micrometeoroid impact tests on unstressed composite wall specimens showed absolutely no damage to the structural layer.

28,194
Shriver, E.L. & Trexler, R.C. A DESCRIPTION AND ANALYTIC DISCUSSION OF TEN NEW CONCEPTS FOR ELECTRONICS MAINTENANCE. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01) HumRRO Tech. Rep. 66 23, Dec. 1966, 136pp. Human Resources Research Office, George Washington University, Alexandria, Va.

Ten new concepts of electronics maintenance are described and analyzed in this report. These concepts differ from the conventional approach in that they advocate an equipment analysis for troubleshooting be made once by experts, then transmitted to the repairman, with appropriate supporting data, to obviate the need for repeated analyses by maintenance personnel on the job. Evidence from experimental evaluations of some of the concepts indicates the potential for marked increases in proficiency and/or decreases in training time as compared to current practice. Comparative evaluation of these concepts should consider system-wide implications rather than any single index, such as reduced training time or cost of preparation of manuals. It would appear that some maintenance situations would be best served by a combination of features from several of the new approaches; in other cases it is possible that one of the concepts is uniquely suited to the particular circuitry or equipment configuration.
R 25

28,195
Fraser, T.M. HUMAN RESPONSE TO SUSTAINED ACCELERATION. Contract NASr 115, NASA SP 103, 1966, 136pp. Scientific & Technical Information Div., National Aeronautic & Space Administration, Washington, D.C. (Lovelace Foundation for Medical Education & Research, Albuquerque, N.M.).

This report is the first in a series of studies concerned with human responses to environmental stress. Its purpose is to provide a critical review of the open literature in the field, and is intended primarily for biomedical scientists and design engineers. The paper is organized under the following chapter headings: a) Introduction; b) The Natural History of Sustained Acceleration Stress; c) Physiological Effects of Sustained Acceleration; d) Tolerance to Sustained Acceleration; e) Performance During Sustained Acceleration; f) Conclusions and Developments. (HEIAS)
R 199

28,196
Roth, E.M. BIOENERGETICS OF SPACE SUITS FOR LUNAR EXPLORATION. Contract NASr 115, NASA SP 84, 1966, 140pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. (Lovelace Foundation for Medical Education & Research, Albuquerque, N.M.).

In this review, the lunar surface is taken as a model of a typical extraterrestrial environment. In Chapter 1 a review of the type of environmental information available from recent astrophysical studies is presented. Chapter 2 is devoted to an analysis of the metabolic load imposed on humans exercising under varied terrain and gravity conditions. An attempt is made to analyze in detail the mechanics of locomotion so that the effects of changing gravity conditions may be logically considered for different gaits and work loads. In Chapter 3 the metabolic cost of mobility restriction in space suits is considered. Chapter 4 is devoted to the problem of thermal control of lunar space suits. Both the exchange with the external environment and metabolically produced heat are covered. The problems of sensible versus latent heat loss in typical suit systems are reviewed. Several approaches to the internal cooling loops are discussed. Chapter 5 presents a brief review of the dangers of thermal overloads and water loss in man. These hazards are discussed in the light of data presented in the previous chapters and suggestions are made for preventive action.
R 352

28,197
Fraser, T.M. PHILOSOPHY OF SIMULATION IN A MAN-MACHINE SPACE MISSION SYSTEM. Contract NASr 115, NASA SP 102, 1966, 107pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. (Lovelace Foundation for Medical Education & Research, Albuquerque, N.M.).

This report examines the philosophy of simulation as it pertains to manned space activities, with a particular orientation to research in the life sciences. Included are discussions on the nature of simulation; prerequisites for simulation; the fidelity, realism, and transfer of training; and the use of manned simulators.
L 76

28,198
Potter, K.W., Tulley, A.T. & Reed, L.E. DEVELOPMENT AND APPLICATION OF COMPUTER SOFTWARE TECHNIQUES TO HUMAN FACTORS TASK DATA HANDLING PROBLEMS. FINAL REPORT. Contract AF 19 (628) 3418, Proj. 1710, Task 171006, AMRL TR 66 200, NASA PR 115, Dec. 1966, 165pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (System Development Corporation, Santa Monica, Calif.).

Research leading to the application of computer software techniques for handling human factors task data generated in support of aerospace system development programs is discussed. It is recognized that data handling techniques must be developed in context with their total operative environment. A concept of an operational data management system for storing, processing, and retrieving human factors task data in a government/contractor environment is discussed and illustrated. This concept is predicated on the assumption that a user-oriented computerized data system will help draw human factors specialists closer to their data. Five problem areas, considered to be fundamental to the development of data handling techniques, were researched. These areas are: a) analysis of human factors task data, data relationships, and classification schemes; b) application of vocabulary and thesaurus techniques to increase the effectiveness of communication among man/machine/software functions; c) application of computer storage and retrieval techniques to human factors task data; d) application of analytical and simulation techniques to human factors task data; and e) application of current awareness techniques to provide notifications of data availability.
R 66

28,199
Hribar, V.F. EXPANDABLE STRUCTURES FOR CONSTRUCTION OF ASTRONAUT TRANSFER TUNNEL. Contract AF 04(695) 469, Rep. TOR 469(5107 15) 11, Feb. 1965, 43pp. USAF Commander Space Systems Div., Los Angeles, Calif. (Aerospace Corporation, El Segundo, Calif.). (AD 484347)

This study investigates the feasibility of using the expandable concept for construction of a transfer tunnel from Gemini B to the Manned Orbiting Laboratory. Current and advanced technology of expandable and/or inflatable structures and data to support its application are presented. The effect of space environment on materials of construction, in addition to various design configurations, properties of reinforcement, elastomers, and fabrication methods are also presented. The study indicates that current technology of expandables is sufficiently advanced such that the construction of an expandable tunnel can be realized if materials, fabrication methods, and design are properly chosen. A self-erectable double-wall composite consisting of a preformed foam interlayer capable of expanding (elastic recovery concept) is considered the best design approach.
R 30

28,200
Dodge, C.H. SOVIET BIOTECHNOLOGY AND BIOASTRONAUTICS. DECEMBER 1964-JUNE 1965. Contract 72202, Proj. PT A67002, ATD WA 22, ATD Rep. 66 14, Rep. 2, Feb. 1966, 228pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 634113)

This compilation of abstracts is based on Soviet-Satellite open sources published 1962-1965. It reflects Soviet research in the fields of space biology, bioastronautics, and biotechnology published for the most part during the last quarter of 1964 and the first two quarters of 1965. There are 132 entries in the form of indicative abstracts, expanded abstracts, and analytical reviews; these entries have been arranged in 11 parts according to the subject: Part I. Effects of altered gravity (15 entries); Part II. Effects of vibration on physiological function (5 entries); Part III. Biological effects of radiation (12 entries) Part IV. Effects of hypothermia on mammals (7 entries); Part V. Effects of altered gas environments (34 entries); Part VI. Effects of combined stresses (12 entries); Part VII. Biomedical effects of space flight (6 entries); Part VIII. Life support systems (8 entries); IX. Human engineering and man-machine factors (11entries); Part X. Monitoring, biotelemetry, and data processing (16 entries); Part XI. Miscellaneous: Future flights, exobiology, ecophysiology (6 entries). The first page of each part contains a list of the entries by number, title, and page number. Also included in the report are an alphabetical author index (including co-authors) and an alphabetical subject index.

28,201
Dodge, C. H. SOVIET BIOTECHNOLOGY AND BIOASTRONAUTICS. JUNE 1965--DECEMBER 1965. Contract 72202, Proj. PT A67002, ATD WA 22, ATD Rep. 66 75, Rep. 3, TT 66 62371, June 1966, 163pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 639781)

This compilation of abstracts is based on Soviet-Satellite-Western open sources published in 1965. The third in a series, this report reflects Soviet research in the fields of bioastronautics, space biology, and space-oriented biotechnology published during the last 3 quarters of 1965. There are 93 entries in the form of indicative abstracts, expanded abstracts, and analytical reviews designed to present as much quantitative data as is permissible within the limitation of the abstracting format. These entries have been arranged in 9 parts according to subject area: Part I. Biomedical effects of altered gravity (10 entries); Part II. Biological effects of vibration and ultrasound (5 entries); Part III. Radiation effects, dosimetry, and technology (23 entries); Part IV. Biological effects of radio frequency and magnetic fields (10 entries); Part V. Effects of altered gas environments (10 entries); Part VI. Effects of combined spaceflight factors (12 entries); Part VII. Life support systems (7 entries); Part VIII. Cosmonaut training, human engineering, and man-machine factors (7 entries); Part IX. Biomedical monitoring, biotelemetry, and biotechnology (9 entries). The first page of each part contains a list of the entries by number, title, and page number. Not included in this report is material from PKB-4 ("Problems of Space Biology", v. 4, 1965). Included in the report are an alphabetical author index and an alphabetical subject index. There is no bibliography.
R many

28,202
Kellogg, R.S. & Graybiel, A. LACK OF RESPONSE TO THERMAL STIMULATION OF THE SEMICIRCULAR CANALS IN THE WEIGHTLESS PHASE OF PARABOLIC FLIGHT. Contract NASA Order R 93, BuMed Proj. MR005.04 0021, NAMI 977, Rep. 136, Aug. 1966, 9pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The objective of this study was to clarify the mechanism of caloric nystagmus in man by conducting the test in weightlessness. 8 Ss were selected on the basis of a strong nystagmus response to irrigation with ice water. Nystagmus was determined by oscillograph tracings and direct observation, and, in addition, subjective responses of the subject were obtained. The experimental evidence indicated that, under the conditions of this experiment, zero gravity completely suppressed caloric nystagmus. This supported Barany's original hypothesis that caloric nystagmus was dependent on difference in specific weight of the endolymph in the horizontal canal.
R 11

28,203
Walker, S.C., Pratt, C.L. & Goodnight, F.H. INTEGRATED BACK-PACK MANEUVERING UNIT PROPULSION STUDY AND EXHAUST PLUME HEATING ANALYSIS. Contract AF 33(657) 10408, Proj. 8170, Task 817008, ASD TDR 63 729, AER 00.252, Sept. 1963, 223pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Astronautics Div., Chance Vought Corp., Dallas, Tex.).

Two technical problems related to the Astronaut Maneuvering Unit are treated. The problems are: a) heating associated with the impingement of the rocket exhaust on space suit surfaces, and b) the performance of inert heated gases as propellants. Methods for predicting rocket exhaust heating rates in space are presented and results are compared with test data. Effects of plume heating of an H_2O_2 monopropellant exhaust from a typical motor placement is summarized. The results obtained from several heated gas propellant tests are reported and compared to theoretically predicted performance. The analytical and experimental techniques utilized are discussed in detail. The refrigerants, Freon 115 and Freon C318 show the highest density impulse and lowest weight. Freon 115 is recommended for use due to the lower storage temperature required. The design and performance of a heated gas system is compared to a hydrogen peroxide system, each to be operational in 1965. The heated gas system is 3 times as large and 2 and one half times as heavy as the peroxide system.
R 39

28,204
Kosenkov, M.M. & Kuz'minov, A.P. SOME RESULTS AND PROBLEMS OF OBSERVATION UNDER SPACEFLIGHT CONDITIONS. Report from: "III International Symposium on Bioastronautics at San Antonio, Texas, 16-18 Nov. 1964." TT 65 61075, FTD TT 65 1/1, Jan. 1965, 7pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: (Russian) (AD 610378))

The great role of the visual apparatus in carrying out human functions during space flight determines the significance given by physiologists and engineers to the questions of the state of the visual analyzer during space flight under the influence of various types of adverse factors. Soviet scientists and engineers, specialists in engineering psychology and ophthalmologists have carried out experimental studies, using for this purpose the Vostok and Voskhod launches. The design of these ships permits observing the earth's surface with the unaided eye. The spectral sensitivity of the eyes under conditions of weightlessness; - a check of the visual acuity of cosmonauts both as the vehicle approaches orbit and under conditions of orbital flight; - a determination of the possibility of identifying various natural formations on the earth; - a determination of optimum illuminating conditions inside the ship's cabin. (DDC)

28,205
Roberts, F.W. CREW TRANSFER BRIEFING. Contract AF 04(695) 469, Rep. TOR 469(5107 15) 7, Sept. 1964, 51pp. USAF Commander Space Systems Div., Los Angeles, Calif. (Aerospace Corporation, El Segundo, Calif.). (AD 484211)

This report describes a briefing on MOL (Manned Orbital Laboratory) crew transfer techniques. Design studies, costs and schedules are given. The presentation employs graphic and ~~tabulated~~ data (HELAS)

28,206
Gini, B., Enright, J.J., Byrne, A.F., Burton, T., et al. SPACE FEEDING. A CLOSED ECOLOGICAL SYSTEM FOR EXTENDED TRAVEL. A REVIEW OF PERTINENT LITERATURE. June 1960, 44pp. USA Quartermaster Food & Container Institute for the Armed Forces, Chicago, Ill. (AD 464278)

A review discusses the use of algae in establishing a closed ecological system for extended space explorations. Special emphasis is given to reports on the use of algae for gas exchange and to those reports which contribute knowledge of rapid growth for future use in food production. To establish a self-sustaining system except for energy supply, it is necessary to consider waste utilization, miniaturization of the algal growth chamber due to space limitations and possible mutation effects to determine the reliability of the system. Therefore, brief reviews on human and animal waste utilization in relation to the growth of algae are presented as well as pertinent knowledge concerning photosynthetic efficiencies and effects of radiation on algae. As an adjunct , a section is presented on tissue culture techniques for consideration as a means of providing additional nutrition but little or no solid waste for the future space travelers and for any possible possible emergency conditions that may arise.
R 175

28,207
Celentano, J.T. & Amorelli, D. CREW STATUS IN VARIOUS SPACE CABIN CONFIGURATIONS AND VOLUMES. Report from: "Third International Congress on 'Man & Technology in the Space Age,'" Milan, Italy, April 21-27, 1963." NAA S&ID F029, April 1963, 25pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457775)

The paper discusses a series of crew confinement studies in a variety of simulated space cabins. The basic test plan and various cabin designs are defined. The biological measurements made during the studies, including physiological and metabolic determinations, are reported and discussed. Comparisons relating crew status to cabin configurations and volumes are made.
R 13

28,208
Freedman, T. & Linder, G.S. CAN MAN BE MODIFIED. NAA S&ID Rep. E428, Rep. 2601 62, Nov. 1962, 14pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457796)

Considering present knowledge of man's past adaptation to adverse environments and present scientific knowledge, it may be in order to consider adapting man to accomodate to some of the extremes of the space environment, instead of putting the entire load on the designer.

28,209
Duke, C.M., Jr. & Jones, M.S. HUMAN PERFORMANCE DURING A SIMULATED APOLLO MID-COURSE NAVIGATION SIGHTING. M.S. Thesis. Contract NAS 9 153, DSR Proj. 55 191, June 1964, 48pp. Instrumentation Lab., Massachusetts Institute of Technology, Cambridge, Mass. (AD 610526)

3 Ss were used. Each performed the superposition task by using a set of hand controllers until the star was on top of the landmark, as seen through the sextant telescope. At this point the S pressed a "MARK" button, which recorded the error that he made in seconds of arc. For each given set of conditions, the S performed the task 25 to 30 times. For each series, the mean error was computed (absolute mean distance from perfect superposition). Statistical tests were then applied to these means to check for significant changes in error due to changing one of the variables.
R 23

28,210
Bedard, E.M. RESEARCH FOR A HEAD ENCLOSURE FOR AEROSPACE ENVIRONMENTS. Contract AF 33(616) 8255, Proj. 6301, Task 630104, Oct. 1963, 19pp. USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (David Clark Company, Inc., Worcester, Mass.). (AD 423943)

A comprehensive study was made of possible design and fabrication approaches for a lightweight head enclosure for aerospace environments. The prototype dome was designed and developed following careful evaluation of the requirements. The transparent hemispherical dome is hinged in the back and is attached to the standard A/P 22S-2 full pressure suit by aluminum locking rings. The convoluted neck joint restraint material is Link-Net of Dacron. The dome is supported by braces resting on the shoulders. An anti-buffeting helmet of lightweight cotton twill houses the energy absorbing pads of Ensolite, the communication system and Straightaway Ear Protectors.

28,211
Zvara, J. & Schroeder, R.L. RECOVERY CONTROL FOR CONTINGENCY RETURNS FROM LUNAR FLIGHTS. Report from: "American Astronautical Society National Meeting on Space Rendezvous, Rescue & Recovery, Edwards AFB, California, September 1963." Rep. GM13.7A(5M)1163, Dec. 1963, 17pp. Systems Requirements Dept., Raytheon Company, Waltham, Mass. (AD 425902)

This paper discusses the problems involved in safe recovery of the crew and spacecraft from lunar flights under contingency situations. Feasible concepts are discussed which would provide recovery support from aborts in all phases of the lunar mission. Data are presented on aborts during powered boost, lunar injection, translunar flight and lunar orbit; and on the maneuverability of an Apollo-type spacecraft during re-entry. Interpretations of these data are made to establish recovery control requirements. A recovery control concept employing high-altitude, long-endurance aircraft as mobile tracking stations is presented.
R 8

28,212
Amorelli, D., Celentano, J.T. & Peters, B.G. RELIABILITY AND THE MAN SUBSYSTEM. Report from: "Fifth International Symposium on Space Technology & Science, Tokyo, Japan, September, 2-7, 1963." NAA S&ID F705, Aug. 1963, 16pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 459187)

This paper discusses the concept of reliability and the relationship of man to total system reliability. Techniques of determining reliability are considered. Examples of man's contribution to the reliability of aircraft and spacecraft systems are discussed. It is the thesis of this paper that the ability of man to manually override, maintain, and repair provides the means by which space mission success can be assured.
R 7

28,213
Zaganescu, F. A BRILLIANT NEW VICTORY OF SOVIET COSMONAUTICS: VALERI BILOVSKI AND VALENTINA TERESHKOVA IN A NEW COSMIC TANDEM. FTD TT 64 34/1+2+3+4, May 1964, 13pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Stiinta Si Tehnica (Rumanian), 1963, 7, 13-15). (AD 600610)

In this new space expedition, the main task assigned to the flight was the problem of studying the influence of the various factors of cosmic flight on the human organism, both as regards prolonged staying in orbit, and as to comparing the effects of these factors on the organisms of man and woman. In addition to these tasks, which require new, complex medical biological research work, the proving and improvement of the systems of manned space vehicles, especially under conditions of group flying, was continued. The new flight through its characteristics, organization, duration and objectives, can be considered as a stage of the greatest importance in the progress of man's penetration into cosmic space. (DDC)

28,214
Heyde, J.S., Jr. FEASIBILITY OF A TRACTOR TYPE SELF-MANEUVERING UNIT. M.S. Thesis. Rep. GA/Phys/64 4, Aug. 1964, 74pp. USAF Institute of Technology, Wright-Patterson AFB, Ohio. (AD 605486)

A small, unstabilized, tractor type, self-maneuvering unit (SMU) is not considered a satisfactory vehicle for extra-vehicular travel in space. A pendulum analogy of flight does not prove a satisfactory method of analyzing the space flight characteristics of an unstabilized system because of the pilots lack of a good reference system and thrust direction indicator. A space flight simulator study reveals that using pitching and yawing thrust to control the main thrust vector of a stabilized SMU, the rendezvous with a target over distances up to five hundred feet is a relatively simple maneuver. No reverse thrust is necessary to reduce terminal velocity because of the small velocity build-up in flight. However, when the conditions of off-center thrust are simulated by providing a constant roll rate the percentage of hits on the target is reduced from a mean value of 90% to 17%; moreover, the terminal velocity increases to the point where retro-thrust is needed to provide a safe landing. The tractor type SMU is a very risky method of transportation which requires a very skilled operator to obtain even minimum success.
R 25

28,215
USAF Translation Division. FIVE MILLION KILOMETERS IN SPACE. FTD TT 64 119/1+2+4, April 1964, 21pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Priroda (Russian) 1963, 7, 11-18). (AD 601078)

A popularized account of the flights of Vostok-5 and Vostok-6. (DDC).

28,216
Schmall, R.A. & Wittmann, T.J. DESIGN AND OPERATION OF A SPACE RENDEZVOUS SIMULATOR. Contract AF 33(615) 1125, Proj. 8170, Task 817008, Nov. 1964, 22pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Technology Incorporated, Dayton, Ohio). (AD 609748)

A one-degree-of-freedom rendezvous simulator was designed and constructed to simulate a 2500-foot rendezvous to determine an astronaut's ability to make a tolerable impact upon a spacecraft when the astronaut is propelled from a first spacecraft by a self-contained, six degree-of-freedom Astronaut Maneuvering Unit (AMU). Conducted in a 270-foot, light-tight photometric tunnel, each run comprised two portions: a) one with an illuminated target appropriately increasing in size to give the effect of motion while subject and target remained stationary, and b) the second with the target full size while a light-weight cart carried the target along the tunnel tracks to produce actual motion. Test results from 30 human Ss revealed that AMU's 20-pound retrothrust would be more than adequate to decelerate from the test closing velocities to a tolerable impact. Autokinetic effects causing the appearance c false target movement and other effects, such as those which might result from a stellar background and a S's having 2 or more angular degrees of freedom, prompted recommendations for provisions to be incorporated in a future test facility.

28,217
Metlay, W., Katz, M.S., Cirincione, P.A. & Tolhurst, G.C. VERTICAL ORIENTATION IN A HOMOGENEOUS ENVIRONMENT. Tech. Rep. NAVTRADEVCEN IH 19, Oct. 1964, 9pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 608568)

Since earlier work investigating the problem of target acquisition and positioning adjustment in a homogeneous environment was directed at horizontal accuracy, the present study was conducted in order to define possible relationships between the ability to position a target in the vertical axis and in the horizontal. 4 Ss were required to reposition, to geometric center, 3 targets which originated from 6 locations, in the vertical axis. In addition, Ss were also required to reposition 1 of the targets along the horizontal axis. The results for vertical and horizontal accuracy could not be determined separately since vertical and horizontal trials were interspersed in the same experimental series. However, what was shown clearly was that feedback, in terms of knowledge of where geometric center is located, can significantly affect vertical and horizontal positioning. It was suggested that a study be conducted to determine whether feedback can be used, and to what degree, to shape an individual's orientation response in the homogeneous environment.
R 4

28,218
Martin, C.P., Long, G.E. & Ritchie, M.L. CONTROL-DISPLAY STUDY FOR ORBITAL RENDEZVOUS. VOLUME II. CONTROL-DISPLAY DEVELOPMENT. FINAL REPORT. Contract AF33(657) 7904, Proj. 6190, Task 619005, FDL TDR 64 94, Oct. 1964, 143pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Ritchie, Incorporated, Dayton, Ohio). (AD 453838)

The general purpose of this volume was to study the control of orbital rendezvous by a human operator. The study began with the physics of the rendezvous situation and a consideration of possible ways of performing rendezvous. A reasonable technological framework was selected by making decisions about the nature of the vehicle, the sensing system, and control equipment. This framework was then used as the foundation upon which subsequent decisions involving human operator-controlled orbital rendezvous could be based. Three phases of rendezvous were identified: a) Open-loop gross orbital corrections, b) Closed-loop terminal approach, and c) Docking. The terminal phase was emphasized first in the study and a tactic for the maneuver was developed which incorporated flexible but accurate manual control using relatively simple sensing, computational, and display equipment. The problem analysis and display-control system development are documented.
R 130

28,219
Ritchie, M.L. CONTROL-DISPLAY STUDY FOR ORBITAL RENDEZVOUS. VOL III. SIMULATOR EVALUATION OF TERMINAL PHASE. FINAL REPORT. Contract AF33(657) 7904, Proj. 6190, Task 619005, FDL TDR 64 94, Oct. 1964, 85pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Ritchie, Incorporated, Dayton, Ohio). (AD 453839)

An experiment is described which provided a simulator evaluation of a control-display system designed to allow an astronaut flexible but precise control over the terminal phase of the rendezvous. Among the displays used was the Rendezvous Vector Display, which showed the pilot the vector velocity relations required to control the vehicle path in the "by-pass plane". Pilot performance was accurate and flexible with little training. Approaches were made reliably to as close as six feet on instruments alone. The conclusions are that any limitation on rendezvous maneuver from 50 miles to 6 feet are not limitations of human performance but of the sensing equipment.

28,220
Dole, S.H. THE ECOLOGICAL COMPLEX IN EXTRATERRESTRIAL BASES. Report from: "Third Annual Meeting, Working Group on Extraterrestrial Resources, November 18-20, 1964." Nov. 1964, 8pp. Rand Corporation, Santa Monica, Calif. (AD 608840)

Several desirable requirements for life-support systems in extra-terrestrial bases are discussed: high reliability, minimum weight transported from Earth, ease of installation and maintenance, effective conversion of metabolic waste products, and maximum use of indigenous supplies and materials. (DDC)

28,221
Haffner, J.W. & Beever, E.R. EFFECTIVE MARS MISSION RADIATION DOSES. Contract NAS 2 1408, SID 64 1298, Rep. F3130, July 1964, 34pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 459190)

The radiation environment encountered by astronauts on a round trip from Earth to Mars was examined. While the trapped radiation belts and the galactic radiation are relatively unimportant, (the former because they are traversed in 15 minutes; the latter because of their low flux) solar proton events on a mission of this duration (400-480 days) require that the astronaut be shielded while these events are taking place. It was found that $\sim$10 gm/cm^2 shielding will provide adequate shielding from the critical organ concept, even without making use of the concept of biological recovery. Making use of biological recovery via the ERD (effective residual dose) concept showed that even on a whole body basis the effective dose never exceeds 110 Rem and decreases (after the mission has been completed) to $\sim$30 Rem. Since many spacecraft designs incorporate 5-10 gm/cm^2 material anyhow, space missions such as the class considered are quite feasible from the standpoint of the space radiation environment.
R 10

28,223
Huertas, J. & Graybiel, A. (Chm.) SECOND SYMPOSIUM ON THE ROLE OF THE VESTIBULAR ORGANS IN SPACE EXPLORATION. Report from: "Symposium held at Ames Research Center, Moffett Field, California, January 25-27, 1966." NASA SP 115, 1966, 312pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif. & USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

These proceedings are the record of the second symposium of a series on gravitoinertial receptor mechanisms and related systems in aerospace flight and add to information presented in the proceedings of the first symposium. In this volume the reports follow the order of presentation in the meeting, thereby preserving the proper continuity of the discussions. The 3 central themes underlying the plan for the conference were: a) the presentation of practical problems posed by weightlessness and subgravity states, including the need for artificial gravity as it might be revealed by exposing animals to weightlessness over extended periods of time; b) up-to-date review articles presented by outstanding authorities in their subspecialties; and c) brief reports on current investigations with special emphasis on the genesis of 'vestibular' nystagmus when animal or human subjects are exposed to certain patterns of linear accelerations and the possibly related phenomenon of modulation of canalicular nystagmus by linear accelerative forces. 25 articles are included.
R many

28,224
Kroshkin, M.G. & Samarin, V.G. FIVE YEARS OF SOVIET SPACE INVESTIGATION. TT66 60077, FTD MT 65 64, Oct. 1965, 19pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: AN SSSR Mezhduvedomstvennyy Geofizicheskiy Komitet. XIII Razdel Programmy MGG. Gravimetriya. Sbornik Statey (Russian), Moscow, 1963, 13, 80-93). (AD 625300)

This survey is a short reference of the basic stages of space investigations carried out in the Soviet Union during the 5 years (1958-1962) of the space era. Data are given on all Soviet spacecraft launched in 1957-1962.
R 41

28,225
Lockheed Aricraft Corporation. GEMINI AGENA TARGET VEHICLE. REPORTS BIBLIOGRAPHY. Contract AF 04(695) 129, Rep. LMSC A605144, Sept. 1964, 12pp. Missiles & Space Company, Lockheed Aircraft Corp., Palo Alto, Calif.

The bibliography lists Gemini ATV reports in 2 ways: numerically by LMSC number and by subject matter. The subject categories are as follows: a) Communications and control system reports; b) Engineering/Technical reports; c) Facilities reports; d) Flight planning reports; e) Human factors reports; f) Service, maintenance, and operation manuals; g) Presentations and briefing aids; h) Product assurance reports; i) Progress reports; j) Propulsion system reports; k) Study reports; and l) Test reports. This document covers Gemini ATV reports published prior to 30 June 1964.

28,226
North American Aviation, Inc. HYPOTHERMIA AND ARTIFICIAL HIBERNATION FOR SPACE TRAVEL, A SURVEY. NAA SID 63 354, March 1963, 45pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 421543)

A survey is presented of the research problem of sending a man on a long space voyage in a state of hypothermia or artificial hibernation. Bibliographic references include foreign language literature as well as English.
R 193

28,227
Kuznetsov, A.G., Agadzhanan, N.A., Dianov, A.G. & Zarov, S.G. HIGHLIGHTS OF FOREIGN BIOASTRONAUTICS. EVALUATION AND SUMMARY OF SOVIET REPRINT: EFFECTS ON THE ORGANISM DUE TO PROLONGED CONFINEMENT IN AN ARTIFICIAL ATMOSPHERE. AMD TR 64 20, Dec. 1964, 11pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 455142)

This report evaluates and comments on reported Soviet results of prolonged confinement in a sealed cabin in which the Ss developed: symptoms of general asthenia, accompanied by an increase in pulse rate and in the time required for its return to normal after physical stress; a reduction in oxygen consumption; deterioration of static endurance and muscular strength of various muscle groups; a reduced resistance to overloads; an increase in S's irritability and fatigue; a decrease in appetite; and a lowering of task motivation toward the end of the experiment.

28,228
USAF Aerospace Medical Division. HIGHLIGHTS OF FOREIGN BIOASTRONAUTICS. VOL 1, NR. 12. AMD TR 64 7, June 1964, 2pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 450333)

This article is an evaluation of the Soviet paper "Manned Space Flight" (HEIAS 28,459). The orthostatic test taken on Cosmonaut Bykovsky, even 2 days postflight, revealed significant residual intolerance to the upright posture evidenced by cardiovascular responses. In addition, he demonstrated during the immediate postflight phase a 30-35 percent decrease in exercise tolerance as evidenced by oxygen consumption rates during a standard exercise test. This presumably reflects decreased cardiorespiratory and muscular reserves. Both this and the tilt-table results appear quite definitely to relate to the prolonged weightlessness deconditioning effects and corroborate similar results obtained on Schirra and Cooper. Such effects promise to be time-dependent; i.e., the longer the weightlessness exposure time the more pronounced will be the biologic effects. Bykovsky's postflight effects were of a much more substantial nature than those reported previously for Titov, although, even in Titov, tilt-table response was altered up to 23 hours postflight. Similarly, in the US astronauts, Schirra's 6-orbit effects were less pronounced than those from Cooper's 22-orbit trip. The postflight encephalographic changes, reported for the first time, are of unestablished etiology and the Soviets offered no further clarification of these results. Apparently, post flight fatigue persisted at least several days. The postflight weight loss reported for the cosmonauts directly supports predictions made from ground-based research concerning body fluid response to gravity. In summary, the Soviets acknowledged the potential significance of deconditioning against prolonged weightlessness.

28,229
USAF Aerospace Medical Division. HIGHLIGHTS OF FOREIGN BIOASTRONAUTICS, VOL 2, NR 2. AMD TR 64 14, Aug. 1964, 17pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 450338)

A summary of Soviet experience with weightlessness in orbital flight, and data on Soviet manned space flights. (DDC)

28,230
Moede, L.W., De Zube, L.H., & Steranka, J., Jr. RESEARCH AND DEVELOPMENT OF UNPOWERED PERSONAL TRANSMITTER TECHNIQUES. FINAL REPORT. Contract AF 33(615) 2206, Proj. BPSN: 5 6339 433506, Task 433506, AFAL TR 66 25, Jan. 1966, 50pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Datametrics Corporation, North Hollywood, Calif.). (AD 478317)

In the absence of the Earth's atmosphere, microwatt voice modulated tramsmitted power will be capable of providing limited range communication between astronauts outside a space capsule and the capsule itself and among the astronauts. Such microwatt RF power can be generated with no external source of power except the acoustic energy of the voice. To demonstrate the utility of such a system, three miniature transceivers and one AC powered transceiver were constructed with provisions to interconnect any of the units into the AN/AIC-18 intercommunication system. Subsequent testing of the completed system demonstrated usable communication for a distance in excess of 300 feet from the hand held transceivers to the AC powered transceiver and over 2500 feet from the AC powered transceiver to the hand held transceiver.
R 6

28,231
Teixeira, C. INVESTIGATION OF "SPACE RESCUE BY A NON-REENTRY MODULE CONCEPT". Proj. 1362, Task 136206, ASD TM 62 26, April 1962, 35pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (AD 447774)

This paper presents the results of an in-house investigation of the feasibility of space rescue by a non-reentry module. Possible hazards to space crews and the subsequent requirements of a rescue module are discussed. Wherever possible, comparisons are made with other rescue techniques in an attempt to arrive at the optimum concept.
R 11

28,232
Olewinski, W., Marton, T., Wilder, L. & Knipe, R., et al. RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF THE PROPOSED AEROSPACE ENVIRONMENTAL CHAMBER. Contract AF 40(600) 1012, Proj. 7778, Task 777803, AEDC TDR 63 256, Dec. 1963, 223pp. USAF Arnold Engineering Development Center, Lackland AFB, Texas. (Missile & Space Div., General Electric Company, Valley Forge, Penn.).

This report describes the work done during a research study for Arnold Engineering Development Center. The purpose of the study was to determine biomedical requirements and provide design criteria for a man-machine system configuration for use in the Proposed Aerospace Systems Environmental Chamber. The major portion of the study considers the chamber where man will be introduced as a member of the crew of a test vehicle or, if necessary, to rescue personnel inside the chamber in case of emergency. Emergency chamber repressurization was not considered acceptable for rescue purposes. This portion of the study describes the emergencies and rescue procedures to be used in the chamber. Equipment including manipulators, pressure suits, pressurized capsules and associated life support equipment, transport equipment, personnel locks, and biomedical equipment were studied for use in the chamber. Recommended system concepts, operational procedures, and manpower requirements are outlined. During the last portion of the study different ground rules were considered (i.e., repressurization was considered for rescue.) The study describes possible vehicle malfunctions which might lead to emergencies, physiological emergencies, and resulting rescue requirements. Simplified equipment concepts to provide for rescue of the test vehicle crew are also described.
R 19

28,233
Vokrouhlicky, L. DOCTORS IN INTERPLANETARY FLIGHTS. FTD TT 65 1177/1+2+4, Dec. 1965, 13pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Kridla Vlasti, (Czechoslovakian), 1962, 14, 406-409). (AD 475268)

Discussed are the most important physiological problems of interplanetary flights. (DDC)

28,234
Pfaffe, H. & Stache, P. TYPES OF COSMONAUTIC BODIES FOR 1957-1964 (SELECTED PARTS). FTD TT 65 992/1+2+4, Feb. 1966, 114pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Typenbuch Der Raumflugkoerper 1957-1964, Deutscher Militaerverlag, Berlin, 1964). (AD 483219)

Since the first man-made Earth satellite, Soviet Sputnik 1, which was launched on October 4, 1957, the number of cosmonautic bodies - satellites and space probes - rose from year to year. But only a few of them became known in their technical details and by the tasks performed by them. The specialists published no details about these bodies. Although the milestone in astronautics has been made visible the whole scope of the development can only then be well evaluated when all the other details are included in them. This book of types offers in its second enlarged edition all the scientific values of the hitherto executed space experiments and their technical missions, as far as it could be attained. Already the systematic evaluation of these tasks offers a good resume of the technical development. The authors have presented extensive material on various blast offs of man-made cosmic bodies and offer a review in a broader and more improved form than in the first edition. This book can no longer claim completeness of all occurrences to this time. This lies in the nature of the fact, that cosmic bodies are being launched almost daily. Until May 31,1964, all known blast offs and blast off trials are included in this book. The data of the cosmic bodies were derived from official communiques of the institutions, upon whose orders and responsibilities the blast offs took place, namely the Academy of Sciences USSR, NASA, USAF, etc.

28,235
Goldburg, A., Hromas, L., McLain, C.E., Menkes, J., et al. OBSERVATIONS OF THE NEAR WAKE RE-ENTRY PHENOMENA BY THE MERCURY ASTRONAUTS. ARPA TN 64 2, Feb. 1965, 80pp. US Advanced Research Projects Agency, Office of the Secretary of Defense, Washington, D.C. (AD 613015)

The near wake re-entry phenomena is discussed as observed by the MERCURY Astronauts during their flights. ARPA has undertaken an extensive research effort to define the properties of the wake for various bodies and shapes of re-entry vehicles as related to Project DEFENDER, (Defense Against Ballistic Missiles).
R 45

28,236
Lebold, J.W. & Lahde, R.N. METHODOLOGY FOR EVALUATING AND VALIDATING MECHANICAL RENDEZVOUS SUBSYSTEMS. Contract AF33(657) 10466, Proj. 1369, Task 136902, RTD TDR 63 4292, Feb. 1964, 268pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Lockheed-California Company, Lockheed Aircraft Corporation, Burbank, Calif.). (AD 601322)

A methodology for evaluating and validating orbital attachment, docking and latching mechanisms was determined. Primary emphasis was placed on validation facilities for systems capable of handling uncooperative, spinning, and nutating targets. Present "state-of-the-art" has been investigated and additional docking concepts, providing specifically for the above type of target, were developed. Analytical and physical validation methods are developed and proposed. These include ground tests in which "g" forces are balanced or canceled by various computer and load sensing devices with controlling servo systems, and by flight tests under zero-"g" conditions. Various physical test methods for evaluating, progressively, components, mechanisms, and finally the complete docking system (including the operator) were established.

28,237
Sisakyan, N.M. (Ed.). PROBLEMS OF SPACE BIOLOGY. VOLUME 4. NASA TT F 368, March 1966, 677pp. National Aeronautics & Space Administration, Washington, D.C. (USSR Academy of Sciences Publishing House, Moscow, Russia). (Transl: Izd-vo Akademii Nauk SSSR, 1965).

This volume includes articles of theoretical and summary nature, experimental investigations carried out on the ground and works relating to the training of cosmonauts, evaluation of the radiation danger associated with spaceflight, isolation and hypodynamia, current status of the problem of ecology in a closed system with the recirculation of substances, cybernetics with reference to the needs of space biology, etc. A separate section describes experiments performed during the orbital flights of the cosmonauts on the Vostoks. The third and major part of the book is concerned with the results of laboratory experiments on animals and testing apparatus. The fourth and last section contains articles on general aspects of space biology and medicine and on methods.
R Scattered

28,238
US Aerospace Information Division. FUTURE LUNAR MISSIONS. REVIEW OF SOVIET & SOVIET-BLOC LITERATURE. AID WA 63, AID Rep. P 64 1, Jan..1964, 246pp. US Aerospace Information Div., Library of Congress, Washington, D.C. (AD 431728)

This report collects materials illustrating informed soviet discussion of manned lunar flight in the period immediately preceding Khrushev's 26 October 1963 disavowal of a crash man-on-the-moon program. Its purpose is to establish the possible patterns of thought of Soviet scientists and authoritative news commentators by the use of selected statements. Since no collection in this field can be thoroughly exhaustive, the criterion for selection of the individuals to be cited and the citations was their representative nature. With certain exceptions forced by time limitations, bio-bibliographic annotations are provided. In order to communicate most fully the impact of the original, the statements are translated rather than paraphrased. In most cases the materials quoted are from the 1961 to 1963 period although earlier statements are occasionally reproduced when necessary to establish the pattern.

28,239
Machelson, Sonya G. BIOLOGICAL DATA ON THE NIKOLAYEV AND POPOVICH FLIGHTS. Contract AID WA 22, Rep. 62 137, TT66 60241, Sept. 1962, 2pp. USA Aerospace Information Div., Library of Congress, Washington, D.C. (AD 626442)

This very brief report contains abstracts of the following two articles: a) Biocurrents Recorded in Space Flight; and b) The Results of the Joint Flights in Space (preliminary findings of the joint flights of Vostok-3 and Vostok-4). Both abstracts are of a general nature.

28,240
Richter, H.L., Jr. (Ed.). SPACE MEASUREMENTS SURVEY. INSTRUMENTS AND SPACECRAFT. OCTOBER 1957-MARCH 1965. Contract DASA DA 49 146 XZ 100, NASA SP 3028, March 1966, 1007pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. (Electro-Optical Systems, Inc., Pasadena, Calif.).

This report summarizes the pertinent characteristics of much of the secentific instrumentation carried in orbital and deep space vehicles. The report is divided into 3 sections: The first section carries the pertinent characteristics of the spacecraft themselves; the section is indexed chronologically, i.e., by launch date (local time in each case). Each satellite and probe sheet carries the initial orbital parameters, a listing of the known scientific experiments and instruments, and details (when available) as to the data and power systems since these often affect the scientific data gathered and transmitted to earth. Each instrument reference cites the page number of the middle section of the book where the instrument description is contained. The second section is arranged by instrument type and carries descriptions, drawings, photographs, and other material pertaining to scientific instruments flown in spacecraft. No attempt has been made to include any of the scientific data gathered by these instruments, although in some cases references are given to papers carrying such data. Whenever possible, the names of the cognizant individuals are given to aid in the search for further information. The information carried on these sheets was gathered from the literature and from personal interview of many of the cognizant scientists and engineers. The third section is a master cross index listing all of the entries in this book by subject, title, common name, etc.

28,241
National Aeronautics & Space Administration. SYMPOSIUM ON PASSIVE GRAVITY-GRADIENT STABILIZATION. Report from: "Symposium held at Ames Research Center, Moffett Field, California, May 10-11, 1965." NASA SP 107, 1966, 269pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C.

The Symposium on Passive Gravity-Gradient Stabilization was organized to document the current state of the art for the benefit of possible users and to focus attention on the remaining problem areas. The committee extended invitations to the principal organizations working in the gravity-gradient-stabilization field to contribute papers on specified subjects. These papers were organized into the following 4 sessions: a) Missions and Mission Requirements; b) Systems Studies; c) Components and Materials Technology; d) Special Studies and Flight Experience. Session (a) contained discussions of the two most likely missions for gravity-gradient-stabilized satellites, namely, communications and meteorology. The other paper in this session deals with the relationship between gravity gradient and geodesy. The next 2 sessions were concerned with the gravity-stabilization techniques. The first brought forth the mathematical description and performance of some promising systems; the second included descriptions of the hardware that has been developed for implementation of these systems. The last session produced papers concerned with special problems, such as station keeping and capture, as well as descriptions of the flight experience that has been gained to date.
R Scattered

28,242
Stiffler, J.J. SPACE TECHNOLOGY, VOLUME V. TELECOMMUNICATIONS. Grant NsG 598, NASA SP 69, 1966, 142pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. (Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.)

Techniques for improving components and data handling and modulation systems in telecommunication are discussed. The mathematical fundamentals are summarized, and component designs for increased signal power at the receiver are described. Details are presented on analog modulation and recent pulse modulation techniques, and the advantages inherent in pulse modulation are indicated. Data compression with the pulsed modulation is covered, and the space craft tracking problems of ranging and telemetry synchronization are discussed. The telemetry systems actually used in the Pioneer and Mariner programs are reviewed, including the ground based equipment at the Deep Space Instrumentation Facilities at the transmitting-receiving sites of goldstone, California; Woomera, Australia; and Johannesburg, South Africa.
STAR
R 18

28,243
Myers, T.I, Murphy, D.B., Smith, S. & Goffard, S.J. EXPERIMENTAL STUDIES OF SENSORY DEPRIVATION AND SOCIAL ISOLATION. Contract DA 44 188 ARO 2, DA Proj. 2J014501B74B 02), HumRRO Tech. Rep. 66 8, June 1966, 70pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To evaluate experimentally some of the psychological effects of sensory deprivation and social isolation, 176 randomly selected volunteers were placed in dark, soundproofed cubicles for four days, while an equal number of other randomly selected volunteers followed a normal routine. Psychological tests and measures were given both Cubicle and Control Ss before, during, and after isolation. Cubicle Ss reported the isolation experience to be unpleasant, boring, and stressful. One-third of them requested early release from the cubicles. In comparison with the Control Ss, Cubicle Ss were better on simple intellectual tasks and on auditory vigilance. They were worse on more complex intellectual tasks, and under some conditions, appeared to be more susceptible to influence. They more often sought meaningful stimulation but also showed some tendency to avoid stimulation. Sensory deprivation and social isolation do have psychological effects, but they are neither simple nor clear-cut.
R 87

28,244
Siegel, B. A THERMODYNAMIC ANALYSIS OF HIGH ENERGY SYNTHETIC FOODS. Contract AF 04(695) 669, TR 669(6210 10) 6, SSD TR 66 91, May 1966, 23pp. USAF Space Systems Div., Los Angeles, Calif. (Aerodynamics & Propulsion Research Lab., Aerospace Corporation, El Segundo, Calif.). (AD 486332)

An analysis is presented of the possibilities of incorporating synthetic foods into the diets of personnel engaged in long duration, manned space flights in order to reduce the weight and volume of the stored food aboard the spacecraft. Organic compounds that would simultaneously give high heats of combustion per unit weight and be readily absorbed and metabolized to combustion products within the human body are evaluated. The objective of this study was either to find compounds that appreciably exceed the caloric content and density of saturated fats, the natural high energy food, or to find appropriate substitutes for the lower energy carbohydrates that normally make up approximately 50 percent of the diet. Various classes of organic compounds were analyzed extensively. The compounds recommended for experimental studies are the longer-chain dihydroxy alcohols and diamines, and synthetic α-amino acids and their peptides of chain lengths in excess of that found in leucine. Methods of reducing possible ketogenic effects are discussed.
R 16

28,245
Drummond, J.E. & Nelson, D.J. ELECTRICAL HAZARDS OF DOCKING IN SPACE. Rep. D1 82 0523, April 1966, 42pp. Plasma Physics Lab., Boeing Scientific Research Laboratories, Seattle, Wash.). (AD 635962)

If two earth satellites are joined by a conductor more than a few meters long the E.M.F. generated by its cutting the earth's magnetic field can set up an electrical current. The return path of the current is through the magnetized plasma surrounding the earth (~1 ohm) and the sheath surrounding the lower (negative) satellite. Calculations are presented of the length of conductor necessary to cause this current to exceed the "limit of physical endurance" of an astronaut attempting to join the two satellites. Should an intermittent connection exist between an astronaut and a single satellite, sufficient alternating component current could flow through the collection area of his suit to exceed the "let go" current of his muscles. Should a hot spot develop on an astronaut's suit or equipment (while he is below his satellite) so that thermionic emission shorts his sheath, the current can exceed one ampere. Partial calculations based on estimated mobilities of small solid particles in rocket exhaust suggest that the limiting potential of a vehicle in the shadow of the moon may approach a million volts. If docking occurred shortly after a power maneuver, as much as a kilojoule of energy could then be dissipated in the ensuing discharge and welding action.
R 22

28,246
Miller, S.A., Dymsza, H.A., Tannenbaum, S.R. & Goldblith, S.A. METABOLIC STUDIES OF ENERGY DENSE COMPOUNDS FOR AEROSPACE NUTRITION. FINAL REPORT. Contract AF 33(657) 7660, Proj. 7164, Task 716405, AMRL TR 64, 121, Aug. 1965, 43pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Massachusetts Institute of Technology, Cambridge, Mass.). (AD 623615)

The aim of these studies was the development of model compounds with which information useful in understanding energy metabolism might be obtained to aid in development of food for space travel. Seven-month studies feeding rats with 1,3-butanediol have been completed. The results of these studies confirm the utilization of this compound as an energy source. Measurement of a number of metabolic parameters at the completion of the study support the contention that 1,3-butanediol is probably metabolized through carbohydrate rather than fat pathways. Metabolism studies with 2,4-dimethylheptanoic acid labeled with C^{14} in the alpha methyl group indicate that this compound as predicted is oxidized through propionate. Design and construction details of the direct animal calorimeter are presented. Results of a limited number of studies with rats fed various diets indicate that the device fulfills its design functions.
R 36

28,247
May, C.B. MAINTENANCE IN A WEIGHTLESS ENVIRONMENT. TECHNICAL PAPER. 1965, 9pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (AD 630807)

The general objective of the Air Force's space maintenance program has been the establishment of a capability to maintain, assemble, and repair vehicles in a space environment. To this end, the Air Force has sought the development of the following: a) maintenance design criteria for space designers; b) maneuvering units to translate an astronaut between spacecraft; c) the concepts, tools, and techniques required to perform in-space maintenance; and d) an analytical model that will simulate the maintenance aspects of a spacecraft, its booster, and all support equipment. Summarized here and referenced in the Bibliography are the reports on efforts performed by the Air Force and industry under contract with the Air Force to effect these specific objectives.
R II

28,248
Vinograd, S.P. (Chm.). MEDICAL ASPECTS OF AN ORBITING RESEARCH LABORATORY. SPACE MEDICINE ADVISORY GROUP STUDY. JANUARY TO AUGUST 1964. Rep. NASA SP 86, 1966, 144pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C.

The Space Medicine Advisory Group (SPAMAG) is a group of consultants representing varied disciplines in the life sciences who met 8 times to be briefed on the current status of the space program and to consider the various aspects of a proposed biomedical program of an orbiting research laboratory. Additionally, the SPAMAG was divided into task groups so that they might address themselves to the specific areas in which they had competence. This report is given in 3 phases. Phase I on life support recommendations covers 6 categories: a) hazards; b) atmosphere; c) living conditions; d) metabolic factors; e) group integrity; and f) medical considerations. Under each of these categories the groups made recommendations concerning the spacecraft, research and development necessary for design of the spacecraft, ground-based experiments which were necessary for the design requirements, and, in some cases, experiments which should be accomplished in space flight preceding the orbiting research laboratory. Phase II is concerned with the experiments. These experiments fall into 3 major categories; the first of which are those related to general medical and physiological measurements. Although a number of specific experiments are designed to test the characteristics of physiological and psychological systems, certain observations are recommended on a continuous daily basis to provide data which may be used in a number of data acquisition and reduction procedures. For Phase III on the design and operational recommendations, the ORL requirements were gathered from a free discussion by the Group and relate to specific spacecraft requirements, requirements for personnel in the spacecraft, and requirements for specific equipment in laboratory facilities on the spacecraft. R scattered

28,249
Miller, A.K. & Lincoln, R.S. STUDY OF HUMAN PERFORMANCE IN A MARK IV PRESSURE SUIT. Rep. 6 62 64 19, Nov. 1964, 24pp. Missiles & Space Company, Lockheed Aircraft Corporation, Sunnyvale, Calif. (AD 619029)

Two subjects wearing Mark IV pressure suits, under both the pressurized and unpressurized condition, were tested on several performance tasks. The purpose of the study was to provide an evaluation of performance tasks under suit conditions. Results of the study indicated that the tasks can be successfully presented on an oscilloscope under computer control to evaluate performance capability of suited crew members. Two interesting effects identified in the experimental data were related to characteristics of the pressure suit. When pressurized: a) the Ss were hindered in the performance of a tracking task because they were unable to rotate their wrists; and b) one subject had difficulty operating push buttons, which were separated by 5/8 in. between edges, because of the characteristics of the gloves included with the Mark IV suit.

28,250
White, W.J., Nyberg, J.W., White, P.D., Grimes, R.H., et al. BIOMEDICAL POTENTIAL OF A CENTRIFUGE IN AN ORBITING LABORATORY. FINAL REPORT. Contract AF 04 (695) 679, SSD TDR 64 209 Suppl., Sm 48502, July 1965, 122pp. Missiles & Space Systems Div., Douglas Aircraft Company, Inc., Santa Monica, Calif. (AD 472550)

The results of several studies pertaining to manned orbital laboratories are reported. The first of these studies concerns the consequence of heart-to-foot acceleration gradients for the measurement of tolerance to positive acceleration. The second was a parametric study of the power requirements of a short radius centrifuge. The third study is an analysis of the errors resulting from use of the centrifuge to determine body mass. The results of an error reduction study and the experimental apparatus for verifying the two-radius method are presented. The salient generalizations derived from a series of studies in which bed rest was used as the analog of null gravity are presented. The results of a pilot study to determine the influence of periodic centrifugation on the physiological disturbances associated with 41 days of bed rest are reported in the fourth study. The investigation was carried out during 20 days of bed rest, and 16 days of bed rest with periodic rides on the centrifuge, followed by 5 days of bed rest, centrifugation, and physical exercise. The fifth study extended the results of the fourth study by increasing the integrated g-time from 0.5 and 2 g-hour to 3 g-hour, added approximately 700 kcal of exercise, and distributed the rides over a 24-hour period as contrasted with the 8-hour schedule of the fourth study. As a result of these studies, the potential of the short-radius centrifuge is presented, recommendations for future research are made; and the impact on future missions is examined.
R scattered

28,251
Prokhorov, A. & Zakharov, I. OUTER SPACE AND CYBERNETICS. FTD TT 65 1147/1+4, TT65 64188, Sept. 1965, 5pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Zarya Vostoka (Russian), Aug. 1962, 1p.) (AD 622463)

Cybernetics substituted the complicated analysis of drawings and the testing of specimens by the investigation of their models, which themselves can be produced with the aid of computing machines. By revealing the profound analogy between the working of computing machines and the functioning of the directing systems of living organisms cybernetics provided a new direction also for research in biology and medicine. The creation of a spaceship, the selection of its optimum design with the computation of an enormous number of factors, the control of its takeoff into orbit, the accomplishing of the checking on the whole complicated program of the flight in the solution of these problems cybernetics has contributed its generous mite. Cybernetics did much for the preparation of the astronauts for the flight. Along with the creation of different automatic training equipment--special devices for testing and training the astronauts--cybernetics put into the hands of the specialists on space medicine methods of precise analysis of all the physiological processes of the human organism under various conditions. The results of the analysis obtained provided the possibility on the one hand to bring out a whole series of requirements for the spaceship, and on the other hand to pick out the people who are better adapted for flight in outer space.

28,252
USAF Translation Division. THE FAMOUS VOSTOK FIRST MANNED SPACE SHIP. FDT TT 65 763/1+4, TT65 62812, July 1965, 8pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Le Celebre Vostok (Russian), 32pp). (AD 618900)

Vostok is a single place sputnik composed of a detachable capsule and an instrument compartment joined by four couplings. The detachable capsule is a sphere with a weight of 2.4 tons and protects the astronaut's compartment. All onboard systems were reported to have functioned normally. Powerful carrier stage rockets have placed the Vostoks in orbits characterized by an 89 minute revolution period and an inclination of almost 65° in relation to the equator. (STAR)

28,253
Tomakov, V. MAN AND OUTER SPACE. FTD TT 65 602/1+4, TT65 63853, Aug. 1965, 7pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Sovetskiy Krasnyy Krest (Russian) 1960, 1, 12-13). (AD 620810)

Russian accomplishments in space technology are expounded with reference to the first 3 satellites to orbit the earth. Dangers or problems encountered in space travel are briefly discussed, and include such areas as acceleration, weightlessness, heat balance, and radiation. (DDC)

28,254
Nikolayev, A. COSMONAUTS PUT ON THE PRESSURE SUITS. FTD TT 65 601/1+4, TT65 63840, Aug. 1965, 4pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Sovetskaya Rossiya (Russian). May, 1960.) (AD 620788)

Problems of life support in space are reviewed briefly. The questions of weightlessness acceleration. tolerance, and food, water, and oxygen requirements are considered. (DDC)

28,255
USAF Office of Aerospace Research. UNITED STATES AIR FORCE RESEARCH AND OTHER PROGRAMS OF THE OFFICE OF AEROSPACE RESEARCH. FOR FISCAL YEARS 1965-1966. Rep. OAR 65 2, Oct. 1964, 185pp. USAF Office of Aerospace Research, Hq., Washington, D.C. (AD 612718)

This publication describes briefly all research and technical-development projects contained in the FY 65FY 66 program of the Office of Aerospace Research. Included are brief descriptions of studies being conducted for ARPA, and resumes of work being performed for NASA and DASA. Each project description includes the name of the center where the work is being conducted, the name of the project scientist, and a description of the project objective, research approach, and plans for succeeding fiscal periods. (DDC)

28,256
US Aerospace Information Division. PRELIMINARY BIOLOGICAL DATA (VOSTOK-3). AID WA 22. Rep. 62 133, TT65 64054, Sept. 1962, 6pp. US Aerospace Information Div., Library of Congress, Washington, D.C. (AD 621811)

Vostok-3 had completed more than 64 orbits around the Earth in 95 hours, and Vostok-4 completed more than 48 orbits in 71 hours. The two spaceships flew close to each other for almost 3 days and maintained direct and regular contact with each other. Launching and landing operations were carried out in strict accordance with the specified plans. All the onboard systems and instruments functioned perfectly during the entire flight. Objective medical data indicated that Nikolayev and Popovich withstood the launch period, orbital flight and landing period with no adverse effects; both cosmonauts were in excellent physical condition during the flight; they were cheerful, felt well, and retained full work capacity. They carried out a large program of flight activities. Their postflight physical condition was good. The two cosmonauts coordinated their activities, exchanged information on their situations and on the functioning of onboard equipment, and compared the results of their observations.
R 9

28,257
Howard, I.P. & Templeton, W.B. HUMAN SPATIAL ORIENTATION. 1966, 533pp. John Wiley & Sons, Inc., New York, N.Y. (University of Durham, Durham, England).

This book presents a comprehensive coverage of human spatial orientation in all its aspects. From a treatment of the spatial senses, the authors continue with behaviour in response to gravity, egocentric localization, shape discrimination and orientation, geographical orientation, visual-motor coordination and human factors in space travel. The following organizational features are emphasized by the authors: a) physiological bases as well as theoretical, experimental and applied aspects included; b) intensive and novel treatment of theoretical issues from a modern viewpoint; c) for the first time data from many disciplines-- physiology, experimental psychology, neurology, education, and space medicine-- are integrated; d) extensive bibliography.
R many

28,258
Bedwell, T.C., Jr. & Strughold, H. (Eds.) THE PROCEEDINGS OF THE THIRD INTERNATIONAL SYMPOSIUM ON BIOASTRONAUTICS AND THE EXPLORATION OF SPACE. Report from: "Symposium held at San Antonio, Texas, 16-18 November 1964." Contract AF 41(609) 2293, Dec. 1965, 642pp. USAF Aerospace Medical Div., AFSC, Brooks AFB, Tex. (AD 627686)

This symposium was focused on manned space flight and was primarily concerned with the life and performance capability of the astronauts. Also included, however, were papers on the closely related areas of technology, astrophysics, and astronomy. 33 presentations by scientists representing the U.S. Air Force, U.S. Navy, NASA, and various civilian institutions, both national and international, are collected in this publication.
R many

28,259
Markey, W. (Chm.). 11TH ANNUAL AIR FORCE SCIENCE AND ENGINEERING SYMPOSIUM. 20-22 OCTOBER 1964. October 1964, 700pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 609378)

Symposium papers of Air Force research, exploratory development, engineering development, advanced development, test and evaluation. Included are two papers of particular interest to human factors specialists: a) 'Cardiovascular Responses to Gravitational Changes After Prolonged Bed Rest';and b) 'Interdisciplinary Measurement of Human Performance Under Low and Zero Gravity Conditions'--see HEIAS 20,781 for full references.

28,260
Ziegler, P.N., Reilly, R.E. & Chernikoff, R. THE USE OF DISPLACEMENT, FLASH, AND DEPTH-OF-FLASH CODED DISPLAYS FOR PROVIDING CONTROL SYSTEM INFORMATION. INTERIM REPORT. Contract NRL Probl. Y02 01, Proj. RR 006 09 41 5351, NRL Rep. 6412, July 1966, 12pp. USN Engineering Psychology Branch, ONR, Washington, D.C.

Two experiments were performed to investigate the use of brightness-coding and flash-coding techniques for presenting information usually provided by displacement displays. The first experiment compared a conventional displacement display with this same display incorporating flash coding, using one of two frequencies to indicate high or low error direction. The results of this study showed that at longer viewing ranges, at which the displacement cannot be discriminated, tracking performance was enhanced by the addition of flash coding to the displacement display. The second experiment, using a point source of light, compared flash coding (of error direction) with combined flash and brightness coding (of error direction plus magnitude). This latter display, termed "depth-of-flash," was found to be superior after a relatively short learning period. The findings indicate that the depth-of-flash technique may be a fruitful approach in the development of an effective landing aid.
R 2

28,261
Gowen, R.J. (Chm.). FIRST ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 4-5 May 1964. May 1964, 296pp. USAF Academy, Colorado Springs, Colo. (AD 450818)

This symposium covered the following areas: bioinstrumentation, search for extraterrestrial life, biodynamics, biological mechanisms, physiology and medicine, and bioengineering education.
R many

28,262
Goodall, R., et al. A STUDY OF AN ORBITAL MAINTENANCE AND MATERIAL TRANSFER SHUTTLE. Contract AF 33(657) 10290, Proj. 8170, Task817010, RTD TDR 63 4057, March 1964, 357pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Lockheed-California Company, Lockheed Aircraft Corporation, Burbank, Calif.). (AD 438517)

A conceptual study of an orbital maintenance and material transfer shuttle is presented. The shuttle is a one-man vehicle used for transporting personnel and materials between other orbiting vehicles and for performing maintenance and repair on space stations or unmanned satellites. The application of the shuttle to existing and proposed space systems is examined and found to be feasible and economically advantageous. The trade-offs between range, duration, propulsion and on-board power systems are presented and design values selected. A simple guidance technique using a short-range radar is formulated. Results of simulated maintenance experiments conducted with a worker in a pressure suit are reported and integrated into the shuttle design. A preliminary design of the vehicle with definitive weights and subsystem characteristics is presented.
R 10

28,263
USAF Translation Division. THE ASSAULT ON OUTER SPACE GOES ON. FTD TT 65 1903/1+4, April 1966, 4pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Tekhnika i Vooruzheniye, 1964, 10, 2-3). (AD 632313)

A powerful rocket carrier first took out into the endless distances of outer space the multiple-place spaceship, the Voskhod, aboard which there was laboring to accomplish their goal, carrying out a complicated and multilateral program of scientific investigations, a friendly group of astronauts, an engineer, a scientist, and a physician. These researches have uniquely important significance for further long flights of the crews of spaceships. Three in outer space on one ship--such a thing has never happened before. And from the moment when the Voskhod soared upward into the skies and went into its assigned orbit from all corners of our planet there flowed in greetings addressed to the Soviet people and its glorious sons, V.M. Komarov, K.P. Feoktistov and R.R. Yegorov. The Soviet Union in opening up a new era in the history of mankind maintains the primacy, true to natural law, in the exploration and conquest of outer space. For this serious affair proves to be a component part of the gigantic creative work which the Soviet people is carrying on in accordance with the general line of the Communist Party in all branches of economy, science, and culture in the name of mankind for the benefit of mankind. (DDC)

28,264
Boreva, L.I. & Zabodovskaya, E.M. LITERATURE INDEX OF AEROSPACE MEDICINE AND BIOASTRONAUTICS. FTD TT 65 1661/1+4, March 1966, 64pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (AD 633355)

A bibliography is presented of literature dealing with aerospace medicine and bioastronautics published in the Soviet Union during 1964 and 1965. Entries are presented alphabetically by author, and separately for each year, under the following headings: general aspects; biology; neuro and sensory physiology; psychology and psychiatry; biological, physiological, and psychological effects of environment factors and stresses; personnel; medical problems and pharmacology; toxicology; and man-machine integration and lift support systems. In addition to authors, only titles and sources are presented for the references.
R 567

28,265
Malcolm, J.R. & Moir, R.K. OPTIMIZATION OF CREW COMFORT SYSTEM. Report from: "Third Space Congress, Cocoa Beach, Florida, March 1966." Rep. D2 84297 1, March 1966, 22pp. Boeing Company, Seattle, Wash. (AD 480504)

This document is a technical paper presented at the Third Space Congress in Cocoa Beach, Florida, in March 1966. This technical paper reports the results of an analytical study conducted to evaluate the environmental parameters that affect man's comfort during shirtsleeve operation under conditions of weightlessness. The parameters considered include air velocity, air temperature, mean radiant temperature, and clothing thermal resistance. Vehicle weight penalties associated with heat rejection by radiation, convection, and evaporation were evaluated to determine minimum weight systems that satisfied the requirements for crew comfort. The study demonstrated that an optimum combination of design parameters of air velocity, air temperature, mean radiant temperature, and clothing thermal resistance may be obtained.
R 4

28,266
Curtis, S.B., Dye, D.L. & Sheldon, W.R. FRACTIONAL CELL LETHALITY APPROACH TO SPACE RADIATION HAZARDS. Report from: "Second Symposium on Protection Against Radiations in Space, Gatlinburg, Tennessee, October, 1964." Rep. D2 90611, 1964, 13pp. Boeing Company, Seattle, Wash.

A method of radiation hazard evaluation has been introduced in which the fractional number of inactivated cells of an organ is calculated. This fractional cell lethality (FCL) depends only on the particle energy spectrum and the probability of cell inactivation. Recent data on inactivation cross sections of human kidney cells have been used to calculate the contribution of protons, alpha particles, and M-group particles to the FCL of the kidney. The results indicate that the proton and alpha particle contributions would have been the same order of magnitude for the 12 November 1960 giant solar flare and their relative contribution does not vary much with shielding thickness. For a seated astronaut, the FCL values are on the order of 5% under reasonable shielding at points 4 and 6 cm inside the body at the waist. When data on inactivation cross sections become available on more critical organs, containing cells not replaced by the body, this approach may yield a realistic evaluation of the hazard from high-LET radiation on extended space missions.
R 13

28,267
Beebe, D.E. FORCE ANALYSIS OF WALKING AT REDUCED GRAVITY. M.S. Thesis. Mech/GA 64 1, Aug. 1964, 98pp. USAF Institute of Technology, Wright-Patterson AFB, Ohio. (AD 610233)

In order to determine the primary surface reaction forces exerted by a man walking under reduced gravity, the vertical and longitudinal surface reaction forces were measured for a number of walking Ss, both on the ground and at reduced gravity levels between 0.1 and 1.0g. Experiments included the study of normal walking, tempo variation, and pressure suit effects. Both reaction forces varied almost directly with gravity. The lower walking limit observed for the unsuited Ss was .12g, where the limiting factor appeared to be the reduced magnitudes of the forces themselves rather than a change in their ratio.
R 9

28,268
Kidd, E.A. & Harper, R.P. Jr. FIXED-BASE AND IN-FLIGHT SIMULATIONS OF LONGITUDINAL AND LATERAL-DIRECTIONAL HANDLING QUALITIES FOR PILOTED RE-ENTRY VEHICLES. Contracts AF 33(616) 5823 & AF 33(616) 7753, Proj. 8219, Task 821905, ASD TDR 61 362, Feb. 1964, 106pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.). (AD 434076)

The results of a research investigation of longitudinal and lateral-directional flying qualitites for the re-entry mission are reported. The research program utilized primarily a high-fidelity fixed-base ground simulator with evaluations made by 3 pilots. One of the 3 pilots also made in-flight evaluations of longitudinal flying qualities in the same vehicle, a three-axis variable stability airplane flown with a two-axis side controller and conventional rubber pedals. The program results are reported and discussed. Control sensitivity evaluations were compared to center stick results of earlier work. The longitudinal flying qualities as evaluated both on the ground simulator and in flight are compared and related to earlier investigations. Pilot rating variability, both interpilot and intrapilot, are quantized and discussed for the ground and flight experiments. Performance measures are reported.
R 19

28,269
USAF Translation Division. COSMIC RESEARCH. VOLUME 4. NUMBER 1. FTD TT 66 76/1+2, June 1966, 289pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Kosmicheskiye Issledovaniya, 1966, 4(1), 175pp). (AD 639378)

Partial contents: Optimum distribution of correcting impulses in single-parameter correction; Energetically optimal transfers from a hyperbolic orbit; Optimum transfers between coplanar elliptical orbits; Two matrix forms of estimates of spacecraft motion parameters; Neutral composition of the atmosphere in the 100-200 km altitude region; Possible antimatter nature of micrometeors; Emission spectra of rarefied molecular gases excited by fast electrons; Photochemical equilibrium and ionic composition of the upper layers of the atmosphere; Investigation of the softest corpuscles with satellites; Registration of fragment λ-radiation in the high-altitude explosion of 9 July 1962 over Johnston Island; Total quantity of neutral hydrogen in the Upper Atmosphere; Temperature field of thin-walled satellite surfaces in radiant heat transfer; Spectral and temperature characteristics of photoelectric transducers and ranges for their application; Certain dynamic characteristics of the operator in tracking under the conditions of spaceflight on the Voskhod 2 Craft; Endogenic formation of carbon monoxide in a closed ecological system; Preflight and postflight medical examination of crew members of the voskhod spacecraft; Factors in spaceflight on tradescantia paludosa microspores; Short communications.
R scattered

28,270
Lindsey, W.C. IMPROVEMENTS TO BE REALIZED THROUGH THE USE OF BLOCK-CODED COMMUNICATION SYSTEMS. IEEE Trans. on Aerospace and Electronic Systems, May 1966, AES-2(3), 364-366. (Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.).

The purpose of this correspondence is to aid the communications engineer in determining the effect which a noisy carrier reference has on the detection process. It also demonstrates the relative practical improvements to be realized from "single-channel" block-coded systems.
R 6

28,271
Vorob'ev, L.M. SPACECRAFT NAVIGATION. NASA TTF 344, TT 66 51024, 1966, 159pp. National Aeronautics & Space Administration, Washington, D.C. (Israel Program for Scientific Translations, Jerusalem, Israel).

A popular exposition of the fundamental problems in space vehicle navigation is presented. The galaxies and solar system are described along with the difficulties likely to be encountered. Celestial mechanics is discussed emphasizing trajectories of spacecraft. Details are given on the basic problems of space navigation and methods of solution. (STAR)
R 43

28,272
Johnston, R.S., Correale, J.V. & Radnofsky, M.I. SPACE SUIT DEVELOPMENT STATUS. NASA TN D 3291, Feb. 1966, 25pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Spacecraft Center, NASA, Houston, Tex.).

Space suit development, starting with the Mercury program, has progressed to its present status as a result of the changing goals of each manned spacecraft mission. The first space suits were designed primarily for protection of flight crews against the possibility of cabin pressure failure. Longer flights and extravehicular activities required design philosophies to change drastically, particularly in the areas of comfort, mobility, reliability, and life-sustaining systems. Future mission goals will require new design objectives and requirements.

28,273
Miller, G.K., Jr. & Sparrow, G.W. VISUAL SIMULATION OF LUNAR ORBIT ESTABLISHMENT USING A SIMPLIFIED GUIDANCE TECHNIQUE. NASA TN D 3524, Aug. 1966, 34pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

A fixed-based simulator study was conducted to determine the ability of pilots to establish 80-nautical-mile (148,16km) circular orbits about the moon by using a simplified guidance technique during retrothrust from a typical lunar approach trajectory. The pilot had control of thrust along the longitudinal axis and of vehicle attitude through an acceleration command system. No automatic damping or control were assumed. The general guidance procedure consisted of maintaining a constant angle between the vehicle thrust axis and the line of sight to the receding lunar horizon while applying thrust for a predetermined period of time. Several approach trajectories were considered for which the thrust angles and thrusting times were determined just prior to thrust initiation. The results of the investigation showed that orbits near the desired parking orbit were established from the various approach trajectories considered when the instrumentation presented to the pilot consisted of only a three-axis gyro horizon nulled to the desired orientation in the plane of the approach trajectory. When the pilot was required to track the lunar features in order to aline the spacecraft with respect to the plane of the orbit and to apply thrust without the benefit of any instrumentation, his performance was degraded.
R 2

28,274
Spady, A.A., Jr. & Krasnow, W.D. EXPLORATORY STUDY OF MAN'S SELF-LOCOMOTION CAPABILITIES WITH A SPACE SUIT IN LUNAR GRAVITY. NASA TN D 2641, July 1966, 15pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

Tests were conducted to compare the effects of a pressurized space suit on man's self-locomotion capabilities at earth gravity and simulated lunar gravity. The suits used were tested at both 0 and 3.5 psi. Langley's reduced gravity simulator described in NASA TN D-2176 was used to simulate lunar gravity. The test subject could walk, run, and perform both vertical and broad jumps under both gravity conditions; however, the tasks were easier and less tiring under lunar gravity. The Ss could jump vertical heights 6 to 7 times higher and perform standing broad jumps about 2 times further at lunar gravity (1/6 g) than at earth gravity (1 g). In general, pressurizing the suit to 3.5 psi reduced the performance by about 30 percent. The test Ss in the pressurized suits were able to perform at lunar gravity many tasks, such as climbing stairs, ladders, poles, and jumping onto a platform 6 feet off the floor, which could not be accomplished at 1 g. The simulator technique used adapted easily to the pressure suits. The comments of the test Ss and the results of the tests indicate that the Langley reduced gravity simulator is an effective research and training tool and should be very useful in the development of advanced types of space suits.
R 2

28,275
Hewes, D.E., Spady, A.A., Jr. & Harris, R.L. COMPARATIVE MEASUREMENTS OF MAN'S WALKING AND RUNNING GAITS IN EARTH AND SIMULATED LUNAR GRAVITY. NASA TN D 3363, June 1966, 36pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

A study was conducted to evaluate the effect of lunar gravity on man's walking and running gait characteristics by comparing results of tests conducted in earth and simulated lunar gravity. The lunar tests were conducted by using a modified version of the Langley reduced gravity simulator described in NASA TN D-2176 and the corresponding earth gravity tests were performed by using a portion of asphaltic concrete road of a length equal to that provided by the modified simulator. The test Ss wore light-weight flight coveralls and boots. The Ss walked and ran at various speeds up to their maximums for both gravity conditions. The data were obtained by using a high-speed motion-picture camera stationed 150 feet (46 m) normal to the center line of the track. The results of this study, which are useful primarily as base-line information, indicated that reduced gravity does have a definite effect on the angular movements of the hip, knee, and ankle joints and on the inclination of the body with walking and running. Maximum walking and running rates at simulated lunar gravity were found to be approximately 60 per cent of those in earth gravity. A loping gait at about 10 feet per second (3 m/sec) in lunar gravity was, according to the test Ss' comments, the most natural method of self-locomotion.
R 5

28,276
Holladay, W.L. & White, A.S. FLIGHT SIMULATOR UTILIZATION FOR SYSTEM DESIGN AND PILOT TRAINING. No date, 14pp. Society of Automotive Engineers, Inc., New York, N.Y. (North American Aviation, Inc., Los Angeles, Calif.). (AD 650205)

The value of full scale, operational work ups of control systems for improvements in design, training, and demonstrations are discussed, using several advanced aircraft as examples, including the X-15 and X B-70 aircraft. (HEIAS)

28,277
Patrick, L.M. HUMAN TOLERANCE TO IMPACT - BASIS FOR SAFETY DESIGN. Report from: "International Automotive Engineering Congress, Detroit, Michigan, January 11-15, 1965." Rep. 1003B, 1965, 12pp. Society of Automotive Engineers, Inc., New York, N.Y. (Wayne State University, Detroit, Mich.).

Fundamental principles of crash safety are discussed from a qualitative and quantitative engineering viewpoint. Categories of impact injury, together with the passenger compartment injury-producing components, are presented. Techniques used for establishing measurable parameters of injury utilizing live anesthetized animals, cadavers, human volunteers, and anthropomorphic dummies are outlined. Several types of experimental impact devices are evaluated with limitations and advantages of each listed. Human impact tolerance levels based on measurable physical quantities, such as force or acceleration, are recommended with values given for forehead impact.
R 22

28,278
Smith, F.A. & Benedetti, F.J. PREDICTION OF RE-ENTRY VIBRATION. Contract AF 04(695) 669, TDR 669(S6810 21) 1, BSD TR 65 453, Sept. 1965, 23pp. USAF Ballistic Systems Div., Norton AFB, Calif. (Aerospace Corporation, San Bernardino, Calif.). (AD 623081)

The current techniques for establishing vibration criteria are predicated on the scaling of measured flight data. Measured vibrations are scaled by the influencing factors of acoustic sound pressure levels, surface weight and mass loading. The level of confidence in the predicted environment is, therefore, dependent on the applicability of the measured data, e.g., engine and structural similarity, mass loading and mission profile characteristics. To date, flight vibration measurements taken within re-entry vehicles during the re-entry period are practically nonexistent. Of the data available, a considerable portion was transmitted on low frequency telemetry channels (less than 1000 cps) and therefore has limited usefulness. Thus, to establish re-entry vibration criteria, launch data measured near the payload interface were extrapolated to the aerodynamic re-entry conditions. The underlying problem in the prediction of re-entry vibrations is the fundamental question regarding the effectiveness of the boundary layer noise to produce structural vibrations, particularly during flight at velocities up to Mach 20. Although the pressure fluctuations in the boundary layer are thought to be larger during the re-entry period than boost, this effect is cancelled, in part, by the increased velocities which distributes the energy over a much broader frequency bandwidth (up to 100kc). Thus, for the frequency range of interest (up to 2000 cps), the predicted vibration criteria may vary by as much as 10 decibels between any two analysts, depending upon how these factors are treated. This paper presents, in non-dimensional form, recent broadband vibration data which indicates a trend toward higher vibration levels during the re-entry period as compared to the boost period. The data are as yet insufficient both in quantity and quality to accurately assess the effect on vibration levels of all flight parameters, however the data seem to tend to follow the dynamic pressure characteristics. R 7

28,279
Kearns, J.P. METHODS OF ANALYSIS OF FLIGHT VIBRATION MEASUREMENTS. Contract NOrd 7386, Rep. APL/JHU CF 2422, Dec. 1955, 24pp. Applied Physics Lab., Johns Hopkins University, Silver Springs, Md. (AD 622291)

A method of analysis of flight vibration measurements is required to provide information for development of design analyses and test procedures. The method of analysis is governed by the objectives of the overall engineering program. The first objective is to design systems whose components will not be subject to severe vibrations in frequency zones of high sensitivity. The second objective is to devise tests which will establish the reliability of the actual system in the presence of realistic vibrations. In the analysis of the flight wave, it would be desirable to extract the exact Fourier component amplitudes corresponding to each multiple of a low fundamental frequency, and thereby produce an exact mathematical representation of the wave. Techniques which are presently available cannot produce such a representation. Rather, they are limited to finding the sums of the squares of the Fourier coefficients over a given frequency band. Information about the instantaneous value of the wave is lost and what emerges is a 'power spectral density' of 'Fourier Coefficient Strength' versus frequency. It is learned that this kind of an analysis, taken with an appropriate electro-dynamical transfer function, will produce root mean square values of any electrical or mechanical quantity at any point. But the instantaneous value of any quantity is unpredictable. One way of making up for the lost information is to measure the output of various electro-dynamical systems when driven by the complex wave. A study can then be made of the percentage of the time the output is above any reference output.
R 3

28,280
Block, A.C., Delateur, L.A., Nelson, R.L. & Stempson, L.J. DATA PRESENTATION FOR POSITIONAL REPRESENTATION OF SPACE VEHICLES. PHASE III. FINAL REPORT. Contract AF30(602) 3119, Proj. 5577, Task 557701, RADC TDR 64 291, LMSC Rep. 659648, Jan. 1965, 134pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.). (AD 459462)

This is the final report of a 3-phase effort to study information requirements for the positional representation of space vehicles and to develop associated display techniques. The Phase III program described in this report includes a) reconsideration of all major principles formulated in the earlier phases; b) development of methods to illustrate how and why information items are selected and associated for display to the CINC level commander; and c) test, through analytical methods, the effects of space vehicle types, numbers and maneuvering capability on proposed display formats.

28,281
US Aerospace Technology Division. DATA ON THE SOVIET SPACE PROGRAM, ANALYTICAL SURVEY. ATD WA 57, ATD Rep. P 65 11, March 1965, 25pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 459646)

Guidance systems; human factor in interplanetary flight; pressure suits and spaceship cabins; coming trends in aerospace vehicle design; and extracts from papers on bioastronautics, simulated space flights, communications, and space vehicles. (DDC)

28,282
Ferguson, G.A. NONPARAMETRIC TREND ANALYSIS. 1965, 61pp. McGill University Press, Montreal, Quebec, Canada.

This monograph is intended to serve as a practical guide to research workers in the nonparametric analysis of experimental data for trend. It describes methods of nonparametric trend analysis using ranks. These methods are analagous to the analysis of variance for trend using orthogonal polynomials. The methods described employ the statistic S as used in the definition of Kendall's tau, and its distribution. Use is made of the ranks for orthogonal polynomials. Methods for the treatment of monotonic, bitonic, and higher-order trend, for both independent and correlated samples, are described.
R 13

28,283
Gatenbee, R.J. INVESTIGATION AND TEST OF SELF-LUMINOUS MARKERS FOR AEROSPACE VEHICLE CREW STATIONS. Contract AF33(657) 7780, Proj. 1425, Task 142501, ASD TDR 62 806, FDFR TM 64 19, June 1964, 6pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (AD 451791)

The intent of this memorandum report is to describe the evaluation and testing of tritium activated phosphorescent paint markings as applied to the crew station areas of future aerospace vehicles. The prototype markers were received as a result of Air Force contract AF33(657)-7780, conducted by the United States Radium Corporation of Bloomsburg, Pennsylvania. This report establishes the visibility, handling and durability characteristics of the prototype items submitted. Test results are reported and conclusions and recommendations are given.
R 11

28,284
Economou, N. A STUDY OF PERSONNEL PROPULSION DEVICES FOR USE IN THE VICINITY OF THE MOON. VOLUME I. Contract NAS 1 4098, NASA CR 365, Jan. 1966, 246pp. National Aeronautics & Space Administration, Washington, D.C. (Bell Aerosystems Company, Buffalo, N.Y.).

This report presents results of studies to establish conceptual configurations of propulsion devices which can be used for transportation on the moon, and for escape from the surface of the moon and injection into the lunar orbit. The study was directed toward "simple" devices which make maximum utilization of the perceptual and control abilities of the pilot and minimum automatic flight control and guidance equipment. The scope of the program was to provide design data and vehicle dynamic characteristics in parametric form to permit the NASA, through simulation studies, to evaluate, refine and select an optimum or near optimum configuration for the intended mission.
R 12

28,285
Rand Corporation. INTEGRATED SPACECRAFT DISPLAY DEVELOPMENT. FINAL REPORT. Contract NAS 4 385, NASA CR 473, May 1966, 247pp. National Aeronautics & Space Administration, Washington, D.C. (Sperry Gyroscope Company, Sperry Rand Corporation, Great Neck, N.Y.).

A study was made of the application of projected display techniques to manned space flight. The study consisted of two specific tasks: a) Generation of a design specification for a projection display system suitable for use in a fixed-base spacecraft simulator; b) A preliminary design investigation of the use of projection display techniques in spacecraft was conducted which included consideration of such factors as information content, projection display/panel integration and display/control compatibility. Trade-off studies of various electronic and optical systems were included. The use of the display system was considered for attitude and translational control for rendezvous and lunar landing. Information was generated to permit the establishment of a complete analog simulator evaluation program for this display technique.

28,286
Wheeler, P.C., Nishinaga, R.G., Zaremba, J. G. & Williams, H.L. EVALUATION OF A SEMI-ACTIVE GRAVITY GRADIENT SYSTEM. VOLUME I. TECHNICAL SURVEY. Contract NAS 5 9640, NASA CR 593, Nov. 1966, 55pp. National Aeronautics & Space Administration, Washington, D.C. (TRW Space Technology Labs., Thompson Ramo Wooldridge, Redondo Beach, Calif.).

This study is directed toward establishing the feasibility of utilizing a Semi-Active Gravity Gradient System (SAGS) for controlling the attitude of an earth-oriented spacecraft. The control configuration employs an active reaction wheel for pitch attitude control. Roll/yaw control is achieved by operating the pitch wheel with a momentum bias, and by gimballing the wheel and coupling it to the vehicle through an energy removal mechanism to provide roll/yaw damping. Long-term momentum buildup is prevented by gravity gradient restoring torques. These investigations have dealt with both the performance analysis and implementation aspects of the SAGS control configuration. The results of the former study phase indicate that steady-state roll/yaw accuracies on the order of one to two degrees are readily attainable with this concept, while pitch accuracy levels of one-half to one degree present no difficulties for the nominal mission and spacecraft here considered. The controller parameter values selected for fine control are completely acceptable for acquisition. Implementation studies have resulted in two preliminary mechanical designs, both of which incorporate all mechanical functions required for attitude control (i.e., horizon sensing and control torque generation). These designs differ primarily in the mechanization of the horizon sensing system. Indications are that a control system weight as low as 25 pounds (including signal processing and control electronics, but not the solar array control system or the inertia augmentation assembly) can be achieved, with a nominal power consumption of 14 watts.
R 2

28,287
Ernst, F.H. & Smith, R.B. AN EXPERIMENTAL INVESTIGATION UNDER ZERO-GRAVITY CONDITIONS OF TETHERED WORKER MAINTENANCE TECHNIQUES. M.S. Thesis. GA/Phys/63 3 10, Aug. 1963, 97pp. USAF Institute of Technology, Wright-Patterson AFB, Ohio. (AD 419776)

High systems reliability for long duration manned space flights requires a capability to perform in-flight maintenance under the conditions of weightlessness. This study investigates a method of providing this capability by tethering the maintenance man to his work area. Determining the feasibility of this method resolved itself into 3 major tasks: a) Devising and fabricating tethering devices and test apparatus; b) Testing the tethering devices under conditions that simulated, as closely as possible, the conditions the maintenance man will encounter in space; and c) Analyzing all test results to assure that any proposed tethering device did, in fact, provide the required capability. Of the 10 tethering devices tested, the device which met all criteria was one that consisted of direct attachment through eyebolts and clamps between the worker's toes and the work area, and attachment through adjustable length straps between the worker's waist and the work area. The applicability of the other tethering devices was also determined.
R 21

28,288
US Aerospace Technology Division. MATERIALS ON VOSTOK-5, VOSTOK-6, AND POLET-1 FLIGHTS. ATD Rep. P 64 57, Rep. 1, Oct. 1964, 65pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 607772)

The contents of this report are as follows: Analyst's discussion of the Soviet space program; Purpose and results of the Vostok-5 and Vostok-6 flights, and the future Soviet space program; Present and future equipment for space vehicles; Space-flight command and communications network, and general data on reentry; Training of male and female cosmonauts; Cosmodrome facilities, prelaunch procedure, and launch description; The Polet-1 unmanned maneuverable space vehicle. (DDC)
R 134

28,289
Shea, R.A. & Summers, L.G. VISUAL DETECTION OF POINT SOURCE TARGETS. Contract NAS 2 2742, NASA CR 563, Sept. 1966, 65pp. National Aeronautics & Space Administration, Washington, D.C. (TRW Space Technology Labs., Thompson Ramo Wooldridge, Redondo Beach, Calif.).

This study presents the results of an experimental investigation of an observer's ability to detect, with the unaided eye, a target satellite in a rendezvous mission. The target was represented by a point source of light moving in a simulated starfield background. Specifically the study sought: a) to determine for a variety of experimental conditions the time taken and the accuracy attained by an observer to detect this target; and b) to delineate the search techniques used by the observer in performing this task. 2 experiments were conducted. Exp. 1 showed that detection time depends upon target velocity, starfield density, and field-of-view. Differences in target velocity produced the greatest variability in performance with an average detection time of 220 sec. for 0.1 mrad/sec rate and 45 sec. for 2.4 mrad/sec rate. Exp. 2 showed that there is an appreciable difference in mean detection time between the 2 modes of starfield presentation--15 sec. for the same starfield background contrasted with 150 sec. for the unique. Detection time for the unique starfield group depended on target velocity and target intensity but for the group exposed to the same starfield became independent of these variables after a number of trials. There was no positive or negative transfer of training from one type of starfield presentation to the other. On the basis of these results 2 models are proposed to explain the observer's search strategy, one for each type of presentation.
R 11

28,290
Fraser, T.M. THE EFFECTS OF CONFINEMENT AS A FACTOR IN MANNED SPACE FLIGHT. Contract NASr 115, NASA CR 511, July 1966, 176pp. National Aeronautics & Space Administration, Washington, D.C. (Lovelace Foundation of Medical Education & Research, Albuquerque, N.M.).

After an initial introduction, the nature of confinement is discussed in relation to isolation and sensory deprivation. The operational and experimental experience of confinement is then tabulated in terms of conditions, subjects, available volume, and significant findings. The response of man to confinement is examined with respect to the psychological and the physiological effects. Excluding as much as possible the elements of sensory deprivation and isolation the psychological response is shown to be manifested in the form of subjective emotional reactions, discomfort and rarely, perceptual aberration. Performance decrement is relatively slight. The physiological response is seen to be one of non-specific reaction to stress accompanied by specific changes (e.g., cardiovascular deconditioning) attributable to the reduced mobility. There is a suggestion that some adaptation takes place with continued confinement, but that the adaptation breaks down after a total of about 60 days. Tolerance to confinement is discussed and tolerance curves are presented indicating a threshold of acceptable tolerance, a threshold of unacceptable tolerance, and an intermediate zone. The curves indicate that, for duration of 30 to 60 days confinement, about 150 cubic feet of free volume per man are necessary. Studies are needed to determine the requirements for more prolonged durations. Tolerance is modified by habitability, work, rest, recreation, and exercise schedules. The effects of weightlessness and the space environment on confinement durations of more than a few days are not known. Weightlessness may improve the restrictive aspects and hence improve tolerance, but at the same time aggravate, for example, the cardiovascular decrement. Recommendations for further studies are included.
R 104

28,291
US Aerospace Technology Division. SCANBACK OF THE SOVIET MANNED SPACEFLIGHT PROGRAM. MAY 1964-APRIL 1965. ATD Rep. P 65 19, April 1965, 146pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 463146)

This scanback report is based on a selective compilation of previously published scan items prepared by analysts of the S and T section of the Aerospace Technology Division between May 1964 and April 1965. Scan items are derived primarily from NON-STEP sources (Soviet and communist bloc newspapers rather than scientific and technical periodicals). Consequently, material from these sources does not find its way into the STEP information system (SIS) for storage and retrieval. However, these sources often contain valuable information pertaining to the Soviet Manned Spaceflight Program which are difficult for interested individuals to locate, identify, and retrieve at some later date. Therefore, the selected abstracts have been assembled in handy form for purposes of reference and review. For the reader's convenience, the material has been grouped into topics or subject areas (e.g., the 2 Voskhod flights, the Soviet Lunar Program, and other plans and projects of the Soviet Manned Spaceflight Program) and arranged in a fairly chronological manner within each subject area.
R many

28,292
Zubek, J.P., Dobbs, Doris & Bayer, L. BIBLIOGRAPHY OF STUDIES ON SENSORY DEPRIVATION AND RELATED CONDITIONS. NIH Grant MH08748 01, DRB Proj. 9425 08, ca. 1966, 26pp. Psychology Dept., University of Manitoba, Winnipeg, Manitoba, Canada. (AD 475872)

This bibliography represents the most comprehensive listing of published and unpublished studies on Sensory Deprivation as of October 1, 1965. Included under this topic are references to papers dealing with various aspects of the same basic phenomenon but classified under such headings as Perceptual Deprivation, Sensory Isolation, Sensory Invariance, Stimulus Deprivation, Patterned Stimulation, etc. In the compilation of this bibliography, particular attention was paid to the foreign literature (e.g., Japanese, Russian, and Italian) and to technical reports from various governmental agencies. The references on material on Confinement, Social Isolation, Monotony, Effects of Early Experience in Humans and Animals, and Brainwashing, are not intended to be comprehensive, but are merely representative.

28,293
Rose, L., Bogan, C.J. & Heaviside, J.B. INSTRUMENTATION FOR FLIGHT SIMULATORS. Contract AF33(600) 36836, Proj. 6114 60165, WADC TN 58 295, Dec. 1958, 44pp. USAF Aeronautical Accessories Lab., Wright-Patterson, AFB, Ohio. (Waldorf Instrument Company).

The utilization of advanced computers without electro-mechanical components in advanced aircraft flight simulators requires the development of compatible simulated flight instruments. A modular system for the design of simulated instruments to operate directly from the output of such electronic computers has been developed, and preliminary designs for several typical instruments prepared. Emphasis has been placed on the development and test of several types of interchangeable servo actuators which may be utilized in the simulation of a whole range of flight instruments.
R 2

28,294
Levin, E. & Ward, J. MANNED CONTROL OF ORBITAL RENDEZVOUS. Report from: "National Symposium on Manned Space Stations, Los Angeles, California, April 20-22, 1960." Rep. P 1834, Oct. 1959, 16pp. Rand Corporation, Santa Monica, Calif. (AD 616402)

A device was assembled at The Rand Corporation to simulate the in-plane response of an orbiting space vehicle to applied thrusts. This simulator was used to study manned control of an orbital rendezvous maneuver. It was found that a pilot with appropriate display and controls could direct the extreme terminal portion of the rendezvous maneuver with great precision and flexibility. The fuel consumed during this "docking" phase of the operation was a very small fraction of the total fuel required to rendezvous and consequently the comparative efficiency of a pilot and an automatic system was not regarded as a major consideration. It was also found that with training a pilot could successfully direct a rendezvous maneuver from large distances. However, properly designed automatic equipment would be significantly more efficient for this phase of the operation and it was concluded, therefore, that the pilot's role in the distant closing phase of the rendezvous operation would be limited to over-ride in case of equipment malfunction or in the event that an unusual maneuver seemed necessary. The use of a pilot appeared to be highly desirable for the extreme terminal phase of rendezvous where local decisions and fine vernier corrections might be required. For this task the pilot was found to be a highly capable instrument whose various functions would be hard to duplicate with purely automatic equipment.
R 9

28,295
US Systems Research & Development Service. SECOND INTERNATIONAL AVIATION RESEARCH AND DEVELOPMENT SYMPOSIUM, ATLANTIC CITY, NEW JERSEY, SEPTEMBER 16-18, 1963. TECHNICAL PAPERS. SESSION I: AIRBORNE SYSTEMS. Nov. 1963, 126pp. US Systems & Research Development Service, FAA, Atlantic City, N.J. (AD 423916)

Titles of papers read at this symposium are: a) Category II Landing approach system for turbojet aircraft; b) The practical design and testing of the automatic monitoring system in the VC 10; c) The BAC one-eleven and all weather landing; d) The flight development of a production automatic landing system; e) A review of the Boeing lower weather minimums program for the 707-720-727 airplanes; and f) Category II operation--no performance compromise.
R Scattered

28,296
Buning, H. FLIGHT SIMULATION OF ORBITAL AND REENTRY VEHICLES. PART III. AERODYNAMICS INFORMATION REQUIRED FOR SIX DEGREES OF FREEDOM SIMULATION. FINAL REPORT. Contract AF 33 (616) 5664, Proj. 6114, Task 611407, ASD Tech. Rep. 61 171 (III), 26pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (University of Michigan, Ann Arbor, Mich.). (AD 282995)

A survey of the aerodynamic information required for a simulator for a glide reentry vehicle is presented. Various phases of the flight are considered: hypersonic reentry, hypersonic-supersonic glide, and supersonic-transonic-subsonic approach and landing. Accuracy requirements and origin of aerodynamic information are briefly discussed. Aerodynamic parameters are defined, and the dependence of aerodynamic coefficients on these parameters is outlined. Special emphasis is placed on a technique for generating functions of 2 or 3 independent variables and some sample calculations are presented.
R 10

28,297
Saenger, E.L., Friedman, B.I., Kereiakes, J.G., Perry, H., et al. METABOLIC CHANGES IN HUMANS FOLLOWING TOTAL BODY IRRADIATION. ANNUAL REPORT. MAY 1963-FEBRUARY 1964. Contract DA 49 146 XZ 029, Proj. A4c 03.009, DASA 1633, ca. 1964, 33pp. US Defense Atomic Support Agency, Hq., Washington, D.C. (University of Cincinnati College of Medicine, Cincinnati, Ohio). (AD 467571)

These studies are designed to obtain information which is necessary to estimate combat effectiveness of troops and to develop methods of diagnosis, prognosis, prophylaxis and treatment of radiation injury. At the present time parameters of active investigation are clinical findings, hematologic effects, profile scores, miscellaneous laboratory tests, deoxycytidine excretion in the urine, xanthurenic acid excretion in the urine, chromosome changes in leucocytes, immunologic studies and the use of autologous bone marrow. Six patients were given from 149r to 231r (100-150 rad) total body irradiation from a Co^{60} source. Only one of the patients had prodromal nausea and vomiting with nausea lasting 48 hours. The lowest hematologic values were found 25 to 35 days after irradiation. Deoxycytidine was found in increased amounts in the urine from patients after total body irradiation. In rats much larger amounts were found in the urine after 500r and 800r whole body irradiation than after lesser doses. Studies by Dr. Anthony Luzzio, U.S. Army Research Laboratory, Ft. Knox, Kentucky, indicate there may be an immunologic post irradiation alteration in human gamma globulin antigenicity. Combat effectiveness would be relatively maintained with an exposure up to 200 rad, though a second exposure would result in significant troop ineffectiveness. Animal experiments described herein were conducted according to the principles of laboratory animal care as promulgated by the National Society for Medical Research.
R 1

28,298
Reynolds, H.H. & Rohles, F.H. BEHAVIORAL RESEARCH WITH ANIMALS IN A MANNED SPACE LABORATORY. Report from: "American Institute of Aeronautics and Astronautics, Los Angeles, California, 19 June 1963." ARL TR 64 17, Nov. 1964, 5pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (AD 608807)

This paper suggests animal behavioral research during prolonged weightlessness. The research suggested is justified on the basis of the short gestation period and rapid maturation of small animals, the number of subjects which may be studied, the controls which can be achieved, and the resultant increase in reliability of findings.

28,299
Matheny, W.G. & Berger, P.K. EFFECTS OF BRIEF EXPERIENCE VS. PRINTED COMMUNICATION ON ALTIMETER PREFERENCE. Contract Nonr 4097(00), Tech. Rep. 1, Oct. 1964, 64pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Life Sciences, Inc., Fort Worth, Tex.). (AD 614655)

The study was undertaken in an effort to gain a better understanding of the problem of resistance to change and how such resistance may be counteracted. The report discusses and illustrates some of the problems surrounding the methodology for investigating equipment preferences and reports the results of a preliminary investigation into procedures for producing changes in preference for new equipment. The selection of the altimeter as an instrument for use in the study was based upon the fact that suitable data was available as to the relative adequacy of the 2 instruments chosen and that the altimeter is an instrument around which controversy still revolves.
R 20

28,300
Oxford Corporation. IMPROVED AIRPORT GUIDANCE SIGNS. FINAL REPORT. Contract FA WA 4486, Proj. 422 3D, Oxford Rep. 6417, SRDS Rep. 65 31, Nov. 1964, 56pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (Oxford Corporation, Buffalo, N.Y.).

Factors affecting the acquisition and legibility of Airport Guidance Signs were studied to determine the optimum relationship between size, height and location of the signs. The studies showed the 500-ft minimum legibility requirement to be the predominant factor in size determination with a black letter on an illuminated field to be preferable from an acquisition viewpoint. A character size of 10 inches high by 8 inches wide was chosen as satisfactory for a distance of 500 ft. Using these results, 2 basic types of frangible signs were developed. The first consists of an air supported plastic bag with an 18 x 48-inch translucent illuminated field on either side of the sign. The second type uses styrofoam in place of air for the support of a similar plastic bag. Because of the light transmission and outdoor weathering requirement, a Tedlar film was chosen for the plastic on both types. A pump for inflating and maintaining the internal pressure of the air supported units and the necessary check and relief valves were developed. A number of prototypes of each design were built and tested to demonstrate the ability of the signs to withstand a 60 MPH air load while collapsing readily when hit by an airplane section.

28,301
Ford, A., Olson, M.W., Rigler, D., Dugan, G.E., et al. SINGLE-OPERATOR SIGNAL TRACKING ON GROUND RADAR. Contract W33 038 ac 22561, E.O. 694 17, AF Tech. Rep. 6370, Sept. 1950, 97pp. USAF Air Materiel Command, Wright-Patterson AFB, Ohio. (Lehigh University, Bethlehem, Penn.).

A series of scope discrimination studies, by the measurement of human error and reaction time, was made to evaluate scale-reading and cursor-tracking techniques on sector-type radar scopes used in ground installations. Particularly it was desirable to discover error tendencies when a single operator was assigned a multiple task of reporting as many as 3 space variables: range, azimuth, and elevation. It was found that even the simplest types of superimposed area-scales lead to several families of systematic errors, and more than 5 times the spread of random errors as compared with cursor-tracking methods. This is true when a specially designed cursor plate is used in conjunction with a manual control which can be moved with at least 2 df.
R 17

28,302
Bailey, H.H. APPROPRIATE ROLES AND SOME LIMITATIONS OF MAN AS A GUIDANCE COMPONENT. Rep. P 2020, June 1960, 16pp. Engineering Div., Rand Corporation, Santa Monica, Calif. (AD 610835)

This paper considers the general role of man in weapon systems: the several kinds of guidance, certain target characteristics and man's capability relative to weapons systems are reviewed. The requirements for target recognition are described: resolution, contrast, search time, and prior knowledge and a simple model is proposed for calculating search times under one set of rather arbitrary conditions.

28,303
Workman, R.D. OXYGEN DECOMPRESSION FOLLOWING AIR DIVES FOR USE IN HYPERBARIC OXYGEN THERAPY. Proj. F 011 06 01, Task 3361, Test 7, Res. Rep. 2 64, Dec. 1964, 10pp. USN Experimental Diving Unit, Naval Weapons Plant, Washington, D.C. (AD 611322)

Two decompression schedules with use of O_2 were tested to provide for 3 and 4 hour air exposures at 3 atmospheres absolute pressure required for use in hyperbaric O_2 treatment. Schedules for such long exposures have not been available previously to permit use of O_2 breathing that decompression time be shortened. 6 Ss were exposed to air breathing in a dry pressure chamber at 70 ft. equivalent depth in sea water for periods of 180 and 240 min., respectively. Decompression was carried out with O_2 breathing at 30, 20, and 10 foot stops. All 6 Ss exposed for 180 min. were symptom-free following decompression. Of 6 Ss exposed for 240 min., 1 S developed transient vertigo 1 hr. post dive, which resolved promptly with O_2 breathing at a depth of 60 ft. Greater than average susceptibility to decompression sickness from such prolonged exposures in this S is considered to be a severe test of adequacy for this schedule. Thus, the schedules tested should provide efficient decompression for these prolonged exposures with minimal risk of symptoms of decompression sickness. No manifestations of O_2 toxicity appeared during the O_2 decompression periods. Risk of O_2 toxicity should be minimal with use of these schedules since the exposure is well within the safe limits for Ss at rest.
R 20

28,304
Barron, C.I. (Princ. Investigator.) et al. RESEARCH STUDIES ON INVESTIGATION OF THE EFFECTS OF SLOW AND RAPID DECOMPRESSION UPON HUMANS AT 45,00 FEET. Contract FA 3082, May 1963, 88pp. US Federal Aviation Agency, Washington, D.C. (Lockheed-California Company, Lockheed Aircraft Corporation, Burbank, Calif.). (AD 421148)

Tests were conducted to determine the effects of decompression from 8,000 to 45,000 feet at rates from 5 to 30 seconds on 4 pilot and 4 passenger Ss. Masks of several types currently in use in transport and business aircraft were worn or donned at varying intervals of exposure. Physiological measurements and cellular enzyme determinations were recorded in all tests, and performance and communication studies were conducted on the pilots. Results of the tests revealed inability of most Ss to complete all pretest instructions. Severe reactions or incapacitation of varying degree occurred in the 3 Ss exposed to the 5-sec. decompressions. Convulsive movements occurred in 2 of the Ss who did not apply their masks for periods of about 5 to 6 sec. after reaching maximum altitude. Encephalographic changes, indicative of severe hypoxia, occurred in these cases between 17 to 40 sec. after the start of decompression. Performance and communications were adversely affected in all pilots undergoing decompression without wearing the mask; however, enzyme changes were nonsignificant in all except 1 passenger. The study confirmed the findings of other investigators in noting that unless 100% O_2 was inspired within 5 to 7 sec. after exposure to 45,000 feet, unconsciousness would occur at 13 to 16 sec. The test emphasized the necessity for wearing an oxygen mask during all rapid decompressions to 45,000 feet and the need for improvement in oxygen disposing devices for passengers.
R 35

28,305
Scrimshaw, N.S. EFFECT OF STRESS ON NUTRIENT REQUIREMENTS OF MAN. (PROGRESS REPORT.) Contract DA 49 193 MD 2239, 1963, 103pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Nutrition & Food Science Dept, Massachusetts Institute of Technology, Cambridge, Mass.). (AD 423385)

Two studies involving 2 groups of 5 students showed that when such individuals were subjected to a reversal of night and day accompanied by an obligation to work during such reversed periods there was enhanced excretion of nitrogen, inorganic sulfate sulfur and during the reversal periods these were paralleled by the excretion of 17-hydroxysteroids; very little effect was observed on the excretion of creatinine, sodium and potassium. A third reversal study involving 10 students for a 21 day period was also completed. Here the days following a return to a normal day and night pattern were also examined. The results of this study have not been statistically analysed and will be reported later. Two studies upon the physiological effect upon the stress of examinations were also completed. The first involved 11 Ss and the second 15Ss. Both studies showed essentially the same response, a greatly enhanced variability in the day by day excretion of nitrogen and inorganic sulfate sulfur paralleled by the excretion of 17-hydroxycorticosteroids during the examination as compared to the baseline. While the majority of students showed a net increase in the excretion of these substances a minority of non-responders prevented the overall differences from reaching statistical significance. The creatinine excretion remained essentially constant throughout both periods of both studies; little effect was observed on the electrolyte excretion except enhanced potassium excretion during the freshman examination. Data from sporadic infections upon Ss in these studies are being accumulated and will be tabulated when enough cases have been assembled.
R 4

28,306
Tucker, G.J. & Reinhardt, R.F. SUICIDE ATTEMPTS. BuMed. Proj. MR005.04 0017.1, NAMI Rep. 975, Aug. 1966, 20pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The military physician is frequently confronted by patients who have made a suicide attempt. In an attempt to clarify the significance of these suicide attempts in the military, all patients who had made a suicide attempt in a 9-month period, and who were seen by the psychiatric staff of the U.S. Naval Aviation Medical Center, were retrospectively studied (N = 42). The suicide group was compared on 35 demographic, historical, and clincial variables to 2 control populations: a) randomly selected psychiatric in-patients (N = 20) who did not make a suicide attempt; b) well-adjusted enlisted men seen for administrative screening evaluations (N = 30). The suicide group and the psychiatric control group were followed 9 to 18 months after initial psychiatric contact. All data were statistically analyzed. From these data emerged statistically significant guidelines for the evaluation, treatment, and disposition of suicidal patients by the military psychiatrist.
R 16

28,307
Whittenburg, J.A., Barlow, C., Deveney, K.L., Warne, R.D., et al. RESEARCH ON HUMAN AERIAL OBSERVATION. PART III. SUMMARY DATA FROM TACTICAL FIELD TESTS. Subcontract HumRRO 1 005, Task OBSERVE I, HSR TN 59/6 Ce, Res. Memo. 5, July 1960, 84pp. USA Aviation Human Research Unit, Fort Rucker, Ala. (Human Sciences Research, Inc., McLean, Va.).

This report is principally concerned with data obtained from 4 tactical field tests of aerial observer capabilities. It contains a brief description of the 4 tactical field tests, a statement of the major findings on aerial observer proficiency, and a number of tables containing summary data on observer capabilities.
R 5

28,308
Hixson, W.C. & Beischer, D.E. BIOTELEMETRY OF THE TRIAXIAL BALLISTOCARDIOGRAM AND ELECTROCARDIOGRAM IN A WEIGHTLESS ENVIRONMENT. Contract NASA Order R 20, Monograph 10, Sept. 1964, 102pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 614789)

This report describes in detail the design and development of the Constraint Platform with attached Biotelemetry Module used to transduce, signal condition, and telemeter the physiological measurements. A similar description is given of the airborne receiving station used to receive, display, and store the telemetered data. Linear and angular acceleration measurements were performed with this equipment and the results represent the first recording of a triaxial inertial acceleration ballistocardiogram. Triaxial electrocardiographic data were simultaneously measured and telemetered to permit correlation of the mechanical and electrical events of the cardiac complex. The linear acceleration patterns were also displayed in loop form and in a 3-dimensional arrangement to facilitate interpretation of their spatial relationship. Analog computer operations were performed on the flight data to obtain a continuous trace of the absolute magnitude of the instantaneous BCG and ECG vector. Differences between the flight BCG and laboratory based BCG data are noted and discussed. A discussion of the instrumental approach outlines performance and limitations of such measurements in the weightless environment and makes suggestions for ballistocardiographic studies in large size manned orbiting space laboratories.
R 5

28,309
Lomov, B.F. (Ed.). PROBLEMS OF ENGINEERING PSYCHOLOGY. Report from: "First Leningrad Conference on Engineering Psychology, June 1964." NASA TT F 312, May 1965, 143pp. National Aeronautics & Space Administration, Washington, D.C. (State University, Leningrad, Russia).

This report contains resumes of conference papers, grouped into seven sections. The titles of the sections and the numbers of resumes are: a) General Topics; Self-Organizing Systems; Functions of Human Beings in Control Systems; General Characterization of the Operator's Activity; Simulation of Psychic Activity; Reliability and Accuracy of Operator's Activity; Engineering Psychology and Allied Sciences; Design of Operator's Working Post (27 papers); b) Training and Selection of Operators (6 papers); c) Group Activity (5 papers); d) Methods of Investigating Human Activity. Experimental Methods and Equipment (17 papers); e) Reception of Information by Human Subjects: Evaluation of Information Received, Sensory Processes and Characteristics of the Sensory Systems, Simulation of Perception and Recognition, Coding of Information (27 papers); f) Sensorimotor Processes. Reactions (24 papers); g) Operative Thinking. Memory (14 papers).
R 120

28,310
Shupe, N.K. BASIC EXAMINATION OF THE DYNAMICS OF AIRCRAFT IN FORMATION FLIGHT. DA Task 1E1 34101 D235 14 05, Tech. Rep. ECOM 2754, Sept. 1966, 33pp. USA Electronics Command, Fort Monmouth, N.J.

This report deals with the control of an aircraft in a formation-flight mode of operation. The purpose is to determine what information should be displayed to the pilot under IFR conditions to best approximate the performance achievable under VFR conditions. Several different types of IFR control concepts are examined, including newly developed acceleration commanding laws, and are compared to the VFR performance achievable in a UH-1B Army helicopter. The presently most popular IFR display, relative position error, is shown to be totally inadequate for tight control.
R 3

28,311
Burket, G.R. A STUDY OF REDUCED RANK MODELS FOR MULTIPLE PREDICTION. Contract NONR 477(33), Public Health Res. Grant M 743(C7), July 1962, 92pp. University of Washington, Seattle, Wash. (AD 420189)

The primary concern of this study was the possibility of using reduced rank solutions for regression weights to increase the accuracy of prediction obtainable in future samples. Using regression theory, a general factor model for reduced rank prediction was developed. It was shown that, if errors in the criterion observations are not to be capitalized upon, the optimal basis for determining a lower rank solution will be the amount of variance accounted for in the predictor data matrix. Thus the best alternative to reduced rank methods which seek to obtain the maximum multiple correlation with the criterion would be the method of largest principal axes factors. Estimates of the weight-validities and total squared errors of prediction to be expected when a particular set of weights is applied in future samples were also derived.
R 18

28,312
Brehens, V.N. AN EXAMINATION OF SOME DISTRIBUTION-FREE METHODS PERTINENT TO STAGE OUTPUT ANALYSIS. Contract AF 33(600) 41896, Staff Memo. 62 3, June 1962, 65pp. OMEGA, Technical Operations, Inc., Washington, D.C. (AD 420476)

The problem areas involved in the present paper are the analysis of STAGE output and the sampling of model runs for validity. Programs are being prepared to carry out some of the output analyses on the computer. The present paper presents an initial step toward extending the statistical nature of the analysis through the application of distribution-free methods. It is anticipated that the application of various parametric methods will follow the distribution-free approach as more is learned about the distributions of output variables. It is believed that the distribution-free techniques presented in the present paper have numerous applications to the analysis of STAGE output data and that these techniques can be incorporated into an "analysis library" adapted to computer operation. However, it appears that a more immediate problem is that of taking current ABAD analyses and adapting these (with moderate extensions) to computer operation. Once this is accomplished, the logical sequence of steps is the application of distribution-free and parametric techniques to STAGE output.
R 10

28,313
MacLeod, S. PHOTOINTERPRETER PERFORMANCE STUDIES. Sept. 1964, 56pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (AD 609071)

This report is a summary of 5 studies sponsored by Rome Air Development Center. These were designed to explore important relationships between measures of photointerpreter performance and the following types of antecedent factors: a) image quality: b) Mode of presenting comparative-cover photography; c) Techniques for rapid recognition training; d) Temporal aspects (viewing time and work/rest cycles) of image presentation; and e) Image content parameters. Each study is reviewed with respect to experimental objectives, approaches, results and conclusions. Immediate applications of the data and implications for future research are also discussed.
R 6

28,314
Crook, M.N., Hanson, J.A. & Weisz, A. AERONAUTICAL CHARTS UNDER RED LIGHT. Contract AF33 (616) 2018, RDO 694 51, WADC TR 54 198, May 1954, 36pp. USAF Aero Medical Lab., Wright-Patterson AFB, Ohio. (Institute for Applied Experimental Psychology, Tufts University, Medford, Mass.). (AD 52509)

The general problem of designing charts for legibility under red cockpit light is examined in the context of related problems. The characteristics of charts and the techniques for presenting information on them are analyzed and evaluated in relation to possible methods for improving red light legibility. Several lines of research carried out under this project are reviewed, and 2 experimental charts are exhibited and described. Methods for improving red light legibility, within the framework of present size and space limitations and production techniques, are summarized.
R 33

28,315
Gagliardi, U.O. & Eckenrode, R.T. SOME INITIAL THOUGHTS ON MAN-COMPUTER RELATIONSHIPS. Contract Nonr 3602(00), Feb. 1962, 98pp. USN Psychological Sciences Div., ONR, Washington, D.C. (Dunlap & Associates, Inc., Stamford, Conn.). (AD 421421)

The topic of this report is the development of means by which computers may aid man in his heuristic approaches to problems. They might do this in any of the following ways: a) by developing the consequences of heuristics formulated by man; b) by solving a simpler problem whose solution set contains that of the problem to be solved; c) by making it possible to answer a large number of related problems and thus to facilitate in man inductive inferences and generalization of the answers. An experiment is described in which the problem is typical of many real-life, non-trivial Navy situations, which has an algorithmic solution, and which can be complicated to almost any degree. Even in its simplest forms, solutions are not obvious, but can be reached heuristically by man. Examples of effective heuristics have been developed and are not only such as can easily be programmed on a machine, but also appear to have a great deal of generality. An experimental program is planned which will explore the ways in which heuristically programmed computers can aid, or even replace man, and the value of their solutions can be compared (at least in the simpler cases) with solutions reached algorithmically.
R 57

28,317
Hertzberg, H.T.E. SOME CONTRIBUTIONS OF APPLIED PHYSICAL ANTHROPOLOGY TO HUMAN ENGINEERING. Ann. N.Y. Acad. Sci., Nov. 1955, 63(4), 616-629. (USAF Aero Medical Lab., Wright-Patterson AFB, Ohio). (Reprint) (AD 233711)

This paper presents the findings of 3 previously unpublished studies in applied physical anthropology. The first study summarizes the usefulness of the percentile graph as a tool in the sizing of work space, clothing, and personal equipment. The second study outlines how the use of muscle strength data can further human safety and care of machine operation. The third study discusses what happens to buttocks in the seated position.

28,318
Gupta, S.S. SELECTION AND RANKING PROCEDURES AND ORDER STATISTICS FOR THE BINOMIAL DISTRIBUTION. Contracts NONR 225(53) & AF33(657 11737), Mimeo. Ser. 31, Oct. 1964, 15pp. Purdue University, Lafayette, Ind. (AD 624070)

The first part of this paper describes some work on selection and ranking procedures for binomial populations. The procedures discussed here fall in the following 2 categories: a) procedures for selecting a subset containing the best population or all those populations that are better than a standard; b) procedures for selecting the best. The second part of this paper discusses order statistics from the binomial distribution and describes some new tables of moments and cumulative distribution function of these order statistics.
R 12

28,319
Pratt, J.W. SHORTER CONFIDENCE INTERVALS FOR THE MEAN OF A NORMAL DISTRIBUTION WITH KNOWN VARIANCE. Ann. Mathematical Stat., June 1963, 34(2), 574-586. (Harvard Graduate School of Business Administration, Boston, Mass.). (Reprint)

This paper obtains and explores a family of confidence procedures for the mean of a normal distribution which are, in a certain sense, more efficient than the usual procedure.
R 4

28,320
Austin, C.M. CURRENT CAPABILITIES OF THE QUALITY EVALUATION LABORATORY FOR CONDUCTING ENVIRONMENTAL TESTS. QE/C 64 731, Nov. 1964, 100pp. USN Quality Evaluation Lab., Ammunition Depot, Crane, Ind. (AD 613640)

The environmental test equipment capabilities are presented of the Quality Evaluation Laboratory, located at the U.S. Naval Ammunition Depot, Crane, Indiana. The laboratory has testing equipment and facilities for meeting any requirement for the simulation of climatic and dynamic environmental conditions and for simulating functionally any installation in aircraft, missiles, and shipboard equipment. The total environmental test capability is available for developmental, acceptance, and surveillance evaluation of weapons systems and components, and of explosive pyrotechnics and their component parts. The report is subdivided into the categories of vibration, acceleration, shock, temperature, combined environments, and other environments. (DDC)

28,321
Honea, F.I. TEMPERATURE CONTROL SYSTEMS FOR SPACE VEHICLES. Contract AF33 (657) 8953, Proj. 6146, Task 614609, ASD TRD 62 493, Part II, Sept. 1963, 285pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Space & Information Div., North American Aviation, Inc., Downey, Calif.). (AD 422763)

Methods of dynamic response analysis for space vehicle temperature control systems are described, including mathematical equations, tables, graphs, and an example analysis. A procedure for design of systems, including selection of control methods, coolants, and components and design analysis, is also included. Other sections include a continuation of some topics from Part I and a description of special temperature control problems associated with precision temperature control, cryogenic cooling and reentry. Conclusions and recommendations are included to show areas which need investigation and further study.
R 53

28,322
Moran, J.A. & Tiller, P.R. INVESTIGATION OF AEROSPACE VEHICLE CREW STATION CRITERIA. Contract AF33(615) 1297, Proj. 1425, Task 142501, FDL TDR 64 86, July 1964, 434pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.). (AD 452187)

This report presents an analysis of the crew station design criteria for three types of space vehicles. As defined in this report they are a) a vertical launch, horizontal landing low orbital vehicle, (250-300 nautical miles) manned by a crew of three and designed for reconnaissance and surveillance; b) a horizontal launched, horizontal landing, high orbit (19,350 miles) vehicle, manned by a crew of three and capable of supporting five passengers over a 10 day period; c) a nonrecoverable low orbital (250-300 nautical miles) space station capable of supporting a crew of 21 men for a minimum period of 30 days. Recommendations are made in the design of mission oriented stations and life support stations. Methods of validating the recommendation are given along with the suggestion of typical experiments and facilities that could be used as a major segment of the validating procedure. As a result of this research, study areas wherein further research would be beneficial to the establishment of crew station criteria have been identified.
R 130

28,323
Pierce, C.M. THE BIOLOGY OF SPACE FLIGHT: AN ANNOTATED BIBLIOGRAPHY. Contract AF 04 (695) 136, SB 63 20, Rep. 8 55 63 2, April 1963, 313pp. Missiles & Space Company, Lockheed Aircraft Corporation, Sunnyvale, Calif. (AD 425915)

This bibliography contains selected references which are concerned with biology and space flight. Topics include food provisions, atmosphere control, waste control and water recovery, emergency survival systems, psychology, radiation and meteoroids, gravitation, magnetic fields, and exobiology. The references are grouped by subject and arranged according to the first author. Indexes for corporate author, personal author, and subject are included. The general period of coverage dates from 1958 through 1962.
R 677

28,324
Aschoff, J. (Ed.). CIRCADIAN CLOCKS. PROCEEDINGS OF THE FELDAFING SUMMER SCHOOL 7-18 SEPTEMBER 1964. 1965, 479pp. North-Holland Publishing Company, Amsterdam, Holland.

This book consists of 44 papers on the subject of circadian rhythms given at Feldafing Summer School Conference in September, 1964. Since the usage of physical and technical terms has become more and more common in describing biological oscillations, a vocabulary defining technical terms and listing widely accepted or suggested symbols was distributed to the participants. It is reproduced as an introduction to the main body of the book, in order to facilitate its reading for those less familiar with this terminology. The papers are organized under the following topic headings: a)Part I. Methods and analysis; b) Part II. Theory of oscillation; c) Part III. Observations and generalizations; d) Part IV. Biochemistry and physiology; e) Part V. Syntheses and hypotheses; f) Part VI. Recent experimental results; g) Part VII. Photoperiodism as related to circadian systems; h) Part VIII. Applied and general aspects.
R many

28,325
Randall, R.B. CREW-COMPARTMENT TEMPERATURES: THE EFFECTS OF A SOLAR-HEAT REFLECTING PAINT. Tech. Note 4 66, July 1966, 42pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This study evaluated an olive-drab enamel that reflects solar heat. The evaluation compared temperatures inside 2 M113 Armored Personnel Carriers (ACPs): one painted with the reflecting paint and the other with a conventional lusterless olive-drab finish. Over a 5-day period, measurements at 5 locations on each APC revealed that temperatures were lower in the vehicle treated with the reflecting paint. Because this paint reduces the temperature of the vehicular skin and of the crew-compartment air, it will probably reduce the thermal stress on personnel confined inside such vehicles. If this paint is used with air-conditioned vehicles, it should reduce air-conditioning requirements.
R 3

28,326
Pratt, H.S., Beck, E.P., Wirthlin, L.S. & Graybiel, A. STUDIES ON THE RESPONSE TO ACUTE ALTITUDE EXPOSURE WITH SPECIAL REFERENCE TO THE POSSIBILITY OF EARLY DETECTION OF HIGH ALTITUDE PULMONARY EDEMA. BuMed. Proj. MF022.03.02 5014.1, NAMI Rep. 964, May 1966, 29pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The pathogenesis of acute pulmonary edema of high altitude remains unknown. The present study was designed to evaluate the baseline and acute cardiorespiratory acclimation data of a group of young males selected to construct and maintain a scientific station on the Antarctic Plateau (pressure altitude 13,500 ft). Should serious altitude sickness or pulmonary edema develop in any of these Ss, it might be possible to determine which investigations, if any, could be used to screen potentially susceptible Ss and to identify avenues for more extensive studies. The baseline studies revealed the Ss to be in good health. The acute cardiorespiratory changes, both in the altitude chamber at 14,000 ft after 36 hours and following return to sea level, were similar to those described by other authors. No evidence of overt or insipient pulmonary edema was detected. However, there was an unexpectedly high incidence of protracted nausea and vomiting, necessitating the removal of two of the Ss from the chamber.
R 26

28,327
Pilié, R.J. PROJECT FOG DROPS. INVESTIGATION OF WARM FOG PROPERTIES AND FOG MODIFICATION CONCEPTS. Contract NASr 156, NASA CR 368, Jan. 1966, 71pp. National Aeronautics & Space Administration, Washington, D.C. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

Mathematical models have been formulated to describe the dynamic properties of warm fog. In the laboratory, experiments were conducted to determine the effects of ionic surfactants on droplet coalescence and to study the behavior of nuclei treated with fatty-alcohol monolayers. Daily measurements were made of the nuclei active at slight supersaturations characteristic of natural fog. The results of these measurements together with past analytical and experimental findings were used to generate new ideas for fog suppression and to evaluate previous concepts for altering warm fog. A climatological survey of fog frequency in the Continental United States describes those regions having frequent occurrences of dense fog, i.e. fog that limits visual range to 1/4 mile or less.
R 24

28,328
Maglieri, D.J., Huckel, Vera & Parrott, T.L. GROUND MEASUREMENTS OF SHOCK-WAVE PRESSURE FOR FIGHTER AIRPLANES FLYING AT VERY LOW ALTITUDES AND COMMENTS ON ASSOCIATED RESPONSE PHENOMENA. NASA TN D 3443, July 1966, 63pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Extensive ground measurements of shock-wave pressure have been made for 2 different supersonic fighter airplanes in the Mach number range of about 1.05 to 1.16 and for altitudes from about 50 to 890 ft. Comparisons of the pressure rises across the shock wave measured on the ground are made with the available theoretical data, and these pressure data are correlated with some data on window-glass breakage. Brief discussions are also given relative to other associated phenomena such as ground motions and response of equipment and personnel, and with respect to observations of human response, no significant adverse physiological reactions were noted. Ear muffs were useful in reducing the intensity of the audible noise although they were not considered necessary by the test operators. Some persons not wearing ear protection observed a brief ringing in the ears, and it was believed that a small amount of temporary hearing loss may have occurred. Some observers exposed repeatedly reported a dislike for the booms and found it difficult to make visual observations.
R 17

28,329
Kern, R.P. A CONCEPTUAL MODEL OF BEHAVIOR UNDER STRESS, WITH IMPLICATIONS FOR COMBAT TRAINING. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 12, June 1966, 79pp. Human Resources Research Office, George Washington University, Alexandria, Va.

On the basis of reported observations of the behavior of individuals under various prolonged physical harm conditions, a sequential pattern of behavioral reactions is described, reflecting the behavioral manifestations of a stress process. This sequential pattern of behavior would be expected, over time, to apply to any individual in any severe physical harm threat. The rate of development of this behavioral pattern under a given set of environmental stressor conditions represents the individual's stress resistance. A conceptual model was developed to describe the mode of operation of key attitudinal variables and environmental stressor variables in producing this behavioral pattern as well as the individual differences in stress resistance. Design of training to increase stress resistance in combat or other hazardous jobs is discussed from the basis of this conceptual framework.
R 40

28,330
Kent, P.R. OXYGEN BREATHING EFFECTS UPON NIGHT VISION THRESHOLDS. INTERIM REPORT. BuMed. Proj. MF011.99 9002.03, Rep. 469, Feb. 1966, 13pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn.

Two series of experiments were conducted, --one was concerned with the effects of mask breathing, and the other with breathing 100% oxygen at ambient (sea level) pressure. It was found that the effect of oxygen excess upon rod and cone scotopic threshold is subject to individual variation. Rod and cone scotopic thresholds are only exceptionally affected by breathing near-100% oxygen for periods up to 140 minutes. When administered at higher pressures, even for periods as short as 20 minutes, the incidence of effects is sharply higher. Rod and cone scotopic thresholds, measured while breathing near-100% oxygen are sensitive to blood sugar levels. Breathing through a mask-demand valve system of the type used in these experiments may cause an elevation of the rod and/or cone scotopic threshold(s) of some individuals, apart from any effect of the inhalant.
R 19

28,331
Summers, L.G. AN INTRODUCTION TO THE SPECIFICATION OF OPTIMUM VISUAL DISPLAY DESIGN CHARACTERISTICS. Contract NONR 1076(00), Rep. ES 40408, June 1961, 28pp. Engineering Dept., Douglas Aircraft Company, Inc., El Segundo, Calif. (AD 466961)

The characteristics of an optimum visual display without any definition of the material presented on the display and without any physical limits for the display can be defined in terms of the maximum amount of information that is capable of being presented to the human S at any one time. A chart lists the estimated optimum values for different display characteristics, such as size, resolution, brightness, contrast and color.
R 29

28,332
Katz, D., Emery, J.A., Gabriel, R.F. & Burrows, A.A. EXPERIMENTAL STUDY OF ACOUSTIC DISPLAYS OF FLIGHT PARAMETERS IN A SIMULATED AEROSPACE VEHICLE. NASA CR 509, July 1966, 154pp. National Aeronautics & Space Administration, Washington, D.C. (Douglas Aircraft Company, Inc., Long Beach, Calif.).

The research reported herein was addressed to evaluation of the feasibility of employing acoustic stimuli in the presentation of information to humans. The considerations responsible for interest in the acoustic display concept include potential alleviation of visual loading of pilots, increased flexibility of displays, and improved information processing capability achieved through the use of more than one sense modality. In particular, applications of acoustic displays of target location in target detection and of flight parameters in aerospace vehicles were experimentally examined in the program described below. A simulated target detection task was devised and provisions were made for displaying the lateral location of simulated targets acoustically be means of an interrupted 500 cps tone emanating from the direction of the target. The same information could be displayed visually on a meter or simultaneously by the acoustic display and the visual display (meter). Ss engaged in the target detection task, which required location and identification of targets, while concurrently involved in a visual tracking task. A secondary acoustic task was superimposed during some trials and, in all cases, the performance of Ss was evaluated as a function of the type of target location display.
R 22

28,333
Hodge, D.C. & McCommons, R.B. FURTHER STUDIES OF THE RELIABILITY OF TEMPORARY THRESHOLD SHIFT FROM IMPULSE-NOISE EXPOSURE. AMCMS Code 5011.11.84100, Tech. Memo. 3 66, April 1966, 44pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

Three studies were conducted to determine the reliability, under various exposure conditions, of temporary threshold shift (TTS) produced by impulse noise. The Ss, who were representative of the Army population, were tested at frequencies throughout the range of human hearing. Individual Ss' TTSs were not consistent enough to permit any meaningful generalizations. However, group-mean TTS was a reliable measure of impulse-noise effects for Ss with both normal and subnormal hearing, and throughout the range of audible frequenceies. Basing interpretations on these types of data should insure that results from various tests will be comparable.
R 17

28,334
Healer, J. & Messer, M. (Eds.). SUMMARY REPORT ON A REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN. VOLUME III. PART I. Contract NASw 535, NASA CR 415, March 1966, 104pp. National Aeronautics & Space Administration, Washington, D.C. (Allied Research Associates, Concord, Mass.).

This report together with the two preceding Summary Reports summarize the results to 1966 of a review of biological mechanisms for application to instrument design and engineering. This study is concerned with the investigation (and extension of previous investigations) of the function, structure and operational principles of biosensor mechanisms throughout the animal world, the integrated role of the sensor in a total regulatory control loop, engineering analyses of sensor operation, and the evaluation of this data in terms of present and anticipated instrumentation requirements for a variety of applications. Similarities and differences between these bio-transducers and their physical counterparts were investigated with particular emphasis paid to studying those characteristics of biosensors which are not currently used in instrumentation. Sensory systems surveyed are: a) mechanoreceptors; b) chemoreception; c) Thermoreception; d) photoreception; and e) Electro-receptors and magnetic field sensors.
R 13

28,335
Hurst, P.M. A VIEWPOINT ON "DRUG ENHANCEMENT." Contract NONR 4423(00), Proj. NR 144 189/12 7 64, Rep. ONR H 66 2, Jan. 1966, 25pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Psychobiology Div., Institute for Research, State College, Penn.).

Pertinent experimental literature is reviewed concerning drug enhancement of cognitive performance. Results are synthesized into a viewpoint concerning psychological mechanisms by which performance can be enhanced, with emphasis upon stressful situations. Criteria are advanced for operational distinction of tasks and/or situations where enhancement effects may be predicted for particular classes of drugs. Preliminary specifications are devised for experimental verification of parts of the theoretical framework.
R 67

28,336
Hurst, P.M. & Weldner, Marianna F. DRUG EFFECTS UPON PERFORMANCE UNDER TASK-INDUCED STRESS. Contract NONR 4423(00), Proj. NR 144 189/12 7 64, Rep. ONR H 66 1, Jan. 1966, 22pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Psychobiology Div., Institute for Research, State College, Penn.).

An experiment was performed to test the interaction between drug/placebo effects and incentive conditions under task-induced stress. 63 student volunteers served in a factorially designed experiment varying level of incentive, drug condition, and placebo condition (whether or not the S was led to believe he had received a drug). All active drugs were given in disguised form. These included d-amphetamine sulfate (10 mg.), chlordiazepoxide HCL (10 mg.), and methylphenidate HCL (10 mg.). Neither the incentive nor the "placebo condition" factor had a significant effect upon performance. D-amphetamine showed a significant superiority to other drug conditions early in the session. Most of this superiority derived from the "high stress" condition. Mood effects were also noted. Results were interpreted as favoring a mood-related component in performance enhancement rather than the psychoanalytic factor.
R 5

28,337
Alt, F. (Ed.). ADVANCES IN BIOENGINEERING AND INSTRUMENTATION. VOLUME I. 1966, 360pp. Plenum Press, Plenum Publishing Corporation, New York, N.Y.

This is the first in a projected series designed as an introduction to bioengineering and bioinstrumentation. The 4 chapters in this volume cover: a) Kinematic and kinetic techniques in biomechanics; b) The transduction of physiological events; c) Ultrasound in biology; and d) Neurological feedback control systems. The chapter on kinetic and kinematic techniques covers the techniques, measurement and instrumentation for recording movements and forces. The chapter on transduction covers instrumentation from a force standpoint (e.g., piezoelectric and inductance transducers) and from a process standpoint, (e.g., eye movements). The chapter on feedback control systems covers the motor system. Each chapter has a separate subject index.
R many

28,338
Ekman, G., Berglund, Birgitta & Berglund, U. LOUDNESS AS A FUNCTION OF THE DURATION OF AUDITORY STIMULATION. Number 205, March 1966, 9pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The perceived loudness of a 1,000 c/s tone was measured by a direct scaling method under different conditions of intensity (19-35 db) and duration (50-500 msec) of stimulation. It was found that loudness grows as a logarithmic function of stimulus duration; the relation was verified for 10 individual Ss and 4 levels of intensity. In addition, the relation between temporal threshold and level of intensity was tentatively described.
R 16

28,339
Edge, P.M., Jr. & Mayes, W.H. DESCRIPTION OF LANGLEY LOW-FREQUENCY NOISE FACILITY AND STUDY OF HUMAN RESPONSE TO NOISE FREQUENCIES BELOW 50 CPS. NASA TN D 3204, Jan. 1966, 11pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

This paper describes a facility designed to provide a research capability for large-scale acoustic tests in the frequency range below 50 cps. The capability exists for sinusoidal-, random-, and impulse-type environmental testing in the test chamber, 24 ft (7.3 m) in diameter and 21 ft (6.4 m) in length. Initial applications of the facility to extend the knowledge of man's behavior in low-frequency noise are described. These tests included whole-body exposure pressures of 2 orders of magnitude greater than man's previous experience in laboratory exposure at subaudible frequencies. Results obtained indicate that man can tolerate short-time exposures at spectrum levels in the range from 135 to 150 db; however, the Ss experienced some annoyance, discomfort, and fatigue and had a slower task performance rate.
R 10

28,340
Curran, P.M. & Wherry, R.J., Jr. SOME SECONDARY DETERMINERS OF PSYCHOLOGICAL STRESS. BuMed. Proj. MF022.03.02 5013.3, NAMI Rep. 963, May 1966, 16pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

This study employed a 4-choice, color discrimination task and electric shock in a simulated aircraft flight over hostile country to investigate certain secondary determiners of anticipatory physical threat stress which are presumed to be components of the perceived proximity of the unpleasant event. The findings suggest that the 3 secondary determiners of anticipatory physical threat stress investigated (perceived time since the situation started, perceived time until the event occurs if it occurs, and time elapsed since the initial warning of the possible event occurence) are significant components of the perceived proximity of the unpleasant event, and that they interact in a complex manner. Further research is suggested to determine the nature of the interaction of these components over time. A measure was devised which is considered to reflect differences in individual susceptibility to anticipatory physical threat stress.
R 2

28,341
Sidowski, J.B. (Ed.). EXPERIMENTAL METHODS AND INSTRUMENTATION IN PSYCHOLOGY. 1966, 803 pp. McGraw-Hill Book Company, Inc., New York, N.Y. (San Diego State College, San Diego, Calif.).

This book contains 18 chapters sectioned into 6 parts with an editorial introduction to each. 14 chapters cover laboratory techniques in major areas of experimental psychology: psychobiology, sensation and perception, conditioning and learning, and human behavior. Two chapters emphasize the use of computers. The remaining chapters provide a general introduction to animal and human research and information on basic instrumentation. An appendix gives a detailed list of names and addresses for various equipment firms and suppliers.
R Many

28,342
Mackenzie, K.D. STRUCTURAL CENTRALITY IN COMMUNICATIONS NETWORKS. Psychometrika, March 1966, 31(1), 17-25. (Carnegie Institute of Technology, Pittsburgh, Penn.).

This paper examines the concept of centrality with respect to small-group communication experiments. An index of centrality is presented which is based on the incidence matrix of actual communications rather than on the deviation matrix of possible communications, as in the Bavelas index of Centrality. The index takes the value of zero for the homogeneous all-channel graph and the value of unity for the homogeneous wheel graph. The index can be computed for individuals as well as groups. 3 examples are computed.
R 7

28,343
Bechtel, G.G. COMPARATIVE SCALING OF UNIDIMENSIONAL DISCRIMINATION AND SIMILARITY DATA. Psychometrika, March 1966, 31(1), 75-84. (Oregon Research Institute, Eugene, Ore.).

Scales constructed from paired-comparison designs under Thurstone's Case V model are discussed in relation to those derived from similarity data by means of the Unilateral Law of Comparative Judgment. Factors inherent in the triadic similarity task are then considered with respect to scale invariance across experimental designs. Illustrative data, although revealing the influence of these factors upon similarity response consistency, indicate the similarity scale to be somewhat robust to their biasing effects.
R 9

28,344
Shuford, E.H., Jr., Albert, A. & Massengill, H.E. ADMISSIBLE PROBABILITY MEASUREMENT PROCEDURES. Psychometrika, June 1966, 31(2), 125-145. (USAF Decisions Sciences Lab., L.G. Hanscom Field, Bedford, Mass.).

Admissible probability measurement procedures utilize scoring systems with a very special property that guarantees that any student, at whatever level of knowledge or skill, can maximize his expected score if and only if he honestly reflects his degree-of-belief probabilities. Section 1 introduces the notion of a scoring system with the reproducing property and derives the necessary and sufficient condition for the case of a test item with just 2 possible answers. A method is given for generating a virtually inexhaustible number of scoring systems, both symmetric and asymmetric, with the reproducing property. A negative result concerning the existence of a certain subclass of reproducing scoring systems for the case of more than 2 possible answers is obtained. Whereas Section 1 is concerned with those instances in which the possible answers to a query are stated in the test itself, Section 2 is concerned with those instances in which the student himself must provide the possible answer(s). In this case, it is shown that a certain minor modification of a scoring system with the reproducing property yields the desired admissible probability measurement procedure.
R 10

28,345
Fagot, R.F. ALTERNATIVE POWER LAWS FOR RATIO SCALING. Psychometrika, June 1966, 31(2), 201-214. (University of Oregon, Eugene, Ore.).

To take account of the observed lack of fit of the power law near threshold intensities, 2 different modifications of the power law have been proposed by various investigators. In this paper, both of these 2 laws are derived as a special case of a generalized power function for ratio scaling. A method is presented for discriminating between the special laws which provides: a) a prescription for the manipulation of independent variables; and b) specification of theoretical curves to which empirical curves are to be compared. Maximum-likelihood estimators are derived for the exponents of the special laws under the assumption that the observed subjective ratios are log normal.
R 15

28,346
Mackenzie, K.D. THE INFORMATION THEORETIC ENTROPY FUNCTION AS A TOTAL EXPECTED PARTICIPATION INDEX FOR COMMUNICATION NETWORK EXPERIMENTS. Psychometrika, June 1966, 31(2), 249-254. (Carnegie Institute of Technology, Pittsburgh, Penn.).

This paper shows how the concept of an incidence matrix of communications can be used to define the entropy of a finite scheme. The properties of the entropy function are examined and the function is found to be best interpreted as a total expected participation index. Data is presented showing the relationship between structural centrality and the new total expected participation index. In general, as the network becomes more centralized the smaller the value of the participation index and as the network becomes more structurally decentralized the greater the participation index.
R 4

28,347
Fhaner, S. SOME COMMENTS IN CONNECTION WITH ROZEBOOM'S LINEAR CORRELATION THEORY. Psychometrika, June 1966, 31(2), 267-269. (University of Uppsala, Uppsala, Sweden).

It is shown that certain correlation measures suggested by information theory are simple functions of the determinants of the correlation matrices involved, if multivariate normality is assumed. This illuminates and in a sense strengthens Rozeboom's point, that information theoretical statistics have "classical" correlational counterparts.
R 5

28,348
Fortier, J.J. SIMULTANEOUS LINEAR PREDICTION. Psychometrika, Sept.,1966, 31(3), 369-381. (S.M.A. Inc., Montreal, Quebec, Canada).

Given a set of items (predictors) suppose one wishes to predict another set of items (predictands) in a simultaneous way. Such a situation may occur when the predictands are different measurable aspects of the same phenomenon. Alternatively one might wish to predict the success of an event (say a successfully performed task) which has many correlated or uncorrelated failure modes (say a set of possible mental or physical disabilities each of them by itself precluding the achievement of the said task.) In such a case a unidimensional prediction is of value only if prediction is simultaneous for all possible failure modes. A linear summarization of the predictors is suggested, which is unique and has "maximum" predictability value for all predictands simultaneously. Other summarizations or scores are found that give "maximum" explanation of residual measures on the predictands and that are uncorrelated. The set of those simultaneous linear predictions is compared to the set of the individual multiple regression predictions as used, for instance, in the same context by Horst for each predictand given the original predictors. We suggest that this technique can be applied in particular to the summarization of a subset of items when the whole set of items constitutes the set of predictands.
R 6

28,349
Pearson, W.H. ESTIMATION OF A CORRELATION COEFFICIENT FROM AN UNCERTAINTY MEASURE. Psychometrika, Sept. 1966, 31(3), 421-433. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

In this paper graphs are given for estimating a correlation p x y from a double-entry table. $2H_r$, twice the statistic H_r, "relative uncertainty" (the average of the ratios of the conditional uncertainty of each variable to its uncertainty) was computed. Mean $2H_r$'s were computed from 100 samples for each of several sample sizes and numbers of categories. Graphs relating mean $2H_r$ to $\hat{r}_H$, the estimated correlation, for 3-17 categories to each variable and 3 sample sizes--50, 100, and 500--were constructed. 2.5% and 97.5% fiducial limits curves were constructed for establishing confidence limits on p x y and $\hat{r}_H$.
R 6

28,350
Green, B.F., Jr. THE COMPUTER REVOLUTION IN PSYCHOMETRICS. Psychometrika, Dec. 1966, 31(4), 437-445. (Carnegie Institute of Technology, Pittsburgh, Penn.).

The author states that psychometric methods involving algorithms are completely objective--at least they are if the algorithm is in the form of a program for a digital computer. These objective procedures need Monte Carlo and other computer runs to determine their properties, but so do many equation-oriented techniques. The objective algorithms are flexible but not flaccid. They offer a way of dealing with complexities that formerly seemed beyond our grasp. As the computer revolution continues in psychometrics, we can expect objective algorithmic methods to become the rule rather than the exception.
R 30

28,351
Fortier, J.J. SIMULTANEOUS NONLINEAR PREDICTION. Psychometrika, Dec. 1966, 31(4), 447-455. (S.M.A. Inc., Montreal, Quebec, Canada).

A previous article was concerned with simultaneous linear prediction (HEIAS 28,348). There one was given a set of predictor tests or items and one predicted a set of predictands (also tests or items, or perhaps criteria.) We proposed a simultaneous prediction which was a certain weighted sum of the predictors. In the present article the constraint that the prediction be a weighted sum is relaxed. We seek a general function of the predictors which will maximize the quantity chosen for measuring prediction efficiency. This quantity is the same as the one used in linear prediction and we justify this approach by showing it is the appropriate one when there is only one predictand. In order to solve the problem we restrict consideration to a vector of predictors having only a finite number of possible values, i.e. it possesses discrete probability distribution weights. This can be applied in the case of dichotomous items for instance. It may also be used in continuous distributions as an approximation, by first dividing the original range of values into a finite number of intervals. Then one attributes to the interval the weight corresponding to the probability mass it underlies in the original distribution.
R 6

28,352
Tucker, L.R., Damarin, F. & Messick, S. A BASE-FREE MEASURE OF CHANGE. Psychometrika, Dec. 1966, 31(4), 457-473. (University of Illinois, Urbana, Ill.).

A model for the measurement of the discrepancy between 2 scores is presented and discussed as a paradigm for the study of growth or experimentally produced change. The model assumes 2 tests or measures differing in complexity, and it analyzes the true difference between the test scores into a component that is entirely, dependent on the first or base-line test and a second component that is entirely independent of it. Equations for estimating both components are given and these are compared with other measurement efforts with similar goals.
R 21

28,353
Castellan, N.J., Jr. A MODEL FOR THE ANALYSIS OF MULTIPLE STRATEGIES. Psychometrika, Dec. 1966, 31(4), 475-490. (Indiana University, Bloomington, Ind.).

In many decision problems the decision-maker must ask a series of questions or select cues relevant to but prior to the decision. There are many strategies which would prescribe an order for asking such questions or selecting such cues. It is the purpose of the paper to describe a manner in which the strategy or strategies of the decision-maker can be analyzed. From this model can be derived limits corresponding to the possible use of a particular strategy, and the effective or observed use of the strategy or strategies by the decision-maker.
R 11

28,354
Kaplan, M., Laeng, W., Merel, W. & Munt, I. COMPUTER ACTIVATED ELECTROLUMINESCENT DISPLAY SCREEN. APPLICATION OF LIGHT AND IMAGE INTENSIFICATION TECHNIQUES, PHASE I. FINAL REPORT. Contract N61339 656, NAVTRADEVCEN 656 1, Oct. 1964, 118pp. USN Training Device Center, ONR, Port Washington, N.Y. (Weston Instruments, Inc., Newark, N.J.). (AD 612278)

A final report on a study of techniques for a computer activated wide-angle terrain display system capable of generating complex scenes. The objects to be displayed exist in computer storage. Perspective equations are utilized by a computer to provide a 2-dimensional display in true perspective of static and dynamic figures on a non-programed wide-angle display. The display is updated in a way determined by the position and orientation of a trainee during a simulated flight. The display screen is of the electroluminescent cross-grid type. The breadboard model has been used to generate dynamic displays of 2 solid objects with changing perspective. A digital computer was used as a tool to solve the perspective equations and represent the objects as they appear from a continuously moving point in space.
R 17

28,355
Stolurow, L.M. A MODEL AND CYBERNETIC SYSTEM FOR RESEARCH ON THE TEACHING-LEARNING PROCESS. Contract NONR 3985(04), Tech. Rep. 4, Sept. 1964, 43pp. Training Research Lab., University of Illinois, Urbana, Ill. (AD 609540)

This paper first presents the basic elements of a learning theory that distinguishes among 3 interrelated process, and then describes the way in which these processes determine the requirements of an adaptive teacher. The learning-teaching process is considered as a cybernetic man-machine system and one which is designed to take into account individual differences in learners. The SOCRATES design and the characteristics of idiomorphic programming are indicated. This part of the paper elucidates the conception and illustrates, in operational terms, the way in which different characteristics of learners are taken into account in idiomorphic programming which is implemented as a 2-stage decision process. Some research is cited to indicate the basis for including certain features in the system design and other research.
R 36

28,356
Katz, M.S. PERCEIVED BRIGHTNESS OF LIGHT FLASHES. Tech. Rep. NAVTRADEVCEN IH 16, Aug. 1964, 55pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 609358)

A psychophysical investigation of some aspects of the Broca-Sulzer effect was conducted by means of an optical system designed to provide contiguous uniocular or separate binocular brightness comparisons of brief flashes superimposed on a constant luminance adapting field. Extensive results from 2 Os agree with those of earlier studies in showing that the briefer of 2 equal-luminance flashes will appear brighter provided luminance is sufficiently high, but indicate that the effect may diminish or vanish if luminance is very high. Presentation of stimuli in separate binocular vision apparently produces no essential change, but increases the effect as compared with that obtained in uniocular vision. Stimulus size, whether 0.5°, 2.5° or 5.0° of visual angle, exerts no marked influence in either uniocular or binocular view, but results in increased observer variability at the smallest size. Whatever the luminance level (in the large range studied) the relative brightness of very brief flashes is approximately proportional to their duration, conforming with the reciprocity law, $B \times t = K$. When the background adapting luminance level increases, the luminance level of flashes giving enhancement increases by approximately the amount of increase in adapting luminance.
R 35

28,357
Applied Psychology Corporation. PERFORMANCE OF PHOTOGRAPHIC INTERPRETERS AS A FUNCTION OF TIME AND IMAGE CHARACTERISTICS. FINAL REPORT. Contract AF 30(602) 2717, Proj. 6244, Task 624402, RADC TDR 63 313, Sept. 1964, 87pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Applied Psychology Corporation, Arlington, Va.).

Effects on photo interpreter performance of different viewing times, work-rest cycles, and image quality and content were studied. Results indicate that collection and processing agencies should avoid inadequate levels of scale, resolution, or contrast even at the expense of sacrificing high levels of any of these variables. Viewing times of 4 sec for scanning and 60 sec for identifying features seem adequate. In these times, the interpreter has extracted about 90% of the total information which he is going to extract. Over relatively short periods of time (4 hrs), varying work-rest cycles do not significantly affect accuracy or completeness of interpreters.
R 1

28,358
Damon, A., Stoudt, H.W. & McFarland, R.A. THE HUMAN BODY IN EQUIPMENT DESIGN. 1966, 360pp. Harvard University Press, Cambridge, Mass. (Harvard University, Cambridge, Mass.).

This book is intended as a guide for the designer of equipment involving human body size and mechanical capabilities. Specific data and design recommendations are given for a) static and dynamic body dimensions; b) body surface areas; c) centers of gravity and moments of inertia of the human body; d) range of motion at the joints of the body; e) muscle strength and speed of body motion; f) body composition and human tolerance to physical and mechanical force; g) design of hand and foot controls; h) design of seats and seated workspace; I) design of passageways, doorways, and escape hatches; j) recommendations for lifting and carrying. Data and recommendations for fitting personnel equipment (clothing, masks, etc.) is considered only insofar as it affects the operator's dimensions and mechanical capabilities.
R many

28,360
Hewes, D.E. ANALYSIS OF SELF-LOCOMOTIVE PERFORMANCE OF LUNAR EXPLORERS BASED ON EXPERIMENTAL REDUCED-GRAVITY STUDIES. NASA TN D3934, May 1967, 19pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley

An analysis of some measurements of metabolic costs of various lunar and corresponding earth locomotive activities has been made to determine the performance capabilities of man in carrying out lunar exploration. Comparisons of limited data from different sources have been made to establish the validity of the data obtained in simulated lunar gravity and used as the basis of this analysis. Various factors such as fatigue limit of the Ss, duty cycle, speed of locomotion, and lunar surface slope have been taken into account. The results of the analysis indicate that the performance of the lunar explorer will be significantly greater than that of his earthly counterpart wearing the same equipment and that there is a very great need for evaluating the pressure suits actually intended for lunar locomotive activities in the simulated lunar gravity condition because of the gross effects of gravity on the locomotive performance.
R 7

28,361
Johnson, R.W. CRITERIA FOR THERMAL REGULATION FOR MANNED SPACECRAFT CABINS. NASA TN D 3349, March 1966, 21pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

Use of man in space for observational, analytical, and experimental missions requires that a comfortable and as nearly stress-free environment as possible be provided. By use of results of engineering and physiological investigations, conditions are proposed for thermal comfort in spacecraft "shirt-sleeve" environments. Air, cabin-wall, and skin temperatures are investigated for a range of clothing and interrelated to obtain essentially sweat-free conditions. This criterion establishes a basis for minimum individual stress and efficient design of atmospheric subsystems. Design methods are recommended in order to apply the minimal sweat condition to a wide range of work and rest levels. Measurements are discussed that may be used to evaluate comfort conditions, taking into account airflow rate and temperature, surface temperature, and metabolic rates.
R 16

28,362
Zarriello, J.J., Norsworthy, Mary E. & Bower, H.R. A STUDY OF EARLY GREYOUT THRESHOLD AS AN INDICATOR OF HUMAN TOLERANCE TO POSITIVE RADIAL ACCELERATORY FORCE. BuMed. Res. Proj. NM 11 02 11, Subtask 1, Rep. 1, July 1958, 15pp. USN School of Aviation Medicine, Pensacola Air Station, Pensacola, Fla. (AD 468310)

The purpose of this study was to investigate the relationship under increased positive radial acceleratory force between peripheral light loss and blackout or unconsciousness when the light stimulus is located at 80° in the peripheral field; and to determine whether on 80° peripheral light stimulus was an earlier indicator than lights located at 23° in the peripheral field. Under conditions of our experiment, it was found that an 80° light stimulus was an earlier indicator than the 23° light for an endpoint of greyout in regard to magnitude of the G force. The time spread between onset of greyout (80° light loss) and onset of blackout or unconsciousness was determined, and this time spread was found to be slightly increased when compared to the use of a 23° light as an endpoint of greyout. The peripheral light loss has limited usefulness as an early indicator for the onset of critical symptoms of blackout or unconsciousness.
R 6

28,363
Jones, R.L. EVALUATION AND COMPARISON OF THREE SPACE SUIT ASSEMBLIES. NASA TN D 3482, July 1966, 135pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Space Center, NASA, Houston, Tex.).

This report describes in detail the program by which the MSC evaluates the performance of space suits. The testing quantifies various aspects of suit design, function, operation, and man-suit-system interface. The technique evaluates the suits with a basic rationale emphasizing mission requirements, and the procedures are structured in such a manner as to maximize objectivity. Test results are presented on the evaluation of 3 different space suits. These results indicate the relative position of each suit in each test and the differences between suits. By a collation of these data, the various interested but not specialized technical personnel can obtain data which reveal the state of technology of space suit design and development. These data can be used by engineers in vehicle design to determine the impact on detail design of the space-suited operator. In this application of these data, the best performance in any single test of any of the 3 suits should be used as minimum design criteria.

28,364
Newsom, B.D., Brady, J.F., Shafer, W.A. & French, R.S. ADAPTATION TO PROLONGED EXPOSURES IN THE REVOLVING SPACE STATION SIMULATOR. Aerospace Med., Aug. 1966, 37(8), 778-783. (Convair, General Dynamics Corporation, San Diego, Calif.).

Prior to design of a space vehicle that is to employ an artificial gravity, it is necessary to establish guidelines based not only on vestibular physiology but also on a measure of crew performance in a simulator that imposes realistic changes in the inertial environments. The Manned Revolving Space Station Simulator has been constructed according to this concept and allows adjustments of radius, RPM, and stability. 4 Ss have been exposed for 5 days of continuous rotation at 6 RPM on a stable platform to establish a baseline to define stability requirements for a space vehicle with a "rotogravic" system. The 4 Ss all adjusted well to the environment and required little post spin re-adaptation. It is concluded that 6 RPM at a 20-foot radius is a satisfactory environment to use as a baseline.

28,365
Fluur, E. & Adolfson, J. HEARING IN HYPERBARIC AIR. Aerospace Med., Aug. 1966, 37(8), 783-785. (Otolaryngology Dept., Karolinska Sjukhuset, Stockholm, Sweden & Psychological Lab., University of Goteborg, Goteborg, Sweden).

The effect of increased ambient air pressure on the hearing function in 26 experienced divers was investigated. Air and bone conduction audiograms were made in normal air (1 ata) and in hyperbaric air (4, and 7, and 10, and 11 ata). After correcting for the transmission changes in the earphone (5-10 dB), the maximum elevation of the hearing threshold was found to be about 30-40 dB in the middle frequency range of hearing. The bone conduction was unaffected.
R 9

28,366
Coop, W.H. & Chapman, M.C. A SPACEFLIGHT EXPERIMENT TO ASSESS RADIATION SHIELDING CALCULATIONS. FINAL REPORT. Contract AF 33(657) 11010, Proj. 6301, Task 630101, AMRL TR 66 34, NSL Rep. 65 158, April 1966, 88pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Northrop Space Laboratories, Hawthorne, Calif.).

The design, development, and testing of a spaceflight experiment to provide data for the assessment of mathematical shielding study models was investigated. The experiment was to provide data for assessment of mathematical shielding study models for comparison with the results obtained by a computer program. This experiment measured proton depth-dose distribution, bremsstrahlung production, and the effects of radiation anisotropy, energy spectrum, and vehicle heterogeneity under known (measured) conditions of radiation environment and vehicle geometry. The experiment instrumentation included sensors for measurement of proton and electron fluxes and spectra, and sensors to measure dosage under various shielding thicknesses of aluminum. An instrument to measure x-ray bremsstrahlung from incident electron flux was also provided. The instrument design features are discussed and methods of operation described.
R2

28,367
Roman, J. FLIGHT RESEARCH PROGRAM. III. HIGH IMPEDANCE ELECTRODE TECHNIQUES. Aerospace Med., Aug. 1966, 37(8), 790-795. (Flight Research Center, NASA, Edwards AFB, Calif.).

This paper describes electrode techniques designed for large-scale flight physiological data collection on a routine basis. Large-scale data collection requires both smaller demands on crew time and less interference with crew comfort than could be achieved by former methods. The resistive components of electrode impedance appears to be related primarily to the extent of skin preparation. For any one method of skin preparation, both resistance and capacitance appear to be primarily a function of electrode area. Motion artifacts are not caused by changes in electrode impedance. Dry electrodes showing a resistive component in excess of 50,000 ohms can be used to obtain tracings of quality comparable, and in some cases superior to those obtained with larger wet electrodes.
R 3

28,368
Warren, B.H., Ware, R.W., Shannon, I.L. & Leverett, S.D., Jr. DETERMINATION OF INFLIGHT BIOCHEMICAL RESPONSES UTILIZING THE PAROTID FLUID COLLECTION TECHNIC. Aerospace Med., Aug. 1966, 37(8), 796-799. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Parotid fluid samples were collected from 11 volunteer Ss during 57 clear weather, daytime, cross-country flights in the back cockpit of NF-100F aircraft. Ss consisted of pilots and nonpilots all of whom were in a nonpiloting capacity during the experiments. Parotid fluid samples were also collected on Ss during a normal nonflying duty day. The plastic collecting device utilized in these experiments was provided with an acrylic bite block moulded to the individual bite of each S. This allowed easy and rapid self-positioning of the device over the parotid duct opening. All parotid fluid samples were analyzed for free 17-OHCS levels. The nonflying day mean values for free 17-OHCS levels were essentially the same for F-100 pilots and nonpilots. F-100 pilots evidenced rises of free 17-OHCS during preflight, take-off, and landing portions of flight which were considerably above the nonflying day mean value as well as above the mean values of nonpilots during corresponding portions of flight.
R 21

28,369
Winget, C.M. & Fryer, T.B. TELEMETRY SYSTEM FOR THE ACQUISITION OF CIRCADIAN RHYTHM DATA. Aerospace Med., Aug. 1966, 37(8), 800-803. (Ames Research Center, NASA, Moffett Field, Calif.).

A module assembly was designed to maintain an ambulatory animal for relatively long periods of time and to collect data on 4 circadian rhythms. Heart rate and deep body temperature data were collected by radio telemetry. The measurement of locomotor activity and oviposition was accomplished by direct data transmission. The data were evaluated by the correlogram, periodogram, power spectral analysis, and periodic regression techniques. Analysis of the data indicated circadian cycles as well as infradian and ultradian cycles. There was a high degree of correlation between the various parameters studied along with approximate equal period lengths in 3 of the cycles (deep body temperature, heart rate, and locomotor activity).
R 19

28,370
Dobbins, D.A., Skordahl, D.M. & Anderson, A.A. PREDICTION OF VIGILANCE. II. HRB Bull. 330, 1962, 7pp. National Academy of Sciences - National Research Council, Washington, D.C. (USA Human Factors Research Branch, Office of the Adjutant General, Washington, D.C.).

The present study was an attempt to predict vigilance performance using a greater variety of psychological predictor measures than is usually reported in vigilance research. The specific objectives were the following: a) To examine the reliability and interrelationships between 2 measures of vigilance performance; b) To determine the predictability of the vigilance criteria using a wide variety of standardized psychological tests and other measures. Primary interest was in determining which, if any, of several well-known psychological domains hold most promise for the prediction of vigilance. The approach was empirical and no provision was made for cross-validating results. For these reasons the study is considered merely exploratory. (c.f. HEIAS 19,220).
R 21

28,371
Hill, J.H. & Chisum, Gloria T. FLASHBLINDNESS PROTECTION: THE EYE PATCH. Aerospace Med., Aug. 1966, 37(8), 813-817. (USN Air Development Center, Johnsville, Penn.).

Two experiments were conducted to evaluate the effectiveness of a simple eye patch as a flashblindness protective device and to provide an indication of the desirability of using large numbers of observers in flashblindness research. The results indicate that a simple eye patch does provide some protection from flashblindness and that a completely light-tight seal is not necessary for this device to be effective. Because of the noxious nature of the stimulus, the general applicability and significance of data collected from large numbers of observers are questionable. The results of unsophisticated and, presumably, relatively unmotivated observers are at variance with those of more sophisticated observers.
R 2

28,372
Riely, P.E., Beard, D.B. & Gatts, J. EFFECTS REAL AND RELATIVE OF A SPACE-TYPE DIET ON THE AEROBIC AND ANAEROBIC MICROFLORA OF HUMAN FECES. Aerospace Med., Aug. 1966, 37(8), 820-824. (Republic Aviation Div., Fairchild Hiller Corporation, Farmingdale, N.Y.).

The effects of a space-type diet on the aerobic and anaerobic microflora of human feces were determined. Fecal specimens from 4 young men confined at the Aerospace Medical Research Laboratories, Wright-Patterson Air Force Base, Ohio, were cultured both aerobically and anaerobically 13 times during a 6-week period. 2 of the men were on an experimental space-type diet which was freeze-dehydrated. The other 2 Ss were on a "control" diet which contained identical foods, fresh and canned, to duplicate the dehydrated diet nutritionally as closely as possible. Although the obligately anaerobic character of the flora remained constant, a shift was found in the types of anaerobic organisms isolated. This change in the biochemically distinct flora occurred after a period on the diet sufficiently long to suggest that the diet was a contributing factor. The aerobic flora differed from that cited in the literature by the frequent presence of Shigella and enteropathogenic types of E. coli.
R 8

28,373
Noid, M.N., Adams, D.A. & Supko, P.R. A CRITIQUE OF THE BIOLOGICAL SIGNIFICANCE OF THE SUPERSONIC TRANSPORT RADIATION ENVIRONMENT. Aerospace Med., Aug. 1966, 37(8), 829-834. (USAF Special Weapons Center, Kirtland AFB, N.M.).

There are several poorly defined aspects of the ambient space radiations, which relate to their biological significance. Although the magnitudes of doses expressed in physical units are low, even for transient solar flare encounters, some concern has been expressed by others regarding the high cell damaging potential of the heavily ionizing component of galactic primary radiations, secondary galactic radiations, and of the alpha particle component of solar particle eruptions. This paper compares the approaches taken by several authors to delineate the radiation problem at 70,000 ft. and comments on the assumptions used for lack of measured parameters. The problems of physiological aging and increased genetic burden are considered, and the status of the fractional cell lethality concept is discussed. Finally, an experimental program is discussed in which the Federal Aviation Agency, Air Force Weapons Laboratory, and National Aeronautics and Space Administration will cooperate to better define the environment at 70,000 ft. The FAA-AFWL experiment will use tissue-equivalent sensors to measure absorbed dose and LET spectra while NASA will measure neutron and charged particle fluxes and spectra. Measurements will be made in high flying aircraft stationed throughout the world.
R 21

28,374
Ronco, P.G., Hanson, J.A., Raben, Margaret W. & Samuels, Ina A. CHARACTERISTICS OF TECHNICAL REPORTS THAT AFFECT READER BEHAVIOR: A REVIEW OF THE LITERATURE. Grant NSF G 25112, March 1966, 191pp. Institute for Psychological Research, Tufts University, Medford, Mass.

This study was conducted to collect and evaluate the literature, mainly experimental, on the effects of characteristics of technical reports on reader behavior. The report consists of 2 parts, the content chapters and the annotated references. The content chapters, other than the general introduction and summary ones, follow the format: introduction, summary of findings, and evaluation. The topics covered include: typographical factors and legibility, illustrations or graphics, report organization, language, devices for inducing proper set, motivational devices, and instruction-type reports. Areas in need of further research also are delineated; these include: more practically oriented field studies on the problems of technical reporting to bridge the gap from rigorous laboratory conditions to field experience, use of more realistic performance measures and development of more adequate criterion measures investigating further rules for grammatical construction, establishing up to date "meaningful" word lists and obtaining information about the intended user population. The 411 annotated references are arranged alphabetically and numbered consecutively so as to be quickly available to the reader. (HEIAS)

28,375
Benson, A.J. & Bodin, M.A. COMPARISON OF THE EFFECT OF THE DIRECTION OF THE GRAVITATIONAL ACCELERATION ON POST-ROTATIONAL RESPONSES IN YAW, PITCH AND ROLL. Aerospace Med., Sept. 1966, 37(9), 889-897. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Labyrinthine nystagmus and the sensation of turning, evoked by impulsive stimuli in yaw, pitch and roll, were compared when the Ss remained in the plane of rotation and when tilted through 90° as soon as the turntable was stopped. In all axes, reorientation of the S brought about a significant decrease in the duration of the post-rotational response, though this was proportionately greater in yaw than in pitch or roll. In the yaw and pitch axes the reduction in the after-sensation was greater than the decrement in the corresponding time constant of nystagmus decay. Possible mechanisms, and the implication of these results to problems of aerospace medicine, are discussed.
R 14

28,376
Mishkin, S. & Jones, G.M. PREDOMINANT DIRECTION OF GAZE DURING SLOW HEAD ROTATION. Aerospace Med., Sept. 1966, 37(9), 897-900. (Physiology Dept., McGill University, Montreal, Quebec, Canada).

When the head is rotated slowly a vestibulo-ocular response acts in a compensatory direction and is usually manifest as ocular nystagmus having a slow compensatory phase interspersed with quick fly-backs in the opposite, or leading, direction. Experiments with human Ss oscillated sinusoidally about a vertical axis have shown that superimposed on this familiar nystagmoid pattern of response there tends to be a slow waveform of change in the average eye position relative to the skull. In these experiments this waveform had the same frequency as the oscillatory motion of the head but was approximately 90° phase advanced with respect to the waveform of head position. This implies that during the sinusoidal head motion the waveform defining averaged eye position relative to the skull was approximately in phase with head angular velocity. Since the semicircular canal functions as an angular velocity transducer over the frequency range employed in these experiments, it is inferred that the observed waveform of averaged eye displacement probably derived in the main from this vestibular source. This conclusion is supported by the fact that the phase advancement was independent of vision and occurred in the absence of relative movement of the head and trunk.
R 16

28,377
Helder, G.K. CUSTOMER EVALUATION OF TELEPHONE CIRCUITS WITH DELAY. Bell Sys. tech. J., Sept. 1966, XLV(7), 1157-1191. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

In 1964 tests were begun in which customers making transatlantic calls, to which varying amounts of delay had been added, were interviewed after call completion to determine the circuit quality. These tests were continued in 1965 using the Early Bird satellite which some customers used extensively before being interviewed. During this period a number of different echo suppressors were also tested. Results show that the quality of telephone circuits with echo suppressors decreases with increasing delay, that previous satellite calls have no effect on the customer's opinion of his present call, and that no echo suppressor was superior for all delays although some appear to be better for the longer delays.
R 3

28,378
Fascenelli, F.W., Cordova, C., Simons, D.G., Johnson, J., et al. BIOMEDICAL MONITORING DURING DYNAMIC STRESS TESTING. I. INSTRUMENTATION AND NORMAL VALUES. Aerospace Med., Sept. 1966, 37(9), 911-922. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

With the advent of manned space flight, it has become increasingly important to be able to assess the physiologic state of many by remote means. This has created a requirement to be able to use essentially atraumatic external sensors providing simultaneous measurements of the vital functions during activity. To obtain this information, a group of 223 Ss from Air Force flight crews between the ages of 25 and 35 were monitored with specialized equipment during rest and during various forms of stress testing. This report describes the data acquisition system that was operated and the methods used for measurement. Normal values of physiologic functions for Ss instrumented in this manner have been computed and are also presented; these include EEG, ECG, phonocardiogram, arterial pulse wave, O_2 saturation, plethysmograph, skin temperature, GSR, and respiration.
R 6

28,379
Vogt, F.B. EFFECT OF INTERMITTENT LEG CUFF INFLATION AND INTERMITTENT EXERCISE ON THE TILT TABLE RESPONSE AFTER TEN DAYS BED RECUMBENCY. Aerospace Med., Sept. 1966, 37(9), 943-947. (Texas Rehabilitation & Research Institute, Texas Medical Center, Houston, Tex.).

11 healthy adult male Ss were studied using tilt table procedures before and after 3 10-day periods of recumbency. Intermittent cuff inflation on the lower extremities or periodic exercise procedures were performed during each of 2 periods of recumbency. Definite cardiovascular deconditioning as manifested in statistically significant changes in the tilt table response was observed after each recumbency period. No statistical difference was observed in the comparison of the response to each recumbency period with that in which a potential treatment was added. Tilt table responses of non-athletes differed from athletes prior to deconditioning, but the trend of change with deconditioning was similar.
R 18

28,380
Figarola, T.R. & Billings, C.E. EFFECTS OF MEPROBAMATE AND HYPOXIA ON PSYCHOMOTOR PERFORMANCE. Aerospace Med., Sept. 1966, 37(9), 951-954. (Preventive Medicine Dept., Ohio State University, Columbus, Ohio).

This study was designed to assess the effects of meprobamate, alone and combined with hypoxia, on the ability of normal human Ss to perform several complex psychomotor tasks simultaneously. 6 male Ss were required to perform a bidimensional tracking task, to solve coded problems and to respond to infrequent changes in the intensity of an auditory signal. The tasks were performed for 36 min. on 6 occasions while Ss were taking either meprobamate, 400 mgm 3 times daily, or a matched placebo. While taking drug or placebo, Ss were exposed in an altitude chamber to either 3,000, 8,000 or 17,000 ft. pressure altitude on 3 separate days. Performance was assessed under each of the 6 possible combinations of drug (or placebo) and altitude. The results indicate that meprobamate in this dosage exerts a decremental effect on certain elements of complex task performance. This effect is approximately additive to the decremental effect of hypoxia. The effect of meprobamate was obvious only during periods when Ss were relatively heavily loaded; it was not significant during periods when Ss were performing the tracking task alone.
R 10

28,381
Fields, D.S. COST/EFFECTIVENESS ANALYSIS: ITS TASKS AND THEIR INTERRELATION. Operations Research, May-June 1966, 14(3), 515-527. (Tempo-General Electric Company, Santa Barbara, Calif.).

Studies of the cost/effectiveness of specific systems and mathematical techniques used in such investigations have frequently been presented at ORSA (Operations Research Society of America) meetings and published in Operations Research . A few other papers have described the general theory of cost/effectiveness or a special approach to one or more of the major tasks involved in its application. This paper discusses the nature of these tasks and how they are interrelated, using as an example the design of a communication system in a nuclear environment.
R 3

28,382
Gibbons, H.L., Plechus, Judith L., Chandler, Evelyn H. & Ellis, J.W. ALCOHOL-INDUCED HYPOGLYCEMIA AS A FACTOR IN AIRCRAFT ACCIDENTS. Aerospace Med., Sept. 1966, 37(9), 959-961. (US Office of Regional Flight Surgeon, FAA, Fort Worth, Tex.).

A case history of an aircraft accident is presented. The apparent cause of the accident was incapacitation secondary to marked hypoglycemia (blood glucose level was 20 mg per cent and blood alcohol level was 98 mg per cent). Alcohol induced hypoglycemia (AIH) is mentioned frequently in the literature. Since 30% of fatal aircraft accidents in the Federal Aviation Agency's Southwest Region have alcohol involved, an investigation was undertaken to evaluate the role of associated hypoglycemia in these accidents as a possible contributing factor. Due to the post mortem changes in blood glucose levels, the data is considered unreliable and no conclusions were reached regarding the frequency of AIH. A phenomenon of agonal hypoglycemia is suggested, and the role of AIH in diabetes is mentioned.
R 28

28,383
Bielicki, Z., Haduch, S. & Etmanowicz, S. OVERLOAD CENTRIFUGE FOR EXAMINING FLIGHT PERSONNEL. FTD TT 64 70/1+2, Nov. 1964, 6pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Wojskowy Przeglad Lotniczy, 1963, 8, 59-63). (AD 452367)

This article describes briefly a centrifuge intended for the examination of flight personnel under effective loads of 1 to 30 g at normal or reduced atmospheric pressures.

28,384
Cambeis, Lillian. BIBLIOGRAPHY OF IMPACT ACCELERATION LITERATURE. ANNEX TO SYNTHESIS OF IMPACT ACCELERATION TECHNOLOGY FOR AVIATION CRASH INJURY PREVENTION (PROJECT SIAT). Contract DA 44 177 AMC 888(T), Task 1A024701A12101, June 1963, 101pp. USA Transportation Research Command, Fort Eustis, Va. (Flight Safety Foundation, Inc., New York, N.Y.).

Project SIAT (Synthesis of Impact Acceleration Technology for aviation crash injury prevention) was conducted by the Flight Safety Foundation under contract to the U.S. Army Transportation Research Command. A major part of this program entailed the collection and collation of information pertaining to the impact acceleration aspects of crash injury research. The resultant bibliographic material is herein listed as a separate annex to the basic report to facilitate its handling. The documents are listed alphabetically, without a further classification breakdown.

28,385
Schaefer, H.J. A NOTE ON THE INFLUENCE OF SHIELD GEOMETRY ON AIR DOSE AND TISSUE DOSE FROM PROTONS WITHIN A SPACE VEHICLE. Contract NASA Order R 75, BuMed. Proj. MR005.13 1002, Subtask 1, Rep. 25, April 1963, 15pp. USN School of Aviation Medicine, Pensacola Air Station, Fla. (AD 613993)

For 3 typical space radiation proton spectra assuming 4 pi incidence the effect of shield geometry on the distribution of air dose within a spherical shell of uniform wall thickness and within a conical vehicle with a heavy heat shield at the base is analyzed theoretically. Highly structured dose patterns are obtained even for the completely symmetrical spherical vessel. Comparative analysis of the depth dose distribution in a tissue phantom of 30 cm diameter at 2 different locations in the conical vehicle shows that greatly different tissue doses can prevail at locations which show equal air doses. It is concluded that the tissue dose in the body of the astronaut cannot be accurately inferred from stationary radiation sensors, but requires instruments carried on the body.
R 7

28,386
Bowen, I.G., Holladay, April, Fletcher, E.R., Richmond, D.R., et al. A FLUID-MECHANICAL MODEL OF THE THORACO-ABDOMINAL SYSTEM WITH APPLICATIONS TO BLAST BIOLOGY. Contract DA 49 146 XZ 055, Proj. A4a 03.012, Rep. DASA 1675, June 1965, 67pp. US Defense Atomic Support Agency, Washington, D.C. (Lovelace Foundation for Medical Education & Research, Albuquerque, N.M.). (AD 469913)

A mathematical model was described which was developed to compute some of the fluid-mechanical responses of the thoraco-abdominal system subjected to rapid changes in environmental pressure. The approach--helpful in understanding many of the primary effects of air blast on animals, but applicable to related problems involving rapid changes in environmental pressure as well--incorporated an air cavity representing the gaseous volume of the lungs (although it is recognized that gas in the organs of the abdomen may influence the response of the system), 2 movable pistons and an orifice through which gas might pass in either direction. One of the pistons represented the chest wall and the other that portion of the abdomen which moves with the diaphragm to change the lung volume. Each piston was "assigned" an effective mass and area, a spring constant, and a damping factor. The orifice was taken to "incorporate" the characteristics of the many airways of the respiratory system. Parameters relating the animal to the model were estimated, tested and then adjusted as required by comparing model results with experimental records of thoracic pressures recorded for rabbits exposed to blast waves in shock tubes. Equations were derived to scale parameters applicable to a given animal to those for similar creatures of arbitrary mass. By dimensional analysis other equations were developed to relate, for a given biological response, the body mass of similar animals to blast wave parameters. Numerical solutions of the model were presented to help explain the mechanisms involved when animals were "loaded" with typical wave forms or with pulses increasing to a maximum in a stepwise manner, a contingency associated with a quite significant increase in mammalian tolerance to over-pressure. Applications of the scaling concepts were exemplified in several ways making use of the published data. R 54

28,387
French, F.W. & Hansen, K.F. VULNERABILITY OF MANNED ORBITAL COMMAND POSTS TO NATURAL SPACE RADIATIONS. Contract AF 19(628) 2390, Proj. 611.1, ESD TDR 64 164, Rep. TM 4073, Nov. 1964, 86pp. USAF Electronic Systems Div., L.G. Hanscom Field, Bedford, Mass. (Mitre Corporation, Bedford, Mass.). (AD 609501)

The shielding requirements for the protection of the crew of a manned orbital command post against the natural space radiations are investigated. 2 types of orbits of military importance and of wide applicability are considered--a long-duration, high-altitude orbit above the Van Allen Belt and a short-duration, low-altitude polar orbit below it. Model environments for both orbits in terms of solar flare, cosmic, and Van Allen Belt radiations are postulated. Radiobiological tolerance criteria are investigated, and a somewhat unique criteria, based on partial recovery of sustained somatic damage, is proposed for the long duration mission. A mathematical description of the radiation transport of the separate environmental components through the radiation shield is formulated. Appropriate simplifications are used to obtain expressions for the doses due to primary protons, secondary protons and neutrons, and bremsstrahlung. Calculations are carried out on the IBM 7030 computer to obtain dose vs. thickness curves for different types and amounts of shielding material. These curves, together with the assumed model environment, and the postulated radiobiological tolerance criteria, are used to calculate minimum shielding thicknesses for both types of orbits. Conclusions are then drawn on the total amount of radiation shielding material that must be carried for each orbit.
R 32

28,389
Schaefer, H.J. RADIATION EXPOSURE FROM HEAVY NUCLEI IN SOLAR PARTICLE BEAMS IN SPACE SYSTEMS OF LOW SHIELDING. Aerospace Med., Jan. 1966, 37(1), 1-4. (USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

In extravehicular activity and in the Lunar Excursion Module, the astronaut is protected from environmental ionizing radiation merely by 0.1 to 0.2 g/cm^2 of material. Behind such low shielding, in addition to protons, alpha particles and heavy nuclei in solar particle beams contribute to exposure. Separate analysis of the proton, alpha, and medium heavy fluxes for the November 12, 1960 flare shows that, on the rad dose level, only the alpha component contributes significantly to total dose and does so only in the first 5 mm. of tissue. On the RBE dose level, the alpha component is the predominant contributor in near-surface regions, becoming equal to the proton dose at 2 mm. depth in tissue. The contribution of the medium heavy group never exceeds, even in the tissue surface and on the RBE dose level, a few per cent of total exposure. No experimental data with laboratory radiations exist that would lend themselves to an interpretation of the peculiar depth dose patterns for flare-produced particles behind low shielding in terms of radiation damage or permissible exposure.
R 6

28,390
Dille, J.R. & Hasbrook, A.H. INJURIES DUE TO EXPLOSION, DECOMPRESSION AND IMPACT OF A JET TRANSPORT. Aerospace Med., Jan. 1966, 37(1), 5-11. (US Aviation Medical Div., FAA, Los Angeles, Calif. & US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

On the night of May 22, 1962, an explosion of a dynamite device occurred in the right rear lavatory of a Boeing 707 cruising at 39,000 ft. over Iowa. Overpressure, decompression, separation of the tail section, other breaking up of the aircraft, and after 4 min., ground impact ensued. All 45 occupants sustained fatal injuries. 8 people were ejected and free-fell to the ground. One of the occupants, however, sustained relatively minor injuries, except for a laceration of the inferior vena cava, and survived for 9 1/2 hrs. The impact speed of the fuselage is estimated as between 100 mph and 140 mph. The forces transmitted to this passenger, who was lying across a triple forward-facing tourist seat, are difficult to determine, but are estimated to have been between 90.6 g and 177.6 g at the seatpan level. The causes of his injuries and his brief survival are discussed in detail. The time of decompression can be calculated as approximately 1.8 sec. The possible causative roles of the decompression, any antecedent overpressure and the impact forces for the pulmonary lesions and the ruptured ear drums, which were found at autopsy, are discussed. Other injuries (blast, striking the airframe, free-fall), human factors (seats, seat belts, oxygen equipment, crew use of smoke masks), autopsy findings (brain lactic acid determination), and procedures are discussed. Recommendations are made which include the installation of crash locator beacons on civil aircraft, additional procedures for the investigation of such accidents to insure the collection of maximum crash injury correlation data, and possible design features for future, particularly V/STOL, aircraft to improve crash survivability.
R 9

28,391
McCrystal, T.J. & Jacobs, T.O. THE EFFECT OF PROGRAMED INSTRUCTION RESPONSE CONDITIONS ON ACQUISITION AND RETENTION. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 20, Dec. 1966, 37pp. Human Resources Research Office, George Washington University, Alexandria, Va.

This report describes a study that explored various programmed instruction conditions in teaching military subject matter. The effect of these conditions on acquisition and retention of the instructional material is evaluated. A course of instruction on military tactics was programmed to provide 4 types of student response conditions: reading the item and writing the answer, reading the item and "thinking" the answer, reading the item with the answer included and then writing the answer, and reading the item with the answer and "thinking"the answer. When compared with each other it was found that there were no significant differences between the mean criterion scores, but that the conditions which included writing the answer consumed approximately 40% more time.
R 17

28,392
Zechman, F.W., Jr. & Peck, D. ERROR IN MEASUREMENT OF PULMONARY VENTILATION DURING SINUSOIDAL VIBRATION AND A METHOD OF CORRECTION. Aerospace Med., Jan. 1966, 37(1), 32-34. (University of Kentucky College of Medicine, Lexington, Ky.).

During whole-body vibration, respiratory airflow is forced into oscillation. Amplitudes of forced oscillation greater than the amplitude of airflow produced by the S produce error in measurements of ventilation by the open-circuit technique. The origin of this error is determined and a device proposed for eliminating the forced oscillation component from the airflow signal. The device consists of a time delay and summing circuits.
R 5

28,393
Torphy, D.E., Leverett, S.D., Jr. & Lamb, L.E. CARDIAC ARRYTHMIAS OCCURRING DURING ACCELERATION. Aerospace Med., Jan. 1966, 37(1), 52-58. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Forty-two pilots were exposed to $+G_x$ and $+G_z$ acceleration in a variety of profiles and the incidence of arrhythmias investigated. $+G_z$ acceleration did not increase the incidence of arrhythmias. $+G_x$ acceleration increased the incidence of arrhythmias and this increase seemed related to both the degree and duration of acceleration. Premature contractions, with and without aberrant conduction, from both the atria and ventricles were noted. One S had paroxysmal atrial tachycardia with $+G_x$ acceleration. Possible causal mechanisms are discussed.
R 15

28,394
Brown, J.H. AN A.M.E.'S EVALUATION OF PILOT FITNESS TO FLY. Aerospace Med., Jan. 1966, 37 (1), 59-66. (USA Medical Research Lab., Psychology Div., Fort Knox, Ky.).

An Aviation Medical Examiner, designated by the Federal Aviation Agency, discusses some of the practical problems in evaluating pilot fitness which may occur in conducting the physical examination required by the Federal Aviation Agency. The presentation is not intended to introduce controversy regarding the present standards and regulations, but to foster thought and discussion. The primary and personal role of the AME in assessing the physical and emotional capability of man to pilot an aircraft is emphasized, this being the physician's contribution to flying safety.
R 12

28,395
Gerritzen, F. INFLUENCE OF LIGHT ON HUMAN CIRCADIAN RHYTHMS. Aerospace Med., Jan. 1966, 37 (1), 66-70. (Medical Dept., KLM Royal Dutch Air Lines, Schiphol, The Netherlands).

The influence of light on the rhythmic excretion of water and electrolytes was studied in 4 groups of 5 healthy students under strict experimental conditions--hourly intake of food and fluid, hourly collection of the urine--during 47 to 62 hrs. Inverse illumination resulted in a decrease of the amplitude and a reversal of maxima and minima. This procedure was not able to produce a maximum of a certain magnitude on a different place in the cycle. In a fifth experiment a shorter period of darkness proved to be incapable to depress the amplitude. Light was considered an unsuitable stimulus to shorten the period of adaptation after rapid flights in East-West direction or vice versa. Induction of artificial sleep might be more appropriate. The significance of circadian rhythms in connection with our conception of the stability of the "milieu interieur" is discussed.
R 11

28,396
Blanc, C., Lafontaine, E. & Laplane, R. PSYCHIATRIC AND PSYCHOLOGICAL PROBLEMS IN COMMERCIAL AVIATION. Aerospace Med., Jan. 1966, 37(1), 70-73. (Air France Central Medical Department, Paris, France).

The frequency of neurotic depressive reactions and other neuroses (65%) was a rather striking finding in the study of 400 Air France employees of whom 148 were flying personnel. 50% of the personnel showed conflicts having no direct relationship to their professional activities. The importance of neuropsychiatric examinations as a part of the pre-employment evaluation is stressed.
R 7

28,397
Torphy, D.E. EFFECTS OF IMMERSION, RECUMBENCY AND ACTIVITY ON ORTHOSTATIC TOLERANCE. Aerospace Med., Feb. 1966, 37(2), 119-124. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of water immersion for 6 hrs. without negative breathing pressures were studied in 5 Ss. Control conditions of normal activity and bed rest with and without activity were also studied to delineate the separate effects, if any, of activity, recumbency and immersion. Heart rate during the separate conditions as well as resting and tilted blood pressures were measured and statistically analyzed. No statistically significant decrement in heart rate and blood pressure response to tilting was found, although immersion resulted in a tendency toward increased heart rate and blood pressures as well as greater narrowing of pulse pressure with tilting. The deficiencies of tilt table testing are discussed and our findings on tilt angle and parameters dependent on degree of orthostatic stress presented.
R 20

28,398
Ambler, Rosalie K. & Guedry, F.E., Jr. VALIDITY OF A BRIEF VESTIBULAR DISORIENTATION TEST IN SCREENING PILOT TRAINEES. Aerospace Med., Feb. 1966, 37(2), 124-126. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

A Brief Vestibular Disorientation Test (BVDT) has been developed that involves an assessment of Ss' reactions produced by head movements in a rotating chair. Reliability of measurement has been demonstrated by the substantial agreement among several types of observers using the BVDT technique for the same Ss and by the substantial agreement of the observers' BVDT ratings with the Ss' self-ratings of sensitivity. This study investigated the validity of the test for predicting various pilot training criteria. 226 naval aviation trainees were administered the BVDT during the latter part of their pre-flight training. After the Ss had had the opportunity either to complete training or separate therefrom, the test results were evaluated for their relation to the following criteria: a) Students separated from flight training for all causes vs. completions; b) Tension and/or airsick separations vs. all others; and c) Airsick separations vs. all others. Results indicated that relationships existed between high sensitivity scores on the BVDT and membership in the various separation groups. The airsick/separation group had the highest mean BVDT sensitivity score. Statistical evidence indicated that the BVDT ratings tapped a significant portion of the flight criterion variance not reached by the present flight aptitude tests.
R 11

28,399
Kemp, W.B., Jr., Lockwood, V.E. & Phillips, W.P. GROUND EFFECTS RELATED TO LANDING OF AIRPLANES WITH LOW-ASPECT-RATIO WINGS. NASA TN D 3583, Oct. 1966, 14pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Some results of a study of the influence of ground-induced aerodynamic effects on the landing maneuver of airplanes with low-aspect-ratio wings are presented. The fundamental mechanism of ground induction is reviewed and a simplified landing-flare analysis is used to illustrate the significance of the ground-induced pitching moment, the load factor just before touchdown, and the ground effects on the elevator characteristics. Some effects of wing planforms and airplane size are shown by use of dynamic calculations of airplane motions during the landing flare. A constant-pitch-attitude landing flare is shown to be possible for some large airplanes with low-aspect-ratio wings.

28,400
Ogden, F.W., Jones, Q.W. & Chappell, H.R. DISORIENTATION EXPERIENCES OF ARMY HELICOPTER PILOTS. Aerospace Med., Feb. 1966, 37(2), 140-143. (USA Aviation Board, Fort Rucker, Ala.).

Spatial disorientation has been recognized as a hazard to aviation for many years, but this has not been studied extensively in helicopter flying. With the increasing requirement for more complex aircraft and all weather operations, this has become a rather serious problem in Army aviation. 36 accidents in which disorientation played a role are compared with the experience of 350 aviators who did not have accidents due to disorientation. Disorientation occurred in only 3.4% of major accidents yet 30.7% of the fatalities are in this group. 43 persons (38.5%) died in these accidents. Most of the aviators in these accidents had low levels of experience, and only 13% had instrument training. Of 350 aviators interviewed and/or completing a questionnaire, two-thirds had experienced disorientation an average of 2 1/2 times during their careers. Most of these occurred at night or in adverse weather conditions. To avert accidents, they were able to give the aircraft control to another pilot, rely on their instruments until the feeling passed, or else regained visual contact with the ground before completely losing control of the aircraft. Present instruments are unsatisfactory in aircraft with multidirectional capabilities, such as helicopters. Therefore, more training is necessary and instruments designed to meet the special characteristics of rotary wing aircraft must be developed.
R 13

28,401
Benson, A.J. & Bodin, M.A. INTERACTION OF LINEAR AND ANGULAR ACCELERATIONS ON VESTIBULAR RECEPTORS IN MAN. Aerospace Med., Feb. 1966, 37(2), 144-154. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

A 1 g rotating linear acceleration vector, produced by rotation about a horizontal cephalo-caudal axis, was found to produce compensatory nystagmus for as long as rotation continued. The velocity of the slow phase of nystagmus showed a cyclical modulation, the amplitude of which increased with the speed of rotation. Following rotation about a horizontal axis the after-sensations were all but abolished and the time constant of decay of post-rotational nystagmus was consistently shorter than when the axis of rotation was vertical. A hypothesis is presented which attempts to explain these findings by the direct action of the linear acceleration on the canal system; however, it is not possible to exclude otolithic mechamisms.
R 35

28,402
Jeantheau, G.G. & Andersen, B.G. TRAINING SYSTEM USE AND EFFECTIVENESS EVALUATION, FINAL REPORT. Contract N61339 1743, Proj. 7789 1, Tech. Rep. NAVTRADEVCEN 1743 1, Rep. SSD 66 325, July 1966, 115pp. USN Training Device Center, Port Washington, N.Y. (Dunlap & Associates, Inc., Darien, Conn.).

Criteria for evaluation of training device effectiveness have been developed. The report examines methods of evaluation with particular emphasis on the problems of objective evaluation in the on-going training situation. Consideration is given to problems of measurement, experimental design, and analysis in the field setting. Further, attention is given to the issues of utilization and design of training devices and their influence on training effectiveness. An evaluation of the Aetna Drivotrainer was made and consequent recommendations are included for the 11H54 Driving Improvement Trainer. A criterion-referenced measurement system was developed for the 1BZ2 Maneuvering Tactics Trainer for possible subsequent use in evaluating that device.
R 35

28,403
Sawyer, C.H., Soblesk, E.J. & Jay, B. AEROMEDICAL FACTORS OF TITAN II ICBM SUPPORT: A SUMMARY OF TWO YEARS' OPERATIONAL EXPERIENCE. Aerospace Med., Feb. 1966, 37(2), 167-172. (USAF 803d Medical Group, Davis-Monthan AFB, Ariz.).

Aeromedical procedures developed to support the lead Titan II Intercontinental Ballistic Missile Wing composed of 18 dispersed complexes are discussed. Mishap experience including a serious nitrogen tetroxide burn with associated chemical pneumonitis is reported. Human factors in combat missile crew duty with emphasis on fatigue, noise and nutrition are discussed. Propellant transfer experience with the USAF Rocket Fuel Handlers Clothing Outfit is summarized. The results of 2939 preplacement and periodic propellant handler physicals are included. Experience gained in this missile program is referenced to future Titan II medical support requirements as well as other advanced weapon system developmental programs.
R 4

28,404
Lundgren, C.E.G. & Malm, L.U. ALTERNOBARIC VERTIGO AMONG PILOTS. Aerospace Med., Feb. 1966, 37(2), 178-180. (Physiology Institute, University of Lund, Lund, Sweden).

The occurrence of alternobaric vertigo—vertigo due to pressure changes in the middle ears—was studied by means of interviews of 108 Swedish RAF pilots. The findings are presented as statistically analyzed data and case reports. The incidence of vertigo was higher than in an earlier investigation. A positive correlation was found between colds, mismanagement of colds, difficulties in pressure equalization of the middle ears and the occurrence of vertigo. Information is given which stresses the risks connected with alternobaric vertigo in flying.
R 5

28,405
Gschwind, R.T. & Torre, J.P., Jr. TROOP-POSTURE SEQUENCES FOR A 155MM HOWITZER CREW: A PILOT STUDY. Tech. Note 6 66, Aug. 1966, 19pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This field study investigated an artillery crew's posture sequence under simulated artillery fire. The results relate their posture (e.g., standing or prone) to time after the initial warning. A method of analyzing the crew's exposed area is presented.

28,406
Balke, B., Melton, C.E., Jr. & Blake, C. PHYSIOLOGICAL STRESS AND FATIGUE IN AERIAL MISSIONS FOR THE CONTROL OF FOREST FIRES. Aerospace Med., March 1966, 37(3), 221-227. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

Success in around-the-clock battles against forest fires depends largely on the effectiveness of special air operations. Considering the potential risk of long hours of of extensive stress to men and aircraft in such operations, attempts were made to measure physiological responses during simulated aerial fire control missions and to detect measurable symptoms of post-flight fatigue. In-flight heart rates and respiratory frequencies of Forest Service pilots were obtained via radiotelemetry in single 5-hr. flights and on 3 consecutive days of 8-hr. flights. Pre- and post-flight exercise tests were performed a) for the establishment of the individual heart rate: metabolic rate relationship, and b) for the detection of any "physical fatigue" effects. Also, for the latter purpose, a simple orthostatic tolerance test was employed. According to the results, the physiological demands in the simulated 5-hr. "bird dog" missions were not excessive. The in-flight metabolic rate of approximately twice the resting rate was not enough to cause measurable physical fatigue. During the 8-hr. flights, the heart rates fluctuated between 24 and 39% increase above resting levels in the pilot, and between 37 to 65% in the observer. In the post-flight exercise tests physical fatigue became apparent especially on the third day as heart rate response to a relatively moderate work-load increased from a normal of 125 to 164 beats per min. Conclusions drawn from this study indicate that the physiological demands of forest fire control missions engage nearly 33% of the pilot's maximum capacity. Actual flying time under such condition should not exceed 5-6 hrs. daily on a 5-day per week schedule.
R 11

28,407
Lategola, M.T., Harrison, H. & Barnard, C. A VIRTUALLY CONTINUOUS MEASUREMENT OF HUMAN SYSTOLIC AND DIASTOLIC BLOOD PRESSURE TRANSIENTS WITHOUT DIRECT ARTERIAL PUNCTURE. Aerospace Med., March 1966, 37(3), 228-233. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

A system for virtually continuous measurement of both systolic and diastolic blood pressures without recourse to direct arterial puncture has been effected by the modification of already-existing, standard equipment. This system entails the measurement of systolic blood pressure via a digital pressure cuff on one arm simultaneously with the measurement of diastolic blood pressure from a brachial cuff mounted on the other arm. The systolic pressure device was used virtually unmodified. The diastolic pressure device was originally designed to measure both systolic and diastolic pressures autometically. The modification consisted mainly in the elimination of the systolic portion of the automatic cycle. The combined system is capable of routinely obtaining measurement frequencies in the order of 20 per minute for protracted time periods. The system functions well under all resting-subject conditions and under some "body-movement" conditions.
R 6

28,408
Tolliver, W.H. & Morris, M.L. CHEMICAL ANALYSIS OF PERMANENT AND ORGANIC GASES IN A 30-DAY MANNED EXPERIMENT. Aerospace Med., March 1966, 37(3), 233-238. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Chemical analyses of the permanent gases and the trace volatile organic constituents were performed on a 30-day manned experiment. This experiment was primarily concerned with the feasibility of providing a suitable atmosphere for 3 men. The primary instrumentation used was the gas chromatograph. The adjunct instrumentation was infrared spectrophotometry and mass spectrometry. Consideration is given to the sampling and analytical procedures used. Organic compounds unique to space cabin and evaluator studies are reported. Indications of future gas chromatography methodology are given.
R 8

28,409
Szafran, J. LIMITATIONS AND RELIABILITY OF THE HUMAN OPERATOR OF CONTROL SYSTEMS TO PROCESS INFORMATION. Aerospace Med., March 1966, 37(3), 239-242. (Experimental Psychology Dept., Lovelace Foundation for Medical Education & Research, Albuquerque, N.M.).

The theory of human skill is briefly reviewed. It is argued that, within certain well-defined limits, the extent to which man can extract information from sensory inputs is impressive, even if for some purposes intensive training has to precede efficient performance. It is concluded that one of the key notions in the appraisal of operational reliability of man in space should be endurance—in the sense of a capacity to adapt rapidly to changing requirements and strange conditions (including those of reduced "signal-to-noise" ratio), as well as a general willingness to plan the effort so as to maximize the likelihood of sustained performance.
R 35

28,410
Eich, R.H., Smulyan, H. & Chaffee, W.R. HEMODYNAMIC RESPONSE TO G-SUIT INFLATION WITH AND WITHOUT GANGLIONIC BLOCKADE. Aerospace Med., March 1966, 37(3), 247-250. (Medical Dept., State University, New York Upstate Medical Center, Syracuse, N.Y.).

The acute hemodynamic effects of G-suit inflation were studied in 21 normal supine Ss. Although suit inflation consistently elevates central venous pressure and augments venous return, cardiac output falls slightly. This is presumably due to various depressor reflexes, which originate in part at least on the arterial side. However, partial removal of reflex regulation by Ganglionic Blockade did not result in an increase in cardiac output following G-suit inflation. Reasons for this are either that the blockade was not complete or that the increase in arterial pressure brought about by suit inflation still prevented the output rise.
R 19

28,411
Urschel, C.W. & Hood, W.B., Jr. CARDIOVASCULAR EFFECTS OF ROTATION IN THE Z AXIS. Aerospace Med., March 1966, 37(3), 254-256. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Rotation of the seated S about the Z axis (Rz) results in a radial acceleration gradient impeding venous return thereby representing a cardiovascular stress. The cardiovascular responses of volunteer Ss instrumented with indwelling arterial and venous catheters were measured during 4 rotational profiles combining 2 rates of angular acceleration (0.1 and 0.8 radians per sec. per sec.) and 2 rotational speeds (60 and 120 RPM). There was a 3-min. plateau at peak velocity. Centripetal acceleration at hand/foot radius (0.5 meters) was 1.8 and 7.4 G at 60 and 120 RPM, respectively. Rotation at 60 RPM represented no significant stress. 3-min. 120 RPM runs, however, caused progressive tachycardia, narrowing of pulse pressure, and a drop in mean arterial pressure, thus inferentially a drop in cardiac output. Tolerance would thus be expected to be limited by the ability of the circulation to maintain venous return.
R 10

28,412
Ward, R.J., Danziger, F., Bonica, J.J., Allen, G.D., et al. CARDIOVASCULAR EFFECTS OF CHANGE OF POSTURE. Aerospace Med., March 1966, 37(3), 257-259. (University of Washington Schools of Medicine & Dentistry, Seattle, Wash.).

20 healthy Ss were studied while supine, standing, and sitting. Cardiovascular parameters investigated include continuous arterial blood pressure, cardiac rate measurements, cardiac output, stroke volume, and total peripheral resistance determinations performed while supine, and 5 min. after the Ss changed from supine to standing and supine to sitting. Standing caused peripheral pooling of blood, a stroke volume decrease of 45%, a cardiac output decrease of 27%, and an increase of cardiac rate, mean arterial pressure, and total peripheral resistance. Postural change from supine to sitting caused half as much peripheral pooling as the change from supine to standing. Stroke volume was reduced 20%, but an 18% increase in cardiac rate reduced the cardiac output fall to only 10%. Mean arterial pressure did not change. 4 of the 20 Ss fainted while standing. All showed mean arterial pressure decrease. 3 of the 4 showed cardiac rate increases. Cardiac output measurements in 2 of these Ss showed no cardiac output change during faint, but a stroke volume fall which was less than the stroke volume fall of the other Ss who did not faint. It is postulated that fainting was due to a loss of total peripheral resistance plus peripheral pooling of blood, which caused an intolerable reduction in cerebral blood flow.
R 7

28,413
Miller, G.K., Jr. FIXED-BASE VISUAL-SIMULATION STUDY OF MANUALLY CONTROLLED TRANSLATION AND HOVER MANEUVERS OVER THE LUNAR SURFACE. NASA TN D 3653, Oct. 1966, 24pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A fixed-base visual-simulation study has been conducted to determine the ability of the human pilot to control a lunar landing vehicle manually during translation to and hover above various landing sites in a given landing area. The general landing area used in this investigation was the interior of the crater Alphonsus as created by the lunar orbit and landing approach (LOLA) simulator located at Langley Research Center. The investigation employed a closed-circuit television system for image generation and permitted all 6 rigid-body degrees of freedom of the vehicle. The pilot controlled the vehicle through a fixed main-engine thruster in conjunction with a rate-command attitude control system. During the final portion of the automatically controlled landing-approach transition phase of a typical lunar landing trajectory, the pilot was required to switch to manual control in order to place the landing vehicle in near-hover conditions over any one of a number of sites that he felt would be acceptable for landing. The results of the investigation showed that the pilots, using only a 3-axis gyro-horizon nulled to the local vertical and an out-the-window view of the lunar surface, could consistently establish near-hover conditions over a fairly large lunar area. The landing sites attained by the pilots extended from approximately 2300 ft (701.0 m) up range of (before) to approximately 7700 ft (2347.0 m) down range of (beyond) the nominal landing site.
R 3

28,414
Beckman, E.L., Reeves, E. & Goldman, R.F. CURRENT CONCEPTS AND PRACTICES APPLICABLE TO THE CONTROL OF BODY HEAT LOSS IN AIRCREW SUBJECTED TO WATER IMMERSION. Aerospace Med., April 1966, 37(4), 348-357. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

The problem of providing adequate clothing for personnel who either accidentally or otherwise are immersed in cold water has continued to challenge clothing manufacturers for the past decade. The development of foamed plastics and other clothing materials offers new possibilities. Likewise new advances in energy conversion systems offer new solutions to this critical operational problem. The basic physical and physiological concepts which pertain to the problem of limiting thermal loss from the immersed human are reviewed. The newer technical developments in insulative clothing and supplemental heating systems are reviewed and discussed with relation to these basic concepts.
R 25

28,415
Alexander, W.C., Sever, R.J. & Hoppin, F.G., Jr. HYPOXEMIA INDUCED IN MAN BY SUSTAINED FORWARD ACCELERATION WHILE BREATHING PURE OXYGEN IN A FIVE POUNDS PER SQUARE INCH ABSOLUTE ENVIRONMENT. Aerospace Med., April 1966, 37(4), 372-378. (Manned Spacecraft Center, NASA, Houston, Tex.).

Presently planned atmospheric entry missions were simulated with respect to predicted acceleration profiles and gaseous environment. Arterial O_2 saturation was measured by earpiece oximetry calibrated with Van Slyke analyses of arterial blood samples collected simultaneously under acceleration. The patterns and severity of hypoxemia were studied by varying the magnitude and duration of the acceleration exposure and the environment of the pilot. The patterns and severity of hypoxemia induced by forward acceleration were shown to vary as a function of the magnitude and duration of the exposure and the gaseous environment of the experimental S. Saturation levels below 80% were uncommon under the conditions of this simulation; however, marked deviations from this value were encountered. Although the present investigations was designed to evaluate the tolerability of the space crew to the dynamic and environmental conditions of manned earth entry characteristics of the Apollo mission, some relevant findings concerning the probable mechanisms of acceleration-induced hypoxemia are discussed.
R 17

28,416
Jeanneret, P.R. & Hutchins, C.W., Jr. USE OF TWO QUALITATIVE INDICES AS PREDICTORS OF SUCCESS IN FLIGHT TRAINING. Aerospace Med., April 1966, 37(4), 379-382. (USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

Two qualitative variables, procurement source and military rank, were employed to supplement the current multiple prediction formulae that identify students with low probabilities of successfully completing the U.S. Navy Flight Training Program. Also 2 dichotomous criterion variables, completion vs. attrition and voluntary withdrawal vs. all other attrition, were created, and the Wherry-Doolittle method of test selection was used to compute multiple prediction formulae for both criteria. The results indicated that the inclusion of the qualitative variables increased the multiple correlations in every case for both criteria. Since these preliminary findings are encouraging, the next step must be to include all qualitative variables available in one intercorrelation matrix and determine the total benefit to the multiple prediction formulae accruing from this method.
R 2

28,417
Mohler, S.R. & Hasbrook, A.H. IN-FLIGHT RESPONSE TO A NEW NON-GYROSCOPIC BLIND FLIGHT INSTRUMENT. Aerospace Med., April 1966, 37(4), 388-394. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

Pilot responses to a new "geomagnetic" non-gyroscopic blind flight instrument were recorded during flight, utilizing an aircraft typical of those flown by many general aviation pilots. Data were obtained under induced conditions of loss of control during simulated instrument flight utilizing Ss ranging from student pilots with as little as 6 hrs. flight time to commercial pilots with up to 10,000 hrs. experience. The device used in tests of human response during simulated blind flight is the Kenyon instrument. This is a small, light-weight, self-contained instrument which requires neither electrical power nor vacuum source. It is non-tumbling and is not susceptible to turbulence. Comparisons of pilot response with the Kenyon instrument and the conventional "turn and bank" instrument were an integral part of the tests. More positive and smooth control was obtained with the new instrument. Also, there was a marked decrease in onset and severity of vertigo with the Kenyon instrument.
R 4

28,418
Brown, W.K., Rothstein, J.D. & Foster, P. HUMAN RESPONSE TO PREDICTED APOLLO LANDING IMPACTS IN SELECTED BODY ORIENTATIONS. Aerospace Med., April 1966, 37(4), 394-398. (USAF Aeromedical Research Lab., Holloman AFB, N.M.).

288 human impact experiments were accomplished on a linear decelerating device (the Daisy Decelerator) for the purpose of studying human response to G forces in certain body orientations likely to occur during impact of the Apollo command module. A proposed Apollo restraint system was used in all human tests. It was observed that impact forces produced effects to the nervous, cardiorespiratory and musculoskeletal systems. Neurological effects of impact were momentary stunning and disorientation. A consistent effect to the cardiovascular system was transitory post-impact slowing of the heart rate in those body orientations in which the decelerative force acts in a footward direction (inertial force acts headward). A theory is presented to explain this effect. Respiratory effects of impact were momentary shortness of breath and chest pain. Effects to the musculoskeletal system were soreness and spasm of muscle groups of the neck and back. Since no effect to the human S was severe enough to exceed human tolerance, the test program results demonstrate that man can endure certain predicted Apollo landing impact forces in different body orientations without significant incapacitation or undue pain.
R 14

28,419
Morgenstern, A.L. FEAR OF FLYING AND THE COUNTER-PHOBIC PERSONALITY. Aerospace Med., April 1966, 37(4), 404-407. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Air Force fliers who become afraid to fly often share similar patterns of unrecognized psychopathology. Case studies reveal a sequence of childhood fears more intense and protracted than usual, counter-phobic fearlessness in teen-age and adult years as a defensive mode of life, and finally reversal of the intense need to fly into an equally strong fear of flying. Overt phobias in fliers are precipitated by stresses similar to those predisposing to other neurotic illnesses. If a career in aviation was chosen primarily for counter-phobic reasons the susceptibility to neurosis under these stresses is greatly augmented. Treatment is difficult and "cure" may comprise no more than a return to the previous counter-phobic adjustment. When the history of an applicant for flying training suggests severe childhood phobias or persistent participation in dangerous work or recreation, a psychiatric consultation is needed. If the consultant confirms the presence of repetitive counter-phobic traits the applicant should be disqualified.
R 6

28,420
Kennedy, R.E., Wood, C.D., Graybiel, A. & McDonough, R.B. SIDE EFFECTS OF SOME ANTIMOTION SICKNESS DRUGS AS MEASURED BY PSYCHOMOTOR TEST AND QUESTIONNAIRES. Aerospace Med., April 1966, 37(4), 408-411. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

The results of this research indicate that many of the side effects of the depressant drugs such as hyoscine and meclizine can be relieved by combination with d-amphetamine. By the same token, some of the stimulatory effects of d-amphetamine are relieved by a combination with a depressant. It was found that both questionnaire and psychometric techniques are necessary to more fully measure the side effects of drugs. Some persistent reports of side effects on the questionnaire were not correlated with the psychometric findings. Also, some side effects measured by the psychometric methods were not reported on the questionnaire. Hyoscine and d-amphetamine produced the most pronounced side effects while meclizine and trimethobenzamide produced fewer side effects.

28,421
Reinhardt, R.F. THE COMPULSIVE FLYER. Aerospace Med., April 1966, 37(4), 411-413. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

This paper examines the significance of compulsive personality traits in the aviator. "Compulsive" implies here a tendency toward over-organization, over-conscientiousness, perfectionism, and an inability to relax. An illustrative case is presented of a very proficient but compulsive flight student who struck a psychologic snag in the Advanced Radio Instrument phase of jet training. Clinical experience has shown that compulsive people generally make fine professional aviators. They are intelligent, safe and dependable. On the other hand, instrument training is hard for them, they lack flexibility, and they often develop headaches. In new situations which are difficult to organize and clearly conceptualize, when novel problems require novel responses, they are at their worst. In workaday flying, with a premium on care, method, timing and preparation, they are at their best, and probably the best.
R 6

28,422
Schreuder, O.B. MEDICAL ASPECTS OF AIRCRAFT PILOT FATIGUE WITH SPECIAL REFERENCE TO THE COMMERCIAL JET PILOT. A SPECIAL REPORT. Aerospace Med., April 1966, 37(4), 1-43. (Medical Committee, Air Transport Association of America, Washington, D.C.).

This special report, which is concerned with pilot fatigue, contains a general discussion of fatigue and stress, operational and non-operational aspects of flight fatigue, and finally such topics as aging, health, and prevention of fatigue.
R 47

28,423
Hilton, D.A., Huckel, Vera & Maglieri, D.J. SONIC-BOOM MEASUREMENTS DURING BOMBER TRAINING OPERATIONS IN THE CHICAGO AREA. NASA TN D 3655, Oct. 1966, 26pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Measurements have been made with the aid of bomber airplanes in an attempt to evaluate the effects of the atmosphere on the sonic-boom pressure signatures. Data are presented for various atmospheric situations ranging from quiescent to turbulent and for a wide range of surface temperatures. Statistical analyses have been performed for both the overpressure and impulse data, and these data are compared with similar data from fighter-type airplanes. The measured sonic-boom signatures were noted to vary widely in both peak amplitude and wave shape because of atmospheric dynamic effects. The distortions were associated with the rapidly rising portions (bow and tail wave) of the boom signatures. The highest overpressures were associated with peaked signatures and the lowest overpressures, with rounded-type signatures. The variations of the overpressures and impulses may be represented over a significant range by log normal distributions, the overpressures having a markedly wider range of variations than the impulses. From the data evaluated to date, similar variations in pressure signatures are noted for the shorter wave lengths produced by fighter airplanes and for the longer wave lengths produced by bomber airplanes.
R 8

28,424
Brosgole, L. AN ANALYSIS OF INDUCED MOTION. FINAL TECHNICAL REPORT. Tech. Rep. NAVTRADEVCEN IH 48, Feb. 1966, 57pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 630275)

The relationship between induced motion and apparent object displacement was assessed by comparing the results of 2 conditions in a main experiment. In each instance, a fixated luminous sphere was surrounded by a rectangular frame. In one condition, the sphere was set in the observer's objective median plane while the rectangle moved back and forth horizontally at a rate of 40 min of visual arc per sec. The S, who was able to move the sphere laterally with a control knob, was instructed to hold the sphere in a stationary position whenever it appeared to move, by turning the knob appropriately. The amount of motion induced in the sphere was ascertained through this procedure. In a second condition, the frame was set at various positions over a series of trials with its center ranging from 12° to the right of the objective mid sagital plane, through zero, to 12° to the left. The S's task was to align the sphere, with each new setting of the frame, so that it appeared to be straight-ahead. In this fashion, the effect of a visual surround upon the observer's conception of the straight-ahead direction was assessed. Although there were large individual variations, the apparent median plane was always found to displace laterally toward the center of the frame. The degree of this displacement significantly correlated with the amount of motion induced in the sphere. Induced motion was therefore interpreted in terms of a subjective change in the location of an object in space, as opposed to the theory of object-relative displacement which was proposed by Duncker in 1929.
R 13

28,425
Myers, L.B., Carter, R.G. & Hostetter, R.S. GUIDEBOOK FOR THE COLLECTION OF HUMAN FACTORS DATA. FINAL REPORT. Contract Nonr 4751(00), PTB 66 3, Rep. 7921I F, Jan. 1966, 121pp. USN Personnel Research Activity, Bureau of Naval Personnel, Washington, D.C. (HRB-Singer, Inc., State College, Penn.). (AD 631023)

This guidebook was developed primarily as a reference to aid the Project Officer in the assessment of human factors effects on system performance and in the isolation of the casual factors. There are 3 sections to this guidebook, each serving a different purpose. Section I provides the necessary background information and sets the persepctive for the use of the techniques and materials presented in Section II. This section contains the tools and techniques for system evaluation. This includes methods for obtaining time, accuracy, and maintenance data as well as the techniques for analyzing and interpreting these data. Methods for obtaining qualitative data through questionnaires and checklists are also contained in this section, including sample questionnaires and checklists. The third section (Section III) contains a fairly detailed example of the application of the previously described techniques. Also included are rather complete lists of test objectives and criteria measures. A list of references will be found in the final section.
R 10

28,426
Hall, S.A. & Taffe, J.B. DEVELOPMENT AND TEST OF A PROTOTYPE ADVANCED BIOMEDICAL SYSTEM. FINAL REPORT. Contract AF 18(600) 2755, Proj. 6770, AMD TR 66 1, April 1966, 215pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 633063)

The development and ground test of a non-flyable, functional prototype life-support system was undertaken. The system was designed to support a 50-pound chimpanzee, or the metabolic equivalent, for 30 days (with a safety factor of at least 3 - to make 90 days) in simulated orbit. The system consisted of a sealed life cell for housing the test specimen and his metabolic support equipment plus a service module for supporting both the life cell and its environmental control system (ECS). The ECS was designed to maintain a sea-level pressure, oxygen-nitrogen environment within the life cell. Following a shakedown test to prove out the hardware without a test subject, a test series, with animals, was initiated. Testing was done in the Air Force Biomedical Van Complex, which was refurbished and specially modified for the tests. The test objectives were: a) to obtain engineering data for a future Bioastronautics Flight Research Program; b) to ascertain the psycho-physiological effects of prolonged confinement in a micro-atmosphere on the test Ss; and c) to acquire baseline data relative to atmospheric contaminants in the environment for the time in question. A total of 25 days of animal testing was achieved in an altitude and temperature controlled chamber using 4 different animals. Medical problems with the animals prevented reaching the 30-day goal with a single specimen. However, the ECS operated continuously for the full 30-days without malfunction, and the life-support system successfully demonstrated its adaptability to a flight program.
R 8

28,427
Bech, R.O., Boardman, W.W., Jr. & Robinson, J.W., Jr. APPLICATION OF LITHIUM CHEMICALS FOR AIR REGENERATION OF MANNED SPACECRAFT. Contract AF 33(615) 1588, Proj. 6373, Task 637302, AMRL TR 65 106, June 1965, 121pp. USAF Biomedical Lab., Wright-Patterson AFB, Ohio. (Lithium Corporation of America, Inc., Bessemer City, N.C.). (AD 619497)

Lithium Oxide of highly active surface area ($10 m^2/g$ or better) has been prepared. This material can absorb up to 1.25 times its weight of carbon dioxide, thus making the most efficient CO_2 absorber on the basis of its weight. For efficient operation, the molar ratio of water vapor over carbon dioxide in the gaseous atmosphere should be at least unity. At 5 psia of oxygen and 50% relative humidity, the temperature of the gas should be at least 50°F (10°C) to approach this molar ratio value. A "passive-dynamic" atmosphere regeneration unit was designed with a small motor blower that circulates the gaseous environment through a cone shaped granular bed of lithium oxide (4-14 mesh). The unit weighs 4-1/2 pounds and has been shown to absorb the daily carbon dioxide output, or more, of one man. The outflowing gas is free of irritating dust due to efficient filters and the gas temperatures are at comfortable levels. The effects of weightlessness, vibration and acceleration on the functioning of the unit, have been considered in its design. An adequate amount of safety of operation also was imparted to the unit. The unit can easily be rechraged with fresh lithium oxide granules.
R 36

28,428
Krieger, F.J. THE SPACE PROGRAMS OF THE SOVIET UNION. Report from: "American Astronautical Society's National Meeting, San Francisco, California, August 18-20, 1965." Aug. 1965, 10pp. Rand Corporation, Santa Monica, Calif. (AD 620883)

This paper reviews the highlights of those aspects of Soviet space programs which have been publicized: the manned Vostok and Voskhod flights, the lunar flight via the Luna probes, the interplanetary flight via Venus, Mars, and Zond probes, scientific research via Cosmos and Electron spacecraft, communications development via Molniya satellite, and technological development via Cosmos, Polyot, and Proton spacecraft.
R 5

28,429
USAF Behavioral Sciences Laboratory. SYMPOSIUM ON MOTION SICKNESS WITH SPECIAL REFERENCE TO WEIGHTLESSNESS, FINAL REPORT. Proj. 7184, Task 718405, AMRL TDR 63 25, June 1963, 80pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio.

This report compiles the papers prepared for the symposium on motion sickness during a weightless state, held at the Behavioral Sciences Laboratory, Aerospace Medical Laboratory, Wright-Patterson AFB in March 1960. Motion sickness is defined, its etiology is discussed, and proposals for prophylaxis and treatment are made. It contains a panel discussion among the principal contributors of the symposium, a theoretical study and 2 papers dealing with personal experiences in weightlessness. The high incidence of nausea occurring in the zero-G flights was suspected to be largely due to the excessive accelerations occurring in the pre- and post-zero-G periods accompanying these flights. Evidence to date indicated that weightlessness by itself was not nauseating, however, rapid head movements in the environment could rapidly produce disturbing influences.
R 38

28,430
Magnolia, L.R. THE SOVIET SPACE PROGRAM: A SELECTIVE BIBLIOGRAPHY. Rep. 9990 7235 TO 000, March 1966, 11pp. TRW Systems, Thompson Ramo Wooldridge, Inc., Redondo Beach, Calif. (AD 632761)

This bibliography on the Soviet space program contains 121 references.
R 121

28,431
Hoover, G.W., Miller, J.H., Glassner, H.F., et al. DESIGN STUDY FOR A CONSOLE SYSTEM. Contract N123 (61756)24946A (PMR), Publ. PMR MP 62 3/NMC MP 62 3, Rep. SM 38530, March 1961, 196pp. USN Missile Center, Bureau of Aeronautics, Point Mugu, Calif. (Life Sciences Section, Douglas Aircraft Corporation, Santa Monica, Calif.). (AD 439092)

This study project was undertaken to provide design criteria and data for a real-time psycho-physiological monitoring console for use primarily in flight operations and secondarily in research studies at the Pacific Missile Range and U.S. Naval Missile Center at Point Mugu, California. The methodology used was to start with a statement of the objective, and perform a progressive and systematic analysis of the individual and overall requirements, with an evaluation of the state of the art. From these analyses an optimum design criterion and an interim design criterion were established. Evaluation of the differences between optimum and interim determines requirements for further research and development. A system was required which would indicate to the monitoring physician the present condition of the pilot and his environment, a trend of his condition and that of the environment, and prediction regarding whether or not the missile could be completed safely. The major subsystems selected were: respiratory, cardiovascular, thermo-regulatory, central nervous, sensory and manipulative. Choice of what parameters to measure was made following a study of information needed by data processing equipment to generate the display meeting the information and operational requirements. Discussions of techniques for and implementation of the various processes involved are included. The recommended design consists essentially of: a) a main console where derived data are displayed for use by the monitoring physician with 3 4-indicator vertical meters, a TV view of the pilot, a contact analog display, a slow graphic write-out, a communication system, and an alarm and control system; b) an auxiliary console where raw and non-critical data are displayed for use by both the physician and the technician; and c) the technician's console for the monitoring, control, and maintenance of the data processing equipment. R 8

28,432
USAF Aero Propulsion Laboratory. SECOND AEROSPACE EXPANDABLE STRUCTURES. CONFERENCE TRANSACTIONS. Report from: "Second Aerospace Expandable Structures Conference, Minnetonka Beach, Minnesota, 25-27 May 1965." AFAPL TR 65 108, Feb. 1966, 802pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Archer Daniels Midland Company, Minneapolis, Minn.). (AD 631406)

This report contains a presentation of technical contributions summarizing the status of current, significant research in field of expandable structures. The report is based upon the discussions at the Second Aerospace Expandable Structures Conference held 25-27 May 1965 at the Lafayette Club, Minnetonka Beach, Minnesota. The subject matter has been arranged in 6 sessions in the order of presentation at the conference, followed by 6 papers which were not given at the conference.

28,433
US Aerospace Technology Division. ATD CUMULATIVE INDEX. 1960-1964. March 1965, 65pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 619771)

This Cumulative Index covers 798 ATD (formerly AID) numbered reports, prepared and distributed by the Aerospace Technology Division during the period from July 1960 to December 1964. In the main body of the index, the reports are grouped into 27 general subject categories, e.g., aircraft and flight equipment, communications, detection, ground transportation equipment, guided missiles, navigation and guidance, nuclear propulsion, photography and other reproduction processes, and industrial technology. Within these groups, the reports are arranged in chronological order with the unedited (U) reports appearing at the end of each group. The "U" reports are listed for information value, and are available only from the Defense Documentation Center. Each entry in the main part consists of ATD number, title of report, brief descriptors, including subject numbers, and AD (DDC) number when assigned. The appendix consists of a numerical listing of ATD report numbers with corresponding AD and main subject numbers.
R many

28,434
Gorbov, F.D. CERTAIN PROBLEMS OF SPACE PSYCHOLOGY. FTD MT 63 68/1+3+4, Oct. 1963, 23pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Voprosy Psikhologii, 1962, 6, 3-13). (AD 428547)

Space psychology as a branch of science is unique. Lying at its basis are the achievements of general psychology and human engineering, the principles of the higher nervous activity and the essential medical requirements for the selection of flying personnel. The author emphasizes the importance of psychological experimental methods both during the training of cosmonauts and during the flight itself. A schematic professiogram is given. On the basis of results obtained in special loading tests applied in the training of flying personnel the author advances the "principle of reproduction" as one of fundamental importance for space psychology. Some new methods of psychological research founded on this principle are proposed, such as diagnoses of suggestivity and noise-immunity. The use of a homeostatic method in the study of group psychology permits differentiating several patterns of individual strategy in the integrative performance of operators.

28,435
Lushnikov, F. AN EXPLOIT WHICH HUMANITY WILL NOT FORGET. FTD TT 64 1379/1+2, May 1965, 12pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Krasnaya Zvezda (Russian), Dec. 1963, 3-4). (AD 615988)

This document contains brief remarks taken from the logbooks of several of the Russian cosmonauts.

28,436
Havill, C.D., White, K.C. & Stinnett, G.W. A SUPERCIRCULAR ENTRY GUIDANCE CONCEPT DESIGNED FOR MAXIMUM MONITORING CAPABILITY. NASA TN D 3668, Oct. 1966, 38pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

The reentry guidance procedure investigated permits either automatic or manual range control, and also permits the pilot to monitor the automatic system. With this procedure, it will be possible to control range from about 2,011 to 19,710 km with little reduction in entry corridor from that corresponding to vehicle capability. The automatic guidance system can be monitored with sufficient accuracy to limit skip-range errors to values which can be cancelled during the second entry for ranges less than 9,650 km and to limit overall range errors to less than 3,218 km at the maximum range. If 3 alternate targets are provided 805 km apart, the manual guidance procedure can be used to control to one of these targets for ranges up to 16,090 km. The results presented are limited to an Apollo type, constant-trim, roll-modulated, lifting reentry vehicle entering the atmosphere at or near escape speed, with only longitudinal range being controlled. However, nothing in the results indicates that the guidance concept could not be extended beyond these restrictions.
R 5

28,437
Carroll, K.D. GRAVITY FORCE AND HUMAN CENTRIFUGE STUDIES ACCELERATION DECELERATION. Rep. SB 59 24, July 1959, 6pp. Missiles & Space Div., Lockheed Aircraft Corporation, Sunnyvale, Calif.

This is an annotated bibliography of studies concerned with gravity forces and acceleration and deceleration effects.
R 33

28,438
Evans, G.R. COMBINED ENVIRONMENTAL TESTING. Rep. SB 60 7, Feb. 1960, 10pp. Missile & Space Div., Lockheed Aircraft Corporation, Sunnyvale, Calif.

This bibliography contains titles and some annotations of references concerned with combined environmental testing.
R 57

28,439
Wolff, R.C. & Gleason, T.L., III. EVALUATION OF SOVIET REPRINT: RESPONSE OF THE CIRCULATION SYSTEM TO THE EFFECTS OF ACCELERATIONS AND WEIGHTLESSNESS BY V.V. PARIN. Proj. C 14002, Rep. AMD CW 01 1 66, Jan. 1966, 17pp. USAF Aerospace Medical Div., Brooks AFB, Ohio. (AD 477780)

This report evaluates and comments on the physiological effects of space flight on the circulatory system of both cosmonauts and animals. The report likewise compares these findings with those obtained with the use of laboratory simulators. The result of the effects of acceleration and weightlessness upon the body during space flight, both for animal and manned flights, is discussed. It is concluded that current data do not indicate what mechanisms are involved in adaptation to space flight. The author proposed 3 phases of adaptation and compensation reactions under weightless conditions a) the transition phase; b) incomplete adaptation; and c) relative stable adaptation. He also concludes that space missions of longer duration will be required to determine if complete adaptation can take place.
R 28

28,440
Amorelli, D., Came, B.J. & Wolfe, D.L. SPACE FLIGHT TRAINING PROGRAMS. NAA S&ID F028, Publ. 543 E /3 63, Jan. 1963, 22pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457792)

Some highlights of training programs of such past projects as X-15 and Mercury, and the role played by spacecraft and/or spaceflight simulators are presented. The relationship of these trainers to future manned spaceflight training programs is shown in addition to other projects such as the Dyna-Soar and the Self-Deploying Space Station. The simulator has a dual purpose: to achieve better integration of man and machine, and to perform research in human factors.
R 21

28,441
Franklin, Margaret E., Schumacher, Anne W. & Tiedemann, J.G. A BIBLIOGRAPHY AND CLASSIFICATION OF THE LITERATURE ON VIGILANCE. DA Proj. 2J024701A723, Res. Memo. 64 8, July 1964, 52pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 481200)

Since the beginning of World War II there has been an increasing volume of research in the area of human vigilance. Previous investigators have summarized much of the literature on vigilance (McGrath, Harabedian, & Buckner (HEIAS No. 14,967); McGrath (HEIAS No. 21,266); however, at the present time there is a need to bring these bibliographies up to date. There is also a need for a categorization of past research according to variables studied, which can be used as an index to further reading on specific topics. The present report provides a list and classification of the psychological literature on vigilance and related topics. The list includes a fairly complete coverage of references directly related to vigilance from the period 1940 through 1963. No attempt was made to obtain a complete listing of references on related topics. The report is divided into 2 sections--bibliography and classification. In the bibliography section references are listed alphabetically by author with each entry numbered. The classification section of the report contains an outline of topics in the field of vigilance and a classification of the papers in the bibliography in relation to this outline. Numbers following each subtopic indicate the like-numbered entries in the bibliography. Classification of the references was based for the most part on titles and was made in terms of variables manipulated in the studies.

28,442
Kottler, C.F., Jr. RADIATION SHIELDING CONSIDERATIONS FOR INTERPLANETARY SPACECRAFT. Rep. RE 236, Jan. 1966, 39pp. Research Dept., Grumman Aircraft Engineering Corp., Bethpage, N.Y. (AD 477027)

This report presents an analysis of the radiation dosage astronauts would receive when protected by various combinations of passive shielding, as a function of mission duration and the probability of exceeding the statistically predicted dosage of the NASA Model Solar Proton Environment. Dosages to the internal organs and the skin (taking into account self-shielding) are determined as a function of the energy of the incident particles, and are compared with permissible dosages. The shielding and associated effective cutoff energies required for protection against alpha particles and protons are calculated for mission durations between 1 week and 2 years, with 3 probabilities of exceeding the indicated dosages (0.1, 0.01, and 0.001). The manner of presentation of the data readily permits comparison between magnetic or electrostatic shielding and passive shielding on the basis of radiation dosage and mission duration. Parametric curves for typical aluminum structure, polyethylene shield, hydrogen fueled spacecraft are shown. An introductory description of the solar atmosphere, solar activity, and associated geomagnetic phenomena is also presented along with a number of reference tables.
R 12

28,443
Pickering, J.E. SPACE RADIOBIOLOGY TRAINING AND OPERATIONS - A CONCEPT. Report from: "Third International Symposium on Bioastronautics and the Exploration of Space, San Antonio, Texas, 18 November 1964." Proj. 7757, AMD TR 65 2, June 1965, 11pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 471731)

Public utterances clearly indicate that the United States plans to pursue scientific explorations in the infinite region of space for the expansion of knowledge and the betterment of mankind. The degree to which manned and unmanned systems will be used is conjectural at this time. Once, however, the utility of man is demonstrated for prolonged periods of time, truly proving cost effectiveness, then maximizing this flight experience and reusability requires a conservation of radiation dose. Dose schedules and rest schedules for in-space training, data gathering, application flights and space-oriented capabilities are discussed based upon the recurring requirement of a limited and highly-selected group of people-astronauts. Weekly doses for different regions of space are suggested along with finite recovery periods based upon the several mission profiles, ages of the crew members, as well as a combination of mission flying years and age. These doses are related to biological effects obtained from 10 yrs of chronic exposure in animals.
R 4

28,444
Famiglietti, M.A., Moreland, S. & Sullivan, J.H. AN ANALYTICAL METHODOLOGY FOR ESTIMATING CREW COMPOSITION OF A TWO-MAN ARMY AERIAL VEHICLE. AMCMS Code 5026.11.81900, Tech. Memo. 7 66, June 1966, 15pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This report describes a method for making coarse quantitative estimates of crew composition for a 2-man Army aerial vehicle. It assumes that crew composition depends predominantly on the tasks men are assigned to perform. For illustration the method is applied to an aerial-vehicle concept for high-speed, low-altitude surveillance and target acquisition.

28,445
Schaefer, H.J. & Sullivan, J.J. RADIATION MONITORING WITH NUCLEAR EMULSIONS ON PROJECT GEMINI. I. EXPERIMENTAL DESIGN AND EVALUATION PROCEDURES: PARTIAL RESULTS ON MISSIONS 4 AND 5. BuMed. Proj. MFO 22.03.02 5001.33, NAMI Rep. 955, Feb. 1966, 12pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla. (AD 631989)

On Gemini 4 and 5, small packs of nuclear emulsions combined with other radiation sensors to flat pliable units were worn by the astronauts inside their space suits. Track and grain counting of 200 micra Ilford G.5 and K.2 emulsion pairs in the packs furnished the particle and energy spectrum of the radiation incident upon the astroanut's body. Evaluation of flux and energy spectrum in terms of millirad dose showed that the bulk of the exposure was due to trapped protons picked up in the South Atlantic Anomaly. The energy spectrum of the proton flux within the ship on the body of the astronaut is a continuum extending from zero to about 300 Mev, with a broad, well-developed maximum in the 30 to 40 Mev region. Because of the large fractional flux of low energy particles, the radiation level sensitively depends on local shield geometry producing variations of dose rate at different locations in the capsule of at least 60%. Representative total doses were 48 millirads on Gemini 4 and 105 millirads on Gemini 5.
R 8

28,446
Celentano, J.T., Amorelli, D. & Freeman, G.G. ESTABLISHING A HABITABILITY INDEX FOR SPACE STATIONS AND PLANETARY BASES. Report from: "Manned Space Laboratory Conference, Statler-Hilton Hotel, Los Angeles, California, May 2, 1963." NAA S&ID F023, Publ. 543 U, May 1963, 47pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457791)

Satisfaction of the physiological needs are the prime requisites for assuring man's performance in a short-duration mission. Many authorities feel that longer-duration missions will require essentially only an increase in requirements proportional to the length of the mission, based upon short term figures. The authors contend, on the other hand, that long-duration stays in space may require much more elaborate provisions for assuring the upkeep of morale and performance. This paper establishes the essential habitability needs that allow man to perform for long periods of time. An evaluation of studies concerning habitability requirements is made. The important periods of habitability are discussed, and an habitability index will be established. An hypothetical mission is used as an example, showing the length of stay as a function of payload weights, and habitability features through the use of an habitability index.
R 17

28,447
Amorelli, D., Celentano, J.T. & Peters, B.G. ENGINEERING TECHNIQUES FOR SPACE CABIN DESIGN. Report from: "Fifth National Symposium on Human Factors in Electronics, San Diego, California, May 5-6, 1964." NAA S&ID F2829, Publ. 546 T, May 1964, 14pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif. (AD 457784)

Space cabin simulation techniques provide significant contributions to the initial phases of manned space system design and development. Among these contributions is the establishment of a habitability index determined by extended confinement of human occupants within mock-ups of proposed cabin designs. The studies emphasize testing of the cabins with respect to configuration, arrangement, and other features essential to the well-being and effectiveness of the crew. Several simulation studies are described, and the resultant impli cations for engineering design and space research are discussed.
R 13

28,448
Weston, H.C. SIGHT LIGHT AND WORK. 1962, 283pp. H.K. Lewis & Co., Ltd., London, England. (Medical Research Council, London, England).

This is the second edition of a book concerned with the visual aspects of occupational efficiency. Visual fatigue, natural and artificial lighting in workrooms, environmental color, and the testing and protection of sight are among the topics covered.
R scattered

28,449
National Aeronautics and Space Administration. ASTRONAUTICS AND AERONAUTICS, 1965. CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY. NASA SP 4006, 1966, 681pp. National Aeronautics & Space Administration, Washington, D.C.

The U.S. space events in this chronology include: Mariner IV photographs of Mars, Ranger IX televised moon approach, the orbitting of the Canadian and French vehicles, the 5 flights of 10 Gemini astronauts which included the space walk, orbital rendezvous, and a 14-day mission, several milestones in the Apollo program, Tiros IX and X weather satellites, and Early Bird I and Syncom III communication satellites.
R 10 (HEIAS)

28,450
Choate, R. LUNAR SLOPE ANGLES AND SURFACE ROUGHNESS FROM RANGER PHOTOGRAPHS. Contract NAS 7 100, Tech. Rep. 32 994, ca. 1966, 22pp. National Aeronautics & Space Administration, Washington, D.C. (Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.). (Reprint from: "Proceedings of the Fourth Symposium on Remote Sensing of Environment, University of Michigan, June 1966," 411-432).

Many published estimates of large slope angles of lunar craters, ranging from 25 to 40 deg., in late P-frame Ranger 7 and 8 pictures are in error because they were based in part on interpretation of the dark areas in the craters in photographic prints as shadows. Shadows do not exist in late-frame Ranger 7 and 8 pictures and are barely present in most late P-frame Ranger 9 pictures. Sun angles for Rangers 7 and 8 were 23 and 15 deg.; thus, slopes facing away from the sun and greater than these values cannot be present in the late P-frames. The angle of repose of lunar material, as measures from maximum slope angle of talus-like slopes, is probably 33 to 35 deg. Slope angle, local relief, and surface roughness measurements indicate that, though the impact area of Ranger 8 is somewhat smoother than that of Rangers 7 and 9, topography in all 3 impact areas probably developed from the same geomorphic processes and is at or near equilibrium.

28,451
Sgro, J.A. & Dougherty, D.J. CONTACT ANALOG SIMULATOR EVALUATIONS: HOVERING AND AIR TAXI MANEUVERS. Contract NONR 1670(00), JANAIR Tech. Rep. D228 421 016, July 1963, 109pp. Bell Aerospace Corporation, Fort Worth, Tex. (AD 424485)

This study represents the second in a series of evaluations of the JANAIR vertical display. 4 basic configurations (basic grid plane, basic grid plane with ground position indicator, basic grid plane with pathway, basic grid plane with pathway plus tarstrips) which could be incorporated into a vertical display are evaluated. 4 Ss were required to perform 3 basic flight maneuvers in the Bell Helicopter Company dynamic simulator. These maneuvers were presented at various assigned flight conditions for all display configurations. The 3 maneuvers were: a) hovering; b) takeoff, hover and touchdown; and c) takeoff, air taxi and touchdown. Analysis of the findings indicates that: a) the configuration of basic grid plane with pathway, and of basic grid plane with pathway plus tarstrips, were most effective for the hovering maneuvers and also for the takeoff, air taxi and touchdown maneuvers; b) for the takeoff, hover, and touchdown maneuver, the displays differed with respect to the various responses being recorded. The configuration of the basic grid plane produced the best performance for vertical velocity for the touchdown maneuvers, while the configuration of the basic grid plane plus ground position indicator provided the best information for touchdown position.
R 8

28,452
Ministry of Aviation. BIBLIOGRAPHY ON SERVOMECHANISMS. BULLETIN OF AUTOMATIC AND MANUAL CONTROL ABSTRACTS. TIL/BIB/52/33, Dec. 1963, 23pp. Technical Information & Library Services, Ministry of Aviation, Essex, England. (AD 426371)

This document is one of a monthly series which gives the accession number, citation and abstract of the literature classified under the following subheadings: control systems and applications (flight control, power control and process control), theory fundamentals, components, testing models, instruments associated with servosystems and new books.
R 67 (HEIAS)

28,453
Ministry of Aviation. BIBLIOGRAPHIES ON SERVOMECHANISMS. BULLETIN OF AUTOMATIC AND MANUAL CONTROL ABSTRACTS. SUBJECT AND AUTHOR INDEXES. TIL/BIB/52/22 33, Jan.-Dec. 1963, 30pp. Technical Information & Library Services, Ministry of Aviation, Essex, England.

This bibliography cumulates the subject and author indices for the 12 monthly publications. The subject index covers the following subject headings: control systems and applications (flight control, power control, process control, transport control, unspecified systems), theory fundamentals, components, model testing, and instruments associated with servomechanisms. Accession numbers in the system are given, and it is necessary to refer to the monthly reports to obtain the citation and the abstract.
R 844

28,454
Mavriplis, F., Little, G., Roberge, A., Nishizaki, R., et al. INVESTIGATION OF INDEPENDENT STRUCTURE (SPACE) CREW ESCAPE CONCEPTS. Contract AF 33(615) 1842, Proj. 1362, Task 136203, AFFDL TR 65 226, March 1966, 211pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Canadair Limited, Montreal, Quebec, Canada). (AD 482176)

This report presents the results of a study concerned with the investigation of independent structure crew escape concepts for multicrew earth orbital vehicles. The study is based on a 3-man reentry vehicle with horizontal landing capability and a mission of 28 days duration in a 200 nautical mile altitude orbit. A preliminary design analysis including a reentry flight simulation and a review of structural concepts and materials, was conducted to establish the important parameters affecting reentry configuration and subsystems design. The constraints imposed by the integration of the crew, escape module and spacecraft were then considered in the synthesis of the systems resulting in 11 lifting type reentry module concepts. These were classified into: a) rigid modules installed in the escape configuration and providing escape capability in all phases of the mission; b) expandable structure modules providing escape capability for the orbital phase only; and c) rigid capsule and expandable reentry structure modules. For space stations with a crew of 5 to 20 men, an expandable disk multicrew module appears to have many advantages and was the best independent structure escape concept considered.
R 90

28,455
Kama, W.N. HUMAN FACTORS IN REMOTE HANDLING: A REVIEW OF PAST AND CURRENT RESEARCH AT THE AEROSPACE MEDICAL RESEARCH LABORATORIES. Projs. 7184 & 8171, Tasks 718407 & 817105, AMRL TR 64 122, July 1964, 10pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (AD 610732)

This report discusses and summarizes the human factors research that has been accomplished both in-house and contracted, by the Maintenance Design Branch in the area of remote handling since 1959. Discussion of this research program is made in terms of the various factors that affect remote handling operations--task variables, equipment variables, operator variables, sensory/perceptual problems, and controls. Identification of future research areas is made.
R 12

28,456
Komarov, V., Feoktistov, K. & Yegorov, B. OVER THE PLANET EARTH. FTD TT 64 1325/1, TT 65 62257, April 1965, 19pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Pravda Nov. 1964, 4pp.). (AD 615257)

This is a general commentary of the Vaskhod flight by the 3 cosmonauts involved. (HEIAS)

28,458
Thrasher, J.R., et al. APOLLO EXTENSION SYSTEM (AES) EXTRAVEHICULAR EXPERIMENT DEFINITIONS. FINAL REPORT. Contract B90118 362460, Rep. 00.672, Aug. 1965, 216pp. LTV Astronautics Div. Ling-Temco-Vought Corp., Dallas, Tex. (AD 477139)

This study resulted in the definition of sub-experiments, the necessary equipment and the corresponding weight, power and volume requirements for the following 5 AES experiment categories: development of manned locomotion and maneuvering capability; emergency techniques, equipment and procedures for rescue operations; development of personnel and cargo transfer operations; maintenance and repair techniques; and extravehicular assembly operations. A brief description of the salient features of each experiment is tabulated. More detailed information concerning the respective experiments is also presented.
R 36

28,459
Parin, V.V., Volynkin, Yu.M. & Vasailyev, P.V. MANNED SPACE FLIGHT. Report from: "COSPAR Symposium, Florence, Italy, May 1964." AMD TR 64 7, May 1964, 31pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (USSR Academy of Sciences, Moscow, Russia). (AD 450333)

Physiologic comparisons are made for Russian and American astronauts through June 1963. Russian research objectives and the means of achieving them through design and preparation for the space flights. (see also 28,228)

28,460
Lippert, S. A BIBLIOGRAPHY OF AIRCRAFT SEATING. Rep. SM 13425, Dec. 1948, 52pp. Douglas Aircraft Company, Inc., Santa Monica, Calif.

This report is a collection of references on seating from many sources, arranged in a manner related to aircraft design problems circa the 1940's. The design categorization was stretched to include problems related to seating, for example physiological responses to blast and tumbling in an ejection seat. The major headings are: a)Preliminary Considerations; b) body measurements; c) positioning of occupant in seat; d) dynamic problems in seating; e) safety considerations; f) fatigue, efficiency; g) seat design; and h) literature.
R 443

28,461
Fischl, M.A., Siegel, A.I. & MacPherson, D.H. STUDIES INTO INFORMATION PRESENTATION THROUGH NOVEL METHODS. III. TWO-WAY INFORMATION TRANSFER THROUGH ELECTROCUTANEOUS TRANSDUCTION. PHASE 10 REPORT. Contract DA 28 043 AMC 00186(E), Proj. ICO 24701 A 121, Task .03, Subtask .03, Rep. ECOM 00186 10, July 1966, 33pp. USA Electronics Command, Fort Monmouth, N.J. (Applied Psychological Services, Wayne, Penn.).

This study, the eleventh in a program of research into information transfer through electrocutaneous methods, investigated 2-way information transfer through electrocutaneous techniques. After brief training in reception and transmission of a simple vocabulary through electrocutaneous means and after orientation to the electrocutaneous transduction equipment, 3 2-man teams employed the vocabulary and the equipment to communicate with one another while jointly performing an experimental task. 2 levels of time stress and 3 levels of attention sharing were imposed. Communication performance was scored, as well as performance on a collateral visual monitoring task. The results indicated that: a) reasonably precise 2-way electrocutaneous information transfer had taken place; b) electrocutaneous communication performance was not degraded by the conditions of stress and attention-sharing; but c) collateral task performance was degraded by stress and possibly by attention-sharing. It was concluded that the feasibility of the cutaneous sensory channel for supporting 2-way information transfer in a limited vocabulary setting had been at least partially demonstrated. Some possible applications are discussed.
R 8

28,462
Siegel, A.I., Sentner, P.J., Deacon, N.E. & Lanterman, R. STUDIES INTO INFORMATION PRESENTATION THROUGH NOVEL METHODS: II. DESIGN FOR SOLDIER CARRIED ELECTROCUTANEOUS RECEPTION APPARATUS. PHASE 9 REPORT. Contract DA 28 043 AMC 00186(E), Proj. 1C0 24701 A 121, Task 03, Subtask 03, Rep. ECOM 00186 9, May 1966, 32pp. USA Electronics Command, Fort Monmouth, N.J. (Applied Psychological Services, Wayne, Penn.).

The electrical and the mechanical design of a preliminary portable, soldier carried electrocutaneous signal reception apparatus are described. Electrical and mechanical schematics are included and descriptions of the logic and rationale for choice of materials, circuits, components, and packaging included. It is held that the proposed design represents a reasonable first approximation of an apparatus which could be employed for initial investigation, under field conditions, of the utility of an electrocutaneous information reception system.
R 2

28,463
LaMoy, E.F. (Chm.). HISTORY OF GEMINI/TITAN LAUNCH VEHICLE-6 AT ETR. Contract AF 04(695) 669, Rep. TOR 669(A6126 10) 2, Dec. 1965, 248pp. USAF Space Systems Div., Los Angeles, Calif. (Eastern Test Range Office, Aerospace Corporation, Patrick AFB, Fla.). (AD 478114)

This report provides an account of activities pertaining to the checkout and launch of GT-6 and to the support equipment and facilities at the Eastern Test Range (ETR). Emphasis has been placed on the chronological sequence of checkout of the various systems and subsystems of GT-6. The structure of the Pilot Safety Program is given in Sec. I. Sec. II contains a glossary of the abbreviations used in this report. Sec. III summarizes the major milestones and the most significant system events occurring during the prelaunch period at the ETR; it also includes a description of the launch complex preparations and concludes with a discussion of the revisions, if any, to the launch schedule. Sec. IV consists of the detailed daily systems reports. Separate chronological logs are prepared for each of the following areas: Propulsion and PTPS (Propellant Transfer and Pressurization System); Mechanical; Electrical; Master Operations Control System (MOCS); Malfunction Detection System (MDS); Airborne Instrumentation and Telemetry; Landline Instrumentation and Weights; Flight Controls and Hydraulics; Airborne Guidance and GMCF (Guidance Monitor Control Facility) No. 1; and LVSS (Launch Vehicle Safety System); Mistram and Ordnance. Sec. V is an account of multiple systems testing requiring participation by all, or a majority, of the launch vehicle systems. A chronology of the launch countdown events is provided in Sec. VI. The serialized critical components (vehicle configuration) are listed in Sec. VII. Sec. VIII contains pertinent reference material. One lists the repositories for Pilot Safety Program supporting documentation too bulky to be included in this history. These documents are on file for easy access and consist of the minutes of the GLVWG (Gemini Launch Vehicle Working Group), Active Review Team, and Pilot Safety Working Team meetings, Interface Committee Reports, reports of modifications to the launch vehicle accomplished at the ETR, discrepancy reports (MARS (Martin Automatic Reporting System) Forms), and failure analysis data (GPIS (Gemini Problem Investigation Status) Forms). R II

28,464
USN Ordnance Laboratories. TARGET DETECTION AND RECOGNITION STUDY. FINAL REPORT. Contract N123 (62738) 29282A(X), CR 588 90, Sept. 1962, 50pp. USN Ordnance Labs., Corona, Calif. (Aerospace Communications & Controls Div., Radio Corporation of America, Burlington, Mass.). (AD 618198)

The experiment described herein has determined the quantitative effects on the ability to localize a terrain sector with respect to a reference photograph of a larger terrain area of: a) television line coverage of the given sectors; b) signal-to-noise ratios of the image; c) use of spot-wobble scanning; and d) level of complexity of "information density" of the actual terrain under consideration. The results have shown that the time to localize a sector is essentially constant when sectors of approximately 0.6 to 1.0 mile on a side are scanned by 1000- to 250-lines per frame. Performance was significantly poorer when the same sectors were scanned by only 125 lines. Video noise degrades performance systematically at all line coverages. Localization is performed least easily when the signal-to-ratio is 13 db, and improves consistently as the ratio increases from 15 to 19 to 27 db. Performance with images derived from a spot-wobble scan mode was not significantly different from performance with images derived from linear scanning. Terrain sector localization was faster and more accurate when the information density of the actual terrain was sparse rather than moderately or highly complex. No significant interactions were found among the experimental variables. It is concluded that the terrain localization task involved in navigational correction control can be performed as well with a 250-line television system at increased noise levels as with one giving more refined definition.
R 5

28,465
Trueblood, R.B. & Kezer, A. ADVANCED FLIGHT CONTROL SYSTEM CONCEPTS FOR VTOL AIRCRAFT. PHASE I. TECHNICAL REPORT. Contract DA 44 177 TC 757, Task 1D 121401A14224, TRECOM Tech. Rep. 64 50, R 428, Oct. 1964, 192pp. USA Transportation Research Command, Fort Eustis, Va. (Instrumentation Lab., Massachusetts Institute of Technology, Cambridge, Mass.).

The report describes the results from Phase I of a research program to develop practical control systems providing optimum control characteristics for VTOL aircraft under all conditions. Control system requirements are developed from an analysis of the VTOL flight control problem. Possible advanced system concepts are described and the evaluation of these concepts using a fixed base flight simulator is reported. The results indicate the desirability of controlling ground velocity during hovering and low speed flight, and aircraft attitude during cruise flight. The analytical design of a self-contained inertial velocity measuring system to provide the required indication of ground velocity is presented. The design of an experimental flight control system for a tandem rotor helicopter is described in detail and a flight test program to evaluate the control system concepts using the experimental equipment outlined.
R II

28,466
Frankenhaeuser, Marianne, Mellis, Inga & Fröberg, Jan. THE EFFECT OF ELECTRICAL STIMULATION ON SENSATION THRESHOLD. Rep. Number 207, April 1966, 6pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The effect on sensation threshold of an alternating current of different intensities applied to 2 fingers of one hand was studied in 15 Ss during 5 separate sessions. In each session stimulation corresponding to either 2, 4, 6, or 8 times the individual sensation threshold was applied intermittently during 3 15-min. periods spread over 90 min. Sensation thresholds were measured at the beginning of each session and twice during the intervals between successive stimulation periods. It was shown that repeated application of suprathreshold electrical stimulation produced a rise in sensation threshold, and that the magnitude of the change in threshold increased with increasing stimulus intensity.
R 5

28,467
Helson, H. SOME PROBLEMS IN MOTIVATION FROM THE POINT OF VIEW OF THE THEORY OF ADAPTATION LEVEL. Contract Nonr 3634(01), Tech. Rep. 40, May 1966, 95pp. Psychology Dept., Kansas State University, Manhattan, Kan. (AD 632854)

This discussion deals with the implications of adaptation-level (AL) theory to 5 areas that are of importance in the consideration of the concept of motivation: a) some implications of AL theory for motivation; b) 2 models of reinforcement; c) vigilant behavior; d)-perceptual organization and motivation; and e) motivational properties of cognitive states.
R 57 (HEIAS)

28,468
Senter, R.J., Abma, J.S., Johnson, K.A. & Morgan, R.L. AN EXPERIMENTAL COMPARISON OF AN INTRINSICALLY PROGRAMMED TEXT AND A NARRATIVE TEXT. FINAL REPORT. Contract AF 33(615) 1046, Proj. 1710, Task 171007, AMRL TR 65 227, March 1966, 30pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio. (University of Cincinnati, Cincinnati, Ohio).

This study compared 3 methods of instruction in binary and octal arithmetic, i.e., a) Norman Crowder's branched programed text, The Arithmetic of Computers, b) another version of this text modified so that Ss could not see the instructional material while answering "branching" questions, and c) a narrative text version presenting the same content material. The principal behavioral measure was relative performance on a pre- and posttraining criterion test. The results indicated that prohibiting visual contact with instructional material while answering questions significantly increased the number of erroneous alternatives selected by the Ss, but did not significantly alter the amount of learning manifested nor the time necessary to complete training. The programed instructional methods resulted in significantly greater improvement on the criterion test than was attained by using the narrative text. The time to complete instruction was significantly less with the narrative text version of the material. Although, in general, less informational content was imparted with the narrative text, the study time necessary per unit improvement was significantly less with that version. Records were kept of the number of "wrong answer" branches taken by the Ss receiving instruction via the branched programs. Only about 6% of the total possible "wrong" branches were actually taken. This suggests that branched programing may be wasteful by virtue of providing a quantity of material that is never studied.
R 7

28,469
Greenberger, M. A NEW METHODOLOGY FOR COMPUTER SIMULATION. Report from: "Conference on Computer Methods in the Analysis of Large-Scale Social Systems, Joint Center for Urban Studies, Massachusetts Institute of Technology & Harvard University, Cambridge, Mass., October 19-21, 1964." Contract Nonr 4102(01), MAC TR 13, Oct. 1964, 27pp. Massachusetts Institute of Technology, Cambridge, Mass. (AD 609288)

Computer simulation is a cooperative venture between researcher and information processor, but the processor's role customarily begins too late. The researcher can benefit substantially by bringing the computer up into the earlier, creative phases of the simulation process. An on-line computer system that makes this possibe is described.
R15

28,470
Rosenblatt, F. PRINCIPLES OF NEURODYNAMICS. PERCEPTRONS AND THE THEORY OF BRAIN MECHANISMS. 1962, 616pp. Spartan Books, Washington, D.C. (Cornell University, Ithaca, N.Y.).

This book presents the principles which have been established in connection with the "perceptron" which is a brain model. As a brain model, its utility is conceived to lie in the area of determining the physical conditions for the emergence of various psychological properties. The author feels that these principles may be applied, wherever they prove useful, by inventors of pattern recognition machines and artificial intelligence systems.
R 116 (HEIAS)

28,471
Bush, W.R. PERMISSIBLE LEVELS OF SURFACE CONTAMINATION. Chapter from: Lanzl, L.H., Pingel, J.H. & Rust, J.H. "Radiation Accidents and Emergencies in Medicine. Research and Industry." No date, 155-162. Charles C. Thomas - Publisher, Springfield, Ill. (Radiation & Industrial Safety Branch, Atomic Energy of Canada, Ltd., Chalk River, Ontario, Canada). (Reprint)

Surface contamination is undesirable because it gives rise to radiation hazards. Inhalation hazard is often the determining factor in setting contamination limits; however, external radiation could be a greater hazard under some circumstances. The relationship between contamination level and radiation hazard is not precise, because of wide variations in actual conditions. Permissible levels of contamination are based on many arbitrary assumptions. When assessing dangerous levels of contamination, permissible levels should be recalculated using the best information available for all parameters. Potentially dangerous areas should be identified with respect to the maximum degree of danger likely to be met in a contamination accident.
R 12

28,472
Horst, P. PSYCHOLOGICAL MEASUREMENT AND PREDICTION. 1966, 455pp. Wadsworth Publishing Company, Inc., Belmont, Calif. (Psychology Dept., University of Washington, Seattle, Wash.).

This text book covers use and interpretation of tests, test statistics, factor analysis, the concepts of reliability and validity, prediction, item analysis, and even such matters as age in relation to test performance.
R ca. 80

28,473
Christensen, J.M. INDIVIDUALS AND US. Hum. Factors, Feb. 1966, 8(1), 1-6. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Since behavior is a function of both heredity and environment, it is axiomatic that those who directly or indirectly structure the environment determine to some extent the behavior of the residents of that environment. Systems and design engineers are responsible for a very significant proportion of the artifactual elements of a modern society and probably have a much greater influence on human behavior than has been generally recognized. The members of the Human Factors Society have a special responsibility and a unique opportunity to see that equipment and systems are designed so as to take advantage of such qualities of man as creativity, flexibility, etc. Further, insofar as possible the human factors specialist should assure that the jobs and man-machine interactions created by specific designs not only take advantage of man's presence but also contribute positively to his personal development and fulfillment.
R 8

28,474
Colquhoun, W.P. TRAINING FOR VIGILANCE: A COMPARISON OF DIFFERENT TECHNIQUES. Hum. Factors, Feb. 1966, 8(1), 7-12. (Applied Psychology Research Unit, MRC, Cambridge, England).

In a 40-min. vigilance session, 72 Ss inspected a series of displays, each of which consisted of a row of 6 small disks, for the occasional presence of a disk 17% greater in area than the remainder. The possibility of improving the generally low levels of performance observed with this task by special training was studied by pre-exposing Ss to a session of similar length with either knowledge of results (KR), one of 3 kinds of cueing of signal occurrence, a mixed KR/cueing program, or no task information. No differential effect of the various training techniques was found, but both the efficiency with which signals were discriminated, and the degree of caution exercised in reporting their occurrence increased during the experiment. It is concluded that greater understanding of the factors affecting signal detectability and decision-criteria in vigilance tasks is required before an appropriate method of training can be devised.
R 9

28,475
Roscoe, S.N., Hasler, S.G. & Dougherty, Dora J. FLIGHT BY PERISCOPE: MAKING TAKEOFFS AND LANDINGS; THE INFLUENCE OF IMAGE MAGNIFICATION, PRACTICE, AND VARIOUS CONDITIONS OF FLIGHT. Hum. Factors, Feb. 1966, 8(1), 13-40. (Hughes Aircraft Company, Culver City, Calif.).

The proficiency with which pilots can make takeoffs and landings using a periscope as the only source of outside visibility was studied under various conditions of flight. A detailed determination was made of the effects of variations in image magnification upon landing accuracy. Speed of transition to flight by periscope was related to flight experience. Effects of various weather, runway surface, and ambient lighting conditions upon flight by periscope were investigated.
R 2

28,476
Allen, R.W. & Hershberger, M.L. TELESCOPE FIELD OF VIEW REQUIREMENTS FOR STAR RECOGNITION. Hum. Factors, Feb. 1966, 8(1), 41-47. (Aerospace Group, Hughes Aircraft Company, Culver City, Calif.).

An experimental study was conducted by Hughes Aircraft Company to determine telescope field of view requirements for human recognition of navigation stars. The study was conducted at the Griffith Park Planetarium in Los Angeles. Four Air Force navigators viewed the night sky projected on the planetarium dome through a simulated telescope. The Ss had control of telescope asimuth and elevation. The telescope had unity power fields of view ranging between 10° and 45°. The Ss were required to identify and acquire any one of the 35 major navigation stars. The results revealed a significant inverse relationship between field of view size and navigation star acquisition-identification time. Identification errors also varied inversely as a function of field of view size, and M acquisition-identification times were significantly different between Ss. The minimum field of view required for rapid, accurate star identification-acquisition was established to be between 25° and 30°.
R 8

28,477
Wortman, P.M. REPRESENTATION AND STRATEGY IN DIAGNOSTIC PROBLEM SOLVING. Hum. Factors, Feb. 1966, 8(1), 48-53. (Carnegie Institute of Technology, Pittsburgh, Penn.).

Four experiments investigating diagnostic problem solving by clinical neurologists were performed. From protocols or verbal reports of physicians diagnosing neurological diseases we have identified several elementary structures used in clinical decision-making and compared them to some precisely defined information-processing primitives. A separate experiment established the reliability of the protocol information. The use of a tree structure as a representational model of the diagnostic process was tested, but not confirmed. In another experiment we discussed the implications of the elementary structures for the diagnostician's search strategy and noted 2 more strategy characteristics. Some hypotheses for an alternative representation and strategy were offered and it was suggested that a computer program could be used as a final test of this model.
R 13

28,478
Rapoport, A. A STUDY OF A MULTISTAGE DECISION MAKING TASK WITH AN UNKNOWN DURATION. Hum. Factors, Feb. 1966, 8(1), 54-61. (University of North Carolina, Chapel Hill, N.C.).

Thirteen college students participated individually in a multistage decision making task. The task consisted of 8 different computer-controlled problems. The duration of each problem was not known to the decision maker. A dynamic programming model employing Bayesian notions was constructed for the adaptive decision making task, tested and confirmed. An alternative explanation is discussed briefly.
R 13

28,479
Bertone, C.M. A COMPARISON OF CZECHOSLOVAKIAN HUMAN ENGINEERING STANDARDS FOR CONTROL PUSHBUTTONS WITH UNITED STATES STANDARDS. Hum. Factors, Feb. 1966, 8(1), 62-70. (Bunker-Ramo Corporation, Canoga Park, Calif.).

This report presents a complete translation of the Czechoslovakian standard for control pushbuttons and compares it with similar standards as established in the United States. The comparison tends to show specific differences between the 2 countries' efforts to establish standards in this area. The Czechoslovak standards are rigid and specific while the U.S. standards are variable and left to interpretation of the individual.
R 1

28,480
Bare, Carole E. THE MEASUREMENT OF ATTITUDES TOWARD MAN-MACHINE SYSTEMS. Hum. Factors, Feb. 1966, 8(1), 71-79. (University of California, Los Angeles, Calif.).

To explore and increase the understanding of man-machine relationships, an instrument designed to assess attitudes toward machines was developed and tested in this study. The scaling techniques used in the instrument were based on the work of Charles Osgood with the Semantic Differential. One hundred Ss, consisting of professionals experienced with various machine systems, i.e., programmers, engineers, human factor and operations research scientists, were asked to describe the characteristics of 10 machines (Radio, Radar, Automobile, Man, Computer, Teletype, Bulldozer, Bicycle, Welding Torch, and Watch), by means of 42 adjectives. The results indicate that the developed instrument can be used effectively for the assessment of man-machine attitudes. The hypothesized attitudes toward control and power, toward machines as an extension of man's capabilities, and toward change did emerge; however, typical Osgood factor patterns were not obtained in most of the analyses. The steps for modification of the test instrument and validation of it against performance criteria were discussed.
R 1

28,481
Williams, L.G. TARGET CONSPICUITY AND VISUAL SEARCH. Hum. Factors, Feb. 1966, 8(1), 80-92. (Honeywell Incorporated, Minneapolis, Minn.).

A general measure of target conspicuity is proposed for predicting the level of search performance as a function of spatial and temporal variables. The probability of locating a target is shown to depend on 2 factors: target conspicuity, the rate at which the observer can scan the field, and information input rate, the rate at which the field is presented to the observer. Predictions of the effects of such factors as size, scale, rate of movement, and time available, are made for reconnaissance displays. Some experimental support is presented.
R 9

28,482
Wierwille, W.W. & Gagne, G.A. NONLINEAR AND TIME-VARYING DYNAMICAL MODELS OF HUMAN OPERATORS IN MANUAL CONTROL SYSTEMS. Hum. Factors, April 1966, 8(2), 97-120. (Aeronautical Lab., Cornell University, Buffalo, N.Y.).

This paper describes the application of a deterministic theory for characterizing or modeling the dynamics of a human operator in a manual control system. Linear time-varying, nonlinear time-varying, and non-linear constant-coefficient models are obtained by applying the theory to tracking data taken for 1- and 2-axis tasks with various displays. The accuracy and fidelity of these advanced models are explored in detail. Also, new information about time variability and nonlinearity of the human operator, obtained by studying the models and the manual control system signals, is presented.
R 5

28,483
Konz, S.A. & Day, R.A. DESIGN OF CONTROLS USING FORCE AS A CRITERION. Hum. Factors, April 1966, 8(2), 121-127. (Industrial Engineering Dept., Kansas State University, Manhattan, Kan.).

A force platform was used to study the effect of varying the height and handle orientation of a push-pull task. Each of the 10 Ss performed the task at knee, hip, waist, chest, and eye heights and at each of the heights the handle was oriented in 5 different positions. Even though the force required for the task itself did not vary, changing the height of the handle forced each S to exert a force to maintain his own body position. This force exerted by the S was minimized when the handle was at chest height. The only previous studies on optimum work heights have concerned work surface location. Since their usual recommendations are to place a work surface below rather than above the elbow, it seems additional experimentation is desirable.
R 20

28,484
Gordon, D.A. EXPERIMENTAL ISOLATION OF THE DRIVER'S VISUAL INPUT. Report from: "Road User Characteristics, 1966, Highway Research Record Number 122." 1966, 19-34. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Traffic Systems Research Div., Washington, D.C.). (Report from: "44th Annual Meeting, January 11-15, 1965.") (Hum. Factors, April 1966, 8(2), 129-137).

A technique for isolating the operator's visual input is presented. The method involves decreasing the visual field so that the essential information is obtained by the operator in separate visual fixations. A continuous film record is made to indicate the center of visual aim and the content of each fixation. Using this aperture device, visual positional data were obtained on 10 drivers on a 2-lane low traffic density road. The essential information was found to be the road edges and center lane marker. The manner in which this information was obtained differed from driver to driver. The film records refute the notion that the driver has a fixed point of forward reference, or that a common pattern of viewing is shared by all drivers. The hypothesis is presented that the persistent pattern of fixation movements forward to the limits of the road, and back again to the vehicle are explained by the contradictory requirements of perceptual anticipation and vehicular alignment with the road.
R 8

28,485
Hoffmann, E.R. NOTE ON DETECTION OF VEHICLE VELOCITY CHANGES. Hum. Factors, April 1966, 8(2), 139-141. (Mechanical Engineering Dept., University of Melbourne, Melbourne, Australia).

Simple expressions are derived for the time required by an observer in a moving vehicle to detect accelerations and decelerations of a leading vehicle. The expressions, which are derived by the use of dimensional analysis, are in agreement with the experimental result of Braunstein and Laughery. Latency time is shown to vary as the square root of separation distance and as the inverse square root of lead vehicle acceleration.
R 1

28,486
Swink, J.R. INTERSENSORY COMPARISONS OF REACTION TIME USING AN ELECTRO-PULSE TACTILE STIMULUS. Hum. Factors, April 1966, 8(2), 143-145. (Kansas State University, Manhattan, Kan.).

The literature on cutaneous communication suggests that a square wave electro-pulse may be a more effective tactile stimulus for cross modality comparisons of reaction times than more traditional stimuli. It was hypothesized that the electro-pulse would give faster reaction times than either light or sound, when presented independently or in simultaneous combinations with the other stimuli. Mean reaction times of 10 male Ss, analysis of variance and mean separation test all indicated that the electro-pulse resulted in faster reaction times and less variability of responses than the other stimuli in both single and combined presentations. The hypotheses were supported and an ordering of reaction times was statistically established as following from the hypotheses. Pooling of stimuli effectiveness was offered as an explanation for the rapid reaction times of combined stimuli.
R 7

28,487
Webster, R.B. DISTORTION, FILL AND NOISE EFFECTS ON PATTERN DISCRIMINATION. Hum. Factors, April 1966, 8(2), 147-155. (Bunker-Ramo Corporation, Canoga Park, Calif.).

This study was conducted in order to investigate the effects of distortion, fill and noise effects on pattern discrimination. Patterns were generated from a 10 x 10 matrix on a random basis and were comprised of black filled squares. There were 4 levels of pattern fill or complexity. Distortion was the random displacement of basic pattern elements while noise was the filling in of additionally selected (on a random basis) pattern elements. 144 male and female undergraduates served as the Ss. Patterns were projected automatically with a stimulus presentation time of 3.0-sec. and a constant intertrial interval of 5.0-sec. The method of constant stimuli was employed. The results indicated that the discrimination of patterns, as generated in this study, were significantly effected by fill, noise, and distortion at the 0.01 level. Interaction effects were significant also at the same level. Response times were also significantly affected as a function of fill and noise.
R 23

28,488
Kaufman, R.A., Corrigan, R.E. & Nunnelly, C.L. THE INSTRUCTIONAL SYSTEM APPROACH TO TRAINING. Hum. Factors, April 1966, 8(2), 157-162. (Douglas Aircraft Co., Inc., Long Beach, Calif.).

A generalized model for an Instructional System is offered, as well as a model for such a system for use in preparing training and training materials for the U.S. Air Force. The rationale for a systematic approach to training is presented along with a discussion of the relationship between an Instructional System and Programmed Instruction.
R 4

28,489
Nunnelly, C.L., Klemmer, A.G., Corrigan, R.E. & Kaufman, R.A. THE INSTRUCTIONAL SYSTEM APPROACH TO MAINTENANCE TECHNICAL TRAINING: DEVELOPMENT AND IMPLEMENTATION MODEL. Hum. Factors, April 1966, 8(2), 163-172. (Douglas Aircraft Co., Inc., Long Beach, Calif.).

An Instructional System model is presented for meeting Maintenance Technical Training requirements for complying with U.S. Air Force weapon system requirements. Methodology is also presented for determining training requirements and identifying appropriate methods/media combinations for meeting student terminal performance requirements.

28,490
Wallis, K.B., Ewart, W.L. & Kaufman, R.A. INSTRUCTIONAL SYSTEM APPROACH TO FLIGHT CREW TRAINING. Hum. Factors, April 1966, 8(2), 173-178. (Douglas Aircraft Co., Inc., Long Beach, Calif.).

This paper discusses the rationale for analysis and definition of flight crew training requirements. Using the Instructional System Approach, the concept of flight crew performance from a management aspect is presented together with methods for determining detailed flight crew training requirements.

28,491
Bowen, H.M., Andersen, B. & Promisel, D. STUDIES OF DIVERS' PERFORMANCE DURING THE SEALAB II PROJECT. FINAL REPORT. Contract NONR 4930(00), Rep. D&A SSD 66 296(571), March 1966, 47pp. USN Office of Naval Research, Washington, D.C. (Dunlap & Associates, Darien, Conn.). (Hum. Factors, June 1966, 8(3), 183-199).

Field studies of the 3 10-men teams of divers participating in the SEALAB II project were undertaken. During each team's 15 day submergence at 205 ft, psychomotor tests and a vision test were conducted in the water, and a mental arithmetic test in the habitat. Compared to base line performance (dry-land and shallow water conditions), performance on the mental arithmetic test showed no deterioration while performance on the psychomotor tests showed considerable deterioration. Many divers found that their in-water activities proceeded slowly; among other causes of a more physical nature, concern for one's safety may detract from the amount of attention one gives to the task at hand. The most active divers in the SEALAB group were those who indicated that they were least fearful and least aroused by the conditions and who were helpful, gregarious, and made least telephone contact with the outside world.
R 11

28,492
Robinson, G.H., Davis, L.E. & Johnson, G.C. THE PHYSICIAN AS AN ESTIMATOR OF HOSPITAL STAY. Hum. Factors, June 1966, 8(3), 201-208. (Industrial Engineering Dept., University of California, Berkeley, Calif.).

The abilities of physicians to estimate the length of stay of their hospital patients was investigated. 2 estimates were made; one at admission request and another after a prescribed number of days of hospitalization. Data are presented as correlation coefficients between actual and estimated lengths of stay and as conditional frequency functions of actual length of stay given an estimated length of stay. Differences between physicians in surgical and medical service are shown. It is concluded that physicians' estimates may be a useful source of data for operating an elective patient scheduling system.
R 6

28,493
Knowles, W.B. & Sheridan, T.B. THE "FEEL" OF ROTARY CONTROLS: FRICTION AND INERTIA. Hum. Factors, June 1966, 8(3), 209-215. (Hughes Aircraft Company, Culver City, Calif. & Massachusetts Institute of Technology, Cambridge, Mass.).

The purpose of this study was to determine the influence of friction and inertia levels on the "feel" of rotary controls. Detection thresholds for changes in friction and inertia were determined and found to be about 10 to 20% of the initial values. Preference ratings obtained for various combinations of friction and inertia increased as a function of inertia level and decreased as a function of friction level. Preferences for viscous friction were greater than for stick-slip friction. Psychophysical evaluations such as these are related to customer acceptance factors and provide a useful supplement to purely functional design criteria.
R 9

28,494
McGrath, J.E. & Altman, I. SMALL GROUPS RESEARCH: A SYNTHESIS AND CRITIQUE OF THE FIELD. 1966, 601pp. Holt, Rinehart & Winston, Inc., New York, N.Y. (University of Illinois, Urbana, Ill. & USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

Part 1 of this book is the case history of the small group research program. Part 2 is a presentation of some perspectives on the small group field. It contains a discussion of substantive generalizations that seem to be of importance in the body of the material compiled, a discussion of methodological problems and possibilities, and a discussion of the socio-cultural setting of the small group research field. Part 3 contains compilations of reference materials generated in the program. 250 studies are annotated from a comprehensive bibliography of approximately 2,000 titles.
R about 2.000

28,495
Baker, J.D. & Goldstein, I. BATCH VS. SEQUENTIAL DISPLAYS: EFFECTS ON HUMAN PROBLEM SOLVING. Hum. Factors, June 1966, 8(3), 225-235. (USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.).

This study was concerned with problem solving under 2 display conditions. In one condition ("Sequential"), only those response alternatives permissable at any given time were displayed at that time. Under the other condition ("Batch"), all response alternatives, permissable at the moment or not, were presented at all times. Significantly greater time was found to be required to learn solutions using the "Batch" display. This requirement was attributed to the significantly greater display search-time which was found to be required in that condition. No significant difference in number of trials to reach the criterion of learning solutions was found, indicating that the additional material displayed in the "Batch" condition carries no significant amount of useful information. It is concluded that displaying data which has only potential relevance is not only ineffective but actually degrades performance.
R 11

28,496
Williams, C.M. HORIZONTAL VERSUS VERTICAL DISPLAY OF NUMBERS. Hum. Factors, June 1966, 8 (3), 237-238. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

A task was constructed to compare performance on a horizontal to that of a vertical array of 3-digit numbers. 16 Ss were required to scan arrays of pairs of numbers and mark the pairs that contained nonidentical members. The average time required to complete the vertical array was 73 sec. and 44 sec. for the horizontal. The finding that an average of 66% more time was spent on the vertical than on the horizontal array is significant at the .005 level.
R 1

28,497
Moss, S.M. SIMPLE REACTION TIME AND RESPONSE SETS. Hum. Factors, June 1966, 8(3), 239-243. (University of Massachusetts, Amherst, Mass.).

This study was concerned with the effects of induced response inhibition on simple visual reaction time. 10 Ss were confronted with up to 4 response alternatives (fingers of the right hand), one of which was the required response. Each of these responses was associated with a specific stimulus. 3 response ensemble conditions were used: a) within a block of trials only 1 light appeared; b) within a block of trials 1 of 2 possible lights appeared; c) within a block of trials 1 of the 4 possible lights appeared. Under all conditions Ss were given more than adequate time to extract the appropriate response from the remaining responses in the ensemble prior to the time that they were required to make the response. A significant interaction was found between the individual responses and response ensembles. These results were explained in terms of the contextual effects of the unused responses within the different ensemble conditions. Additional data indicated that these effects reflect a spatial relationship to responses being measured. Unused responses that are more proximal to the measured response depress the reactions to that response as compared to unused responses that are more distant.
R 6

28,498
Dreyfuss, H. PEOPLE COME IN ASSORTED SIZES. Hum. Factors, Aug. 1966, 8(4), 273-277. (N.Y. & Pasadena, Calif.).

Industrial designers are very concerned with the physiological and psychological comfort of all people associated with a product. This applies equally to the people who make it, the people who sell it, the people who use it and the people who service it. For these people the product is designed to be safer, easier to use, more economical and, as a result, better to look at. These elements are not merely added at the end, but are integrated throughout the entire design process, as reflected in the designer's approach to the problem.

28,499
Bishop, E.W. & Guiness, G.V., Jr. HUMAN FACTORS INTERACTION WITH INDUSTRIAL DESIGN. Hum. Factors, Aug. 1966, 8(4), 279-289. (System Sciences Div., Dunlap & Associates, Inc., Darien, Conn.).

A working relationship between the fields of Human Factors and Industrial Design is postulated. It is described as a symbiotic relationship evolving out of the common objectives and unique methodologies of each discipline, and determined by the characteristics of the design problem that requires their collaboration. In working toward the solution of a specific problem, the disciplines exchange leadership roles as the contributions of each field selectively predominate during various stages of the development of a solution. 3 examples are discussed in which human factors specialists and industrial designers collaborated to develop design solutions. In the first, a handheld weapon was designed in accordance with the findings of a human factors analysis. These findings established requirements for the industrial designer. In the second example, a system of console and workplace modules was designed by the simultaneous application of human factors and industrial design. In the third, the functional feasibility of a concept for a small field compass was established by the human factors specialist, and the structural feasibility was established by the industrial designer.
R 5

28,500
Harkins, W.H. THE KB SYSTEM: A MODULAR CONTROL PANEL CONCEPT. Hum. Factors, Aug. 1966, 8 (4), 291-298. (Honeywell Incorporated, Minneapolis, Minn.).

This report describes the design and development of an integrated system of manually operable switch modules and related keyboard and control panel components called the KB System. The size of the basic module was based on the standard center-to-center spacing of keys in a conventional keyboard. The system of components and mounting structure based on this module can be assembled in an unlimited number of arrangements to satisfy widely varying man-machine system control and display requirements.

28,501
Propst, R.L. THE ACTION OFFICE. Hum. Factors, Aug. 1966, 8(4), 299-306. (Research Div., Herman Miller Incorporated, Ann Arbor, Mich.).

Several years of self-directed work experience in his own office resulted in the development and application by the author of a new approach to the design and arrangement of office equipment, and a resulting increase in alertness, productivity, and fluency in his work. These outcomes led to an association with Herman Miller, Inc. in 1960 to conduct research to obtain more definitive and conclusive information on how office elements influence the office worker, and how these elements may be redesigned to improve health and productivity. This effort involved 4 major aspects-actual experience with prototype offices and equipment, obtaining information from pertinent disciplines, studying office patterns of exceptional performers, and testing and evaluation of office environments. The study results indicated that most prevailing offices and furnishing systems are substantially too restrictive and inflexible, and tend to ignore and stifle prime human capabilities. However, there are indications of an awakening to the importance of new office facility concepts in meeting the growing needs of day-by-day change and modifications of environmental effect.
R 6

28,502
Short, D. & Stovell, R.J. PACKAGING FOR PEOPLE. Hum. Factors, Aug. 1966, 8(4), 307-315. (Walter Landor & Associates, San Francisco, Calif.).

The case histories presented in this paper illustrate the various marketing, technological and human factors requirements which influence the design of a relatively simple everyday artifact, the consumer package. During the past 20 years, package design has grown from modest beginnings to become one of the major areas of industrial design activity. Concerned with the protection, distribution, sales and use of products, the designer of the package must accommodate a number of different human interfaces, placing strong emphasis on the satisfaction of emotional as well as physical needs. Some packaging requirements are amenable to rational design solutions and the application of established human engineering criteria, but despite the growing use of a variety of research techniques, packaging relies, more than most other areas of industrial design, on limited empirical findings and the designer's intuitive interpretation of requirements.

28,503
Stevens, P.H., Chase, D.O. & Brownlie, A.W. INDUSTRIAL DESIGN OF A NARROW AISLE SIT-DOWN LIFT TRUCK. Hum. Factors, Aug. 1966, 8(4), 317-325. (Stevens-Chase Design Associates, Camillus & Skaneateles, N.Y.).

This report describes the industrial design and human engineering of a sit-down lift truck for narrow aisle warehouse materials handling applications. The objective of the design program was to develop a truck which would be a) safe, efficient and comfortable to operate; b) aesthetically appealing; c) economical to manufacture and use; and d) easy to maintain and service. A working mockup was constructed to demonstrate the feasibility of the engineering approach, and to validate human engineering, maintainability and safety provisions. Field use under varying conditions has confirmed that the concept of a seated position for the operator of a narrow aisle lift truck was a sound solution for reducing fatigue with no sacrifice in operator effectiveness.

28,504
Carr, R., Ashford, F.C. & Easterby, R.S. DESIGN OF A LATHE FOR INTERNATIONAL MARKETS. Hum. Factors, Aug. 1966, 8(4), 327-337. (Council of Industrial Design, London, England).

The need to export, and the high-quantity production capabilities of a new precision assembly line, stimulated the development of a new line of center lathes for world markets. A survey of international requirements established basic performance capabilities and features. The industrial designer, in conjunction with the manufacturer's engineering organization, developed an appearance design concept that was adaptable to machines of varying sizes and proportions, that was compatible with the unique manufacturing facilities, and that conveyed a strong, recognizable company style. The human factors specialist collaborated with the industrial designer in the design of the operator's workplace, controls and displays, and through a systematic analysis of operator tasks, devised a new, more effective display for translating machine instructions specified on an engineering drawing into control settings on the lathe. Results of the industrial design and ergonomic analyses are illustrated and discussed.

28,505
Sundberg, C.W. & Ferar, M. DESIGN OF RAPID TRANSIT EQUIPMENT FOR THE SAN FRANCISCO BAY AREA RAPID TRANSIT SYSTEM. Hum. Factors, Aug. 1966, 8(4), 339-346. (Sundberg-Ferar Incorporated, Southfield, Mich.).

Automobile traffic is threatening to overwhelm the cities of the San Francisco Bay Area, and an advanced mass transit system is being built by the Bay Area Rapid Transit District (BARTD) to help alleviate this problem. This article describes the design and development of the passenger vehicle for this system. BARTD system requirements and car design criteria are discussed, and the conceptual design and detailed development of passenger accommodations, environmental control provisions, lighting, ingress/egress, visibility and appearance design features are presented. The requirements for and the detailed design of the train attendant's pod are also discussed. A prototype car has been designed with primary emphasis on those human factors considerations that are expected to induce 200,000 commuters to use the system in preference to private automobiles. Public reactions to the prototype vehicle will be employed to refine and improve upon the design prior to its introduction into service in 1971.

28,506
Seminara, J.L. & Gerrie, J.K. EFFECTIVE MOCKUP UTILIZATION BY THE INDUSTRIAL DESIGN-HUMAN FACTORS TEAM. Hum. Factors, Aug. 1966, 8(4), 347-359. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

Mockup technology, the transformation of 2-dimensional design drawings into 3-dimensional representations of hardware concepts, is a well established design tool within the engineering community. When employed or controlled by the industrial design-human factors support team, mockup development is an extremely effective means for influencing equipment design so that the needs of the eventual user are served. A number of difficulties that confront the industrial designer within the aerospace industry setting are discussed. One method of entering into the advanced system development process is through the assumption of responsibility for mockup design, development, construction and evaluation. In the course of mockup development, excellent opportunities are available for introducing human factors and industrial design principles into preliminary and detailed design of advanced manned systems. The diverse purposes served by mockups are discussed, and representative case histories illustrating the application of various mockup techniques in aerospace systems are presented.
R 1

28,507
Crist, J.W. EDUCATING INDUSTRIAL DESIGNERS. Hum. Factors, Aug. 1966, 8(4), 361-370. (San Jose State College, San Jose, Calif.).

This paper discusses the status, objectives and procedures of contemporary industrial design education. It points out that professional designers are searching for meaningful and valid guidelines for the relatively new profession, and that current attitudes and practices in design education reflect this search. The major historical movements contributing to current industrial design training are reviewed briefly. The early marriage of industrial design and the visual arts is noted, as is the increasing interdisciplinary nature of industrial design education exemplified by its extension into many new but related fields such as human factors engineering. General descriptions of typical and atypical contemporary academic programs in industrial design education are presented. Reference is made to the important contribution of the professional association of industrial designers in support of design education, the Industrial Designers Society of America.
R 3

28,508
Bond, N.A., Jr. & Rigney, J.W. BAYESIAN ASPECTS OF TROUBLE SHOOTING BEHAVIOR. Hum. Factors, Oct. 1966, 8(5), 377-383. (Sacramento State College, Sacramento, Calif. & Electronics Personnel Research Group, University of Southern California, Los Angeles, Calif.).

39 Navy technician trainees filled out a symptom-malfunction matrix on a blocking oscillator circuit. The technicians then attempted to solve 6 troubleshooting problems in the same oscillator circuit. The particular sequence of checks used by each man on each problem was combined with his symptom-malfunction matrix, via a Bayesian algorithm, to yield computer estimates of failure likelihoods for each component. The computer program predicted actual parts-replacement behaviors in about half of the cases. Those technicians who start out with valid symptom-malfunction matrices are more likely to resemble the Bayesian processor.
R 3

28,509
Trumbull, R. DIURNAL CYCLES AND WORK-REST SCHEDULING IN UNUSUAL ENVIRONMENTS. Hum. Factors, Oct. 1966, 8(5), 385-398. (USN Office of Naval Research, Department of the Navy, Washington, D.C.).

The extension of man's working environment and its control have lead to a new consideration of his "normal" neuro-physiological and psychologcial rhythms. There are some 50 such patterns of fluctuating functions within man which have various degrees of influence upon his level of performance and ability to maintain performance. Data are provided from physiological and psychological research in an attempt to provide perspective for selection of appropriate personnel and establishment of work/rest or duty cycles in deference to these influences.
R 86

28,510
Weis, E.B., Jr. & Primiano, F.P., Jr. THE MOTION OF THE HUMAN CENTER OF MASS AND ITS RELATIONSHIP TO MECHANICAL IMPEDANCE. Hum. Factors, Oct. 1966, 8(5), 399-405. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio & Technology Incorporated, Dayton, Ohio).

This report concerns the development of a relationship between the human mechanical impedance and the coupling of the human center of mass to the environment. The mechanical impedance is a common analysis tool in biomechanics while the analysis of the coupling of the center of mass to the environment is technically more difficult, if not impossible. The development is based on linear, passive, isotropic theory and shows that the transfer function which expresses the relation between the motion of the center of mass and the motion of the source is similar to a linear second order mechanical system in each of the translational spatial degrees of freedom.
R 6

28,511
Vicino, F.L., Andrews, R.S. & Ringel, S. TYPE, EXTENT AND CODING OF UPDATED SYMBOLIC INFORMATION. Hum. Factors, Oct. 1966, 8(5), 407-416. (USA Personnel Research Office, OCRD, Washington, D.C.).

This study concerned how information extraction and assimilation from dynamic visual displays are affected by 3 amounts of information presented (12, 18, or 24 units), 3 types of updating changes ("Adding", "Moving", or "Removing" units), 3 extents of changes (2, 4, or 6 units), and 3 ways of indicating updates (double-cue coding, single-cue coding and history hard copy.). Ss were presented successive pairs of slides with the second slide containing the updates. Speed and accuracy of extracting and assimilating the updated information were recorded. It was found that: a) Double-cue improved extraction 97%; assimilation 57%, b) Single-cue coding improved extraction 68%, assimilation 47%, c) Hard copy history did not aid extraction; improved assimilation only slightly, d) Increasing the amount of information and extent of change degraded extraction and assimilation, e) For assimilation, double-cue coding nullified the degrading effects of increasing amount of information, f) In both tasks, the "Removed" condition was easiest, "Added" next, and the "Moved" condition most difficult. Results indicate that major performance improvement can be achieved through coding without use of relatively costly color techniques.
R 3

28,512
Nicholson, R.M. THE FEASIBILITY OF A HELMET-MOUNTED SIGHT AS A CONTROL DEVICE. Hum. Factors, Oct. 1966, 8(5), 417-425. (Systems & Research Div., Honeywell, Incorporated, Minneapolis, Minn.).

The purpose of this research was to investigate the practicality of a helmet-mounted sight as an operational element in a quick-reaction bore-sighting system. A 3-phase experimental program was conducted to determine the human capabilities with the helmet-mounted sight. In a laboratory environment sighting accuracies were obtained on both static and moving targets. Field test data were obtained during high-speed, low-altitude flights. The series of tests indicated that the accuracy of the sighting process can be expected to vary between a fraction of a degree and 4° depending on target angular rate and the target sighting angle.

28,513
Smith, R.L., Garfinkle, D.R., Groth, Hilde & Lyman, J. EFFECTS OF DISPLAY MAGNIFICATION, PROPRIOCEPTIVE CUES, CONTROL DYNAMICS AND TRAJECTORY CHARACTERISTICS ON COMPENSATORY TRACKING PERFORMANCE. Hum. Factors, Oct. 1966, 8(5), 427-434. (University of California, Los Angeles, Calif.).

An experiment was performed on the NOTS-UCLA heavy inertia tracking simulator to assess effects of display magnification, proprioceptive cues, displacement aiding, trajectory characteristics and trajectory direction on tracking performance. Particular attention was paid to interactions among these variables. The results showed that: a) 5x magnification significantly decreased tracking error compared to tracking without magnification; b) proprioceptive cues related to both azimuth and elevation significantly improved performance; c) velocity plus displacement-aiding control dynamics (time constant = 0.1 sec) produced significantly lower error scores than unaided velocity control dynamics (time constant = 0.0 sec); d) since no crossover tendencies were found, the effects of the variables appear to be independent.
R 17

28,514
Caulfield, H.J. APPARENT SIZE AND HUE VARIATIONS OF A LASER LIGHT SPOT. Hum. Factors, Oct. 1966, 8(5), 435-440. (Texas Instruments Incorporated, Dallas, Tex.).

Both the apparent size and the apparent hue of a single spot of 6328 Å laser light vary with varying conditions, and with the particular observer. The apparent radius of a spot can vary from 0 to several times the objectively-determined radius as the background lighting conditions are changed. The general features of this variation are predictable theoretically. The apparent hue of the center of a laser spot can shift as much as 340 Å. Previous theory for the hue shift is shown to be inadequate, but no fully adequate theory is suggested.
R 9

28,515
Torf, A.S. & Duckstein, L. A METHODOLOGY FOR THE DETERMINATION OF DRIVER PERCEPTUAL LATENCY IN CAR FOLLOWING. Hum. Factors, Oct. 1966, 8(5), 441-447. (Systems Engineering Dept., University of Arizona, Tucson, Ariz.).

An experiment was conducted to determine the feasibility of the use of motion picture test'ng in lieu of road testing for experiments concerning visual perceptual latency in car following. A second purpose was the determination of perceptual latencies for accelerations and decelerations at fixed speed and gap. The results show that motion picture testing is statistically acceptable. Details on instrumentation and test procedures are given and a discussion given on the findings that for the test conditions, acceleration detection time is lower than for deceleration.
R 6

28,516
Ferrell, W.R. DELAYED FORCE FEEDBACK. Hum. Factors, Oct. 1966, 8(5), 449-455. (Massachusetts Institute of Technology, Cambridge, Mass.).

In master-slave manipulators, forces encountered by the remote hand are transmitted back to the operator. At very great distances there will be a transmission delay between an operator's movement and a resulting force. Investigation was made of the effect of long delays and differences in strategy on positioning time with force feedback alone. Positioning could be accomplished, but delay coupled with high loop gain creates serious instability. Experimental results suggest that alternative displays of the feedback force can overcome the stability problem.
R 3

28,517
Weasner, M.H. & Carlock, J. DETECTION AND IDENTIFICATION OF COLORED SMOKE. Hum. Factors, Oct. 1966, 8(5), 457-462. (USA Feltman Research & Engineering Labs., Picatinny Arsenal, N.J.).

A field study was conducted to determine the rates of detection, identification, and location of colored smokes by ground and aerial observers. Distances from observers to smoke varied between 500-10,000 meters. Red, yellow, green, violet and white smokes were generated by initiating U.S. Army Standard M8 and M18 smoke grenades. 9 volume-duration combinations of smoke were tested. Volume of smoke was controlled by initiating various numbers of grenades (1, 2, or 3) simultaneously. Duration was controlled by initiating various numbers of grenades in succession so as to give a continuous smoke. The larger volume-duration combinations (e.g., 2-3 and 3-3) yielded the highest rates of detection, identification, and smoke location. In terms of overall effectiveness, the best volume-duration combination was 2-3. The most effective color was white, then red, while violet was the poorest.
R 5

28,518
Hennessy, J.R. CUTANEOUS SENSITIVITY COMMUNICATIONS. Hum. Factors, Oct. 1966, 8(5), 463-469. (USA Avionics Lab., Fort Monmouth, N.J.).

The general and specific problems facing emergence of cutaneous sensitivity devices into a useful sub-system of communications systems are discussed. The cutaneous sensory channel is emerging as a contender for application in communications systems in pace with the solution of corollary problems of psychology, neurology and bio-electronics. Transduction of electrical energy into living systems 's only beginning to be understood. When suitable hardware is designed to match the nerve impulse and neuronal channels, the safety and user acceptability of cutaneous sub-systems will enhance the reliability of modern communications under extremes of environment, as well as provide an independent channel for the sensorially deprived.
R 11

28,519
Klemmer, E.T. HUMAN FACTOR PROBLEMS IN SATELLITE TELEPHONING. Hum. Factors, Dec. 1966, 8(6), 475-480. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Telephone calls routed via satellite involve long transmission paths which in turn require significant transmission times even at the speed of light. This transmission time produces a delay in speech transmission of about 0.3 sec. in each direction for a synchronous satellite. Although the delay itself is not usually noticed by the talkers, it significantly increases the disturbing effects of echo and mutilation of speech by the echo suppressors so that the overall quality of the circuit, as judged by the users, suffers.
R 5

28,520
Hornick, R.J. & Lefritz, N.M. A STUDY AND REVIEW OF HUMAN RESPONSE TO PROLONGED RANDOM VIBRATION. Hum. Factors, Dec. 1966, 8(6), 481-492. (North American Aviation, Incorporated, Los Angeles, Calif.).

This article describes a study conducted to determine the effects of long duration, random vibration--characteristic of low-altitude high-speed (LAHS) flight aircraft--on human performance, physiological, biodynamic, and tolerance responses. Ten Ss experienced 0.10, 0.15, and 0.20 RMS g with a shaped power spectral density from 1 to 12 cps while engaging in LAHS control tasks. Simulation runs were of 5 hrs. duration, with the centermost 4 hrs. under dynamic conditions. Results of this experiment are related to those of other studies which had the same general objectives in order to provide a brief review and summary about what is known regarding human capabilities for LAHS flight.
R 12

28,521
Bauer, R.W., Cassatt, R.K., Corona, B.M. & Warhurst, F., Jr. PANEL LAYOUTS FOR RECTILINEAR INSTRUMENTS. Hum. Factors, Dec. 1966, 8(6), 493-497. (USA Human Engineering Labs., Aberdeen Proving Ground, Md.).

Rectilinear dials on a typical cockpit display were arranged in parallel, both horizontally and vertically, and also in a mixed, orthogonal arrangement. Although, intuitively, the parallel layouts appeared advantageous, the mixed layout yielded the best detection accuracy and the shortest detection times. Increasing the spacing between groups within a parallel, vertical array did not significantly improve performances. Uniform scales in any arrangement proved superior to non-uniform scales in readout accuracy. Thirty-six pilots and 16 technical and scientific laboratory personnel participated in the study. Performances of pilots and non-pilots were very similar.
R 8

28,522
Weltman, G. & Egstrom, G.H. PERCEPTUAL NARROWING IN NOVICE DIVERS. Hum. Factors, Dec. 1966, 8(6), 499-506. (University of California, Los Angeles, Calif.).

It was hypothesized that in diving, danger-induced stress may contribute to performance decrement by narrowing perceptual scope. A study was conducted to examine the effect of task load and type of underwater exposure on response time to a signal light in the visual periphery. Novice divers monitored a peripheral light alone, or while simultaneously performing a central addition or dial-watching task. Each S was tested on the surface, in a diving tank, and in the open ocean. It was found that the central tasks did not interfere with peripheral vigilance on the surface. During diving, a distinct subgroup of the dual-task Ss exhibited markedly increased response times to the peripheral light while maintaining near constant performance on the central tasks. Their behavior appeared more closely related to diving risk than to other environmental factors. The remaining dual-task Ss, and the light alone group, were almost uneffected by underwater exposure. The hypothesis was considered partially validated.
R22

28,523
Vallerie, L.L. DISPLAYS FOR SEEING WITHOUT LOOKING. Hum. Factors, Dec. 1966, 8(6), 507-513. (Dunlap & Associates, Incorporated, Darien, Conn.).

A laboratory study was conducted to determine the effectiveness of peripheral vision displays for presenting dynamic tracking information during difficult control tasks such as landing high speed aircraft or rendezvousing spacecraft. It was hypothesized that peripheral displays could be successfully used to improve performance provided visual switching between information sources is normally an essential part of such tasks. Visual switching consists of eye movement, accommodation and convergence. The hypothesis was tested by comparing the performance on a 2 dimensional compensatory tracking task under conditions in which the requirements for visual switching and the provisions of peripheral displays were systematically varied and controlled. The study clearly demonstrated that tracking performance deteriorates as visual switching increases and that peripheral displays can be used to overcome its adverse effects.
R 21

28,524
Rigney, J.W. & Fromer, R. EVALUATION OF A FAULT LOCALIZATION JOB-AID FOR A NAVY TRANSCEIVER. Hum. Factors, Dec. 1966, 8(6), 515-523. (Electronics Personnel Research Group, University of Southern California, Los Angeles, Calif.).

The assessment of corrective maintenance performance of Navy technicians has revealed that they have difficulty with the problem-solving aspects of this task. This difficulty is due partly to the large amount of information concerning the relationships between symptoms and malfunctions (S-M relations) that must be available for efficient problem-solving behavior. The sheer bulk of this information almost precludes memorization, especially if the technician is responsible for the maintenance of several different types of equipment. A job-aid which contains S-M relations in an accessible form, should greatly assist the electronics technician in fault localization. A fault locater (XFL) was developed for the AN/URC-32 transceiver. The XFL contains S-M relations for AN/URC-32 circuits and front-panel indications. It accomplishes 3 things: a) it leads the electronics technician through an appropriate sequence of front-panel tests; b) it indexes the technician to the smallest possible fault area; and c) it describes the fault area in terms of equipment circuitry. Two studies were performed to evaluate the effectiveness of the XFL. The results showed that both maintenance and non-maintenance personnel can quickly learn to use the job-aid, and that it may be useful in supporting corrective maintenance performance.
R 2

28,525
Levine, J.M. THE EFFECTS OF VALUES AND COSTS ON THE DETECTION AND IDENTIFICATION OF SIGNALS IN AUDITORY VIGILANCE. Hum. Factors, Dec. 1966, 8(6), 525-537. (University of Massachusetts, Amherst, Mass.).

The effects on performance of the value of detecting a signal, the cost of a miss or false detection, and the size of the set from which the signals were drawn were studied in an auditory vigilance task. Seventy-two Ss were randomly assigned to each cell of a factorial arrangement of the cost and load variables and required to detect and identify each of several 49 db SPL pure tones differing only in frequency. Analyses of the number of correct detections, correct identifications, false detections and detection response time indicated a significant performance decrement with time for all measures and suggested that increasing costs for misses and false detections led to poorer detection performance while value had no effect. Load effected only identification performance, as higher loads led to a decrease in the percentage of signals correctly identified. The d' and β statistics of signal detection theory, indicated sensitivity to be invariant with manipulations of costs and with time. These findings imply that the performance decrement during a vigil is due to an increased strictness in the criterion the S sets for deciding whether or not a signal was present. The cost factors were effective in manipulating performance by causing changes in the Ss' decision criteria.
R 17

28,526
Bradley, J.V. CONTROL-DISPLAY ASSOCIATION PREFERENCES FOR CONCENTRIC CONTROLS. Hum. Factors, Dec. 1966, 8(6), 539-543. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio & Behavior Research Lab., Antioch College, Yellow Springs, Ohio).

Seventy-five male college students and 25 human engineering psychologists were given a questionnaire presenting diagrams consisting of 3 concentrically ganged knobs and 3 dials which they were told the knobs operate. They were asked which dial they thought should be operated by each of the 3 knobs. Knob-dial associations were obtained with dials in horizontal and vertical arrays above, below, to the left of, and to the right of the knobs, and with dials differing in size, shape and distance from the knob axis. Knob-dial associations were found to be influenced by all of these factors except dial shape. Associations which were both strong and relatively unrivaled were found for dial position in a horizontal array (except when the array is to the left of the knobs), and for dial size. Ss associated the spatial knob progression, front knob to back knob with the spatial dial progression, left dial to right dial and with the dial size progression, smallest dial to largest dial. Strong, but strongly rivaled, associations were found for dial position in a vertical array and for dial distance from the knob axis.
R 2

28,527
Emery, J.A., Burrows, A.A. & Collier, D.R., Jr. BIOMEDICAL CONSIDERATIONS OF POSSIBLE DECOMPRESSION EFFECTS IN A SUPERSONIC TRANSPORT. Hum. Factors, Dec. 1966, 8(6), 545-561. (Douglas Aircraft Co., Inc., Long Beach, Calif.).

The possible consequences of the event of a supersonic transport cabin decompression are discussed in terms of biomedical considerations for passengers. Recent data concerning health and age-sex distributions are reviewed in an effort to derive a model group likely to be encountered among future supersonic transport flights along both transcontinental and transatlantic routes. Further consideration is directed to an analysis of various disease groups in terms of functional impairment as a means of anticipating passenger safety during cabin decompression. The results have been used to establish a basis for safety equipment design recommendations. Finally, attention is directed to research areas and methodology by which usable statistics might be obtained to provide further clarification of the tolerance ranges of debilitated humans.
R 21

28,528
Smith, R.L., Garfinkle, D.R. & Lyman, J. INDEPENDENT EFFECTS OF ERROR MAGNIFICATION AND FIELD OF VIEW ON COMPENSATORY TRACKING PERFORMANCE. Hum. Factors, Dec. 1966, 8(6), 563-567. (University of California, Los Angeles, Calif.).

This experiment evaluated the independent effects of error magnification and field of view on compensatory tracking performance. Both display and optical magnification were investigated. In general, the results demonstrated that: a) the facilitative effect on performance of display magnification was primarily due to the concomitant field of view reduction and not magnification per se; b) optical magnification facilitated performance but subsequent display gain increases had no further affect; c) regardless of visual mode employed, optimum performance levels on a complex trajectory converged at approximately the same field of view. It was suggested that increasing the optical gain or decreasing the field of view resulted in Ss reducing their reaction times to target movements. No evidence was found which indicated that magnification facilitated visual perception.
R 16

28,529
Ailslieger, R.E. & Dick, R.D. THE INFLUENCE OF AN INTERMITTENT VISUAL STIMULUS ON PERCEPTUAL MOTOR SKILLS IN AVIATION. Hum. Factors, Dec. 1966, 8(6), 569-572. (North American Aviation, Los Angeles, Calif. & Wisconsin State University, Eau Claire, Wisc.).

The effect of a light flashing at 5 fps on performance of tasks representative of those required of a pilot was studied. The tasks were digit span, pursuit rotor, reaction time, and a combination of all 3. Reaction time was longer in the combined task, and pursuit rotor performance was degraded by the flashing light. It was concluded that the longer reaction times were due to lowered vigilance, and the degradation of pursuit rotor performance was attributed to interference in the central processes by the flashing light.
R 9

28,530
Clark, H.J. CONTROL OF A REMOTE MANEUVERING UNIT DURING SATELLITE INSPECTION. Hum. Factors, Dec. 1966, 8(6), 573-582. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Operator performance in flying a simulated remote maneuvering unit (RMU) on a coplanar satellite inspection mission was evaluated under 2 conditions of RMU attitude control and 2 conditions of cockpit instrumentation. The maneuver was repeatedly performed successfully using either an on-off acceleration-command attitude control system or an on-off rate-command attitude control system, each with either a full panel of cockpit instruments (6) or only 1 cockpit instrument. The rate-command system was found to be superior for pitch control during station keeping and for roll control in general. The acceleration-command system was superior for pitch control during the trajectory portions of the mission. Because both control systems had disadvantages, investigation of a variable rate-control system is recommended. More economical and precise RMU control was obtained under the full-panel cockpit instrumentation condition irrespective of the control system used. The instruments of most value were found to be those which provided X (longitudinal) and Z (vertical) distance information. The limitations of the simulation and the advantages and disadvantages of an "inside-out" vs an "outside-in" television display of the target and its surrounds are also discussed.
R 3

28,531
Sandler, H. CINERADIOGRAPHIC OBSERVATIONS OF HUMAN SUBJECTS DURING TRANSVERSE ACCELERATIONS OF $+5G_x$ AND $+10G_x$. Aerospace Med., May 1966, 37(5), 445-448. (USN Air Development Center, Johnsville, Penn.).

X-ray motion pictures were recorded for 5 human Ss during transverse accelerations of $+5G_x$ and $+10G_x$ on the Johnsville centrifuge. Quantitative measurements of change in A-P chest diameter and heart position were made from photographic prints of the films. A slight but significant posterior displacement of heart position could be demonstrated when compared to change in the A-P chest diameter.
R 16

28,532
Zeft, H.J., Behar, V.S., Quigley, D.G., Ulvedal, F., et al. OBSERVATIONS ON MAN IN AN OXYGEN-HELIUM ENVIRONMENT AT 380 MM. HG TOTAL PRESSURE: I. CLINICAL. Aerospace Med., May 1966, 37(5), 449-453. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of a 15-day exposure to an environment with a Po_2 of 165.4 mm. Hg and a P_{He} of 205.5 mm. Hg at 379.9 mm. Hg total pressure have been studied in 4 men. Initially, all developed conjunctivitis associated with decreased relative humidity which cleared by increasing water vapor pressure. One individual was removed from the chamber prior to completion of the experiment because of the unrelated development of an acute prostatitis. No hematologic, electrolyte, or liver function abnormalities were noted. Stress testing showed some deconditioning from confinement. From this limited study, there appears to be no medical contraindication to the use of this environment for future space cabin atmospheres.
R 28

28,533
Robertson, W.G., Zeft, H.J., Behar, V.S. & Welch, B.E. OBSERVATIONS ON MAN IN AN OXYGEN-HELIUM ENVIRONMENT AT 380 MM. HG TOTAL PRESSURE: II. RESPIRATORY. Aerospace Med., May 1966, 37(5), 453-456. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The pulmonary effects of a 2-week exposure to a helium-oxygen atmosphere at a total pressure of 380 mm. Hg were evaluated in 4 healthy young men. O_2 consumption, CO_2 production, alveolar ventilation, dead space, and alveolar gas tensions were determined. The various lung compartments including residual volumes were measured. In addition, vital capacities and maximum breathing capacities were studied. CO diffusing capacities were measured just prior to exposure to the oxygen-helium atmosphere and immediately upon descent from altitude. All other studies were carried out during a 14-day pre-experimental control period, 15-day experimental exposure, and a 6-day post-experimental period. Results are discussed with reference to the physical characteristics of helium. An analysis of the effects of the decreased density of the inspired gas mixture is presented.
R 19

28,534
Epperson, W.L., Quigley, D.G., Robertson, W.G., Behar, V.S., et al. OBSERVATIONS ON MAN IN AN OXYGEN-HELIUM ENVIRONMENT AT 380 MM. HG TOTAL PRESSURE: III. HEAT EXCHANGE. Aerospace Med., May 1966, 37(5), 457-462. (USAF, Williams AFB, Ariz.).

4 male Ss were exposed to an atmosphere of helium (205.5 mm. Hg) and O_2 (165.4 mm. Hg) at a pressure of 379.9 mm. Hg for a period of 2 weeks and to an atmosphere of 579.3 mm. Hg helium and 159 mm. Hg O_2 at 760 mm. Hg for 1 day. Body temperatures, environmental temperatures, body weights, and metabolic heat were determined both at rest and at exercise. From these data the thermal balance of each S was calculated. Differences in both skin temperatures and heat balance were seen between the experimental environments and ground-level air. In particular, heat loss by convection was increased and heat loss by evaporation was reduced in the 579.3 mm. Hg helium condition. A theoretical consideration of convective heat exchange is presented.
R 17

28,535
Cooper, K.H. & Leverett, S., Jr. PHYSICAL CONDITIONING VERSUS +GZ TOLERANCE. Aerospace Med., May 1966, 37(5), 462-465. (USAF Aerospace Medical Lab., Lackland AFB, Tex.).

An attempt was made in this study to determine the effect of endurance training on $+G_z$ tolerance in experienced centrifuge Ss. 11 Ss were divided into 6 exercisers and 5 controls. For 3 months the exercisers engaged in a daily (5 times a week) progressive running program while the controls were asked to avoid vigorous exercise. Frequently during this period, all 11 Ss were subjected to both rapid onset and gradual onset runs on the USAF School of Aerospace Medicine centrifuge. At the conclusion of the 3 months, significant differences were noticed between the exercise and control groups in endurance capacity as indicated by an increase in maximal O_2 consumption. However, no significant difference was noted between the two groups in their ability to tolerate positive Gs during either gradual or rapid onset centrifuge runs. In this study, neither an increase nor a decrease in +Gz tolerance could be correlated with endurance capacity.
R 18

28,536
Stevens, P.M., Miller, P.B., Lynch, T.N., Gilbert, C.A., et al. EFFECTS OF LOWER BODY NEGATIVE PRESSURE ON PHYSIOLOGIC CHANGES DUE TO FOUR WEEKS OF HYPOXIC BED REST. Aerospace Med., May 1966, 37(5), 466-474. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of hypoxia and lower body negative pressure (L.B.N.P.) on blood volume, orthostatic and physical tolerance were studied in 22 Ss maintained at bed rest for 4 weeks at simulated altitudes of 10,000 and 12,000 ft. No significant differences in results were noted between the 2 altitudes. Hematocrits increased significantly by 7.2%. Plasma volume decreased (610-637 cc.) while the calculated red cell mass either increased slightly or remained unchanged (133-89 cc.). This suggests that hypoxia prevents the loss in red cell mass, but has no influence on the loss of plasma volume that occurs during bed rest at ground level; furthermore the erythropoietic response to hypoxia seems to be decrease by bed rest. A significant decrease in calculated red cell mass occurred during ambulation following bed rest but not during exposure to L.B.N.P. while at continued bed rest. Exposure to L.B.N.P. during the last 2 days of bed rest repleted plasma volume and prevented subsequent orthostatic intolerance. In response to a given exercise load the heart rate was much higher if the plasma volume was decreased but unchanged if the plasma volume was re-expanded by L.B.N.P. Maximum O_2 consumption was decreased in all Ss following bed rest regardless of their blood volumes.
R 15

28,537
Durfey, J.Q. & Leeming, M.N. AN ON-LINE SYSTEM FOR MEASURING RESPIRATORY PARAMETERS USING A HYBRID ANALOGUE/DIGITAL COMPUTING SYSTEM. Aerospace Med., May 1966, 37(5), 474-478. (Anesthesia Div., Baylor University College of Medicine, Houston, Tex. & Memorial Sloan-Kettering Cancer Institute, New York, N.Y.).

Work was begun approximately 6 years ago by Bellville and Seed on a system to measure various respiratory parameters using a pneumotachograph, strain, gauge, infra-red CO_2 analyzer, and an analogue computer with an X-Y plotter read-out. This work was continued by T.W. Murphy who digitalized the system at the sacrifice of much of the direct read-out capabilities. Therefore the system was re-vamped so that both digital and direct analogue/digital read-outs were achieved. The system proved successful in monitoring and instrumentation, as is shown in the text. At present it is undergoing sophistication and redesign so that even greater capabilities may be achieved.
R 18

28,538
Clark, B.C. & Janni, J.F. A DOSE-EQUATED PHANTOM FOR SPACE RADIATION RESEARCH. Aerospace Med., May 1966, 37(5), 479-484. (USAF Special Weapons Center, Kirtland AFB, N.M.).

A rugged dose-equivalent plastic manikin has been fabricated which is suitable for use in space flight. This phantom simulates the interaction of all types of radiation with the geometry of the human body, allowing precise experimental measurements of the depth-dose, linear-energy transfer spectrum, and dosage to critical organs. Dosimeter insertion holes are located in important organs and other appropriate locations within the body. Extensive environmental testing has been done to guarantee the capability of the manikin to withstand the rigors of spaceflight launch and recovery. A complete analysis of the dose equivalency has been performed. The manikin contains every element which composes at least .1% of the human body. The interaction characteristics of the manikin are dose-equated to within 15% for neutrons, and within 10% for photons with energies greater than .04 Mev. The response is within 1.5% for electrons with energy between .05 Mev and 10.0 Mev, less than 1.2% for protons with energy greater than 1.0 Mev, and within 1.2% for alpha particles of energy greater than 5 Mev.
R 18

28,539
Goldman, R.F., Breckenridge, J.R., Reeves, E. & Beckman, E.L. "WET" VERSUS "DRY" SUIT APPROACHES TO WATER IMMERSION PROTECTIVE CLOTHING. Aerospace Med., May 1966, 37(5), 485-487. (USA Research Institute of Environmental Medicine, Quartermaster Research & Engineering Command, Natick, Mass.).

Immersion protection flight clothing can be of either a skin diver, "wet" suit type or waterproof, "dry" suit. A waterproofed copper manikin was used to study the insulative properties of both types of suits, in air and also during water immersion. The bulkier characteristics of the dry suit studied, the Mark 5A, provided greater insulation in air than either a 1/4" or 3/16" unicellar sponge, neoprene wet suit. However, during water immersion, compression of the "dry" suit by the water reduced the insulation by 75%. The insulation of the "wet" suits was also reduced but these suits are less compressible and thus during water immersion provide significantly more insulation than the "dry" suit.
R 13

28,540
Tepas, D.I. & Vianello, M.A.B. METHOD OF RECORDING BODY TEMPERATURE FOR PROLONGED TIME. Aerospace Med., May 1966, 37(5), 488-491. (Human Factors Group, Honeywell Incorporated, St. Paul, Minn.).

A harness-mounted temperature sensor was developed for prolonged monitoring of human skin temperature. This sensor was 30 in. by 1 in. in size and was mounted in an adjustable harness which held the sensor in close contact with the chest. Temperature measurements, together with concomitant heart rate readings, were recorded from Ss in the course of 48-hour experimental sessions. The harness proved to be a reasonably comfortable item for the Ss to wear. The temperature measures display many of the characteristics associated with standard body temperature recordings, and the heart rate changes obtained agree with the temperature changes recorded. The results suggest that this may be a promising technique for monitoring body temperature changes remotely in the course of extended space travel. Additional parametric research is needed to completely assess this approach.
R 14

28,541
Zeiner, F.N. 60-DAY EXPOSURE TO ARTIFICIAL ATMOSPHERES. Aerospace Med., May 1966, 37(5), 492-494. (Zoology Dept., University of Denver, Denver, Colo.).

3 laboratory species were subjected to elevated O_2 tensions for 60-day periods, with N_2 at either high or at minimal levels. No influence of the N_2 could be detected. At 337 mm. O_2 with hamsters and 373 mm. with mice there was no increase in mortality, either during the exposure or following return to the normal altitude environment of Denver. Lung damage was seen, however, at the 300 mm. level and became more severe as O_2 tension was further increased. Rats are more tolerant of elevated O_2 than are mice or hamsters, no lung changes being detectable at the 300 mm. level. It is concluded that higher O_2 tensions may be withstood, and for longer periods, than previously reported.
R 12

28,542
Wherry, R.J., Jr. MODEL FOR THE STUDY OF PSYCHOLOGICAL STRESS. Aerospace Med., May 1966, 37(5), 495-500. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

This paper discusses the need for experimentation in anticipatory physical threat stress and offers a model of the determiners of this type of stress. The major determiners are postulated to be the perceived probability of the occurrence of an unpleasant event, the perceived proximity of the event, and the perceived unpleasantness associated with the occurrence of the event. The paper discusses various problems associated with conducting laboratory research in this area. Problems discussed include a) finding events for laboratory use which are threatening but safe and ethically acceptable; b) the necessity for being able to actively control how a S perceives the laboratory situation; and c) the measurement of the effects of stress on behavior.
R 13

28,543
Burton, D.R. PERFORMANCE OF WATER CONDITIONED SUITS. Aerospace Med., May 1966, 37(5), 500-504. (Royal Aircraft Establishment, Farnborough, Hants, England).

An engineering assessment of the performance of a water conditioned suit as a heat exchanger has been made in a series of experiments. The experimental data have been reduced, with the aid of a simple theoretical analysis, to an equation which adequately describes the characteristics of the water conditioned suit, and defines its performance limits. The experimental technique required that each S chose his rate of cooling according to his own comfort preference. Precise predictions of suit inlet temperature and mass flow cannot be made because of the large observed variation in cooling rate chosen by different Ss. Adjustment of the pipe distribution of the present demonstration suit is recommended to improve the cooling patterns.
R 4

28,544
Ewing, C.L. VERTEBRAL FRACTURE IN JET AIRCRAFT ACCIDENTS: A STATISTICAL ANALYSIS FOR THE PERIOD 1959 THROUGH 1963, U.S. NAVY. Aerospace Med., May 1966, 37(5), 505-508. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

Vertebral fracture rate analysis of U.S. naval aircraft accidents in the period fiscal years 1959 through 1963 showed that the highest rates were found in jet aircraft ejections. The F-3 and TF-9J aircraft with multiple catapult seats had significantly higher ejection fracture rates than all other aircraft seat combinations, the sitting height accommodations of both aircraft are below the 70th percentile, and over 94% of all ejections from both aircraft were through the canopy. The combination of the sitting-height disparity between man and aircraft, and high through-the-canopy ejection rate would appear to be a major factor in production of vertebral fracture in the accidents studied.
R 2

28,545
Kirchhoff, H.W. & Lauschner, E.A. EARLY DIAGNOSIS OF CARDIOVASCULAR DISEASE AMONG AIR-CREW. Aerospace Med., May 1966, 37(5), 509-514. (Institute of Aviation Medicine, German Air Force, Fürstenfeldbruck, Germany).

During the last few years the Institute of Aviation Medicine of the German Air Force has been working on functional tests which seem to be of great help in detecting cardiovascular disease in an early stage. The following research methods have been used: a) registration of pulse-rate and blood-pressure under ergometer workload is capable of giving early information on beginning hypertension; b) spiroergometry indicates a decrease in efficiency; c) tests under determined hypoxia are useful for the detection of coronary insufficiency and d) combined examinations of cardiac efficiency and of the peripheral cardiovascular and respiratory system are helpful in discovering functional disturbances and limitations of the physical efficiency of many different functional regions. If through these functional tests a decrease of efficiency and a beginning of organic damage of the cardiovascular system or regulatory disturbances have been discovered most of the pilots will have to follow a terrain-cure in the Bavarian Alps. The main therapy consists in systematically increasing physical exercise, led and supervised by experienced physicians. The patient has to contribute actively in resuming his health. The success can be objectivated by the functional tests mentioned before. We feel that this form of treatment constitutes a progress and increases the number of aging pilots being maintained on flying status.
R 8

28,546
Durfey, J.Q. A NEW NON-REBREATHING VALVE SYSTEM AND SQUEEZE BAG RESUSCITATOR. Aerospace Med., May 1966, 37(5), 515-517. (Anesthesia Dept., Baylor University College of Medicine, Houston, Tex.).

An attempt to bypass increased complexity and cost in the design of emergency medical equipment for resuscitation has been made in the development of a new type of squeeze bag resuscitator which can also be used as a mouth-to-mask resuscitator by inexperienced individuals. This resuscitator incorporates an exceptionally fine, non-corrosive, light weight, sterilizable non-rebreathing valve which can easily be assembled and disassembled for cleaning and repair purposes. It has the additional advantages of having no forward or back leaks; very low dead space; virtually no resistance to inspiratory or expiratory flow; extreme reliability and durability under a variety of conditions; and universal adaptation to existing anesthesia and resuscitative equipment. The newly designed bag has built-in protection against hyperventilation, a hand strap for maintaining position, and finger grips. It is hoped that further design of such equipment will allow in-the-field emergency anesthetic possibilities, and that presently anticipated low cost of production and marketing will allow universal availability of such emergency resuscitative equipment where it is vitally needed, and will provide training aids for further education and treatment of patients.
R 3

28,547
Ekman, G. TEMPORAL INTEGRATION OF BRIGHTNESS. Rep. Number 209, June 1966, 7pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The relation between stimulus duration and perceived brightness of light flashes was studied on the basis of data previously published by Raab. A re-analysis of the data made it possible to demonstrate a simple logarithmic time/brightness relation. This relation has recently been found for the perception of pain, elicited by electrical stimulation, and for loudness of a pure tone. The logarithmic relation between stimulus duration and perceived intensity thus appears to possess a certain inter-modal generality. Finally, various aspects of the interaction of time and intensity as factors in brightness perception were tentatively described and discussed.
R 9

28,548
Hargreaves, J.J., Robertson, W.G., Ulvedal, F., Zeft, H.J., et al. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. I. INTRODUCTION AND GENERAL EXPERIMENTAL DESIGN. Aerospace Med., June 1966, 37(6), 552-555. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Four Air Force aircrew members, ranging in age from 27-29 years, lived in the USAFSAM double-wall test cell for 68 consecutive days. The test cell, with a total volume of 40.2 cubic meters, was operated at ground level for 8 days, at 257.7 mm. Hg for 56 days, and at ground level for 4 days. During the 56 days at 257.7 mm. Hg total pressure, the atmosphere consisted of 175.2 mm. Hg P_{O2} and 73.9 mm. Hg P_{He}. P_{N2} averaged 1.9 mm. Hg. The purpose of the experiment was to evaluate the physiologic suitability of this atmosphere for use in future manned space missions. This suitability was established by detailed, repetitive examination of physiologic functions throughout the course of the experiment.
R 30

28,549
Adams, J.D., Conkle, J.P., Mabson, W.E., Watson, J.T., et al. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. II. MAJOR AND MINOR ATMOSPHERIC COMPONENTS. Aerospace Med., June 1966, 37(6), 555-558. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The atmosphere to which 4 human volunteers were exposed for 56 days during a study designed to describe the effects of oxygen-helium on man was analyzed for major and minor constituents. The partial pressure of the major constituents, oxygen (175.2 ± 2.4 mm. Hg) and helium (73.9 ± 2.3 mm. Hg), remained within the established experimental parameters. 68 minor constituents were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. The instrumental methods employed were sufficient for a comprehensive analysis of the synthetic atmosphere.
R 4

28,550
Glatte, H.V. & Giannetta, C.L. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. III. RENAL RESPONSE. Aerospace Med., June 1966, 37 (6), 559-562. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

To assess the effects of helium on renal function, 4 healthy Air Force officers lived for 56 days in a space cabin simulator with a partial pressure of oxygen of 175 mm. Hg and helium of 74 mm. Hg at a total pressure of 258 mm. Hg. All renal parameters measured during the control and experimental periods failed to reveal any deviation from accepted normals. Studies performed included renal hemodynamics utilizing inulin, PAH, and endogenous creatinine clearances; concentrating and diluting tests; and 24-hr urinary excretion of proteins. In addition, multiple determinations of blood pH and standard bicarbonate utilizing a modified Astrup technique were normal. It was concluded that the experimental atmosphere had no adverse effect on renal function.
R 25

28,551
Bartek, M.J., Ulvedal, F. & Brown, H.E. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. IV. SELECTED BLOOD ENZYME RESPONSE. Aerospace Med., June 1966, 37(6), 563-566. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

An oxygen-helium atmosphere at a total pressure of 258 mm. Hg was evaluated for 56 days with 4 normal Ss to determine what effects it had on a selected group of serum enzymes and on enzyme-mediated erythropoietic mechanisms. Weekly serum lactic dehydrogenase, lactic dehydrogenase isozymes, glutamic dehydrogenase and lipase determinations were made as well as hematocrit, erythrocyte glucose-6-phosphate dehydrogenase, glutathione and glutathione stability measurements. A 14% decrease in lactic dehydrogenase was observed, as well as a slight decrease in the "heart" isozyme during the experimental period. Glutamic dehydrogenase remained well within the normal range and lipase was not detected. There was a 3.4% decrease in hematocrit during the post-experimental period, with an accompanying slight increase in glucose-6-phosphate dehydrogenase, glutathione and glutathione stability. Considering that all values obtained were well within the normal range, man appears to tolerate this atmosphere quite well.
R 14

28,552
Zeft, H.J., Robertson, W.G. & Welch, B.E. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. V. EXERCISE PERFORMANCE AND CARDIOVASCULAR RESPONSE. Aerospace Med., June 1966, 37(6), 566-571. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Four healthy Air Force crew members participated in an experiment to evaluate an oxygen-helium environment at 258 mm. Hg for future manned space flights. For 3 weeks prior to entering the space cabin simulator, the Ss took part in a program of physical exercise on a Collins bicycle ergometer. During the 56 days of the atmosphere test, they exercised 6 days per week on the same bicycle ergometer with 3 daily 20-min exercise periods. Each exercise period was graded with a warm-up, moderate load (pulse, 150-160/min), and heavy load (pulse, 170-180/min). The workloads were determined prior to the Ss entering the chamber and remained constant. Pulse rates during moderate and heavy exercise revealed an initial fall, corresponding to conditioning and increased efficiency with the ergometer. Subsequently, these parameters leveled off except for 1 S who showed a minimal rise in pulse rates during the latter half of the confinement period. Stress testing was performed immediately before and after the atmosphere test phase. Treadmill times (Balke test) showed slight improvement in the postexperimental period. Maximum oxygen consumption measurements on the bicycle ergometer postexperimentally were diminished by 2.9 to 9.4 ml/min/kg from initial values. Changes in plasma volume (pre- to post-test) ranged from -143 cc to +222 cc. Tilt table studies showed little change from earlier tests with no syncopal symptoms. It was felt that the programmed daily exercise was adequate in preventing a significant deconditioning effect or orthostatic intolerance.
R 15

28,553
Ulvedal, F. & Roberts, A.J. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. VI. EXCRETION OF STEROIDS AND CATECHOLAMINES. Aerospace Med., June 1966, 37(6), 572-578. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The urinary excretion of 17-hydroxycorticosteroids, corticosterone-like hormones, epinephrine and norepinephrine was measured in an attempt to evaluate the degree of emotional and physical stress experienced by Ss participating in an oxygen-helium atmosphere experiment at 258 mm. Hg total pressure for 56 days. The values obtained for these variables were within physiologic range for this type of experiment, but several trends were observed. Differences in the rest-day values vs. work-day values were noted. A reversal in the normal 12-hr. excretion ratio took place for the Ss who slept during the days and worked during the nights, as measured by the 17-OHCS and corticosterone-like hormones. The effect of diet and exercise in this environment was also reported. Thus, it appears that the oxygen-helium atmosphere utilized in this experiment provides satisfactory environmental conditions for human activity over a prolonged period of confinement.
R 22

28,554
Robertson, W.G. & McRae, G.L. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. VII. RESPIRATORY FUNCTION. Aerospace Med., June 1966, 37(6), 578-582. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The respiratory effects of a 56-day exposure to an oxygen partial pressure of 175.2 mm. Hg with a helium partial pressure of 73.9 mm. Hg at a total pressure of 257.7 mm. Hg were evaluated in 4 healthy U.S. Air Force crew members. Control data were obtained during an 8-day pre-experimental and a 4-day postexperimental period. Steady-state CO diffusing capacities were unchanged pre- and postexperimentally. Basal oxygen consumption and CO_2 production were increased throughout the experimental period. This increase is attributed to an increased water loss at altitude. Vital capacities were decreased approximately 4% with ascent to altitude but returned toward pre-experimental values with time. Vital capacities were all normal immediately on descent from altitude. Lung compartment measurements reflected the decrease in vital capacity at altitude as an apparent decrease in total lung volume as a function of a decreased expiratory reserve volume. Residual volumes were unchanged. Maximum breathing capacities increased approximately 40% as a function of the decreased atmospheric density. There were no changes that would indicate that this atmosphere produces any impairment of man's pulmonary function.
R 20

28,555
Heidelbaugh, N.D., Vanderveen, J.E., Klicka, Mary V. & O'Hara, May J. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. VIII. OBSERVATIONS ON FEEDING BITE-SIZE FOODS. Aerospace Med., June 1966, 37(6), 583-590. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

21 bite-size foods supplemented with 8 fruit juices, an enriched drink, coffee, tea, sugar, a vitamin-mineral tablet and water ad libitum were arranged into a 2-day menu cycle. This feeding system was offered to 4 flight crew members as the sole source of nutrients for a period of 72 days, including 56 consecutive days in a space vehicle simulator containing an atmosphere of 257.7 mm. Hg total pressure including 175.2 mm. Hg P_{O_2} and 73.9 mm. Hg P_{He}. The relationship between the consumption of food and the following was studied: initial and mean acceptability ratings by the Ss, ratings by a technical taste panel, rehydratability, and fat content of the food. Trends in each S's consumption and acceptability rating of each food item were studied as a function of time. The manufacturing procedures and criteria for each food are outlined. Suggestions are offered for adapting this type of feeding system to aerospace situations.
R 22

28,556
Vanderveen, J.E., Heidelbaugh, N.D. & O'Hara, May J. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. IX. NUTRITIONAL EVALUATION OF FEEDING BITE-SIZE FOODS. Aerospace Med., June 1966, 37(6), 591-594. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A feeding system composed of beverages and bite-size foods was used to support 4 flight crew members for 72 days. During the experiment, the crew spent 56 consecutive days in a 4-man space cabin simulator at 258 mm. Hg total pressure, including 175.2 mm. Hg PO_2 and 73.9 mm. Hg P_{He}. Energy was supplied to each crew member proportionally to his lean body weight. Metabolic balance studies were performed every 4 days of the experiment. The digestibility of energy and protein was low and was probably caused by the high melting point of the fat used in the formulation and coating of the bite-size foods. Fecal fat levels were high; however, there were no indications that a gastrointestinal disorder was associated with the low fat absorption. These studies indicate that bite-size foods are useful in supporting men in simulated aerospace conditions, but, new coatings are required to allow maximum digestibility of nutrients with minimum waste production.
R 11

28,557
Cordaro, J.T., Sellers, W.M., Ball, R.J. & Schmidt, J.P. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. X. ENTERIC MICROBIAL FLORA. Aerospace Med., June 1966, 37(6), 594-596. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

124 fecal samples collected during various phases of the study were examined to determine any changes which may have occurred in the bacterial flora. The counts of all microorganisms remained within the normal range except those for the enterococci. There was a decrease in the number of enterococci as the Ss went on the experimental diet, but the values returned to normal as the regular diet was resumed after the 56-day flight. The change observed was not considered to be of clinical significance.
R 4

28,558
Moyer, J.E., Farrell, Dorothy G., Lamb, W.L. & Mitchell, J.L. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. XI. ORAL, CUTANEOUS, AND AEROSOL BACTERIOLOGIC EVALUATION. Aerospace Med., June 1966, 37(6), 597-600. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Studies were initiated to determine the numbers, distribution, and types of microorganisms encountered under conditions of a sealed environment for extended periods of time, such as would occur during space explorations. A 56-day experiment, utilizing 4 test Ss confined within a double-walled test cell in an oxygen-helium atmosphere at 258 mm. Hg, was performed. Quantitative counts of the aerobic microorganisms present in the circulating atmosphere as well as those present on the skin of the Ss were established. Distribution of coagulase positive, phage typable Staphylococcus aureus strains and predominant microbial types in throat, nasal, skin and aerosol samples was determined. Evidence of a staphylococcal transfer between Ss was obtained. Implications of these findings, as related to the utilization of the 2-gas atmosphere for future space flights, are discussed.
R 6

28,559
Zeft, H.J., Krasnogor, L.J., Motsay, G.J., Glatte, H.V., et al. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. XII. CLINICAL OBSERVATIONS. Aerospace Med., June 1966, 37(6), 601-604. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The present report describes the clinical findings in 4 aircrew members who lived for 56 days in an oxygen-helium environment at 258 mm. Hg total pressure. During pre- and post-experimental periods, the Ss underwent a complete medical evaluation to include appropriate roentgenographic studies, electrocardiograms, electroencephalograms, and blood chemistries. During the 56-day test phase, clinical symptoms were minimal. Most bothersome to the Ss were increased amounts of flatus, only rarely causing abdominal discomfort from trapped intestinal gas. All of the individuals developed mucous membrane dryness associated with a decreased relative humidity in the chamber. 2 Ss noted nasal congestion and none experienced middle ear problems. One individual developed mild elevations in transaminase enzymes which could not be explained. Resting electrocardiograms from another S showed intermittent changes consistent with the Wolf-Parkinson-White syndrome, which could not be attributed to the environment. Daily exercise was performed on a bicycle ergometer without symptoms or signs of a decompression disturbance. At no time during the experiment were there any clinical disturbances which might have prevented the completion of a prolonged manned space mission.
R 16

28,560
Rodgin, D.W. & Hartman, B.O. STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. XIII. BEHAVIOR FACTORS. Aerospace Med., June 1966, 37(6), 605-608. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Four officer aircrewmen performed psychomotor tests 3 times daily and reported on sleep once a day during a 56-day exposure to an oxygen-helium atmosphere at 258 mm. Hg total pressure. Psychomotor and sleep changes were minimal and essentially benign. Adaptation to altered schedules was generally good except for persistent complaints about sleep (not fully supported by sleep histories) from one S. The tempo of activity and physical exercise regimen apparently prevented behavioral manifestations of deconditioning frequently seen in confinement studies.
R 2

28,561
Woods, R.H., Trudo, F.J. & Pieper, W.J. AN INSTRUCTIONAL PROGRAM ON OPERATION OF THE TEKTRONIX 545A OSCILLOSCOPE. FINAL REPORT. Contract AF 33(615) 1414, Proj. 1710, Task 171007, AMRL TR 66 81, June 1966, 255pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Applied Science Associates, Inc., Valencia, Penn.).

This report contains a 368 frame, book program, for teaching the operation of the Tektronix 545A Oscilloscope together with a response booklet and administrator's manual. The oscilloscope operations included in the program are preset and calibration, voltage measurement, frequency measurement, comparison of waveshape to waveshape standard and high accuracy time-base measurements and comparisons. These operations reflect a behavioral analysis of maintenance usage of this test equipment in conjunction with electronic communications equipment. The appendix contains technical information for building a small signal generator for use with this program.

28,562
O'Connor, W.F. & Pendergrass, G.E. TASK INTERRUPTION AND PERFORMANCE DECREMENT FOLLOWING RAPID DECOMPRESSION. Aerospace Med., June 1966, 37(6), 615-617. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

16 Ss, active pilots and flight crew personnel, were decompressed to altitudes of 25, 27, 30, 35, or 41 thousand ft while performing a task on the Scow coordinator. All Ss were current on their medical qualifications, and all but 2 were physiologically trained. Results showed a marked decrement in performance following decompression, with the decrement increasing as decompression altitude increased and persisting for 3-4 min. Measuring only mask-donning time underestimates the performance gap following decompression. Estimates of the performance gap were found to agree with value obtained by Bennett in his study of aircraft decompression.
R 1

28,563
Nyberg, J.W., Grimes, R.H. & White, W.J. CONSEQUENCE OF HEART-TO-FOOT ACCELERATION GRADIENT FOR TOLERANCE TO POSITIVE ACCELERATION. Aerospace Med., July 1966, 37(7), 665-668. (Advance Biotechnology Dept., Douglas Aircraft Co., Inc., Santa Monica, Calif.).

Consequences of heart-to-foot acceleration gradients on tolerance to positive acceleration (+ Gz) were determined in 3 studies on a variable radius centrifuge. In the first, tolerance was measured at radii ranging from 172 to 30 in., corresponding to gradients of 20 to 116%, respectively. As the radius decreased, the tolerance increased. At the shortest radius, discomfort in the legs resulting from the high acceleration at the feet precluded tolerance determination. In the second and third studies, low-intensity bioassay lights were used as a means of determining tolerance at lower levels of acceleration. In the third study, a slow onset run to blackout was used as a means of reducing the number of runs. Radii of 156 and 16 in. and rates of onset of 0.2 G/sec. and 3.0 G/sec. were used. At the long radius, tolerance was +3.9 Gz during slow onset, and +3.8 Gz during fast onset. At the 16 in. radius, during fast onset, tolerance was +3.0 Gz and, during the slow onset, tolerance was +3.6 Gz, +3.3 Gz, and +3.4 Gz.
R 7

28,564
Hauty, G.T. & Adams, T. PHASE SHIFTS OF THE HUMAN CIRCADIAN SYSTEM AND PERFORMANCE DEFICIT DURING THE PERIODS OF TRANSITION: I. EAST-WEST FLIGHT. Aerospace Med., July 1966, 37(7), 668-674. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

At periodic intervals throughout the biological day biomedical assessments were made for a week prior to jet flight to Manila, for 8 days of layover at Manila and for a week following return to the environment of origin. The data revealed that for the physiological functions assessed time displacement effected a primary shift of phase of circadian periodicity which, for rectal temperature and heart rate, required 4 days for completion and, for palmar evaporative water loss, approximately 8 days. Return back to the environment of origin also effected a shift of phase requiring only 1 day for completion. Behavioral integrity was degraded during the primary period of transition and, to a lesser extent, during the primary period of transition and, to a lesser extent, during the period of transition occasioned by return to the environment of origin but duration of behavioral impairment was much shorter than the lag time of physiological phase shifts.
R 16

28,565
Clark, B. & Graybiel, A. INFLUENCE OF CONTACT CUES ON THE PERCEPTION OF THE OCULOGRAVIC ILLUSION. Contract NASA Order R 93, BuMed. Proj. MR005.04 0021, NAMI Rep. 976, Rep. 135, Aug. 1966, 8pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The purpose of this experiment was to study the influence of otolith and nonotolith information in the perception of the visual horizontal during rotation. 5 normal men and 5 men with defective labyrinthine function acted as observers. All measurements were made in a room which could be rotated. Initial, static measurements were made while the men stood erect in the stationary room. Similar measurements were made during rotation while the observer stood on a platform set to the resultant horizontal with head and body aligned with resultant force. Data were also obtained with 3 other combinations of head and body position. This procedure was designed to produce 2 situations for the normal men in which otolith and nonotolith information were synergistic and 3 others in which they were antagonistic. The results showed that the perception of the visual horizontal during rotation in this situation is quite different from that found when the observer is rigidly supported in a chair during rotation. Settings to the visual horizontal during rotation were not systematically related to differences in head and body position nor were there significant differences between the normal and L-D men. The results show that nonotolith information predominates in this experimental situation. Furthermore, the data suggest that the spatial orientation of a pilot strapped in a cockpit may be somewhat different from his spatial orientation when he is standing on a rotating space platform.
R 12

28,566
Henzel, J.H., Clarke, N.P. & Mohr, G.C. EFFECT OF ANTERIOR INTERCOSTAL NERVE BLOCK ON THE THRESHOLD OF THORACIC PAIN ASSOCIATED WITH G_z AND G_x VIBRATION. Aerospace Med., July 1966, 37(7), 682-687. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

In investigating the origin of chest pain associated with $Gz \pm ngz$ and $Gx \pm ngx$ sinusoidal vibration, the effect of anterior chest wall anesthetization was studied. Ss were exposed to vibration of increasing amplitude and the acceleration required to induce perceptible chest pain was taken as the threshold. 2 randomly ordered threshold determinations were made in each test. In one, vibration was preceded by bilateral anesthetization of the second through sixth intercostal nerves. In the other, intradermal infiltration of anesthetic created a sensation somewhat similar to this without actually blocking the nerves; this provided a control condition with minimal subjective bias for comparison. Subsequent to intercostal nerve block, there was a statistically significant ($p<0.01$) increase in threshold of chest pain for both orientations of vibration. These results strongly suggest that vibration induced chest pain originates in the chest wall and not in the more critical cardiac-great vessel complex.
R 18

28,567
Craig, A.B., Jr. VALSALVA MANEUVER: POSSIBLE USE IN SPACE FLIGHT AS A TEST OF CARDIOVASCULAR FUNCTION. Aerospace Med., July 1966, 37(7), 687-690. (Physiology Dept., University of Rochester School of Medicine & Dentistry, Rochester, N.Y.).

It is suggested that the heart rate response to a standardized Valsalva maneuver performed at intervals during space flight might have predictive value in regard to the problem of developing orthostatic intolerance. A group of Ss was immersed for 1 hr. in warm water. This heat stress caused a greater increase in heart rate and a greater reduction of the pulse pressure in response to tilting than during the same test performed before immersion. It was also observed that the heart rate increase during the Valsalva done when the S was in air was greater after the thermal stress. The heart rate response to the breath-hold performed in water changed from a bradycardia to a tachycardia. These changes were attributed to the stress of the warm environment, as they were not noted after cool water immersion.
R 12

28,568
Yuganov, E.M., Gorshkov, A.I., Kasyan, I.I., Bryanov, I.I., et al. VESTIBULAR REACTIONS OF COSMONAUTS DURING THE FLIGHT IN THE "VOSKHOD" SPACESHIP. Aerospace Med., July 1966, 37(7), 691-694. (Novosti Press Agency, Moscow, Russia).

The vestibular tolerance of members of the crew of the "Voskhod" ship to a 24-hr. stay in a zero-weight environment was found to differ from S to S; it was high in the case of V.V. Komarov and lower in the case of B.B. Egorov and K.P. Feoktistov. Differences in tolerance are connected with the differences in the initial sensitivity of the vestibular apparatus, and different lengths of vestibular training (sufficiently long in the case of Komarov and shorter in the case of Feoktistov and Egorov). An intense 3-month ground vestibular training of persons with a vestibular analyzer of an average sensitivity cannot secure the required vestibular tolerance to a zero weight environment.
R 8

28,569
Fine, P. & Jennings, C.F. PERSONALITY DEVELOPMENT; APPLICATIONS OF THEORY TO PROBLEMS OF AEROSPACE SELECTION. Aerospace Med., July 1966, 37(7), 695-701. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

In recent years vocational specialization has placed a premium on procedures to match men and jobs. This has been particularly true in Aerospace operations where mismatching can lead to serious consequences for individuals and society at large. The paper was written to call attention to a body of knowledge which, although not yet widely applied in aviation circles, could have a direct bearing on selection procedures for Aerospace missions. Pertinent findings derive from divergent disciplines such as infant and child development, child psychiatry, ethology and psychophysiology. These findings all contain a common concern with the process of personality development. Familiarity with this process gives one an ability to make plausible predictions about how an individual will function in specific situations. This report will review recent findings about psychological development, then suggest 2 procedures to apply resultant theory to Aerospace problems.
R 29

28,570
Moyer, J.E. & Lewis, Y.Z. BACTERIOLOGIC POTABILITY OF CONDENSATE WATER FROM HEAT EXCHANGERS OF PRESSURE SUITS. Aerospace Med., July 1966, 37(7), 701-703. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The possibility of utilizing water condensates recovered from the heat exchangers of pressure suits as an emergency source of drinking water was investigated. Condensate samples were collected in sterile containers at 5-hr. intervals and subjected to quantitative (MPN/100 ml) and qualitative bacteriologic analysis. Several samples were retained in the sealed vessels and reanalyzed following storage for 12 days at room temperature. Results indicate that condensate water may serve as an emergency source of potable water provided it is consumed within a short period of time following collection. Storage of the condensates results in a water of an unacceptable bacteriologic purity for imbibition purposes.
R 6

28,571
Berger, P.K., Matheny, W.G. & Newmiller, C.E. THE ROLE OF TRIAL IN THE ACCEPTANCE AND ADOPTION OF NEW EQUIPMENT. A REVIEW AND SUMMARY. FINAL REPORT. Contract NONR 4097(00), Rep. LS/TR 66 1, Aug. 1966, 73pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Life Sciences, Inc., Fort Worth, Tex.).

This report reviews 3 experiments and a substantial amount of related research literature concerned with the acceptance of innovations. The particular aim of this review is to consolidate information describing how trial usage or exposure can enhance the acceptability of new equipment developed for military utilization. The relations of individual differences to acceptance and adoption processes also are discussed. It is concluded that studies of acceptance behavior tend to be excessively restricted to specific products, personnel and situations. A more fruitful approach is believed to lie in systematic examinations of the acceptance-rejection processes and personal, attitudinal, and group variables which affect innovativeness.
R 37

28,572
Siegel, A.I., Lanterman, R.S., Platzer, H.L. & Wolf, J.J. TECHNIQUES FOR EVALUATING OPERATOR LOADING IN MAN-MACHINE SYSTEMS. DEVELOPMENT OF A METHOD FOR REAL TIME ASSESSMENT OF OPERATOR OVERLOADING. TECHNICAL REPORT. Contract NONR 2492(00), Jan. 1966, 81pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.). (AD 479045)

The logic involved in deriving certain constants, thought important for describing the human transfer function, is presented. Then an experiment investigating the effects of varying operator alertness level (sleep deprivation) on 2 of the constants is described and the results presented. In the experiment, Ss performed compensatory tracking and a series of cognitive and perceptual motor tasks at intervals over a 27 hour period of sleep deprivation. The results were not in accordance with the preexperimental hypothesis, which stated that the 2 constants derived should decrease as the alertness level decreased (increasing period of sleep deprivation). On the other hand, some relationship was found between one of the transfer function constants and the scores of the Ss on the accessory intellectual and cognitive tasks. Several possible explanations for the findings are presented.
R 8

28,573
Arde, Incorporated & Town & City, Incorporated. A STUDY OF THE OPTIMUM USE OF LAND EXPOSED TO AIRCRAFT LANDING AND TAKEOFF NOISE. Contract NAS 1 3697, NASA CR 410, March 1966, 140pp. National Aeronautics & Space Administration, Washington, D.C. (Arde, Inc., Paramus, N.J. & Town & City, Inc., Paramus, N.J.).

This report considers methods of alleviating the airport community noise problem by supplying guide lines for land use and building practices in noise affected areas near airports to reduce the area's sensitivity to noise. The report examines the legal, economic, and administrative aspects of such guidance. Various governmental units and special authorities can control land use and building through their power to enact and enforce zoning ordinances, building codes and housing codes; to acquire property by eminent domain; and to levy taxes on property. The Federal government and to some extent, states, will provide technical and financial assistance to communities for planning and executing land use control programs. The report considers the costs, technical possibilities, and limitations of noise-proof building construction to relieve the noise problem. Actions by airport authorities in dealing with property owners in noise affected areas are reviewed. Procedures are presented for estimating the expected noise exposure around airports based on projected flight schedules. Desirable land uses near airports are defined and listed. A hypothetical airport community situation is analyzed to show, by example, how the various land use control and building noise proofing techniques can be applied, and the cost of such application. The important elements of several significant law cases concerning noise affecting properties near airports are summarized.
R 164

28,574
Jackson, Margaret M. & Sears, C.W. EFFECT OF WEIGHTLESSNESS UPON THE NORMAL NYSTAGMIC REACTION. Aerospace Med., July 1966, 37(7), 719-721. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

20 individuals were subjected to manually imposed angular accelerations about the vertical axis during the weightless period of parabolic flight. Continuous electrooculographic recordings and infrared motion pictures of eye movements were obtained before, during, and after each rotational period. Rotations of the Barany chair and aircraft accelerations were also recorded. Control tests were conducted on the ground and in flight at 1 and 2 g's. The traces obtained were evaluated visually. Each S exhibited the nystagmic response both during and following rotation in weightlessness. This response appeared about the same as those recorded at 1 and 2 g's.
R 21

28,575
Dille, J.R. PULMONARY DISEASE IN GENERAL AVIATION. Aerospace Med., July 1966, 37(7), 732-735. (US Federal Aviation Agency, Los Angeles, Calif.).

Inflight cases of hypoxia and hyperventilation, and the reported prevalence of spontaneous pneumothorax (143), lobectomy (145), asthma (236), emphysema (38), bronchiectasis (9), bronchitis (9), and unclassified pulmonary diseases (91) among 288,000 active pilots with third class medical certificates are presented. The age relationship of chronic generalized obstructive lung diseases, the frequency of the presence of more than one of these diagnoses, the age distribution of active airmen over age 50, and the obvious underreporting of these conditions are also discussed. The lung volumes, lung capacities and pulmonary function tests are briefly described. There is a need for better detection and highly-individualized evaluation of civil airmen with pulmonary diseases.
R 3

28,576
Kramer, E.F., Jr., Hale, H.B. & Williams, E.W. PHYSIOLOGICAL EFFECTS OF AN 18-HOUR FLIGHT IN F-4C AIRCRAFT. Aerospace Med., Nov. 1966, 37(11), 1095-1098. (USAF 836th Tactical Hospital, MacDill AFB, Fla.).

Physiological assessment was performed by means of postflight urinalysis for 8 pilots who flew F-4C aircraft for 18 hrs. Flight effects were neither numerous nor of large magnitude, nor were the pilots unduly fatigued. The flight-induced, physiological changes included: a) increased 17-hydroxycorticosteroid excretion, which implies adrenocortical stimulation, and b) decreased excretion of uric acid, potassium and urine, which suggests metabolic depression.
R 15

28,577
Collins, W.E. VESTIBULAR RESPONSES FROM FIGURE SKATERS. Aerospace Med., Nov. 1966, 37(11), 1098-1104. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

Several professional figure skaters who, as part of their daily routine, subject themselves to strong semicircular canal stimuli, were given a series of laboratory tests consisting primarily of caloric irrigations and mild angular accelerations. Brisk nystagmus and clear turning sensations were consistent findings in total darkness. Motion pictures and telemetered eye-movement recordings were then obtained during and following the skaters' normal spins on ice. Mean peak velocities of 235-278 rpm were achieved by 4 of the skaters. Vigorous nystagmus and dizziness or turning sensations occurred following spins when visual fixation was not permitted. Loss of equilibrium and disorientation also occurred when the skaters attempted to maneuver after their spins without visual cues. The notion that complete suppression of vestibular responses occurs in figure skaters as a result of their repeated exposure to high velocity angular accelerations is not upheld by the present data. Implications of the data for medical evaluations and for problems in aerospace medicine are noted.
R 5

28,578
Sionim, A.R. WASTE MANAGEMENT AND PERSONAL HYGIENE UNDER CONTROLLED ENVIRONMENTAL CONDITIONS Aerospace Med., Nov. 1966, 37(11), 1105-1114. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

36 highly selected, young male Ss were utilized in a series of 9 6-week experiments. The effects of various experimental conditions on the nature of waste were evaluated to determine waste management criteria for space systems. No significant changes resulted from a dehydrated food diet, Evaluator confinement, wearing full pressure suits, and constant 32°C exposure. Fecal mass increased ($P < 0.05$) on liquid foods and on compressed, bite-sized food. On the latter diet, there was a highly significant ($P < 0.01$) increase in fecal fat and decrease in moisture, which with a very soft fecal consistency suggested steatorrhea. A high correlation (+0.82) existed between fecal and dietary fat for all experiments, less in the case of fiber and none for protein. The importance of these findings to waste management systems are discussed, as are differences found between individuals, between time periods, and intraindividual variations. The effects of minimal personal hygiene care and other experimental conditions were evaluated in these Ss. Lack of bathing and changing clothes caused no major problem. Body odor, strongest in axilla, groin and feet, heightened in 7-10 days in the Evaluator; response to odors subsided in the second week. 25% of the Ss had to trim their mustache due to lip irritation, whereas about half the Ss needed to trim their fingernails at or after the fourth week. The greatest effect was in dental health, with all Ss on substandard oral hygiene procedures developing varying degrees of gingivitis. Minimal hygiene during exposure to 2 32°C periods produced no major but a number of minor problems associated with much dryness of skin and scalp. Continuous wearing of full pressure suits was tolerated satisfactorily. Continuous wearing of electrodes caused varying degrees of skin irritation. Various waste management items were evaluated also.
R 13

28,579
Gray, T.H., Waller, T.G. & Wright, R.H. SPEED AND ACCURACY OF ADDITION IN NORMAL TIME AND DECIMAL TIME SYSTEMS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 17, Oct. 1966, 31pp. Human Resources Research Office, George Washington University, Alexandria, Va.

The study compared the efficiency of decimal and sexagesimal, or normal, time systems in the solution of addition problems, using the time required to reach a solution and the number of errors as dependent variables. 12 Ss solved sets of addition problems composed of 8, 16, or 24 digits, using the decimal and sexagesimal time systems. When the conversion process required by the sexagesimal system was included in the analysis, the results clearly showed that addition using the sexagesimal system required significantly more time (1 1/2 to 2 1/2 times as much) and produced significantly more errors (1 1/2 to 3 times as many). When the conversion process required by the sexagesimal system was excluded from the analysis, there was no significant difference between the 2 time systems on either dependent variable.
R 3

28,580
Hartman, B.O. & McKenzie, R.E. HANGOVER EFFECT OF SECOBARBITAL ON SIMULATED PILOTAGE PERFORMANCE. Aerospace Med., Nov. 1966, 37(11), 1121-1124. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A previous research study by one of the authors reported performance decrement in a simulated piloting task as a residual effect of secobarbital. This is a followup study to evaluate both the dose levels and the "hangover" effect without the complications of an extended "mission" and another drug (d-amphetamine) used in the previous design. The results on 64 Ss performing a simulated flying task for 4 hrs. under 1 of 4 treatment conditions (3.0 gr. of secobarbital, 1.5 gr. of secobarbital, placebo, or control) indicated that 3.0 gr. of secobarbital administered the previous evening 10 hrs. prior to the "flight" produced degraded performance with associated subjective reports of a "hangover" effect. No degradation of performance was obtained with a dose level of 1.5 gr.
R 1

28,581
Monty, R.A., Karsh, R. & Taub, H.A. PACED REHEARSAL IN SEQUENTIAL SHORT-TERM MEMORY. AMCMS Code 5011.11.84100, Tech. Memo. 12 66, Nov. 1966, 11pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

Ss were required to mentally keep track of the number of occurrences of each of 4 different symbols presented sequentially. It was found that a green light introduced into the sequence just prior to the presentation of each successive symbol tended to enhance performance. It was suggested that the light served to cue the Ss to complete rehearsal of the current state of the information in preparation for the next stimulus in the sequence.
R 4

28,582
Sells, S.B. A MODEL FOR THE SOCIAL SYSTEM FOR THE MULTIMAN EXTENDED DURATION SPACE SHIP. Aerospace Med., Nov. 1966, 37(11), 1130-1135. (Behavioral Research Institute, Texas Christian University, Fort Worth, Tex.).

The conditions of isolation, confinement, and other stresses to which extended duration space crews will be exposed are unprecedented and many of the problems are not yet understood Hypotheses directed toward principles to optimize crew organization and adaptation must be generated from present knowledge. Extrapolations might be attempted from various literature sources of human experience in extreme situations. However, the appropriateness of such generalization depends on the system similarity of the various situational contexts to that of the spaceship. A model social system for such microsocieties was constructed and system profiles of 11 well known systems patterns were compared with that postulated for the extended duration spaceship. Greatest similarity was found for submarines, exploration parties, naval ships and bomber crews, and least for shipwrecks and disasters, industrial work groups, and prison groups.
R 8

28,583
Beckman, E.L. & Reeves, E. PHYSIOLOGICAL IMPLICATIONS AS TO SURVIVAL DURING IMMERSION IN WATER AT 75° F. Aerospace Med., Nov. 1966, 37(11), 1136-1142. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

It has been determined in previously reported experiments that immersion at water temperatures of 75° F (23.8°C) may be limited by failure of the body's physiological compensatory mechanisms. This investigation was designed to study the physiological responses of Ss immersed to neck level in 75° F water for periods up to 12 hours. Measurements relating to the body loss of heat, energy, fluids, and electrolytes were obtained. It was found that a 12 hour period of immersion could not be tolerated by all of the Ss for various reasons: a) loss of body heat with a reduction in deep body temperature to below the predetermined limiting temperature of 95° F; b) extreme discomfort with muscle cramps following prolonged shivering; and c) decrease in blood glucose to levels below the predetermined limiting value of 60 mg per cent. The changes in blood morphology, blood electrolytes, oxygen utilization and urinary excretion during the period of immersion, in addition to the physiological changes which caused the termination of some experiments are directly related to tolerance of immersion. It was also found that some Ss experienced a significant adrenocortical stress response with subsequent adrenocortical insufficiency. These factors are of importance in survival from the involuntary immersion associated with disasters at sea.
R 12

28,584
Callin, G.D. & Kaufman, W.C. PHYSIOLOGICAL BASIS FOR A PASSIVE EXTRAVEHICULAR THERMAL CONTROL SYSTEM. Aerospace Med., Nov. 1966, 37(11), 1143-1147. (USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio).

Determinations of O_2 consumption during work simulating that to be expected in earth-orbital extravehicular activity indicate that 225-350 kcal/hr. is a reasonable requirement for metabolic heat removal. A passive heat transfer system was postulated for an extravehicular suit and found capable of dissipating heat production at these levels for missions of 3 hrs. or less.
R 7

28,585
Barber, M.R., Jones, C.K., Sisk, T.R. & Haise, F.W. AN EVALUATION OF THE HANDLING QUALITIES OF SEVEN GENERAL-AVIATION AIRCRAFT. NASA TN D 3726, Nov. 1966, 56pp. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

A quantitative and qualitative flight-evaluation program has been conducted on 7 late-model general-aviation aircraft. The quantitative portion of this program indicated that the aircraft, as a class, have generally satisfactory stability and control characteristics. However, these characteristics are degraded with decreasing airspeed, increasing aft center of gravity, increasing power, and extension of gear and flaps. The qualitative portion of the program showed that the handling qualities are generally satisfactory during visual flight and during instrument flight in smooth air. Atmospheric turbulence degrades these handling qualities, with the greatest degradation noted during instrument landing system approaches. Such factors as excessive control-system friction, low levels of static stability, high adverse yaw, poor Dutch roll characteristics, and control-surface float combine to make precise instrument tracking tasks, in the presence of turbulence, difficult even for experienced instrument pilots. The program revealed 3 characteristics of specific airplanes that are considered unacceptable if encountered by the inexperienced or unsuspecting pilot: a) a violent elevator force reversal at reduced load factors in the landing configuration; b) power-on stall characteristics that culminate in rapid rolloffs and/or spins; and c) neutral-to-unstable static longitudinal stability at aft center of gravity.
R 12

28,586
Newsom, B.D. & Brady, J.F. A COMPARISON OF PERFORMANCES INVOLVING HEAD ROTATIONS ABOUT Y & Z CRANIAL AXES IN A REVOLVING SPACE STATION SIMULATOR. Aerospace Med., Nov. 1966, 37(11), 1152-1157. (Manned Spacecraft Center, NASA, Houston, Tex.).

A Manned Revolving Space Station Simulator was used to investigate the disorientation and resultant performance degradation that occur when head turns are made in planes inclined to the spin plane. It was found that during rotation Y axis head turns were less traumatic than Z axis head turns. At 12.2 rpm, Ss were able to perform satisfactorily with head movements at 45° to the spin plane when made about the Y axis but not about the Z axis. This suggests that in spacecraft to be rotated for the purpose of creating an artificial gravity displays arranged vertically within 45° of visual centerline on leading or trailing bulkheads would be desirable.
R 13

28,587
McConville, J.T. & Hertzberg, H.T.E. A STUDY OF ONE-HANDED LIFTING. FINAL REPORT. Contract AF 33(616) 6792, Proj. 7184, Task 718408, AMRL TR 66 17, May 1966, 24pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Antioch College, Yellow Springs, Ohio).

This research study is intended to aid in establishing realistic criteria for size and weight of industrial packages. Size and weight, objective and subjective factors that potentially affect human weight-lifting, and proper approach to the design of industrial loads are discussed. Additional programs of investigation that would clarify other aspects of the problem are outlined. This study examined the interaction of 2 variables--weight and width--of one-handled, symmetrical boxes that a sample of 30 adult males were able to lift from the floor to a table 30 inches high. No carrying was involved. The subject sample was chosen to be a reasonable representation by height and weight of the U.S. Air Force population. All lifts were made with the preferred hand under "ideal" laboratory conditions. Box width was varied from 6 to 32 inches. The maximum weight of box that Ss were able to lift varied linearly, but inversely, with the width of the box. From this sample, the maximum weight that 95% of the population would be able to lift--but not necessarily carry--can be expressed by a linear equation: $Y = 60 - X$, where Y is the weight (in pounds) of the package to be lifted and X is the width (in inches). The numerical values of this formula provide a recommended upper limit on the design of industrial or military equipment which must be lifted under ideal conditions. If the expected conditions of use are less than ideal, or if carrying for appreciable distances is likely to be necessary, reasonable reductions in weight, or size, or both should be made by the manufacturer.
R 9

28,588
Harris, C.W., Shields, J.L. & Hannon, J.P. ACUTE ALTITUDE SICKNESS IN FEMALES. Aerospace Med., Nov. 1966, 37(11), 1163-1167. (USA Medical Research & Nutrition Lab., Fitzsimmons Army Hospital, Denver, Colo.).

An evaluation of symptomatic responses of 8 college females to high altitude exposure was conducted at Pikes Peak, Colorado (altitude 14,110 ft.). Significant illness occurred during the first 4 days at altitude, with the predominant complaints being headache, drowsiness, fatigue and insomnia. Only minimal gastrointestinal and cardiorespiratory symptoms were noted. A reduction in blood pressure and elevation of resting pulse and respiratory rate was observed. The electrical activity and x-ray appearance of the heart remained within normal limits during the 10-week stay. Menstrual changes at altitude consisted of decreased flow in 5 girls. The response of several medications given for the symptoms of altitude sickness was evaluated.
R 27

28,589
Cardus, D. EFFECTS OF 10 DAYS RECUMBENCY ON THE RESPONSE TO THE BICYCLE ERGOMETER TEST. Aerospace Med., Oct. 1966, 37(10), 993-999. (Texas Rehabilitation & Research Institute, Houston, Tex.).

Eleven healthy men were submitted to 3 periods of 10 days bed recumbency with intervening 3-week periods of normal activities. In one of the bed recumbency periods the Ss were submitted to bed rest alone. In another period, half of the Ss followed a program of muscular exercises with limited movement and the other half a program of intermittent venous occlusion in the lower extremities. In the third bed recumbency period, the treatments were switched. Bicycle ergometer tests were conducted before and after bed recumbency periods. Heart rate, pulmonary ventilation and metabolic gas exchange measurements were done at different work load levels. After bed recumbency the heart rate at rest and during exercise was higher than before bed recumbency. The oxygen intake at the heart rate of 160 was diminished after bed recumbency. No changes were observed in pulmonary ventilation, frequency of breathing and mechanical efficiency. The effect of muscular exercises and intermittent venous occlusion as preventative treatments for the altered heart rate response observed after bed recumbency seemed to be different for the 2 groups of Ss. Possible interpretations of this observation are discussed.
R 10

28,590
Glenn, W.G. & Garcia, C.F. NORMAL HUMAN SERUM PARAMETERS FOR SIMULATED ALTITUDE AND AEROSPACE FLIGHTS. I. ESTIMATION OF CHANGE IN SERUM PROTEIN CONCENTRATION. Aerospace Med., Oct. 1966, 37(10), 1000-1003. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

In future aerospace flights, it should be and will be essential to establish that changes in serum protein concentration over time are outside the expected changes under normal stress. Such information cannot be obtained from normal range values. From 240 samples, representing 3 serum samples per week on each of 20 male Ss for 4 weeks, serum protein determinations coupled with statistical treatment established that with 95 per cent confidence, 95 percent of the differences between serum protein concentrations on the same S under normal stress will be within ± 1.57 per cent protein of the previous concentration. These data are based on a longitudinal sampling of a male population selected by criteria appropriate for aerospace endeavors. The data are pertinent for comparison with studies of human sera from Ss exposed to simulated altitude and aerospace flights in the absence of longitudinal preflight characterization.
R 5

28,591
Glenn, W.G. & Marable, I.W. NORMAL HUMAN SERUM PARAMETERS FOR SIMULATED ALTITUDE AND AEROSPACE FLIGHTS, II. ESTIMATION OF CHANGE IN ALBUMIN, GAMMA GLOBULIN, ALBUMIN/GAMMA GLOBULIN RATIO, AND A/G RATIO. Aerospace Med., Oct. 1966, 37(10), 1004-1007. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

This report provides essential guidelines whereby the flight surgeon remotely monitoring sera from Ss exposed to simulated altitude or from astronauts can determine when a subject is undergoing statistically significant changes in serum values. Especially are these guidelines needed in the absence of a longitudinal pre-flight study of the subject(s). Albumin and γ globulin concentrations, albumin/γ globulin ratios, and albumin/globulin ratios, are considered for a population sampling of 20 normal males, each contributing 3 samples a week for 4 weeks. The result is a tolerance interval on each variable which includes 95 per cent of the changes-with 95 per cent confidence - between 2 readings taken on different days on a given individual.
R 14

28,592
Smith, K.J. NUTRITIONAL EVALUATION OF A PRECOOKED DEHYDRATED AND BITE-SIZED COMPRESSED FOOD DIET AS SOLE SOURCE OF NUTRIMENT FOR SIX WEEKS. FINAL REPORT. Contract AF 33(657) 11716, Proj. 7164, Task 716405, AMRL TR 66 3, July 1966, 37pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Miami Valley Hospital, Dayton, Ohio).

A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The 42-day experiment reported herein was designed to evaluate nutritionally an experimental diet composed of precooked dehydrated and bite-sized compressed foods. Organoleptically, the experimental diet was highly acceptable. The food items did not become less acceptable after having been served repeatedly or a long period of time. The nutritional balance data show that the experimental diet was highly utilized and that it efficiently maintained the Ss for the duration of the experiment. The confinement of the Ss for 28 days in the Aerospace Medical Research Laboratories Life Support Systems Evaluator did not affect S body weight, nutrient balance, digestion, or water balance. No abnormal hematological or physiological measurements were recorded as a result of subsisting on the experimental diet.
R 19

28,593
Denison, D.M., Ledwith, F. & Poulton, E.C. COMPLEX REACTION TIMES AT SIMULATED CABIN ALTITUDES OF 5,000 FEET AND 8,000 FEET. Aerospace Med., Oct. 1966, 37(10), 1010-1013. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Light work was performed on a bicycle ergometer in a decompression chamber while carrying out spatial transformations on pictures of a man in 1 of 4 orientations. At a pressure equivalent to a height of 8,000 ft., 4 laboratory personnel breathing air started by responding more slowly and more variably ($p<.02$ in each case) than 4 matched personnel breathing an enriched mixture providing the sea-level partial pressure of O_2, while 3 out of 10 apprentices started by responding randomly. Even at 5,000 ft., 8 apprentices started by responding more slowly ($p<.05$) than 9 matched apprentices breathing the enriched mixture. After practice these relatively mild degrees of hypoxia had no reliable effect upon performance. Conclusion: mild hypoxia affected performance while the task was being learned, but not after practice.
R 12

28,594
Shephard, R.J. DYNAMIC CHARACTERISTICS OF THE HUMAN AIRWAY AND THE BEHAVIOR OF UNSTABLE BREATHING SYSTEMS. Aerospace Med., Oct. 1966, 37(10), 1014-1021. (Chemical Defence Experimental Establishment, Ministry of Defence, Salisbury, England).

Experiments involving rapid repetitive interruption of airflow in man, and the behavior of electrical and mechanical analogues of the respiratory tract are discussed in relation to the problem of unstable breathing systems. The impedance characteristics of the human respiratory system (total impedance, phase shift, damping ratio, and resonant frequency) are defined, and the influence of these mechanical characteristics on externally imposed oscillations is considered. The adverse effects of an unstable breathing system are discussed, and possible modifications in the breathing system that would reduce instability are examined from the human standpoint. The design of a "test-rig" to simulate the human element of the unstable system is briefly considered.
R 23

28,595
Maulsby, R.L. ELECTROENCEPHALOGRAM DURING ORBITAL FLIGHT. Aerospace Med., Oct. 1966, 37(10), 1022-1026. (Physiology Dept., Baylor University College of Medicine, Houston, Tex.).

The electroencephalogram of Command Pilot Frank Borman was recorded continuously during the first 2 days of the Gemini VII flight in December, 1965. This first U.S. attempt to record EEG during orbital flight was designed to study sleep cycles during flight and to assess the effect of "weightlessness" upon the electrical activity of the brain. This report gives the technique used and the preliminary results of visual interpretation of the record. The recording was of good technical quality. The 2 sleep periods which occurred during the record were evaluated visually for depth of sleep versus time on a minute-to-minute basis. The first sleep period was found to be inadequate in terms of depth and length, but the second sleep period was normal. The tracing during the alert state, including ascent and orbital flight, showed no pathological changes and no definite alterations which could be attributed to "weightlessness". It is concluded that these preliminary results confirm the view that orbital flight has no apparent deleterious effect on cerebral functions.
R 4

28,596
Hauty, G.T. & Adams, T. PHASE SHIFTS OF THE HUMAN CIRCADIAN SYSTEM AND PERFORMANCE DEFICIT DURING THE PERIODS OF TRANSITION: II. WEST-EAST FLIGHT. Aerospace Med., Oct. 1966, 37(10), 1027-1033. (Psychology Dept., University of Delaware, Newark, Del. & Physiology Dept., Michigan State University, East Lansing, Mich.).

At periodic intervals throughout the day, biomedical assessments were made during the week prior to jet flight to Rome, throughout a 12-day layover period in Rome, and during the week following return to Oklahoma City. Completion of the primary shift of phase of the circadian periodicity manifested by internal temperature and heart rate required from 4-6 days and 6-8 days, respectively. Increase in subjective fatigue occurred during the primary period of transition and following return to the environment of origin but psychological performance was not impaired to any statistically significant extent during either of these periods. Compared to the time lag of the physiological phase shift, the duration of subjective fatigue was very short. Comparison of these results with those obtained from a previous East-West flight did not reveal striking bidirectional differences save for the possible exception of psychological performance which was significantly impaired in the case of the East-West flight.
R 5

28,597
Lane, N.E. ANALYSIS OF QUALITATIVE DATA IN THE BIOLOGICAL SCIENCES. Aerospace Med., Oct. 1966, 37(10), 1033-1036. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

The development of computers has made possible the analysis of the complex interrelationships of relatively large numbers of variables. In order to use regression or multiple correlation techniques, the data from these variables must be meaningfully quantified. The raw data in medical and biological studies, however, are often expressed as categories (such as diagnoses) or in purely qualitative form (such as the presence or absence of a symptom). This paper describes a method of converting such categorical or qualitative data into a series of so-called "pseudo-variables," which permits their inclusion in correlational analysis and prediction studies. Examples illustrate the method as applied to a study of the relationships of occupation and cholesterol level. Extensions of the technique and additional applications are suggested.
R 6

28,598
Brigden, W.H. & Roman, J. FLIGHT RESEARCH PROGRAM: IV. A SMALL GAS ANALYZER FOR AEROSPACE. Aerospace Med., Oct. 1966, 37(10), 1037-1040. (Flight Research Center, NASA, Edwards AFB, Calif.).

Miniaturized mass spectrometers suitable for medical work are new. Indeed, the feasibility of the concept is not generally acknowledged. Because of this, the NASA Flight Research Center double-focusing mass spectrometer was extensively tested in the laboratory. The instrument weighs 28 lbs. and measures 10 x 10 x 11 in. in a configuration suitable for use in spacecraft. It can continuously monitor the partial pressure of 12 gases with a response time of from 30 to 50 msec. It can scan the entire mass range from mass 3 to mass 100 with considerably longer response time. Simplicity of operation, accuracy, and stability of this mass spectrometer make it highly suitable for medical work, not only in the laboratory but in flight as well. In its present form, it is not suitable for determining the presence of trace components.

28,599
Macklin, M. WATER HANDLING IN THE ABSENCE OF GRAVITY. Aerospace Med., Oct. 1966, 37(10), 1040-1045. (Thompson Ramo Wooldridge Incorporated, Redondo Beach, Calif.).

The problem of collecting humidity control condensate, urine and feces; controlling water flow in showers; and washing clothes in the absence of gravity are discussed in terms of the practical and theoretical problems in space vehicles due to the absence of gravitational field. For use in the absence of gravity 2 approaches for air-water separation are described: creation of a centrifugal force field with rotation, or the use of static impingement separation. Examples of the former are cyclone separators and rotating impeller separators. The latter types include sponge and wick separators and the recently developed packed bed, porous plate water separator. The static separators are particularly attractive since they require a minimum of power and have high inherent reliability. An analysis of the porous plate separator is presented in terms of dimensionless numbers.
R 17

28,600
Prescott, E.J. & Wortz, E.C. METABOLIC COSTS OF UPPER TORSO EXERCISES VS TORQUE MANEUVERS UNDER REDUCED-GRAVITY CONDITIONS. Aerospace Med., Oct. 1966, 37(10), 1046-1049. (AiResearch Manufacturing Company, Garrett Corporation, Los Angeles, Calif.).

The object of the present study was to determine whether metabolic requirements for upper torso activity under reduced-gravity conditions would parallel those for walking under reduced-gravity conditions. The results showed that torque maneuvers increased O_2 consumption as the force of gravity was reduced, but that exercises caused no significant change in O_2 consumption with changes in the level of the force of gravity. Also, no significant difference was observed between O_2 consumption at rest at 1 g and at rest at reduced gravity. The observed differences in metabolic rate during exercise as opposed to those during torque maneuvers lead to the tentative conclusion that metabolic work penalties usually reported for low-traction environments apply to external work only.
R 8

28,601
Stevens, P.M., Lynch, T.N., Johnson, R.L. & Lamb, L.E. EFFECTS OF 9-ALPHAFLUROHYDROCORTISONE AND VENOUS OCCLUSIVE CUFFS ON ORTHOSTATIC DECONDITIONING OF PROLONGED BED REST. Aerospace Med., Oct. 1966, 37(10), 1049-1056. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of 9-alphaflurohydrocortisone and venous occlusive cuffs on the plasma volume and orthostatic tolerance were evaluated following 28 to 78 days of bed rest. In 5 Ss the plasma volume and orthostatic tolerance were decreased after 29 days of bed rest, and no further change occurred up to 50 days. Venous occlusive cuffs inflated around the upper thighs of 4 Ss for 16 hrs. a day during the last 2 days of a 30-day period of bed rest, restored plasma volume but had no significant effect on orthostatic tolerance. Oral administration of 9-FF 2 mg/day for 2 to 4 days following either 43, 53, or 74 days of bed rest caused complete repletion of plasma volume, but orthostatic intolerance persisted.
R 19

28,602
Gibbons, H.L., Ellis, J.W., Jr. & Plechus, Judith L. MEDICAL FACTORS IN 1964/1965 FATAL AIRCRAFT ACCIDENTS IN THE SOUTHWEST. Aerospace Med., Oct. 1966, 37(10), 1057-1060. (US Office of Regional Flight Surgeon, FAA, Fort Worth, Tex.).

A nationwide study of 1963 fatal general aviation accidents with a 30% sampling revealed 35.4% of the cases studied to have alcohol involvement. Medical investigation of fatal general aviation accidents in the Federal Aviation Agency's Southwest Region during 1964 and 1965 revealed measurable blood alcohol in 30.8% of the cases studied. This represents a 72% sampling of 162 fatal accidents. On 28% of the fatal accidents studied, blood alcohol was over 50 mg per 100 ml. In 2 cases, otherwise unremarkable levels of hypoxia plus CO were thought to have been potentiated by alcohol. The combined effects of drugs, fatigue, alcohol, hypoxia, and other factors generally not recognized by an automobile-orientated public are considered to be a significant hazard in air transportation.
R 10

28,603
Blanc, C., Lafontaine, E. & Medvedeff, M. RADIOTELEMETRIC RECORDINGS OF THE ELECTROENCEPHALOGRAMS OF CIVIL AVIATION PILOTS DURING FLIGHT. Aerospace Med., Oct. 1966, 37(10), 1060-1065. (Central Medical Dept., Compagnie Nationale, Air France, Paris, France).

Continuous radio telemetric recordings of the pilots' EEG activities have been obtained on long duration flights between Paris and Rio de Janeiro. Many technical difficulties had to be overcome before we could record EEG tracings of correct quality without too many artifacts. Today, brain radiotelemetry provides us with an objective method allowing the study of neurophysiological wakefulness of pilots during flight.
R 2

28,604
Vogt, F.B. AN OBJECTIVE APPROACH TO THE ANALYSIS OF TILT TABLE DATA. Aerospace Med., Dec. 1966, 37(12), 1195-1204. (Texas Rehabilitation & Research Institute, Texas Medical Center, Houston, Tex.).

An objective approach for the analysis of data from tilt table studies is presented. Utilization of minute-by-minute measurements of heart rate and blood pressure during a tilt table procedure forms the basis for definition of measurements and derived values which represent an expression of the tilt response of an individual. The analytic technique utilizes computers to provide graphic displays, tabular displays, and statistical analyses. This analytic approach is an attempt to provide a valid method to define the characteristics of cardiovascular deconditioning resulting from bedrest, water immersion, and space flight. Such objective and statistical expressions of the characteristics of tilt table data provide a means to define the degree of deconditioning for a given test circumstance and allow comparison of various tilt data with control data on the same subjects.
R 34

28,605
Whitted, J.H., Jr., Weaver, E.E. & Foley, J.P., Jr. DEVELOPMENT AND EXPERIMENTAL EVALUATION OF AN AUTOMATED MULTI-MEDIA COURSE ON TRANSISTORS, FINAL REPORT. Contract AF 33(615) 2880, Proj. 1710, Task 171007, AMRL TR 66 142, Sept. 1966, 105pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (RCA Service Co., Radio Corporation of America, Camden, N.J.).

A completely automated multi-media self-study program for teaching a portion of electronic solid-state fundamentals was developed. The subject matter areas included were fundamental theory of transistors, transistor amplifier fundamentals, and simple mathematical analysis of transistors including equivalent circuits, parameters, and characteristic curves. The media included a tape slide audio-visual presentations, a programmed text, a cued text, a sound movie, a workbook, and a RCA transistor trainer. A controlled experiment was conducted, comparing the effectiveness of the self-sufficient multi-media materials, with a conventional instructor/classroom presentation and existing self-study materials from Air Force Extension Course Institute. Even though the instructor/classroom Ss received somewhat higher ratio gain scores, on the average, than the multi-media Ss, this difference was not significant. Both of these modes were superior in effectiveness to the extension course materials. The principal measures of this effectiveness were a pre-test and a post-test made up of multiple choice items concerning the solid state theory covered.

28,606
Kubicek, W.G., Karnegis, J.N., Patterson, R.P., Witsoe, D.A., et al. DEVELOPMENT AND EVALUATION OF AN IMPEDANCE CARDIAC OUTPUT SYSTEM. Aerospace Med., Dec. 1966, 37(12), 1208-1212. (University of Minnesota Medical School, Minneapolis, Minn.).

A 4 electrode impedance plethysmographic system was developed which apparently monitors right heart ventricular output. 2 band electrodes were placed around the S's neck, a third band around the thorax at the level of the xiphisternal joint, and the fourth around the abdomen. The upper neck electrode and abdomen electrode were excited by a 100 kHz constant sinusoidal current and the resultant voltage (impedance) changes occurring with the cardiac cycle were monitored from the inner 2 electrodes. Stroke volume was calculated from the impedance change information using a formula relating impedance changes to volume changes in a conducting solid. A comparison study with simultaneous impedance and dye dilution measurements under rest and exercise conditions was carried out on 10 healthy young adult males. Preliminary results indicate that the impedance method predicts relative changes (ratios) in cardiac output with an accuracy of ±16% with 95% confidence.
R 8

28,607
Roman, J. & Brigden, W.H. FLIGHT RESEARCH PROGRAM: V. MASS SPECTROMETER IN MEDICAL MONITORING. Aerospace Med., Dec. 1966, 37(12), 1213-1217. (Flight Research Center, NASA, Edwards AFB, Calif.).

Mass spectrometers, traditionally large and complicated instruments, have been miniaturized and greatly simplified for the National Space Program. This recent development opens new areas to medicine and to space medicine in particular. The principles of operation of mass spectrometers will soon be important to those engaged in physiological research or in medical monitoring. They are discussed in this paper. A summary of flight test data obtained with a small mass spectrometer in a jet aircraft is presented.
R 4

28,608
Wortz, E.C. & Prescott, E.J. EFFECTS OF SUBGRAVITY TRACTION SIMULATION ON THE ENERGY COSTS OF WALKING. Aerospace Med., Dec. 1966, 37(12), 1217-1222. (AiResearch Manufacturing Company, Garrett Corporation, Los Angeles, Calif.).

A series of experiments was conducted to determine the effects of subgravity traction on metabolic rates during walking on a treadmill. The simulated subgravity tractions were 1/4 g, 1/6 g, and 1/8 g on each of 2 simulators. Systematic reduction in the energy cost of walking was observed with simulated reduction in S weight and traction. The change in energy expenditure for simulated 1/6 g was found to be a 32% reduction for a 2 mph walk and 56% reduction for a 4 mph walk for Ss wearing street clothing. A 3 dimensional analysis of variance performed on the data revealed a significant interaction effect between the level of traction simulated and the amount of work performed which suggests that the validity of extrapolation of metabolic rate data will be heavily influenced by the adequacy of simulation.
R 7

28,609
USAF Aerospace Medical Research Laboratories. PROCEEDINGS OF THE 2ND ANNUAL CONFERENCE ON ATMOSPHERIC CONTAMINATION IN CONFINED SPACES 4 AND 5 MAY 1966. Contract AF 33(657) 11305, Proj. 6302, AMRL TR 66 120, Dec. 1966, 314pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.

This report is a complete compilation of the papers presented and the Proceedings of the 2nd Annual Conference on Atmospheric Contamination in Confined Spaces, sponsored by the Aerospace Medical Research Laboratories and held in Dayton, Ohio on 4 and 5 May 1966. Major technical areas discussed by the invited speakers, members of the Open Forum, and Conference attendees included toxicology of space cabin materials, comparative toxicology and pathology of oxygen, and the effects of oxygen on contaminant toxicity.
R Many

28,610
Clark, D.C. & Kroll, J. GENERAL PURPOSE AIRBORNE SIMULATOR - CONCEPTUAL DESIGN REPORT. Contract NAS 4 607, NASA CR 544, Aug. 1966, 209pp. National Aeronautics & Space Administration, Washington, D.C. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

This report goes into the various design considerations required for the airborne simulator, namely: the longitudinal control loops, lateral-directional control loops, analog computer aspects, estimated performance limits, and control system considerations. It is felt that a model-controlled system will obviate some of the faults (such as difficulty of calibration) of a response-feedback control system.
R 9

28,611
Chase, G.A., Grave, C. & Rowell, L.B. INDEPENDENCE OF CHANGES IN FUNCTIONAL AND PERFORMANCE CAPACITIES ATTENDING PROLONGED BED REST. Aerospace Med., Dec. 1966, 37(12), 1232-1238. (Boeing Company, Seattle, Wash.).

Eighteen young men were studied before and after 15 and 30 days bed rest to examine the effects of absolute bed rest and recumbent exercise during bed rest on the pulse rate response to submaximal work, cardiovascular functional capacity (max $\dot{V}o_2$), physical work capacity, and orthostatic tolerance. Changes in the submaximal pulse rate as a result of the conditions of this study did not predict the trend in either the work capacity or max $\dot{V}o_2$ whereas, changes in work capacity occurred independently of changes in max $\dot{V}o_2$ and vice versa. The highest $\dot{V}o_2$ attainable during exercise to exhaustion on a bicycle ergometer underestimated max $\dot{V}o_2$ 4 to 23 percent. When recumbent exercise was carried out during bed rest, the difference in the highest $\dot{V}o_2$ attainable on a bicycle ergometer and the max $\dot{V}o_2$ was decreased after bed rest by an increment in $\dot{V}o_2$ during the bicycle test. Unless max $\dot{V}o_2$ was increased during bed rest, Ss had decreased adaptability to posture afterward.
R 37

28,612
Kaufman, W.C. & Pittman, J.C. A SIMPLE LIQUID TRANSPORT COOLING SYSTEM FOR AIRCREWMEMBERS. Aerospace Med., Dec. 1966, 37(12), 1239-1243. (USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio).

A water-cooled vest through which icewater was circulated, was evaluated as a means of reducing thermal strain in aircraft operated in hot humid climates. In 2 hour exposures to an environment of 46.5 C with a water vapor pressure of 15mm. Hg, the vest reduced sweat production by 59%. Relative thermal comfort was provided by melting 2 to 3 kg ice per manhour.
R 12

28,613
Batteau, D.W., Fisher, H.G., Robinson, H. & van Lennep, W. A STUDY OF ACOUSTICAL MULTIPATH SYSTEMS. SECTION I. THEORY AND PROGRAM. SECTION II. SUBJECTIVE TESTING. SECTION III. APPARATUS AND DEVICES. FINAL REPORT. Contract NONR 494(00), June 1966, 43pp. USN Office of Naval Research, Washington, D.C. (Mechanical Engineering Dept., Tufts University, Medford, Mass.)

This document is concerned with an investigation of the effects of multiple paths on acoustical signals as related to speech recognition and improvement of signal-to-noise ratios. The first section is concerned with theory, the second section with the subjective testing program, and the third with the devices and apparatus used in the experiments.

28,614
McCally, M., Plemme, T.E. & Murray, R.H. TILT TABLE RESPONSES OF HUMAN SUBJECTS FOLLOWING APPLICATION OF LOWER BODY NEGATIVE PRESSURE. Aerospace Med., Dec. 1966, 37(12), 1247-1249. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Orthostatic tachycardia and hypotension are known consequences of bed rest in normal Ss. This response is felt to follow from the reduction in plasma volume accompanying the salt and water diuresis of recumbency. Similar effects are felt to result from zero gravity during manned space flight. Lower body negative pressure (LBNP) has been suggested as a countermeasure to such adverse effects of weightlessness. Tilt table test responses were measured in 6 Ss after exposure to 2 conditions of LBNP. 6 hours of intermittent (1 min. on, 1 min. off) LBNP (55 mm. Hg) prevents the orthostatic tachycardia of 6 hours of bed rest. A continuous 90 min. LBNP (30 mm. Hg) exposure improves the tilt response to better than control values. These data support the proposal that LBNP may be useful in maintaining the orthostatic tolerance of confined and weightless astronauts.
R 7

28,615
Borsky, P.N. COMMUNITY REACTIONS TO SONIC BOOMS IN THE OKLAHOMA CITY AREA. VOLUME III. QUESTIONNAIRES. APPENDIX TO VOLUME II. FINAL REPORT. Contract AF 33(657) 11148, Proj. 7231, Task 723103, AMRL TR 65 37, March 1966, 58pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (National Opinion Research Center, University of Chicago, New York, N.Y.).

This appendix (see also HEIAS 26,142) contains samples of questionnaires used during the interviews that took place from February to July 1964 in the Oklahoma City, Oklahoma, area. That area was repeatedly exposed to sonic booms generated to simulate overpressure levels that are expected for supersonic transport overflights. The schedule provided for 8 sonic booms per day. During the 6-month period, almost 3,000 local residents were interviewed 3 times to determine the nature and extent of their reactions to the sonic booms.

28,616
Plemme, T.E., McCally, M. & Hyde, A.S. RENAL RESPONSE TO +Gz GRADIENT ACCELERATION IN MAN. Aerospace Med., Dec. 1966, 37(12), 1253-1256. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Weightlessness is accompanied by an hyposthenuric diuresis and consequent loss of total blood volume. This response is presumably mediated by atrial stretch receptors sensing engorgement of the central circulation consequent to the loss of the gravitational hydrostatic column of blood. On-board, short radius centrifugation has been suggested as a countermeasure to this adverse effect of zero gravity. Effectiveness of a countermeasure rests upon the demonstration of antidiuresis and retention of fluid volume. 5 water loaded Ss have been exposed to short radius +Gz acceleration of graded magnitude up to 3G. Free water clearance decreased with increasing G-load from a control mean of +2.8 cc/min to -0.5 cc/min at 3G. Creatinine clearance was unaffected as a function of acceleration. The results imply that acceleration impairs the ability to excrete a water load, and further, that the response is mediated by antidiuretic hormone. This is to be expected on the basis of the Henry-Gauer blood volume control mechanism. The results do not imply that acceleration is the best method of achieving blood volume control during space flight. Other methods of peripheral pooling of blood require investigation.
R 28

28,617
Hauty, G.T. & Adams, T. PHASE SHIFTS OF THE HUMAN CIRCADIAN SYSTEM AND PERFORMANCE DEFICIT DURING THE PERIODS OF TRANSITION: III. NORTH-SOUTH FLIGHT. Aerospace Med., Dec. 1966, 37(12), 1257-1262. (University of Delaware, Newark, Del. & Michigan State University, East Lansing, Mich.).

At periodic intervals throughout the biological day, biomedical assessments were made for a week prior to jet flight to Santiago, for 12 days in Santiago, and for a week following return to Washington, D.C. From a comparison of these data with those obtained from the East-West and West-East flights, the following conclusions were drawn: While the East-West and West-East flights effected a primary shift of phase of circadian periodicity manifested by the physiological functions, the North-South flight did not. This latter flight, however, did produce a significant increment of subjective fatigue as did the other 2 flights but was not followed by a significant performance deficit.
R 6

28,618
Zumoff, B. & Smith, S.M. EVALUATION OF VASOMOTOR INSTABILITY BY MEANS OF THE BLOOD PRESSURE RESPONSE TO CAROTID SINUS PRESSURE. Aerospace Med., Dec. 1966, 37(12), 1262-1266. (USAF Flight Surgeon's Office, Lackland AFB, San Antonio, Tex.).

The blood pressure response to carotid sinus pressure was studied in normal Ss and in Ss with vasomotor instability, in an effort to delineate quantitative criteria for separating the latter group from normals. It was found that the diastolic blood pressure response was of no diagnostic value whereas a useful distinction could be made on the basis of the systolic blood pressure response. 46% of the abnormals fell outside the normal range (mean $\pm$ 2 S.D.). It is concluded that any S whose systolic blood pressure falls 36 mm. Hg or more, after pressure on either carotid sinus, can be considered as manifesting vasomotor instability.

28,619
McIver, R.G. & Kronenberg, R.S. TREATMENT OF ALTITUDE DYSBARISM WITH OXYGEN UNDER HIGH PRESSURE; REPORT OF THREE CASES. Aerospace Med., Dec. 1966, 37(12), 1266-1269. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

3 new cases of altitude decompression sickness not responding to descent to ground level are reported. They were treated effectively with a 100% O_2 breathing 41.4 psia. Pressure of relief of symptoms for all known instances in which increased barometric pressures were used for treatment are compared. There are indications that other factors in addition to the physical presence of bubbles are involved in the production of symptoms.
R 16

28,620
Levinson, J. ONE-STAGE MODEL FOR VISUAL TEMPORAL INTEGRATION. J. Opt. Soc. Amer., Jan. 1966, 56(1), 95-97. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Many characteristics of visual temporal integration, found in both psychophysics and physiology, have been thought of as arising from a number of cascaded integrations, or exponential delays. As an alternative, a single process is proposed which has a temporal response identical with that of the many-stage model. This process is readily visualized as taking place within a single receptor cell. It consists of a number of subprocesses, the number being proportional to the number of photons absorbed. Each subprocess consists of 3 steps: a) initiation by photon absorption; b) counting of a series of random events; and c) emission of a signal when the count reaches a specific number. Response is taken to be the summation of all the signals produced by the subprocesses. Temporal delay and spread of the response is entirely attributed to the time required to accumulate the independent random events of step (b). Possible physiological correlates of the 3 steps are touched on, but only speculatively.
R 9

28,621
Rushton, W.A.H. & Gubisch, R.W. GLARE: ITS MEASUREMENT BY CONE THRESHOLDS AND BY THE BLEACHING OF CONE PIGMENTS. J. Opt. Soc. Amer., Jan. 1966, 56(1), 104-110. (Physiological Lab., University of Cambridge, Cambridge, England).

The visual threshold of the fovea is raised by a surrounding "glare" ring of bright light. If this is due entirely to scattered light, then the equivalent uniform background that raises the threshold equally will bleach the cone pigments equally. The equivalence of bleaching was measured by 2 different techniques: retinal densitometry, and the effect on subsequent dark adaptation. Both agree that the background which matches the glare in raising the threshold for foveal cones also matches it (correct to 0.1 log unit) in bleaching the pigment in those same cones.
R 19

28,622
Connors, Mary M. EFFECT OF WAVELENGTH AND BANDWIDTH OF RED LIGHT ON RECOVERY OF DARK ADAPTATION. J. Opt. Soc. Amer., Jan. 1966, 56(1), 111-115. (USN Medical Research Lab., New London Submarine Base, Groton, Conn.).

Recovery curves were run following 1- and 5-min. adaptation to wavelengths ranging from 595 to 670 mμ taken at 15-mμ intervals at a luminance of 100 ft.-L. The effects of near-monochromatic and broad bandwidths were investigated. Recovery curves are in terms of time necessary to return to a predetermined dark-adapted threshold and to stated values above that threshold. After 1 min. of adaptation to a light of 610mμ, recovery is faster than after exposure to an equally bright light of 595 mμ. Lengthening the wavelength causes no further reduction in recovery time. After 5 min. of similar adaptation, recovery time is progressively shortened by lengthening the wavelength to 640 mμ. Further increases in wavelength result in recovery times equivalent to those of the 640-mμ adaptation. Spreading the bandwidth from near monochromatic to 30 mμ has no effect on subsequent recovery, although further broadening the bandwidth to include the shorter wavelengths results in reduced sensitivity for the 595-mμ setting. These findings are consistent with luminosity theory.
R 8

28,623
Bratfisch, O. A FURTHER STUDY OF THE RELATION BETWEEN SUBJECTIVE DISTANCE AND EMOTIONAL INVOLVEMENT. Rep. Number 208, May 1966, 11pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

3 groups of altogether 65 Ss were instructed to estimate, in 3 experiments, a total number of 30 different inter-city distances with Stockholm as the center. In another part of the experiments the same Ss estimated the degree of emotional involvement which they would experience in things happening in the various cities. Emotional involvement was found to be inversely proportional to the square root of subjective distance, when other variables were kept constant, and the result of a previous study by Ekman and Bratfisch is thus further confirmed.
R 13

28,624
Thomas, J.P. BRIGHTNESS VARIATIONS IN STIMULI WITH RAMP-LIKE CONTOURS. J. Opt. Soc. Amer., Feb. 1966, 56(2), 238-242. (Psychology Dept., University of California, Los Angeles, Calif.)

Perceived brightness was measured at several points on stimuli bounded by luminance ramps. As the ramps widen, the perceived contrast between stimulus and background decreases, although objective contrast is unaffected. The rate of decrease varies from one part of the stimulus to another, and complex variations in perceived brightness, including Mach bands, occur. A von Békésy-type model accounts for many features of the data.
R 7

28,625
Wasserman, G.S. BRIGHTNESS ENHANCEMENT IN INTERMITTENT LIGHT: VARIATION OF LUMINANCE AND LIGHT-DARK RATIO. J. Opt. Soc. Amer., Feb. 1966, 56(2), 242-250. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

The effects of varying luminance and light-dark ratio (LDR) on the brightness enhancement of an intermittent light were investigated. The enhancement observed in this experiment with a train of flashes displayed the same functional relationships as the brightness enhancement found with a single flash. In both cases, increasing luminance increases brightness enhancement and decreases the optimal flash duration until an optimal luminance is reached, whereupon further increases in luminance have an opposite effect. Varying the LDR, which is the same as varying the flash duration independently of the repetition rate, increased the optimal repetition rate, while optimal flash duration and enhancement magnitude remained invariant. Interactions among the flashes were observed and appeared to be manifestations of backward and forward masking among the flashes in a train.
R 12

28,626
Erickson, R.A. VISUAL SEARCH EXPERIMENT: NOISE PERSISTENCE, ACUITY, RESPONSE TIME. J. Opt. Soc. Amer., April 1966, 56(4), 491-498. (USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif.).

Search time in a static, structured field has been measured in noise-free displays and in displays containing visual noise similar to that found on a TV monitor operating at 2 frame rates--26 and 5.2 pictures/sec. Search time increased significantly when the "fast" noise (26 frames/sec) was added to the display and increased even more in the "slow" noise condition (5.2 frames/sec). After 10 sec of search, the probability of detection with no noise was 0.94; it dropped to 0.85 in the fast-noise condition, and dropped to 0.78 with the slow noise. The observers were also given tests of foveal acuity, peripheral acuity, eye dominance, response time, and speed on a card-sorting task involving search. Neither peripheral nor foveal acuity correlated significantly with search time, a fact attributed to the restricted range of variables and possibly to the use of different test objects in the tests. As determined by the Miles ABC color test, eye dominance was not a significant factor in searching. Although performance on the card-sorting task correlated significantly with search performance, the relationship is not strong enough to predict search performance accurately from card-sorting scores. The significant correlations of response times with search times are thought to be indicative of the mental processing and decision time common to both tasks.
R 11

28,627
Watrasiewicz, B.M. SOME FACTORS AFFECTING THE APPEARANCE OF THE MACH BANDS. J. Opt. Soc. Amer., April 1966, 56(4), 499-503. (Applied Optics Section, Imperial College, London, England).

Some measurements are given which show the influence of retinal illuminance, wavelength, object contrast, and plane of polarization on the Mach bands. Some theoretical models (including numerical computations) are discussed.
R 15

28,628
Takasaki, H. LIGHTNESS CHANGE OF GRAYS INDUCED BY CHANGE IN REFLECTANCE OF GRAY BACKGROUND. J. Opt. Soc. Amer., April 1966, 56(4), 504-509. (US National Bureau of Standards, Washington, D.C.).

A relatively small gray sample looks lighter (darker) when it is placed on darker (lighter) background. This phenomenon is an example of the well-known contrast effect. The purpose of this paper is to make a quantitative determination of the effect, and to derive a formula for it. For any given gray sample and gray surround on the left side, the observer was instructed to choose, for the different gray surround on the right, a different gray sample appearing as light as that on the left. It was found that sample lightness changes rapidly with reflectance when sample reflectance is close to that of the background. This effect was named the "crispening effect." Several models (von Kries coefficient law, Hurvich-Jameson induction) were tried, but none of them reproduced the experimentally discovered crispening effect A fairly successful empirical formula was developed by adding a term for the crispening effect to the formula for the induction theory.
R 5

28,629
Lit, A. & Hamm, H.D. DEPTH-DISCRIMINATION THRESHOLDS FOR STATIONARY AND OSCILLATING TARGETS AT VARIOUS LEVELS OF RETINAL ILLUMINANCE. J. Opt. Soc. Amer., April 1966, 56(4), 510-516. (Southern Illinois University, Carbondale, Ill.).

Equidistance settings were obtained for stationary and oscillating targets presented in "real depth" at scotopic and photopic levels of retinal illuminance. The data have been analyzed in terms of the effects of retinal illuminance and target velocity on both the constant and variable errors of the settings. The results show that both stimulus variables have a systematic effect on the stereoscopic threshold: The variability of the settings progressively increases as either the retinal illuminance is decreased or the target velocity is increased. Their effects on the constant errors are less systematic: The localization error is smallest for stationary and slowly oscillating targets, particularly at high levels of retinal illuminance. The curves relating stereoscopic threshold angle and level of retinal illuminance for both stationary and oscillating targets exhibit the typical discontinuity predicted by the duplicity theory of vision. The discontinuities occur at progressively higher values of retinal-illuminance level as target velocity is increased, in quantitative agreement with expectations based on the Bunsen-Roscoe-Bloch law. The curves are progressively displaced upward as target velocity is increased. The results are discussed in relation to data obtained in earlier experiments on stereoscopic acuity and on the Pulfrich stereophenomenon.
R 12

28,630
Cole, B.L. & Brown, B. OPTIMUM INTENSITY OF RED ROAD-TRAFFIC SIGNAL LIGHTS FOR NORMAL AND PROTANOPIC OBSERVERS. J. Opt. Soc. Amer., April 1966, 56(4), 516-522. (Victorian College of Optometry, University of Melbourne, Melbourne, Australia).

Optimum intensities for a red road-traffic signal light have been determined for observers with normal and protanopic color vision. The term optimum intensity is used to mean the intensity necessary to minimize the chance of not seeing the signal and also the time of response. The experimental conditions simulated an 8-in.-diam. signal light viewed from 100 m against a sky with a luminance of about 1500 ft-L. Under these conditions the optimum intensity was shown to be at least 83 cd and preferably 133 cd. Protanopes required about 4 times this intensity for the particular red filter used. For a sky of 3×10^4 ft-L luminance a red signal should have intensity of 160-260 cd. Protanopic drivers would require at least a 600 cd intensity. Surround screens were shown to improve the visibility of a red signal for normal observers only when the intensity of the signal was less than optimum.
R 11

28,631
Baker, H.D. SINGLE-VARIABLE ANOMALOSCOPE MATCHES DURING RECOVERY FROM ARTIFICIAL RED BLINDNESS. J. Opt. Soc. Amer., May 1966, 56(5), 686-689. (Psychology Dept., Florida State University, Tallahassee, Fla.).

An anomaloscope was designed so that the full amounts of its red and green primaries could be adjusted to match for a protanope. After a protanope had made that adjustment, Rayleigh matches of red-green mixtures to yellow were made by a device in which the same percentage of one primary was subtracted from the mixture as was added of the other. The instrument was used to study the proposition that protanomaly is an intermediate form of protanopia, based upon the presence in the protanomalous trichromat of a diluted form of erythrolabe, which is assumed to be absent altogether in the protanope. The technique was to generate artificial protanopia in normal Ss by adaptation to very strong red light, and then to record their Rayleigh matches during subsequent regeneration. The results indicate that something more than dilution of erythrolabe is involved in protanomaly.
R 12

28,632
Patel, A.S. SPATIAL RESOLUTION BY THE HUMAN VISUAL SYSTEM. THE EFFECT OF MEAN RETINAL ILLUMINANCE. J. Opt. Soc. Amer., May 1966, 56(5), 689-694. (Electrical Engineering Dept., Northwestern University, Evanston, Ill.).

This paper reports experimental results showing the effect of mean retinal illuminance on the modulation transfer function (MTF). The line spread function of the human visual system was computed. The test pattern in which the luminance varied sinusoidally in the horizontal direction was generated on the face of an oscilloscope by modulating the intensity of the beam. The behavior of the system changes with the mean retinal illuminance. At the highest mean retinal illuminance (1000 td) the MTF shows 2 peaks which gradually disappear at lower mean retinal illuminances. The line spread function of the entire visual system also exhibits a change in shape dependent on the mean retinal illuminance. In particular, what are deemed inhibitory influences become less prominent at lower mean retinal illuminance. From the line spread function of the optical part up to the retina, the line spread function of the physiological part of the visual system is also evaluated. A common asymptote appears at high frequencies when the characteristics are plotted in terms of absolute deviation from the mean vs spatial frequency for threshold perception. The asymptote provides an upper bound for the behavior of visual acuity at any retinal illuminance.
R 24

28,633
Ball, R.J. & Bartley, S.H. CHANGES IN BRIGHTNESS INDEX, SATURATION, AND HUE PRODUCED BY LUMINANCE-WAVELENGTH-TEMPORAL INTERACTIONS. J. Opt. Soc. Amer., May 1966, 56(5), 695-699. (Michigan State University, East Lansing, Mich.).

Measurement of the brightness, hue, and saturation produced by 3 different narrow spectral bands having dominant wavelengths of 500, 580, and 660 mμ, was made with intermittent inputs having a rate of 9.8 cps. The PCF (pulse-to-cycle fraction) was 1/4, and the luminance ranged from 3319 candles/ft^2 down to 0.3 candle/ft^2. At the higher luminance levels, the 500-mμ waveband produced the greatest brightness; the 660-mμ waveband, the lowest; and the 580-mμ waveband, an intermediate effect. As luminance decreased, the 3 bands finally became about equally effective around 30 candles/ft^2. A range of 200 to 30 candles/ft^2 manifested the greatest brightness index. Whereas brightness was above expectations under some conditions, it fell below expectations under others. The intermittent inputs also produced hue changes and desaturation. Only the 500-mμ band produced large desaturation. When the 660-mμ waveband was used and when luminance was high, hue shifts were toward colors expected of the shorter wavelengths. Only 1 S experienced hue shifts for the 580-mμ band; 3 of the 4 Ss obtained hue shifts for the 500-mμ band. The results here were complex.
R 19

28,634
Siegel, I.M., Graham, C.H., Ripps, H. & Hsia, Y. ANALYSIS OF PHOTOPIC AND SCOTOPIC FUNCTION IN AN INCOMPLETE ACHROMAT. J. Opt. Soc. Amer., May 1966, 56(5), 699-704. (Ophthalmology Dept., New York University Medical Center, New York, N.Y.).

Spectral sensitivity and color vision tests were performed on a S who was totally color blind at low photopic luminances, but exhibited hue discrimination at relatively high photopic levels. Chromaticity confusion loci showed that the residual color vision was abnormal; a tritan defect was superimposed on the generalized reduction of cone sensitivity. Although cone function was markedly depressed, a photopic spectral sensitivity curve was obtained for the light-adapted fovea. Dark-adapted foveal measurements, on the other hand, gave a scotopic function almost identical to that of the dark-adapted periphery. However, it was possible to demonstrate objectively that this S shifts fixation to an eccentric position under scotopic conditions, i.e., the dark-adapted "foveal" results were, in fact, for a para-macular region. Irrespective of the degree of light adaptation, cone function was not detectable in the peripheral measurements.
R 20

28,635
Das, S.R. RECOGNITION OF SIGNAL COLORS BY A DIFFERENT SET OF COLOR NAMES. J. Opt. Soc. Amer., June 1966, 56(6), 789-794. (National Physical Laboratory, New Delhi, India).

Recognition of signal colors has been studied by statistics of use of names or red, yellow, green, blue, and difficult, over a wide range of illuminance. Results have been compared with those obtained by other authors. The International Commission on Illumination (CIE) limits for red satisfy the experimental tests made on the basis of a color naming criterion; this assures a high certainty of color recognition. The CIE limits for green are also satisfactory, though the incidence of "blue" responses near the blue boundary of this green is moderately high, in the range of 25-35%. The green limit of blue is very diffuse in that the incidence of "blue" responses does not rise sharply; in fact, it does not rise at all across the CIE green boundary for blue from the bluish-green region. Blue is not a very satisfactory signal color. The use of "difficult" among the permissible color responses and the absence of "white" reveal that recognition of both desaturated blue and yellow is difficult.
R 9

28,636
Shapiro, W.A. GENERALIZATION OF TRISTIMULUS COORDINATES. J. Opt. Soc. Amer., June 1966, 56 (6), 795-802. (Kearfott Systems Div., General Precision Aerospace, Wayne, N.J.).

The characterization of light by its tristimulus coordinates is briefly reviewed. The vector-transformation properties of these coordinates are shown, and the interpretation of change of reference stimuli as a change of basis in a 3-dimensional vector space is mentioned. The transformation coefficients are then examined as inner products, in a vector space over a basis of the order of the continuum. In this larger system, all possible sets of tristimulus coordinates are associated with a common 3-dimensional subspace. The vector analogy is thereby extended and a generalization is made from tristimulus coordinates to systems based on any number of arbitrary weighting functions. Each such system has an associated subspace, of the appropriate number of dimensions (not necessarily 3), not necessarily significant for human vision. Applications to spectrum characterization and electro-optical detector-response estimation are given.
R 8

28,637
Miller, Norma D. POSITIVE AFTERIMAGE FOLLOWING BRIEF HIGH-INTENSITY FLASHES. J. Opt. Soc. Amer., June 1966, 56(6), 802-806. (School of Optometry, Ohio State University, Columbus, Ohio).

The time course of the decay of the positive afterimage following high-intensity flashes was measured by monocular and binocular brightness matching. The comparison field luminance was adjusted by means of crossed neutral edges driven by a reversible motor. Density of the wedges was continuously recorded and the afterimage was tracked up to 7 min. following the flashes. Flash durations of 0.24 to 1.4 msec were used with a flash luminance of 4×10^5 L. With a 10° monocular bipartite photometric field, the afterimage brightness 5 sec following a 3×10^7 td·sec flash was matched by a 10^5-td comparison field. Photometric matches made monocularly or binocularly with an annular afterimage, 10° o.d. and 5° i.d., concentric with a 2° centrally fixated comparison field required approximately 10^4 td. A 2° central afterimage matched with an annular comparison field showed no significant difference from the annular afterimage. The results for the first 2 min. following the flashes for all conditions showed a linear relationship between the logarithm of the comparison field luminance and the logarithm of the time measured from the flash.
R 9

28,638
Westheimer, G. & Felsenstein, L. AUTOMATIC PHOTOELECTRIC KERATOMETER. J. Opt. Soc. Amer., June 1966, 56(6), 807-810. (School of Optometry, University of California, Berkeley, Calif.).

An instrument is described which automatically measures the radius of curvature of the cornea and other spherical surfaces. The principle involves moving a light pattern across the face of a cathode-ray tube. After being imaged by a lens and reflected off the cornea, the light strikes 2 photocells. The placement of the photocells and the lens and the geometry of the cornea determine the positions on the cathode-ray tube face from which light must issue for its reflection off the cornea to reach the photocells. The measurement is in the form of an electronic signal and the accuracy is comparable to that of an optical keratometer.
R 3

28,639
Bryngdahl, O. CHARACTERISTICS OF THE VISUAL SYSTEM: PSYCHOPHYSICAL MEASUREMENTS OF THE RESPONSE TO SPATIAL SINE-WAVE STIMULI IN THE PHOTOPIC REGION. J. Opt. Soc. Amer., June 1966, 56(6), 811-821. (Research Div., Xerox Corporation, Rochester, N.Y.).

The perceived brightnesses of the maxima and minima in spatial sinusoidal light variations have been determined by suprathreshold psychophysical techniques in the photopic region. For example, the response/stimulus contrast ratio at 20 cd/m^2 average luminance and spatial frequencies between 1.5 to 7.5 lines/deg is 2.4 to 3.4 for 25% and 1.8 to 2.0 for 50% object contrast. Contrast transfer has a pronounced peak at about 5.5 lines/deg for all object contrasts. The visual system is nonlinear and a contrast transfer function does not exist in the photopic region. The measurements have been performed under normal viewing conditions where both successive and simultaneous contrast phenomena are operative.
R 19

28,640
Foley, J.M. LOCUS OF PERCEIVED EQUIDISTANCE AS A FUNCTION OF VIEWING DISTANCE. J. Opt. Soc. Amer., June 1966, 56(6), 822-827. (University of California, Santa Barbara, Calif.).

The locus of perceived equidistance in the eye-level plane was determined at distances of 1.2, 2.2, 3.2, and 4.2 m from the observer. The stimuli were small, point-like light sources viewed in complete darkness. The observer's head was held fixed; his eyes were allowed to move freely. There were 5 lights, one in the median plane which remained fixed on every trial, and 2 variable lights on each side of this at angles of 12° and 24° with respect to the median plane. The locus of perceived equidistance was found to be concave toward the observer at all distances, usually slightly asymmetric with respect to the median plane, and with a variable curvature generally intermediate between that of the physically equidistant circle and that of the corresponding Vieth-Müller circle. The results are inconsistent with an assumption made by Luneburg in his theory of space perception. The pattern of disparities provided by the locus of perceived equidistance was found to vary with viewing distance. This indicates that the perception does not depend on the spatial distribution of retinal stimulation alone and poses a problem as to the nature of the cues that determine perceived equidistance in this situation.
R 10

28,641
Schelbner, H. ADAPTIVE COLOR SHIFTS. J. Opt. Soc. Amer., July 1966, 56(7), 938-942. (Visual Science Center, University of Rochester, Rochester, N.Y.).

Some experiments on chromatic adaptation are reviewed. The adaptive color shifts due to changes of chromatic adaptation are interpreted as linear mappings. The results show that the special type of mappings known as the von Kries coefficient law does not generally hold. One conclusion is that the processes connected with chromatic adaptation cannot take place at the first retinal stage of the visual pathway alone, but also at higher stages.
R 29

28,642
Wheeless, L.L., Jr., Boynton, R.M. & Cohen, G.H. EYE-MOVEMENT RESPONSES TO STEP AND PULSE-STEP STIMULI. J. Opt. Soc. Amer., July 1966, 56(7), 956-960. (University of Rochester, Rochester, N.Y.).

A spot of light is presented to an observer who tracks its movement visually, doing so as quickly and accurately as possible. The positions of the eye are continuously recorded so that direction and magnitude of eye movements as a function of time can be assessed. Without warning, the target spot steps from its resting position, moving 6° horizontally to one side, followed after a time W by a 12° step in the opposite direction. The result is a pulse-step pattern of target motion with the time interval W msec defining the pulse duration. The directions of the pulse and step are always opposite but otherwise are unpredictable. Trials consisting of pulses followed by steps are intermixed randomly with a larger number of trials consisting of 6° steps alone. The experiments demonstrate that the visual system is sometimes able to cancel an eye-movement response to a pulse, on the basis of information contained in the subsequent step, to which it responds instead. As the step is delayed by progressively longer pulses, the probability increases that a response to the pulse will occur. If a response does occur in the direction of the step, it begins about 325 msec after the beginning of the step. This latency is independent of pulse time W and is about 40 msec longer than the latency of responses to steps presented alone. It is concluded that the visual system utilizes this 40 msec to operate upon a latent response to a pulse, and thereby to cancel its overt manifestation (eye movement) before initiating a response to the second, incompatible stimulus.
R 3

28,643
Guastella, Martha J. NEW THEORY ON APPARENT MOVEMENT. J. Opt. Soc. Amer., July 1966, 56(7), 960-966. (Jamaica, N.Y.).

A theory is presented to explain the difference between the true motion of a figure and its apparent motion, as in the Ames trapezoid illusion. Of central importance are the changes in geometric relationships between the boundaries of a figure as they project on the retina. The changes in retinal image that accompany rotation of the figure have been analyzed by use of a unique picture-plane model, to which the dimension of depth is added. The only assumption necessary to predict the perceived effect from the geometry of the illusion is that the observer will be most affected by whatever element of the retinal image is changing at the greatest rate. Apparent size, displacement, and rates of change are quantified. The interrelationship of the horizontal and vertical edges are shown. The projection of the edge of the figure farthest from the observer recedes in an opposite direction and at varying speed and size from the true edge. The lack of a perfect 1-to-1 relationship between the physical and psychological stimulus is determined by the nature of the projection of the physical stimulus. While other theories base their explanations on past experience, this theory designates the mechanisms underlying the illusion.
R 7

28,644
Lee, R.P. FLIGHT EVALUATION OF SERVO-ALTIMETER DISPLAYS FOR THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM/IFF/MARK 12/SYSTEM (AIMS) PROGRAM. FINAL REPORT. WepTask RAV09P003, Probl. RAV09P003/38, NATC Tech. Rep. ST32 92R 64, Nov. 1964, 21pp. USN Air Test Center, Patuxent River Air Station, Md.

The Counter-Drum-Pointer, Counter-Pointer, Drum-Pointer, and Three-Pointer altimeter presentations were evaluated by 23 Navy, Air Force and Army pilots to select the best display for altimeters to be used in airplanes operating above 18,000 ft as part of the AIMS program. The Counter-Drum-Pointer (CDP) was the first choice of 80% of the pilots. Deficiencies in the CDP altimeter presentation for which correction is mandatory are: lag in the stand-by mode of operation and insufficient differentiation between the thousand foot counter and the hundred foot drum. Deficiencies in the CDP altimeter presentation for which correction is desirable for improved service use are: drum obscuration when the pointer indicates 250 or 750 ft and possible misreading altitude by a thousand feet when pointer is between the 900 and 1,000 ft positions. The CDP altimeter presentation is recommended for the AIMS program when the mandatory category deficiencies are corrected. The flight profile questionnaire and flight simulator methods are recommended as required phases in the evaluation of flight displays.

28,645
Davidson, H.R. & Hemmendinger, H. COLOR PREDICTION USING THE TWO-CONSTANT TURBID-MEDIA THEORY. J. Opt. Soc. Amer., Aug. 1966, 56(8), 1102-1109. (Davidson & Hemmendinger, Incorporated, Easton, Penn.).

The turbid-media theory used most widely for industrial color matching is based on the mathematical work of Kubelka and Munk but employs a single constant (K/S) rather than the 2 constants K and S. For a wide gamut of colors the single-constant theory is adequate, but it is not adequate for colors in which the scatter is highly dependent on the colored pigments present. The accuracy of the 2-constant theory in handling the latter colors has been experimentally determined and found to be as high as is required for present industrial processes.
R 13

28,646
Richards, W. OPPONENT-PROCESS SOLUTIONS FOR UNIFORM MUNSELL SPACING. J. Opt. Soc. Amer., Aug. 1966, 56(8), 1110-1120. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

An iterative method is used to transform the chromaticity coordinates of the Munsell samples into another coordinate system such that the transformed values are spaced in accordance with the perceptual spacing of the colors. Acceptable transformations are restricted to those having an opponent-process form; brightness information is assumed to be conveyed by an independent channel. Under these conditions, the optimal transformation based on 2 chromatic processes is similar to one stage of the Müller-Judd formulation. By changing the constraints imposed on acceptable transformations, however, support can also be found for the Hering model. Therefore, even though many quantitative transformations can already be excluded, more data are needed before this method can be applied as a decisive test for models of color vision.
R 19

28,647
Leibowitz, H. & Moore, D. ROLE OF CHANGES IN ACCOMMODATION AND CONVERGENCE IN THE PERCEPTION OF SIZE. J. Opt. Soc. Amer., Aug. 1966, 56(8), 1120-1123. (Pennsylvania State University, University Park, Penn. & University of Wisconsin, Madison, Wisc.).

The effect on perceived size of changes in accommodation and convergence was determined at various observation distances. Accommodation and convergence were varied by lenses and prisms chosen so as to preserve the normal relationship between these 2 functions for all conditions of observation. For observation distances up to about 1 meter, perceived size is proportional to the distance at which the accommodation and convergence in force would normally obtain. At greater distances, this relationship becomes progressively less marked. It is concluded that accommodation and convergence could mediate size constancy only at observation distances of 1 meter or less, and that other mechanisms must be operative at greater distances of observation.
R 18

28,648
Biersdorf, W.R. & Baird, J.C. EFFECTS OF AN ARTIFICIAL PUPIL AND ACCOMMODATION ON RETINAL IMAGE SIZE. J. Opt. Soc. Amer., Aug. 1966, 56(8), 1123-1129. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

A very small artificial pupil in frontof the eye allows a distinct view of an object when accommodation is incorrect. Helmholtz reported that the retinal image size of the object is changed when the eye is not accommodated for the object. Binocular size matching with an artificial pupil before one eye is used to provide quantitative data relating image-size change to accommodation and distance of the artificial pupil from the eye. Control experiments, including paralysis of accommodation in one eye, establish that the phenomenon is related to accommodation and is not an artifact of other variables.
R 12

28,649
Ikeda, M. & Fujii, T. DIPHASIC NATURE OF THE VISUAL RESPONSE AS INFERRED FROM THE SUMMATION INDEX OF N FLASHES. J. Opt. Soc. Amer., Aug. 1966, 56(8), 1129-1132. (Minolta Camera Research Lab., Daisen-Nishimachi, Sakai, Japan).

A summation index σ was originally defined to show the summating effect of 2 test flashes in determining the increment threshold. The definition was extended here for any number of test flashes and the index was measured for n light flashes that were presented to the eye successively. When the interflash interval was 60 msec, the index showed the inhibition for any number of flashes (n), that is the index value of near zero. At $t = 40$ msec, the index value was about 0.1 for 2 flashes and it remained about the same as n was increased. At $t = 120$ msec on the other hand, the index gradually increased from 0.1 to 0.2 as n was increased from 2 to 10. It is suggested that these results are reasonably explained assuming a diphasic response for the peripheral visual system corresponding to each light flash, and superposing a number of them linearly with suitable intervals.
R 1

28,650
Grimm, M.A. & Lohmann, A.W. SUPERRESOLUTION IMAGE FOR ONE-DIMENSIONAL OBJECTS. J. Opt. Soc. Amer., Sept. 1966, 56(9), 1151-1156. (IBM San Jose Research Lab., San Jose, Calif.).

Objects which vary strongly as a function of x but only slowly in y occupy a cigar-shaped area in the spatial-frequency domain. Such an object spectrum is badly matched to the frequency-transfer domain of a lens, which is usually circular. By means of spatial modulation, the object spectrum can be adapted to the transfer domain of the lens. In this way, the one-dimensional resolution limit or bandwidth of the lens can be overcome, as shown by experiment and theory.
R 5

28,651
Allen, E. BASIC EQUATIONS USED IN COMPUTER COLOR MATCHING. J. Opt. Soc. Amer., Sept. 1966, 56(9), 1256-1259. (American Cyanamid Company, Bound Brook, N.J.).

If we are given the spectrophotometric curves of a color and 3 colorants to be used in matching it, the computation of the concentrations of the 3 colorants required for a tristimulus match is a complicated nonlinear problem. However, with the help of an approximating assumption, a linear solution may be obtained by a matrix inversion technique. Although this is an approximate solution, it is better the less metameric the match. With this rough solution as a starting point, iteration may be used to approach an exact match to any desired degree of accuracy. The inverted matrix used for the iterative computation is identical to that used for the rough solution.

28,652
Fried, D.L. LIMITING RESOLUTION LOOKING DOWN THROUGH THE ATMOSPHERE. J. Opt. Soc. Amer., Oct. 1966, 56(10), 1380-1384. (Electro-Optical Lab., Autonetics, North American Aviation, Incorporated, Torrance, Calif.).

The turbulence of the atmosphere places an upper limit on the quality of an image of ground objects obtained by long-exposure photography from high altitudes in the atmosphere or in space. (By making the imaging optics good enough, the film resolution fine enough, and the platform stable enough, this limit could be approached but not exceeded.) A useful quantity for indicating the magnitude of this limit is the integral of the MTF associated with the turbulence. Treating the integral as a 2-dimensional bandwidth, one-half the inverse of its square root can be associated with a resolution length, or angle, in the same manner that an electrical engineer associates a rise time with one-half the inverse of the bandwidth of an R-C filter. Based on published data for typical strength of atmospheric turbulence, the integral of the MTF was calculated as a function of altitude and the corresponding resolution computed. This resolution is shown to correspond to a length of about 4.6 cm on the ground. It is shown that as an observer goes deeper into space, this limiting ground resolution remains constant, but the diameter of the optics needed to approach the limit goes up. Graphs of achievable ground resolution at any altitude and of the diameter of the optics needed to approach this limit are presented.
R 7

28,653
Farrell, E.J. INTRINSIC LIMITATIONS IN LOCATING PHOTOGRAPHIC STAR IMAGES. J. Opt. Soc. Amer., Oct. 1966, 56(10), 1385-1390. (Research Div., Control Data Corporation, Minneapolis, Minn.).

The accuracy of locating weak photographic star images is described from a theoretical viewpoint. The objective is to determine the accuracy limitations imposed by the granular nature of the photographic image, by background radiation, and by image size and shape. After selecting models for both saturated and unsaturated images, lower bounds are derived for the rms location errors. These relationships are based on results developed for photoelectric images. The bounds apply to every method of interrogating the photographic images, and thus represent intrinsic limitations. For unsaturated images, the bound is a monotone function of the image "spread" σ; it is approximately proportional to $\sigma\,(c-\ln\sigma)^{-1/2}$ where c is a constant. For saturated images, the bound is not necessarily a monotone function of the image spread. The bound may decrease as the image spread increases. The error bounds are compared to experimental errors. For an 18th-magnitude star, the bound is 70% of the experimental errors observed with plates from the 48-in. Schmidt telescope on Palomar.
R 8

28,654
Tyler, J.E. & Smith, R.C. SUBMERSIBLE SPECTRORADIOMETER. J. Opt. Soc. Amer., Oct. 1966, 56(10), 1390-1396. (Visibility Lab., Scripps Institution of Oceanography, University of California, San Diego, Calif.).

This paper describes a submersible spectroradiometer for measuring the spectral distribution of the multiply scattered natural light in ocean or lake water. Because of the anticipated large range of flux levels in the spectrum at the exit slit, strong measures have been taken to reduce stray light within the instrument. These methods are described in some detail. Procedures for spectral alignment and calibration, determination of bandwidth, absolute calibration, and over-all testing of the instrument are described in detail and the probable errors introduced by various components are estimated. It is estimated that the precision of measurements, limited by random errors of data taking, will be within $\pm 2.5\%$ and that the absolute accuracy is between 5% and 12%. The major limitations on the accuracy are the uncertainties of the standard of spectral emittance and the measurement of the bandwidth of the instrument. The instrument makes possible a mode II determination of the optical properties of natural water as a function of wavelength and can furnish data on the spectral distribution of the flux available for photosynthesis and animal stimulation.
R 9

28,655
Anderson, D.A., Huntington, Jane & Simonson, E. CRITICAL FUSION FREQUENCY AS A FUNCTION OF EXPOSURE TIME. J. Opt. Soc. Amer., Nov. 1966, 56(11), 1607-1611. (Physiological Hygiene Lab., University of Minnesota, Minneapolis, Minn.).

The effect of exposure time from 0.1 to 1.1 sec on the critical flicker frequency (CFF) was studied. For all 5 Ss the CFF drops with shortening of the exposure time below 0.5 to 0.7 sec, gradually to 0.2 sec and steeply below 0.2 sec. The steepness of slope varied with the light-dark ratio (LDR) in the following order from most to least pronounced: LDR = 1:9, 5:5, 9:1. The data were plotted in terms of "critical number of flashes," i.e., the number of light flashes at fusion multiplied by exposure time in msec, vs exposure time. There was a linear relationship between 0.2 to 0.9 sec.
R 17

28,656
Miller, Norma D. POSITIVE AFTERIMAGE AS A BACKGROUND LUMINANCE. J. Opt. Soc. Amer., Nov. 1966, 56(11), 1616-1620. (School of Optometry, Ohio State University, Columbus, Ohio).

In one experimental session, each of 6 Ss received 6 flashes of 1.4-msec duration from a centrally fixated 10° field of 4×10^5 L. The brightness of the afterimage was tracked, following the first 2 flashes, by means of a monocular bipartite photometric field. The bipartite field was formed by blocking one-half of the flash field to provide a semicircular afterimage and arranging a semicircular comparison field in juxtaposition. The comparison field could be varied over an 8-log-unit range by the S. The density of the wedges was continuously recorded as the match was maintained. Recovery times for recognition of 28.7' and 16.3' Sloan Snellen letters at various luminance levels were measured following the other flashes. The letters were transilluminated and viewed against a dark surround. They were presented at 1-sec intervals and were at 140 mL immediately following the flashes. As soon as the S correctly identified 2 successive letters, the luminance was reduced by introducing a neutral density filter. In this manner, 10 luminance levels were measured following each flash, with the lowest 0.007 mL. The letters were superimposed on a 10° variable-luminance field and each S determined the field luminance necessary for threshold recognition of each letter condition. The recovery times for the various letter conditions were then predicted for each S from his afterimage brightness measurements and cross correlated with the measured recovery times. The correlation coefficient for the measured and predicted values was 0.82.
R 13

28,657
Riggs, L.A., Johnson, E.P. & Schick, Amy M.L. ELECTRICAL RESPONSES OF THE HUMAN EYE TO CHANGES IN WAVELENGTH OF THE STIMULATING LIGHT. J. Opt. Soc. Amer., Nov. 1966, 56(11), 1621-1627. (Hunter Psychology Lab., Brown University, Providence, R.I.).

The eye fixates on a stationary point at the center of a pattern consisting of alternate stripes of 2 different wavelengths of light. The pattern exhibits quick, lateral displacements so that each point on the observer's stationary retina is exposed first to one wavelength, then to the other, then back to the first, and so on for several hundred repetitions. A conventional corneal electrode, together with amplifying equipment and a computer of average transients, provides cumulated records of the electrical responses of the eye to these wavelength shifts. The striped pattern is used to present pairs of monochromatic lights throughout the visible spectrum, the energy of each individual monochromatic light being carefully adjusted so as to be capable of producing a constant amplitude of electrical response from the eye. Alternation between 2 such monochromatic lights yields electrical responses, the amplitudes of which are related to the difference in wavelength between the 2 lights. We have found that the algebraic sums of output functions of 3 color response mechanisms provide a reasonably good fit to the measured amplitudes of response. We conclude that wavelength changes arouse responses, at the retinal level, that are consistent with a simple, additive trichromatic theory.
R 18

28,658
Kelly, D.H. FREQUENCY DOUBLING IN VISUAL RESPONSES. J. Opt. Soc. Amer., Nov. 1966, 56(11), 1628-1633. (Vidya Div., Itek Corporation, Palo Alto, Calif.).

This paper reports an unexpected visual phenomenon. When a wide, photopic stimulus field is sinusoidally modulated in both space and time, over a certain frequency range the apparent spatial frequency of the stimulus is doubled. In its original form, the (deLange) flicker-fusion model which has been accepted by the author and others cannot account for this result. But it can be explained by assuming that there is a second (low-pass) filtering operation which follows the nonlinear (brightness) response of the visual system, rather than preceding it. If this hypothesis is correct, then the frequency-doubling effect is the result of neural mechanisms which are more central than the locus of flicker fusion.
R 12

28,659
Hill, H.A. & Zanoni, C.A. COMPENSATION FOR THE LATERAL COLOR ABERRATION PRODUCED BY THE ATMOSPHERE. J. Opt. Soc. Amer., Dec. 1966, 56(12), 1655-1659. (Scott Lab., Wesleyan University, Middletown, Conn.).

Since the atmosphere is an inhomogeneous refractive medium, images formed with light which has passed through the atmosphere in general exhibit color aberrations. For example, at sea level the atmospheric dispersion separates the red (λ_R= 7000 Å) and the blue (λ_B= 4000 Å) images of a star at a zenith angle of 45° by approximately 1.4". This paper shows that by considering as a single problem the refraction of the atmosphere and the color aberrations of the telescope optics, it is possible to devise a telescope which almost completely compensates for the lateral color aberration arising from atmospheric refraction. In particular it is shown that for an objective consisting of BSC-2 glass the lateral color aberration at the final focus produced by the atmosphere is reduced by a factor Γ, where Γ=0.006±0.002 for a bandwidth from 3650 to 5876 Å, and Γ=0.010±0.002 for a bandwidth from 3650 to 6563 Å. For an objective consisting of a flint glass, Γ=0.012±0.002 for a bandwidth from 4047 to 10140 Å.
R 9

28,660
Montgomery, W.D. VISUAL DISPLAY OF INCOHERENT WAVE FIELDS BY PLANAR ARRAYS. J. Opt. Soc. Amer., Dec. 1966, 56(12), 1769-1774. (Institute for Defense Analyses, Arlington, Va.).

The passive planar arrays used to receive sonic waves through the earth or water or those employed in radio astronomy use mechanical or electronic scanning in order to observe a large solid angle, such as 2πsr. The purpose of the present paper is to develop a method for real-time visual display of such wave fields. It is analogous to the use of a wide-angle lens for viewing large solid angles in the visible spectrum. The method is analogous to a recently developed technique of incoherent holography, with the important difference that the sampling performed by an array makes unnecessary any film-processing stage.
R 5

28,661
Boynton, R.M., Das, S.R. & Gardiner, Jean. INTERACTIONS BETWEEN PHOTOPIC VISUAL MECHANISMS REVEALED BY MIXING CONDITIONING FIELDS. J. Opt. Soc. Amer., Dec. 1966, 56(12), 1775-1780. (Visual Science Center, University of Rochester, Rochester, N.Y.).

The luminances of conditioning fields that are necessary to reduce the visibility of a previously suprathreshold test flash to an increment threshold are determined for each of 2 conditioning fields of different color. Normalizing each of these luminances to 1.0, subthreshold amounts (e.g., 0.8, 0.6, etc.) of one field component are preset by the experimenter; the S then adjusts the other component until threshold is again attained. In an eye for which the adaptive state is controlled by the action of light upon only one spectral class of photopic mechanism, the normalized luminance sum must always equal 1.0. We find, however, that this sum is consistently less than 1.0, indicating a supersummative interaction of adaptive effect between 2 or more different mechanisms.
R 14

28,662
Harcum, E.R. MNEMONIC ORGANIZATION AS DETERMINANT OF ERROR-GRADIENTS IN VISUAL PATTERN PERCEPTION. Percept. mot. Skills, June 1966, 22(3), 671-696. (College of William and Mary, Williamsburg, Va.).

This paper presents evidence that the accuracy of tachistoscopic perception for elements arranged in a spatial pattern is determined primarily by the difficulty of organizing the pattern for storage in memory, rather than by the sensory capacity of the visual system for discriminating the individual elements. 4 lines of evidence are followed. The first shows that the distribution of errors among the elements of a serial-learning task and the pattern-perception task are affected similarly by manipulation of the same given variable. The second reveals parallels between the element-position functions of errors in serial learning and in pattern perception for different independent sets of data. The third line of evidence shows that errors in tachistoscopic perception are independent of the retinal area stimulated by individual elements. The final area of evidence is the demonstration of a close similarity for the serial learning and the perceptual tasks of the functions relating errors per element and ranks of the elements in accuracy of performance for individual Ss.
R 65

28,663
Crovitz, H.F. SIMULATION OF STRABISMUS: MOTOR FUSION AS A FUNCTION OF SPEED OF MONOCULAR ALTERNATION. Percept. mot. Skills, June 1966, 22(3), p718. (US Veterans Administration Hospital, Durham, N.C.).

12 Ss viewed a monocularly alternating pinpoint of light of 5 alternation cycle-lengths and reported periods of the breaking of the fixation point into 2. Maintenance of motor fusion decayed from 59 sec. at 100 msec. cycles to 5 sec. at 500 msec. cycles. At the cycles longer than 100 msec. the Ss act like strabismics, the optic axes cannot align. The non-dominant eye tends to deviate, though not always, when the cycle portions are equal; and the eye seeing the shorter part of an unequal cycle deviates, regardless of dominance. These findings are related to suppression theories of binocular vision.
R 3

28,664
Walk, R.D. PRESENTATION OF LABORATORY EXPERIMENTS THROUGH MOTION PICTURE FILMS. Percept. mot. Skills, June 1966, 22(3), 723-730. (George Washington University, Washington, D.C.).

2 motion picture films for use in student laboratory courses are described. The film on the "span of attention" showed 4 to 13 black dots on a white field at 2 exposure intervals for 100 trials. The film on the influence of word frequency on perception presented 15 words in a random order with the ascending method of limits, more adequate exposure conditions on each successive exposure until each word had been shown 3 times. Results from use of laboratory sections are given for each film. The laboratory film is an inexpensive method of increasing the range and depth of materials available to the laboratory instructor.
R 3

28,665
Helson, H., Bevan, W. & Masters, H.G. A QUANTITATIVE STUDY OF RELEVANCE IN THE FORMATION OF ADAPTATION LEVELS. Percept. mot. Skills, June 1966, 22(3), 743-749. (Kansas State University, Manhattan, Kan.).

Quantitative measures of relevance as shown by changes in adaptation levels (AL) resulting from the influence of prior stimulation on subsequent judgments of a standard set of circles show that pooling is a matter of degree, and hence that relevance is not an all-or-none matter. What will be relevant cannot be decided on purely a priori grounds, e.g., on the basis of perceptual similarity. While similarity plays an important role, other factors that make relevant dimensions of stimuli more focal tend to influence subsequent judgments to a greater extent than mere dimensional similarity. Thus, angles enclosed in small circles exerted greater effects on judgments of large circles than did the same small circles without the enclosed angles, although the latter were more similar than the former to the large circles. Similarly, a response language in terms of acute-obtuse in judging the angles had greater effect than a small-large response language, even though the latter was identical with that used in judging the standard stimuli. Finally, with positive correlations between angles and their sides (degrees and length of sides) the pre-adaptation series yielded greater effects than were found with negative or zero correlations between these variables. The results of this study thus support the assumption that focal stimuli tend to exert greatest weight on the formation of internal norms, and, therefore, any condition that contributes to focalization influences the pooling process and thus can be said to be relevant to ensuing responses.
R 7

28,666
Carini, L. NOTE ON THE THEORY OF SYMBOLIC TRANSFORMATIONS. Percept. mot. Skills, June 1966, 22(3), p750. (Bennington College, Bennington, Vt.).

The Theory of Symbolic Transformations consists of 2 postulates about human experiences--the human experiences (percepts or concepts) which lead to our actions--and thus the theory is humanistic rather than mechanistic. Postulate I. If no physiological stimulation is present, our experiences will equal our symbolized meaningful representations (PS = 0, E = SMR). Postulate II. If no symbolized meaningful representations are present, our experiences will equal our physiological stimulation (SMR = 0, E = PS). As in physics, the postulates consist of mathematical axions from which deductions about actual empirical events can be made. At present the theory lacks a third postulate which would allow it to predict numerically the characteristics of our seeings, but by deduction one can now predict the seen sizes, orientations, shapes, colors, and movement characteristics of our visual experiences, and, by extension, of all our human experiences.
R 1

28,667
Portnoff, G., Baekeland, F., Goodenough, D.R., Karacan, I., et al. RETENTION OF VERBAL MATERIALS PERCEIVED IMMEDIATELY PRIOR TO ONSET OF NON-REM SLEEP. Percept. mot. Skills, June 1966, 22(3), 751-758. (State University of New York, Downstate Medical Center, Brooklyn, N.Y.).

During the night Ss were awakened a number of times and shown verbal learning materials. Latency of subsequent onset of non-REM sleep was experimentally manipulated. In the morning, retention for the materials perceived was tested. Retention for words perceived immediately prior to sleep onset was significantly worse than for those followed by a period of enforced wakefulness. This finding suggests than non-REM sleep may impede the consolidation of memory traces.
R 16

28,668
Ehrlich, N.J. TOWARD A TAXONOMY OF AUTOMOBILE DRIVING: I. TRACKING. Percept. mot. Skills, June 1966, 22(3), 759-762. (Mental Health Research Institute, Ann Arbor, Mich.).

An experiment was conducted to explore the characteristics of straight line tracking performance in automobile driving. 2 Ss were used in driving an automobile on a public road at 50, 60, 70, and 80 mph. Photographic records were made of the track of the automobile while the drivers were instructed simply to "drive as straight as possible" at a constant speed. An analysis of the tracking records indicates that different strategies were being employed by the 2 drivers. One corresponded to the mathematical biophysics formulation of Rashevsky (avoidance of lateral boundaries) while the other operated under the more familar psychological laboratory tracking task (direct error-feedback). The experiment is an exploratory effort in the microcharacteristics of automobile driving.
R 2

28,669
Sweeney, D.R. PAIN REACTIVITY AND KINESTHETIC AFTEREFFECT. Percept. mot. Skills, June 1966, 22(3), 763-769. (USA Research Institute of Environmental Medicine, Quartermaster Research & Engineering Command, Natick, Mass.).

The previously reported relationship between reaction to suprathreshold pain and kinesthetic aftereffect was substantiated, the pain being induced by exposure of the hand to cold air. 3 groups ($n_i = 9$) constructed to represent 3 levels of reported pain reactivity differed in extent of kinesthetic aftereffect as measured by displacement of post-inspection judgments from control PSE. Those of highest reported pain reactivity showed the least displacement. The groups did not differ in recovery from aftereffect or in ascending-descending trial difference, postulated in the literature as a measure of rapid satiation on the variable stimulus. An attempt was made to resolve theoretical differences by using a vector model for displacement, and this model was applied, in a general sense, to prior studies.
R 13

28,670
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: XLVIII. PSYCHOLOGICAL ABSTRACTS, 1965, VOLUME 39, THIRD THIRD. Percept. mot. Skills, June 1966, 22(3), 819-822. (University of Montana, Missoula, Mont.).

104 citations of work on motor skills are listed alphabetically.
R 104

28,671
Brown, D.R., Condon, C.F. & Hitchcock, L., Jr. STIMULUS EQUIVALENCE OF AUDITORY AND VISUAL PATTERNS IN AN INTERMODAL DISCRIMINATION TASK. Percept. mot. Skills, June 1966, 22(3), 823-832. (Purdue University, Lafayette, Ind.).

100 college students were tested on cross-modal discrimination problems in an effort to determine possible bases for translating patterned stimuli between the visual and auditory modalitites. 160 4-choice oddity problems were presented as auditory patterns with the solution requiring a response to visual equivalents. Of the 5 pattern characteristics related to discrimination, it was found that the presence of all pattern characteristics facilitated intermodal discrimination with the exception of a baseline for pitch (visual height). In addition, increasing pattern complexity facilitated performance. The data were interpreted as supporting central factors in pattern perception.
R 15

28,672
Mefferd, R.B., Jr., Wieland, Betty A., Cook, T.H., Sadler, T.G., et al. ANALYSIS OF PERSPECTIVE REVERSAL AND ASSOCIATED APPARENT MOTIONS USING A PERSPECTIVE-BOUND MOVEMENT ILLUSION. Percept. mot. Skills, June 1966, 22(3), 835-858. (US Veterans Administration Hospital, Psychiatric & Psychosomatic Research Lab., Houston, Tex.).

The nature of perspective reversal was examined using among other techniques a previously undescribed movement illusion specific to the non-veridical perception of actual depth. The apparent movement of the illusion proved to be veridical parallax movement displaced spatially. Apparent changes in direction of rotation and apparent oscillation were shown to be consequences of perspective. Objects seen in reversed perspective illustrated spectacularly the size-distance invariance. Detailed analysis revealed that depth perception per se is veridical, and only the apparent relocations of parts are involved in perspective reversal. When a perspective reverses, observer misperceives the location of the near and far parts of the object, but those parts "reverse" about the veridical center in situ and on a strictly 1:1 depth basis. Perspective changes occur only at a plane perpendicular to observer in the depth dimension--never in the horizontal-vertical plane. Parts of a single figure may reverse independently of others, thereby forming a separate perceptual unit, the configuration of which is determined by observer's position rather than by properties of the stimulus. More complex figures (e.g., a rectangular prism composed of 3 cubes), may be perceived as an entire Gestalt, or as various smaller independent units each reversing perspective independently as verified by the movement illusion. The analysis of the nature of perspective reversal suggests that depth perception is composed of at least 2 processes: first, the perception of absolute depth, and second, the spatial ordering of objects or points on objects. The first process seems not to be related to perspective reversal, but the second seems to be implicated as a critical one.
R 18

28,673
Chakrabarti, J. & Barker, D.G. LATERAL DOMINANCE AND READING ABILITY. Percept. mot. Skills, June 1966, 22(3), 881-882. (Texas A & M University, College Station, Tex.).

A correlational analysis of reading and laterality variables revealed no significant tendency for 41 left-handed college students to be either inferior or superior to 311 right-handed male freshman students in reading achievement (vocabulary, comprehension, reading rate).
R 10

28,674
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXIX. PSYCHOLOGICAL INDEX, NO. 25, 1918. Percept. mot. Skills, June 1966, 22(3), 896-898. (University of Montana, Missoula, Mont.).

74 items comprise items relevant to perceptual problems.
R 74

28,675
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXX. PSYCHOLOGICAL INDEX, NO. 26, 1919. Percept. mot. Skills, June 1966, 22(3), 907-909. (University of Montana, Missoula, Mont.).

70 items dealing with some aspect of perception were listed for the year 1919.
R 70

28,676
Senn, D.J. & Manley, M.B. COMPARISON OF SCALING METHODS: PAIRED COMPARISONS VERSUS CONSTANT-SUM. Percept. mot. Skills, June 1966, 22(3), 911-918. (University of Massachusetts, Amherst, Mass.).

15 stimuli were scaled by 100 Ss using the paired-comparison procedure; another 100 Ss scaled the same stimuli using the constant-sum procedure; and finally the data obtained from the constant-sum procedure were reanalyzed in terms of the paired-comparisons method. 3 data plots of scale values were made: a) paired-comparison--constant sum; b) paired-comparison--converted constant-sum; and c) converted constant-sum--constant-sum. All 3 plots indicated a near linear relationship between scales. The findings were interpreted as supporting the notion that qualitative (methathetic) stimuli result in linear functions while quantitative (prothetic) stimuli result in logarithmic functions. It was concluded that the differences between the 2 methods were not sufficiently great to merit the use of the more demanding and time consuming constant-sum technique when scaling "general" stimuli.
R 15

28,677
Bevan, W. & Avant, L.L. COLOR CODING AND POTENCY OF ANCHORS AND RESIDUALS IN JUDGMENT OF SIZE. Percept. mot. Skills, June 1966, 22(3), 919-926. (Kansas State University, Manhattan, Kan.).

This experiment was concerned with the possible influence of color coding upon anchor potency in a criterion task (judgment of the size of squares) and in a residual task (judgment of lifted weights) which preceded it. Color coding had no effect on the potency of the size anchors but produced a slight diminution in the effectiveness of the heaviness anchors. An interesting--and unexpected--result was an upward shift in size judgments following the judgment of the weights.
R 9

28,678
Rechtschaffen, A., Hauri, P. & Zeitlin, M. AUDITORY AWAKENING THRESHOLDS IN REM AND NREM SLEEP STAGES. Percept. mot. Skills, June 1966, 22(3), 927-942. (University of Chicago, Chicago, Ill.).

The auditory awakening thresholds of the major electroencephalographically defined sleep stages were compared. A modification of the method of constant stimuli was used in an apparently successful attempt to minimize the incorporation of the experimental stimuli into the mental activity of the sleeper. A total of 319 experimental trials were distributed among 7 human Ss who served for about 6 experimental nights each. The sequence and timing of experimental trials were counterbalanced to control for nights, habituation, amount of accumulated sleep, and amount of sleep since last awakening. The results showed approximately equal awakening thresholds during rapid eye movement (REM) periods (the rapid eye movement stage of sleep) and stage 2 (low voltage EEG and 12 to 14 cps "sleep spindles"). Both these stages had lower awakening thresholds than delta sleep (large slow EEG waves). Awakening thresholds became lower with accumulated sleep, independent of sleep stage. There were no significant stage independent relationships between awakening threshold and time since last awakening or time since last body movement, although the latter were varied over a relatively narrow range which limits the generality of these findings. There was no stage independent relationship between heart rate and awakening threshold. The possible physiological determinants of the awakening response were discussed.
R 31

28,679
Snadowsky, A.M., Rizy, E.F. & Elias, M.F. SYMBOL IDENTIFICATION AS A FUNCTION OF MISREGISTRATION IN COLOR ADDITIVE DISPLAYS. Percept. mot. Skills, June 1966, 22(3), 951-960. (USAF Display Techniques Branch, RADC, Griffiss AFB, N.Y.).

The relation of misregistration in color additive projection displays to speed and accuracy of symbol identification was investigated. Ss viewed 36 letters and numbers, presented simultaneously in 7 colors (white, red, green, blue, yellow, magenta, cyan), under 7 conditions of misregistration (0 to 200%). Performance seriously deteriorated from 67 to 200% misregistration, but a misregistration as high as 100% was necessary to produce a level of performance which was significantly lower than that obtained under perfect registration conditions. Under misregistration conditions, red and blue were the most efficient color codes, while cyan and white were the least efficient. It was concluded that a) future studies might profitably investigate misregistrations of smaller increments lying between 67 and 100% misregistration, and b) the relative tolerance of individual colors to deleterious misregistration effects should be taken into consideration when color codes are assigned to critical information categories.
R 3

28,680
Kaufman, H. & Levy, R.M. A FURTHER TEST OF HICK'S LAW WITH UNEQUALLY LIKELY ALTERNATIVES. Percept. mot. Skills, June 1966, 22(3), 967-970. (University of Connecticut, Storrs, Conn.).

The present study was designed to replicate Lamb and Kaufman's (1965) findings of a relationship between choice reaction time and transmitted information for equally likely (ELA) and unequally likely (ULA) stimulus alternatives. The possible confounding of variability between sessions and between experimental conditions in the Lamb and Kaufman study was eliminated by using a single S in all experimental sessions. Results, in essential agreement with those of the earlier study, suggest strongly that the ELA and ULA conditions are fundamentally different as information sources.
R 7

28,681
Smith, A.H. PERCEPTION OF SHAPE AS A FUNCTION OF ORDER OF ANGLES OF SLANT. Percept. mot. Skills, June 1966, 22(3), 971-978. (Defence Research Medical Labs., Toronto, Ontario, Canada).

Twenty-four observers viewed a rectangle and a triangle binocularly under reduced viewing conditions. The forms were shown in the frontal-parallel plane and at slants of 15°, 30°, 45°, and 60° in random, increasing and decreasing order of angles. Observers judged shape by matching and by drawing. There was more constancy for decreasing order than for increasing order. The results for random order were inconclusive. The differences between the indices for drawing and matching were, in general, not significant. The rectangle produced more constancy than the triangle, especially at large slants. The series effect was contrary to prediction based on Helmholtzian and Gestaltist interpretations of the relation between phenomenal slant and phenomenal shape and was interpreted as consistent with adaptation-level theory on the assumption that the focal stimuli affected responses more than the residual stimuli.
R 12

28,682
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXV. PSYCHOLOGICAL INDEX, NO. 21, 1914. Percept. mot. Skills, Feb. 1966, 22(1), 79-82. (University of Montana, Missoula, Mont.).

One hundred fourteen items dealing with many aspects of perception are listed.
R 114

28,683
Kalil, R.E. & Freedman, S.J. INTERMANUAL TRANSFER OF COMPENSATION FOR DISPLACED VISION. Percept. mot. Skills, Feb. 1966, 22(1), 123-126. (Tufts University, Medford, Mass.).

While wearing displacing prisms, each S viewed one hand as he reached for and touched a target in the mid-saggital plane. After exposure, significant compensation was measured with the contralateral hand.
R 10

28,684
Kalil, R.E. & Freedman, S.J. PERSISTENCE OF OCULAR ROTATION FOLLOWING COMPENSATION FOR DISPLACED VISION. Percept. mot. Skills, Feb. 1966, 22(1), 135-139. (Tufts University, Medford, Mass.).

Photographic measurements of eye position before and after compensation for prismatic visual displacement revealed significant and persistent lateral ocular rotations of which Ss seemed unaware. These rotations could account for errors in reaching when prisms are first worn as well as for aftereffect errors.
R 10

28,685
Templeton, W.B., Howard, I.P. & Lowman, Ann E. PASSIVELY GENERATED ADAPTATION TO PRISMATIC DISTORTION. Percept. mot. Skills, Feb. 1966, 22(1), 140-142. (University of Durham, Durham, England).

Os were provided with both a motive and an opportunity to resolve the conflict arising from displaced vision under conditions which precluded reafferent information. Passive pointing to displaced visual targets with knowledge of results was shown to produce significant adaptation of subsequent active pointing.
R 2

28,686
Cohen, D.B. & Nelson, W.H. EFFECT OF DIFFERENTLY COLORED INCIDENTAL STIMULI ON CUED DISCRIMINATIONS. Percept. mot. Skills, Feb. 1966, 22(1), 143-146. (Saint Leo College, St. Leo, Fla.).

The effect on choices of geometric forms of using differently colored, similar, geometric forms as incidental cues was investigated. For this task there was a significant difference in frequency of choice of cued form associated with sex, but none associated with the 5 different colors for the 18 male and 22 female Ss tested. The use of colored incidental cues did not result in significantly more frequent choice of cued form than did the use of non-colored incidental cues.
R 6

28,687
Rusnak, A.W. PSYCHOPHYSICAL METHOD AND PHORIA AS VARIABLES DETERMINING APPARENT MOTION PERCEPTION. Percept. mot. Skills, Feb. 1966, 22(1), 147-152. (Larue D. Carter Memorial Hospital, Indianapolis, Ind.).

Psychophysical method, degree of heterophoria, and type of heterophoria (esophoria and hyperphoria) were studied as variables affecting the perception of beta motion in 25 male Ss and 25 female Ss. Esophoria was more disruptive of motion perception than hyperphoria, for all Ss, with the stimuli presented in a horizontal plane. The method of constant stimuli produced greater mean durations of perceived motion in the male Ss than the method of serial exploration but was non-significant for females. Degree of heterophoria did not significantly affect mean durations of perceived motion for either group, leading to the conclusion that beta motion is a highly stable phenomenon.
R 8

28,688
Sayons, K. KINETIC FRAME EFFECTS: III. GYROSCOPIC MOTION. Percept. mot. Skills, Feb. 1966, 22(1), 153-154. (St. Louis University, St. Louis, Mo.).

When a frame, in the kinetic frame situation was rotated at 5 cps, the frame was experienced by each of 40 Ss as spinning three-dimensionally around the line, primarily at either the objective rate (in 10 Ss) or half the objective rate (23 Ss). Phase overlay, presumed to underlie the three-dimensional spin, was also observed.
R 4

28,689
Chatterjea, R.G. & Rakshit, P. ESTIMATION OF TEMPORAL INTERVAL. Percept. mot. Skills, Feb. 1966, 22(1), p176. (Brown University, Providence, R.I. & Calcutta University, Calcutta, India).

The purpose of the present study was to examine the effect of colored light, white light, and sound in the estimation of short intervals. The hypothesis was that preference of an individual for a color affects his estimation of time considerably. Twenty Ss were used. Color preferences were first determined followed by exposure to the auditory signal (calling bell) and light signals (red, green, yellow, blue and white) at intervals of 0.2-1.0 sec. Arithmetic means and constant errors were calculated. The relation between stimulus time and estimation was linear and was in conformity with data reported earlier. The group means at the different intervals in the visual presentation were 0.27, 0.41, 0.55, 0.67, and 0.82 sec., indicating the location of the indifference interval fell between 0.4 and 0.6. Colored light, however, did not have appreciable effect on individual estimation. The sound data followed the same trend, although the indifference interval was between 0.6 and 0.8 sec.
R 2

28,690
Strauss, P.S. & Carlock, J. ESTIMATION OF PERPENDICULARITY AND LAYING OF RIGHT ANGLES. Percept. mot. Skills, Feb. 1966, 22(1), 185-186. (USA Picatinny Arsenal, Dover, N.J.).

As part of a larger field study, 10 Ss estimated the perpendicularity of a flat wire to an undefined road edge, a string to a flat wire, and the flat wire angularly bent. Differences were found between estimations made without a definite baseline (Mean angle=97.9°) and estimations made with a clearer baseline (Mean angle=90.7°). There were no significant differences between conditions where some type of a definite baseline was available.

28,691
Benfari, R. THE SCANNING CONTROL PRINCIPLE AND ITS RELATIONSHIP TO AFFECT MANIPULATION. Percept. mot. Skills, Feb. 1966, 22(1), 203-216. (Research Dept., Grumman Aircraft Engineering Corporation, Bethpage, N.Y.).

An experiment was carried out with 32 Ss, using hypnosis as a means of inducing an affect state. The main purpose was to test the relationship between induced affect and cognitive-perceptual behavior. The design controlled for the effects of the organismic variable of scanning. The results gave weight to the hypothesis that cognitive controls can act as regulators of an intervening affect state. High scanning Ss made fewer errors in judgment during affect manipulation while limited scanners tended to increase their error scores. A theoretical tie-in with ego psychology was proposed, based on Rapaport's and Hartmann's theory of the relative autonomy of the ego processes.
R 12

28,692
Taylor, J.G. THE PRISM ILLUSION: A FUNCTION OF DISLOCATED EQUIVALENCE CLASSES. Percept. mot. Skills, Feb. 1966, 22(1), 219-232. (Defence Research Medical Labs., Toronto, Ontario, Canada).

A mathematical analysis of the transformation of the direction of light rays passing through a wedge prism is presented. It is shown that if (x,y) is the angle of incidence and (x^1,y^1) the angle of emergence, $y^1=y$ and $x^1=f(x,y)$. The main properties of the function are displayed, and a numerical example is presented in tabular form. Looking through a prism gives the impression that, in general, $y^1\neq y$, vertical dimensions being enlarged at the base end and contracted at the apex end of the prism. The function $x^1=f(x,y)$ shows that horizontal dimensions are contracted at the base end and expanded at the apex. It is suggested that the perceptual process resists this deformation, so that horizontal dimensions are less contracted and less expanded than the function would indicate. Since this does not affect the dimensions of the retinal image, perceptual expansion (or contraction) of contracted (or expanded) horizontal dimensions entails expansion (or contraction) of vertical dimensions as well. The conclusion that $y^1=y$ may be tested by looking through binocular prisms with bases on the temporal sides. If $y^1\neq y$, vertical disparity will make binocular fusion difficult. No failure of fusion has been reported.
R 4

28,693
Pfeiffer, M.G. & Siegel, A.I. COMPARISON OF CATEGORY AND MAGNITUDE SCALES OF TECHNICAL SKILLS. Percept. mot. Skills, Feb. 1966, 22(1), 235-248. (Applied Psychological Services, Science Center, Wayne, Penn.).

Category and magnitude scaling procedures were employed by 36 journeymen electronics personnel to scale the apparent complexity of various aspects of their own job. Included were traditional and modified rank order, paired comparison, magnitude estimation and constant sum methods. The stimuli to be judged by Ss were in the form of descriptive statements about their avionics job activities and the avionics circuits which they maintained. The orthogonality of these stimuli had been determined in previous multidimensional scaling analyses. The results indicated that: a) the data derived from the four different scaling techniques are within a linear transformation of one another, thus indicating that it is possible to obtain high equivalent job complexity data on an interval scale by using such ordinal scaling methods as rank order (traditional) and paired comparisons; b) journeymen aviation electronics personnel can consistently and reliably scale the complexity of the familiar descriptive stimuli used to represent their jobs; c) the continuum of apparent job complexity based on the four activity stimuli and the 16 circuit stimuli is metathetic; and finally d) since the distortions introduced by the different methods were small, the present data suggest support for a single psychophysical law in the avionics job performance area.
R 23

28,694
Somiya, T. AN EXPLANATION FOR A CONTRADICTION IN THE EFFECTS OF FIGURE MEASURED IN TERMS OF LIGHT THRESHOLD AND CFF. Percept. mot. Skills, Feb. 1966, 22(1), 249-250. (Bisai Educational Center, Bisai-city, Japan).

An apparent contradiction in the effects of figure measured in terms of light threshold and CFF was explained on the basis of interactions of onset-offset stimulus characteristics, duration of the stimulus, and background illumination.
R 9

28,695
Freeberg, N.E. SHADOW EFFECTS IN RECOGNITION OF COMPLEX TEXTURED SURFACES. Percept. mot. Skills, Feb. 1966, 22(1), 251-256. (Educational Testing Service, Princeton, N.J.).

Recognition judgments of complex-textured relief surfaces were made under varying angles of a projected light source. Photos of these same and similar surfaces, taken under the identical light angles, served as the variable stimuli against which the recognition judgments were made. The extent to which shadow enhanced recognition was a function of the availability of other cues for recognition in the stimulus material. Addition of shadow could serve to degrade recognition as well, when pictorial information from which judgments were made contained minimal shadow.
R 8

28,696
Pfeiffer, M.G. & Siegel, A.I. PERSONNEL PSYCHOPHYSICS. Percept. mot. Skills, Feb. 1966, 22(1), 257-258. (Applied Psychological Services, Science Center, Wayne, Penn.).

It was hypothesized that the psychophysical law would describe the relationship between perceived circuit complexity as judged by journeymen maintenance personnel and the actual number of complexity attributes of circuits as determined by professional engineers. Employing data independently derived from these two sources, the above hypothesis appears to have been verified.
R 3

28,697
Eysenck, H.J. ON THE DUAL FUNCTION OF CONSOLIDATION. Percept. mot. Skills, Feb. 1966, 22 (1), 273-274. (University of London, London, England).

It is suggested that there are two types of consolidation. Primary consolidation is concerned with a process of making available to the learner for use neural traces acquired during massed practice; secondary consolidation is concerned with the protection of these learned effector patterns against traumatic events affecting the brain.
R 7

28,698
Dunn, B.E. & Thomas, S.W. RELATIVE HEIGHT AND RELATIVE SIZE AS MONOCULAR DEPTH CUES IN THE TRAPEZOID. Percept. mot. Skills, Feb. 1966, 22(1), 275-281. (University of Alberta, Calgary, Alberta, Canada & Michigan State University, East Lansing, Mich.).

Ss viewed trapezoids and made absolute judgments of their degree of tilt around a vertical axis. The trapezoids were equal in horizontal length but the ratio of their vertical edges was 15:16 or 13:16. The height in the frontal plane of the midpoint of the shorter vertical edge varied from above (positive) to below (negative) the midpoint height of the lower vertical edge. Two extremes in the type of function to expect were predicted on the basis of past experimentation and geometric considerations. It was found that as the relative midpoint height went from negative to positive, perceived tilt increased linearly except for a brief reversal in the 15:16 condition. Perceived tilt was shown to be greater, but with some overlap, for the 13:16 trapezoids.
R 11

28,699
Wolff, P. TRACE QUALITY IN THE TEMPORAL ORDERING OF EVENTS. Percept. mot. Skills, Feb. 1966, 22(1), 283-286. (University of Michigan, Ann Arbor, Mich.).

The hypothesis was tested that the degree to which an event is recognized as having occurred before acts as a cue in determining when that event occurred in relation to a second event. It was assumed that a high association value (AV) nonsense syllable would be forgotten less rapidly than a low AV syllable. S saw a mixed list of high and low AV trigrams. Periodically S was asked which of two syllables he had seen first in the list. All four possible combinations of AV were used in the questions about order of occurrence. As predicted, more errors were made on High-Low pairs than on Low-High pairs. However, this relationship was found only for Ss who reported having used memory as a cue in ordering the syllables (13 of the 24).
R 7

28,700
Compton, Norma H. DEVELOPMENT OF A FABRIC PREFERENCE TEST. Percept. mot. Skills, Feb. 1966, 22(1), 287-294. (Utah State University, Logan, Utah).

A paired-choice test is described by means of which preferences for color, design, and texture in clothing fabrics can be measured. The test consists of 78 35-mm. colored slides of apparel fabrics, differing with respect to chroma and value of color, figure-ground color value contrasts, warm versus cool colors, design size, and rough versus smooth textures.
R 7

28,701
Smith, A.H. SERIES EFFECT IN MONOCULAR PERCEPTION OF SLANT. Percept. mot. Skills, Feb. 1966, 22(1), 295-302. (Defence Research Medical Labs., Toronto, Ontario, Canada).

In Exp. I, 24 Os viewed a circular disc monocularly, under reduced conditions, in the frontal-parallel plane and at geometric slants of 15°, 30°, 45°, & 60°, in random, increasing and decreasing order of angles. Os estimated slant by setting a tilt-rod from the vertical, the horizontal, and the position of the preceding response. The response pattern, increase in error to 30° or 45° and decrease to 60°, was stable for most conditions. Amount of error was affected by order and tilt-rod setting. The results for order and for the response and vertical initial settings of the tilt-rod were interpreted in terms of anchoring. The results for the horizontal initial setting were ascribed to extension of subjective reference scales. Exp. II tested the possibility that the results for order were due to figural aftereffect. Os fixated the disc for 4 min at 15° and later estimated its slant at 60°, and conversely. The results, relative to those for a control condition involving 4-sec exposures of the disc, were negative.
R 9

28,702
Sulzer, J.L. & Levy, C.M. A TEST FOR THE EFFECT OF NUMERICAL MAGNITUDE OF KNOWLEDGE OF RESULTS. Percept. mot. Skills, Feb. 1966, 22(1), 311-316. (Newcomb College, Tulane University, New Orleans, La. & University of Florida, Gainesville, Fla.).

Ss were given 3 guided training (T) trials, each followed by a free response, to learn to move a concealed lever 60°. No KR was administered. 6 unguided countertraing (CT) trials followed, during which KR related to a target 20° above the origin was administered after each free response. A unit error of 2° was reported as 1, 10, 100, or 1000 units, depending upon the group. In the first post-KR trial and over all CT trials, no significant differences among the groups were observed. The Groups X Trials interaction was likewise nonsignificant. It was concluded that inflating error by "adding zeroes" was a very weak manipulation in this situation.
R 6

28,703
Marshall, J.E. EYE MOVEMENTS AND THE VISUAL AUTOKINETIC PHENOMENON. Percept. mot. Skills, Feb. 1966, 22(1), 319-326. (USA Medical Research Lab., Fort Knox, Ky.).

The autokinetic reports of 64 male Ss reflected to a significant extent the direction of compensatory eye movements which had been experimentally manipulated using a retinal image displacement technique. A tracking device was used to record the seconds per trial that the stimulus appeared in each of 4 visual field quadrants, a temporal measure of magnitude, latency, and direction of initial movement. The results suggest compensatory eye movements associated with the maintenance of single-point binocular fixation and consequent reduction of the disruptive effects of heterophorically stimulated fixation disparity, as the visual mechanism primarily responsible for the autokinetic phenomenon.
R 13

28,704
Morinaga, S., Noguchi, K. & Yokoi, K. DIRECT COMPARISON OF REAL AND APPARENT VISUAL MOVEMENT. Percept. mot. Skills, April 1966, 22(2), p346. (Chiba University, Chiba, Japan).

This English summary of a Japanese article very briefly reports the findings of 3 experiments which investigated discrimination between real and apparent visual movement and compared their apparent velocities. 2 black drums with white lines (2mm. in width) were rotated by motors around vertical axes behind a black screen which had 2 vertical slits (2 x 200mm.) 650mm. apart from each other and was located 150 cm. from S in a dark room. For real movement, a drum with a zigzag line was used and for apparent movement, a drum with 2 horizontal broken lines. When the drum was rotated, a white patch (the intersection of the slit and the white line) moved up and down for real movement; 2 white patches were exposed alternately with dark intervals for apparent movement. In Exp. 1, 4 Ss were asked to compare apparent and real movement having the same amplitude (5 cm.) and the same cyclic period (1 to 2 sec.). In Exp. 2, Ss were asked to compare 2 apparent movements having various durations of exposure and dark intervals at 3 levels of amplitude (3, 6, and 9 cm.). In Exp. 3, a white broken zigzag line on the drum was used to produce apparent motion.

28,705
Challlet, R.F. & Klett, Shirley L. HUMAN FACTORS ENGINEERING EVALUATION OF USNS CORPUS CHRISTI BAY. Tech. Note 9 66, Sept. 1966, 26pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This report addresses the areas of human factors engineering attendant to a floating depot maintenance facility. Results and recommendations of the 4-month analytic study and onsite survey of the USNS Corpus Christi Bay are discussed.
R 18

28,706
Fiss, H. PHYSIOGNOMIC EFFECTS OF SUBLIMINAL STIMULATION. Percept. mot. Skills, April 1966, 22(2), 365-366. (Mental Health Research Center, New York University, New York, N.Y.).

24 Ss were tachistoscopically shown a series of nonsense figures in a counterbalanced design in which half of the figures were preceded by the subliminal word "angry" and half by a blank. Ss rated each figure on an "angriness" scale that indicated how "angry" the figure looked. Ss also rated themselves on the Sarason Hostility Scale. Contrary to expectations, figures preceded by the subliminal word "angry" were rated as only slightly "angrier looking" than figures preceded by the blank. However, a significant product-moment correlation was obtained between Ss' self-ratings on the hostility scale and their responses to the subliminal word "angry" as measured by their ratings of the figures, indicating that the occurrence of the physiognomic effect of the subliminal word depended on Ss' consciousness of their hostile feelings and thoughts.
R 5

28,707
Wieland, Betty A. & Mefferd, R.B., Jr. LONG-TERM CHANGES IN PROPERTIES OF THE AUTOKINETIC ILLUSION. Percept. mot. Skills, April 1966, 22(2), 367-369. (US Veterans Administration Hospital, Houston, Tex. & University of Houston, Houston, Tex.).

Large inter-individual differences were noted in latency, complexity, amount, and direction of movement reported by 3 sophisticated Ss exposed to the autokinetic illusion for 90 sec. on each of 120 consecutive days. Systematic changes characteristic of each S were far too complex to permit the typical analyses found in the literature, using only the 4 primary directions, simple latencies, simple qualitative comparison of drawings, etc.
R 3

28,708
Evans, W.O. PERFORMANCE ON A SKILLED TASK AFTER PHYSICAL WORK OR IN A HIGH ALTITUDE ENVIRONMENT. Percept. mot. Skills, April 1966, 22(2), 371-380. (USA Medical Research & Nutrition Lab., Fitzsimmons Army Hospital, Denver, Colo.).

The purpose of this experiment was to examine the effects of heavy physical work and of a high terrestrial environment on the complex psychomotor skill of pistol firing. 6 Ss walked on a treadmill, using the titration procedure, to 4 different degrees of fatigue. With instructions for either rapid or accurate firing, S, on a light signal, got off the treadmill and fired 6 shots. Scores were analyzed in terms of time from the turning on of the light until the pistol was picked up, time to fire the first shot, time to fire the remaining 5 shots in a series, and the accuracy of all 6 shots. Time to fire the pistol on the first shot and time to fire the remaining 5 shots were affected by treatments. The effects on pistol shooting of a high terrestrial environment were studied in 8 men taken rapidly from sea level to an altitude of 14,110 ft. The same general prodecures were used but no fatigue was induced. High altitude increased speed of firing and decreased accuracy.
R 15

28,709
Baldwin, R.O., Thor, D.H. & Wright, D.E. SEX DIFFERENCES IN THE SENSE OF TIME: FAILURE TO REPLICATE A 1904 STUDY. Percept. mot. Skills, April 1966, 22(2), p398. (Western Michigan University, Kalamazoo, Mich.).

McDougall (1904), Yerkes and Urban (1906), and other early investigators reported sex differences in time estimation by human Ss, and more recent studies (Loehlin, 1959) have reported no difference. The replication of McDougall's study followed his procedure as reported with the addition of more Ss and variables. 40 male and 78 female students in introductory psychology estimated 4 intervals (15, 30, 60, 90 sec.) under 4 conditions (listening to E read, crossing out ms, waiting, counting) by the method of verbal estimation at one of 5 sessions throughout the day. Differences between mean estimates given by males and those given by females were not significant for any of the conditions and were opposite in direction to what would be expected from McDougall's results. Our obtained differences among the conditions were similar in rank but different in magnitude. McDougall's Ss overestimated all intervals with one exception; the present Ss underestimated all intervals. Additional hypotheses investigated concerned the influence of the time of day at which the estimates were made (Thor & Baldwin, 1965), the effect of the onset of the menstrual cycle, and the importance of psychosexual role identification (PRI) as measured by the Gough femininity scale (Gough, 1952). None of these variables significantly affected time estimates of men and women. However, the relation of biological sex and scores on PRI needs particular clarification in future research. Assuming the early studies were accurate, Loehlin's hypothesis of changing cultural roles as a determinant of time perception may be essentially correct.
R 5

28,710
Giannitrapani, D. ELECTROENCEPHALOGRAPHIC DIFFERENCES BETWEEN RESTING AND MENTAL MULTIPLICATION. Percept. mot. Skills, April 1966, 22(2), 399-405. (Institute for Juvenile Research, Chicago, Ill.).

The average frequency of 30 sec. of EEG tracing for 2 states, resting and mental multiplication (thinking), was determined for 20 Ss by counting each visually detectable change in pen deflection regardless of amplitude. a) Thinking gave higher average activity scores than resting. b) The difference in average activity between thinking and resting was greatest in in the 2 frontal and left temporal areas and it was significantly different from the differences in the other areas. c) In the resting state there was a difference between left and right frontal and temporal areas (which increased while thinking) in contrast with a left-right symmetry of the other areas tested. These findings were interpreted as representing characteristic average activity for the areas and conditions tested and were offered as evidence for the differential utilization of brain areas in the given tasks.
R 19

28,711
Matin, L. & Kibler, G. ACUITY OF VISUAL PERCEPTION OF DIRECTION IN THE DARK FOR VARIOUS POSITIONS OF THE EYE IN THE ORBIT. Percept. mot. Skills, April 1966, 22(2), 407-420. (Columbia University, New York, N.Y. & Johns Hopkins University, Baltimore, Md.).

Viewing monocularly in a dark room, Ss reported the location of a 4' 100-msec. flash relative to the location of a fixation target extinguished 3 sec. earlier. In one experiment the flashes were randomly preselected from a horizontal array centered on the fixation target and S reported the horizontal displacement of the flash (left, right, same); fixation was either in primary position or in secondary position 34 1/2° to the right or to the left of primary position. In a second experiment the flashes were randomly preselected from a vertical array centered on the fixation target and S reported the vertical displacement of the flash (above, below, same); fixation was either in primary position or in a secondary position 34 1/4° above or 23 1/4° below the fixation target. JNDs were about 20' of arc in primary position and increased considerably in all secondary positions of fixation. In the first experiment PSEs shifted to the right as fixation position was shifted to the left; in the second experiment PSEs shifted upward as fixation position shifted downward.
R 12

28,712
Brown, D.R. & Michels, K.M. QUANTIFICATION PROCEDURES, STIMULUS DOMAINS AND DISCRIMINATION DIFFICULTY. Percept. mot. Skills, April 1966, 22(2), 421-422. (Purdue University, Lafayette, Ind. & Florida Atlantic University, Boca Raton, Fla.).

Quantification of visual stimuli from different stimulus domains has led to conflicting results when discrimination difficulty is related to selected pattern attributes. It is suggested that complete physical specification of visual patterns should involve both structural and metrical units and that independent manipulation of each may resolve conflicting data.
R 11

28,713
Elliott, T.K. A COMPARISON OF THREE METHODS FOR PRESENTING PROCEDURAL TROUBLESHOOTING INFORMATION. FINAL REPORT. Contract AF 33(615) 1137, Proj. 1710, Task 171004, AMRL TR 66 191, Dec. 1966, 38pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Applied Sciences Associates, Inc., Valencia, Penn.).

The effects of subject aptitude and performance aid mode of presentation on the performance of procedural, between-stage troubleshooting tasks on a real piece of electronic equipment were studied. The study used nondecision aids presented in 3 modes, namely, an automatic retrieval of visual information, an automatic retrieval of audio information, and a manual retrieval of visual information. 2 aptitude groups (Air Force electronic index 40-60 and 75-95) with no previous electronic training or experience were given from 3 to 5 hours of task training before the experiment. Each S solved 26 actual, and 11 synthetic problems. The study indicated no difference in effectiveness of aids using visual presentations. Both were superior to audio presentations. The 2 aptitude groups were equally effective in performing troubleshooting tasks using nondecision aids. In comparison with a previous study using decision aids, the study showed nondecision aids produced superior performance on the same between-stage troubleshooting problems using similar Ss.
R 10

28,714
Zuckerman, M. & Hopkins, T.R. HALLUCINATIONS OR DREAMS? A STUDY OF AROUSAL LEVELS AND REPORTED VISUAL SENSATIONS DURING SENSORY DEPRIVATION. Percept. mot. Skills, April 1966, 22(2), 447-459. (Endocrinology & Reproduction Div., Albert Einstein Medical Center, Philadelphia, Penn.).

The primary purpose of the study was to assess the level of arousal prior to the time visual sensations were reported in sensory deprivation conditions. Concurrent recordings of EEG, GSR and verbal reports were obtained from 22 female Ss who spent 1 hr. in sensory deprivation. 10 Ss who reported experiencing visual sensations noted that they were awake or, in a few cases, drowsy at the time of their experience. Examination of their EEG records prior to the reports confirmed their impressions. Ss who reported visual sensations made more verbal reports of other kinds, and reported more anxiety, depression hostility, and somatic discomfort during the sensory deprivation period. The evidence does not support the "postponed dream report" explanation of reported visual sensations (RVS).
R 21

28,715
Blitz, B., Dinnerstein, A.J. & Lowenthal, M. RELATIONSHIP BETWEEN PAIN TOLERANCE AND KINESTHETIC SIZE JUDGMENT. Percept. mot. Skills, April 1966, 22(2), 463-469. (New York Medical College, New York, N.Y.).

40 Ss were tested in tasks measuring pain tolerance and kinesthetic size judgment (KSJ). The results demonstrated a significant relationship between the 2 types of performance: Ss low in pain tolerance tended to make larger errors in KSJ than Ss with higher pain tolerance. Among Ss with descending series, pain tolerance correlated negatively with degree of overestimation of the standard. The results are consonant with the hypothesis that attentional function is the relevant underlying mechanism.

28,716
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: XLVI. PSYCHOLOGICAL ABSTRACTS, 1965, VOLUME 39, FIRST THIRD. Percept. mot. Skills, April 1966, 22(2), 471-474. (University of Montana, Missoula, Mont.).

99 references to research on motor skills are listed alphabetically

28,717
Edwards, A.E. & Rosenberg, Beth. AN AUTOMATED BRANCHING DEVICE FOR THE ASSESSMENT AND TRAINING OF VISUAL DISCRIMINATION. Percept. mot. Skills, April 1966, 22(2), 488-490. (US Veterans Administration Hospital, Los Angeles, Calif.).

An automated device for the assessment and training of visual discrimination is described. The device utilizes a juke-box upon which film apparatus is mounted, as a random access slide projector. Filmed stimulus material is placed around the circumference of plastic discs housed in the juke-box and is projected onto a screen in programmed sequences. The device is inexpensive, has a good memory, is electrically controllable, and has a maximum search time of 11 sec. for 2400 chips of film. It has been used successfully in the assessment and training of more than 200 brain-damaged patients.
R 5

28,718
Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: XLVII. PSYCHOLOGICAL ABSTRACTS, 1965, VOLUME 39, SECOND THIRD. Percept. mot. Skills, April 1966, 22(2), 511-514. (University of Montana, Missoula, Mont.).

This bibliography contains 101 selected references on motor skills. The references are listed alphabetically.

28,719
Jacobson, J.Z., Frost, B.J. & King, W.L. A CASE OF DERMOOPTICAL PERCEPTION. Percept. mot. Skills, April 1966, 22(2), 515-520. (Dalhousie University, Halifax, Nova Scotia, Canada).

A 21-yr.-old woman was found to possess the ability to discriminate colors through her fingertips under conditions which controlled for normal visual information, order of stimulus presentation, experimenter-produced cues, and textural differences. A forced-choice method employing 4 different colors and knowledge of results was used. The data indicated that light on the stimulus cards was necessary for her discrimination.
R 11

28,720
Lazar, G. ADAPTATION TO DISPLACED VISION AS A FUNCTION OF DIRECTION OF HAND MOVEMENT. Percept. mot. Skills, April 1966, 22(2), 521-522. (State University, New Paltz, N.Y.).

2 groups of Ss adapted to prismatically displaced vision while moving their arms. The group which moved their arms vertically against a vertical target adapted more completely than a group moving their arms laterally against the same target when a trial-by-trial record was made of adaptation. However, these differences are absent when aftereffects are used as the criterion of adaptation. The findings can be interpreted to mean the background as well as the direction of hand movements is important in adaptation and that aftereffects may be a poor criterion by which to assess the effects of variables on adaptation.
R 1

28,721
Gibb, Margaret, Freeman, I. & Adam, June. EFFECTS OF LUMINANCE CONTRAST FACTORS UPON FIGURAL AFTEREFFECTS INDUCED BY SHORT FIXATION PERIODS. Percept. mot. Skills, April 1966, 22(2), 535-541. (University of Alberta, Calgary, Alberta, Canada).

An experiment was designed to investigate the effects of luminance contrast factors upon the concentric circles aftereffect for very short periods of fixation. 64 Ss participated in the experiment. The general finding was that the immediate aftereffect increased as the luminance contrast of the inducing figure increased and decreased as the luminance contrast of the test figure increased.
R 15

28,722
Cratty, B.J. PERCEPTION OF INCLINED PLANE WHILE WALKING WITHOUT VISION. Percept. mot. Skills, April 1966, 22(2), 547-556. (University of California, Los Angeles, Calif.).

164 blind Ss and 30 blindfolded, sighted controls walked and reported their perceptions of a pathway whose surface contained grades of 1, 2, 4, and 6° of incline and decline from the horizontal. It was found that the perception of incline and decline were independent perceptual attributes and that Ss were more sensitive to decline than to incline. The blind were more sensitive to decline than sighted controls. Various other inter-group differences between various portions of the blind population were found.
R 7

28,723
Endler, N.S. ESTIMATING VARIANCE COMPONENTS FROM MEAN SQUARES FOR RANDOM AND MIXED EFFECTS ANALYSIS OF VARIANCE MODELS. Percept. mot. Skills, April 1966, 22(2), 559-570. (York University, Toronto, Ontario, Canada).

The analysis of variance can be used for: a) F tests of the null hypothesis; b) investigating theoretical models; and c) estimating, from mean squares, the relative contributions of variance components. The methods of estimation of variance components enable the researcher not only to test significance but to attribute the relative contribution (percentage of variance) of each source to the total variation (sum of variance components). Discussion concerns the advantages, disadvantages and limitations of random and mixed effects models. The study concludes that each researcher must logically choose the model which best describes his experiment. Three-way random and mixed effects models with one observation per cell are compared and illustrated using data from a multidimensional personality inventory.
R 20

28,724
Toppen, J.T. MONEY REINFORCEMENT AND HUMAN OPERANT (WORK) BEHAVIOR: IV. TEMPORALLY EXTENDED WITHIN-S COMPARISONS. Percept. mot. Skills, April 1966, 22(2), 575-581. (University of Cincinnati, Cincinnati, Ohio).

2 groups of 10 college male Ss were recruited, to be given 5 successive, weekly, 1-hr. work sessions, each following a 20-min. "pre-test" and a questionnaire. These 1-hr. work sessions were all rewarded at the same frequency of reinforcement (1/1000). The control group was continued throughout each of the 5 sessions at 15 cents each reinforcement. The test group was, for the first session, given 15 cents each reinforcement and then the reinforcement level was systematically lowered for each next session by 3 cents, thus resulting in levels of 12 cents, 9 cents, 6 cents, and 3 cents for Sessions 2, 3, 4, and 5, respectively. The work was that of repetitively pulling a manipulandum against a constant-tension spring requiring 25 lb. of force, horizontally, through 5/8 in. distance. Counting the output of only those Ss keeping their appointments for any given session, the mean work output of the decreasing-magnitude group showed a statistically significant, poorer maintenance of work-performance level than did the control group. Counting failures to keep appointments as zero performance for each group, the test group showed even more markedly poor maintenance of output over the 5 sessions.
R 5

28,725
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXVII. PSYCHOLOGICAL INDEX NO. 23, 1916. Percept. mot. Skills, April 1966, 22(2), 592-594. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 82 references to work in perception and closely related fields.

28,726
Standing, L.G. NOTE ON CENTRAL AND RETINAL MECHANISMS IN THE AFTEREFFECT OF SEEN MOVEMENT. Percept. mot. Skills, April 1966, 22(2), 601-602. (Queen's University, Kingston, Ontario, Canada).

If fixation is maintained upon a rotating spiral or a set of moving stripes for more than a few seconds, an illusion of movement in the reverse direction occurs (the aftereffect) when objective movement of the inspection stimulus ceases, provided that various conditions of rotation speed, viewing angle, etc., are fulfilled. The aftereffect also occurs if the inspection stimulus is fixated monocularly and the other eye is used for the post-rotation (test) fixation, though to a lessened extent (Holland, 1957). This finding of interocular transfer has led to a common assumption that the phenomenon occurs within the C.N.S. This paper suggests, however, that a retinal origin for visual movement aftereffect is not refuted by the occurrence of interocular transfer and 2 sources of recent experimental evidence are cited. An explanation of the phenomenon involving both retinal and central processes is presented.

28,727
Brown, J.H. MODIFICATION OF VESTIBULAR NYSTAGMUS BY CHANGE OF TASK DURING STIMULATION. Percept. mot. Skills, April 1966, 22(2), 603-611. (USA Medical Research Lab., Fort Knox, Ky.).

The extent to which changes in task-controlled arousal can influence nystagmic output during both angular acceleration and subsequent constant velocity was examined. 2 groups of 12 Ss each received a series of 16°/sec.^{2} angular accelerations during which alertness states were changed from mental arithmetic to reverie or vice versa at selected intervals. Analysis of variance indicated that task-controlled arousal significantly influences nystagmic output both during angular acceleration and during constant velocity. This finding is at variance with predictions based on earlier work which indicated that arousal influenced nystagmus output only during the acceleration.
R 9

28,728
Orbach, J., Zucker, Ellen & Olson, R. REVERSIBILITY OF THE NECKER CUBE: VII. REVERSAL RATE AS A FUNCTION OF FIGURE-ON AND FIGURE-OFF DURATIONS. Percept. mot. Skills, April 1966, 22 (2), 615-618. (Michael Reese Hospital).

Reversal rate varied as a function of figure-off duration, holding figure-on duration constant at 300 msec. (N=13). There was a rise in reversal rate from 14.0 at 10 msec., then a sharp decline to 4.8 reversals at 800 msec. The rise in reversal rate with increase in figure-on duration from 3.0 at 400 to 18.9 at 4,500 msec., holding figure-off duration constant at 1,000 msec., seemed due primarily to within-exposure, not between-exposure, reversals (N=21).
R 2

28,729
Johnston, Dorothy M. EFFECT OF SMOKING ON VISUAL SEARCH PERFORMANCE. Percept. mot. Skills, April 1966, 22(2), 619-622. (Personnel Subsystem Labs., Boeing Company, Seattle, Wash.).

The purpose of this exploratory study was to determine what effect no-smoking or reduced smoking had on time required to find a target on static displays. 4 males served as Ss in the experimental group and 4 in the control groups. Search performance improved 34% for a group of habitual smokers who reduced their smoking or abstained from smoking for 2 weeks. In contrast, search performance improved only 6% for the control group of smokers and 25% for the control group of nonsmokers. Although only a few Ss were measured, results indicate further study should be made.
R 8

28,730
Olson, R. & Orbach, J. REVERSIBILITY OF THE NECKER CUBE: VIII. PARTS OF THE FIGURE CONTRIBUTING TO THE PERCEPTION OF REVERSALS. Percept. mot. Skills, April 1966, 22(2), 623-629. (Michael Reese Hospital).

When the Necker cube was presented at 109 exposures/min. and 46 exposures/min. the median reversal rates were 41.0 and 0.0, respectively. A variety of figures consisting of parts of the Necker cube were interpolated between successive exposures of the test Necker cube. Some of these figures proved to be effective interpolators, i.e., they shifted the reversal rate toward 14.0, the median for continuous viewing. These figures had in common a minimum linear length. Dispensable characteristics of the effective interpolated figure included intersecting lines, oblique lines, and the feature of reversibility.
R 2

28,731
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXVIII. PSYCHOLOGICAL INDEX. NO. 24, 1917. Percept. mot. Skills, April 1966, 22(2), 631-634. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 86 references to work in perception and closely related fields.

28,732
Garner, W.R., Kaplan, G. & Creelman, C.D. EFFECT OF STIMULUS RANGE, DURATION, AND CONTRAST ON ABSOLUTE JUDGMENTS OF VISUAL SIZE. Percept. mot. Skills, April 1966, 22(2), 635-644. (Johns Hopkins University, Baltimore, Md.).

2 experiments on absolute judgment of visual size were carried out with variations in stimulus range of size, exposure duration, and contrast. The results indicate that the effects of all 3 variables are interchangeable within limited values of each, in the sense that their effects are simply additive. Thus they can be considered to form a common class of energic variable within limited conditions. Stimulus range has an additional effect over and above these mutual effects, however, in a manner which suggests that it influences judgmental factors as well as receptor factors in absolute judgment.
R 10

28,733
Sheridan, J., Foulke, E. & Alluisi, E. SOME FACTORS INFLUENCING THE THRESHOLD OF THE ELECTROCUTANEOUS STIMULUS. Percept. mot. Skills, April 1966, 22(2), 647-654. (University of Louisville, Louisville, Ky.).

An experiment was performed to display the absolute threshold for electrical stimulation of the skin as a function of S, the finger and the hand stimulated, and the day and time of day stimuli were administered. Thresholds were determined by a method of limits. S, the finger, and hand were significant sources of variation. A diurnal effect was suggested but not clearly shown. No quotidian effect was demonstrated.
R 12

28,734
Whitley, J.D. FASTER REACTION TIME THROUGH INCREASING INTENT TO RESPOND. Percept. mot. Skills, April 1966, 22(2), 663-666. (University of California, Riverside, Calif.).

The RT of 50 college men was measured under normal (N) and artificial (E) limb mass conditions. It was hypothesized that RT in condition E would be significantly faster than in N because the heavier mass would encourage a stronger conscious and willful intent, during the response foreperiod, to trigger the simple learned RT response stored in the memory motor drum. The results ($t=4.202$, $p<.05$) substantiated this hypothesis. Even though the relationship of RTs in N and E conditions was moderately large ($r=.56$), the specificity was very high, 69%; thus the possibility that 2 separate neuromotor programs are involved cannot be excluded. It is concluded that in a simple RT experiment the creation of a situation during the response foreperiod which increases S's conscious and willful intent to respond, will result in a faster RT. Also, the results support the known specificity of individual differences in performance of simple discrete motor acts.
R 3

28,735
Smith, A.H. COMPARISON OF THE DRAWING AND MATCHING METHODS FOR JUDGING SHAPE. Percept. mot. Skills, Aug. 1966, 23(1), 3-15. (Defence Research Medical Labs., Toronto, Ontario, Canada).

Observers judged the slant and shape of a circle, a rectangle and a triangle binocularly under reduced viewing at 0°, 15°, 30°, 45°, and 60° geometric slant. In Exp. I they drew shape with drawing size unrestricted (Draw 1) and matched shape with the horizontal axes of 14 comparison shapes constant (Match 1). In Exp. 2, a different group drew shape by the method of Draw 1 and with the horizontal axis of the drawing constant (Draw 2) and matched shape with the areas of 14 comparison shapes variable (Match 2). Slant was underestimated. Draw 1 and Match 1 produced about the same overall constancy in Exp. 1, Draw 1 and Match 2 about the same in Exp. 2. Draw 2 produced more constancy than Draw 1 and Match 2 in Exp. 2. There was more constancy for the rectangle than for the circle and triangle. The results were contrary to the view that drawn shape is confounded with implicitly registered slant and were inconclusive for the invariance hypothesis.
R 9

28,736
Webster, R.B. STIMULUS CHARACTERISTICS AND EFFECTS OF FILL, DISTORTION, AND NOISE ON PATTERN PERCEPTION. Percept. mot. Skills, Aug. 1966, 23(1), 19-33. (Bunker-Ramo Corporation, Canoga Park, Calif.).

A review of recent research concerning the effects of fill, distortion and noise on human pattern discrimination is presented. Studies wherein dot patterns, light-point patterns and/or patterns comprised of filled squares of various dimensions serving as stimuli are considered. The problems of quantifying stimulus (pattern) parameters and measuring their effects on pattern discrimination performance and the use of information concepts are discussed. Also, important related areas of interest where investigation is required are discussed as well as methods of eliciting more specific knowledge relating to pattern discrimination.
R 72

28,737
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXXI. PSYCHOLOGICAL INDEX NO. 27, 1920. Percept. mot. Skills, Aug. 1966, 23(1), 43-46. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 105 articles and books dealing with perception and closely related fields.

28,738
Bergum, B.O. A TAXONOMIC ANALYSIS OF CONTINUOUS PERFORMANCE. Percept. mot. Skills, Aug. 1966, 23(1), 47-54. (Fundamental Research Lab., Xerox Corporation, Rochester, N.Y.).

A conceptual framework is presented, based upon an expanded concept of activation level, which is designed to encompass the full range of performance task research, from vigilance to production-line type performance. Specific characteristic aberrations in performance are associated with specific extreme deviations in activation level and a matrix of task characteristics is developed for relating tasks in terms of their total stimulation value and for predicting the effects of experimental variables on the performance associated with these tasks.
R 16

28,739
Logan, G.A., McKinney, W.C., Rowe, W., Jr. & Lumpe, J. EFFECT OF RESISTANCE THROUGH A THROWING RANGE-OF-MOTION ON THE VELOCITY OF A BASEBALL. Percept. mot. Skills, Aug. 1966, 23 (1), 55-58. (Southwest Missouri State College, Springfield, Mo.).

To determine the effect of specific isotonic resistance applied through the overhand throwing range-of-motion on the velocity of a baseball 3 groups of Ss (varsity baseball players) were studied. Group 1 trained for 6 weeks with an isotonic resistance device; Group 2 trained for 6 weeks by throwing, and Group 3 took the pretest and posttest only. The results indicated that velocity of baseball throwing can be increased significantly by means of moderately light resistance applied specifically through the overhand throwing range-of-motion.
R 8

28,740
Freides, D. & Hayden, Susan P. MONOCULAR TESTING: A METHODOLOGICAL NOTE ON EIDETIC IMAGERY. Percept. mot. Skills, Aug. 1966, 23(1), p88. (Lafayette Clinic, Detroit, Mich.).

Previous research has indicated an association between eidetic imagery and brain damage. Present data on lateral differences strongly suggest an even more specific relationship. It seems likely that unilateral eidetic imagery may be correlated with unilateral brain damage, and bilateral eidetic imagery with bilateral or basal damage. At this time, the number of cases is insufficient and our neurological evidence inadequate, but preliminary findings suggest a contralateral relationship between eidetic eye and locus of brain lesion. Whether these specific relationships are confirmed, further research in this area should include monocular testing. It appears very likely that even closer control, such as would be provided by selective stimulation of the separate visual fields in each eye, will be methodologically fruitful.
R 2

28,741
Francis, R.D. INTRA-SUBJECT STABILITY OF ISOLATION TOLERANCE. Percept. mot. Skills, Aug. 1966, 23(1), 89-90. (Wollongong University College, University of New South Wales, Sydney, Australia).

22 Ss were tested for toleration time of isolation by immersion. The intercorrelations on 12 tests were compared for the toleration time extremes. It appears that each of the 2 extreme groups of 6 Ss is internally homogeneous but unlike the other. Thus it appears that some stable individual difference factor distinguishes the high- and low-isolation tolerator.
R 3

28,742
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXXII. PSYCHOLOGICAL INDEX NO. 28, 1921. Percept. mot. Skills, Aug. 1966, 23(1), 99-102. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 103 references to work in perception and closely related fields.

28,743
Meade, R.D. PROGRESS DIRECTION AND PSYCHOLOGICAL TIME. Percept. mot. Skills, Aug. 1966, 23(1), 115-118. (Western Washington State College, Bellingham, Wash.).

It has been found that time estimates under conditions of motivation to reach a goal are inversely related to rate of progress through a task. This investigation extended the progress variable into negative values where S's actions on each trial took him farther from the goal. Replications for 15-, 30-, 45-, and 60-min. periods showed that longer estimates were made where S moved neither forward nor backward (zero progress) and shorter estimates for both backward as well as forward progress. Explanation of this effect in terms of both Hindle's equation and frustration theory are rejected in favor of one utilizing sensory input as the critical variable.
R 8

28,744
Pick, H.L., Jr., Hay, J.C. & Willoughby, R.H. INTEROCULAR TRANSFER OF ADAPTATION TO PRISMATIC DISTORTION. Percept. mot. Skills, Aug. 1966, 23(1), 131-135. (University of Minnesota, Minneapolis, Minn.).

8 Ss were exposed monocularly to wedge prisms for a period of 3 days. Substantial interocular transfer of adaptation to prismatic distortions was found for gaze contingent distortions and for curvature of vertical lines but not for chromatic fringes. Interocular transfer implies central involvement in the adaptation. Lack of such transfer for chromatic fringes is congruent with previous similar results of other investigators and in line with recent evidence from another kind of experiment suggesting a receptor mechanism for such adaptation.
R 6

28,745
Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: XLIX. PSYCHOLOGICAL ABSTRACTS, 1927, VOLUME 1. Percept. mot. Skills, Aug. 1966, 23(1), 139-142. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 95 selected items on motor skills.

28,746
Eagle, M., Bowling, L. & Klein, G.S. FRAGMENTATION PHENOMENA IN LUMINOUS DESIGNS. Percept. mot. Skills, Aug. 1966, 23(1), 143-152. (Yeshiva University, New York, N.Y.).

This study was concerned with subjective fragmentation of luminous designs. It was found that: a) degree of meaningfulness did not influence amount or pattern of fragmentation; b) angular structures showed greater fragmentation than rounded structures; and c) fragmentation was greatest for the fixated and immediately adjacent area; d) whole lines tended to disappear and reappear as separate units. The interrelationship between structure and fixation as variables influencing fragmentation was discussed in the general context of Hebb's (Amer. Psychol., 1963, 18, 16-27) hypothesis regarding the role of perceptual "units" in the development of stimulus structure.
R 10

28,747
Gregson, R.A.M. CROSS-MODAL MATCHING OF HISTOGRAMS AND FOUR-COMPONENT TASTE MIXTURES, WITH ONE COMPONENT FIXED, UNDER TWO PACING CONDITIONS. Percept. mot. Skills, Aug. 1966, 23(1), 183-190. (University of Canterbury, Christchurch, New Zealand).

16 Ss made cross-modal comparisons of 4-component taste mixtures with histogram representations of tastes. 2 pacing conditions were investigated, and in each, 1 taste component was fixed at one of two intensity levels. Pooled estimates of interstimulus similarities were scaled by a distance model which simulated perceived similarities for all cross-modal comparisons made. Not less than 79% of reliable data variance was mapped into the scaling model for all 4 conditions. Relations between experimental conditions were meaningfully represented in the free parameters of the distance model.
R 11

28,748
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: L. PSYCHOLOGICAL ABSTRACTS, 1928, VOLUME 2. Percept. mot. Skills, Aug. 1966, 23(1), 191-194. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 101 articles on motor skills.

28,749
Ross, B.M. SERIAL ORDER AS A UNIQUE SOURCE OF ERROR IN RUNNING MEMORY. Percept. mot. Skills, Aug. 1966, 23(1), 195-209. (Catholic University of America, Washington, D.C.).

3 running memory experiments were administered to college students. Over-all error difficulty was manipulated by requiring different previously seen symbols to be recalled and varying the time allowed for recall. Results showed that errors attributable to one particular symbol serial-order did not change as a function of mean error. It was concluded that serial order can be a unique source of error in running memory because "interference" and temporal duration cannot account simultaneously for the divergent error trends. Moreover, serial order must be of special importance in determining the relative accessibility of retained items. A further conclusion was that a viewed symbol has to become part of S's memory load if it is to be compared with a previously seen symbol.
R 3

28,750
Burns, N.M., Baker, C.A., Simonson, E. & Keiper, C. ELECTROCARDIOGRAM CHANGES IN PROLONGED AUTOMOBILE DRIVING. Percept. mot. Skills, Aug. 1966, 23(1), p210. (Systems & Research Center, Honeywell, Incorporated, Minneapolis, Minn.).

Exploratory work investigated changes on the ECG during nearly continuous (without sleep) driving over distances from 200 to 700 miles. Data were obtained for a total of 6000 miles of driving. A, male (26 yr.); B, male (40 yr.); and C, male (77 yr.) were clinically healthy; D, male (32 yr.) had nephrosis with chronic albuminuria, with otherwise negative clinical findings. The resting conventional 12-lead ECGs of all 4 Ss were within normal limits. The ECG was taken with a bipolar lead (manubrium-C-5 position) at intervals of approximately 20 min., using a commercially available portable instrument modified for automobile use. The start of each driving session was preceded by a resting ECG taken in the same position. Experimental cars were equipped with power steering and brakes and automatic transmission. A logbook was kept of driving events and conditions. The total distances driven by each S were as follows: A drove 2600 miles in 4 days; B drove 970 miles in 2 days; C drove 200 miles in 1 day; and D drove 2500 miles in 4 days. The electrical activity of the heart was noted to respond distinctly to duration of driving and critical road situations. It appears that significant ECG changes may occur in healthy Ss during long distance driving which would be considered as abnormal in response to other stress situations.

28,751
Penman, K.A. A NEW DYNAMIC BALANCE TESTING DEVICE: THE "DYNABALOMETER". Percept. mot. Skills, Aug. 1966, 23(1), 232-234. (Washington State University, Pullman, Wash.).

A device which measures dynamic balance ability was designed. The dynabalometer is basically a triaxial stabilometer which provides a balance measure for the poorly skilled as well as the highly skilled person. The apparatus is well suited for learning studies.
R 8

28,752
Engel, G.R. A TEST OF THE EXISTENCE OF MONOCULAR STEREOSCOPIC DEPTH PERCEPTION. Percept. mot. Skills, Aug. 1966, 23(1), 235-238. (Defence Research Medical Labs., Toronto, Ontario, Canada).

3 Os, highly trained in observing visual phenomena, viewed a pair of Julesz Stereo Random Brightness Fields presented alternately to the same eye. Under no circumstances was there any report of stereoscopic depth arising from this mode of presentation. This finding contradicts recent reports of monocular stereoscopy obtained by alternately presenting both halves of a stereo pair to the same eye. It is concluded that impressions of depth gained in this way are not due to stereopsis but to the presence of monocular depth cues in the stimuli. Stereoscopic stimuli, such as Random Brightness Fields, which contain no monocular depth cues, do not give rise to the perception of depth.
R 6

28,753
Stager, P. NOTE ON USE OF INFORMATION CONCEPTS IN THE ASSESSMENT OF GROUP STRUCTURE. Percept. mot. Skills, Aug. 1966, 23(1), 239-242. (Princeton University, Princeton, N.J.).

The derivation and possible applications of a procedure for the assessment of group structure are presented. Group structure is discussed in terms of uncertainty and structure of functional role organization. The measure applied to group structure is the average information measure H.
R 14

28,754
Mayzner, M.S. & Tresselt, M.E. STUDIES IN SEQUENTIAL PERCEPTION: LOOKING AT ONE THING BUT FINDING ANOTHER. Percept. mot. Skills, Aug. 1966, 23(1), 257-258. (New York University, New York, N.Y.).

The present note discusses the use of a computer-based CRT display facility being employed to study problems of sequential perception and presents preliminary findings on a possibly new perceptual masking phenomenon.

28,755
Dorfman, D.D. & Miller, R. SOME EFFECTS OF LIGHT ON SOUND INTENSITY GENERALIZATION AS A FUNCTION OF NUMBER OF TRAINING TRIALS. Percept. mot. Skills, Aug. 1966, 23(1), 291-294. (San Diego State College, San Diego, Calif.).

This study determined whether the magnitude of a lateral displacement of a generalization gradient was a function of number of training trials. The results showed that a) when Ss were trained in the absence of a light, introduction of the light on generalization-test trials displaced the gradient toward the weaker sound intensities; and b) the magnitude of this effect was independent of number of training trials.
R 4

28,756
Foulke, E., Coates, G.D. & Alluisi, E.A. DECODING OF ELECTROCUTANEOUS SIGNALS: EFFECTS OF DIMENSIONALITY ON RATES OF INFORMATION TRANSMISSION. Percept. mot. Skills, Aug. 1966, 23(1), 295-302. (University of Louisville, Louisville, Ky.).

Each of 4 electrocutaneous codes, alike with respect to the number of code signals, but different with respect to the dimensions used in composing the signals, was learned by 10 Ss. When response time (RT) was used as the index of performance after practice, the codes were ranked in order of increasing difficulty (or RT) as follows: the location code, location-by-intensity, location-by-duration, the location-by-intensity-by-duration codes. When errors were taken as the index of performance and when Ss had received a moderate amount of practice, the codes were arranged in order of increasing difficulty (or errors) as follows: the location-by-intensity code, location-by-duration, the location code, and the location-by-intensity-by-duration code. When the rate of information transmission (which takes into account both time and errors) was employed as the index of performance, the codes were ranked in order of increasing difficulty (or decreasing efficiency) as follows: the location-by-intensity code, the location code, location-by-duration, and the location-by-intensity-by-duration code.
R 14

28,757
Strauss, P.S. & Carlock, J. EFFECTS OF LOAD-CARRYING ON PSYCHOMOTOR PERFORMANCE. Percept. mot. Skills, Aug. 1966, 23(1), 315-320. (USA Picatinny Arsenal, Dover, N.J.).

Previous studies have indicated that performance after load-carrying may be related to psychological fatigue rather than physiological impairment. This study measured performance on a battery of psychomotor tests and subjective fatigue ratings after 10 Ss carried loads of 14 and 34 lb. over a 2-mile test course. These scores are compared with those obtained after several periods of inactivity. Subjective fatigue was significantly related to all test scores but not to time required to walk the course. Although performance was poorer after load-carrying than after inactivity, scores for load-carrying conditions were higher for the 34-lb. load than they were for the 14-lb. load when both were carried in a comfortable position. This is taken to suggest that, under some conditions, carrying greater weights may have an activation effect on psychomotor performance and may even reduce subjective fatigue.
R 10

28,758
Edgington, E.S. IMPLICATIONS OF SYMMETRY ABOUT A REGRESSION LINE. Percept. mot. Skills, Aug. 1966, 23(1), 321-322. (University of Calgary, Calgary, Alberta, Canada).

When responses are symmetrically distributed about the regression line, there are intuitively appealing reasons for expecting reduction in the variability of the responses from better experimental control to yield responses which cluster more closely about the regression line. This expectation is not always justified but may be appropriate for special cases.

28,759
Vreuls, D. & Schmidt, J.F. MODEL FOR EFFECT OF A SECOND VISUAL STIMULUS UPON REACTION TIME TO THE FIRST. Percept. mot. Skills, Aug. 1966, 23(1), 323-328. (Bunker-Ramo Corporation, Canoga Park, Calif. & Trinity University, San Antonio, Tex.).

When 2 visual stimuli are separated by an interval of not more than 200 msec., the second stimulus delays the response to the first, primary stimulus. Reaction time was found to be lengthened (inhibited) in a curvilinear fashion; peak inhibition occurred when the second stimulus appeared 100 msec. after the onset of the primary stimulus. The results confirmed earlier work by others. A highly speculative model of the underlying process was suggested.
R 9

28,760
Williamson, T.R. & Barrett, G.V. FEASIBILITY OF MEASURING EYE MOVEMENTS IN REAL-WORLD AND SIMULATED DRIVING SITUATIONS. Percept. mot. Skills, Aug. 1966, 23(1), 329-330. (Goodyear Aerospace Corporation, Akron, Ohio).

Preliminary investigation to determine the feasibility of utilizing the 1962 Mackworth head-mounted eye-marker camera in both a simulated and real-world driving situation indicated that: a)the camera limits scene width to a total of 25° when S looks straight ahead; b) eye-marker spot drops below center as distance from original calibration location is increased; c) an auxiliary boresight device is required to make the initial eye-spot calibration quickly and efficiently; d) ambient light of real-world hampers initial calibration procedures; e) interior height of automobile limits heights of Ss; f) film and filter selection varies from real-world to simulator.
R 1

28,761
Harker, G.S. & McLean, Jane A. RETINAL CORRESPONDENCE AND THE PERCEIVED VERTICAL. Percept. mot. Skills, Oct. 1966, 23(2), 347-360. (USA Medical Research Lab., Fort Knox, Ky.).

Measures of induced cyclotorsion made with 2 stereoscopic configurations and appropriate associated adjustment criterion are compared with measures obtained with "Volkmann's discs." Individual data for 15 observers are given and some implications of observed individual variations in response and inconsistencies in the stereoscopic measures for stereoscopic depth perception are discussed.
R 13

28,762
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXXIII. PSYCHOLOGICAL INDEX NO. 29, 1922. Percept. mot. Skills, Oct. 1966, 23(2), 367-370. (University of Montana, Missoula, Mont.).

In this listing are 113 items in which perceptual processes and materials are discussed.
R 113

28,763
Glick, J. & Wapner, S. EFFECT OF VARIATION IN DISTANCE BETWEEN SUBJECT AND OBJECT ON SPACE LOCALIZATION. Percept. mot. Skills, Oct. 1966, 23(2), p438. (Yale University, New Haven, Conn. & Clark University, Worcester, Mass.).

This study varied the physical distance between S and the object to be localized under neutral instructional conditions. Results comparable to those obtained when the object was defined relative to the physical dimensions of the room were hypothesized for conditions when subject: object distance distance was greater, and results comparable to those obtained using an egocentric definition were expected for the smaller distance. 2 groups of 12 Ss performed the task under 3 conditions of fixation (right edge, left edge, center of square). Ss sat facing the center of the front wall of a dark room and adjusted the fixated square until the fixation point "appears straight-ahead." Group I viewed an 8-inch square at a distance of 8 ft; Group II a 2-inch square at 2 ft. Although retinal size was controlled, Ss were aware of the approximate distance of the object. Obtained shifts due to fixation and distance varied significantly (interaction $F = 3.37$, $df = 2/44$, $P<.05$), according to expectation. For Group I displacement was away from the side of fixation (final adjusted position of fixated left edge was 0°17′ to right of fixated right edge), while for Group II displacement was toward the side of fixation (final adjusted position of fixated left edge was 3°45′ to left of fixated right edge). The demonstrated influence of distance, as well as cognitive variation, suggests that these factors should be taken into account in both theory and experimental design in the study of space localization.
R 3

28,764
Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: LI. PSYCHOLOGICAL ABSTRACTS, 1929, VOLUME 3. Percept. mot. Skills, Oct. 1966, 23(2), 447-450. (University of Montana, Missoula, Mont.).

107 references to research on motor skills are listed alphabetically.
R 107

28,765
Martz, R.L. SIGNAL PRESENTATION RATE, AUDITORY THRESHOLD, AND GROUP VIGILANCE. Percept. mot. Skills, Oct. 1966, 23(2), 463-469. (USN Medical Research Lab., New London Submarine Base, Groton, Conn.).

Auditory thresholds were obtained during the course of a single, 2-hour vigilance session from 8 groups of 11 to 14 rated and nonrated Navy enlisted men each, to 1 of 4 signal rates; 1/hr., 2.5/hr., 7.5/hr., and 15/hr. Ss of each group were tested together in a dark, unlighted, noise-homogeneous room in close physical (and possibly tactile and vibratory) proximity but without visual or acoustic interaction. Each S wore earphones and pressed a microswitch to report single tones in trains of 12 successive tones ranging in 2-db steps from roughly 14 db below to 10 db above the average S's threshold. Results showed: a) a positively accelerated linear relation between auditory detection and log signal rate; b) decrements of 1 to 10 db occurring early in the first half of the watch in all groups' (and virtually all Ss') performance at all signal rates; and c) large individual differences permitting an arbitrary, significant separation of "better" and "poorer" performers.
R 5

28,766
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXXIV. PSYCHOLOGICAL INDEX NO. 30, 1923. Percept. mot. Skills, Oct. 1966, 23(2), 479-482. (University of Montana, Missoula, Mont.).

Alphabetical listing of 103 references to work in perception and closely related fields.
R 103

28,767
McCandless, C.E., Landiss, C.W. & Barker, D.G. COMPARISONS OF DISTANCE RUNNERS AND SPRINTERS ON SELECTED PHYSIOLOGICAL AND BEHAVIORAL VARIABLES. Percept. mot. Skills, Oct. 1966, 23(2), 483-489. (Texas A & M University, College Station, Tex.).

The 42 members of a university track team were Ss in a comparative study of those athletes classified as sprinters and those classed as distance runners. The 2 groups were compared on 28 physiological and behavioral variables, including height, weight, body surface, metabolism rate, respiration rate, vital capacity, blood pressure, pulse rate, vertical jump, reaction time, scholastic aptitude, reading ability, and grade-point average. Greatest differences were found in measures of pulse rate (especially those observed after periods of vigorous physical activity), in vital capacity, and in vertical jump ability. Distance runners tended to be somewhat taller but lighter than sprinters and to surpass sprinters on most measures of scholastic aptitude and achievement.
R 5

28,768
Busch, A.C. SENSORIMOTOR EXPERIENCE AND KINESTHETIC AFTEREFFECTS. Percept. mot. Skills, Oct. 1966, 23(2), p508. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

The present problem was how well knowledge of expected results and feedback in a motor task aid in future performance. More specifically, can operators performing a task requiring a specific level of muscular tension perform better after experiencing the specific desired level. 10 naive males (Mdn age = 21 yr.) with apparently normal physical capabilities were given an appropriate size Allen wrench and instructed to tighten each of 5 bolts. Ss were then instructed to tighten the 5 bolts to a specified level with the torque wrench, and with an appropriate Allen wrench tighten 5 other bolts to the level specified for the previous use of the torque wrench (Trial 2). This procedure was repeated 5 times using 5 levels of tension and 5 different size bolts. In all instances (averaged across Ss) change from Trial 1 to Trial 2 was in the direction desired. Analysis by S and nature of change from Trial 1 to Trial 2 gave a χ^2 of 27.68 ($p < .001$), i.e., if S was over the desired level on Trial 1, on Trial 2 he decreased his tension and came closer; increased tension followed an underestimate. Thus Ss can improve motor performance when they have experienced the necessary amount of muscular tension which is important for this type of task.
R 1

28,769
Cook, T.H. & Mefferd, R.B., Jr. CHANGING PERCEPTION OF AN "INCOMPLETE" TRAPEZOID IN ROTATION. Percept. mot. Skills, Oct. 1966, 23(2), 509-510. (US Veterans Administration Hospital, Houston, Tex.).

Mean relative durations of 6 kinds of apparent motion produced with 2 vertical luminous rods varied significantly (N = 10). The pattern of motion was like that obtained with "complete" trapezoids in rotation.
R 11

28,770
Bevan, W. AN ADAPTATION-LEVEL INTERPRETATION OF REINFORCEMENT. Percept. mot. Skills, Oct. 1966, 23(2), 511-531. (Kansas State University, Manhattan, Kan.).

This paper summarizes a theory of reinforcement, based on the concept of adaptation level, that was developed in the late 1950's by Bevan and Adamson to account for contrast effects, distinctiveness of cue, partial reinforcement effects, and other reinforcement phenomena within a single conceptual setting. It also reviews a program of experiments suggested by this approach that has been carried out in the writer's laboratory.
R 29

28,771
Standlee, L. & Bilinski, C. NOTE ON SIMULATED VS ACTUAL ELECTRONIC TROUBLESHOOTING PERFORMANCE. Percept. mot. Skills, Oct. 1966, 23(2), p532. (USN Personnel Research Field Activity, Bureau of Naval Personnel, San Diego, Calif.).

The present paper points out the different picture of electronic troubleshooting performance that can emerge with the evaluation of technicians' performance on simulated and on actual electronic equipment. Ss, 114 Data Systems Technicians, were tested on the Electronics Trainer-Tester, developed by Van Valkenburgh, Nooger, and Neville, Inc., and their actual equipment troubleshooting performance was evaluated by means of a supervisor's rating scale, a performance check list, and a work diary. The Trainer-Tester yielded a permanent record of the steps taken while troubleshooting pencil-and-paper simulated malfunctions in a superheterodyne receiver, a push-pull amplifier, and a three-stage transmitter. The supervisor's rating scale consisted of 5 paragraphs written in operational terms and describing electronic ability levels. The performance check list consisted of 384 maintenance tasks on which Ss checked their own ability. The work diary was a detailed log of troubleshooting activity for a 5-day work week. Results of the simulated troubleshooting test indicated that the Navy's Data Systems Technicians were quite poor in troubleshooting ability. Results of the on-the-job performance evaluations, on the other hand, indicated that they were quite proficient in troubleshooting ability. The truth, no doubt, lies somewhere between these two extremes. And the psychological researcher again is reminded that test performance is not necessarily concept performance.

28,772
Lott, D.F. & Woll, R.J. A DEVICE PERMITTING ONE-WAY VISION WITHOUT A MIRROR IMAGE. Percept. mot. Skills, Oct. 1966, 23(2), 533-534. (Animal Behavior Institute, Rutgers University, New Brunswick, N.J.).

A description of a device which makes it possible for experimenter to observe S while S sees neither experimenter nor a reflection of himself. The basic optical principles and several suggested applications are presented.

28,773
Brown, R. & Strongman, K.T. VISUAL SEARCH AND STIMULUS ORIENTATION. Percept. mot. Skills, Oct. 1966, 23(2), 539-542. (University of Exeter, Exeter, England).

Two experiments were carried out to determine the relative efficacy of visual search with horizontal and vertical lists of letters. Exp. I showed that visual search was faster with horizontally presented material. In Exp. II this finding was analyzed further. The factors of list orientation and letter orientation affected search times but the actual letter-to-letter relationship within a list was unimportant. Results were discussed briefly in terms of their relevance to studies of discrimination.
R 5

28,774
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: LII. PSYCHOLOGICAL ABSTRACTS, 1930, VOLUME 4. Percept. mot. Skills, Oct. 1966, 23(2), 543-546. (University of Montana, Missoula, Mont.).

104 selected items on motor skills are listed alphabetically.
R 104

28,775
Smith, A.H. PHENOMENAL SLANT AS A FUNCTION OF AMBIGUITY OF CONTOUR PERSPECTIVE. Percept. mot. Skills, Oct. 1966, 23(2), 587-594. (Defence Research Medical Labs., Toronto, Ontario, Canada).

Observers judged the slants of a rectangle and 3 trapezoids, with complete and broken outlines, exposed under reduced viewing conditions at slants of 10°, 25°, 40°. All forms were of the same height and area. The smallest projective angular convergence of the sides of the frontal-parallel trapezoids was larger than that of the rectangle at its greatest slant. The slant estimates of the monocular and binocular groups for the trapezoids differed significantly; those for the rectangle did not. Observers distinguished effectively between the rectangle and the trapezoids but not among the trapezoids. Estimates for particular forms with complete and broken outlines did not differ significantly. The data were interpreted as limiting the contour perspective theory of slant perception and as demonstrating a subjective shape influence in accordance with either the Helmholtzian or the Gestaltist type of explanation.
R 12

28,776
Culp, W.C. & Edelberg, R. REGIONAL RESPONSE SPECIFICITY IN THE ELECTRODERMAL REFLEX. Percept. mot. Skills, Oct. 1966, 23(2), 623-627. (Psychiatry, Neurology & Behavioral Sciences Dept., University of Oklahoma Medical Center, Oklahoma City, Okla.).

By comparing electrodermal response amplitudes from the right and left hands when either the right foot or left foot was flexed, it was possible to demonstrate relative augmentation of the response amplitude on the side ipsilateral to the active member. Comparison of responses from the left hand and left foot showed relative augmentation of the hand response with motor activity in the opposite hand and of the foot response with motor activity of the opposite foot. These regional influences also appeared when the response to motor activity was compared with centrally elicited orienting responses.
R 10

28,777
Dees, J.W. MOON ILLUSION AND SIZE-DISTANCE INVARIANCE: AN EXPLANATION BASED UPON AN EXPERIMENTAL ARTIFACT. Percept. mot. Skills, Oct. 1966, 23(2), 629-630. (McDonnell Aircraft Corporation, St. Louis, Mo.).

The apparent size and the size constancy explanations of the moon illusion are supported by an explanation of an informal observation made during the course of an experiment. Size-distance-invariance is related to this explanation.
R 5

28,778
Goldstein, K.M., Blackman, S. & Collins, D.J. RELATIONSHIP BETWEEN SOCIOMETRIC AND MULTIDIMENSIONAL SCALING MEASURES. Percept. mot. Skills, Oct. 1966, 23(2), 639-643. (Wakoff Research Center, Staten Island Mental Health Society, Staten Island, N.Y.).

Sociometric measures may be conceived of as indicators of distance among group members. Multidimensional scaling methods have also been developed to measure distances among objects and appear to offer several advantages. The study reported compares the 2 techniques, and while there is some overlap, MDS appears to offer a promising approach to the study of the relationships among group members.
R 6

28,779
Mirabella, A. & Lamb, J.C. COMPUTER BASED ADAPTIVE TRAINING APPLIED TO SYMBOLIC DISPLAYS. Percept. mot. Skills, Oct. 1966, 23(2), 647-661. (Electric Boat Div., General Dynamics Corporation, Groton, Conn.).

Three experiments were conducted to explore the effects of adaptive vs nonadaptive training upon performance in a visual target detection task involving symbolic data displays. The results indicated that increasing display complexity during training and requiring Ss to respond actively to the displays were more effective than maintaining a constant level of complexity and requiring only passive viewing of the displays. But there was no evidence to suggest that changing complexity in an adaptive fashion was more effective than changing complexity in an arbitrary stepwise fashion. Additional findings indicated that maintaining Ss at a high nominal error rate during training was not necessarily detrimental to post-training performance. A high error rate was at least as effective as a low rate, where the high rate was reached by increasing error rate in a stepwise fashion.
R 27

28,780
Stern, R.M. PERFORMANCE AND PHYSIOLOGICAL AROUSAL DURING TWO VIGILANCE TASKS VARYING IN SIGNAL PRESENTATION RATE. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 691-700. (Pennsylvania State University, University Park, Penn.).

The purpose of this study was to compare vigilance performance and level of arousal of 2 groups of Ss differing in the signal presentation rate they received. It was hypothesized that a group receiving relatively infrequent signals would be over-aroused and would perform at a lower level primarily because they would be responding to irrelevant stimuli. Basal skin resistance and muscle potentials indicated that, as hypothesized, the Infrequent Ss were more highly aroused than the Frequent Ss. Performance data indicated that the Infrequent group made a smaller percentage of correct detections and a much greater number of false alarms than the Frequent group.
R 14

28,781
Francis, R.D. ISOLATION TOLERANCE AND THE SENSORY SATIATION HYPOTHESIS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 701-702. (Wollongong University College, University of New South Wales, Sydney, Australia).

From a group of 22 Ss tested for toleration time by immersion, 12 Ss were selected, 6 from either toleration time extreme. Their upper auditory thresholds for stimulus intensity were determined. Those who stayed long had significantly higher thresholds than those who did not. 12 new Ss were isolated and a new determination made embracing all Ss. The results were in the same direction and at the same significance level. 2 explanations are proferred, both involving the satiation concept.
R 2

28,782
Espenschade, Anna S. GENERAL ACTIVITY MEASURES OF WOMEN 35 TO 80 YEARS OF AGE. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, p718. (University of California, Berkeley, Calif.).

As part of a study on exercise habits of older women, the following questions were investigated: a) Do women who show a strong physical activity interest in youth continue in later years to be more physically active than others? b) Is there a temperamental difference that might be identified by a pencil-and-paper test? Ss all majored in physical education at the same institution between 1913 and 1953. Ns are proportional to those enrolled. Almost certainly both Ss (N=119) and control (N=78) groups are biased in favor of healthy individuals. As was expected, younger participants were significantly more active than the older ones, and Ss were significantly more active (M Activity Ratings = 9.2, SD = 2.6) than controls (M = 7.3, SD = 3.1). Apparently women who show a strong physical activity interest in youth continue to be more physically active than others in their later years, but the difference cannot be detected by means of the Guilford-Zimmerman Temperament Scale.
R 1

28,783
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXXV. PSYCHOLOGICAL INDEX NO. 31, 1924. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 731-734. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 109 articles and books dealing with perception and closely related fields.

28,784
Yensen, R. NEUROMOTOR LATENCY AND TAKE-UP OF MUSCULOTENDINOUS SLACK AS COMPONENTS OF RT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 747-750. (Massey University, Palmerston North, New Zealand).

Neuromotor and movement latencies were recorded from the stretched and slack muscles of the preferred upper arm in 6 Ss. Both latencies were significantly shorter from the stretched position. Possible factors underlying this finding are discussed. The results further suggest that traditional measures of RT may be misleading when used as indices of variations in central functioning.
R 7

28,785
Pillard, R.C., Carpenter, J., Atkinson, K.W. & Fisher, S. PALMAR SWEAT PRINTS AND SELF-RATINGS AS MEASURES OF FILM-INDUCED ANXIETY. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 771-777. (Boston University Medical Center, Boston, Mass.).

To observe the response to an affect-arousing film, a palmar sweat print and self-ratings of anxiety and sweat-output were taken from 14 Ss, once before and once during a film believed to induce "anxiety." Ss showed significantly darker sweat prints and reported more anxiety during the film. The increase in palmar sweat appears to correlate moderately with both of the self-ratings. This finding is compared with similar relationships obtained by Lazarus and his co-workers. Some difficulties in the measurement of psychophysiologic variables are discussed.
R 22

28,786
Costello, C.G. DIRECTION OF ROTATION AND DECAY OF THE SPIRAL AFTEREFFECT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 779-782. (University of Calgary, Calgary, Alberta, Canada).

Previous findings have suggested that there are a number of differences between the expansion spiral aftereffect and the contraction spiral aftereffect. A neurophysiological hypothesis has been proposed to account for these differences. A more simple explanation in terms of quality of fixation was investigated in the present study. In order to test the fixation hypothesis, use was made of Spigel's observation that an interval of darkness following exposure to a rotating spiral was in some way associated with a delay of the decay of the aftereffect. It was predicted on the basis of the previous findings that a) an interval of darkness introduced following rotation of the spiral would result in a significant delay of the decay of the aftereffect. On the basis of the fixation hypothesis it was predicted b) that there would be no significant difference between the expansion aftereffect and the contraction aftereffect in the delay of the decay of the aftereffect produced by post-rotation darkness. Prediction (a) was confirmed but not Prediction (b), casting doubt on the fixation hypothesis.
R 12

28,787
Targonski, D.E. & Baer, D.J. HYPERVENTILATION EFFECT ON NECKER CUBE REVERSAL AND DURATION OF SPIRAL AFTEREFFECT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 783-786. (Boston College, Chestnut Hill, Mass.).

To evaluate the effects of hyperventilation on Necker cube reversal and duration of spiral aftereffect, 42 males were each tested subsequent to no, slow, and rapid hyperventilation. A significantly ($p < .01$) greater number of Necker cube reversals and significantly ($p < .05$) shorter durations of spiral aftereffect occurred subsequent to both slow and rapid hyperventilation conditions. It is proposed that hyperventilation reduces the effectiveness of the perception of both illusions.
R 10

28,788
Pressey, A.W. & Kelm, H. EFFECTS OF SLEEP DEPRIVATION ON A VISUAL FIGURAL AFTEREFFECT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 795-800. (University of Manitoba, Winnipeg, Manitoba, Canada & University of Saskatchewan, Saskatoon, Saskatchewan, Canada).

On the basis of Koehler and Wallach's concept of "permanent homogeneous satiation" it was predicted that a visual figural aftereffect would decrease following prolonged sleep deprivation. Measurements of figural displacement were obtained from 7 Ss after 12, 30, 60, & 72 hr. of deprivation and also after 8 hr. of sleep. The results showed that lack of sleep decreased displacement immediately after inspection and produced counter displacement, i.e., attraction of the test figure, 30 and 60 sec. after inspection. The relevance of the findings to research on figural aftereffects in atypical individuals such as schizophrenics and retardates was discussed.
R 8

28,789
Busch, A.C. & Eldredge, D. DURATION AND INTENSITY OF VOCALIC ELEMENTS AS PHYSICAL CORRELATES OF ACOUSTIC STRESS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 801-802. (USAF Decision Sciences Lab., Hanscom AFB, Mass. & Northeastern University, Boston, Mass.).

This experiment attempted to clarify the effects of the cues of duration and intensity of the vocalic element under conditions of acoustic stress (S/N ratio). Graphic recordings of the vocalic elements were used to determine intensity and duration ratios. The results show that duration and intensity are both used as cues under conditions of acoustic stress and that under high levels of acoustic stress intensity is a more effective cue than duration.
R 3

28,790
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: LIII. JOURNAL SOURCES OF SKILLS ARTICLES, 1955-1965. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 803-806. (University of Montana, Missoula, Mont.).

Journal sources of reports of skills research from 1955 through 1965 were tabulated and analyzed. Perceptual and Motor Skills has become the major outlet for publication of such research, carrying approximately 15% of the skills articles for the whole period and 25% for 1963-1965. 16 journals contributed 55% of the 1842 skills articles listed, with Perceptual and Motor Skills, Journal of Experimental Psychology, and Research Quarterly alone accounting for about 30%. Some implications are pointed out.
R 7

28,791
Woods, R.W. & Erlanson, E.P. THERMAL INTEGRATION OF ELECTRIC POWER AND LIFE SUPPORT SYSTEMS. FOR MANNED SPACE STATIONS. Contract NAS 3 6478, NASA CR 543, Sept. 1966, 315pp. National Aeronautics & Space Administration, Washington, D.C. (General Electric Company, Philadelphia, Penn.).

Rankine and Brayton Cycle electric power systems using isotopic and Solar Sources are analyzed and thermally integrated with attitude control, refrigeration, life support and cabin environmental control systems. The resulting system design with the most potential for use with a six-man orbiting station is a combined life support - solar Brayton system weighing 3593 pounds. The electrical power requirements were reduced from 8 kilowatts for a non-integrated system to 5 kilowatts for an integrated system with the use of power system waste thermal energy. The 2-man lunar shelter considered had an integrated electrical power reduction of 1.2 kilowatts.
R Many

28,792
Bee, Helen L. INDIVIDUAL DIFFERENCES IN SUSCEPTIBILITY TO DISTRACTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 821-822. (University of Washington, Seattle, Wash.).

In 2 experiments, Ss solved their mathematics or anagram problems with and without distraction. 4 different distraction conditions were used in each case: In Exp. 1, the problems were presented individually, with instructions to add or subtract given over earphones. One set was presented with each of the following conditions: a) without distraction; b) buzzer to both ears; c) buzzer to only one ear; d) variable content distractor (sound effects and electronic music) to both ears; and e)variable content distractor to one ear. Similar distractions were used in Exp. 2. Intercorrelations among difference scores (distraction minus non-distraction) indicate considerable individual consistency for females but little for males.
R 3

28,793
Wieland, Betty A. & Mefferd, R.B., Jr. EFFECTS OF ORIENTATION, INCLINATION AND LENGTH OF DIAGONAL ON REVERSAL RATE OF NECKER CUBE. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 823-826. (US Veterans Administration Hospital, Houston, Tex.).

Length of the diagonal in a Necker cube drawing was shown to affect the rate of reversal in naive Ss under passive observing instructions. A similar trend was found with experienced Ss. Inclination of the diagonal did not affect rate but orientation did. It is concluded that effects of characteristics of the cube per se decrease with experience and, unless interest is in these variables, experienced Ss should be used in experiments with the Necker cube.
R 4

28,794
Tebbs, R.B. & Foulkes, D. STRENGTH OF GRIP FOLLOWING DIFFERENT STAGES OF SLEEP. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 827-834. (University of Wyoming, Laramie, Wyo.).

20 Ss (10 sensitizers and 10 repressers) were awakened 4 times at REM-sleep onset on one night and 4 times during NREM sleep on another. Strength of grip on arousal from REM sleep was consistently but insignificantly lower than on NREM nights. Decrement from presleep strength of grip was significant for sensitizers but not for repressers.
R 17

28,795
Holzman, P.S. SCANNING: A PRINCIPLE OF REALITY CONTACT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 835-844. (Menninger Foundation, Topeka, Kan.).

On the basis of results of earlier experiments, scanning had been defined as a system principle of cognitive behavior that represents individual differences in the investment of attention in objects. This formulation explained that, in earlier experiments, accuracy of size estimation was associated with responsiveness to relatively peripheral aspects of perceptual fields in a size estimation test. The present experiment demonstrates that accuracy in size estimation predicts the amount and quality of incidental recall in 2 test situations. The study extends the definition of extreme scanning to describe a relatively stable disposition to attend to tasks intensely and in a focussed manner, yet with extensive coverage of relatively incidental aspects of the field. The relevance of this cognitive control of scanning to need-cognition experiments and its possible relationship to the defense mechanism of isolation is noted.
R 14

28,796
Levine, F.M., Tursky, B. & Nichols, D.C. TOLERANCE FOR PAIN, EXTRAVERSION AND NEUROTICISM: FAILURE TO REPLICATE RESULTS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 847-850. (Harvard Medical School, Boston, Mass.).

High correlations between extraversion (E) and level of pain tolerance have been found in 2 experiments which used a method of continuously increasing level of the pain stimulus. The present experiments found no such correlation in 2 quite independent samples (ns = 29, 52) when a method of increasing the stimulation in discrete steps was used. The different findings appear to be due to the methods used in measuring pain tolerance, discrete steps vs continuous increase in pain stimulus. Nevertheless, the reported relationship between E and tolerance of intensity of a pain stimulus was not supported.
R 10

28,797
Anderson, B. & Johnson, W. TWO METHODS OF PRESENTING INFORMATION AND THEIR EFFECTS ON PROBLEM SOLVING. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 851-856. (University of Oregon, Eugene, Ore.).

In a perceptual condition (P), information critical to the solution of a problem was presented by means of a simple demonstration; in a verbal condition (V), this same information was presented by means of a short verbal statement; and in a control condition (C), this information was not presented at all. There was a significant linear trend ($p < .001$) between information condition and solution score such that solution scores for P were higher than those for V and those for V were higher than those for C. In addition, most Ss (80%) reported using images, and imaging was positively correlated with solution score ($r = .55$, $p = .03$) in the P condition and only in that condition.
R 14

28,798
Cohen, R.L. EFFECT OF VERBAL LABELS ON RECALL OF A VISUALLY PERCEIVED SIMPLE FIGURE: RECOGNITION VS REPRODUCTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 859-862. (Psychology Lab., University of Uppsala, Uppsala, Sweden).

An experiment is reported in which the distortion effects found in the recall of a visually perceived figure, which had been presented together with a verbal label, were confined to one dimension of the figure. This made possible the direct measurement of the effect in physical units and also the use of recognition as a method of recall. It was found that the method of recall, i.e., reproduction or recognition, made little or no difference to the amount of distortion produced.
R 6

28,799
Burns, N.M. & Ayers, F.W. MMPI PROFILE CHANGES DURING AN EIGHTEEN-DAY CONFINEMENT STUDY. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 877-878. (Systems & Research Center, Honeywell, Incorporated, Minneapolis, Minn. & American Rehabilitation Institute, Minneapolis, Minn.).

As part of an 18-day simulated manned lunar scientific exploration study, the 2 Ss who served as scientist/engineers were given the MMPI on the first and last days of the experiment. In the customary clinical interpretation, both profiles from both Ss were valid and within normal limits. The 18-day profile for Operator 1, however, shows some interesting elevations, particularly on Scales 3 and 4. These suggest decreased effectiveness in censoring negative self descriptions, increased social need, and (with the elevation in Scale 9) less impulse control. Operator 2 shows a decrease in Scale 9 elevations which suggests a decrease in feelings of well being. There is also a suggestion from elevations on the research scale Ib that there is a tendency to develop physical complaints under stress. In comparing the profiles of the 2 individuals the work of Meier indicates that Operator 1 should more rapidly both accumulate and dissipate reactive inhibition. On continuous performance tasks, the error scores of Operator 1 would exceed those of Operator 2, while on distributed performance tasks the error scores and reaction times for Operator 1 would be less than those for Operator 2. The behavioral observations made on the mission-oriented tasks confirmed these 2 inferences.
R 2

28,800
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXXVI. PSYCHOLOGICAL INDEX NO. 32, 1925. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 879-882. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 106 references on perceptual processes and materials.

28,801
Barrett, G.V. & Williamson, T.R. SENSATION OF DEPTH WITH ONE OR TWO EYES. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 895-899. (Goodyear Aerospace Corporation, Akron, Ohio).

References in the literature indicate that perception of depth with 2 eyes is decidedly better than with 1 eye but there is no empirical evidence to support such statements when the effect of suggestion is controlled. The quality of depth of a 3-dimensional scene was judged by 15 Ss, using a paired-comparison technique. The vision in one eye was occluded without S's being informed so that the effect of suggestion was controlled. Ss judged the quality of depth to be significantly better when viewing the scene binocularly than when viewing it monocularly. However, there were marked differences and the monocularly-viewed scene was judged to have equal or better quality of depth on approximately 30% of the trials.
R 6

28,802
Lewis, J.T., III. PACING RATE IN PROGRAMMED INSTRUCTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, p900. (Stephen F. Austin State College, Nacogdoches, Tex.).

One of the basic assumptions of programmed instruction is that the student should be allowed to proceed at his own rate. The present study attempted to assess the relationship between pacing and achievement on objective test items. The first 372 frames, 186 operation frames and 186 answer frames, from Holland and Skinner's The Analysis of Behavior, were reproduced on 35-mm. filmstrip for presentation with a filmstrip projector equipped with remote control. This material was presented to 179 college freshmen enrolled in courses in introductory psychology before learning was discussed in the course. Students were assigned to 2 groups: Group 1, the experimental group, was paced by E, and Group 2, the control group, was allowed to study the material by self-pacing. These groups were matched on the basis of grade-point averages and sex. A pre-test of the material was given to all Ss to determine the level of performance prior to exposure to the programmed material. The control or self-paced group took more than twice the time to study the material needed by the experimental paced group. At the end of the study period, all Ss were given a paper-and-pencil examination composed of 16 verbatim operation frames from the Holland and Skinner material. 8 items required that learned principles be applied to a new situation. There was no difference in performance between groups on this test.
R 5

28,803
Rierdan, Jill E. & Wapner, S. EXPERIMENTAL STUDY OF ADAPTATION TO VISUAL REARRANGEMENT DERIVING FROM AN ORGANISMIC-DEVELOPMENTAL APPROACH TO COGNITION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 903-916. (Clark University, Worcester, Mass.).

Visual and tactual-kinesthetic indications of apparent verticality and apparent body position under erect posture were made by 16 Ss prior to, following, and during the course of adapting to a 20° clockwise rotation of the visual field. Ss adapted under 1 of 2 conditions: a "body-directed" condition where Ss viewed and were directed toward their body, and an "object-directed" condition where Ss viewed and were directed toward objects. Significant changes in apparent verticality and apparent body position were found in both the visual and tactual-kinesthetic modalities. In the visual modality the relative location of apparent verticality and apparent body position varied dependent upon the directedness of the adaptation condition. The results are interpreted within an organismic-developmental theory.
R 42

28,804
Lehr, D.J. & Bergum, B.O. NOTE ON PUPILLARY ADAPTATION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 917-918. (Fundamental Research Lab., Xerox Corporation, Rochester, N.Y.).

In a study examining the relationship between the pupillary response and the affective value of verbal stimuli, pupillary adaptation effects were observed. These effects occur quite rapidly and researchers interested in pupillometrics are cautioned that adaptation should be considered as one potential confounding variable.
R 2

28,805
Erickson, R.A. COMPARISON OF VISUAL SEARCH BY PILOTS AND HIGH SCHOOL STUDENTS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 923-928. (USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif.).

Data were obtained on the search time required by high school senior boys to find a target in structured, abstract displays presented at 3 visual noise levels. It was found that the rank ordering of performance on the 3 noise levels was the same for these 12 Ss as for 22 Navy pilots tested earlier. Also, the students had effectively the same absolute performance as the pilots. This study provided the basis for the decision to use high school senior boys in future laboratory experiments of this type when pilots were not available. Data were also obtained from the 12 Ss on 4 foveal-acuity tests. The scores on 3 of the tests showed significant correlation with one another. Scores on the fourth test (Bausch & Lomb checkerboard) did not correlate significantly with scores from any of the other 3.
R 1

28,806
Ehrensing, R.H. & Lhamon, W.T. COMPARISON OF TACTILE AND AUDITORY TIME JUDGMENTS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 929-930. (Cornell University Medical College, New York, N.Y. & New York Hospital, New York, N.Y.).

In the present study 12 Ss adjusted variable auditory and tactile durations to equal standard 1-sec. tactile and auditory durations. Ss were presented with 1 sec. in one mode, e.g., auditory, followed by 1 sec. of silence, followed by a variable duration in the other mode, e.g., tactile, followed by 1 sec. of silence, after which the cycle repeated for no more than 2 min. until S was satisfied he had adjusted the variable to be identical in duration with the standard. No differences between auditory and tactile time judgments were observed.
R 8

28,807
Ekman, G., Hosman, J. & Berglund, U. PERCEIVED BRIGHTNESS AS A FUNCTION OF DURATION OF DARK-ADAPTATION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 931-943. (Psychological Labs., University of Stockholm, Stockholm, Sweden).

The increasing brightness of white light perceived at constant luminance in the course of dark-adaptation was measured by means of a direct psychophysical scaling method. The same trend was found for all 6 luminance levels of the experiment. It could be characterized as composed of 2 functions, both growing at a decelerated rate and intersecting at about 8 min. A further analysis revealed that the empirical trend could be represented by the sum of 2 logarithmic functions of time.
R 20

28,808
Denner, B. EXPECTANCY OF SYNTACTIC STRUCTURE AND RECALL. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 944-946. (Indiana University, Bloomington, Ind.).

In this exploratory study 32 adults were randomly assigned to a 2 x 2 factorial design employing 2 types of pre-experimental training (a set to expect syntactic structure and a set to expect no syntactic structure) and 2 degrees of sentence structure (structured and unstructured). The "syntactic set" facilitated while the "non-syntactic set" inhibited recall, and this effect was independent of sentence structure.
R 5

28,809
Wilson, G.D. AROUSAL PROPERTIES OF RED VERSUS GREEN. Percept. mot. Skills, Dec. 1966, 23 (3), Part 1, 947-949. (University of Canterbury, Christchurch, New Zealand).

20 Ss were each exposed for 60 sec. to 5 red and 5 green slides in alternating order. 2 electrodermal measures, conductance level and GSR, were taken. Results support the hypothesis that red is a more "arousing" color than green, the effect being particularly apparent in the GSR data ($p < .002$).
R 3

28,810
Wright, A.D. FACTORS INFLUENCING THE VISUAL DETECTION AND RECOGNITION OF LOW-ALTITUDE AIRCRAFT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, p950. (Human Resources Research Office, George Washington University, Washington, D.C.).

This paper is based upon an analysis of the major independent variables contained within an extensive study of man's visual ability to detect, recognize, and estimate range of low-altitude aircraft. All 27 Army enlisted men were given training and field experience in detecting and recognizing aircraft. Os were randomly assigned to the 9 combinations of observer offset from the aircraft flight path (head-on, 650- and 1400-meter offset) and use of binoculars (binoculars for detection and recognition, binoculars for recognition, and no binoculars). 2 classes of aircraft, jet (consisting of an F-4, F-100, and T-33) and propeller (consisting of an O-1A, U-6A, and U-1A), provided the low-altitude (100 to 200 ft.) targets. Os were provided early warning in time and aircraft position (within $\pm$ 15°) prior to each trial. A significant interaction ($p < .001$) of the binoculars by offset by aircraft class variables occurred over the detection and recognition responses. This interaction indicated that: a) recognition range increased for both jet and propeller targets when offset increased and binoculars were employed; b) binoculars and offset did not materially affect the detection range of propeller aircraft; c) detection range increased as offset increased when binoculars were used to detect jet targets; and, d) detection range decreased when offset increased if binoculars were not used to detect jet targets. Under the test conditions employed, binoculars reduced detection range on the most threatening targets, i.e., head-on jet targets.
R 1

28,811
Plutchik, R. FREQUENCY ANALYSIS OF ELECTROENCEPHALOGRAPHIC RHYTHMS IN HUMANS EXPOSED TO HIGH INTENSITY INTERMITTENT AUDITORY INPUTS. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 955-962. (Hofstra University, Hempstead, N.Y.).

Through binaural earphones, 10 Ss were presented with intermittent auditory stimuli ranging from 3 to 15 pps at intensities from 100 to 130 db. EEGs were taken and the occipital or temporal output was analyzed with a frequency analyzer. Only one of 10 Ss showed EEG following at most input frequencies. When the data from all Ss were combined, it was discovered that the introduction of auditory inputs at 10 pps produced an inhibition of the 10-cps alpha rhythm. The data imply a limited interaction between the visual and auditory modalities.
R 12

28,812
Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: LIV. PSYCHOLOGICAL ABSTRACTS, 1966, VOLUME 40, FIRST THIRD. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 963-966. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 107 selected items on motor skills.

28,813
Neal, G.L. & Pearson, R.G. COMPARATIVE EFFECTS OF AGE, SEX, AND DRUGS UPON TWO TASKS OF AUDITORY VIGILANCE. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 967-974. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

Two auditory vigilance tasks were evaluated for their sensitivity and operator performance characteristics: a) one required Ss to monitor a sequence of single-digit numbers and record the occurrence of prescribed digit sets; b) the second involved monitoring periodic tones and detecting signals of increased duration. Ss were 8 young males, 8 young females, and 8 older males, and all received 3 drugs involved in the design during separate 1-hr. watches. Both tasks showed comparable decrement with time but did not differ significantly in terms of mean signal detection. Data trends suggested women to be poorer monitors than men but failed to reveal expected age-related decrement. A depressant (Benadryl) increased false positive responses and, with female Ss, produced significantly poorer signal detection on the tone task. Vigilance decrement was less under an analeptic (Dexedrine), as compared to placebo, but not significantly so.
R 19

28,814
Andreassi, J.L. EFFECTS OF REGULAR AND IRREGULAR SIGNAL PATTERNS UPON SKIN CONDUCTANCE AND REACTION TIME. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 975-978. (Western Reserve University, Cleveland, Ohio).

An experiment was conducted to study the effects of stimulus patterning upon reaction time (RT) performance and palmar skin conductance (PSC) of one S over a period of 10 consecutive days. The main findings were that: PSC was significantly more variable with an irregular signal pattern than with a regular one, RTs were significantly faster with the regular pattern, there was a non-significant trend in which high PSC values were associated with fast RTs and low PSC values with slow RTs. The results were discussed in terms of wider variations in arousal produced by irregularly occurring signals and greater learning with regular signals.
R 5

28,815
McNulty, J.A. & Noseworthy, W.J. PHYSIOLOGICAL RESPONSE SPECIFICITY, AROUSAL, AND TASK PERFORMANCE. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 987-996. (Dalhousie University, Halifax, Nova Scotia, Canada).

Two groups of 25 Ss were given 3 different tasks to perform, a) a verbal paired-associate learning task, b) a pursuit rotor task, and c) a finger dexterity task. One group performed the tasks under high arousal (electric shock) and the other under low arousal (no shock). A number of physiological measures, including muscle tension, heart rate, skin resistance, and blood pressure, were also recorded. On the basis of these physiological measures, each S was classified according to the physiological function in which he showed the greatest relative activity over the 3 tasks. This was done in order to determine whether S's most active physiological index was related in any systematic way to his task performance. Results showed that neither arousal condition nor most active index was related to performance on the verbal learning task. On the 2 motor tasks, however, performance was, in general, better under high arousal than under low arousal, and, in addition, varied with S's most active physiological index. It appears, therefore, that S's typical mode of channelling activation may influence his performance on certain tasks.
R 23

28,816
Brosgole, L. CHANGE IN PHENOMENAL LOCATION AND PERCEPTION OF MOTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 999-1001. (USN Training Device Center, ONR, Port Washington, N.Y.).

The question was raised as to whether relative displacement is necessary in order for object motion to be visually perceived. An illusory figure was created which, when stroboscopically presented, caused an objectively stationary target to appear as though it were changing location. This was sufficient to generate an apparent movement in the target. It was, therefore, concluded that the necessary condition for visually perceived movement is a change in phenomenal location rather than relative displacement.
R 4

28,817
Sumi, S. PATHS OF SEEN MOTION AND MOTION AFTEREFFECT. Percept. mot. Skills, Dec. 1966, 23(3), Part 1, 1003-1008. (Keio University, Tokyo, Japan).

When 2 small light spots moved successively and independently in straight lines, the apparent path of the second light was seen as curving in direction opposite to that of the motion of the first light. The effect of the first motion on the apparent path of the second light was considered a motion aftereffect. The phenomenal displacement of the apparent path was measured in all of Ss' drawings and used as the index of the aftereffect. The effect depended on the direction of motion and the included-angle of the tracks.
R 8

28,818
Holmes, C. & Holzman, P.S. EFFECT OF WHITE NOISE ON DISINHIBITION OF VERBAL EXPRESSION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1039-1042. (Menninger Foundation, Topeka, Kan.).

Two groups each composed of 10 male Ss were required to tell E about an embarrassing situation, in nonsense language, under 2 conditions: with white noise masking their speech and without white noise. 16 of 20 Ss uttered more English words and 18 of 20 talked for a greater length of time in the white noise condition. Latency was not significantly affected by the white noise. The average number of syllables spoken per 15 sec. was significantly greater under white noise, for both groups combined and separately only for the second or replication group. The results are interpreted to indicate a process of disinhibition of speech under white noise.
R 4

28,819
Leppmann, F.K. & Wieland, Betty A. VISUAL DISTORTION WITH TWO-COLORED SPECTACLES. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1043-1048. (US Veterans Administration Hospital, Houston, Tex. & University of Houston, Tex.).

Observations of visual phenomena by an O continuously wearing blue-yellow split-half lens for an 11-day period are reported. Color adaptation began on the first day but hue and brightness distortions associated with specific body position continued to be observed. Situational aftereffects of hue, related to body position, continued during the first day after removal of the spectacles, and of brightness for an additional 24 hr.
R 12

28,820
Devoe, D.B., Eisenstadt, B. & Brown, D.E., Jr. MANUAL INPUT CODING STUDY. FINAL REPORT. Contract AF30(602) 3728, Proj. 4594, RADC TR 66 476, Rep. F 5150 1, Sept. 1966, 234pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Sylvania Electronic Systems, Waltham, Mass.).

Many automated data-handling systems still require the handprinting of entries on special forms as an initial step. This investigation sought and evaluated methods for bypassing handprinting in the manual entry of data into computers. The state-of-the-art in manual input devices was surveyed and summarized; the requirements of users in the intelligence community were studied, and several tentative input methods were proposed and compared. 3 laboratory experiments were performed to obtain data on human performance rates in various input modes, including writing, printing, marking, and keying with both print and scope feedback. It is concluded that devices applicable to the problem are available today; their use would be more expensive but also faster, more accurate, and more versatile than current methods. It is estimated that conversion to new input methods might initially slow down the input rate of the analysts who formerly handprinted their entries but that practice would be likely to restore former speeds. It is recommended that any further study of conversion of input method be preceded by an operations analysis of the entire function involved, that realistic rather than simulated equipment, tasks, and personnel be tested, and that testing be extensive enough to predict ultimate speeds of operation.
R 13

28,821
Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: LV. PSYCHOLOGICAL ABSTRACTS, 1966, VOLUME 40, SECOND THIRD. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1075-1078. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 106 selected items on motor skills.

28,822
Ogasawara, J. THREE FORMULAE FOR THE SENSITY-GRADIENT OF STIMULI IN DEPTH PERCEPTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, p1086. (University of Tokyo, Tokyo, Japan).

Two rules on the gradient of density of stimuli as an important factor in depth perception were given by Gibson as follows, a) S is proportional to $1/D$; b) A is proportional to $1/D^2$ where S is frontal size, A is altitude, and D is distance. But his rules are practically of no use because they are too simple and incomplete for generating certain figures or stimulus patterns representing the density-gradient according to these rules for experimental use. Now we would like to show 3 main formulae of our 6 improved formulae on the density-gradient which are more accomplished and more convenient than Gibson's rules: a) $a = AN/D$; b) $c = CHN/(CD + D^2)$; and c) $-d = HN/D$ where a is frontal size which corresponds to Gibson's S, c is the exact value of depth while Gibson's A (altitude) is its approximate value, and -d is the downward distance of a or c from the level of vanishing point; nothing of this sort is found in the Gibson's rules, D is distance of the thing from viewing point which is only one variable in all formulae and the same as Gibson's D. A, C, H, and N are constants or parameters which determine the gradient; A is the frontal size of the thing, C is its depth, H is the height of the viewing point above the ground, N is the distance of projection plane from the viewing point. Fig. 1 illustrates a figure composed of a, c, -d. If one assigns certain appropriate values to A, C, H, N, and D, definite values of a, c, and -d are obtained. This permits us to draw the expected and exact density-gradient picture. This proposition is only the introductory part of our current experimental program.
R 2

28,823
Sadler, T.G., Mefferd, R.B., Jr. & Wieland, Betty A. EXTENT, DIRECTION, AND LATENCY OF AUTOKINETIC MOVEMENT AS A FUNCTION OF PLACEMENT OF AN ADJACENT LIGHT. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1087-1096. (US Veterans Administration Hospital, Houston, Tex.).

4 Os drew maps of their autokinetic movement for a central light when it was the only stimulus, and when another light was adjacent to it. 8 directions (at 45° intervals) at each of 2 distances from the central light (1.27 and 2.54 cm) were used to yield 16 different placements of the light-pairs. The addition of the second light in any placement resulted in a significant reduction in the amount of movement and an increase in its latency. At either of the distances used, both lights were still viewed in the fovea, and the results did not differ in this respect. The direction of the second light from the central one did exert a significant influence, however. The results are compatible with the view that autokinesis results from a combination of eye movements and efferent tension.
R 16

28,824
Ross, B.M. SERIAL-ORDER EFFECTS IN TWO-CHANNEL RUNNING MEMORY. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1099-1107. (Catholic University of America, Washington, D.C.).

It is hypothesized that serial order can sometimes be a more important source of error in running memory than the number of items S is required to retain. This hypothesis was tested using binary series of symbols in 2-channel memory conditions that required S to recall 2 previously seen symbols when 2 new symbols were viewed. It was found that those Ss who performed a 1-back match before performing a 2-back match committed more errors on 2-back matching than Ss who performed 2 2-back matches each trial. The increased error shown in going from 1B to 2B matching on the same trial was primarily attributed to Ss' inability to deal accurately with retained double-tons of identical symbols. 4 other sources of error did not show a specific relation to serial order.
R 5

28,825
Yensen, R. REACTION TIME AND INTENT TO RESPOND. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1108-1110. (Massey University, Palmerston North, New Zealand).

It is suggested that increases in muscle tension may have occurred just prior to the initiation of the response under conditions of artificially increased mass and that these may have contributed to Whitley's finding of significantly faster RT under this condition. Following brief discussion of variation in intent to move more or less strongly, it is postulated that the exertion of near maximum voluntary contraction of the prime movers in the initiation of a movement would decrease the RT and that such RT would correlate positively with movement time.
R 7

28,826
Lehr, D.J., Bergum, B.O. & Standing, T.E. RESPONSE LATENCY AS A FUNCTION OF STIMULUS AFFECT AND PRESENTATION ORDER. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1111-1116. (Fundamental Research Lab., Xerox Corporation, Rochester, N.Y.).

An experiment was conducted to examine the interrelationships between response-latency, perceived stimulus affect, and stimulus presentation order. 3 groups of 5 Ss each responded to 100 pictorial and verbal stimuli along an ATTRACTIVE-UNATTRACTIVE affect dimension. Overt evaluative responses and response latencies were recorded on paper tape. The results indicated that the relationship between affect and response latency is an inverted U-shaped function with the attractive responses yielding significantly shorter latencies than either neutral or unattractive responses. The order in which stimuli are presented significantly affects both perceived affect and response times. A random order of stimulus presentation results in shorter latencies and greater perceived positive affect than the systematic arrangement of stimuli.
R 6

28,827
Urmer, A.H. PERFORMANCE DEGRADATION EFFECTS OF INFORMATION LOADING. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1117-1118. (Lear Siegler, Incorporated, Santa Monica, Calif.).

Performance degradation as related to visual information transmission was investigated in a simulated military display system. 2 series of 32 slides were designed to present hypothetical air traffic data. From 5 to 18 information variables were presented on the slides in durations of 2, 4, 6, 8, and 10 sec., resulting in information presentation rates of from 0.6 to 4.0 variables per sec. The design was counterbalanced so that each information quantity variable was presented at least once with each time variable. In this manner it was possible to evaluate the effect of increasing the total quantity of information with the rate of presentation. The results indicated a sharp performance decline at a saturation point rather than a gradual decline.
R 2

28,828
Pearce, D.G. CONSISTENCY OF INDIVIDUAL PATTERNS OF AUTOKINETIC DIRECTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1119-1123. (Defence Research Medical Labs., Toronto, Ontario, Canada).

Four Ss continuously reported the direction of autokinetic movement during 20 10-min. sessions. Individual patterns of directional dominance and change in direction over the 20 sessions were assessed by means of the Kendall coefficient of concordance. Individual patterns of directional dominance were consistent; the range of values of W for the 4 Ss was from 0.619 to 0.791. The individual patterns of direction change were generally less consistent; the range of W was from 0.242 to 0.704.
R 2

28,829
Rule, S.J. SUBJECT DIFFERENCES IN EXPONENTS OF PSYCHOPHYSICAL POWER FUNCTIONS. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1125-1126. (University of Alberta, Calgary, Alberta, Canada).

Psychophysical power functions were obtained from magnitude estimation of circle size, numerousness, and line length for each of 36 Ss. Correlations for individual exponents were found between continua. The findings supported the hypothesis that an individual exhibits a characteristic range of responses in magnitude estimation tasks.
R 4

28,830
Bryden, M.P. LEFT-RIGHT DIFFERENCES IN TACHISTOSCOPIC RECOGNITION: DIRECTIONAL SCANNING OR CEREBRAL DOMINANCE. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1127-1134. (University of Waterloo, Waterloo, Ontario, Canada).

Although both single letters and groups of 3 letters are more readily identified when they appear in the right visual field, right visual-field superiority on the 2 tasks is not correlated. Single letters presented in mirror-image orientation are also better identified in the right visual field. These results suggest that hemispheric dominance is more important than directional scanning in determining left-right differences in the recognition of single-letter material.
R 16

28,831
Panagiotou, Maria A. & Roberts, W.A. ORDER OF PRESENTATION, DURATION AND LATENCY OF SPIRAL AFTEREFFECT. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1139-1146. (Vassar College, Poughkeepsie, N.Y.).

In Exp. 1 the duration and latency of contracting and expanding SAE illusions were measured for alternating and consistent orders of presentation with 1-min. intervals between trials. The duration of the illusion was shorter under the alternating order than under the consistent order, and this effect was attributed to the carry-over of neural aftereffects from one trial to the next. In Exp. 2 order of presentation was again investigated with intertrial interval varied from 1 to 5 min. The results revealed 2 types of inhibitory effects: a) a general inhibitory effect produced when one illusion of either type follows another illusion of either type and b) a specific inhibitory effect which occurs only when successive illusions are of opposite direction. Latency appears to be inversely related to duration.
R 7

28,832
Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXXVII. PSYCHOLOGICAL INDEX NO. 33, 1926. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1147-1150. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 79 books and articles dealing with perception and related fields.

28,833
Smith, S. & Myers, T.I. STIMULATION SEEKING DURING SENSORY DEPRIVATION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1151-1163. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

36 volunteer Naval enlisted men underwent isolation for 48 hr. during a study of conditions of "relaxation." Each S spent 24 hr. alone in dark quiet sensory deprivation (SD) and 24 hr. in a control condition (C) providing a virtual stimulus cafeteria. The amount of time S listened to a boring stock market report during 1 hr. each day was used an an index of stimulation-seeking need. Significantly more listening occurred while Ss were in the SD than in the C condition. Stimulation-seeking results were compared with various pre-isolation predictor tests, criterion measures during isolation and with post-isolation reports of isolation symptomatology.
R 22

28,834
Smith, R.G., Jr. THE DESIGN OF INSTRUCTIONAL SYSTEMS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 18, Nov. 1966, 87pp. Human Resources Research Office, George Washington University, Alexandria, Va.

This report, based on an extensive survey of current literature, describes and discusses a system approach to designing training and considers factors bearing on training effectiveness. An efficient instructional system is conceived as one in which the components form an integrated whole, achieving maximum effectiveness at the least possible cost. Components considered in this report include presentation media, student management, techniques for practicing knowledge and performance, knowledge of results, directing student activities toward the goals of the training program, and testing and evaluating the system in terms of efficiency and cost.
R 153

28,835
Baekeland, F. & Lasky, R. EXERCISE AND SLEEP PATTERNS IN COLLEGE ATHLETES. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1203-1207. (State University of New York, Downstate Medical Center, Brooklyn, N.Y.).

Visual stage-of-sleep analysis of the sleep EEGs of 10 college athletes under 3 different conditions of exercise suggests a general positive relationship between exercise and the amount of slow-wave (delta) sleep in a night's sleep as well as a stress effect of exercise obtained in the evening.
R 21

28,836
Dalrymple-Alford, E.C. & Budayr, B. EXAMINATION OF SOME ASPECTS OF THE STROOP COLOR-WORD TEST. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1211-1214. (American University of Beirut, Beirut, Lebanon).

In the Stroop Test color naming is found to be slower when the colors are those in which non-corresponding color names are written. A similar result was found when the incongruent word-color combinations were presented individually. When presented in lists, the structure of the lists was found to contribute to impairment of color naming.
R 3

28,837
Brown, R.L., Spern, R.A., Schmitt, K. & Solomon, A. STIMULUS PARAMETER CONSIDERATIONS AND INDIVIDUAL DIFFERENCES IN CUTANEOUS SENSITIVITY TO ELECTROPULSE STIMULATION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1215-1222. (Human Resources Research Office, George Washington University, Alexandria, Va.).

The 2 experiments described were concerned with defining the optimal parameter values for an electropulse stimulus and the extent of S differences. In Exp. I, touch and pain threshold variations were established on 12 Ss as a function of pulse number (1, 4, 8) and pulse duration (0.5, 1.0 msec.). Significant support was obtained for use of a single pulse of 0.5-msec. duration. In Exp. II, touch and pain thresholds were obtained on 20 Ss coincident with body region and session variation. The abdomen and chest appear to be ideal electrode sites. S differences over time were discussed.
R 12

28,838
Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: LVI. PSYCHOLOGICAL ABSTRACTS, 1966, VOLUME 40, THIRD THIRD. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1223-1226. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 103 references to research on motor skills.

28,839
Cratty, B.J. & Williams, H.G. ACCURACY OF FACING MOVEMENTS EXECUTED WITHOUT VISION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1231-1238. (University of California, Los Angeles, Calif.).

58 university-age men and women were blindfolded and ear-plugged and asked to execute facing movements of 90°, 180°, and 360°. 90° turns were overestimated, while 180° and 360° turns were underestimated. The accuracy of judgments on this task depended upon the individual making the turn, the direction in which the facing movement was made, and the magnitude of the turn requested.
R 12

28,840
Brown, R.L., Spern, R.A., Schmitt, K. & Solomon, A. RECOGNITION THRESHOLDS AND ACCURACY FOR DIFFERING BODY REGIONS AS A FUNCTION OF NUMBER OF ELECTRODES AND THEIR SPACING. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1247-1254. (Human Resources Research Office, George Washington University, Alexandria, Va.).

Recognition thresholds and maximum accuracy levels were established on 12 Ss as a function of number of electrodes (2, 3, 4, and 5) and inter-electrode distance for various body regions (chest, abdomen, and back). There was little systematic difference among body regions with respect to the threshold and accuracy data; however, the number of electrodes proved to be significant. The abdomen appeared to be a slightly more favorable electrode site with a 5-electrode array.
R 11

28,841
Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXXVIII. PSYCHOLOGICAL ABSTRACTS, 1927, VOLUME 1. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1263-1266. (University of Montana, Missoula, Mont.).

This bibliography consists of an alphabetical listing of 103 articles and books dealing with perception and closely related subjects.

28,842
Williams, H.L., Gieseking, C.F. & Lubin, A. SOME EFFECTS OF SLEEP LOSS ON MEMORY. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1287-1293. (University of Oklahoma, School of Medicine, Norman, Okla.).

Immediate recall of word lists showed significant impairment after one night of sleep loss. Since S was required to write down each word immediately after its presentation, the deficit was not due to failure of sensory registration. With 24-hr. delayed testing, a picture-recognition test did not show significant deficit after one night of sleep loss. Performance on this test was impaired, however, after a night of recovery sleep. These results imply that moderate sleep loss causes deficit in formation of the memory trace rather than in storage or retrieval functions and that this effect is probably independent of the physiological lapses (brief periods of sleep) which affect vigilance and sensory registration.
R 11

28,843
Coules, J. & Avery, D.L. HUMAN PERFORMANCE AND BASAL SKIN CONDUCTANCE IN A VIGILANCE-TYPE TASK WITH AND WITHOUT KNOWLEDGE OF RESULTS. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1295-1302. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

This study showed no trends between reaction time and inter-stimulus intervals and reaction time and time blocks under knowledge of results or no knowledge of results. An ABC x S variance design of reaction time scores showed only knowledge of results by Ss was statistically reliable. The source of this variance was attributed to sex differences. Results showed that under knowledge of results fast mean reaction time (males) was associated with high skin conductance. For females slow mean reaction time was associated with low conductance. Under the no knowledge of results condition, females showed slower mean reaction time than males. Their conductance scores showed significantly greater variability without knowledge of results than under the knowledge condition. Males under no knowledge show mean conductance scores as high as those under knowledge of results. However, their mean reaction time scores under the no knowledge condition was significantly lower than under knowledge of results. It was concluded that males, contrasted with females, respond differentially to knowledge and no knowledge of results in simple reaction time studies. As males show high conductance and females high variability in conductance under no knowledge of results, an inhibition-reinforcement theory for vigilance tasks appears inadequate.
R 18

28,844
Giorgi, A.P. & Colaizzi, P.F. COMPLETION OF SIMPLE GEOMETRIC FORMS AS A FUNCTION OF VARIED DEGREES OF INCOMPLETE PRESENTATION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1303-1309. (Duquesne University, Pittsburgh, Penn.).

26 Ss were shown 9 partial presentations of 3 simple geometric figures. The figures were a circle, a square, and a diamond, and they were presented in stages of 1/4, 1/2, and 3/4 completion. Ss were told that the stimuli were parts of a more complete figure which they were to draw. They were also required to explain why they drew the figure they did. The following conclusions seem most significant. a) All Ss complete partial figures according to a generic sense of good continuation in the sense that all completions conform to the incomplete stimulus figure. b) In order to account for all of the data a distinction between situation demand and task demand was introduced. All Ss who experienced task demand did experience the partial figures as in need of completion. c) A 3/4 presentation of a familiar geometric figure can lead to the experience of demand to complete the figure in a univocal way for most Ss. d) The partial squares, circles, and diamonds, conceived as incipient systems, constitute 3 different systems with respect to their functional significance. Also, in the sense that all Ss who experienced the parts as parts did so on the basis of functional significance, the data support Gurwitsch's functionalistic conception of a whole.
R 5

28,845
Schiff, W., Kaufer, L. & Mosak, Sandra. INFORMATIVE TACTILE STIMULI IN THE PERCEPTION OF DIRECTION. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1315-1335. (City College, City University of New York, New York, N.Y.).

Three experiments evaluated the efficiency of a special tactile symbol, whose stimuli purportedly specify direction, for use in tactile diagrams for the blind. A tactile form of the conventional visual arrow symbol served as a control symbol. The directional aspects of the stimuli were easily discriminated by both blind and sighted Ss. Either symbol proved effective in simple diagrams, but the special symbol was superior in more complex diagrams, suggesting an interaction effect between symbol type and diagram complexity, appearing in response latency. The special symbol was preferred by blind Ss in simple and complex diagrams. Various aspects of diagram presentation also proved significant. For blind Ss IQ was negatively related to response time. Sighted Ss provided similar results, suggesting that effects were general. Blind Ss were faster than sighted Ss, tended to make more errors, and required more information about the tasks. The results were discussed considering involvement of cognitive factors and tactile sensitivity factors. General implications for symbolic displays and tactile graphics for the blind were also discussed.
R 21

28,846
Beritashvili (Beritoff), J.S. FROM THE SPINAL COORDINATION OF MOVEMENTS TO THE PSYCHONEURAL INTEGRATION OF BEHAVIOUR. Annu. Rev. Physiol., 1966, 28, 1-16. (Physiology Institute, Georgian Academy of Sciences, Tbilisi, Russia).

This chapter reviews 55 years of study of nervous activity by the author from the central coordination of tonic and conditioned reflexes through image-driven psychoneural activity, general inhibition in the integrative activity of the central nervous system, emotional activity relative to satisfaction of the biological needs, and finally his current work aimed at studying the physiological bases of memory.
R 37

28,847
Permutt, S. RESPIRATION. Annu. Rev. Physiol., 1966, 28, 177-200. (School of Hygiene & Public Health, Johns Hopkins University, Baltimore, Md.).

The areas covered in this review include: control of breathing--chemical, and nonchemical, pulmonary circulation--mechanical factors, vasomotor activity, misc., gas exchange--distribution of ventilation and perfusion, diffusing capacity, extracapillary gas exchange, surfactant, and mechanics--resistance to airflow, bronchoconstriction, constriction of terminal airways, compliance and venous admixture, mechanical properties of thorax and respiratory muscles, distribution of intrapleural pressure and collateral ventilation.
R 126

28,848
Ashby, W.R. MATHEMATICAL MODELS AND COMPUTER ANALYSIS OF THE FUNCTION OF THE CENTRAL NERVOUS SYSTEM. Annu. Rev. Physiol., 1966, 28, 89-106. (Electrical Engineering & Biophysics Depts., University of Illinois, Urbana, Ill.).

This review is concerned with the interactions between what is known of computers and what is known of the brain, and accordingly is organized as follows: the computer model as archive, the computer as laboratory, the computer as analyzer, "higher functions"--the facts, "higher functions"--the methods, and quantity of information. A last section indicates where the reader may find any necessary detail.
R 35

28,849
Wenzel, Bernice M. & Sieck, M.H. OLFACTION. Annu. Rev. Physiol., 1966, 28, 381-434. (Physiology Dept., University of California School of Medicine, Los Angeles, Calif.).

This review covers the 15-year period from 1950-1965, the last 6 years being chosen for detailed coverage. The presentation is organized as follows: olfactory perception--olfactometers, psychophysical methods, human olfactory thresholds, environmental and physiological factors affecting thresholds, olfactory sensitivity (nonhuman), odor quality, odor mixtures; the receptive process; receptors and central pathways--olfactory mucosa, olfactory pigments, mucosal potentials, receptor specificity, olfactory bulb (anatomy), olfactory bulb (electrophysiology), induced activity, unit activity and intrabulbar connections, extrabulbar anatomy and function, lateral olfactory tract, medial olfactory tract, higher olfactory centers, reticulobulbar influences and arousal reactions, behavioral effects of lesions, and effects on other functions--reproduction, eating and drinking, water balance, and X radiation.
R 262

28,850
Brown, L.T. & Farha, W. SOME PHYSICAL DETERMINANTS OF VIEWING TIME UNDER THREE INSTRUCTIONAL SETS. Perception & Psychophysics, Jan. 1966, 1(1), 2-4. (Oklahoma State University, Stillwater, Okla.).

150 human Ss viewed 32 patterns under neutral (N), pleasingness (P), or interestingness (I) instructional sets. An analysis of variance indicated that patterns with larger areas were viewed longer than patterns with smaller areas under all conditions; however, this effect was more pronounced under the P and I conditions than under the N condition. Patterns containing 9-sided shapes were viewed longer than those containing 3-sided shapes under the N and I conditions, while the reverse was true for the P condition.
R 8

28,851
Stevens, S.S. MATCHING FUNCTIONS BETWEEN LOUDNESS AND TEN OTHER CONTINUA. Perception & Psychophysics, Jan. 1966, 1(1), 5-8. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

Cross-modality matches have been made between loudness and 10 other perceptual continua. The matching functions are all power functions. When the exponent values of the matching functions are divided by the exponent values previously determined for the various continua, the quotients predict values for the loudness exponent. A tentative consensus suggests that the loudness exponent may be about 0.64.
R 12

28,852
Estes, W.K. & Taylor, H.A. VISUAL DETECTION IN RELATION TO DISPLAY SIZE AND REDUNDANCY OF CRITICAL ELEMENTS. Perception & Psychophysics, Jan. 1966, 1(1), 9-16. (Stanford University, Stanford, Calif.).

Visual detection was studied in relation to displays of discrete elements, randomly selected consonant letters, distributed in random subsets of cells of a matrix, the S being required on each trial to indicate only which member of a pre-designated pair of critical elements was present in a given display. Experimental variables were number of elements per display and number of redundant critical elements per display. Estimates of the number of elements effectively processed by a S during a 50 msec. exposure increased with display size, but not in the manner that would be expected if the S sampled a fixed proportion of the elements present in a display of given area. Test-retest data indicated substantial correlations over long intervals of time in the particular elements sampled by a S from a particular display. Efficiencies of detection with redundant critical elements were very close to those expected on the hypothesis of constant sample size over trials for any given display size and were relatively invariant with respect to distance between critical elements.
R 8

28,853
Marks, L.E. & Stevens, J.C. INDIVIDUAL BRIGHTNESS FUNCTIONS. Perception & Psychophysics, Jan. 1966, 1(1), 17-24. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

A total of 34 individual brightness functions were measured for 18 observers by 2 different methods. In one method the observer set various luminance levels of a white target and assigned numbers proportional to the apparent brightness of the levels set. In the other method the observer adjusted the loudness of a white noise and the luminance of a white target in order to achieve a series of cross-modality matches between loudness and brightness. Both methods gave good approximations to power functions, showing that the psychophysical power law holds for the individual perceiver.
R 29

28,854
Wallach, H. & Lewis, C. THE EFFECT OF ABNORMAL DISPLACEMENT OF THE RETINAL IMAGE DURING EYE MOVEMENTS. Perception & Psychophysics, Jan. 1966, 1(1), 25-29. (Swarthmore College, Swarthmore, Penn.).

The displacement of the images on the retina that results from a turning of the eye does not lead to an apparent motion of what is seen. It has been generally assumed that this is due to a compensating process which takes eye movement into account and serves to discount those image displacements that result from eye movements. It follows from this view that an abnormal image displacement, i.e., an image displacement that is larger or smaller than the causing eye movement would warrant, should lead to an experienced displacement of the target. Abnormal image displacement was produced by placing the eye in the converging or diverging bundle of rays from a point source that form behind a strong positive lens; this arrangement yielded a disc-shaped image, the projection of the pupil onto the retina, which displace abnormally during eye movements. By changing the position of the eye along the axis of the lens in relation to the crossing point of the bundle, the degree to which the displacement was abnormal could be varied. For various displacement rates ranging from 25% to 120 and 400% of normal, abnormal displacements produced by incidental eye movements remained unnoticed. Only where eye movements were intentional did some of our Ss report shifts of the perceived image. It is suggested that the organism copes with the image displacement resulting from the ever-present incidental eye movements not by compensation but by ignoring them.
R 3

28,855
Garrett, M., Bever, T. & Fodor, J. THE ACTIVE USE OF GRAMMAR IN SPEECH PERCEPTION. Perception & Psychophysics, Jan. 1966, 1(1), 30-32. (University of Illinois, Urbana, Ill.).

Judgments of the location of short bursts of noise in sentences were used to reveal perceptual segmentation of sentences. It was assumed that segmentation would correspond to major constituent boundaries. In order to control for correlated variables of pitch and intonation, identical acoustic material was provided with alternate constituent structures. It was found that differences in response to identical strings were predicted by the points of variation in constituent structure.
& 3

28,856
Handel, S. & Garner, W.R. THE STRUCTURE OF VISUAL PATTERN ASSOCIATES AND PATTERN GOODNESS. Perception & Psychophysics, Jan. 1966, 1(1), 33-38. (Johns Hopkins University, Baltimore, Md.).

Two tasks were used with a total set of 126 dot patterns. In one task Ss rated the goodness of each pattern. In another task they produced a dot pattern as an associate to each of the patterns used as a stimulus. The distributions of the associates suggest that the total set of patterns is both partitioned and nested. Groups defined by rotation and reflection are partitioned, thus kept intact. These groups in turn form a series of nested subsets. Both partitioning and nesting produce subsets of different size. The size of these subsets is related to pattern goodness, with good patterns coming from small subsets.
R 4

28,857
Levelt, W.J.M. SOME DEMONSTRATIONS OF THE COMPLEMENTARY FUNCTIONING OF THE EYES. Perception & Psychophysics, Jan. 1966, 1(1), 39-40. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

The eyes have complementary shares in the production of binocular brightness. Artificial increase of the contribution of one eye automatically leads to an equal decrease of the contribution of the second eye. The responsible mechanism for increase and decrease of shares is called "contour mechanism." Its functioning is explained by means of 2 stereoscopic patterns.
R 4

28,858
Royer, F.L. & Garner, W.R. RESPONSE UNCERTAINTY AND PERCEPTUAL DIFFICULTY OF AUDITORY TEMPORAL PATTERNS. Perception & Psychophysics, Feb. 1966, 1(2), 41-47. (US Veterans Administration Hospital, Perry Point, Md. & Johns Hopkins University, Baltimore, Md.).

Two qualitatively different sounds were used to generate 256 different sequences of length 8, and these sequences were presented to Ss at a rate of 2 stimuli per sec. These sequences, when repeated continuously, can be grouped into 20 fundamentally different patterns, each having either 2, 4, or 8 distinguishably different starting points. Ss were required to listen and to begin responding (with telegraph keys) in synchrony to the patterns when they were able. The point at which they began responding, the delay before responding, and errors after beginning responding were measured. The response uncertainty (variability of point of response for a given pattern), average delay, and average errors are all highly correlated, indicating that patterns which are easily organized are those which have few alternative modes of organization, and thus can be considered as simple, or good in the Gestalt sense.
R 8

28,859
Imai, S. CLASSIFICATION OF SETS OF STIMULI WITH DIFFERENT STIMULUS CHARACTERISTICS AND NUMERICAL PROPERTIES. Perception & Psychophysics, Feb. 1966, 1(2), 48-54. (Johns Hopkins University, Baltimore, Md.).

The purpose of this experiment was to determine the effects of stimulus characteristics and numerical properties of sets of stimuli on classification. Sets contained 12 stimuli which were all identical, had different categories defined by color, or had different categories defined by attributes of color and size. Number of categories and numerical distribution of stimuli in categories were varied. For each set S made a free classification and several restricted classifications in which the number of classes was specified. The results show: Sets of identical stimuli are classified into equal sized groups. Categorically defined stimuli are classified by category insofar as possible, but the tendency to numerical balance affects classifications with unbalanced numerical distributions or when the task restriction is incompatible with category classification. Stimuli defined by attributes are classified so as to maintain the attribute structure, although both category classification and numerical balance tendencies are evident with unbalanced numerical distributions and incompatible classification restrictions.
R 6

28,860
Sorkin, R.D. TEMPORAL INTERFERENCE EFFECTS IN AUDITORY AMPLITUDE DISCRIMINATION. Perception & Psychophysics, Feb. 1966, 1(2), 55-58. (Sensory Intelligence Lab., University of Michigan, Ann Arbor, Mich.).

The efficiency, η, of performance in amplitude discrimination is examined as a function of the temporal separation, τ, of the 2 signals to be discriminated. Performance in a monaural amplitude discrimination task is compared with that in a dichotic amplitude discrimination task, in which the first of the 2 signals was always presented to one ear and the second signal to the other ear. The difference in the shape of the resulting η versus τ functions for the monaural and dichotic cases is interpreted in terms of peripheral and central interference effects.
R 2

28,861
Panek, D.W. & Stevens, S.S. SATURATION OF RED: A PROTHETIC CONTINUUM. Perception & Psychophysics, Feb. 1966, 1(2), 59-66. (Harvard University, Cambridge, Mass.).

A battery of scaling procedures was applied to the visual saturation of colors produced by mixtures of red and gray papers. By direct magnitude estimation, the apparent saturation was found to grow as the 1.7 power of the percentage of red in the mixture. The power law was confirmed by the cross-modality matching of loudness to saturation, and the matching-function exponent had the predicted value, namely, a value approximately equal to the ratio between the exponents for saturation and loudness. The foregoing procedures were also used to scale the inverse continuum, paleness. 3 findings suggest that saturation behaves as a prothetic (intensive) continuum and not as a metathetic (qualitative) continuum: a) light brightness, loudness, and other prothetic continua, the apparent magnitude grows as a power function of the stimulus magnitude; b) the category (partition) scale is nonlinear relative to the scale of direct magnitude estimation; and c) the just noticeable difference, measured in subjective units, grows larger as saturation increases.
R 18

28,862
Kinchla, R.A., Townsend, J., Yellott, J.I., Jr. & Atkinson, R.C. INFLUENCE OF CORRELATED VISUAL CUES ON AUDITORY SIGNAL DETECTION. Perception & Psychophysics, Feb. 1966, 1(2), 67-73. (New York University, New York, N.Y.).

Two experiments investigated the effects on auditory signal detection of introducing visual cues that were partially correlated with the signal events. The results were analyzed in terms of a detection model that assumes that such cue-signal correlations will not affect sensitivity, but will instead cause the S to develop separate response biases for each cue. The model specifies a functional relationship between the asymptotic values of these cue-contingent biases. The overall results of the experiments supported the detection assumptions of the model and the general bias learning assumption, but indicated a more complex learning process than that specified by the model.
R 8

28,863
Engen, T. & Ross, B.M. EFFECT OF REFERENCE NUMBER ON MAGNITUDE ESTIMATION. Perception & Psychophysics, Feb. 1966, 1(2), 74-76. (Brown University, Providence, R.I.).

The psychophysical function obtained by the method of magnitude estimation was influenced by the reference number (modulus) assigned to a "standard" line and the position of this standard in the range of comparison stimuli. Data from 2 experiments with judgments of apparent length of lines show how both variables systematically affect the slope of the power function. Allowing O to choose his own reference numbers, even though these numbers varied among Os, tended to produce less variability in slope than if E imposed fixed reference numbers for O to use.
R 2

28,864
Rachlin, H.C. SCALING SUBJECTIVE VELOCITY, DISTANCE, AND DURATION. Perception & Psychophysics, Feb. 1966, 1(2), 77-82. (Harvard University, Cambridge, Mass.).

By magnitude estimation, the relation between the subjective and physical values of linear velocities, durations, and distances were found to be power functions with exponents of about 0.75, 0.90, and 0.90. When subjective values are substituted for their physical correlates in the equation, velocity = distance/duration, we obtain: subjective velocity = k(subjective distance/subjective duration)$^{0.8}$ This relation depends on no physical measurements for its confirmation. The influence of stimulus range on velocity judgments was also examined. Although the shorter ranges tended to yield power functions with higher exponents, the constraint due to range did not make itself fully felt in the first few judgments.
R 10

28,865
Parducci, A., Marshall, Louise M. & Degner, Mary. INTERFERENCE WITH MEMORY FOR LIFTED WEIGHT. Perception & Psychophysics, March 1966, 1(3), 83-86. (University of California, Los Angeles, Calif.).

An adaptation-level model for memory was tested by interpolating different weights between the standard and comparison weights. The results suggest that the model should be modified to account for the general tendency to use alternative categories of judgment with equal frequency. In terms of the modified model, memory for the standard shifts toward the value of the interfering stimulus, the magnitude of shift being proportional to the difference between the interfering stimulus and the value the memory would otherwise have had.
R 7

28,866
Eriksen, C.W. TEMPORAL LUMINANCE SUMMATION EFFECTS IN BACKWARD AND FORWARD MASKING. Perception & Psychophysics, March 1966, 1(3), 87-92. (University of Illinois, Urbana, Ill.).

2 experiments tested 6 predictions derived from the assumptions underlying the luminance summation-contrast reduction explanation for certain instances of forward and backward masking effects. The predictions concerned the circumstances under which masking would occur and also that forward masking would be more extensive than backward masking under specified luminance arrangements. All 6 predictions were confirmed.
R 15

28,867
Stevens, S.S. DURATION, LUMINANCE, AND THE BRIGHTNESS EXPONENT. Perception & Psychophysics, March 1966, 1(3), 96-100. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

The relation of brightness to duration and luminance has been studied by matching one brightness to another and also by matching numbers to brightness (magnitude estimation). The 2 methods concur in confirming certain well-known visual functions: Bloch's law, the Broca-Sulzer effect, and the shift of the Broca-Sulzer enhancement to shorter durations when luminance increases. It is shown that the shift with luminance requires the exponent of the power function for short-flash brightness to be larger than the exponent for stimuli of longer duration. An attempt is made to analyze some of the reasons why the procedure advocated by Graham may not give comparable results.
R 30

28,868
Winters, J.J., Jr. & Gerjuoy, Irma R. LATERAL PREFERENCE FOR IDENTICAL GEOMETRIC FORMS: I. NORMALS. Perception & Psychophysics, March 1966, 1(3), 101-103. (Johnstone Training & Research Center, Bordentown, N.J.).

Ss made size discriminations between 2 identical and equal-sized geometric forms presented tachistoscopically. Under "larger" instructions the right side stimulus was chosen more often. Under "smaller" instructions and 30 sec. intertrial interval, the left side was chosen more often; with 10 sec. intertrial interval and "smaller" instructions perceptual and motor preferences canceled one another.
R 8

28,869
Leckart, B.T., Keeling, K.R. & Baken, P. THE EFFECT OF RATE OF PRESENTATION ON FREE LOOKING TIME. Perception & Psychophysics, April 1966, 1(4), 107-109. (Ohio University, Athens, Ohio).

Two experiments investigated the effect of a pre-test series of pictures, presented at a fixed rate, upon Ss subsequent free looking time. The results indicated that high fixed rates of presentation (3 sec./presentation) reduced "natural" looking times, and low fixed rates of presentation (15 or 60 sec./presentation) increased natural looking times. The results were interpreted within an adaptation level theory framework. Accordingly, the fixed rate serves as an anchor which influences Ss "natural" looking time. Evidence was also found suggesting that a simple imitation interpretation is questionable.
R 19

28,870
Scharf, B., Zamansky, H.S. & Brightbill, R.F. WORD RECOGNITION WITH MASKING. Perception & Psychophysics, April 1966, 1(4), 110-112. (Northeastern University, Boston, Mass.).

At illuminances between .07 and 17 ft.-c, the word-recognition threshold was lower when a common word was preceded and followed by a homogenous field than by a noise pattern composed of a random array of bits of letters. Most of the difference is ascribed to the pattern's interference with post-stimulatory processes. This interference may explain why with masking the threshold reached a minimum at 90 msec. and then did not decrease further despite increasing illuminance, whereas without masking the threshold continued to decrease down to 7 msec., the shortest duration tested.
R 8

28,871
Taylor, M.M. THE EFFECT OF THE SQUARE ROOT OF TIME ON CONTINUING PERCEPTUAL TASKS. Perception & Psychophysics, April 1966, 1(4), 113-119. (Defence Research Medical Labs., Toronto, Ontario, Canada).

When an observer is confronted with a stimulus pattern that in some aspect does not change over time, perception of that aspect of the pattern does change. This paper documents several different types of change, all of which progress linearly with the square root of the observing time. Examples are drawn from studies of figural after-effects, motion after-effects, vigilance, motion neutralization, visibility of the stabilized retinal image, effects of contours on visibility and fluctuations in the perceptual organization of ambiguous figures.
R 20

28,872
Lee, W. & Zentall, T.R. FACTORIAL EFFECTS IN THE CATEGORIZATION OF EXTERNALLY DISTRIBUTED STIMULUS SAMPLES. Perception & Psychophysics, April 1966, 1(4), 120-124. (University of California, Berkeley, Calif.).

On each trial a sample point randomly drawn from one of 2 normal probability distributions was exhibited to S, who had to guess whether the sample was a "1" or a "2". He was then given feedback, which was determined by which of the 2 distributions the sample point derived from. Two continua were employed: dot position on a file card, and grayness of square in. patches. Three levels of d' were employed. The function giving the probability of a response "1" for different sample values was sharper for the higher d' conditions, and for the dot position continuum. Cessation of feedback resulted in improved performance for the low d' condition. Incentive payoff, confidence ratings, and experimenter had virtually no effects on task performance.
R 16

28,873
Bliss, J.C., Crane, H.D., Link, S.W. & Townsend, J.T. TACTILE PERCEPTION OF SEQUENTIALLY PRESENTED SPATIAL PATTERNS. Perception & Psychophysics, May 1966, 1(5), 125-130. (Stanford Research Institute, Menlo Park, Calif.).

Tactile pattern recognition was studied by presenting pairs of alphabetic shapes in rapid succession at the same anatomical location, the S being required on each trial to identify both of the patterns. Experimental variables were the duration of each stimulus and the time between stimuli. 3 aspects of the observed interaction were a) an increase in letter reversals for very short interstimulus intervals; b) a greater percentage of first-response errors for short-stimulus onset intervals and a greater percentage of second-response errors for long-stimulus onset intervals; and c) a crossover in the first- and second-response error rates in the range of 100 to 200 msec. after the onset of the first stimulus. These results are consistent with some of the temporal properties of models proposed for analogous visual tasks.
R 12

28,874
Sjoberg, L. A METHOD FOR SENSATION SCALING BASED ON AN ANALOGY BETWEEN PERCEPTION AND JUDGMENT. Perception & Psychophysics, May 1966, 1(5), 131-136. (Psychological Labs., University of Stockholm, Stockholm, Sweden).

Two techniques for studying judgment are discussed. In the first of these one assumes invariance of perception over different judgment processes and conceives of the properties of one judgment process as known. Then, perceptions may be estimated under this process and utilized in the study of other judgment processes of interest. A second technique disposes of the reliance upon a basic, "known" process and instead suggests that perception be treated as free parameters to be estimated from data. The paper then proceeds to show how this second technique may be used under certain conditions on perception themselves. A concept of sensation is introduced which is thought of as generating percepts in formally the same manner as percepts are thought of as generating judgments. The idea is tried out on the perception of movement time. A simple perception process appears to give a good fit to data.
R 26

28,875
Leckart, B.T. LOOKING TIME: THE EFFECTS OF STIMULUS COMPLEXITY AND FAMILIARITY. Perception & Psychophysics, May 1966, 1(5), 142-144. (Michigan State University, East Lansing, Mich.).

During a 10 min. stimulus familiarization period, 3 groups of 60 Ss each received either 0, 10, or 20 sec. of familiarization on each of 30 experimental stimuli: 10 each of low, medium and high stimulus complexity. All Ss then viewed the experimental stimuli in a second task, during which they could look at each stimulus for as long as they wished (free looking). For half the Ss in each group, free looking was administered immediately after the familiarization period. The remaining Ss received free looking 48 hr. later. The results replicated earlier research which has shown that free looking time is inversely related to stimulus familiarity, and directly related to stimulus complexity. Unlike earlier findings, the data suggested that with a 48 hr. delay between familiarization and free looking, a stimulus can, at least partially, recover from the decrement in looking time produced by 10 sec. of familiarization.
R 8

28,876
Warren, R.M. & Poulton, E.C. LIGHTNESS OF GRAYS: EFFECTS OF BACKGROUND REFLECTANCE. Perception & Psychophysics, May 1966, 1(5), 145-148. (University of Wisconsin, Milwaukee, Wisc. & Applied Psychology Research Unit, MRC, Cambridge, England).

The influence of background reflectance was determined for lightness judgments relative to white of small gray patches. The effect of prior stimulus-context was avoided by considering only first judgments. It was found that lightness was proportional to the square root of reflectance when the background was a gray darker than the stimulus, but not when the background was lighter gray or white. In general, a small difference in reflectance between the stimulus and background produced the same effect as a larger difference.
R 14

28,877
Verrillo, R.T. SPECIFICITY OF A CUTANEOUS RECEPTOR. Perception & Psychophysics, May 1966, 1(5), 149-153. (Sensory Communication Lab., Syracuse University, Syracuse, N.Y.).

Absolute vibrotactile thresholds were determined on the human tongue and compared to corresponding data obtained on the hand. The mucosa of the tongue is devoid of Pacinian corpuscles but the hand is richly endowed with these nerve endings. These thresholds on the tongue when plotted as a function of stimulus frequency, contactor area and depth of protrusion into the tissue all yielded flat curves. The dermal nerve network can thus be dropped from consideration. This leaves only the Pacinian corpuscle. Summation of energy over time and space and increasing sensitivity with contactor protrusion (the Pacinian corpuscle lies deep in the tissue) are characteristic of measurements made on tissues which contain Pacinian corpuscles. In the absence of Pacinian corpuscles, none of these characteristics can be produced. On the basis of successive elimination of other cutaneous receptors and the direct evidence of physiological and psychological investigations it is concluded that the Pacinian corpuscle is a peripheral neural termination which functions specifically as a receptor for periodic mechanical stimuli.
R 20

28,878
Gregson, R.A.M. QUALITATIVE IDENTIFICATION OF THE TASTE OF WEAK SUCROSE-SODIUM CHLORIDE MIXTURE STIMULI. Perception & Psychophysics, May 1966, 1(5), 154-156. (University of Canterbury, Christchurch, New Zealand).

Near-threshold mixtures of sucrose and sodium chloride were shown to elicit acidic or bitter sensations as well as, or instead of, sweetness and saltiness. The probability of a bitter response was relatively stable and consistent with error due to residual noise in the identification task. The acidic response varied in probability with the sodium chloride concentration, and was generally substitutive for a sweet response.
R 11

28,879
Winnick, Wilma A. & Rosen, Barbara E. SHAPE-SLANT RELATIONS UNDER REDUCTION CONDITIONS. Perception & Psychophysics, May 1966, 1(5), 157-160. (Queens College, City University of New York, Flushing, N.Y.).

Two experiments are reported which attempted to test implications of the shape-slant invariance hypothesis. Both experiments employed an apparatus in which variations in the slant and in the width settings of a rectangle were highly ambiguous and subject to instructional sets. In the first experiment, the stimulus was varied in both its width and its slant to achieve matches to 4 standard angles; the resultant width settings were found to be close to the projected widths of the obtained angles of slant. In the second experiment, width and slant were varied to match 4 standard widths; the projected widths of the obtained angles of slant did not differ from the obtained width settings.
R 10

28,880
Schiller, P.H. FORWARD AND BACKWARD MASKING AS A FUNCTION OF RELATIVE OVERLAP AND INTENSITY OF TEST AND MASKING STIMULI. Perception & Psychophysics, May 1966, 1(5), 161-164. (Massachusetts Institute of Technology, Cambridge, Mass.).

Forward and backward visual masking for patterns was investigated as a function of relative overlap between test and masking stimuli, relative intensity of masking stimulus and length of interval between stimuli. The extent of masking increased with increasing spatial overlap between stimuli and with increasing intensity of the masking stimulus. Increasing the interval between the stimuli decreased masking; this occurred at faster rates in backward than in forward masking. Possible mechanisms explaining these findings are discussed.
R 13

28,881
Smode, A.F. & Meyer, D.E. RESEARCH DATA AND INFORMATION RELEVANT TO PILOT TRAINING. VOLUME I. GENERAL FEATURES OF AIR FORCE PILOT TRAINING AND SOME RESEARCH ISSUES. FINAL REPORT. Contract AF 33(615) 2968, Proj. 1710, Task 171003, AMRL TR 66 99, July 1966, 46pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (BioTechnology, Inc., Arlington, Va.).

This report is a result of findings at selected operational pilot training schools in major air commands that are headquartered in the United States. It describes general features of Air Force pilot training from entry into the undergraduate pilot training program through the specialized schools conducted by the major using commands. As a result of on-site visits with authoritative training personnel, a number of researchable issues that hold promise for the improvement of selected aspects of pilot training are reported.

28,882
Smode, A.F., Post, T.J. & Meyer, D.E. RESEARCH DATA AND INFORMATION RELEVANT TO PILOT TRAINING. VOLUME II. DESCRIPTION OF PILOT JOB REQUIREMENTS AND TRAINING PRACTICES FOR REPRESENTATIVE MISSIONS AND ASSOCIATED AIRCRAFT. FINAL REPORT. Contract AF 33(615) 2968, Proj. 1710, Task 171003, AMRL TR 66 99, July 1966, 337pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (BioTechnology, Inc., Arlington, Va.).

This report describes specific pilot training programs for aircraft that are representative of those flown by the various operational commands in support of their assigned missions Pilot activity descriptions are included to form a bridge between the programs of training and the functions for which the pilots are trained. In addition to descriptions of training programs for current aircraft and weapon systems, pilot requirements for the coming generation of aircraft are discussed in terms of their projected missions.

28,883
Kaplan, G.A., Yonas, A. & Shurcliff, A. VISUAL AND ACOUSTIC CONFUSABILITY IN A VISUAL SEARCH TASK. Perception & Psychophysics, June 1966, 1(6), 172-174. (Cornell University, Ithaca, N.Y.).

Visual and acoustic confusability between a target item and background items was varied in a visual search task. Visual confusability was a highly significant source of difficulty while acoustic confusability had no effect. The results do not seem to be interpretable within a theory which assumes compulsory auditory encoding of visual information.
R 18

28,884
Sherrick, C.E. & Rogers, R. APPARENT HAPTIC MOVEMENT. Perception & Psychophysics, June 1966, 1(6), 175-180. (Princeton University, Princeton, N.J.).

When Os were presented with 150-Hz vibrotactile bursts at 2 loci on the skin of the thigh and permitted to adjust the time between burst onsets, they reported good apparent movement between the loci. The time between stimulus onsets for optimal movement was found to vary directly with the duration of the stimulus. Replication of the experiment with electrocutaneous stimuli at 1 KHz yielded similar results. Comparison of the data with results from a study of visual apparent movement revealed no difference between the 2 modalities for the relationship between stimulus onset intervals and stimulus duration. The significance of the results for hypotheses about the processes underlying perception of apparent movement is discussed
R 9

28,885
Winnick, Wilma A. & Dornbush, Rhea L. CLASSIFICATION AND IDENTIFICATION THRESHOLDS FOR THREE TYPES OF VERBAL MATERIALS. Perception & Psychophysics, June 1966, 1(6), 181-184. (Queens College, City University of New York, Flushing, N.Y. & Douglass College, Rutgers State University, New Brunswick, N.J.).

The first 2 experiments found thresholds for classification into one of 3 categories of English words, Turkish words, and letter alternations to be significantly lower than thresholds for the identification of the specific items; parallel results were found with the 2 methods of measurement employed: ascending limits method--beginning with .0/sec. duration and random order series method. Both thresholds were lowest for English words, and classification thresholds were lower for Turkish words than for letter alternations, but the identification thresholds of these 2 kinds of materials showed a reversal. Exp. III measured classification and identification thresholds in 2 separate groups by a method providing similar information content for identification as obtained for classification responses. Classification thresholds for the same 3 types of materials were found to be higher than either of 2 3-choice identification thresholds, one a choice among 3 same-type items and the other, a choice among one English word, one Turkish word, and one letter alternation.
R 20

28,886
Craig, J.C. VIBROTACTILE LOUDNESS ADDITION. Perception & Psychophysics, June 1966, 1 (6), 185-190. (Princeton University, Princeton, N.J.).

Os adjusted the intensity of vibration at a single locus on the right hand to a value equal in vibratory loudness to various patterns of vibration on the left hand. The patterns were created by 1 to 5 equated vibration generators, varied with respect to sensation level and distances among the vibrators. The results were: a) increasing from 1 to 5 vibrators produced a doubling in vibratory loudness; b) neither loudness level of the components nor distance among vibrators had any effect on the slope of the overall loudness growth function. Os also adjusted the intensity of a white noise to equal in magnitude the patterns of vibration presented a) to the left hand as before and b) to loci distributed over the surface of the body. The results were the same as those obtained using a single vibrator as standard. The specific loci stimulated did not appear to have any effect on vibrotactile loudness addition.
R 12

28,887
Schiffman, H.R. GOLDEN SECTION: PREFERRED FIGURAL ORIENTATION. Perception & Psychophysics, June 1966, 1(6), 193-194. (Rutgers University, New Brunswick, N.J.).

A hypothesis that the shape of the binocular visual field determines the supposed preference for rectangles possessing dimensions similar to those of the golden section was tested by having Ss draw pleasing rectangles. 36 Ss served. The results indicated that rectangles were oriented in correspondence with the shape of the visual field but there was, generally, a failure to obtain ratios approximating the golden section.
R 6

28,888
Bliss, J.C., Crane, H.D. & Link, S.W. EFFECT OF DISPLAY MOVEMENT ON TACTILE PATTERN PERCEPTION. Perception & Psychophysics, July 1966, 1(7), 195-202. (Stanford Research Institute, Menlo Park, Calif.).

The effect of display movement on the ability of Ss to recognize alphabetic shapes tactually was investigated. The display consisted of a computer-controlled 8-by-6 array of small airjet stimulators that could be physically translated in a small circle by means of a mechanical linkage. The experimental parameters were the stimulus duration, the angular velocity of the display, and the amplitude of the rotation. Recognition accuracy increased with stimulus duration between 100 and 400 msec. For a rotation amplitude of 0.8 cm, a maximum in recognition accuracy occurred at a rotation velocity of 400 rpm, or 150 msec. per revolution. The optimum angular velocity appeared to decrease as the amplitude of rotation increased. From these results and certain related neurophysiological evidence, a hypothetical model is suggested which qualitatively can account for the data.
R 10

28,889
Treisman, M. A STATISTICAL DECISION MODEL FOR SENSORY DISCRIMINATION WHICH PREDICTS WEBER'S LAW AND OTHER SENSORY LAWS: SOME RESULTS OF A COMPUTER SIMULATION. Perception & Psychophysics, July 1966, 1(7), 203-230. (Experimental Psychology Institute, University of Oxford, Oxford, England).

A model for visual intensity discrimination is described. The main assumptions are: a) The absorption of quanta from a light-flash by the retinal receptors is subject to fluctuations due to the physical variability of light; b) absorbed quanta may give rise to neural messages; c) retinal noise also gives rise to neural messages; d) the number of neural messages depends on the "overall transducer function" relating the central nervous effect (E) of the stimulus to its physical intensity (I): E=f(I), and on e) the state of light adaptation; f) sensory noise affects the magnitude of the neural messages; g) the magnitudes of the sensory messages generated by a given light-flash are positively correlated; h) the sensory messages sum to give the final central effect, E, and the response selected is determined by a statistical decision procedure. Many of these assumptions are already accepted or are plausible. To examine their predictions when taken together, and the effects of variation in the parameters and functions assumed, the model was simulated on a digital computer. It appears that it correctly predicts the relation between the difference threshold, ΔI and the intensity of the background stimulus, I (the Weber function), found experimentally, and it also predicts a number of the features of retinal summation, including the effects of increase in background intensity, and stimulus area and duration, on partial temporal or spatial summation. Evidence is provided that the overall transducer function is not a logarithmic function or a power function with a small exponent, and a new basis for scaling the sensory effect of a stimulus is suggested. It is shown that Weber's law arises if there is any degree of positive correlation between sensory messages, but not if there is 0 correlation, and possible mechanisms of light adaptation are considered. The assumptions which allow Weber's law to be derived for vision are sufficiently general to be capable of being applied to other sensory systems. R 71

28,890
Aiken, E.G. & Lau, A.W. MEMORY FOR THE PITCH OF A TONE. Perception & Psychophysics, July 1966, 1(7), 231-233. (USN Personnel Research Field Activity, Bureau of Naval Personnel, San Diego, Calif.).

Observers attempted to detect the presence of a pitch difference between 2 successive tones. The percentage of correct judgments was equivalent for tones separated by .95, 4.5, and 8.9 sec. There was a general increase in reports of a pitch difference with increased intertone interval, which is interpreted as arising from hypothesized shifts in the neural locus of the first stimulus during the intertone interval.
R 9

28,891
Hyman, L.M. & Kaufman, H. INFORMATION AND THE MEMORY SPAN. Perception & Psychophysics, July 1966, 1(7), 235-237. (Stanford University, Stanford, Calif. & University of Connecticut, Storrs, Conn.).

Messages differing in number of symbols and symbol information load were presented tachistoscopically to 4 adult Ss. The messages were constructed by random drawing with replacement from an alphabet of 8 black form symbols and an alphabet of 32 colored form symbols. The number of symbols recalled varied as a function of alphabet; however, the information in recall was constant for all conditions. The number of symbols recalled and the information in recall was independent of message length.
R 11

28,892
Sumby, W.H. THE EFFECT OF CONTEXT ON RECALL AND RECOGNITION OF LONG VERBAL SERIES. Proj. 7682, Task 768201, ESD TR 66 278, June 1966, 18pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

The effects of context on the recall and recognition of words in that context were investigated under a variety of constraints. The major results are reported: a) The recall of a particular word in a sentence when the sentence is presented for a second time with that word omitted is a direct function of the probability of the word occurring within the context, regardless of the word-frequency in the language; b) Recognition of a particular word in a sentence is not influenced by the probability of the word occurring within the context; c) In recognition there is a strong response bias to identify a word as having previously occurred when long series of material are shown; d) In both recall and recognition there is a highly significant relationship between the confidence which is assigned to the response and the correctness of that response. The results are discussed in terms of retrieval of material from memory as involving a search process.
R 9

28,893
Egeth, H.E. PARALLEL VERSUS SERIAL PROCESSES IN MULTI-DIMENSIONAL STIMULUS DISCRIMINATION. Perception & Psychophysics, Aug. 1966, 1(8), 245-252. (University of Michigan, Ann Arbor, Mich.).

Although considerable effort has been devoted to the description of processes underlying discriminations along single dimensions, there have been few attempts to determine whether or how these elementary processes are combined when discrimination requires the consideration of more than one stimulus dimension. In the present experiment, Ss were required to indicate whether 2 simultaneously presented multidimensional visual stimuli were identical or different. The response measure was reaction time, and Ss had a monetary incentive to respond both quickly and accurately. It was concluded that the most appropriate model for this task is one that assumes that dimensions are compared serially, and that the order in which dimensions are compared varies from trial-to-trial. Further, when a pair differs along several dimensions, Ss do not necessarily examine every dimension before initiating the response "Different."
R 18

28,894
Indow, T. & Stevens, S.S. SCALING OF SATURATION AND HUE. Perception & Psychophysics, Aug. 1966, 1(8), 253-271. (Harvard University, Cambridge, Mass.).

The study concerns the relation of saturation to the purity and luminance of aperture colors viewed in a dark surround. For the primary hues, red, yellow, green, and blue, and the intermediate hues, orange and yellowish green, the saturations increased as power functions of colorimetric purity. An 18-dB increase in luminance caused a threefold increase in the exponent for yellow, but luminance had little effect on the exponents of the other colors. The direct heterochromatic matching of saturation to saturation confirmed the validity of the scales determined by magnitude estimation and led to the construction of families of saturation scales based on a common unit called a crome. Equisection and jnd scales were also determined. Their nonlinearity suggests that saturation is a prothetic continuum. It was found that mixing red or green with yellow behaves much the same as mixing red or green with achromatic light. The changes in hue behave as prothetic continua, for the equisection and jnd scales are nonlinearly related to the power-function scales obtained by magnitude estimation and matching.
R 19

28,895
Bliss, J.C., Crane, H.D., Mansfield, Phyllis K. & Townsend, J.T. INFORMATION AVAILABLE IN BRIEF TACTILE PRESENTATIONS. Perception & Psychophysics, Aug. 1966, 1(8), 273-283. (Stanford Research Institute, Menlo Park, Calif.).

Two experiments investigated characteristics of immediate recall for brief tactile stimuli applied to the 24 interjoint regions of the fingers of both hands (thumbs excluded). The obtained immediate-memory span varied from 3.5 to 7.5 stimulus positions correct after correction for guessing, similar to the results in analogous visual studies. Properties of any hypothetical tactile short-term memory were studied by requiring Ss to report only a specified portion of the stimuli presented, and by varying the time of occurrence of the marker specifying which portion of the stimuli to report. In this partial-report condition, Ss had more stimulus information available at the time of reporting than their immediate memory spans indicated, provided that the stimulus marker occurred within 0.8 sec. after stimulus termination. The data suggest that at least for the amount of training employed here, any tactile short-term memory has much less capacity than an analogous visual short-term memory.
R 12

28,896
Fraisse, P. VISUAL PERCEPTIVE SIMULTANEITY AND MASKING OF LETTERS SUCCESSIVELY PRESENTED. Perception & Psychophysics, Sept. 1966, 1(9), 285-287. (Sorbonne, University of Paris, Paris, France).

Two sets of letters S_1 and S_2 when presented successively are perceived as simultaneous if the total duration of time from the beginning of S_1 to the end of S_2 is kept constant, whatever the duration of S_1, S_2, or the interval. The same law applies in the case of dots arranged to form geometrical figures. On the other hand, the phenomena of meta-contrast with letters are modified when the relative duration of S_1, S_2, and the interval vary. Thus perceptive integration and masking depend upon different processes. These findings were based on the results from 8 Ss for each of the following S_1, S_2, interval conditions: $S_1 = S_2 =$ 15 msec. with a varying interval from 0 to 320 msec.; $S_1 = S_2$ varying simultaneously from 20 to 180 msec. with an interval = 0, S_1 varying from 20 to 320 msec., S_2 = 20 msec. and the interval = 0; S_1 = 20 msec., S_2 varying from 20 to 320 msec. and the interval = 0.
R 9

28,897
Smith, R.P., Warm, J.S. & Alluisi, E.A. EFFECTS OF TEMPORAL UNCERTAINTY ON WATCHKEEPING PERFORMANCE. Perception & Psychophysics, Sept. 1966, 1(9), 293-299. (University of Louisville, Louisville, Ky.).

Two experiments were conducted to assess the relative effects of signal density and regularity on watchkeeping performance. In Exp. I, 3 levels of density (6, 24, and 96 signals/hr.) were combined factorially with 3 levels of variability (coefficients of variation of 0.01, 0.10, and 1.00), and 10 Ss were assigned at random to each of the 9 conditions. In Exp. II, 5 levels of density (6, 12, 24, 48, and 96 signals/hr.) were combined with the same 3 levels of variability, and 13 Ss were assigned to each condition. Each S monitored a visual "blinking-lights" display for an hour under instructions to detect and report the occurrence of certain "critical signals," i.e., arrests of alternation of the lights. Response times (RTs) to correctly detected signals in both experiments decreased as a linear function of logarithmic increases in signal density. An uncertainty metric, the signal surprisal due to density, was derived, and the watchkeeper's RT was expressed as an increasing linear function of this measure of temporal uncertainty. Interpretation of these and other data support a functional, psychophysical approach to the study of watchkeeping behavior.
R 40

28,898
Beck, J. EFFECT OF ORIENTATION AND OF SHAPE SIMILARITY ON PERCEPTUAL GROUPING. Perception & Psychophysics, Sept. 1966, 1(9), 300-302. (Harvard University, Cambridge, Mass.).

A method in which Os were asked to partition a pattern into 2 regions was used to investigate the perceptual grouping produced by changes in the orientation and shape of 2-line figures. The results show that the judged similarity of the figures fails to predict the degree to which the figures form distinct perceptual groups. Grouping was most strongly influenced by differences in the orientation of the lines composing the figures. Crossing of lines making up the figures also affected grouping, but was less decisive than line orientation.
R 1

28,899
Stenson, H.H. THE PHYSICAL FACTOR STRUCTURE OF RANDOM FORMS AND THEIR JUDGED COMPLEXITY. Perception & Psychophysics, Sept. 1966, 1(9), 303-310. (Behavior Research Lab., Antioch College, Yellow Springs, Ohio).

This study relates the perceived complexity of 20 random forms to their physical factor structure. 10 principal axes, accounting for 94% of the total variance of 24 physical measures, were rotated using the Varimax criterion. Factor scores for each form were correlated with the complexity ratings of the forms by each of 11 Ss. A single factor accounted for most of the variance in the complexity ratings. This factor was best described by 4 physical measures: the number of turns in the form, the length of the perimeter, the perimeter squared to area ratio, and the variance of the internal angles of the form.
R 7

28,900
Royer, F.L. FIGURAL GOODNESS AND INTERNAL STRUCTURE IN PERCEPTUAL DISCRIMINATION. Perception & Psychophysics, Sept. 1966, 1(9), 311-314. (US Veterans Administration Hospital, Brecksville, Ohio).

The time required for 24 Ss to sort 4 decks of cards composed of 5-dot figures was measured. A deck consisted of 32 cards: 4 each of 8 patterns. There were 4 sets of figures: Sets A1 and A2 had identical amount and form of redundancy; so also did B1 and B2. Sets B1 and B2, having more uncertainty in simple contingencies and having negative interaction terms, required significantly more time to sort than Sets A1 and A2. All sets differed in mean ratings of figural goodness. Even when amount and form of redundancy are held constant, the figural goodness of the individual figures constituting the set influence the discriminability. Sets consisting of good or simpler figures are easier to sort.
R 9

28,901
Williams, L.G. THE EFFECT OF TARGET SPECIFICATION ON OBJECTS FIXATED DURING VISUAL SEARCH. Perception & Psychophysics, Sept. 1966, 1(9), 315-318. (Honeywell Incorporated, Minneapolis, Minn.).

When a person searches for a target in a cluttered visual field his eye fixations typically fall on objects. The effect of target specification on the probability of fixating different classes of objects was studied. For fields containing objects differing widely in size, color, and shape: a high proportion of searchers' fixations were on objects of a specified color; a moderate proportion of their fixations were on objects of a specified size; and a slight proportion of their fixations were on objects of a specified shape. When 2 or more target characteristics were specified, fixations were generally based on a single characteristic. It is proposed that the specification of a target creates a perceptual structure which the searcher explores. The study of visual fixations, in effect, is the study of the perceptual structure.
R 11

28,902
Stevens, J.C. & Hall, J.W. BRIGHTNESS AND LOUDNESS AS FUNCTIONS OF STIMULUS DURATION. Perception & Psychophysics, Sept. 1966, 1(9), 319-327. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

The brightness of white light and the loudness of white noise were measured by magnitude estimation for sets of stimuli that varied in intensity and duration. Brightness and loudness both grow as power functions of duration up to a critical duration, beyond which apparent magnitude is essentially independent of duration. For brightness, the critical duration decreases with increasing intensity, but for loudness the critical duration is nearly constant at about 150 msec. Loudness and brightness also grow as power functions of intensity. The loudness exponent is the same for all durations, but the brightness exponent is about half again as large for short durations as for long. The psychophysical power functions were used to generate equal-loudness and equal-brightness functions, which specify the combinations of intensity E and duration T that produce the same apparent magnitude. Below the critical duration ET equals k for equal brightness, and ET^a equals k for equal loudness. The value a is about 0.7 for threshold and about 1.25 for supraliminal loudness.
R 19

28,903
Michon, J.A. NOTE ON THE GENERALIZED FORM OF WEBER'S LAW. Perception & Psychophysics, Oct. 1966, 1(10), 329-330. (Institute for Perception, Soesterberg, The Netherlands).

In this note it is argued that $\Delta I = k(I + I_n)P$ as an expression for the generalized Law of Weber is confusing. The expression $\Delta I = kI^{\beta} + i_n$ should be preferred in the light of the evidence available.
R 6

28,904
Fox, R. & Check, R. BINOCULAR FUSION: A TEST OF THE SUPPRESSION THEORY. Perception & Psychophysics, Oct. 1966, 1(10), 331-334. (Vanderbilt University, Nashville, Tenn.).

Three alternative hypotheses of the suppression theory were tested: a) the fused targets may be engaged in alternating suppression following the same pattern observed for binocular rivalry; b) targets may interact to produce continuous suppression of one target, i.e., there is not interocular alternation; c) targets may be engaged in alternating suppression but following an independent sequence. A test probe method (reaction time to a light pulse) was used to measure visual sensitivity during binocular rivalry and fusion. The major conclusion is that an inhibitory suppression process does not occur during binocular fusion, thus the suppression theory is not supported. Modification of some of the assumptions of this theory is suggested for further testing.
R 9

28,905
Marks, L.E. BRIGHTNESS AS A FUNCTION OF RETINAL LOCUS. Perception & Psychophysics, Oct. 1966, 1(10), 335-341. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

Brightness functions were determined for the dark-adapted fovea and periphery. In one series of experiments, observers matched numbers to the brightness of a 1° white target at various intensities, presented half the time to the fovea, the other half to one of 5 peripheral loci: 5°, 12°, 20°, 35°, and 60°. In a second series, observers matched the brightness of a 1° white target in the fovea of one eye to the brightness of an identical target in the periphery of the other eye at various intensities. Thresholds were also determined for the fovea and for the 5 peripheral loci by a staircase procedure. The magnitude estimations and the interocular matches concur in showing that a stimulus of fixed luminance appears brighter in the periphery than in the fovea. The brightness was found to be maximal at 20°. Brightness grows as a similar power function of luminance at all 6 retinal positions.
R 18

28,906
Beck, J. CONTRAST AND ASSIMILATION IN LIGHTNESS JUDGMENTS. Perception & Psychophysics, Oct. 1966, 1(10), 342-344. (Harvard University, Cambridge, Mass.).

The purpose of the present study was to investigate the phenomena of assimilation and contrast as a function of the reflectance of figures above and below the reflectance of a gray background. 3 experiments were performed to examine whether the size of the difference in stimulation alone does in fact determine if assimilation or contrast will occur. Experiments I and II compare the lightness judgments of a gray background when the reflectance of lines and circles was varied. Exp. III studied the effects of repeated judgments on assimilation and contrast when a) the reflectance of lines was varied, and b) the width of black and white lines was varied. This experiment also provided a further check upon the finding that assimilation is more readily produced by lines darker than the background, and contrast is more readily produced by lines lighter than the background. The results showed that for the experimental conditions investigated: a) contrast always occurs when the reflectance of lines is above the reflectance of the background; b) assimilation occurs when the reflectance is below that of the background; c) circles produce the same degree of assimilation and contrast as lines of equal width; and d) repeated judgments do not affect contrast but reduce assimilation; as line darkness and line width increase assimilation gives way to contrast following repeated judgments. The results are discussed in connection with the hypothesis that assimilation and contrast arise from opponent processes in the visual system.
R 3

28,907
Weiner, M.M. DIRECTIONAL TRAFFIC FLOW. Traffic Quarterly, Oct. 1966, 589-615. (Radiation Center, Honeywell, Inc., Boston, Mass.). (Reprint)

In order to apply the favorable one-way-street experience of the United States to a larger number of road networks, a scientific method is needed for determining the feasibility of unidirectional traffic flow in a road network of arbitrary geometry. The accessibility of one-way streets in road networks of arbitrary geometry is determined by utilizing topological concepts. Trees and independent cycles are utilized to orient the roads of a unidirectional road network so that it is strongly connected. It is shown that any road network, excluding isthmuses and pendent edges, can be unidirectional and still be strongly connected. Evaluation of certain metric parameters in the topological graph of an arbitrary road network is suggested for determining the potential feasibility of unidirectional traffic flow. The one-way-street experience of the United States is summarized. Some of the differences between topological graphs and directional flow graphs are reviewed.
R 51

28,908
Haber, R.N. & Hillman, Elaine R. THE EFFECT OF REPETITION ON THE PERCEPTION OF SINGLE LETTERS. Perception & Psychophysics, Oct. 1966, 1(10), 347-350. (University of Rochester, Rochester, N.Y.).

Single letters were presented for from 1 to 5 flashes, with S required to report what he saw after each flash. The clarity of the letter increased sharply with repetition. Since the letters were no larger than one-third of a degree in size, clarity could not have been increased by S making different fixations from flash to flash and combining them into a total percept. Nor was S guessing, since this could be ruled out by other indicators. Thus, it was concluded that repetition of the stimulus can have a direct effect on the clarity of a S's percept of that stimulus.
R 6

28,909
Rock, I., Goldberg, J. & Mack, A. IMMEDIATE CORRECTION AND ADAPTATION BASED ON VIEWING A PRISMATICALLY DISPLACED SCENE. Perception & Psychophysics, Oct. 1966, 1(10), 351-354. (Yeshiva University, New York, N.Y.).

It was shown that when observers view a scene of a room through displacing prisms there is an immediate correction of the prismatic distortion. Objects appear to lie in a direction closer to their true direction than to that produced by the refraction of the prisms. It was also shown that a brief period of exposure to the prismatically viewed scene, without movement or sight of the body, results in substantial adaptation to the displacement.
R 7

28,910
Stone, H. & Oliver, Shirley M. BEIDLER'S THEORY AND HUMAN TASTE STIMULATION. Perception & Psychophysics, Oct. 1966, 1(10), 358-360. (Stanford Research Institute, Menlo Park, Calif.).

Beidler's fundamental taste equation, relating response magnitude and stimulus concentration, was found to be a useful means of expressing data derived from chemoreception experiments with man. 7 L-amino acids and glycine were studied over a wide range in concentration. To a first approximation, the data are in accord with Beidler's taste equation. Interestingly, the change in free energy (ΔF) for each stimulus was found to be small, in agreement with earlier published conclusions that the initial step in chemoreception is most likely one of adsorption. Several means of depicting these data are evaluated and their contribution to a better understanding of chemoreception is discussed.
R 10

28,911
Sticht, T.G. & Foulke, E. REACTION TIME TO THE ONSET AND OFFSET OF ELECTROCUTANEOUS STIMULI AS A FUNCTION OF RISE AND DECAY TIME. Perception & Psychophysics, Oct. 1966, 1(10), 361-365. (University of Louisville, Louisville, Ky.).

Reaction times from 3 Ss were obtained to the onset and offset of 70-cps electrocutaneous signals of 5 rise and decay times and 5 intensity levels. The results show that both onset and offset RTs increase linearly with increased rise and decay times. With fast rates of rise or decay, the onset produces faster RTs than the cessation of stimulation. The opposite effect is found when long rise and decay times are used. Interpretations of these results are given in terms of neural adaptation and accommodation.
R 8

28,912
Caldwell, L.S. & Smith, R.P. PAIN AND ENDURANCE OF ISOMETRIC MUSCLE CONTRACTIONS. J. engng. Psychol., 1966, 5(1), 25-32. (USA Medical Research Lab., Fort Knox, Ky. & University of Louisville, Louisville, Ky.). (Reprint)

12 Ss were required to maintain a constant pressure on a hand-grip dynamometer as long as possible and to report pain intensity on a 5 point scale as it developed during the sustained contraction. Each trial yielded 5 scores corresponding to the times of appearance of the 5 pain intensities. Loads of 25%, 40%, and 55% of maximum strength were presented with normal circulation, and with the blood supply to the arm occluded by a pressure cuff wrapped around the upper arm and inflated to 15 mm Hg above systolic blood pressure. This study has demonstrated that : a) the pain scales did not have equal intervals in that for a given period of contraction the increment in pain intensity was progressively reduced as the contraction continued, or, conversely, the temporal span between successive scale points increased with contraction time; b) With an increase in load there was a progressive increase in the rate with which pain developed; c) Occlusion of the blood supply to the arm was associated with accelerated pain development, particularly for the lightest load; and d) Judging from the test-retest correlations, the pain threshold (Level 1 intensity) is the least stable point of the scale. The correlations for the other 4 points were all statistically significant and ranged from .59 to .80; e) The intercorrelations of pain intensities 2, 3, 4, and 5 were determined from separate scalings and all were found to be statistically significant; and f) Since it has been demonstrated that variables which affect the endurance of isometric contractions exert a commensurate influence on pain intensity, the pain scaling procedure may prove useful as a device for assessing reserve strength well in advance of the point at which the task demands exceed the physical capabilities and performance is necessarily terminated.
R 8

28,913
Estes, W.K. & Wessel, D.L. REACTION TIME IN RELATION TO DISPLAY SIZE AND CORRECTNESS OF RESPONSE IN FORCED-CHOICE VISUAL SIGNAL DETECTION. Perception & Psychophysics, Nov. 1966, 1(11), 369-373. (Stanford University, Stanford, Calif.).

Response times were recorded in a 2-alternative, forced choice visual detection situation. Stimulus displays, presented tachistoscopically, were randomly selected consonant letters distributed in random subsets of cells of a matrix. Display sizes in Exp. 1 were 8, 12, and 16 letters; in Exp. 2—1, 4, and 8 letters; on each trial S operated a key to indicate which member of a predesignated pair of letters (signal elements) was present in a given display. Correct response times, on the average, increased uniformly with display size. Incorrect response times were uniformly greater than correct response times and, except for a reduction in the case of one element displays, were constant over display size. These relationships appear to require a modification of one assumption in the earlier proposed serial processing model for tachistoscopic perception.
R 4

28,914
Clampett, H.A., Jr. PSYCHOLOGICAL PREDICTIONS BASED ON BAYESIAN PROBABILITIES. Contract NONR 624(14), Tech. Rep. 11, March 1966, 27pp. University of Pittsburgh Graduate School of Business, Pittsburgh, Penn. (AD 630314)

Bayesian analysis was applied to personnel predictions in comparison to traditional regression procedures. The main advantage the Bayesian approach has over regression techniques is freedom from the homogeneity-of-variance requirement. It was seen that when the assumption of homogeneous variance is violated, the Bayesian method yields more accurate predictions than the regression method. When the assumption is tenable, the Bayesian and regression approaches yield the same results. Along with algebraic and empirical analyses, computer simulation was used to contrast Bayesian and regression predictions of dichotomous budgeting decisions from scores on intelligence tests and inventories or orientation and personal values.
R 5

28,915
Geldard, F.A. CUTANEOUS CODING OF OPTICAL SIGNALS: THE OPTOHAPT. Perception & Psychophysics, Nov. 1966, 1(11), 377-381. (Princeton University, Princeton, N.J.).

Means of transmuting optical signals into cutaneous patterns are sufficiently rare to warrant a fresh attempt at devising one. An instrument called the "optohapt" is described. It converts printed or typed characters into tactual signals having various spatial and temporal properties. These are impressed on 9 widely scattered bodily loci. Data on discriminability of a wide range of patterns are reported, and there is proposed a promising coding system for the instrument.
R 9

28,916
Flock, H.R., Wilson, A. & Poizner, Sonja. LIGHTNESS MATCHING FOR DIFFERENT VISUAL ROUTES THROUGH A COMPOUND SCENE. Perception & Psychophysics, Nov. 1966, 1(11), 382-384. (York University, Toronto, Ontario, Canada).

Left and right halves of a visual display were covered with inducing fields (IFs) of different lightnesses. S's monocular gaze moved over an irreversible route from a neutral Munsell target to a CO series through either the left- or right-side IFs. For the 16 Ss there were 8 different IFs, varying from light to dark. For each of 3 different gray targets Munsell CO choices varied directly with the lightness of the IFs through which the gaze was routed rather than with the lightness of the total presented display. A replication with modifications is also reported.
R 7

28,917
Kaufman, H. & Lamb, J. CHOICE REACTION AND UNEQUAL STIMULUS FREQUENCIES IN AN ABSOLUTE JUDGMENT SITUATION. Perception & Psychophysics, Nov. 1966, 1(11), 385-387. (University of Connecticut, Storrs, Conn. & Electric Boat Div., General Dynamics Corporation, Groton, Conn.).

Previous investigators have reported discrepant results for Ss in a choice reaction time (CRT) situation when stimuli are not equi-probable. 60 Ss participated in an absolute judgment CRT task under 3 conditions of equi-probable stimuli and 3 of unequally probable stimuli. The results indicate that previous findings may be determined by a threshold dependent upon the effect of unequal stimulus frequencies and the utilities of different response strategies.
R 11

28,918
Frisch, H.L. & Julesz, B. FIGURE-GROUND PERCEPTION AND RANDOM GEOMETRY. Perception & Psychophysics, Nov. 1966, 1(11), 389-398. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Constructs of random geometry were applied to the problem of figure-ground perception. Random-dot images of black and white dots with various area fractions and tesselations (square and triangular lattices) were used as stimuli. The constructs of random geometry are correlation functions of n-th order and some functionals defined on them. The only parameter which is independent of the tesselation used is the first-order correlation which is the area fraction. It was first conjectured and then experimentally verified that figure-ground perception is not affected by the various tesselations used. Thus, figure-ground phenomena depend only on the area fraction of the white and black dots in the stimulus. There is a perceptual bias for white, i.e., figure-ground reversal is easiest at 40% white-black area fraction. It was also experimentally shown that size-constancy prevails in figure-ground perception, but brightness-constancy does not.
R 12

28,919
Bakan, P. & Thomas, J.O. SOURCE VARIABILITY AND RECALL OF AUDITORY MATERIAL. Perception & Psychophysics, Nov. 1966, 1(11), 399-400. (Michigan State University, East Lansing, Mich.).

Recall of auditory narrative material was measured under 3 conditions of presentation. These were a single source condition with material from one speaker, a 4 source fixed sequence condition with material from 4 speakers in a fixed sequence of 3-sec. lengths, and a 4 source random condition with material from 4 speakers in a random sequence of 3-sec. lengths. Recall was better for the single source condition than for the 4 source conditions. No significant difference was found between the fixed and random sequential presentations. Results are discussed in terms of the attentional behaviors involved in the tasks.
R 6

28,920
Trimble, R. & Eriksen, C.W. "SUBLIMINAL CUES" AND THE MÜLLER-TYPE ILLUSION. Perception & Psychophysics, Nov. 1966, 1(11), 401-404. (University of Illinois, Urbana, Ill.).

Using the viewing box from a 2-field tachistoscope, feathers-arrows from one field were superimposed upon line-pairs from the other field to construct the Muller-Lyer illusion. 6 Os were tested for the illusory effects under 4 conditions of feather-arrow detectability: a) $d'=0$, (no luminance); b) $d'=.42$; c) $d'=1.00$; and d) $d'=3.7$. The length differences of lines of any given pair were 0 in., 1/64 in., 2/64 in., or 6/64 in. The illusion effect was observed when the feather-arrow d' equaled 3.7. No significant nor suggestive illusion effects were found for the other feather-arrow detectability conditions.
R 17

28,921
Eriksen, C.W., Greenspon, T.S., Lappin, J. & Carlson, W.A. BINOCULAR SUMMATION IN THE PERCEPTION OF FORM AT BRIEF DURATIONS. Perception & Psychophysics, Nov. 1966, 1(11), 415-419. (University of Illinois, Urbana, Ill.).

Visual form identification at brief durations was studied under: a) monocular presentation; b) dichopic presentation where the same form was presented successively on noncorresponding areas: and c) dichopic presentation where the same form was presented on corresponding areas simultaneously and successively. Form identification for noncorresponding area dichopic presentation was at the level to be expected from 2 independent chances to perceive. Both simultaneous and successive dichopic presentation on corresponding areas gave identification accuracy significantly above the level predicted by the assumption of independence. However, the binocular summation was not complete. When the same amount of energy entering the visual system in a binocular presentation was given in a monocular stimulation, the latter condition gave significantly better identification.
R 14

28,922
Hodge, M.H. & Riege, W.H. INDIVIDUAL RESPONSE PATTERNS IN BINARY CHOICE TASKS WITH NONDISCRIMINABLE STIMULI. Perception & Psychophysics, Dec. 1966, 1(12), 421-425. (University of Georgia, Athens, Ga.).

The present experiment sought to determine whether individual Ss tend to employ repeatedly the same response patterns in binary choice tasks containing nondiscriminable stimuli and, if so, whether the response sequences when used to construct stimulus sequences improve the performance of other choice tasks. Information and frequency analyses of the response sequences of 48 Ss showed moderate consistency of patterning within a light and within a tone task. Performance of a card task following the light and tone tasks was closely related to the task (light or tone) from which the stimulus sequence was obtained. The frequency analysis showed that repetition patterns were preferred by most Ss but at the expense of alternation responses. The presentation of reinforcement in the card task did not improve performance over that observed in the light and tone tasks.
R 9

28,923
Thompson, R.W., Enter, R. & Tarpinian, J. INTERDIGITAL TRANSFER OF KINESTHETIC AFTEREFFECTS. Perception & Psychophysics, Dec. 1966, 1(12), 437-438. (Ohio University, Athens, Ohio).

Two experiments investigated the effect of using a different finger for inspection (I) than is used in making judgments on the size of a kinesthetic aftereffect (KAE). Exp. 1 investigated transfer of I stimulation of the ring finger to judgments made with the index finger. A control group used the index finger for both judgments and I period. Results indicated significant KAE for both groups. Exp. 2 replicated Exp. 1 except the second finger was used to test for transfer of I stimulation to judgments made with the index finger. Results indicated KAE for only the control group which used the index finger for both judgments and I stimulation.
R 4

28,924
Stevens, S.S. & Greenbaum, Hilda B. REGRESSION EFFECT IN PSYCHOPHYSICAL JUDGMENT. Perception & Psychophysics, Dec. 1966, 1(12), 439-446. (Harvard University, Cambridge, Mass.).

Psychophysical judgment, like all other kinds of judgment, involves a matching or equating of 2 different domains. When the judgment involves the matching of values on 2 perceptual continua, the observer tends, on the average, to constrict the range of his adjustments on whichever variable is placed under his control. When the observer adjusts each variable in turn, 2 different regression lines are produced. This regression effect presumably occurs whenever the results of the matching judgments yield less than a perfect correlation. Illustrative examples are given for the continua, loudness, vibration, brightness, and duration.
R 15

28,925
Shaffer, Olivia & Wallach, H. EXTENT-OF-MOTION THRESHOLDS UNDER SUBJECT-RELATIVE AND OBJECT-RELATIVE CONDITIONS. Perception & Psychophysics, Dec. 1966, 1(12), 447-451. (Swarthmore College, Swarthmore, Penn.).

The experiment was designed to discover the threshold extent of motion at medium speeds amounting to 41, 82, and 164 min./sec., and to compare the perception of motion arising from subject-relative displacement with the perception of motion arising from object-relative displacement. Extent thresholds were found while velocity was kept constant. Different groups of 10 Ss were used for each displacement velocity, and for each S the extent threshold was twice obtained by the method of constant stimuli, once under subject-relative and once under object-relative displacement conditions. Sensitivity to brief displacements of a continuously visible target was high; average thresholds ranged from 1.0 to 4.4 min. under the various conditions employed. The thresholds were higher for subject-relative conditions and the slower displacement velocities and lower for object-relative conditions and faster displacements.
R 6

28,926
McLaughlin, S.C., Rifkin, K.I. & Webster, R.G. OCULOMOTOR ADAPTATION TO WEDGE PRISMS WITH NO PART OF THE BODY SEEN. Perception & Psychophysics, Dec. 1966, 1(12), 452-458. (Tufts University, Medford, Mass.).

When S looks at a visual target through prisms, adaptive shifts in reaching behavior occur even though he sees no part of his body through the prisms. These shifts are caused by a change in the judgment of the direction of gaze (oculomotor change), which in turn is caused by 2 secondary prismatic effects: a) asymmetry of the visual display and b) apparent rotation about a vertical axis of a panel or wall facing S. The "asymmetry" factor contributes 22% of the total oculomotor change, and the "rotation" effect contributes the remaining 78%. Oculomotor change is not facilitated by eye-movement activity. The adaptive oculomotor change induces a non-adaptive proprioception change about 1/10 as large as the oculomotor change. These findings are capable of accounting for the previously unexplained results reported by Wooster in 1923, and also for the current controversy about the role of reafferent stimulation in sensory-motor adaptation.
R 23

28,927
Fiddleman, P.B. THE HUMAN FACTOR IN PROJECT SAMPLES III. Proj. CMLCD 62T31, Task 1C522301A07901, Rep. CRDLR 3328, Dec. 1965, 87pp. USA Chemical Research & Development Labs., Edgewood Arsenal, Md. (AD 482819)

This report is an evaluation of the individuals taking part in a large-scale chemical field test investigating the extent of operational leakage of current Army protective masks. A total of 103 individuals was evaluated on characteristics such as intelligence, personality adjustment, overall military performance, education, age, and discipline records. An attempt was made to predict which individuals would violate mask security while engaged in field problems to the extent that they would be classified as high leakers. The expectation was that certain individuals, by virtue of individual personality characteristics, could be isolated as potential leakers, whereas others (considered to be more effective soldiers) would show a significantly lower incidence of such mask violations. It is concluded that: a) Individual personality characteristics are only partial determinants of mask performance. b) Setting (scheduling of tests) and interpersonal factors (leadership) seem to be relevant to performance. c) A more meaningful evaluation of predictive validity of individual personality factors can be accomplished by using a more representative group of Ss and by controlling the effects of leadership and attitude by appropriate measures.

28,928
Nelson, J.H. & Griffin, G.M. UNITED STATES NAVY PILOT-CONTROLLED LANDING PROCEDURE AND ASSOCIATED EQUIPMENT. Report from: "Aircraft Take-Off & Landing Specialists' Meeting, AGARD Flight Mechanics Panel, Paris, 15-18 January 1963." AGARD Rep. 423, Jan. 1963, 15pp. Advisory Group for Aeronautical Research & Development, NATO, Paris, France. (AD 426286)

The constant glide slope power approach to landing is defined as establishing the airplane in the desired landing condition early in the landing maneuver and maintaining this condition to touchdown. Reasons for the U.S. Navy adopting this procedure are advanced. The applicability of the procedure to non-carrier based fixed-wing airplanes is discussed. Various optical and electronic devices, including an approach power compensator, which can aid the pilot in executing the discussed procedure are fully described. The effectiveness of each device, integral or external to the airplane, in presenting airspeed, glide slope, line-up, bearing and range information to the pilot under VFR and IFR conditions is delineated.

28,929
Holden, K.J. SIMULATION OF GROUND CONTROLLED APPROACHES WITH REFERENCE TO CERTAIN ACCIDENTS. Contracts ARC 24,545, S&C 3694, GCS 312 & EP 821, Feb. 1963, 60pp. Queen's University of Belfast, Belfast, Ireland. (AD 423106)

This report deals with the simulation of ground controlled approaches and describes an investigation into possible defects in the system which might lead to accidents. 2 such accidents are described and in both of these the aircraft built up long period expanding oscillations about the glide path. This motion is then investigated by simulation techniques and its causes determined. The trouble is found to be inherent in the technique of using the throttle to control height and the elevator to control speed. This is demonstrated by systematic use of the throttle in response to height errors according to various logical schemes. It is found that, in certain circumstances, entirely logical use of the throttle results in an oscillation of increasing amplitude no matter how successfully the pilot controls speed with the elevators. It is concluded that accidents have sometimes resulted from use of the throttle to control height. Finally, a simple device is described, which led to a different flying technique giving much improved control of an aircraft making a blind approach. It consisted of an auxiliary spring-loaded throttle control. Flight tests of this device are strongly recommended.
R 10

28,930
Clarke, F.R., Becker, R.W. & Nixon, J.C. CHARACTERISTICS THAT DETERMINE SPEAKER RECOGNITION. FINAL REPORT. Contract AF 19(628) 3303, Proj. 2808, Task 280803, SRI Proj. 4663, ESD TR 66 636, Dec. 1966, 63pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Stanford Research Institute, Menlo Park, Calif.).

Development and evaluation of 3 types of speaker-discrimination tests are discussed, including effects of various types of signal degradation upon human speaker-recognition performance and comparisons of various techniques for differentiating among speakers. Properties of 3 tests--a Four-Alternative Forced-Choice Test, and ABX Test, and a Same-Different Test--are described. Using these tests, it was found that effects of signal degradation upon speaker discrimination performance are small in comparison with effects of the same degradation upon intelligibility. It was found that various physical measures and psychophysical scaling techniques provide information appropriate for discrimination among talkers. However, none of these techniques performed as well as human observers and provided little direct information regarding the characteristics used by human observers in discriminating among talkers.
R 7

28,931
Fletcher, J.L., Cairns, A.B., Collins, F.G. & Endicott, J. HIGH FREQUENCY HEARING FOLLOWING MENINGITIS. FINAL REPORT. DA Proj. 3A025601A819, Task 00, Work Unit 017, USAMRL Rep. 711, Dec. 1966, 4pp. USA Medical Research Lab., Fort Knox, Ky.

The high frequency hearing of 26 military persons, diagnosed as having had meningitis was examined and compared to the high frequency hearing of a control population of the same age. Those persons who had been categorized as seriously ill differed significantly from those who had the disease but had not been seriously ill. Implications of these findings for industry and for diagnosis were discussed.
R 5

28,932
Sable, J. DESIGN OF RELIABILITY CENTRAL DATA MANAGEMENT SUBSYSTEM. VOLUME II. FINAL REPORT. Contract AF 30(602) 3433, July 1965, 41pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Auerbach Corporation, Philadelphia, Penn.). (AD 469269)

Vol. I (HEIAS 27,601) described the functional characteristics of a reliability system called the Reliability Central Data Management Subsystem (RCDMS). This report shows how the design of RCDMS: a) met the specific operational objectives of the Reliability Central; b) has drawn on the available state of the art; and c) advanced the state of automated data management and data analysis technology. The above points are made by a comparison of RCDMS with other major data management systems in existence or currently under development with respect to: a) processing capability; b) user languages; c) file structure; d) programmer interface; and e) response time.

28,933
Ora, J.P., Jr. CHARACTERISTICS OF THE VOLUNTEER FOR PSYCHOLOGICAL INVESTIGATIONS. Contract Nonr 2149(03), Tech. Rep. 27, Nov. 1965, 46pp. Vanderbilt University, Nashville, Tenn. (AD 626753)

On the basis of the relevant experimental data, volunteering (vg) for psychological experiments is considered as a function of background, message, and personality variables. The important methodological distinction between volunteers and psuedo-volunteers is stressed. A comprehensive survey and summarization of the literature suggests that the less socio-cultural influences favor volunteering, the more volunteers will tend to be unaware of social desirability, unconventional, neurotic, and introverted than non-volunteers. It was concluded that an appropriate question to be asked in evaluating volunteers for psychological investigation is not whether they are representative of the population, but on what dimensions they are unrepresentative; and whether the particular dimensions on which they are unrepresentative defeat the purposes of the investigation.
R 58

28,934
Fletcher, J.L. & Cairns, A.B. RECOVERY FROM IMPULSE NOISE INDUCED ACOUSTIC TRAUMA. DA Proj. 3A025601A819, Task 00, Work Unit 017, USAMRL Rep. 686, Nov. 1966, 4pp. USA Medical Research Lab., Fort Knox, Ky.

Recovery from impulse noise induced acoustic trauma was examined in soldiers stationed at Fort Knox, Ky. Serial audiograms were obtained on the day of exposure, one day, 3 days, one week, 2 weeks, 4 weeks, 6 weeks, 12 weeks, 4 months, 5 months, and 6 months post exposure. Recovery from temporary threshold shifts as large as 35 dB was observed at frequencies from 500 - 2,000 cycles. At the higher frequencies shifts of magnitudes as great as 85 dB were observed with good recovery most of the time. Our results indicate that for legal purposes 6 months is a minimum waiting period necessary to substantiate permanent hearing loss. However, recovery at the speech frequencies is essentially complete in about 2 weeks.

28,935
Simmons, R.F. DESIGN FOR A LANGUAGE PROCESSING LABORATORY. SP Rep. 1366, Oct. 1963, 26pp. System Development Corporation, Santa Monica, Calif.

States that the described laboratory and the theoretical framework for language synthesis must each be broad enough to encompass a whole realm of behavior from the sensing and perception of stimuli that lead to language, the production of motor (including language) responses to languages, and the central cognitive processing that extracts meanings from the complicated structure of language. Outlines one view of such a laboratory, its program, its requirements and goals. Suggests that a language processing laboratory will materially reduce the time and effort required to achieve natural language processing on computers. Recommends that the personnel policy should be such as to attract a fair share of the most active researchers concerned with language, meaning and computers.

28,936
Gallo, P.S., Jr. & Levine, J.R. HUMAN FACTORS IN THE DESIGN OF AN OBSERVER'S KEYSET. RESEARCH REPORT. Contract N123 (953) 55266A, Proj. SR 006 09 02, Task 11281 (NEL N51461), NEL Rep. 1411, Oct. 1966, 36pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif. (San Diego State College, San Diego, Calif.). (AD 645653)

Describes an investigation of the effects of changes in a number of design characteristics and other variables on operation with keysets used to record information in binary notation from stimulus displays that contain a maximum of 5 bits of information per stimulus. Principle result was a demonstration of superiority in transmission and error rates of 5-key pattern entry over 2-key sequential entry. Other variables tested were less significant.
R 7

28,937
Israel, Jean. PILOTING ERRORS AND AIRCRAFT INSTRUMENTS. RSIC Rep. 89, Oct. 1963, 11pp. USA Redstone Scientific Information Center, Redstone Arsenal, Ala. (Transl: Technique et Science Aeronautiques et Spatiales, May-June 1962, 203-208). (AD 422784)

The art of flying an aircraft in its broadest sense is a process of receiving information and transforming it into action by means of controls operated by the crew. This report is an anecdotal account showing how accurate information can be misused and so cause piloting errors on hence accidents.

28,938
Pask, G. SOME COMMENTS ON THE ORGANIZATION OF MEN, MACHINES, AND CONCEPTS. Report from: "Proceedings of American Documentation Institute Working Symposium on "Education for Information Science," Airlie House, Virginia, 7-10 September 1965." Contract AF 61(052)640, Proj. 9769, Task 976904, AFOSR 65 2666, 1965, 21pp. USAF Office of Scientific Research, OAR, Washington, D.C. (System Research, Ltd., Richmond, England). (AD 628141)

Part 1 of this paper describes abstract cybernetic models for the data processing activities of organisms. In the model, an organism is regarded as reducible to minimal components that are active control systems. Part 2 of the paper discusses relevant features of several experiments in the field of man-machine interaction and provides data in support of model hypotheses. The model postulates a system composed of a pair of distinct and goal-directed individual organisms Z_α and Z_ε which exist in an environment E. For purposes of data processing and problem solving aspects of Z_ε and Z_β, E is a semantic environment. In metalanguage, organism Z is described as the realization of a code for a stable, goal-directed and active control system C. The Z's learn concepts about problem solving. Admissible C's are therefore restricted to a class of hierarchically organized adaptive control systems $C = (C^0, C^1, \ldots)$ where the terms 0, 1, ... denote levels of organization. System structures are considered in which Z_α and Z_β cooperatively communicate to achieve a common goal. Z_θ and Z_φ, for example, can be viewed as the user and the librarian, respectively, in an information system, E being the content of a library. A conservation principle is introduced which leads to the notion of quantitative measures for the rate at which operators can be applied and the amount of work required to achieve a goal. For Z to be a stable self-organizing system, the codes available to Z must allow for continual abstraction of classes of or methods, the level of abstraction at which essential codes are realized tending to increase. Applicability of this model to a commonly accepted model for cellular metabolism and control and to instructional systems is suggested.
R 54

28,939
Klatt, D.H. THEORIES OF AURAL PHYSIOLOGY. Contract NONR 1224(22), Proj. NR 049 122, Rep. 13, Nov. 1964, 137pp. USN Information Systems Branch, ONR, Washington, D.C. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.). (AD 610827)

In this investigation an attempt has been made to formulate specific theories for relating structure to behavior in several portions of the peripheral auditory system. The hypotheses presented are based upon the anatomy and physiology of the mammalian ear. The behavior patterns implied by the set of mathematical assumptions have been investigated by employing homomorphic physical models. An electronic analog of the cochlea and electronic models of primary and secondary auditory neurons have been designed and tested. A general purpose digital computer was used in the design of the cochlear model and in the statistical processing of the outputs of the electronic model neurons. The behavior of the simulated neurons has been compared to that of the natural system as a function of various types of input waveforms. The results of the investigation contribute to a further understanding of the methods of information encoding and processing in the auditory system.
R 62

28,940
Gallos, P.S., Jr. THE EFFECTS OF MODES OF PRESENTATION AND LARGE REWARDS ON A PRISONERS' DILEMMA GAME. Contract NONR 233(54), Proj. NR 171 350, Tech. Rep. 18, March 1966, 13pp. Psychology Dept., University of California, Los Angeles, Calif. (AD 632491)

Eight male and 8 female Ss played a matrix form of the Prisoners' Dilemma game; an additional 8 male and 8 female Ss played a non-matrix form of the game. Each S played for both high monetary reward (maximum joint payoff of $1.00 per trial for 15 trials) and low monetary reward (maximum joint payoff of $.10 per trial for 15 trials). Half of the Ss played first for low reward and then for high. The order was reversed for the other half of the Ss. It was predicted that there would be greater cooperation when the Ss were given: a) large rewards as compared to small; and b) non-matrix presentation as compared to matrix. The results failed to confirm these hypotheses. In addition, there were no sex differences in style of play nor were there significant interactions among the 3 variables. However, the overall level of cooperative play was considerably higher than is usually encountered in these games, averaging 55%, and the usual over trials decline in the percentage of cooperation was not observed. The results of the present study were compared with the results of more recent experiments which manipulated the same variables, and suggestions for future research were discussed.
R 14

28,941
Marschak, J. DECISION-MAKING. Contract NONR 233(75) Proj. 047 041, Working Paper 93, Dec. 1965, 36pp. Western Management Science Institute, University of California, Los Angeles, Calif. (AD 632524)

Descriptive decision theory is an extension of psychology or anthropology; prescriptive decision theory can be regarded as an extension of logic. Propositions of prescriptive theory can also be regarded as possible hypotheses of descriptive theory. Accordingly, an account of experiments that test such hypotheses is used to acquaint the reader with both the currently available empirical evidence and the main elements of current prescriptive literature. In addition, some alternative descriptive hypotheses are introduced, especially those of probabilistic nature; and the prescriptive materials are extended to include a brief discussion of sequential, informational, and exploratory strategies, and of the cost of decision.
R 37

28,942
McIntosh, B.B., Milton, J.L. & Cole, E.L. PILOT PERFORMANCE DURING EXTENDED PERIODS OF INSTRUMENT FLIGHT. Proj. RDO 694 34, AF TR 6725, May 1952, 42pp. USAF Aero Medical Lab., Wright-Patterson AFB, Ohio.

The purpose of this investigation was to collect exploratory data on pilot performance during extended instrument flights. Each of 3 pilots flew a C-47 aircraft for 10, 15 and 17 hrs. respectively. Equipment installed in the aircraft permitted recordings of a) amount of time flight indicators were kept within tolerance limits; and b) continuous variation of flight indicators and control positions. Pilots' introspections and observations by a safety pilot were also obtained after each flight. To supplement the above measures, addition, illusion, and reading comprehension tests were given before, during and after the 10 hr. flight, pilot reaction time to a signal light was taken during the 15 hr. flight and an alertness indicator was operated during the 17 hr. flight. The time within tolerance results indicate that the pilots kept the flight indicators within the specified tolerance limits for both precision maneuvers and straight and level flight as well after 10, 15 and 17 hrs. of instrument flight as they did during the first hours of these flights. The results of the graphic records also gave indications that performance, as measured, was not a function of time, since no decrement appeared between the first and last portions of the flight. The introspections of the pilots indicate that they became preoccupied with their physical discomfort but they believed they could cope with a critical situation, had it appeared. The constant level of their performance indicates they were coping satisfactorily with the flight requirements.
R 7

28,943
Rubin, S. DESIGN OF AN ENCODER, CONVERTER, AND DISPLAY DEVICE. Contract AF 33(657) 9208, Proj. 4421, Task 442104, ASD TDR 63 659, Oct. 1963, 168pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (American Machine & Foundry Company, Alexandria, Va.). (AD 423552)

Communication between an airborne navigational computer and the navigator requires means for encoding decimally entered information, displaying output information, and converting between the binary notation of the computer and the decimal notation of the operator. A design is presented of a device which performs those functions. Conversion between binary and B.C.D. notation is accomplished by a fixed-program, special-purpose computer coupled to the navigational computer. Display devices for decimal digits are proposed based upon a small stepping motor with opto-electronic feedback to assure that the device is actually in the position called for. A complete logic design is presented. Suggested construction is of micro-miniature electronic blocks available now or in the near future.
R 13

28,944
McGregor, D.M. A FLIGHT INVESTIGATION OF THE INFLUENCE ON VARIOUS LEVELS OF DIHEDRAL EFFECT ON V/STOL AIRCRAFT DIRECTIONAL HANDLING QUALITIES. Rep. LR 412, Nov. 1964, 40pp. National Aeronautical Establishment, National Research Council, Ottawa, Ontario, Canada. (AD 461879)

An investigation into the influence of dihedral effect on the directional angular rate dampings and control sensitivities required for both normal and emergency operation was undertaken, using an airborne V/STOL simulator. The visual flight task performed by the pilots during the evaluation included hovering turns and a complete cirucit terminated by a low speed, steep angle approach to touch-down. Both a simulated steady wind and synthetic lateral turbulence were introduced into the simulation to represent realistic flight conditions. As the dihedral effect was raised the normal operation boundaries moved to higher levels of both directional angular rate damping and control sensitivity, while the emergency operation boundaries were found to be essentially insensitive to this parameter.
R 8

28,945
Jones, A.G. ANALYSIS OF THE ROSS CONTROL SYSTEM INSTALLED IN A T-33 AIRCRAFT. Contract AF 33(600) 28965, Proj. 1365, Tasks 13541 & 61922, ASRMCM TM 62 9, Sept. 1962, 16pp. USAF Aeronautical Systems Div., Wright-Patterson AFB, Ohio. (AD 422246)

The objective of this report is to analyze the Ross rudder-aileron interconnect system through partial use of servo analysis techniques, as well as discuss some other aspects of the system. The Ross Control System is a 2 part mechanical device which combines the action of the aileron and rudder of an aircraft in an attempt to produce coordinated flight on one hand and cross controlled flight on the other. The first is a double differential unit which varies the ratio of rudder deflection to aileron deflection, depending upon the position of the elevator. The second is an adjustor unit which permits variance of the rudder-aileron ratio range.
R 7

28,946
US Federal Aviation Agency. SECOND INTERNATIONAL AVIATION R & D SYMPOSIUM ALL-WEATHER LANDING SYSTEMS. Report from: "FAA International Aviation Research & Development Symposium, Atlantic City, New Jersey, September 16-18, 1963." 1963, 119pp. US Systems Research & Development Service, FAA, Washington, D.C. (Sperry-Phoenix Company, Sperry Rand Corp., Phoenix, Ariz.). (AD 424153)

A collection of 6 papers describing research relevant to all-weather landing systems is presented. The papers cover: a) development of an automatic throttle system for automatic landing application; b) a ground-based monitor system for automatic landing; c) instrument landing system ground components for category II and III operations; d) solid state ILS receiver developments for low approach; e) the application of flight simulator techniques to all-weather landing systems; f) modern glide slope projectors for category III instrument landing systems.

28,947
Palmquist, M.L. HELICOPTER RADAR NAVIGATION SYSTEM AND ENHANCEMENT DEVICES. FINAL REPORT. Contract ARDS 510, Proj. 320 103 02N, Rep. RD 64 125, Sept. 1964, 82pp. US Systems Research & Development Service, FAA, Washington, D.C. (Bendix-Pacific Div., Bendix Corporation, N. Hollywood, Calif.). (AD 612610)

Contract ARDS-510 was initiated by the Federal Aviation Agency to provide a navigational radar system to be used in evaluating radar as a prime navigation aid for helicopter operations. The radar system developed for this program operates in the 15.4 to 15.7 gc navigation band, and uses a slotted array antenna to form an approximate cosecant squared pattern. The direct-view storage display unit provides a bright PPI display, with range representations of 1.5, 5.0, and 15.0 miles. Information renewal rotation speed is 30 rpm; pulse length is 0.22 μsec. and beam width is 2°. Selection of video types is incorporated to enable evaluation of the FTC, video processor, and displaying beacons. The scope of the program was expanded to include 3 compatible ground-based beacons, and 3 passive enhancement devices.

28,948
Page, M., Goff, C. & Palmer, J.D. THE PSYCHOLOGICAL EFFECTS OF NON-NUCLEAR WEAPONS: A BIBLIOGRAPHY WITH SELECTED ABSTRACTS. VOLUME I. TECHNICAL REPORT. Contract AF 08(635) 3693, Rep. 1419 4, Aug. 1964, 84pp. University of Oklahoma Research Institute, Norman, Okla. (AD 608380)

The bibliography contained in this volume was developed as a part of an investigation of "The Psychological Effects of Non-Nuclear Weapons for Limited War." A thorough search of several libraries has been made and a collection and analysis of data dating from World War II to the present time has been undertaken. This bibliography represents only a fraction of the material covered in the study program and is therefore selective rather than exhaustive. The main body of literature on the Psychological Effects of Weapons Systems is of the anecdotal, journalistic and questionnaire survey type. This material is included in Section I. Abstracts of relevant articles are included. Section II of this bibliography includes listings of the literature pertinent to the development of an adaptive systems model to simulate social system response to the various weapons, and to aid in the development of the Psychological Index. This portion of the program is an attempt to develop an adaptive systems model for computer simulation for the psychological effects of attack. Section III contains a bibliography of experimental literature on psychological effects that have possible relevance to to combat related stress.
R many

28,949
Armer, P. ATTITUDES TOWARD INTELLIGENT MACHINES. Rep. P 2114, Sept. 1960, 27pp. Mathematics Div., Rand Corporation, Santa Monica, Calif.

This paper is on the examination of comments on intelligent machines taken from literature of the U.S. and the Soviet Union. The proposition that research on intelligent machines should be viewed merely as an attempt to push machine capabilities further out in the continuum of intelligent behavior is advanced in the hope that it will help reduce some of the semantic difficulties frequently associated with discussions of this topic.
R about 40

28,950
Hill, E.L., Caldwell, J.G. & Grogan, W.K. DETERMINATION OF SHELTER CONFIGURATION FOR VENTILATION. Contract OCD PS 64 56, WU 1235A, RTI OU 177, July 1965, 7pp. US Office of Civil Defense, Department of Defense, Washington, D.C. (Research Triangle Institute, Durham, N.C.). (AD 629928)

This is a summary report of a survey aimed at determining the current capabilities and capacities of structures as shelter from radioactive fallout, and the feasibility and cost of improving and increasing same. Shelter specifications are indicated and the ventilation requirement was found to cause a major problem. Data pertaining to the ventilation problem are described and analyzed. HEIAS
R 3

28,951
Budd Company. A STUDY OF PICTORIAL DATA ANALYSIS CONCEPTS AND TECHNIQUES. FINAL REPORT. Contract AF 49(638) 1231, AFOSR 64 2529, May 1964, 118pp. Information Sciences Center, Budd Company, McLean, Va. (AD 609711)

The goal of the research performed on this program is the development of rules for subdividing complex pictures into "components" analogous to those which would be reported by observers asked to describe the pictures. It was recognized at the outset of the program that a complete model for human performance on general picture description tasks could not be formulated, since such performance can depend on unquantifiable properties of the intentions and personalities of the observers. (A discussion of the difficulties inherent in the picture subdivision problem is presented in Appendix A). For this reason, the studies conducted under the program have dealt with restricted cases in which important "textural" picture subdivision variables could be investigated in isolation (Appendix A). Specific experiments herein (Appendix B) have involved "one-dimensional" pictorial stimuli in which the stimulus brightness (or "density") is constant in one direction and varies only in the other. Such stimuli may be thought of as representing single scans across real-world (2-dimensional) pictures; methods of generating them which were developed in the course of the program are summarized in Appendix C. The use of such stimuli has made it possible to study basic textural stimulus variables "nearly independently" of the form and pattern variables which otherwise make the subdivision process highly multivariate. Simple models for picture subdivisions which are "optimal" with respect to mean brightness difference have been found to give results closely similar to observers' judgments (Appendix B).
R 50

28,952
US Office of Aviation Medicine. AVIATION MEDICAL PAPERS AND REPORTS, A BIBLIOGRAPHY. Rep. AM 64 20, Oct, 1964, 89pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 613364)

This is a bibliography of aviation medical papers and reports produced or sponsored by the several divisions, institutions and laboratories of FAA. The citations and abstracts are listed by the divisions, etc. of the FAA, and all are cross indexed by subject.

28,953
Hays, D.G., Henisz-Dostert, B. & Rapp, Marjorie L. COMPUTATIONAL LINGUISTICS: BIBLIOGRAPHY, 1965. Contract AF 49(638) 1700, RM 4986 PR, April 1966, 80pp. Rand Corporation, Santa Monica, Calif. (AD 630985)

A bibliography citing 700 U.S. and foreign articles, reports, and books relevant to the fields of computational linguistics and documentation. A selective coverage of classification theory, computation and programming, computers and hardware, non-numerical applications of computers, and psycholinguistics is included. In the area of linguistics, the editors have taken a broad view of structural theory and semantics.

28,954
USAF Decision Sciences Laboratory. DECISION SCIENCES LABORATORY BIENNIAL PROGRESS REPORT (TERMINAL REPORT) FOR THE PERIOD JULY 1964 THRU JUNE 1966. ESD TR 67 204, Projs. 7682, 2808, 2806 & 280111, Oct. 1966, 49pp. USAF Decision Sciences Lab., Hanscom AFB, Bedford, Mass.

This report, covering the period July 1964 through June 1966, describes the exploratory development work performed by the Decision Sciences Laboratory in the areas of data presentation and display, communications testing, problem solving, and automated training. A fairly extensive bibliography is included in each section. The Decision Sciences Laboratory (DSL) is a behavioral sciences laboratory especially concerned with the behavior of man in complex military environments involving the presentation and processing of information. It is a laboratory whose main function is exploring, defining, and effecting the most efficient interaction between man and machines in military information systems. Such systems are sophisticated computer based electronic systems which gather and process huge quantities of data, and present information to military commanders and controllers which they then use as aids in decision-making.
R many

28,955
Cutler-Hammer, Incorporated. HEIGHT CODE TABLES FOR USE WITH AIR TRAFFIC CONTROL RADAR BEACON SYSTEM. Contract FAA/BRD 329, Task 6, Rep. 8893 SP 1, May 1962, 40pp. US Aviation Research & Development Service, FAA, Washington, D.C. (Airborne Instruments Lab., Cutler-Hammer, Inc., Long Island, N.Y.). (AD 615818)

The Seventh Communications Division of the International Civil Aviation Organization (ICAO) has recommended the adoption of a digital code for automatic height transmission via the AIR TRAFFIC CONTROL RADAR BEACON SYSTEM. Salient features of the code are: a) 100 ft. digitizing increments; b) range from -1000 ft. to +126,750 ft; c) compatibility with limited-capability 500-ft. incremented code; unambiguous unit-distance characteristic; e) height transmission with respect to a fixed datum of 1013.2 millibars (29.92 in. of mercury). The code, as recommended by ICAO, is tabulated for height increments in increasing numeric order (Table 1) and for the equivalent octal Mode 3/A reply in increasing numeric order (Table 2). (Asterisked replies indicate the use of the SPI position.) The "PULSE POSITIONS" column lists the time-sequence assignment of the pulse-transmission reply, and the "HEIGHT CODE POSITIONS" column gives a rearrangement of the code information in significant-digit sequence. 500-ft. increments are extracted from the tables by omitting the C information pulses for the appropriate integer multiple of 500-ft height.

28,956
Dunlap and Associates, Incorporated. A METHOD FOR DERIVING JOB STANDARDS FROM SYSTEM EFFECTIVENESS CRITERIA. VOLUME I. METHOD DEVELOPMENT. Contract Nonr 4314(00), Dec. 1964, 120pp. USN Psychological Research Branch, Bureau of Naval Personnel, Washington, D.C. (Western Operations, Dunlap & Associates, Inc., Santa Monica, Calif.). (AD 609725)

The purpose of this study centers around developing a methodology that would fulfill 2 objectives: a) derivation of specific personnel performance standards with definable relations to ultimate system effectiveness requirements; and b) determination of the effect on system effectiveness of performance levels that deviate from established performance standards. Generally, the effort has consisted of reviewing existing methods and techniques for relating personnel performance to system effectiveness and combining, modifying and extending those methods and techniques as required to quantify the relation between system processes and criteria of system effectiveness. To insure that the method would have practical utility and to test its applicability empirically, it has been applied to the AN/SPS-40 radar which is an installed shipboard subsystem (see Volume II of the report). That application demonstrated the usefulness of the method as well as its present limitations. During that test application, a procedural format was developed for applying the method (see Appendix B). The procedural format permits use of the method by skilled systems analysts and does not require the use of advanced mathematics.
R approx. 50

28,957
Brissey, F.L. AN EXPERIMENTAL TECHNIQUE FOR THE STUDY OF HUMAN COMMUNICATION. Contracts AF AFOSR 62 214 & AFOSR 64 2409, Sept. 1964, 73pp. USAF Office of Scientific Research, ARDC, Washington, D.C. (Communications Research Lab., Montana State University, Missoula, Mont.). (AD 609946)

This study evaluated the serial reproduction of information through "chains" each composed of 5 Ss. Group I (N=16) heard a message of high adequacy concerning an arrangement of pegs in a simple peg-board apparatus. Each S immediately tape-recorded from memory his version of the model message. He then tried to reproduce the peg arrangement described in the message. The message redorded by Ss of Group I were assigned to the Ss of Group II who recorded their versions of Group I messages and then also attempted to reproduce the arrangement of pegs. This process was continued through the fifth group. Communicative effectiveness through the 16 chains was estimated on the basis of completion and discrimination. Completion and discrimination were evaluated under a condition allowing the S to terminate the task at his discretion and discrimination was evaluated for a condition requiring the S to complete the display. Experimental conditions were employed under which it was hypothesized that the 5 groups would be equally well-informed as a function of serial reproduction. The results of the investigation support the following tentative conclusions: a) When a receiver is free to terminate the criterion task, display completion tends to decrease through the first 4 groups, while discrimination drops initially then tends to remain relatively constant through the last 4 groups; b) When a receiver is required to complete the task, discrimination progressively declines from a nearly maximum value for the first group to a level of best guess for the fifth group. c) When message adequacy is low Ss may tend to maximize completion at the expense of discrimination.
R 25

28,958
Peters, G.A. & Hall, F.S. BASIC REFERENCES AND SOURCES OF INFORMATION IN HUMAN FACTORS ENGINEERING. Rep. RH 3398A, Nov. 1963, 56pp. Rocketdyne, North American Aviation, Inc., Canoga Park, Calif. (AD 425408)

This publication is intended to provide a comprehensive listing of the many guidance and planning documents, technical references, and general sources of information in human factors engineering. It contains 184 regulatory and guidance documents, 74 descriptive or illustrative publications, and 176 reference and information sources. These 434 items were selected on the basis of frequency of use, suggested utility, and to provide entrance points to a cross section of the related primary reference literature. The listing requires periodic updating and frequent feedback from those who find it useful. A survey of item content shows that current human factors activities encompass a wide scope of functions. They vary to a considerable extent between projects and organizations, and may overlap or interact with a number of closely related functions or technical disciplines.
R Many

28,959
McKelvey, R.K. & Brown, G.S. ANALYSIS OF RUNWAY MARKING CONFIGURATIONS FOR BRIGHT DAYLIGHT CONTACT FOG OPERATIONS. INTERIM REPORT. Proj. 430 008 01R, Rep. RD 64 154, Nov. 1964, 76pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 618678)

Four experiments were conducted to determine the feasibility of utilizing runway marking to provide guidance for visual transition for landing and for monitoring of runway distance to go. The experiments were done in a visual landing simulator modified to present the field and brightness contrast relationships characteristic of a bright daylight contact fog with a visual range of approximately 1,200 ft. The results suggest that it is feasible to provide visual support under the specified visibility conditions with patterns compatible with the standard narrow gauge touchdown lighting configuration. In addition, it appears possible that these systems can be designed without marking elements in the critical centerline wear area of the landing zone and in "double ended" versions providing distance to go information. Future work will attempt to extend the distance indicating code to a configuration adequate for 12,000 ft, as well as for the 7,000-ft runway used in these experiments.
R 13

28,960
Unger, A., Bernadyn, J. et al. SAMPLED-DATA ADAPTIVE FLIGHT CONTROL SYSTEM. PART I. Contract AF 33(616) 8014, Proj. 8226, Task 822601, ASD TDR 63 580, Nov. 1963, 52pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Eclipse-Pioneer Div., Bendix Corporation, Teterboro, N.J.). (AD 425695)

A 2-axis sampled-data adaptive flight control system was built, installed and flight tested in an F102A aircraft. The system is independent of air data gain scheduling, as it is self-adaptive and employs sampled-data techniques to achieve automatic gain control without the use of control surface residual oscillations as stimuli. The sampled-data adaptive system measures its own performance against model data each tenth of a second, predicts the error for each succeeding tenth of a second and generates appropriate servo commands to obtain desired aircraft performance.

28,961
Hamilton, C.W., VanBuskirk, R.C., et al. FORMULATION OF SYSTEM STATUS CONTROL TECHNIQUES. Contract AF 33(616) 7761, Proj. 8119, Task 811922, ASD TDR 63 792, Sept. 1963, 191pp. USAF Aero-Propulsion Lab., Wright-Patterson AFB, Ohio. (Battelle Memorial Institute, Columbus, Ohio). (AD 428673)

Techniques for the measurement and prediction of future system performance are described. Failure prediction using these techniques is then accomplished based on the assignment of tolerance limits to appropriate performance characteristics. The techniques developed in this report can be classified into 2 parts: a) statistical failure prediction models of general applicability; and b) measurement and prediction techniques for specific classes of systems taking into account those properties peculiar to the class. In the first part, techniques are derived for systems which are continuously monitored, and for systems checked periodically. In the second part, feedback, adaptive, and redundant systems are considered. The techniques developed are designed to be programmed into automatic checkout equipment. Sample flow charts are given in some cases. Finally, plans for validating these techniques in application to specified hardware systems are described.
R 7

28,962
Price, H.E., Honsberger, W.D. & Ereneta, W.J. A STUDY OF POTENTIAL ROLES OF SUPERSONIC TRANSPORT CREWS AND SOME IMPLICATIONS FOR THE FLIGHT DECK. VOLUME II. FEASIBLE AUTOMATED AND MANUAL IMPLEMENTATION CONCEPTS FOR SST ACTIVITIES AND FUNCTIONS. Contract NAS 2 2209, NASA CR 562, Oct. 1966, 601pp. National Aeronautics & Space Administration, Washington, D.C. (Serendipity Associates, Chatsworth, Calif.).

This is the second volume of a 2 volume final report titled "Potential Roles of Supersonic Transport Crews and Some Implications for the Flight Deck." Volume I is concerned with Workload, Crew Roles, Flight Deck Concepts, and Conclusions. This volume is concerned with Feasible Automated and Manual Implementation Concepts for SST Activities and Functions. It is published as a separate volume because of the large amount of material it contains. It should be noted for continuity purposes that Volume I identified 7 major activities for the operation of an SST and this volume presents the results of the derivation of functions within each activity and analysis of these functions to develop implementation concepts. The 7 major activities from Volume I are: a) Flight management; b) Phase-oriented system checks; c) Communication; d) Power plant operation; e) Flight control; f) Inlet nozzle configuration; g) Navigation.
R 82

28,963
Bennett, H.S., Burkhard, H.F. & Hennessy, J.R. MAN-MACHINE INTEGRATION - ENHANCEMENT OF MAN'S SENSORY CHANNELS OF COMMUNICATION. Report from: "National Aerospace Electronics Conference Proceedings, Dayton, Ohio, May 1966, 53-59." USA Electronics Command, Fort Monmouth N.J.

This report briefly reviews the work and developments from several facilities in the area of skin as a communication channel. 2 experiments were then described in which the basic problem of reduction of current and voltage levels for adequate and acceptable electrical stimulation of the skin was studied. 12 soldiers were utilized for measurement of thresholds of sensation and pain with 3 types of electrodes. The data, involving approximately 7500 observations, indicated that cutaneous communications could serve as a primary communications channel. Also cutaneous communications could serve to reinforce other communications systems. One or two orders of magnitude reduction over previously reported data on required current and power levels for adequate electrocutaneous stimulation indicate that practical, man-portable systems are feasible. The large range of current between sensation and pain; and the relatively small variability of sensation thresholds among Ss, indicate that the cutaneous communication components will need only simple controls for adjustment from individual to individual.

28,964
David W. Young & Associates, Inc. HIGH SPEED, RASTER SCANNING, HIGH RESOLUTION, RADAR SENSOR FOR VERTICAL DISPLAY. Contract Nonr 4032(00), Jan. 1964, 42pp. David W. Young & Associates, Inc., Canoga Park, Calif. (AD 435558)

The radar system concept described here, when instrumented and installed in a helicopter or fixed wing aircraft, is intended to fully enable a pilot to perform a blind landing during inclement weather without aid or assistance of any kind from ground installations, and further, to be capable of both manual and automatic terrain following. Apparently, all this is to be possible with a simple, light-weight radar system. The antennas are the key elements in the system and are fairly long, but their width and depth is very small. The system is a high speed, raster scanning, high resolution radar used with a vertical display. The result is similar to television with range measurement capability. There are 2 antennas, each mounted approximately perpendicular to one another. One antenna is located in the plane of lift (horizontal) and the other in the plane of the longitudinal axis of the volume required for the man (vertical) and incidentally associated with lateral aircraft stability (rudder, dihedral, etc.). A transparent windshield display is introduced to allow correlation or comparison of human optical sensing and microwave (radar) sensing. A photograph of one manually scanned radar raster of "Stony Point", Chatsworth, California, is included along with a radar presentation of a runway. It is attempted to indicate what a complete raster scanning radar would actually provide in an end result. Many illustrations are included which define the radar design concept as well as the detailed workings of subcomponent parts of the radar. A set of references is included which provides greater design detail. Several of the references have not been generally available and are now on file with the Office of Naval Research.
R 20

28,965
USN Research Laboratory. THE SHOCK AND VIBRATION BULLETIN, BULLETIN 35. PART 5. Feb. 1966, 328pp. USN Research Lab., ONR, Washington, D.C. (AD 631234)

This bulletin contains papers in 2 general areas: transportation and shock and vibration isolation. In the section on transportation all major modes from railroad through spacecraft are represented. The second section evaluates various techniques of attenuation.
R many

28,966
Jackson, D.H., Oberman, A., Mitchell, R.E. & Graybiel, A. FACTORS CONTRIBUTING TO THE BALLISTOCARDIOGRAPHIC WAVE FORM IN HEALTHY MIDDLE AGED MALES. Contract NASA Order R 136, BuMed. Proj. MF022.03.02 5007.12, NAMI Rep. 966, Rep. 12, May 1966, 37pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Extensive use of the ballistocardiogram (BCG) as a sensitive screening device for heart disease, through assessment of myocardial efficiency, has never materialized. Although many criteria for the diagnosis of heart disease have evolved, considerable overlap between normals and abnormals has limited their usefulness. A greater knowledge of biologic factors influencing the ballistocardiographic wave form might facilitate progress in this area. Ballistocardiograms were recorded on a large group of healthy men, 42 to 54 years of age. Various anthropometric, laboratory, and personal history factors were studied to determine how they related to the BCG wave form. Wave amplitudes and durations were influenced by the factors more than has previously been recognized. It appears that, until the factors and their interrelationships are more precisely evaluated, the strictly quantitative use of BCG standards derived from groups to determine such things as stroke volume, among others, must be regarded with caution. The results seem to indicate that serial BCG's will be necessary for complete evaluation of an individual's cardiovascular status.
R 24

28,967
Hanes, R.M. & Hansen, K.B. LEARNING CURVES FOR COLOR IDENTIFICATION. Nov. 1960, 6pp. Applied Physics Lab., Johns Hopkins University, Silvers Spring, Md. (AD 627400)

Os can learn to identify 65 different color chips with less than 5% error in 40 to 55 hours of study when the chips are presented singly. With the stimulus materials used in this study (chips from the Munsell Student Set), 2 different distributions of the chips within the set produced essentially equivalent results. Presentation of more than 1 chip simultaneously, after prolonged study with single-chip presentation, has little effect on some Os but seems to make the identification problem much more difficult for others.
R 1

28,968
Bonnell, M., Carr, W. & Lauer, C. ACRONYMS. Dec. 1965, 75pp. McDonnell Aircraft Corporation, St. Louis, Mo. (AD 625208)

The purpose of this list is to provide a current list of acronyms and abbreviations that are being used in the McDonnell Aircraft Technical Library. This list contains the acronym, its meaning, and source from which it was originated.

28,969
Snodgrass, Joan G., Luce, R.D. & Galanter, E. SOME EXPERIMENTS ON SIMPLE AND CHOICE REACTION TIME. Contract NONR 477(34), Rep. PRP 26N, Aug. 1966, 43pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (New York University, New York, N.Y.).

The concern here is with 4 problems about simple and choice reaction time (RT). First, in Exp. 1 and 2, the role of time estimation in the manipulation of responses in simple reaction time experiments was examined by means of payoffs and information feedback. Second, in Exp. 3, it was asked whether the changes in the shape and location of choice RT distributions as compared with simple ones are due primarily to the increase in the number of signals, in the number of responses, or in some more basic difference between the 2 tasks. Third, in Exp. 4, the relation between RT and signal presentation probability in choice situations was investigated. And, finally, using all of the empirical distributions obtained in Exp. 2, 3, and 4, an attempt was made to see if any of several theoretical distributions appear to give a satisfactory description of the data.
R 21

28,970
Watters, D.L., Rollins, W.F., Frey, R.B. & Cavonius, C.R. FLIGHT ANALYSIS OF APPROACH AND LANDING GUIDANCE ELEMENTS OF HELIPORT LIGHTING PATTERNS, FINAL REPORT. Contract FAA/BRD 401, Proj. 424 2R, HSR RR 64/7 MkX, Rep. RD 64 93, June 1964, 150pp. US Systems Research & Development Service, FAA, Washington, D.C. (Human Science Research, Inc., McLean, Va.). (AD 608050)

This report presents the flight phase of a series of tasks directed at the development of preliminary design criteria for approach and landing guidance elements of a heliport lighting configuration. Helicopter pilots flew approaches to 8 experimental lighting and marking patterns. The patterns included a brightly colored panel presented during daylight approaches and 7 night patterns consisting of a single touchdown light or pairs of lights spaced 5, 15, or 80 ft. apart oriented along the flight path or transverse to the flight path. 72 measures of aircraft position, aircraft attitude and pilot control movement were analyzed in order to identify measures sensitive to changes in lighting configuration, but insensitive to individual pilot technique. Those measures which successfully discriminated among different lighting conditions were measures of deviation from a generally accepted standard (e.g., a straight flight path during approach) as opposed to measures which reflect individual pilot technique. The vast majority of the recorded measures (particularly pilot control movement) reflected inter-pilot differences in technique, since individual pilots display great consistency when repeating the same pattern. Recommendations include investigation of lighting configurations which give the pilot immediate and unambiguous information when he deviates from a desired flight path, e.g., a system similar in concept to the fixed wing mirror system. Other recommendations concern suggestions for planning, conducting, and processing performance data.
R 26

28,971
Marks, M.R. & Taylor, R.D. FORECASTING ELECTRONIC MAINTENANCE SKILL LEVELS FOR NEW DEVELOPMENTS IN THE NAVY, FINAL REPORT. Contract NONR 3861(00), Rep. 63 1, Oct. 1963, 165pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Matrix Corporation, Arlington, Va.). (AD 425719)

The purpose of the present study was the development of a task-description and skill-level-estimate technique that would represent an improvement over existing practices. The essential notion behind the study was to build such a technique around a standard catalogue of tasks. If such a standard catalogue or list could be developed--one which would be applicable to all present of future systems--the process of task analysis could be made more uniform and, hence more reliable. Further, if a technique could be developed to standardize also the method for assigning skill levels to tasks, improvement could be almost guaranteed. This report describes the progress made to date in the development of the standard list (master list) and the skill-level-estimate technique. Further, it will indicate the way in which these may be applied to new developments. Finally, certain auxiliary benefits of the technique will be described. This report is divided into 2 parts. The first part is the Management Report. In it is described the general rationale of the study, the way in which the materials were developed, and the data collected. The results are then presented in what is hoped to be a relatively nontechnical form. Conclusions are drawn, and recommendations for further study are made. The second part of the report is a set of Technical Appendices. Appendix 1 is a reproduction of the form used for collecting the data reported in this study. The second appendix presents the statistical analysis. The third appendix contains an expansion of material summarized at one point in the Management Report.
R 3

28,972
Weiner, M.G. (Chm.). FIRST CONGRESS ON THE INFORMATION SYSTEM SCIENCES, SESSION II. INFORMATION ASPECTS OF MILITARY COMMAND ORGANIZATION. Contract AF33(600) 39852, Proj. 704, ESD TDR 63 474 2, MITRE SS 2, Oct. 1963, 24pp. USAF Electronic Systems Div., Hanscom AFB, Mass. (Mitre Corporation, Bedford, Mass.). (AD 422459)

The problem of how the present and projected information technology developments can help the military commander is discussed. A review is made of the developments required in the past and in recent years, many of which came as a result of growth in weapons technology. The concepts of war held by leaders in the '50's are analyzed and the information systems requirements resulting from their outlook are covered. Changes in concepts in the '60's and their effects on information technology and on systems of the future are outlined and discussed. Although enthusiasm for highly automated and expensive systems was high a few years ago, such systems are now looked upon with caution and misgiving. However, it is suggested that the use of more advanced technology into the command process can promote flexibility and adaptiveness.

28,973
Sinclair, R.S. AN ANALYSIS OF DIRECTIONAL VIEWING SCREENS: A COMPARISON TO A MATTE-WHITE SURFACE. DA Subtask 1P6 22001 A 055 03 05, Tech. Rep. ECOM 2500, Sept. 1964, 14pp. USA Electronics Labs., Fort Monmouth, N.J. (AD 609034)

Screens used for viewing projected images have been analyzed to consider the effect on brightness as a function of viewing angle caused by making the screen directional in its reflective properties. In each case the screen is compared to a matte-white surface. This surface has the property of brightness being a constant at all viewing angles. 3 screens are considered: a beaded screen and 2 hypothetical screens. The beaded screen is the most directional screen commercially available.
R 3

28,974
Shaw, C.J. THE COMPUTER AND THE PROMISE OF AUTOMATION. Report from: "Meeting of Southern California Occupational Therapy Association, September 15, 1964." Rep. SP 1751/000/01, Sept. 1964, 14pp. System Development Corporation, Santa Monica, Calif. (AD 608575)

Briefly reviews the history of automation. Describes the computer as a machine for processing information. Outlines several computer programs such as SYNTHEX, HELP, STUDENT and others. Discusses the computer in terms of the job opportunities it ends and creates. Suggests areas in which there is work to be done.
R 8

28,975
Terry, R.A. & Rasmussen, Elizabeth A. HUMAN FACTORS LITERATURE RELEVANT TO CIVIL AVIATION: A GUIDE FOR MANAGEMENT AND DESIGN ENGINEERS. FINAL TECHNICAL REPORT. Contracts OMRF 930 & FAA 6AC 38891, Aug. 1966, 71pp. US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (Oklahoma Medical Research Foundation, Oklahoma City, Okla.).

This is a selective bibliography covering the following topics: a) General References; b) Human Factors Methods: systems design; maintainability; use of simulators and computers in man-machine studies; c) Accident Investigation: incident analysis; d) Crash Safety: emergency evacuation and survival; restraint systems; decelerative forces; e) Anthropometry and Cabin Design: biomechanics; doors; seats; personal equipment; f) Equipment Design: panels; displays; instrument; workspace layout; g) Control System Dynamics: simulation; tracking; h) Visual Factors in Air Navigation and Ground Control: radar; conspicuity; approach lighting; i) Airspace Utilization: navigation; SST profiles; automatic landing--adaptive control; j) Air Traffic Control Systems Operation; k) Personnel Factors: selection and training; l) Skilled Performance: fatigue; stress; work schedules; biological rhythms; communication networks; speech and hearing; information processing; computer storage and retrieval; m) Environmental Factors: lighting; noise; temperature; ventilation; climate; n) Acceleration & Vibration: disorientation (vertigo); o) Altitude Physiology; p) Toxicology: fuels; dusts; sprays; radiation; ozone; q) Aircrew and Passenger Comfort and Health: preventive medicine; drugs; diet; aging.

28,976
Helson, H. PERCEPTION. Contract Nonr 3634(01), Tech. Rep. 28, May 1965, 75pp. Psychology Dept., Kansas State University, Manhattan, Kan. (AD 464228)

We conclude this chapter by noting that perception now embraces phenomena ranging from simple sensory processes to complex, patterned formations having cognitive and affective components. Modern advances in neurophysiology have shown that perception involves more than central elaboration of afferent impulses terminating in the brain; rather, it is the product of afferent-central-efferent interactions in which centrifugal as well as centripetal impulses determine what is focal, what is background, or is entirely excluded from notice. On the phenomenological side, new attributes and qualities have been discovered in the various sense modalities and new sources of stimulation have been found to account for many of them. Phenomena of adaptation, contrast, assimilation, constancy, and satiation or figural aftereffects were shown to be products of a single underlying process that is essentially adaptive in nature. A quantitative theory involving interaction or pooling in both space and time and across as well as within sense modalities has been found to provide an operational approach to problems of perception. Among the more important problems being investigated within this framework are the extent and limits of the pooling process. The solution to many problems, such as effects of anchoring stimuli and what is or is not relevant in judging classes of stimuli lies in further exploration of pooling processes.
R many

28,977
Gray, Florence E. & Ellson, D.G. (Proj. Dir.). THE VALIDITY OF TIME-ON-TARGET (CLOCK) SCORES AS AN ESTIMATE OF TRACKING ERROR MAGNITUDE. Contract W33 038 ac 13968, Rep. 6, May 1947, 14pp. USAF Aero Medical Lab., Wright-Patterson AFB, Ohio. (Psychology Dept., Indiana University, Bloomington, Ind.).

Time-on-target scores and mean error scores were obtained simultaneously during tracking of single dimension constant rate courses. Correlations between the 2 types of score varied with: a) target speed; and b) sensitivity of the time-on-target system. Since no single setting of on-target limits provides a maximal correspondence between the 2 types of score over a wide range of target speeds, it is suggested that an integrated error score be used when accurate measurement of error magnitude is required on variable rate target courses. If it is necessary to substitute time-on-target scoring, the best estimate of error magnitude is obtained when the on-target limits: a) are set approximately equal to the mean error magnitude; and b) record the tracking as "on-target" between approximately 50% and 80% of the total tracking time. In general the correlation between time-on-target scores and mean error scores is reduced more by increasing than by decreasing the on-target scoring limits.

28,978
Cheatham, T.E., Jr. (Chm.). FIRST CONGRESS ON THE INFORMATION SYSTEM SCIENCES. SESSION-12. PROGRAMMING INFORMATION PROCESSING AUTOMATA. SOME OBSERVATIONS ON THE DEVELOPMENT OF LARGE PROGRAMS. HARDWARE/SOFTWARE INTERACTION. Report from: "First Congress on the Information System Sciences, Homestead, Hot Springs, Virginia, November 19-20, 1962." Contract AF33(600) 39852, Proj. 704, ESD TDR 63 474 12, Rep. MITRE SS 12, Oct. 1963, 67pp. USAF Directorate of System Design, L.G. Hanscom Field, Bedford, Mass. (Mitre Corporation, Bedford, Mass.).

This report contains 2 preliminary manuscripts for consideration by participants in the First Congress on the Information System Sciences: some observations on the development of large programs and hardware/software interaction.

28,979
Ryabchikov, Ye., Loginov, V. & Salmonov, L. BIOLOGICAL DATA ON THE SPACE FLIGHTS OF A. NIKOLAYEVICH AND P. POPOVICH. (SUPPLEMENT: TRAINING OF COSMONAUTS). AID WA 22, AID Rep. 62 157, Express Rep. 7, TT65 64058, Sept. 1962, 4pp. US Aerospace Information Div., Library of Congress, Washington, D.C. (AD 621807)

Several aspects of the cosmonauts' training program are described briefly, together with some of the simulation devices and techniques.

28,980
Hutton, R.S. KINESTHETIC AFTEREFFECT, A MEASURE OF KINESTHETIC AWARENESS. Percept. mot. Skills, Dec. 1966, 23(3), Part 2, 1165-1166. (University of California, Los Angeles, Calif.).

It was hypothesized that scores on similar tests for kinesthetic awareness (KA) and kinesthetic aftereffects (KAE) should correlate negatively. 57 male university students were administered tasks designed to measure KA and KAE. Low inter-test Pearsonian correlation coefficients indicated negligible relationships between the 2 tasks. Further investigation is suggested since the correlation values fell in the posited direction.
R 5

28,981
Plath, W.J. MULTIPLE-PATH SYNTACTIC ANALYSIS OF RUSSIAN. (Ph.D. Dissertation). Rep. NSF 12, June 1963, 365pp. Computation Lab., Harvard University, Cambridge, Mass. (AD 419967)

A new system for the automatic syntactic analysis of Russian sentences is described in this thesis. The approach employed in the system, an extension of the method of predictive syntactic analysis, makes possible the production of multiple analyses of syntactically ambiguous sentences, as well as a more reliable treatment of sentences which are not syntactically ambiguous. Analyses are obtained through the systematic application of a set of rules, called a grammar table, which constitutes a description of syntactic structures that can occur in Russian. The system incorporates a special-purpose language of grammatical indices; this language not only serves to express agreement and government relationships in the grammar table, but also makes the treatment of such relationships by the analysis program much easier.
R many scattered

28,982
National Aeronautics & Space Administration. SECOND ANNUAL NASA-UNIVERSITY CONFERENCE ON MANUAL CONTROL, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASSACHUSETTS, FEBRUARY 28-MARCH 2, 1966. NASA SP 128, 1966, 417pp. National Aeronautics & Space Administration, Washington, D.C.

This volume contains the proceedings of the Second Annual NASA-University Conference on Manual Control held February 28 to March 2, 1966, at Cambridge, Massachusetts. The program was divided into the following 9 sessions: discrete and continuous models, adaptive control, information theory, multivariable control, display, motion and stress, applications, optimal control, and analysis and design methods. Both formal and informal presentations were made. All of the formal and some of the informal papers are included in this volume. The session on applications contained only informal presentations, and it is not included in these proceedings although the major points of that session are reviewed in the summary.
R many scattered

28,983
Pew, R.W., Duffendack, J.C. & Fensch, L.K. SUMMARY OF SINE-WAVE TRACKING STUDIES. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 15-24. National Aeronautics & Space Administration, Washington, D.C. (University of Michigan, Ann Arbor, Mich.).

The highlights of a study of sine-wave tracking are reported which illustrate the extent to which the predictability of the input and of the control device dynamics can be utilized with extended practice. Analysis of the error power spectra establishes the presence of a stable source of noise power in the operator's output that has implications for deriving models of manual tracking performance. It was hoped that further analysis of the effects of extended practice on tracking of sine waves would provide insight into the process of acquisition of skilled performance. Since the normalized power spectra do not change substantially with practice, it can only be concluded that much of what is learned is concerned with improved utilization of the predictability of the signals and system dynamics to which the operator is exposed. However, this study has revealed an underlying processing limitation that restricts the ultimate accuracy of tracking performance that can be achieved.
R 9

28,984
Bekey, G.A. & Angel, E.S. ASYNCHRONOUS FINITE STATE MODELS OF MANUAL CONTROL SYSTEMS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 25-37. National Aeronautics & Space Administration, Washington, D.C. (University of Southern California, Los Angeles, Calif.).

The mathematical models most commonly used to represent human operator behavior in manual control systems are based on the assumption that the operator observes and makes use of a continuum of input states. In contrast to those approaches, this paper is based on the assumption that the operator quantizes his input and output into a limited number of states and that data processing is performed on asynchronous samples of this coarsely quantized input; that is, the human operator behaves as a finite-state machine. A hybrid output element or hybrid actuator is used to achieve a continous variation of output position. In order to provide for the generation of timed output waveforms in manual tracking, the paper shows that the concept of the hybrid actuator also provides a bridge between binary decisions and continuous time. The application of standard logical design techniques to the synthesis and minimization of the resulting mathematical models is discussed. It is shown that for the particular case of compensatory control of a pure inertia plant, a human controller model can be synthesized by using only threshold gates, flip-flops, gates, and hybrid actuators. The paper concludes with a discussion of proposed research in further applications of finite-state machine theory to manual control.
R 10

28,985
McRuer, D. SOME NEUROMUSCULAR SUBSYSTEM DYNAMICS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 39-43. National Aeronautics & Space Administration, Washington, D.C. (Systems Technology, Inc., Inglewood, Calif.).

The neuromuscular actuation properties of the human operator have always been considered to be an essential element in the operator's dynamic characteristics. In the past, however, the available data for systems with random-appearing inputs have permitted the description of neuromuscular system only as a low-frequency approximation to higher frequency dynamics. Typical approximations have included a lag or a pure time delay. Recently, refined data of low variability and large dynamic range have become available. These provide the basis for better neuromuscular system descriptions and a greater scope in model-building activities. The 2 reasons for interest in more refined neuromuscular system data and descriptions are as follows: a) Practical ramifications of neuromuscular dynamics in manual control systems; b) Implications of these data on the structural organization of the neurological apparatus which make up the neuromuscular system. The single simple example discussed in this paper bears on both of these points.
R 2

28,986
Elkind, J.I. & Miller, D.C. PROCESS OF ADAPTATION BY THE HUMAN CONTROLLER. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technonogy, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 47-63. National Aeronautics & Space Administration, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

This paper is a model for 3 phases of the process by which the human controller adapts to changes in dynamics--detection, identification, and modification. The key features of the model are: a) an internal, adjustable model for the plant dynamics; b) a threshold detector which operates upon the difference between the observed change in error rate due to control movement and that predicted by the internal model; c) a decision tree that identifies the change in dynamics by determining in a sequential manner what modifications to the internal model are necessary in order that the observed error rate and the predicted error rate correspond; and d) a switching tree that allows for rapid and sequential changes in human controller characteristics as determined by the identification procedure. The detection and identification models have been found to predict accurately the time at which the human controller will detect a change in plant. Most of the verification data are for plants of the form Y=K/s. However, application of the model to a few more complex plants has also been successful. The model predicts the kind of dependence of identification time upon such factors as plant change uncertainty and plant change complexity that has been observed in previously reported experiments. The mode switching adjustment model has been verified by analysis of the adjustment process of well-trained controllers who show very rapid changes in characteristics once they have detected a change in plant dynamics.
R 12

28,987
Weir, D.H. & Phatak, A.V. MODEL OF HUMAN-OPERATOR RESPONSE TO STEP TRANSITIONS IN CONTROLLED ELEMENT DYNAMICS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 65-83. National Aeronautics & Space Administration, Washington, D.C. (Systems Technology, Inc., Inglewood, Calif.).

A critical control problem involving the vehicle/controlled-element system results from a step transition (sudden change) in the controlled element. Practical examples include failure of a manned aircraft stability augmenter, or the large changes in center of gravity which might occur during staging in the manual control of boost. This paper summarizes the derivation of an analytical model useful in predicting operator transition response. Extensive use is made of experimental data from a variety of sources. Other topics, such as detection criteria and the effects of learning, alerting, and uncertainty about the new dynamics, are included by reference only.
R 16

28,988
Gould, E.E. & Fu, K.S. ADAPTIVE MODEL OF THE HUMAN OPERATOR IN A TIME-VARYING CONTROL TASK. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 85-97. National Aeronautics & Space Administration, Washington, D.C. (Purdue University, Lafayette, Ind.).

This paper presents a model for the human operator engaged in 1-dimensional, compensatory, visual-manual tracking. Instead of a lumped input-output model, the human operator is considered as a system consisting of an input device (visual stimulus), an adaptive controller (central nervous system), and an actuator (arm and muscle mechanism). The main concern of this paper is modeling the strategy of the adaptive controller section. Pattern recognition techniques, which usually attempt to mimick human behavior, are used in the model to identify the type of plant being controlled. This basis for a model is then augmented by more conventional techniques to more closely approximate human behavior. The model has been simulated and is presently undergoing extensive tests.
R 15

28,989
Li, Y.T. MAN IN AN ADAPTIVE AND MULTILOOP CONTROL SYSTEM. Report from:"Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 99-105. National Aeronautics & Space Administration, Washington, D.C. (Massachusetts Institute of Technology, Cambridge, Mass.).

In considering difficulties involved in the control of a multiloop system--such as that of providing effective visual contact displays, the complications involved in providing other forms of displays, all the computation needed to decouple the intercoupled output-input relationships of a multiloop system, the compensation of the higher order dynamics, and the computation of the performance index for the adaptive control loop--it would appear that humans have very little place in the control of this type of system. Indeed, 1 primary advantage of the human is his visual perception of natural surroundings. But the other equally important aspect of the human operator is his ability to make impromptu adaptive control under situations which were unexpected by the systems designer or too complicated to be included in the system design. The importance of the human operator is illustrated by the numerous accident aversions handled by experienced pilots or drivers. In such a situation, he is powerless unless he has the primary control. For this reason manual operation should be employed in a primary control loop of the dominating vehicle output for the critical phase of operation. Automatic devices may be used to bypass the pilot for load relieving purposes. By this reasoning, in a multilooped vehicle control system, man should be burdened only with those functions for which his attention is needed under adverse operating conditions. For this purpose, both the system design and operator training should put emphasis on the effectiveness of the operator's function of facing all unforeseeable emergencies in the control loop.

28,990
Wierwille, W.W. & Gagne, G.A. TIME VARYING AND NONLINEAR MODELS OF HUMAN OPERATOR DYNAMICS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 107-108. National Aeronautics & Space Administration, Washington, D.C. (Aeronautical Lab., Cornell University, Ithaca, N.Y.).

The application of a deterministic theory for characterizing or modeling the dynamics of a human operator in a manual control system is described. In the study, linear time-varying, nonlinear time-varying, and nonlinear constant-coefficient models of the human operator's dynamics were obtained for 1- and 2-axis tracking tasks. The displays in the experiment included 1- and 2-axis compensatory (single spot) displays, an artificial horizon, separate panel meters, and separate panel meters with workload meter. The accuracy for these new models for the various tracking tasks was discussed in detail. In addition, new information about time variability and nonlinearity of the human operator, obtained by studying the models and the manual control system signals, is presented.

28,991
Wempe, T. & Baty, D. USEFULNESS OF TRANSINFORMATION AS A MEASURE OF HUMAN TRACKING PERFORMANCE. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28- March 2, 1966." NASA SP 128, 1966, 111-129. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

This study was conducted to determine the applicability of information theory concepts to human tracking tasks. Data for 1 S's tracking performance were analyzed for various bandwidths of the forcing function. The task was to track a filtered gaussian input, displayed on a cathode ray tube, by operating a controller with fixed-gain dynamics. This paper first examines different ways of applying information theory concepts to this tracking task as related to definitions of signal and noise. Then, describing functions and measures of information processing rates were determined for the experimental data. This provided material to examine measures of transinformation rates along with relative tracking error for the same task. Finally, the concept of human capacity as related to this simple tracking task was investigated.
R 32

28,992
Gainer, P.A. MEASURED INFORMATION CAPACITY AS A PERFORMANCE INDEX IN MANUAL TRACKING TASKS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 131-139. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

Two applications of the concepts of information theory to the assessment of human performance in compensatory tracking tasks are presented. One analyzes the input and output of the whole system, treating as noise any part of the output that is not correlated to the input through a linear dynamic system. The second application considers only the tracking error signal and the filtering operations that must be performed on it. Although the second approach is rather crudely approximated, it shows that the human operator may logically use his information capacity in ways which are not made apparent by linear analysis of throughput. Until more is learned of the internal dynamics of the human operator, there is little hope for the discovery of a single performance index for evaluation of control and display systems.
R 2

28,993
Todosiev, E.P., Rose, R.E. & Summers, L.G. HUMAN PERFORMANCE IN SINGLE- AND TWO-AXIS TRACKING SYSTEMS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 143-158. National Aeronautics & Space Administration, Washington, D.C. (TRW Systems, Thompson Ramo Wooldridge, Redondo Beach, Calif.).

A compensatory tracking experiment was performed on single and uncoupled 2-axis tracking systems to determine the effects of training and task difficulty on the parameters of a describing function model of the human operator. The plant dynamics were identical in both the single-axis system and the symmetrical 2-axis system. Second-order dynamics consisting of a pure integration and first-order lag were used. Task difficulty was varied by changing the magnitude of the lag time constant and the frequency bandwidth of the input disturbance. Linear second-order describing functions, obtained by a model matching technique, were used to model the operator's performance. Analysis of system tracking error showed that the rate at which error decreased with training was dependent upon task difficulty. The amplitude ratio and phase lead of the model describing function increased with training, indicating an increase in open-loop bandwidth and a decrease in phase margin. Increasing the plant lag time constant resulted in an increase in the model lead time constant and a decrease in the zero frequency gain. No significant difference was found to exist in the tracking error per axis between the 2-axis tasks and the single-axis tasks. However, the model lead time constant was significantly greater in 2-axis tracking.
R 6

28,994
Levison, W.H. TWO-DIMENSIONAL MANUAL CONTROL SYSTEMS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 159-180. National Aeronautics & Space Administration, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

Experiments were conducted to determine what modifications to the current models of the human controller of single-variable systems are necessary for them to be good representations of the controller in 2-variable situations. These experiments were performed with a single compensatory display and a single 2-axis control. 2 descriptors of performance were obtained for each axis: the normalized M^2 error, and the describing function. Of prime interest was the extent to which performance on a given axis was modified by the requirement of simultaneously tracking a second axis. 3 2-axis control situations were investigated: a) homeogeneous control situation, in which the input power spectra and controlled elements were identical on X and Y; b) heterogeneous inputs, in which the input bandwidths were different but the controlled elements were identical; and c) heterogeneous dynamics, in which the controlled-element dynamics were different but the input bandwidths were identical. 2-axis performance degradation was small when the tracking conditions were homogeneous and when the inputs (but not the dynamics) were heterogeneous. Large and significant performance differences were seen when the dynamics were heterogeneous. 3 factors that affect human controller characteristics in 2-axis control situations are identified. They are: a) visual-motor interaction; b) differential allocation of attention, and c) nonhomogeneity of required equalization when the controlled-element dynamics are nonhomogeneous. A simple model has been developed for predicting visual-motor interference effects.
R 11

28,995
Stapleford, R.L., McRuer, D.T. & Magdaleno, R. PILOT DESCRIBING FUNCTION MEASUREMENTS IN A MULTILOOP TASK. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 181-204. National Aeronautics & Space Administration, Washington, D.C. (Systems Technology, Inc., Inglewood, Calif.).

As an element in a control system, the human pilot generally operates in a non-linear and time varying manner. In many situations, however, his responses can be represented by a quasi-linear model. The experimental program described in this paper was undertaken to provide data essential for the development of detailed adjustment rules, loop-closure criteria, and other aspects of model refinement. For multiloop situations with an integrated display, the quasi-linear pilot model and adjustment rules evolved for single-loop systems are applicable to the multi-loop system command loop. The single-loop pilot model is also applicable, with reservations, to inner loop closures.
R 13

28,996
Adams, J.J. PILOT RESPONSE IN MULTILOOP TRACKING TASKS IN COMBINATION WITH SIDE TASKS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 205-209. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

Response records of human control in multiloop tracking tasks in combination with side tasks were obtained. The task presented to the pilot was to follow a predetermined pitch program which was designed to bring the vehicle from a 50,000-foot orbit to a condition of zero vertical velocity and low horizontal velocity at an altitude of approximately 1500 ft. At this point the pilot must depart from the pitch program, adjust pitch attitude and thrust to establish a stable hovering condition, and reduce the horizontal velocity to zero. This was the terminal condition for the simulation. The pilots were able to perform this maneuver in a very smooth manner. This type of test was also conducted with side tasks added to the pilot's work load. These side tasks were presented using the simulator known as the Mercury Procedures Trainer. They consisted of such items as coping with stopping the suit ventilation fan. In this example situation the pilot had to consider whether the fan failure was due to a fuse failure, in which case he would switch to the alternate fuse, or due to a fan motor failure, in which case he would select one of two alternate motor switch positions. The fan would also stop, in combination with other events, if a battery or an inverter failure occurred. A total of 26 such failures could be caused to occur, each with its own indication, or combination of indications, of failure, and its own procedure for correction. These failures were presented to the pilot in random succession. As soon as the pilot corrected one failure, he would be presented with another. The results indicate that including task-switching in the model of human controllers improves the fit of the model.

28,997
McLane, R.C. & Wolf, J.D. SYMBOLIC AND PICTORIAL DISPLAYS FOR SUBMARINE CONTROL. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 213-228. National Aeronautics & Space Administration, Washington, D.C. (Honeywell, Inc., Minneapolis, Minn.).

This paper describes a research program on integrated display concepts for nuclear submarines through which comparative, empirical analyses of these concepts were accomplished. The experiments established guidelines for use of these integrated displays in vehicle control including monitoring and mission plan revision as a function of external constraints such as attacking weapons systems. The displays evaluated can be classed in 2 general categories--symbolic and pictorial. The pictorial contact analog format was tested with symbolic and with pictorial or perspective-quickened tracking techniques. The symbolic depth-azimuth format was tested with symbolic quickened tracking and with a pictorial presentation of a predictor tracking device. The experimental approach employed tests which were designed to reveal differences between the displays that have practical significance to the Navy. The tests were: measurement of tracking performance with forced sampling or blanking; recording reaction, judgment, and decision times in response to the presence of a homing torpedo; and determination of the correctness of the decision on collision imminence. There was no appreciable degradation in tracking performance due to periodic blanking of the display for as long as 75% of a 10-sec. period. The pictorial or contact analog format produced lower tracking error scores than those with the symbolic depth-azimuth format. The predictor display yielded a significantly smaller number of collisions than any of the other display configurations. There were no significant differences between the displays in the recordings of reaction, judgment, and decision times.
R 12

28,998
Young, L.R. SOME EFFECTS OF MOTION CUES ON MANUAL TRACKING. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 231-239. National Aeronautics & Space Administration, Washington, D.C. (Massachusetts Institute of Technology, Cambridge, Mass.).

It has been adequately demonstrated that sustained high acceleration or vibration can have a deleterious effect on tracking ability. This paper, however, considers some situations in which the motion cues, as felt in flight or moving base simulation, yield a significant improvement in pilot performance. The first of these situations is in a control task requiring more lead compensation than is easily developed from visual displays. The vestibular and tactile sensations contribute velocity and acceleration information which is used in stabilization. Experiments on control of inverted pendulums and VTOL's, with and without motion cues, demonstrate the extent to which this lead is used in certain tasks. Tests of labyrinthine-defective patients on similar tasks demonstrated the critical importance of vestibular inputs. The importance of motion cues in rapid adaptation to controlled element failures was investigated in a simulated blind landing experiment. Motion effects were found to be important in a class of flexible booster control experiments. These results were combined with many comparisons of fixed-base, moving-base, and flight experiments in the literature to arrive at some general conclusions regarding the effects of motion cues on tracking.
R 21

28,999
Sadoff, M. & Dolkas, C.B. ACCELERATION STRESS EFFECTS ON PILOT PERFORMANCE AND DYNAMIC RESPONSE. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 241-257. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

Several brief studies were conducted to assess the effects of a wide range of acceleration environments, varying from zero gravity to high sustained accelerations, on pilot performance and dynamic response. The results indicated that the control-performance decrements observed at high sustained accelerations were attributable to decreased pilot gains and corresponding reductions in open-loop system crossover frequency. Limited results for extreme vibratory accelerations suggested that performance deterioration was associated with a reduction in pilot lead equalization (and a corresponding reduction in open-loop crossover). Under short-term weightless conditions, performance in a simulated control task was appreciably poorer than under comparable 1 g conditions for one of two sets of simulated vehicle dynamics investigated. The reason was attributed primarily to increased pilot excitation of the vehicle's lightly damped short-period mode. Russian data, available from Voskhod flights, indicated that cosmonauts did not perform as well in a simulated control system as during ground training sessions.
R14

29,000
Gibbs, C.B. THE EFFECT OF MINOR ALCOHOL STRESS ON TRACKING SKILL. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 259-267. National Aeronautics & Space Administration, Washington, D.C. (Defense Research Medical Labs., Toronto, Ontario, Canada).

20 men were tested in step-input tracking. Minor stress was imposed by moderate alcohol dosage and an incompatible directional relation between control and display. Some target movements demanded a response in an improbable direction and posed a choice between long delay in response and a movement in the wrong direction. The duration of response latency and the number of directional errors revealed a S's preference for accuracy or speed and his ability to estimate probabilities. Directional errors stem from wrong decisions and may be more relevant to accidents than lack of precision in tracking which has been the main measure used in previous studies of alcohol effects. Directional errors, response latencies, and eye movements were recorded before and after drinking, when breathalyzer readings were zero, and at 0.05-percent and 0.1-percent breathalyzer levels which may be produced in a man weighing 160 lbs by drinking 2 and 4 12-oz bottles of beer, respectively. Alcohol caused a progressive increase in responce latencies in and errors ($p < 0.01$); there was no evidence for a threshold below which alcohol has no adverse effect. The test emphasized the markedly different effects of the same alcohol dosage on the skill of different Ss, but habitual drinkers obtained no undue advantage on the test. The task was learned quickly, and extensive practice did not reduce the discriminatory power of the test. The effects of a dose producing a 0.05-percent breathalyzer reading were not significantly different in an ascending or descending series of levels of intoxication. The alcohol dosages tested had no significant effect on simple reaction time.
R 18

29,001
Welsz, A.Z., Allen, R.W. & Goddard, C.J. AN EVALUATION OF THREE TYPES OF HAND CONTROLLERS UNDER RANDOM VERTICAL VIBRATION. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 269-278. National Aeronautics & Space Administration, Washington, D.C. (Hughes Aircraft Company, Culver City, Calif.).

The present experiment was conceived to determine degradations in manual tracking performance due to whole-body vertical vibration for different controller designs. The results indicate that the speed of response possible with a rigid controller leads to improved tracking performance in both static and vibration environments. Further tests should be undertaken to determine whether this advantage is found under vibration conditions for other combinations of tracking task and controller dynamics, including zero order (target designation) and rate-aided applications.
R 7

29,002
Smith, Harriet J. HUMAN DESCRIBING FUNCTIONS MEASURED IN FLIGHT AND ON SIMULATORS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 279-290. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

Comparisons have been made between human describing functions measured in flight and on the ground using 2 different types of ground simulation. A T-33 variable-stability airplane was used for the in-flight measurements. The ground tests were conducted in the T-33 airplane on the ground with simulated instrument flight and also on a general-purpose analog computer in conjunction with a contact analog display. For this study a multiple-degree-of-freedom controlled element was used in a single-loop compensatory tracking task. The input disturbance in each case consisted of the sum of 10 sine waves with a cutoff frequency of 1.5 radians per sec. The results of this investigation indicate no significant difference between the average describing functions measured in flight and those measured in a fixed-base simulator. However, the variance was found to be considerably higher in the flight data. The system open-loop describing functions measured in the fixed-base simulator agreed well with the results of an investigation by McRuer in which the tracking task was similar, although the controlled-element dynamics were different. The average linear coherence was also close to the values found in this same investigation. Although contrary to the results of previous investigations, the linear-correlation function ρ was always equal to 1.
R 3

29,003
Sheridan, T.B., Fabis, B.F. & Roland, R.D. PREVIEW CONTROL BEHAVIOR AND OPTIMAL CONTROL NORMS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 293-310. National Aeronautics & Space Administration, Washington, D.C. (Massachusetts Institute of Technology, Cambridge, Mass.).

A model, based upon the theory of optimal control, is presented for characterizing the human operator in a preview control task, that is, where he can observe the input targets and their importance prior to the time he must initiate a response to them. While in need of much further development from the behavioral science point of view, the model provides a frame of reference for investigation of performance value and learning in manual control. Two exploratory experiments are reported which may illustrate some relevant experimental variables and provide a rough comparison of the human operator to an optimal preview controller.
R 5

29,004
Obermayer, R.W., Webster, R.B. & Muckler, F.A. STUDIES IN OPTIMAL BEHAVIOR IN MANUAL CONTROL SYSTEMS: THE EFFECT OF FOUR PERFORMANCE CRITERIA IN COMPENSATORY RATE-CONTROL TRACKING. Report from: "Second Annual NASA-University Conference of Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 311-324. National Aeronautics & Space Administration, Washington, D.C. (Bunker-Ramo Corporation, Canoga Park, Calif.).

12 college students performed compensatory tracking with rate control dynamics (1/s) and a low-frequency forcing function composed of the sum of 6 sinusoidal components. After 2 practice sessions, the Ss performed the basic task with 4 performance criteria: a) keep the display bar in the center; b) only keep the display bar from exceeding 1-cm boundaries on the display face; c) minimize a total score which is the sum of M^2 display deviation and M^2 control deflection; and d) minimize M^2 display deviation. The following kinds of information were collected: learning curves; display, control and total scores; amplitude ratio and phase at each forcing function frequency; cm tolerance-band counts; correlation coefficients; reversals; oscillograph recordings; control and display amplitude distribution; and average control response as a function of display deviation. These data show different levels of human control behavior and nonamplifier-type behavior, and yield methodological implications.
R 10

29,005
Thomas, R.E. & Tou, J.T. HUMAN DECISION-MAKING IN MANUAL CONTROL SYSTEMS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 325-334. National Aeronautics & Space Administration, Washington, D.C. (Battelle Memorial Institute, Columbus, Ohio).

A model is proposed to describe human decision making in manual control systems. The human operator in the control loop is represented by a model which will generate an output consisting of: a) operational control actions as a result of sequential decision-making; and b) verbal statements or heuristics of how to achieve optimal control. In the proposed model, the operational control actions are generated by a search algorithm, and the verbal statements are determined through the detection of invariance of variables associated with minimum incremental "cost." At high levels of generality the verbal prescriptions for obtaining optimal control are called heuristics. These heuristics are considered as the verbal equivalents of those mathematical statements expressed in terms of "characteristic numbers" which are often used in dimensional analysis. By making use of the heuristics, adaptive features can be introduced into the search algorithm. The proposed model will carry out sequential evaluation of the validity of the heuristics which are derived on the basis of past experience. By associating a Bayesian probability with the derived heuristic, this model simulates the evolution of a heuristic to a high subjective probability of being valid, even though the controller may have difficulty in executing the heuristic as shown by control actions which do not optimize the criterion function.. An experiment is suggested for testing the validity of the proposed model.
R 14

29,006
Baron, S. DIFFERENTIAL GAMES AND MANUAL CONTROL. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 335-344. National Aeronautics & Space Administration, Washington, D.C. (Electronics Research Center, NASA, Cambridge, Mass.). (IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 133-137).

Variational methods are used to solve a particular pursuit-evasion differential game. The problem involves the determination of optimal strategies for both the pursuer and evader. The performance measure is the miss distance at some fixed terminal time. Both pursuer and evader have limited control energy. The performance of a trained research pilot, for both single- and 2-axis control tasks is compared with that of the optimal pursuer. State vector display and "quickened" display are discussed. A film showing typical pilot performance is presented. The results suggest that differential game problems could be quite useful in the study of manual control.
R 5

29,007
Falb, P.L. & Kovatch, G. DYNAMICAL SYSTEM MODELING OF HUMAN OPERATORS-A PRELIMINARY REPORT. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 345-358. National Aeronautics & Space Administration, Washington, D.C. (University of Michigan, Ann Arbor, Mich. & Electronics Research Center, NASA, Cambridge, Mass.).

Results from control theory are applied to the development of dynamical system models for human operators in a control loop. Linear differential equation models are examined using a procedure of B.L. Ho to determine the model from estimates of the impulse response. The system order, the system matrix, and the system gains are adjusted. Nonlinear Volterra series models are also considered and an identification method of A.V. Balakrishnan is used to estimate the kernels.
R 10

29,008
Jex, H.R., McDonnell, J.D. & Phatak, A.V. A "CRITICAL" TRACKING TASK FOR MAN-MACHINE RESEARCH RELATED TO OPERATOR'S EFFECTIVE DELAY TIME. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 361-377. National Aeronautics & Space Administration, Washington, D.C. (Systems Technology, Inc., Inglewood, Calif.).

A closed-loop compensatory tracking task has been developed which yields a measure of the human operator's time delay characteristics while tracking, constrains his behavior to within very narrow limits, and provides a low variability indicator of the operator's tracking ability. The procedure is called the critical task because the operator is required to stabilize an increasingly unstable controlled element up to the critical point of loss of control. A theoretical analysis of this man-machine system is performed, and the results of an experimental program are described, which enables describing function and critical task measures to be compared. An analysis of the measured human operator describing functions shows that, when operating near criticality, the S's behavior is adequately represented by the most recent human-operator describing-function models and adaptation laws. Further, the extrapolation of describing function data to the critical level of instability shows that the operator is constrained by the vanishing stability margins. The just-controllable first-order divergence is shown to be related dominantly to the operator's effective time delay, and secondarily to low-frequency neuromuscular adaptation effects. Very good agreement is demonstrated between theory and experiment for both stability and performance parameters. A number of applications for the critical task are reviewed, including secondary workload research, control and measurement of operator and controlled-element gain, and display research.
R 17

29,009
Kelley, C.R. DESIGN APPLICATIONS OF ADAPTIVE (SELF-ADJUSTING) SIMULATORS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 379-401. National Aeronautics & Space Administration, Washington, D.C. (Dunlap & Associates, Inc., Santa Monica, Calif.).

Adaptive simulators have been previously applied to problems of training. This study explores their usefulness for manual control system design. The history and development of the field of adaptive vehicle simulation is reviewed. The technique of adaptation most suitable for design studies is one in which operator performance is kept at a preset criterion level by means of adaptive changes in task difficulty. This technique permits design variables to be assessed without the intervention of operator error scores. The performance criterion used to measure operator performance is important in adaptive as well as nonadaptive simulation. Time-on-target scores were analyzed and found to be excessively imprecise. The recommended performance criterion for many applications is rms error in one axis and vector error in 2 or more iddependent axes. Adaptive system changes are a compromise between speed of adjusting to change in operator performance and stability of the adaptive level achieved. The emphasis on speed versus stability can be changed by varying coefficients in the adjustment equation. Example design data are presented with respect to: a) display gain; b) continuous versus on-off control; and c) 1 versus 2 versus 3 axes.
R 15

29,010
Taylor, L.W., Jr. DISCUSSION OF SPECTRAL HUMAN-RESPONSE ANALYSIS. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 403-412. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

Estimates of describing functions and associated parameters that represent a human pilot performing a compensatory tracking task, while being subjected to a random-appearing input, are expressed in terms of cross- and power-spectral-density functions. The expression most commonly used for spectral densities is the Fourier transform of the autocorrelation and cross-correlation functions. Use of an equivalent expression for spectral-density functions, the product of the Fourier transforms of the signals divided by the record length, makes several simplifications become evident. The extimates of the human describing function are seen to be unchanged by correlation with other signals and are shown to be equal to the ratio of the Fourier transforms of the pilot's output and error. The expression for the linear-correlation coefficient is shown to be ill-defined, since it equals 1 under all circumstances. Alternate definitions of this parameter are discussed. The need for a sum of sine waves for an input is also discussed, and the technique for making measurements of the remnant is outlined. In addition to the analytical considerations, a computational advantage results which enables improvements in accuracy.
R 7

29,011
Grignetti, M.C. & Elkind, J.I.. ANALYSIS AND PREDICTION OF PERFORMANCE OF A DIGITAL COMPUTER FACILITY FOR FLIGHT SIMULATION STUDIES. Report from: "Second Annual NASA-University Conference on Manual Control, Massachusetts Institute of Technology, Cambridge, Mass., Feb. 28-March 2, 1966." NASA SP 128, 1966, 413-417. National Aeronautics & Space Administration, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

This paper is concerned with the design of a digital computer facility for use in manual control and flight simulation studies. The facility will provide a group of experimenters with the means of monitoring the signals and data obtained from their experiments while they are being run, for extracting information from these signals in order to control the experiments, for recording the data and signals in permanent files, for editing these data, and for applying a variety of different analysis techniques to the edited data.

29,012
Morrow, C.T. & Ely, L.D. (Chm.). TRANSACTIONS OF THE NINTH SYMPOSIUM ON BALLISTIC MISSILE AND SPACE TECHNOLOGY. VOLUME I. UNITED STATES NAVAL TRAINING CENTER, SAN DIEGO, CALIFORNIA, 12-14 AUGUST 1964. Aug. 1964, 544pp. Aerospace Corporation, El Segundo, Calif. (AD 435500)

This volume of the Transactions contains the keynote address and papers on the following topics: command and control, space communications, space navigation, space station design factors, and physiological considerations.
R Many

29,013
Courts, D.E. TOLERANCE TO SPINNING IN EJECTION ESCAPE. Aerospace Med., Feb. 1966, 37(2), 133-135. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

Some modern-day ejection systems employ a small stabilizing parachute which introduces a spin to the man-seat package during descent. In this study, spin rates of 30 to 90 rpm for 4 min were duplicated, using 8 human Ss in an effort to ascertain whether temporary incapacitation would occur which would compromise a safe parachute landing. Reaction to spinning was determined by subjective complaints of nausea and dizziness and objective identification of nystagmus. Careful examination of the Ss' faces was conducted for evidence of swelling, petechial hemorrhages, and conjunctivitis. Results of the testing revealed that the design characteristics of the ejection system under study minimize the possibility of incapacitation.
R 3

29,014
Shaw, D.B., Cinkotai, F. & Thomson, M.L. SYNCOPE INDUCED BY APPLICATION OF NEGATIVE PRESSURE TO THE LOWER BODY AND ITS EFFECT ON LUNG CO DIFFUSING CAPACITY. Aerospace Med., Feb. 1966, 37(2), 154-157. (Occupational Health & Applied Physiology Dept., London School of Hygiene & Tropical Medicine, London, England).

Application of negative pressure of -70 cmH_2O to the lower half of the body in 9 healthy human volunteers induced progressive changes in all Ss, which appeared to be typical of vasovagal syncope. The Ss withstood the strain for 7 to 17 min; atmospheric pressure was restored in time to prevent loss of consciousness in most individuals. Heart rate rose steadily to maxima between 110-140/min, then fell precipitously to normal or sub-normal levels 1 or 2 min before fainting. In all Ss the pulmonary diffusing capacity for CO (D_{LCO}) fell by 12.5% on the average during the first 6 min of negative pressure, then rose towards control levels in 5 of the 7 Ss who had tolerated the strain thus far; it was within normal limits in all Ss 8 min after removal of the strain. The circumference of the upper arm fell progressively until the pressure was restored. One experiment using radioactive Xenon (133Xe) indicated that there was an increase in the perfusion gradient down the lung during the negative pressure phase. The application of reduced pressure to the lower body should provide a safe, rapid method for studying individual resistance to vasovagal syncope and possibly to the strain of positive acceleration.
R 19

29,015
Jones, G.M. INTERACTIONS BETWEEN OPTOKINETIC AND VESTIBULO-OCULAR RESPONSES DURING HEAD ROTATION IN VARIOUS PLANES. Aerospace Med., Feb. 1966, 37(2), 172-177. (Physiology Dept., McGill University, Montreal, Quebec, Canada).

Ss were accelerated on an electronically controlled turn-table to a chosen angular velocity which was then maintained constant for 3 min. and finally decelerated to a standstill. They either had their heads tilted backwards, or sideways, at 45° to the vertical axis of the turntable. Thus they were simultaneously exposed to equal angular velocity stimuli in the skull planes either of yaw and roll, or of yaw and pitch. The eyes were open and looking at an appropriate stationary optokinetic stimulator. Measurement of compensatory eye angular velocities in the relevant planes with a movie-photographic technique revealed very poor optokinetic following in the roll plane and hence wide dissociation of oculomotor responses in yaw and roll. In yaw and pitch the components of eye angular velocity were always equal to one another, despite failure (often gross) to reach the numerical value required for visual fixation. In the latter case, therefore, ocular compensation always tended to parallel that of the rotational stimulus, despite failure to achieve visual fixation. A number of applied implications are adduced.
R 9

29,016
Johnson, W.H. & Ireland, P.E. SUPPRESSION OF MOTION SICKNESS BY THIETHYLPERAZINE (TORECAN). Aerospace Med., Feb. 1966, 37(2), 181-183. (Otolaryngology Dept., University of Toronto, Toronto, Ontario, Canada).

It is sometimes forgotten that the primary cause of motion sickness is motion, although many stimuli may contribute to its incidence. Because of the importance of the non-auditory labyrinth in the etiology of motion sickness, it is reasonable to assume that any chemical compound which suppresses vestibular response is likely also to be of value in the prevention of motion sickness. Since it has already been established that thiethylperazine does suppress the nystagmus and vertigo resulting from strong semicircular stimulation, it was considered an appropriate compound to test for its possible effectiveness in the prevention of motion sickness. It was found that the drug is an effective anti-nauseant for the prevention of motion sickness.
R 8

29,017
Wood, C.D., Graybiel, A. & McDonough, R. HUMAN CENTRIFUGE STUDIES ON THE RELATIVE EFFECTIVENESS OF SOME ANTI-MOTION SICKNESS DRUGS. Aerospace Med., Feb. 1966, 37(2), 187-190. (USN School of Aviation Medicine, Pensacola, Fla.).

A series of antimotion sickness drugs was evaluated on the human centrifuge at the Navy School of Aviation Medicine. The procedures used enabled the same stimulus to be applied to the individual Ss through the series of drug tests. A combination of hyoscine and d-amphetamine was found to be the most effective preparation. Hyoscine alone was the most effective single drug followed by d-amphetamine and meclizine. Prochlorperazine was slightly effective, but chlorpromazine, thiethylperazine, and trimethobenzamide were ineffective. Hyoscine alone produced pronounced drowsiness. The combination with d-amphetamine relieved this side effect but not the vertigo and dry mouth. The advantages of the human centrifuge in the testing of antimotion sickness drugs are pointed out.
R 19

29,018
Newsom, B.D. PHYSIOLOGICAL CONSIDERATIONS ON MAINTENANCE OF MUSCLE TONE UNDER SUBGRAVITY CONDITIONS. Report from: "Transactions of the Ninth Symposium on Ballistic Missile & Space Technology, Volume I, United States Naval Training Center, San Diego, California, 12-14 August 1964." July 1964, 445-462. Aerospace Corporation, El Segundo, Calif. (Astronautics, Life Science Section, General Dynamics, San Diego, Calif.). (AD 453500)

An Exercise Program for space crews is needed so muscles maintain their proper function. A review of available literature indicates the types of research required to develop an exercisor that will automatically proportion energy expenditure of major muscle groups. The information that is required to develop a proper exercise program is as follows: a) Tabulation of muscles active in anti-gravity or posture; b) Relative contribution of muscle groups in anti-gravity activity; c) An estimate of the whole body metabolic rate as a function of g; d) An estimate of the metabolic change that will be incurred at zero g. (a) and (b) provide the design guides for an exercise device providing an adequately balanced energy expenditure of muscles to be conditioned in the zero-g environment. (c) and (d) provide a basis for a preliminary exercise schedule which may be modified if shown necessary by biochemical monitoring.
R 38

29,019
Parker, F.A., Ekberg, D.R. & Withey, D.J. ATMOSPHERE SELECTION AND ENVIRONMENTAL CONTROL FOR MANNED SPACE STATIONS. Report from: "Transactions of the Ninth Symposium on Ballistic Missile & Space Technology, Volume I, United States Naval Training Center, San Diego, California, 12-14 August 1964." July 1964, 463-491. Aerospace Corporation, El Segundo, Calif. (Missile & Space Div., General Electric Company, Philadelphia, Penn.). (AD 453500)

The selection of an atmosphere for use aboard a manned space station not only has physiological implications but can also have a significant affect upon station weight and the hazard due to fire. These effects are investigated and some comparisons are made between a 5-psia oxygen atmosphere and a 7-psia oxygen/nitrogen atmosphere. A mixed oxygen/nitrogen atmosphere, at about 7 psia, should result in a lower space station weight, and be considerably safer from the standpoint of fire hazard, than a 5-psia oxygen atmosphere. Additionally, it will cause none of the nuisance type oxygen toxicity complaints associated with a 5-psia oxygen atmosphere. It may cause symptoms of the bends (at perhaps the 5 percent occurrence level) if a crew member uses a 3.5-psia space suit for extra vehicular activities; unless oxygen is pre-breathed before donning the suit. The Environmental Control System (ECS) used to provide the 2 gas atmosphere will be insignificantly more difficult to design and build than a pure oxygen system; and should cause no operational problem, even if a pure oxygen atmosphere is used in the ferry vehicle.
R 17

29,020
Christensen, J.M. THE MEASUREMENT OF GENERAL HUMAN PERFORMANCE IN MILITARY SPACE SYSTEMS. Report from: "Transactions of the Ninth Symposium on Ballistic Missile & Space Technology, Volume I, United States Naval Training Center, San Diego, California, 12-14 August 1964." Aug. 1964, 493-540. Aerospace Corporation, El Segundo, Calif. (USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio). (AD 453500)

It is suggested that the astronaut of the near future will serve as: a functional subsystem, a scientific observer, and a scientific S. The importance of integrating man and machine so as to maximize systems effectiveness is stressed. The assessment of human performance as it relates to space operations is viewed as a continuum that begins in the ground laboratory, includes tests in zero-gravity aircraft, and culminates with tests in space vehicles. Because the latter tests are so expensive, it is mandatory that great care be exercised in selecting what aspects of human performance to measure in space and how to measure them. Suggestions for doing this are made.
R 35

29,021
Craven, C.W., Dyer, D.L. & Lindberg, R.G. LUNAR BASE MISSION CREW NUTRITION SUBSYSTEMS OPTIMIZATION. Report from: "Transactions of the Ninth Symposium on Ballistic Missile & Space Technology, Volume I, United States Naval Training Center, San Diego, California, 12-14 August 1964." July 1964, 541-544. Aerospace Corporation, El Segundo, Calif. (USAF Space Systems Div., AFSC, Los Angeles, Calif.). (AD 453500)

Space crew diet need not be varied, but should be formulated for proper fat-protein-carbohydrate balance. Missions under 6 to 12 months duration will carry all food. Longer missions will quickly start regenerative (photosynthetic) systems.

29,022
Harvey, W.T. & Hamilton, J.P. HEARING SENSATIONS IN AMPLITUDE MODULATED RADIO FREQUENCY FIELDS. M.S. Thesis. GE/EE/64 11, Aug. 1964, 49pp. USAF Institute of Technology, Wright-Patterson AFB, Ohio. (AD 608889)

When the head is subjected to an amplitude modulated radio frequency field, a hearing sensation results. This sensation was investigated by holding a small circular metal probe close to the skull. The probe was then excited at a radio frequency of 3.5 megacycles. The audio frequency components of the field existing between the probe and the head produced the threshold electromechanical pressures necessary for hearing. These electromechanical pressures were computed and compared to the pressures on the skull which were necessary to produce bone conduction hearing. These pressure values fall within the same limits, and produce a similar characteristic threshold curve. This leaves little doubt that the investigated hearing phenomenon is caused by the bone conduction mechanism.
R 9

29,023
Moser, H.M. THE PRONUNCIATION OF ENGLISH AIR TRAFFIC CONTROL WORDS BY CONTROLLERS FROM TWELVE ICAO NATIONS. Contract FAA/BRD 407, Proj. 113 026R, Rep. RD 64 123, July 1964, 48pp. US Systems Research & Development Service, FAA, Washington, D.C. (Psycholinguistic Lab., Ohio State University, Columbus, Ohio). (AD 608532)

Selected English air traffic control words and phrases were recorded as pronounced by controllers in 12 International Civil Aviation Organization (ICAO) nations. These recordings were analyzed and lexicons of variant pronunciations of these words which might be encountered in various places were produced. A summary lexicon is included, as is a guide for recommended pronunciation of the words. The procedures for gathering and analyzing the data and a method of pronunciation representation are also discussed.

29,024
Cherry, E.C. ON THE VALIDITY OF APPLYING COMMUNICATION THEORY TO EXPERIMENTAL PSYCHOLOGY. Brit. J. Psychol., 1957, 48, 176-188. (Imperial College, University of London, London, England). (Reprint)

Communication theory is properly applied to human performance only under certain conditions: for example, the application must be made by an outside person and not by the subject himself. The theory also requires averages of numerous events rather than dealing with isolated ones. Given these and similar conditions, some useful and valid applications may be made to psychology. It is perfectly possible to apply the theory in the case in which stimulus and response are continuous functions of time, although this is not always realized.
R 10

29,025
Schultz, L. (Ed.). PROCEEDINGS OF THE SYMPOSIUM ON INFORMATION PROCESSING IN COMMAND AND CONTROL SYSTEMS. Report from: "Symposium on Information Processing in Command and Control Systems, Santa Monica, California, 9-10 November 1960." SDC TR 4, June 1962, 71pp. System Development Corporation, Santa Monica, Calif. (AD 419744)

This paper contains abstracts of the presentations at the Symposium. 9 large-scale computer-based systems are discussed in terms of their characteristic information-processing problems: SAGE System, Air Traffic Control Data Processing Central, U.S. Naval Space Surveillance System, Project Mercury Computer Control System, AN/MSQ-19 Army Tactical Operations Central Facility, Army Command Control Information System, Naval Tactical Data System, Strategic Air Command Control System, and Ballistic Missile Early Warning System.
R 30

29,026
Parin, V. BIOMEDICAL ASPECTS OF MAN'S FIRST EMERGENCE INTO OUTER SPACE. JPRS: 29,800, TT: 65 30841, ca. 1965, 5pp. US Joint Publications Research Service, Department of Commerce, Washington, D.C. (Transl: Pravda, March 1965, 79(17031), p3).

This article describes some of the problems and implications of Aleksey Leonov's venture outside the Voshkod-2 spacecraft on March 18, 1965.

29,027
Lehmann, W.P. & Pendergraft, E.D. (Dirs.). SYMPOSIUM ON THE CURRENT STATUS OF RESEARCH. Report from: "National Science Foundation Symposium on the Current Status of Research at the Linguistics Research Center, University of Texas held at the National Science Foundation Auditorium, Washington, D.C., 14 June 1963." Grant NSF GN 54, Rep. LRC 63 SRI, Oct. 1963, 144pp. Linguistics Research Center, University of Texas, Austin, Tex. (AD 422222)

The following papers were presented: Machine Translation--An Introduction, Basic Methodology, Linguistic Research, Computer Programming, and Mathematical Model for Syntax.

29,028
Pyron, B.O. & Williamson, F.R., Jr. SIGNAL PROCESSING BY INFINITE CLIPPING AND RELATED TECHNIQUES. FINAL REPORT. Contract DA 49 092 ARO 21, Proj. A 727, April 1964, 119pp. USA Research Office, Department of the Army, Washington, D.C. (Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Ga.). (AD 600863)

Infinite peak clipping was studied as a technique for processing speech and other signals. Current and past utilization of this technique was surveyed briefly, and limited experimental and theoretical studies were performed. A new explanation is advanced for the high intelligibility of infinitely clipped speech, and a technique is suggested for achieving an acceptable compromise between the improved resistance to noise or jamming (or, alternatively, reduction in transmitted power) provided by infinitely clipped speech with amplitude modulation, and the concomitant reduction in quality and voice recognition. A possible system for speech bandwidth compression using a signal obtained by infinite clipping is described, and results of simple experiments are given. Also described is a type of visual display which produces patterns on speech signals that tend to show high correlation with the spoken word and its enunciation, and low correlation with the particular voice speaking. Fields of application for the techniques discussed include: radio communication systems, antijamming measures, acoustic systems, speech bandwidth compression, speech therapy and training, automatic recognition of speech, doppler radar signal analysis, and analysis of phonocardiographic and other physiological signals for medical diagnosis.
R 99

29,029
Pollack, I. INTERACTION OF FORWARD AND BACKWARD MASKING. J. aud. Res., 1964, 4, 63-67. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.). (Reprint)

The present note examines the interaction of the "forward masking" produced by a brief noise burst upon a brief tonal pulse presented after the burst with the "backward masking" produced by a brief noise burst following the tonal pulse. The study is an extension in the time domain of the search for the interaction of masking effects in the frequency domain by Bilger and by Green. Within the conditions tested, the combination of equally effective forward and backward masking conditions produced from 7 to 22 db additional masking relative to the components. The effectiveness of forward masking and of backward masking were largely independent each of the other.
R 3

29,030
Bishop, D.E. ANALYSIS OF COMMUNITY AND AIRPORT RELATIONSHIPS/NOISE ABATEMENT. VOLUME II. DEVELOPMENT OF AIRCRAFT NOISE COMPATIBILITY CRITERIA FOR VARIED LAND USES. Contract FA WA 4409, Proj. 430 001 01R, SRDS Rep. RD 64 148, BBN Rep. 1093, Dec. 1964, 102pp. US Systems Research & Development Service, FAA, Washington, D.C. (Bolt, Beranek & Newman, Inc., Los Angeles, Calif.). (AD 618191)

This report is Volume II of 3 separate reports that together document engineering and research activities undertaken during the first year of a 2-year effort. The effort is directed towards determining the technical basis and procedures for assessing and predicting community response to noise. This report describes 2 simplified procedures for analyzing aircraft noise in the vicinity of airports to determine: a) whether or not aircraft noise will interfere with work activities or land use, and b) what building arrangements and construction features should be incorporated in building design so that aircraft noise will not interfere with planned activities inside buildings. The first procedure is general in nature and defines aircraft noise acceptability criteria for broad categories of land use (residential, commercial, industrial, etc.). The second procedure provides methods for developing aircraft noise criteria for specific work activities having varying degrees of dependence upon speech communication or freedom from noise interference; it also specifies methods for evaluating the noise protection afforded by different types of building construction and building arrangements. Both procedures make use of the noise level information given in the report, "Land Use Planning Relating to Aircraft Noise," previously submitted to the FAA. Thus, this report extends methods for evaluating aircraft noise compatibility to land uses other than residential, considered in the earlier report. The report contains detailed descriptions of each step in the procedures, plus several examples of the application of the procedures to land use and building arrangement and design.

29,031
Clark, W.E. ANALYSIS OF COMMUNITY AND AIRPORT RELATIONSHIPS/NOISE ABATEMENT. VOLUME I. AN APPROACH TO ANALYSIS OF AIRCRAFT NOISE PROBLEMS USING COMPUTER-AIDED TECHNIQUES. Contract FA WA 4409, Proj. 430 001 01R, SRDS Rep. RD 64 148, BBN Rep. 1093, Dec. 1964, 66pp. US Systems Research & Development Service, FAA, Washington, D.C. (Bolt, Beranek & Newman, Inc., Los Angeles, Calif.). (AD 618190)

The 3 volumes of this report describe engineering and research activities undertaken during the first year of a 2-year contract directed towards determining the technical basis and procedures for assessing and predicting community response to noise. Volume I summarizes the development of a computer-aided approach to the analysis of aircraft noise as it affects communities near airports. The major factors used to specify the noise stimulus and the factors which appear to be relevant in describing the community-wide response to that noise are discussed and diagrammed. An approach to analysis of aircraft noise situations that involves close man-computer interaction is formulated and programming to interpret this approach is described.

29,032
Chistovich, L.A., Klaas, Iu.A. & Kuz'min, Iu.I. THE PROCESS OF SPEECH SOUND DISCRIMINATION. Contract AF 19(604) 8505, June 1963, 32pp. USAF Office of Aerospace Research, Hanscom AFB, Mass. (Research Language Center, Emmanuel College, Boston, Mass.). (Transl: Voposy Psikhologii, 1962, 6, 26-39). (AD 424513)

Articulation movements in a rapid repetition of speech sounds were studied. It was found that 100-150 msec after a transition from vowel to consonant occurs in the audible signal, the articulation apparatus of the S assumes a consonant state. This undifferentiated state may fail to coincide with any of the consonants found in the given language. As new information comes in, it is more and more specified until a full correspondence with perceived consonant is attained. The specification goes on until all information on the consonant becomes available. The above results would seem to indicate that articulation reflects the very mechanism by which the discriminative arrangement in the brain operates, and that it reflects the very process of the running synthesis of the articulation image of the consonant. This is contrary to the point of view which assumes that at first a phonemical classification is evoked in the mind. The authors uphold the theory according to which the process of discrimination of speech sounds involves a recoding of acoustic information into an articulative image.
R 29

29,033
Nixon, C.W., Trimboli, F., Mabson, W.E., Endicott, J.E., et al. SPEECH IN AN ARTIFICIAL ATMOSPHERE (44% OXYGEN - 56% HELIUM). FINAL REPORT. Projs. 7231 & USAFSAM 7930, Tasks 723103 & 793002, AMRL TR 66 165, Dec. 1966, 22pp. USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.

Intelligibility and physical characteristics of helium speech were investigated during a simulated space mission at Brooks Air Force Base, Texas. Speech was produced under conditions of room air at ground level, 100% O_2 at 18,000 ft., 56% helium-44% O_2 at 18,000 ft., and 80% helium-20% O_2 at ground level. Results of both objective and subjective analyses of the data show that a) word intelligibility in the 80% helium condition was less than in room air; b) when in the presence of noise, intelligibility was less in both 56% and 80% helium mixtures than in room air; c) the high fundamental pitch observed immediately upon entering the helium atmosphere gradually decreased, but did not return to the prehelium level of pitch; d) measured rate of speaking was unaffected; and e) mean second formant frequencies were 1.35 times higher in 56% helium and 1.62 times higher in 80% helium than in room air. Observed ratios were slightly less than ratios predicted on the basis of velocity of sound in the vocal tract.
R 13

29,034
Hays, D.G. LINGUISTIC RESEARCH AT THE RAND CORPORATION. Report from: "National Symposium on Machine Translation, University of California, Los Angeles, February 2-5, 1960." RAND Rep. P 1900, Feb. 1960, 20pp. Mathematics Div., Rand Corporation, Santa Monica, Calif. (AD 616558)

This paper describes postediting rules for description of function in context, work on computational routines for semi-automatic analysis, the concept of idiom-in-structure, and 2 broad problems on which work is just beginning at RAND: grammatic transformation and distributional semantics. The latter problems are expecially important for automatic indexing, abstracting, and text searching.
R28

29,035
Tsemel, G.I. INCREASING THE RELIABILITY OF OBJECTIVE PERCEPTION OF VOCAL SOUNDS BY INTRODUCING A REPEATED DEMAND. FTD TT 65 104/1+2, May 1965, 4pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: AN SSSR, Institut Problem Peredachi Informatsii, (Russian), 1963, 15, 77-79).

To increase the reliability of machine perception, the principle of repeated demand is examined. It can be used in devices of objective perception of vocal sounds without substantial complications in these devices. The signal of repeated demand should be given in cases, when the parameters (signs) of the pronounced word do not fall into any one of word parameter areas, perceived by the given device. When establishing boundaries of these areas it is necessary to eliminate areas (sections) of sign overlapping of two or more words. The number of repeated demands can be reduced considerably if the operators will undergo a short preliminary training.
R 1

29,036
Bolt, Beranek & Newman, Incorporated. LAND USE PLANNING RELATING TO AIRCRAFT NOISE. TECHNICAL REPORT. Oct. 1964, 62pp. Bolt, Beranek & Newman, Inc., Cambridge, Mass. (AD 615015)

This manual describes a procedure for predicting average community responses to engine noise generated by aircraft operations. Through the use of this procedure it becomes possible to apply the same yardstick to military and civil aircraft noise problems. The procedure therefore can serve as a uniform guide in plans for land utilization in the vicinity of military, civil and combined airfield facilities world-wide.
R 7

29,037
Rapoport, A., Livant, W.P., Kramer, F.R., Roosen-Runge, P.H., et al. STUDIES IN BEHAVIORAL ASPECTS OF GRAMMAR AND SEMANTICS. FINAL REPORT. Contract AF 30(602) 3042, Proj. 459403, RADC TDR 64 146, Oct. 1964, 203pp. USAF Rome Air Development Center, Griffis AFB, N.Y. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.). (AD 609807)

Investigations were made of natural and simulated language behavior. The first concerned the question of how syntactic language behavior is related, if at all, to modern theories of grammar. In order to develop a mechanical syntactic analyzer to replace an ordinary literate reader of a text, it is necessary to understand how the latter comprehends a text. In other words, a syntactic analyzer should be modeled on principles similar to those used by a human reader. The second covered a number of approaches to the study of a "semantic space." These experiments are essentially word association experiments, in which the controls are stricter than free association experiments, but not as strict as in Osgood's semantic differential techniques.
R 38

29,038
Talbert, L.R., Groner, G.F., Koford, J.S., Brown, R.J., et al. A REAL-TIME ADAPTIVE SPEECH-RECOGNITION SYSTEM. Contract AF33(616) 7726, Proj. 4159, Task 415904, ASD TDR 63 660, Rep. SEL 63 064, May 1963, 26pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Systems Theory Lab., Stanford University, Stanford, Calif.). (AD 420180)

This report describes a real-time speech-recognition system employing adaptive Adaline threshold-logic elements. Time-normalized digital patterns, representing the time-frequency spectrum, are obtained from amplitude-normalized outputs of 8 bandpass filters. Adaline networks which perform the speech pattern classification are simulated on an IBM 1620 computer. In one experiment, the Adalines were trained on 10 samples each of a group of 10 phonetically balanced words. After correct classification of these samples, 100 different samples by the same speaker were identified correctly. When trained on 4 speakers of the same sex, the system recognized--with 95% accuracy--500 testing samples spoken by these speakers. The use of adaptive networks as pattern classifiers has achieved a high degree of system flexibility since design of the classification system can be accomplished by a training process. The system has successfully carried out many speech-recognition tasks, including simultaneous recognition of 4 digits spoken in 4 different languages, identification of different speakers saying the same word, and recognition of words spoken over conventional telephone lines.
R 5

29,039
Garvin, P.L. & Trager, Edith C. THE CONVERSION OF PHONETIC INTO ORTHOGRAPHIC ENGLISH: A MACHINE-TRANSLATION APPROACH TO THE PROBLEM. FINAL TECHNICAL REPORT. Contract AF 49(638) 1186, Nov. 1963, 22pp. US Office of Scientific Research, ARDC, Washington, D.C. (TRW Computer Div., Thompson Ramo Woolridge Inc., Canoga Park, Calif.). (AD 425819)

The problem of conversion is treated as a special case of the machine translation of languages with spoken English as the source language and written English as the target language. The automatic conversion program has 2 goals: a) the recognition of orthographic word boundaries; b) the selection of the correct written equivalent among several theoretically possible ones. This pilot study tests the validity of the conversion process. The discussion first deals with the question of the phonetic segments that are envisioned as the source units for the phonetic-to-orthographic conversion. Then the machine dictionary required for a conversion program is described and exemplified. Finally, 3 levels of graduated context searching are presented, the first two of which are discussed in some detail. The presentation is illustrated by tracing a sample sentence through the process from initial phonological transcription to expected orthographic result. (HEIAS)
R 8

29,040
Lehmann, W.P. & Pendergraft, E.D. MACHINE LANGUAGE TRANSLATION STUDY. FINAL REPORT. Contract DA 36 039 SC 78911, File 18678 PM 59 91 91(6909), Rep. LRC 63 P16, Rep. 16, June 1963, 75pp. USA Electronics Research & Development Lab., Fort Monmouth, N.J. (Linguistics Research Center, University of Texas, Austin, Tex.). (AD 422221)

4 years of mechanical translation research are reported. A study was made of previous research efforts in the field. A working hypothesis was formulated for syntactic, semantic and pragmatic structural relations occurring in natural language. The general syntax of programming languages to be used in describing language data were derived from the formalized hypothesis, and programming criteria were extracted for generalized analysis and synthesis algorithms. A generalized algorithm for interlingual transfer was also derived from formalized languages used for interlingual description. All of the processes are stochastic. A computer system to implement the theory is being programmed. Syntactic analysis and all of its supporting programs have been completed, as well as programs which maintain semantic descriptions.
R 43

29,041
Rudiuk, A. SOUND ABSORBING AND INSULATING DEVICES IN AVIATION. FTD TT 64 1353/1+2, May 1965, 12pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Technika Lotnicza (Polish), 1964, 4, 103-106). (AD 464206)

This article is an abbreviated version of a lecture held at a scientific-technical conference dealing with noise combatting problems. Noise in the aircraft is examined relative to its sources and the interactive effects of insulation and structure. Several insulating techniques are indicated and the necessary requirements for insulating materials are listed. Examples of insulation in 4 existing aircraft are described briefly. 2 experimental systems of insulation are evaluated.

29,042
Otten, K.W. SIMULATION AND EVALUATION OF PHONETIC SPEECH RECOGNITION TECHNIQUES. VOLUME I. SEGMENTATION OF CONTINUOUS SPEECH INTO SYLLABLES. Contract AF 33(657) 9205, Proj. 4335, Task 433521, RTD TDR 63 4005, Sept. 1963, 22pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (National Cash Register Co., Dayton, Ohio). (AD 422472)

Objective of the program is for the analysis of design parameters required for the simulation and evaluation of phonetic speech methods. An approach to the segmentation of continuous speech into syllables is described, and the results of segmentation experiments intended to evaluate the approach are presented in this report. Continuous speech is segmented by an analysis of the overall speech amplitude in which potential segmentation points are determined. These points divide continuous speech into units which are either silences or what are defined here as impulse syllables. By a further analysis, in which the sequential order of these silence periods and impulse syllables, the time between segmentation points, and the binary information on the type of impulse syllable (whether predominantly voiced or unvoiced) are considered, some of the potential segmentation points are eliminated. The resulting new units are silences and linguistically meaningful syllables.

29,043
Belden, T.G. STUDIES OF COMMAND AND CONTROL. STUDY NO. 2. THE LANGUAGE OF COMMAND. FINAL REPORT. Contract SD 50, Tech. Rep. 62 17, Aug. 1962, 35pp. Research & Engineering Support Div., Institute for Defense Analyses, Washington, D.C. (AD 425822)

A coincidence has been found between natural organization and natural language. With little training this natural language, a tightened correct English, could improve the function of command. The advantages are that this Language: a) Disciplines both the originator and the recipient in the transfer of information by requiring precision in creating a message; b) Compresses information to convey the same degree of meaning in less volume; c) Puts the information in a form which can be manipulated directly by data processing devices; d) Separates the information in categories susceptible of logical inference; e) Creates a new type of redundancy and error correction by means of standard grammatical rules; f) Can incorporate a variety of formats and grammatical complexities depending on the problem area; and g) Allows for simple translations between most NATO languages.
R 8

29,044
Mottley, C.M. & Belden, T.G. STUDIES OF COMMAND AND CONTROL. STUDY NO. 1. THE STRATEGIC DIRECTION OF THE ARMED FORCES. FINAL REPORT. Contract SD 50, Tech. Rep. 62 18, Aug. 1962, 46pp. Research & Engineering Support Div., Institute for Defense Analyses, Washington, D.C. (Stanford Research Institute, Menlo Park, Calif.). (AD 425825)

This work is aimed at contributing to the conceptual base needed for the functional design and operation of a national military command complex. The strategic direction of the Armed Forces is regarded as the prime purpose of such a complex. The concept of dynamic control is first examined. This concept is then extended to the organizational requirements: central command, supporting staff and the operational command system.

29,045
Clarke, F.R., Nixon, J.C. & Stuntz, S.E. TECHNIQUE FOR EVALUATION OF SPEECH SYSTEMS. Contract DA 28 043 AMC 00227(E), Proj. 1E6343O1D246, SRI Proj. 5090, Task 1E6343O1D4603, Dec. 1964, 98pp. USA Electronics Labs., Fort Monmouth, N.J. (Stanford Research Institute, Menlo Park, Calif.). (AD 462836)

This report covers the progress made and the conclusions reached during the first 6 months of effort on the development of an automated speech intelligibility test. The literature in intelligibility testing has been surveyed and evaluated. 6 of the most common intelligibility tests have been compared in terms of their materials, employment of speakers and listeners, validity and reliability of results, and potential for automation. On the basis of theoretical considerations and well-known empirical findings, it is concluded that the requirement for a highly efficient and reliable automated test procedure can best be satisfied with a multiple-choice test in which the set of possible messages is known to the listener.
R 12

29,046
Biersdorf, W.R. CONVERGENCE AND APPARENT DISTANCE AS CORRELATES OF SIZE JUDGMENTS AT NEAR DISTANCES. J. gen. Psychol., Oct. 1966, 75(Second Half), 249-264. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

Apparent size matches and apparent distance estimates were obtained with the use of lighted targets within a blacked out vision tunnel. 4 standard targets of constant visual angle at one meter and less were matched with a comparison target at 4 meters distance. Size matches were obtained under 2 sets of instructions: equidistant and objective, all under monocular viewing. In the first experiment, a half-silvered mirror before the S's eye enabled concurrent measures of monocular convergence to be made. The size matches showed a small, but statistically significant, deviation from constant angular size, which was highly correlated with convergence and apparent distance estimates. The apparent distance estimates were foreshortened from the physical target distance, but were in the correct relative ordering for large differences in target distance. The size matches were not affected by changes of instruction. In the second experiment, the half-silvered mirror was removed from in front of S's eye. The size matches showed a deviation from constant angular size similar to the first experiment, but 2 of the 4 Ss showed changes in size with changed instructions. These same 2 Ss showed correct relative distance judgments similar to the first experiment. The 2 Ss who failed to change size with instructions got relative distance judgments significantly reversed from the correct direction. It is concluded that this apparent size effect of a deviation from constant angular size at near distances in reduction conditions occurs regardless of the direction of distance judgments of the same targets.
R 9

29,047
Turner, E.D. & Bevan, W. RESPONSE LATENCY AS A FUNCTION OF THE STATISTICAL STRUCTURE OF A PRIOR SCHEDULE OF PRESENTATION INTERVALS. J. gen. Psychol., Oct. 1966, 75(Second Half), 279-284. (Kansas State University, Manhattan, Kan.).

Four independent groups of 36 Ss each were used in a study of response latency as a function of the statistical structure of a prior schedule of presentation intervals. Each group received an adaptation series of 25 trials followed without interruption by 2 test trials. For 3 groups the adaptation series were variable interval schedules: a rectangular, a randomly sequenced normal, and a nonrandomly sequenced normal schedule. The fourth group received a constant interval schedule set at the mean duration of the other 3 (15 seconds). The test intervals were consecutively 15 seconds and 5 seconds. The groups did not differ from each other, nor from their pretest response latency, on the first test trial. The groups receiving the rectangular and randomly sequenced normal distribution of presentation intervals showed no change in response latency from the 15 second to the 5 second test trial. In contrast, the groups on the nonrandom normal and the constant-interval adaptation schedules showed a significant increase in response latency on the 5-second test trial. These results, except for those of the random normal group, conform to predictions from Expectancy Theory.
R 14

29,048
Horne, E.P. & Dowler, J.K. INTERMITTENT AND STEADY STIMULATION EFFECTS ON PERCEPTION OF VISUAL APPARENT MOVEMENT. J. gen. Psychol., Oct. 1966, 75(Second Half), 285-289. (Psychology Dept., University of Florida, Gainesville, Fla.).

The study involves the stability of the upper threshold of apparent movement. 20 Ss were randomly divided into 2 groups, each with a fixed sequence of trials. After an appropriate pretrial period involving familiarization and instruction, the Ss were exposed to 20 3-minute periods of stimulation containing 1 of 4 selected exposure levels. After each of these exposure periods the S was randomly presented 1 of 5 selected inspection rates balanced around the predicted upper threshold. During each of these inspection periods, the S was required to respond with either a movement or a no-movement response. An analysis of variance showed that the 3 variables of exposure rate, inspection rate, and sequence of trials (order) were all significant. Another analysis showed that for all 4 exposure levels the 2 lowest inspection rates were reported as movement a significantly greater number of times than the 2 highest inspection rates. An additional analysis indicated that the low intermittent exposures were consistent in their effect when inspection rates were within apparent movement rates previously reported (2, 3). For both a highly intermittent exposure and steady luminance, the higher inspection rates elicited more movement than for the low intermittent exposures. In conclusion, the results of this study define some experimental variables influencing the measurement of upper thresholds of apparent movement. If inspection of beta movement follows an exposure to an intermittent stimulation, the intermittent effect influenced the judgment of movement for some higher inspection rates. These results indicate that an upper threshold should be appropriately measured within a given operational condition and may not be extrapolated from it.
R 5

29,049
Haslam, Diana R. "REPETITION EFFECT" IN THE DETERMINATION OF PAIN THRESHOLD. J. gen. Psychol., Oct. 1966, 75(Second Half), 297-303. (Psychology Dept., University of Bristol, Bristol, England).

The purpose of the study was to throw some light on the "repetition effect" reported by Clausen, Gjesvik and Urdal. The term "repetition effect" refers to the finding that pain threshold was lowered significantly if it was determined immediately following the pain threshold determination of another body area. Because the repetition effect appeared to be more pronounced after two than after one preceding stimulation, Clausen et al. favored a physiological rather than a psychological explanation of their results. The kind of physiological explanation suggested by them has been shown by the writer to be unlikely, however, because the phenomenon did not occur when the same body area was tested twice consecutively. On the basis of the present results, a "psychological" explanation of the repetition effect has been suggested.
R 6

29,050
Smiarowski, R.A. & Kintz, B.L. THE AUDITORY FUSION FREQUENCY OF INTERMITTENT SOUNDS. J. gen. Psychol., Jan. 1966, 74(First Half), 129-143. (Psychology Dept., Ohio University, Athens, Ohio).

This paper describes literature relative to auditory fusion frequency phenomena: the prethreshold phases, the perceptual decay of loudness, the fusion threshold, and future research.
R 18

29,051
Schlesinger, I.M. & Melkman, Rachel. THE EFFECT ON CHOICE-REACTION TIME OF STIMULUS INFORMATION VARIED INDEPENDENTLY OF TRANSMITTED INFORMATION. J. gen. Psychol., Jan. 1966, 74(First Half), 165-172. (Hebrew University, Jerusalem, Israel).

The authors hypothesized that performance in a reaction-time task is affected not only by the amount of information transmitted but also by the perceptual task resulting from characteristics of the stimulus display. The problem of varying stimulus information independently of transmitted information without increasing the "confusability" of the stimuli was solved in the following way: S was required to respond to either light in one set of 2 lights by depressing one pushbutton and to respond to either light in a second set of lights by depressing a second pushbutton. The relative frequencies with which the 2 lights (linked to one response) appeared varied for different experimental conditions. The following proportions were employed: 9-1, 7-3, and 5-5. Stimulus information was increased from one experimental condition to the next in the order given, whereas transmitted information was held constant for all conditions; i.e., there were always 2 equiprobable responses. Both reaction time and the number of errors increase with stimulus information, and reaction time is found to be almost a perfect linear function of the amount of stimulus information.
R 14

29,052
Horne, E.P. & Bowen, A.J., Jr. PULSE RATE AND LIGHT-GRID POSITION EFFECTS ON BETA MOVEMENT. J. gen. Psychol., July 1966, 75(First Half), 79-83. (Psychology Dept., University of Florida, Gainesville, Fla.).

In a small visual field the effects of certain ground structures and direction of light movement were studied. 10 Ss judged 12 fixed rates against several grounds: grid patterns in either horizontal, diagonal, or vertical position. Light movements in horizontal, vertical, and left and right diagonal positions were introduced. Each S judged each rate with each combination of ground and light position. Only rate was found to be a significant source of variance. As rate increased, the frequency of movement judgments decreased. None of the position combinations shifted beta movement significantly. It was concluded that in beta movement the directional ground structures in relation to directional light movement were not significant determinants of the frequency of movement response.
R 6

29,053
Bevan, W. A MULTIPURPOSE STIMULUS-PROGRAMMING SYSTEM. J. gen. Psychol., July 1966, 75(First Half), 147-149. (Kansas State University, Manhattan, Kan.).

This note describes a versatile programming package consisting of commercially available units mounted in a single chassis on wheels for use in conducting several psychophysical experiments concurrently. It also can be applied to any situation in which stimuli must be presented sequentially, e.g., simple and serial reaction time studies, vigilance studies, serial learning, etc. (HEIAS)

29,054
Walsh, J.F. & Mislak, H. DIURNAL VARIATION OF CRITICAL FLICKER FREQUENCY. J. gen. Psychol., July 1966, 75(First Half), 167-175. (Psychology Dept., Fordham University, New York, N.Y.).

The effect of hour-to-hour variability upon critical flicker frequency (CFF) thresholds of 60 college resident students, 30 males and 30 females, was investigated. Monocular thresholds were obtained by the method of constant stimuli from 8 a.m. to 8 p.m. in 5 sessions spaced 3 hours apart. A diurnal effect was found in which there is an inverse relationship between CFF thresholds and time of day ($p < .05$). The highest values for CFF were obtained at 8 p.m. and 11 a.m., indicating a nonlinear relationship was also present ($p < .05$). In addition, 3 patterns of response were detected: a) positive slope--indicating an increase in CFF values with time of day; b) negative slope--showing a decrease in CFF with time of day; and c) zero slope--reflecting no basic change in threshold values over time. The validity of the 3 patterns of responding needs to be explored systematically in CFF as well as in other perceptual and cognitive areas. Such patterns would be strong evidence against using averaged data in making evaluations of a function or an agent.
R 10

29,055
Tune, G.S. NEGLECT OF STIMULUS INFORMATION IN A TWO-CHOICE TASK. J. gen. Psychol., April 1966, 74(Second Half), 231-236. (Harvard University, Cambridge, Mass.).

This paper reports an experiment in some ways similar to probability-learning tasks and in which S's sources of information are limited. Instead of requiring S to anticipate which event would occur next in a 2-choice task, he was asked to report which event had occurred. No knowledge of results was given, and S's initial preconceptions about the nature of the task were left unhindered. The stimuli were made redundant by arranging that one type of stimulus occurred proportionately more often than the other. In addition, a certain proportion of the stimuli were deleted from the record, so that S (instead of reporting what had occurred) had to guess which event should have occurred. Ss, therefore, were left with virtually one source of useful information: namely, the statistical regularities in the stimuli. The responses were examined by a Friedman analysis of variance and indicate that the Ss did not use the stimulus information and that there was no significant probability matching. The findings were explained on the basis of Ss' response preferences which because they average out to equal frequency usage, can account for the increase in error with increasing stimulus redundancy.
R 3

29,056
Morrison, Linda J. & Nazzaro, J.R. ANCHORING OF PITCH JUDGMENTS. J. gen. Psychol., April 1966, 74(Second Half), 307-311. (Psychology Dept., Mary Washington College, Fredericksburg, Va.).

With the method of single stimuli the anchoring of pitch judgments is clearly observed in groups for which the intensity level is held constant and in groups for which the intensity is varied. The obtained functions are linear, which is expected for a metathetic dimension. The shifts in judgments caused by the anchor are in accord with predictions of adaptation-level theory.
R 9

29,057
Lloyd, K.E., Johnston, W.A. & Belcher, Sandra A. SHORT-TERM RETENTION AS A RATIO OF AVERAGE STORAGE LOAD TO AVERAGE LOAD REDUCTION. J. gen. Psychol., April 1966, 74(Second Half), 347-353. (Psychology Dept., Washington State University, Pullman, Wash.).

An attempt was made to relate short-term recall to a ratio of the average number of items being stored (when a request for recall occurred) to the average number of items requested. When the ratio is unity, all stored items are requested. As the ratio departs from unity, fewer items are requested per recall in relation to the number being stored. Mean recall errors increase as the ratio increases. The shape of the function remains constant despite changes in the ease with which the stored items can be encoded. Within any one ratio, the recall scores are rank ordered directly with both variables in the ratio.
R 5

29,064
Recht, J.L. SYSTEMS SAFETY ANALYSIS: FAILURE MODE AND EFFECT. Nat. Safety News, Feb. 1966, 93(2), 24-26. (Statistics Div., National Safety Council, Chicago, Ill.).

Failure mode and effect analysis is one of the 4 principal methods used by systems safety engineers. This article gives a general outline of its main aspects.

29,083
Howell, W.C., Johnston, W.A. & Goldstein, I.L. COMPLEX MONITORING AND ITS RELATION TO THE CLASSICAL PROBLEM OF VIGILANCE. J. Org. Behav. Hum. Perf., Dec. 1966, 1(2), 129-150. (Human Performance Center, Ohio State University, Columbus, Ohio).

Classical vigilance research has provided little insight into mechanisms responsible for complex monitoring performance. It has been unsuccessful both in establishing an appropriate data base for such behavior and in generating fruitful hypotheses. An empirical approach is therefore proposed in which variables contributing to task complexity are manipulated at a molar level, and those found to influence monitoring performance are subjected to progressive refinement. 3 illustrative experiments are reported using a task designed to permit manipulation of a variety of complexity variables. Low frequency, high density, and irrelevant signals all were found to inhibit detection; in addition, sizable decrements occurred under some combinations of these conditions. Refinement of the density effect suggested that pattern of scanning, probably controlled by the reinforcing properties of detected signals, is of major importance in complex monitoring performance.
R 29

29,084
Ryterband E.C. & King, D.C. RELATIONSHIP BETWEEN TASK CHOICE AND RESISTANCE TO CHANGE: A DISSONANCE ANALYSIS. J. Org. Behav. Hum. Perf., Dec. 1966, 1(2), 151-168. (Purdue University, Lafayette, Ind.).

High and low dissonance conditions were established by having Ss perceive greater or lesser choice associated with their performance on a boring, useless task. Enhanced assessments of that task, as resolutions of dissonance were predicted and observed more extensively in high than in low dissonance conditions. In order to examine "resistance to change" via dissonance conceptions, Ss were subsequently offered two otherwise equally attractive incentives. As predicted dissonance level produced variations in response to incentives. Low dissonance Ss (low prior task enhancement) showed no resistance to change, accepting both incentives. High dissonance Ss, however (high prior task enhancement), showed resistance to one incentive because its acceptance implied devaluating assessments of the task adopted in previous dissonance resolution.
R 16

29,085
Welck, K.E. & Penner, D.D. TRIADS: A LABORATORY ANALOGUE. J. Org. Behav. Hum. Perf., Dec. 1966, 1(2), 191-211. (University of Minnesota, Minneapolis, Minn. & General Electric Co.).

This paper argues that organizational researchers should study triads and the process of coalition formation more intensely since triads contain several organizational properties that are not found in smaller groups. A triad task is proposed that offsets many shortcomings of previous tasks used to study 3 person groups. Procedural variations and psychological properties of the task are discussed as are reformulations of traditional issues in triad theory that seem feasible given the properties of the triad task.
R 37

29,086
Vroom, V.H. ORGANIZATIONAL CHOICE: A STUDY OF PRE- AND POSTDECISION PROCESSES. J. Org. Behav. Hum. Perf., Dec. 1966, 1(2), 212-225. (Carnegie Institute of Technology, Pittsburgh, Penn.).

The Ss in this investigation were graduate students in a school of industrial management who were nearing the completion of their program of training and were engaged in the process of selecting an organization in which to begin their managerial career. After "surveying the market" but before making their choices, Ss rated the attractiveness of each of three organizations from which they expected to make their choices and completed a questionnaire designed to measure their conceptions of the instrumentality of each of these organizations for the attainment of their goals. Identical measures were obtained after the choice had been made. A strong positive relationship was observed, both before and after choice, between the attractiveness of organizations and the Ss' conceptions of the instrumentality of organizational membership for goal attainment. The mean attractiveness of chosen organizations increased from before to after choice as did the Ss' conceptions of their instrumentality for goal attainment. On the other hand, both the attractiveness and cognized instrumentality of unchosen organizations decreased. The findings are generally in accord with predictions made from Festinger's theory of cognitive dissonance.
R 17

29,087
Wherry, R.J. & Curran, P.M. A MODEL FOR THE STUDY OF SOME DETERMINERS OF PSYCHOLOGICAL STRESS: INITIAL EXPERIMENTAL RESEARCH. J. Org. Behav. Hum. Perf., Dec. 1966, 1(2), 226-251. (USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

A four-choice discrimination task and various levels of electric shock have been used to investigate possible determiners of anticipatory stress, and individual differences in performance decrements resulting from such stress. In general, disruption increases as the threatening event comes closer, as the perceived probability of its occurrence becomes greater, and as the perceived degree of unpleasantness is increased. Whether or not the anticipated unpleasant event really occurred in previous exposures influences behavior in subsequent exposures. There are several indications that anticipatory physical threat stress has a curvilinear relationship to performance, with low amounts of threat enhancing performance. There were wide individual differences in susceptibility to performance disruption by threat.
R 21

29,088
Scott, W.E., Jr. ACTIVATION THEORY AND TASK DESIGN. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 3-30. (Indiana University, Bloomington, Ind.).

Performance decrements and dissatisfactions at the work place have long been observed but have not been adequately explained. Activation research and selected studies of work behavior are reviewed to show that decrements in performance may be better understood in the light of recent neuropsychological findings. This review indicates that activation theory and the research upon which it is based anticipates behavior related to variations in task design and suggests new avenues of investigation for those interested in the determinants of work behavior.
R 81

29,089
Schum, D.A. PRIOR UNCERTAINTY AND AMOUNT OF DIAGNOSTIC EVIDENCE AS VARIABLES IN A PROBABILISTIC INFERENCE TASK. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 31-54. (Human Performance Center, Ohio State University, Columbus, Ohio).

Ss' probabilistic inference capabilities were evaluated in a simulated threat-diagnosis task. Ss revised probabilities on the basis of equivocal, contradictory, and unreliable evidence. Revisions of subjective probability were compared with theoretical revisions calculated using a modification of Bayes' theorem. Ss' revisions and the theoretical revisions showed a significantly increasing disparity as the amount of evidence to be processed was increased. The overall disparity between Ss' and theoretical revisions obtained when a uniform prior probability distribution was assumed did not differ significantly from the disparity obtained under an assumed nonuniform prior probability distribution. A general paradigm for complex inference task situations is discussed.
R 11

29,090
Vroom, V.H. A COMPARISION OF STATIC AND DYNAMIC CORRELATIONAL METHODS IN THE STUDY OF ORGANIZATIONS. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 55-70. (Carnegie Institute of Technology, Pittsburgh, Penn.).

Most of our existing knowledge of the behavior of complex organizations has stemmed from the use of static correlational methods. Measurements of a sample of organizations or subparts of organizations are taken on two or more variables, and the resulting scores are correlated with one another. In the present investigation the results obtained with this procedure were compared with 2 dynamic methods, one involving a simple correlation between changes on two or more variables and the second involving the correlation between changes corrected for regression toward the mean. Data on 20 variables were obtained from questionnaires and from company records for 26 geographically separated units of a large package delivery organization. The results show relatively little agreement between static correlations and those obtained by either of the dynamic methods. However, static correlations were more highly related to expert predictions of causal relations than were the newer methods. Further use of dynamic methods would seem to be warranted in situations in which different amounts or directions of change have occurred in independent variables while other variables have remained constant.
R 21

29,091
Posner, M.I., & Konick, A.F. SHORT-TERM RETENTION OF VISUAL AND KINESTHETIC INFORMATION. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 71-86. (University of Oregon, Eugene, Ore. & Kent State University, Kent, Ohio).

This series of experiments concerns short-term retention of the position of a circle on a line (visual-location) and of the length of a motor movement without visual feedback (kinesthetic-distance). Both tasks show forgetting of information over time intervals up to 30 seconds. Visual-location shows a systematic increase in forgetting as interpolated task difficulty is increased. Forgetting of kinesthetic-distance is unrelated to interpolated task difficulty. Analysis of the data suggests that in both tasks primary retention is through imagery rather than verbal codes. Retention of information about visual-location seems to require the availability of central processing capacity but kinesthetic-distance does not. The implications of these findings for the analysis of perceptual-motor skills and for a general theory of short-term memory are examined.
R 16

29,092
Frederiksen, N. VALIDATION OF A SIMULATION TECHNIQUE. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 87-109. (Center for Psychological Studies, Educational Testing Service, Princeton, N.J.).

Scores on tests of cognitive abilities, interests, and personality and biographical information were obtained for a group of 115 administrators in the federal government who had also been given the Bureau of Business In-Basket Test. The group overlapped with a larger group (N = 335) of Ss who had provided data for a factor analysis of scores from the in-basket. The purpose of the present study was to observe the correlations of in-basket scores with the ability and other measures and to estimate the factor loadings of the other measures on the factors obtained in the previous study. This was accomplished by estimating the correlations between in-basket scores and other variables for the larger group (assuming explicit multivariate selection), and then using a factor extension procedure to estimate loadings on the oblique primary factors and the second-order factors. The general trend of the results is in harmony with the relationships one might expect on logical or theoretical grounds. The results tend to establish the construct validity of in-basket scores. It would therefore seem reasonable to consider using scores on situational tests like the in-basket as dependent variables in social-psychological experiments, or as provisional criteria for validating tests which approach the problem of measuring personality less directly. The use of situational tests in assessment is discussed.
R 16

29,093
Dudycha, Linda W. & Naylor, J.C. CHARACTERISTICS OF THE HUMAN INFERENCE PROCESS IN COMPLEX CHOICE BEHAVIOR SITUATIONS. J. Org. Behav. Hum. Perf., Sept. 1966, 1(1), 110-128. (Ohio State University, Columbus, Ohio).

Ten Ss were assigned to each of 6 experimental 2-cue inference conditions created by varying the validity of the first cue across levels of .40 and .80, and by varying the validity of the second cue across levels of .20, .40, and .60. In each case the 2 cues were orthogonal. All performance indices closely approximated the dictates of a probability matching strategy. Subject consistency did not deviate greatly from the predictability available in the stimulus system, and Ss exhibited a high degree of ability in matching their equations to those defining the environmental complex. The value of a second ecological cue was a function of both the validity of the cue itself and the validity of the cue it was paired with. Pairing an additional cue to one of low validity was always facilitating, while adding an additional cue to one of high validity was always detrimental.
R 18

29,105
Weiner, B. EFFECTS OF MOTIVATION ON THE AVAILABILITY AND RETRIEVAL OF MEMORY TRACES. Psychol. Bull., Jan. 1966, 65(1), 24-37. (Center for Personality Research, University of Minnesota, Minneapolis, Minn.).

A review which analyzes a vast array of studies relating motivation and memory is presented. Investigations in which the motivational manipulation occurred during trace formation are distinguished from studies in which the manipulation occurred during trace storage or trace retrieval. The review includes a series of investigations by the author which varied the incentive for retaining stimuli. The general conclusion is that many studies in the area are methodologically inadequate, and have yielded conflicting results. However, there are studies which provide strong evidence that memory can be influenced by nonassociative factors.
R 113

29,106
Saugstad, P. EFFECT OF FOOD DEPRIVATION ON PERCEPTION-COGNITION. Psychol. Bull., Feb. 1966, 65(2), 80-90. (University of Oslo, Oslo, Norway).

9 experiments designed to investigate the effect of food deprivation on perceptual-cognitive processes are examined in detail. An effect is revealed in only some of these experiments. The deviating results are explained by assuming the motivational state will not affect perceptual-cognitive processes unless the material presented is meaningful in relation to the motivational state. An examination of the operational definitions given of the processes studied indicate that the processes may by more meaningfully termed imaginary than perceptual. An examination of the operational definition of the motivational state of hunger revealed that in most of the experiments the important condition may not be hours of food deprivation, but the expectancy of the Ss as to when they may next receive food.
R 28

29,107
Gyr, J.W., Brown, J.S., Willey, R. & Zivan, A. COMPUTER SIMULATION AND PSYCHOLOGICAL THEORIES OF PERCEPTION. Psychol. Bull., March 1966, 65(3), 174-192. (University of Michigan, Ann Arbor, Mich.).

Computer simulations of perceptual processes have often not related directly to questions of concern to the psychology of perception and, in particular, have regarded perception as a sensory, as opposed to a sensorimotor or active, process. Some of the psychological literature which is relevant to the issue of perception as a passive vs. an active process is reviewed and the differences between these alternative conceptions of perception and the gains to be derived from using the active-perceiver model are spelled out. Past computer models are reviewed in the light of such psychological theories of perception. A different simulation program based explicitly on the active-perceiver model of perception is then sketched in broad outlines and its potential for doing research upon psychological problems is reviewed.
R 50

29,108
Royce, J.R., Carran, A.B., Aftanas, M., Lehman, R.S., et al. THE AUTOKINETIC PHENOMENON: A CRITICAL REVIEW. Psychol. Bull., April 1966, 65(4), 243-260. (University of Alberta, Edmonton, Alberta, Canada).

Studies reviewed in this article are grouped under the areas of response problems, dynamic determinants, individual differences, clinical studies, reduction of movement, and theories of autokinesis (AK). Much of the work to date is concerned with the demonstration of various "suggestion effects" without regard to the basis of residual AK. Determinants of AK are many and varied but little can be said about their relative potencies. Although a modified version of the Gregory-Zangwill model may serve well, there is presently no single theory of AK which accounts for all the data. Further developments in the theory and control of AK hinge upon the sedulous development of improved techniques for measuring AK. 3 criteria for measuring AK are offered.
R 103

29,109
Montagu, J.D. & Coles, E.M. MECHANISM AND MEASUREMENT OF THE GALVANIC SKIN RESPONSE. Psychol. Bull., May 1966, 65(5), 261-279. (Pharmacology Dept., University College, London, England & Psychiatry Dept., University of British Columbia, Vancouver, British Columbia, Canada).

The measurement of the galvanic skin response (GSR) is subject to error from many sources. Recent work has elucidated the peripheral mechanism of the response and has provided an appropriate electrical model. This review considers the measurement and analysis of the GSR in the light of this recent work. dc and ac methods are compared. The relative merits of constant current (resistance) and constant voltage (conductance) measurements are discussed; and the optimal electrode systems are defined. A brief survey of the organismic and environmental variables which influence the response is included.
R 81

29,110
Marascuilo, L.A. LARGE-SAMPLE MULTIPLE COMPARISONS. Psychol. Bull., May 1966, 65(5), 280-290. (University of California, Berkeley, Calif.).

Large-sample multiple comparisons based upon a χ^2 analog of Scheffé's Theorem (1959) are illustrated by means of 5 examples. The examples involve the correlation coefficients of K independent bivariate normal populations; the parameters of K independent binomial populations; the interaction measures of K independent continency tables; the parameters of K independent normal populations with unequal variances; and the differences between the parameters of K sets of paired normal populations with unequal variances. In addition, a general test statistic is presented to test the null hypothesis that involves the parameters.
R 12

29,111
Buck, L. REACTION TIME AS A MEASURE OF PERCEPTUAL VIGILANCE. Psychol. Bull., May 1966, 65(5), 291-304. (Industrial Psychology Research Unit, University College, London, England).

This article reviews the use made of reaction time as an index of performance deterioration in monitoring tasks, with special reference to the hypothesis that RT and detection rate are correlated indices of perceptual vigilance. It is concluded that this is the case, and a theoretical model relating the 2 indices to changes in vigilance occurring with time on task is proposed.
R 59

29,112
Graham, Frances K. & Clifton, Rachel K. HEART-RATE CHANGE AS A COMPONENT OF THE ORIENTING RESPONSE. Psychol. Bull., May 1966, 65(5), 305-320. (University of Wisconsin, Madison, Wisc.).

Both Sokolov and the Laceys have proposed that autonomic feedback to central neural structures amplifies or reduces the effects of stimulation. Lacey and Lacey distinguished between the effects of feedback from the cardiovascular system and from other autonomic systems and suggested, specifically, that heart-rate (HR) acceleration should be associated with stimulus "rejection" and HR deceleration with stimulus enhancement. This appeared to be contradicted by evidence that HR increased with the orienting reflex whose function, according to Sokolov, is the enhancement of stimulus reception. However, when studies using simple "nonsignal" stimuli were reviewed, it was found that the criteria identifying an orienting reflex were satisfied by responses of HR deceleration and that instances of HR acceleration probably reflected a "defense," "startle," or "acoustic-cardiac" response.
R 83

29,115
Martin, Irene & Venables, P.H. MECHANISMS OF PALMAR SKIN RESISTANCE AND SKIN POTENTIAL. Psychol. Bull., June 1966, 65(6), 347-357. (Institute of Psychiatry, London, England & Birkbeck College, London, England).

An attempt is made to analyze peripheral and central factors responsible for 4 electrical properties of palmar skin: a) skin-resistance level (SRL), b) skin-resistance responses (SRRs), c) skin-potential level (SPL), and d) skin-potential responses (SPRs), these latter being often diphasic--an initial negative change in potential followed by a positive wave. There seems little doubt that SRL and SRRs are closely linked with sweat-gland activity, but, in addition, there is probably some contribution from epidermal factors. Available data suggest that SPL is largely independent of sweat-gland activity and may relate to certain membrane characteristics of the epidermis. In the case of SPR, the latency of the negative wave seems to correlate closely with the latency of the SRR, and both are probably functions of the presecretory activity of sweat-glands. The mechanism of the positive wave is in doubt; it is regarded by some as a secondary aspect of sweat-gland activity and by others as being of independent epidermal origin.
R 54

29,116
Clark, W.C. THE PSYCHE IN PSYCHOPHYSICS: A SENSORY-DECISION THEORY ANALYSIS OF THE EFFECT OF INSTRUCTIONS ON FLICKER SENSITIVITY AND RESPONSE BIAS. Psychol. Bull., June 1966, 65(6) 358-366. (Psychiatry Dept., Columbia University, New York, N.Y.).

Instruction-induced changes in flicker thresholds measured by traditional psychophysical procedures may reflect changes in sensory sensitivity or in response bias. In a group of 16 psychiatric patients, a facilitating set, in contrast to an inhibiting set, increased the proportion of flicker responses to both a physically intermittent light ("hits," $p<.01$) and to a continuous light ("false affirmatives," $p<.01$). Analysis of the data by the method of constant stimulus suggested a change in the flicker threshold; however, analysis of the same data by sensory (statistical) decision theory demonstrated that sensory sensitivity (d') was unchanged, and that only the Ss' response bias or subjective criterion (x_c) was altered. The results suggest that differences in sensory thresholds, which are often reported between control and experimental groups are likely to reflect a difference in attitude towards the subjective costs and values of the various decision outcomes.
R 34

29,118
Poulton, E.C. & Freeman, P.R. UNWANTED ASYMMETRICAL TRANSFER EFFECTS WITH BALANCED EXPERIMENTAL DESIGNS. Psychol. Bull., July 1966, 66(1), 1-8. (Applied Psychology Research Unit, MRC, Cambridge, England).

In comparing 2 conditions using a simple Group I AB, Group II BA design, transfer effects may be a) 2-way asymmetrical: after A, B is better; after B, A is worse. This appears as an interaction between Conditions and Order, and can be due to an initial difference between Groups I and II. b) 1-way: A remains unchanged; after A, B is better (or worse). This may show in Tukey's mean square for nonadditivity. Examples are given of both kinds. Asymmetrical transfer generally reduces, but can exaggerate, the difference between 2 conditions. With this simple balanced experimental design, a between-group analysis of the conditions performed 1st can be made which is uncontaminated by transfer effects, as well as a within-group analysis of 1st and 2nd conditions combined. Only if the individual differences are too large should the experimenter resort with caution to the latter.
R 32

29,119
Mukherjee, B.N. APPLICATION OF CANONICAL CORRELATIONAL ANALYSIS TO LEARNING DATA. Psychol. Bull., July 1966, 66(1), 9-21. (Nagpur University, Nagpur, India).

This paper is concerned with the application of Hotelling's canonical correlational analysis to certain problems of learning, such as a) prediction of learning from external measures, b) efficiency of learning indices as predictors of academic grades, c) the extent to which different sets of learning scores share the same function, and d) changes in the factorial structure of learning as practice continues. Analyses of the published data using this statistical method revealed that there is a considerable amount of improvement in predictive efficiency if learning is treated in multivariate terms. An important methodological point is the finding that in classical eyelid-conditioning experiments, the Ss should be matched in terms of their reflex sensitivity to light and puff. It is also felt that canonical analysis may serve as an alternative method of studying the nature and extent of change in ability patterns as improvement occurs in a learning task.
R 56

29,120
Davis, G.A. CURRENT STATUS OF RESEARCH AND THEORY IN HUMAN PROBLEM SOLVING. Psychol. Bull., July 1966, 66(1), 36-54. (University of Wisconsin, Madison, Wisc.).

Problem solving theories in 3 areas are summarized: traditional learning and cognitive-Gestalt approaches plus more recent computer and mathematical models of problem solving. Recent empirical studies are categorized according to the type of behavior elicited by the particular problem-solving task. Anagram, "insight," water-jar, and arithmetic problems are considered to be solved by covert trial-and-error behavior (Type C problem-solving tasks). Switch-light, classification, probability-learning, and numerous "miscellaneous" tasks are approached by overt trial-and-error behavior (Type O problem-solving tasks).
R 128

29,121
Price, R.H. SIGNAL-DETECTION METHODS IN PERSONALITY AND PERCEPTION. Psychol. Bull., July 1966, 66(1), 55-62. (University of Illinois, Urbana, Ill.).

Methodological problems encountered in the use of traditional threshold measures in the study of personality and perception are discussed. The threshold is shown a) to yield results dependent upon the psychophysical method used, b) to be arbitrary in definition, c) to be unimproved by corrections for guessing, and d) to confound the observer's sensory capabilities with his criterion for reporting a given stimulus event. Methods derived from signal-detection theory are described. Studies using the logic and methods of signal-detection analysis in personality and perception research are reviewed and their implications discussed.
R 35

29,122
Opsahl, R.L. & Dunnette, M.D. THE ROLE OF FINANCIAL COMPENSATION IN INDUSTRIAL MOTIVATION. Psychol. Bull., Aug. 1966, 66(2), 94-118. (University of Minnesota, Minneapolis, Minn.).

Theories and research studies related to the effects of financial compensation on employee motivation are reviewed and critically evaluated. Such theories are based primarily on limited studies conducted on subhuman species; no deductions from these theories have been adequately tested in industry. Most compensation practices in industry are based on impressionistic evidence characterized by anecdotal accounts and data gathered by means of self-report questionnaires. Studies of the effects of money on employee behavior need to be conducted in laboratory or in tightly controlled field settings. A commendable start in this direction has been made by a few investigators, but more empirical tests of the bases of current compensation practices are needed. Such research should lead eventually to a sound theory of money and employee motivation from which more effective and more behaviorally relevant compensation practices may be derived.
R 106

29,123
Mulaik, S.A. INFERRING THE COMMUNALITY OF A VARIABLE IN A UNIVERSE OF VARIABLES. Psychol. Bull., Aug. 1966, 66(2), 119-124. (University of Utah, Salt Lake City, Utah).

Given a sample of variables from a universe of variables measuring an unlimited number of different properties, and assuming that the most likely additional variables to be found in the universe are variables differing from the sample variables by arbitrarily small amounts, it is argued that the most likely inference about the communality of a sample variable in the context of the universe is the reliability of the variable. All true variance in a sample of variables should thus be used in inferring common variance in the universe.
R 15

29,125
Ganz, L. IS THE FIGURAL AFTEREFFECT AN AFTEREFFECT? A REVIEW OF ITS INTENSITY, ONSET, DECAY AND TRANSFER CHARACTERISTICS. Psychol. Bull., Sept. 1966, 66(3), 151-165. (University of California, Riverside, Calif.).

It has been shown how figural aftereffects might be generated by the lateral inhibitory effects of the inspection figure, in the manner of a simultaneous illusion. The present effort reviews some evidence suggesting that a figural aftereffect is a simultaneous illusion: a) Varying the intensity of the inducing figure affects the simultaneous illusion and figural aftereffect in similar ways. b) Temporal characteristics--onset and decay--of light adaptation, of afterimages, and of figural aftereffects are considered. It is shown that they obey similar empirical equations and that the constants in those equations have similar values. c) The argument that the use of an interocular presentation of inducing and test figure eliminates the possible influence of afterimages is reviewed. It is concluded that figural aftereffects are very closely related to 3 visual phenomena: simultaneous contrast (the result of lateral inhibition), light and dark adaptation, and ocular tremor.
R 64

29,127
Pugh, D.S. MODERN ORGANIZATION THEORY: A PSYCHOLOGICAL AND SOCIOLOGICAL STUDY. Psychol. Bull., Oct. 1966, 66(4), 235-251. (Industrial Administration Research Unit, University of Aston, Birmingham, England).

"Organization theory" is the study of the structure and functioning of organizations and the behavior of groups and individuals within them. It is an emerging interdisciplinary quasi-independent science, drawing primarily on the disciplines of psychology and sociology but also on economics and to a lesser extent on production engineering. The main lines of development affecting the conceptualization of the subdiscipline can be traced under 6 headings: a) management theorists (from Henri Fayol to Wilfred Brown); b) structural theorists (from Max Weber to Tom Burns); c) group theorists (from Elton Mayo and Kurt Lewin to Rensis Likert); d) individual theorists (from the Industrial Fatigue Research Board to March and Simon); e) technology theorists (F.W. Taylor, Eric Trist, Joan Woodward); and f) economic theorists (from Alfred Marshall to Robin Marris). Current work is surveyed and certain lessons drawn.
R 107

29,128
Bresnahan, Jean L. & Shapiro, M.M. A GENERAL EQUATION AND TECHNIQUE FOR THE EXACT PARTITIONING OF CHI-SQUARE CONTINGENCY TABLES. Psychol. Bull., Oct. 1966, 66(4), 252-262. (Emory University, Atlanta, Ga.).

This paper considers the technique of the exact partitioning of χ^2 contingency tables. Methods are presented for partitioning contingency tables into components. A general equation for χ^2 is derived. The equation may be used for the calculation of exact χ^2 values for a) nonexhaustive sets of categories, and b) situations in which some cells have small expected frequencies.
R 13

29,129
Groen, G.J. & Atkinson, R.C. MODELS FOR OPTIMIZING THE LEARNING PROCESS. Psychol. Bull., Oct. 1966, 66(4), 309-320. (Stanford University, Stanford, Calif.).

This paper is concerned with showing how certain instructional problems can be reformulated as problems in the mathematical theory of optimization. A common instructional paradigm is outlined and a notational system is proposed which allows the paradigm to be restated as a multistage decision process with an explicit mathematical learning model embedded within it. The notion of an optimal stimulus presentation strategy is introduced and some problems involved in determining such a strategy are discussed. A brief description of dynamic programming is used to illustrate how optimal strategies might be discovered in practical situations.
R 29

29,130
Bakan, D. THE TEST OF SIGNIFICANCE IN PSYCHOLOGICAL RESEARCH. Psychol. Bull., Dec. 1966, 66(6), 423-437. (University of Chicago, Chicago, Ill.).

The test of significance does not provide the information concerning psychological phenomena characteristically attributed to it; and a great deal of mischief has been associated with its use. The basic logic associated with the test of significance is reviewed. The null hypothesis is characteristically false under any circumstances. Publication practices foster the reporting of small effects in populations. Psychologists have "adjusted" by misinterpretation, taking the p value as a "measure", assuming that the test of significance provides automaticity of inference, and confusing the aggregate with the general. The difficulties are illuminated by bringing to bear the contributions from the decision-theory schoo' on the Fisher approach. The Bayesian approach is suggested.
R 43

29,131
Treisman, M. & Watts, T.R. RELATION BETWEEN SIGNAL DETECTABILITY THEORY AND THE TRADITIONAL PROCEDURES FOR MEASURING SENSORY THRESHOLDS: ESTIMATING d' FROM RESULTS GIVEN BY THE METHOD OF CONSTANT STIMULI. Psychol. Bull., Dec. 1966, 66(6), 438-454. (Institute of Experimental Psychology, Oxford, England).

The theory of signal detectability assumes that the central effect of a stimulus varies because of physical and neural noise; consequently, the detection of a signal requires a central statistical decision procedure. Similar assumptions have been made by psychophysicists to explain the results of traditional threshold measurement procedures. The interrelations between signal detectability and threshold measures are discussed in relation to psychophysical statistical decision theory, and it is shown that a) the false positive rate should be related to the Crozier ratio $C = \Delta I/\sigma_{\Delta I}$, and b) it should be possible to use responses given in the method of constant stimuli to predict the value of d' that will be assigned to a given stimulus by a signal detectability procedure. Evidence supporting both predictions is reported, and the relation between threshold measures and "personality tests" is discussed.
R 56

29,132
Lykken, D.T., Rose, R., Luther, B. & Maley, M. CORRECTING PSYCHOPHYSIOLOGICAL MEASURES FOR INDIVIDUAL DIFFERENCES IN RANGE. Psychol. Bull., Dec. 1966, 66(6), 481-484. (Psychiatry Dept., University of Minnesota Medical School, Minneapolis, Minn.).

Most psychophysiological output variables display marked individual differences in the maximum and often in the minimum levels of which S is capable. Since such variations in range are generally unrelated to the underlying variable of interest, measures of tonic level or of changes in level should be corrected so as to remove their influence. Formulas for this correction are provided together with experimental evidence showing that such range-corrections may accomplish marked reductions in error variance.
R 5

29,133
Wever, E.G. ELECTRICAL POTENTIALS OF THE COCHLEA. Physiol. Rev., Jan. 1966, 46(1), 102-127. (Auditory Research Labs., Princeton University, Princeton, N.J.).

The generation of electrical potentials in the ear in response to sounds has been known for three and a half decades. During this time something like 900 reports have appeared dealing with these potentials and about 300 more have been concerned with the activities in the cochlear nerve and its central projections. General reviews in this area have been few. An early one appeared in Physiological Reviews in 1933, when experiments on the phenomena were still in an exploratory stage, and another came in 1939, when the relations to hearing were better understood and many applications were being made to auditory theory. No review has since appeared that can truly be regarded as comprehensive, though discussions from particular points of view have been included in the books by Stevens and Davis, Davis and Fowler, Wever, and Wever and Lawrence. In addition, citations of current literature, often with evaluative comments, have been included in the frequent general summaries of the auditory field appearing in Annual Reviews of Psychology and Annual Reviews of Physiology. Because of the intense activity in this area and the manifold nature of the problems that have arisen it is no longer possible to bring this subject up to date in an article of reasonable length the present discussion is thus severely limited in scope.
R 80

29,134
Mills, J.N. HUMAN CIRCADIAN RHYTHMS. Physiol. Rev., Jan. 1966, 46(1), 128-171. (Physiology Dept., University of Manchester, Manchester, England).

Many functions show circadian rhythmicity, but this is often merely impressed by external rhythm of habit or environment. There is, however, a circadian clock, which may be placed tentatively in the region of the hypothalamus, influencing a variety of functions through many channels, known and unknown, and it may itself be influenced by various environmental stimuli. When the social environment contributes, the cortex is presumably involved; but the clock does not seem to reside there, since temperature and eosinophil rhythms persist during regression induced by intensive electroshock therapy, when neurological examination indicates a lack of cortical function. There is no compelling evidence for the existence of more than one clock; only the demonstration of 2 rhythms of slightly different cycle length, neither corresponding to an external rhythm, could prove this. Conversely, it is perfectly conceivable that endogenous rhythmicity is present at many levels of organization. Each would normally be entrained by another rhythm, external or internal, thus securing the customary integration and synchronization of different functions, but leaving varied possibilities for disturbance that have hardly yet been explored in man.
R 253

29,135
Oakley, B. & Benjamin, R. M. NEURAL MECHANISMS OF TASTE. Physiol. Rev., April 1966, 46(2), 173-211. (Zoology Dept., University of California, Los Angeles, Calif. & Physiology Dept., University of Wisconsin Medical School, Madison, Wis.).

This review covers the comparative physiology and anatomy of taste. Research that is primarily behavioral or clinical in nature in not emphasized. Consideration of invertebrate taste mechanisms is confined to insects, for little is known about the taste physiology of most other invertebrate forms. This review is divided into 2 portions: a comparative section organized according to anatomical locus and a section dealing with some principles and topics of current interest.
R 239

29,137
Harmon, L.D. & Lewis, E.R. NEURAL MODELING. Physiol. Rev., July 1966, 46(3), 513-591. (Bell Telephone Laboratories, Inc., Murray Hill, N.J. & Librascope Group, General Precision, Inc., Glendale, Calif.).

Overt neural modeling has proven valuable in neurophysiology, and it seems certain that it will continue to do so. The purposes of modeling that are significant to physiologists are threefold: facilitation of preliminary testing of pertinent hypotheses, provision of tractable means of synthesizing disparate physiological data into unified consistent pictures, and generation of guidelines to crucial physiological experiments. In this review we have shown how numerous models have fulfilled one or more of these goals, contributing concrete knowledge to neurophysiology. Contemporary neural models are playing an important role in complementing direct neurophysiological investigation. While their accomplishments have been substantial, their utility certainly has by no means been fully exploited. The increasingly close liaison between theoretical and experimental neurophysiology made possible by modeling presents an intriguing challenge for the future.
R 305

29,138
Murdock, B.B., Jr. THE CRITERION PROBLEM IN SHORT-TERM MEMORY. J. exp. Psychol., Sept. 1966, 72(3), 317-324. (University of Toronto, Toronto, Ontario, Canada).

According to signal-detection theory the response is a function of both sensitivity and the criterion; this experiment tested for criterion shifts in short-term memory (STM). Each list consisted of 5 A-B paired associates followed by a probe (A or B) for 1 of the pairs. 4 Ss were tested intensively, and recall was supplemented with confidence ratings and latency measures. Analysis of the results showed that the strength of the evoked response (as measured by d') was invariant over serial position but the criterion (as measured by β) became stricter as retention interval increased. Thus the predicted changes did occur; these findings raise doubts about conventional error analyses in studies of human verbal learning and suggest caution in extrapolating from probability measures to strength measures.
R 18

29,139
Epstein, W. PERCEIVED DEPTH AS A FUNCTION OF RELATIVE HEIGHT UNDER THREE BACKGROUND CONDITIONS. J. exp. Psychol., Sept. 1966, 72(3), 335-338. (University of Kansas, Lawrence, Kan.).

The hypothesis was proposed, that the perceived depth, which results from the relative height cue, depends on "optical adjacency." A 3 x 3 factorial experiment was conducted to examine this hypothesis. The 2 factors were vertical separation (3.5, 5.5, 7.5 in.) and background conditions (0 background, outline background without surface texture, textured background). Verbal estimates of the depth between pairs of frontal parallel points were obtained under the 9 conditions. In one experiment, the backgrounds simulated a floor surface, and in another, the backgrounds simulated a ceiling surface. The results in both experiments were comparable. Both main effects, separation and background, and the interaction effect were significant. All the effects were in the direction predicted by the optical adjacency hypothesis.
R 4

29,140
Binford, J.R. & Loeb, M. CHANGES WITHIN AND OVER REPEATED SESSIONS IN CRITERION AND EFFECTIVE SENSITIVITY IN AN AUDITORY VIGILANCE TASK. J. exp. Psychol., Sept. 1966, 72(3), 339-345. (University of Louisville, Louisville, Ky. & USA Medical Research Lab., Fort Knox, Ky.).

The sensitivity and criterion indexes, d' and β, of signal-detection theory were calculated and used as measures descriptive of vigilance performance, and trends were studied in terms of these indexes in addition to the usual ways involving detections and false alarms. Ss were run under 2 conditions: a) 1/2 the Ss employed a multiple criterion, i.e., indicated their degree of confidence at 1 of 3 levels when they thought they detected a signal; b) 1/2 the Ss merely indicated the occurrence of a signal (single criterion). All Ss performed the same task--detection of a 1.8-db. increment to periodically occurring 60-db. noise pulses--for 9 80-min. sessions. It was found that a) d' decreased slightly during sessions and increased slightly over sessions; b) criterion indexes, β, increased both within and over sessions; c) Ss employing a single criterion, i.e., single standard of judgment, showed more pronounced trends than did Ss employing multiple criterion. The usual changes in Hits and False Alarms, i.e., decreases in detections within sessions (especially the early sessions) and decreases in false alarms within and over sessions were observed.
R 15

29,141
Ludvigson, H.W. RESPONSE UNITS IN THE PREDICTION OF SIMPLE EVENT PATTERNS. J. exp. Psychol., Sept. 1966, 72(3), 355-360. (University of Texas Southwestern Medical School, Dallas, Tex.).

Two response unit hypotheses were tested in a task similar to probability learning except that the stimulus events occurred in a simple recurring pattern prior to an extinction series of all one event. Ss were 144 male and female college students. The hypothesis, that persistence of erroneous responding in extinction is constant when measured in units of the length of the acquisition pattern of events, received support. However, the hypothesis more closely predicted the data of Ss who learned and could describe the pattern than the data of other Ss. A 2nd hypothesis, that equally resistant units of specific elemental responses are acquired and extinguished, was not supported. The necessity for an additional assumption of a sequence of mediating responses representing the same-different relations among successive events is discussed.
R 6

29,142
Norman, D.A. ACQUISITION AND RETENTION IN SHORT-TERM MEMORY. J. exp. Psychol., Sept. 1966, 72(3), 369-381. (Harvard University, Cambridge, Mass.).

Retention in short-term memory was studied by manipulating rates of presentation (from 1 to 10 digits per sec.), the type of digit presentation (spoken, computer spoken, and visually presented), the type of item (single digits, paired digits, and nonsense sounds), and the type of test (recall and recognition). Performance in short-term memory experiments is attributed to interactions among 3 different processes: acquisition, retention, and decision. Rate of presentation, length of list, type of item, and modality seemed mainly to affect the initial acquisition of items in memory. The rate of forgetting depended mainly upon the number of items presented between the critical item and its test.
R 15

29,144
Crawford, June, Hunt, E. & Peak, G. INVERSE FORGETTING IN SHORT-TERM MEMORY. J. exp. Psychol., Sept. 1966, 72(3), 415-422. (University of Sydney, Sydney, Australia).

As a test of short-term memory, human Ss were shown a pattern of letters, then asked to recall it. Stimuli were presented for less than 1 sec., while the retention interval varied from 1 to 10 sec. The letter patterns used were either meaningless, formed words, or formed sentences. There was no intervening activity during the retention interval. Accuracy of recall was higher at longer retention intervals, in contrast to the usual fall of accuracy with time which is seen when retention is measured over a period of minutes or longer. Degree of meaningfulness of the stimuli did affect accuracy of recall, but there was no interaction with the retention-interval effect.
R 13

29,145
Oostlander, A.M. & de Swart, H. SEARCH-DISCRIMINATION TIME AND THE APPLICABILITY OF INFORMATION THEORY. J. exp. Psychol., Sept. 1966, 72(3), 423-428. (Experimental Psychology Lab., Free University, Amsterdam, The Netherlands).

In this paper some objections against the application of information theory with regard to discrimination tasks are refuted by means of comments on and a replication of an experiment by Thomas and Solley (J. exp. Psychol., 1963, 65, 501-506). In search-discrimination experiments information theory does not "predict" a logarithmic relationship between RT and stimulus uncertainty because of the instability of the rate of gain of information, as already pointed out by Hick (Quart. J. exp. Psychol., 1952, 4, 11-26). Besides the influences of amount of uncertainty, amount of redundancy and form of the constraint in the stimulus field were considered. The results of our corrected replication turned out to be wholly congruent with expectations based on information theoretical research.
R 9

29,146
Kaplan, I.T. & Schoenfeld, W.N. OCULOMOTOR PATTERNS DURING THE SOLUTION OF VISUALLY DISPLAYED ANAGRAMS. J. exp. Psychol., Sept. 1966, 72(3), 447-451. (Ophthalmology Dept., New York University Medical Center, New York, N.Y. & Columbia University, New York, N.Y.).

The S was shown a series of 40 5-letter anagrams. The first 20 anagrams could all be solved by rearranging their letters in the same order, the next 10 followed a different order, and the last 10 followed a 3rd rule. As S solved the anagrams, his eye movements were photographed. After the whole series had been presented, S was asked whether he had noticed any pattern in the anagrams. Those Ss who discovered the rules developed distinctive eye-movement patterns: they looked at the letters of the anagram in the order that they appeared in the solution word, and the solution was achieved with just 5 fixations, 1 on each letter. When the rule that solved the anagrams was changed, the fixation pattern also changed to follow the new rule. This oculomotor response may be regarded as the behavioral counterpart of a "mental set" to perceive the letters in the order of the rule.
R 5

29,147
Markowitz, Nancy & Renner, K.E. FEEDBACK AND THE DELAY-RETENTION EFFECT. J. exp. Psychol., Sept. 1966, 72(3), 452-455. (University of Pennsylvania, University Park, Penn.).

Brackbill (J. exp. Child Psychol., 1964, 1, 199-207) has found that delay of reinforcement during acquisition results in better retention than occurs when immediate reinforcement is used. The present experiment, using her stimulus discrimination procedure, indicated that the effect was due to feedback which was given in addition to the reinforcement. The effect did not occur when the feedback was eliminated and traditional delay of reinforcement procedures were used.
R 8

29,148
Dees, J.W. ACCURACY OF ABSOLUTE VISUAL DISTANCE AND SIZE ESTIMATION IN SPACE AS A FUNCTION OF STEREOPSIS AND MOTION PARALLAX. J. exp. Psychol., Sept. 1966, 72(3), 466-476. (McDonnell Aircraft Corporation, St. Louis, Mo.).

3 experiments were performed on the accuracy of distance estimation in space as a function of stereopsis alone, stereopsis plus motion parallax, and motion parallax alone using a motion-picture stereoscope. The motion parallax was induced by a simulated head motion. During training, Ss received 10 sets of 20 discrete distance presentations each and were asked to identify them as to distance as they were presented and were immediately informed of the correct answer. The identifying code used was a rank order. Procedure was repeated during testing except knowledge of results was omitted. Equations, expressing the median and the dispersion of judged distance were given as a function of actual distance. With proper training, a cyclical head motion can add significantly to the accuracy of distance and size estimation. The equipment and techniques are described. The moon illusion is discussed relative to an informal observation made during the experiment.
R 4

29,149
Harcum, E.R. VISUAL HEMIFIELD DIFFERENCES AS CONFLICTS IN DIRECTION OF READING. J. exp. Psychol., Sept. 1966, 72(3), 479-480. (College of William & Mary, Williamsburg, Va.).

This study verifies and extends the conclusions of Harcum and Finkel (Canad. J. Psychol., 1963, 17, 224-234), who attributed right-left hemifield differences in the visual perception of words to a conflict in the directions for scanning the visual patterns. Orientation and sequence of letters in meaningful English words, presented to the right or left of fixation, were varied together or separately. Generally, when the directional characteristics of the words did not agree with the normal direction for reading English, perception was less accurate.
R 3

29,150
Peter, J. & Wyndham, C.H. ACTIVITY OF THE HUMAN ECCRINE SWEAT GLAND DURING EXERCISE IN A HOT HUMID ENVIRONMENT BEFORE AND AFTER ACCLIMATIZATION. J. Physiol., Dec. 1966, 187(3), 583-594. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

6 unacclimatized African mine labourers were subjected to exercise for 4 1/2 hr. in a hot humid environment (90°-93°F wet-bulb/dry-bulb (W.B./D.B.); approximately 90% r.h.). The patterns of glandular activity and the densities of active glands on the chest and back were assessed half-hourly from plastic impressions. Acclimatization increased and prolonged glandular activity. The increment in activity of the sweat glands on the back was greater than that on the chest. There was no significant increase in the maximum number of active glands on either site after acclimatization. Acclimatization greatly reduced the number of inactive glands, subsequent to the maximum count, on the back, but this was not observed on the chest. The increased sweat rates with acclimatization were due mainly to increased glandular activity. The decline in sweat rates and activity on prolonged exposure to hot humid environment was attributed to glandular fatigue. Other factors, such as increased body temperature, hydration of the skin and fatigue of the central nervous system, suggested by other investigators as possibly causing the decline in sweat rates, did not have support in this study.
R 21

29,156
Collins, K.J., Crockford, G.W. & Weiner, J.S. THE LOCAL TRAINING EFFECT OF SECRETORY ACTIVITY ON THE RESPONSE OF ECCRINE SWEAT GLANDS. J. Physiol., May 1966, 184(1), 203-214. (London School of Hygiene & Tropical Medicine, London, England).

The influence of repeatedly raising the body temperature by radiant heat to a level at which acclimatization to heat is normally acquired was investigated in 2 series of experiments, the first without the Ss sweating, the second with sweating. In a second investigation local sweat-gland activity was induced by drug injections on successive days without raising the body temperature. These experiments show that the increased sweating capacity characteristic of acclimatization to heat is a result of sweat-gland activity and does not appear to be induced by or to depend on an elevated body temperature. Secretory activity results in a loss of glycogen from sweat-gland cells on the first day of heat exposure but not after the glands have been "trained" by acclimatization to heat. The state of acclimatization has no influence on the threshold concentration of acetylcholine required to elicit sweating when injected intradermally.
R 18

29,170
Naka, K.I. & Rushton, W.A.H. AN ATTEMPT TO ANALYSE COLOUR RECEPTION BY ELECTROPHYSIOLOGY. J. Physiol., Aug. 1966, 185(3), 556-586. (Physiological Lab., University of Cambridge, Cambridge, England).

The problem of colour reception is that we do not know the action spectra of the visual pigments involved, the nature of the signals generated nor the interaction between these signals. We only know the incident light and the electric results of interaction. In Part I we show that S-potentials from red/green (R/G) units saturated with deep red light show this property: added green light pulls down the ceiling of depolarization, but more added red had no power to raise it again. Thus lights that depress the deep red ceiling equally stimulate the green pigment equally. From this the action spectrum of the green pigment can be obtained. In Part 2 we consider the following mathematical problem: "Is it possible that 2 pigments of given action spectra could combine their outputs in such a way that the resultant would be identical with the output of a third pigment of given action spectrum, for every intensity of every monochromatic light?" The solution shows that this is always mathematically possible, and the necessary interaction function is deduced. In Part 3 monochromatic lights are matched by red + green mixtures that give identical responses. From this the action spectrum of the red pigment may be obtained without involving nerve organization (except as a null detector).
R 16

29,171
Short, A.D. DECREMENTAL AND INCREMENTAL VISUAL THRESHOLDS. J. Physiol., Aug. 1966, 185(3), 646-654. (University Laboratory of Physiology, Oxford, England).

Extrafoveal decremental and incremental visual thresholds have been measured with a circular test-object of 57' diameter, an exposure time of 0·1 sec and background luminance ranging from 2·5 to 7·3 log. quanta (equivalent to 507 nm) per sec per square degree at the cornea. The decremental threshold is lower than the incremental threshold by factors up to 0·4 log. unit when the background luminance is low; and the 2 thresholds are virtually the same when the background luminance is high.
R 20

29,175
Campbell, F.W. & Gubisch, R.W. OPTICAL QUALITY OF THE HUMAN EYE. J. Physiol., Oct. 1966, 186(3), 558-578. (Physiological Lab., University of Cambridge, Cambridge, England).

Optical quality of the eye was measured at 8 pupil sizes between 1·5 and 6·6 mm diameter by recording the faint light emerging from the eye; this light was reflected from the bright image of a thin line on the fundus. The nature of the fundus reflexion was examined; it was found that the fundus acts very much like a perfect diffuser while retaining polarization. Using the result that the fundus acts like a diffuser, the recorded line images were Fourier analysed to provide modulation transfer functions. These functions indicate an optical quality considerably higher than that found in previous physical studies. Linespread profiles were then derived from the modulation transfer functions. These profiles are 40% narrower than those of previous physical studies for a 3·0 mm pupil. The narrowest profile occurred with a 2·4 mm pupil. Our results demonstrate that physical and psychophysical studies can yield similar estimates of optical quality. The influence of optical factors not common to both techniques is discussed. Evidence for the existence of neural "image sharpening" mechanisms is reviewed.
R 27

29,190
Kontos, H.A., Richardson, D.W. & Patterson, J.L., Jr. BLOOD FLOW AND METABOLISM OF FOREARM MUSCLE IN MAN AT REST AND DURING SUSTAINED CONTRACTION. Amer. J. Physiol., Oct. 1966, 211 (4), 869-876. (Medicine Dept., Medical College of Virginia, Richmond, Va.).

The distribution of total forearm blood flow (TFBF) between skin and muscle was determined in 21 normal Ss by epinephrine iontophoresis. There was a linear relationship between TFBF on one hand, and forearm muscle or forearm skin blood flow on the other hand. Muscle blood flow averaged 60.2% (range 46.4-76%) of TFBF. During sustained contraction of forearm muscles in 7 Ss, O_2 consumption of muscle increased by an average of 293% of the control value. This increase was met primarily by increases in blood flow and to a much lesser extent by increased extraction of O_2. A good linear correlation between O_2 consumption or CO_2 production of forearm muscle and muscle blood flow was found for the combined resting and exercise data. On the basis of the changes in deep forearm venous blood Po_2 and Pco_2 during exercise, and assuming that these changes are reasonably close approximations of the changes in tissue gas tensions, it was suggested that local hypoxia and hypercapnia cannot account entirely for functional hyperemia of skeletal muscle.
R 23

29,191
Laszlo, Judith I. THE PERFORMANCE OF A SIMPLE MOTOR TASK WITH KINAESTHETIC SENSE LOSS. Quart. J. exp. Psychol., Feb. 1966, 18(1), 1-8. (University of Western Australia, Perth, Australia).

Two related studies were carried out, to test the suitability of the nerve compression block as a technique in the investigation of kinaesthesis in motor skills. In both studies a key tapping task was used. Each experimental group was composed of 6 volunteer Ss. It was found that kinaesthetic sensation was eliminated after pressure had been applied for 20-25 min., but muscle power was not seriously affected at this stage of the block. The results also showed a pronounced performance decrement in the absence of kinaesthetic feedback, and that this decrement was not due to emotional or other disturbances caused by the experimental procedure. The loss of tactile sensation was also observed.
R 6

29,192
Micko, H.C. VIGILANCE-AROUSAL VS. REINFORCEMENT. Quart. J. exp. Psychol., Feb. 1966, 18(1), 39-46. (Gottingen University, Gottingen, Germany).

Task-irrelevant stimuli (projected jokes, which were difficult to read) received an increasing attention as the auditory vigilance session progressed. This result supports reinforcement theories at the cost of activation theory of vigilance.
R 15

29,193
Hamilton, V. SUSCEPTIBILITY TO THE MULLER-LYER ILLUSION AND ITS RELATIONSHIP TO DIFFERENCES IN SIZE CONSTANCY. Quart. J. exp. Psychol., Feb. 1966, 18(1), 63-72. (Psychology Dept., University of Reading, Reading, England).

The hypothesis that susceptibility to the Müller-Lyer illusion is the result of normal constancy scaling, misapplied, was submitted to direct test. No significant correlations between illusion error and size constancy estimates were obtained. Also invalidated were hypotheses that under-constancy is correlated with non-susceptibility to the illusion, and that over-constancy is correlated with greater illusion error. The results suggest than an approach to the explanation of illusion effects by means of analysing individual differences in size constancy, in intelligency and preferred "perceptual style," might be fruitful. Some tentative suggestions are made concerning the role of perceptual inference, abstraction and analysing.
R 21

29,194
Murdock, B.B., Jr. VISUAL AND AUDITORY STORES IN SHORT-TERM MEMORY. Quart. J. exp. Psychol., Aug. 1966, 18(3), 206-211. (Psychology Dept., University of Missouri, Columbia, Mo.).

If retrieval in short-term memory can be either from a pre-perceptual sensory store or from a post-perceptual memory then recall should vary as a function of input into sensory store. To test this possibility 2 experiments with paired associates compared visual and auditory presentation under conditions as comparable as possible. In both experiments modality interacted with retention interval: more recency with auditory but, in Exp. I, more primacy with visual. The interaction was taken as support for the hypothesis. An alternative hypothesis (that storage is post-perceptual but not a-historical) was discussed and weak negative evidence presented.
R 12

29,195
Dale, H.C.A. & Baddeley, A.D. REMEMBERING A LIST OF TWO-DIGIT NUMBERS. Quart. J. exp. Psychol., Aug. 1966, 18(3), 212-219. (Applied Psychology Research Unit, MRC, Cambridge, England).

The way Ss remember a list of 2-digit numbers has been examined in some detail. It is found that intrusions in free recall are not random. They resemble omissions in having the same first digit but not in other ways. This non-randomness of recall errors has been used to construct recognition tests of varying difficulty. Numbers which occurred commonly as intrusions were difficult to distinguish from the correct items when used as distractors in recognition tests. The experiments suggest that the previously observed relationship between recognition efficiency and number of alternatives can be attributed to the increased probability that such intrusions will be included when the total number of distractors is increased.
R 7

29,196
Gottsdanker, R. THE EFFECT OF SUPERSEDING SIGNALS. Quart. J. exp. Psychol., Aug. 1966, 18 (3), 236-249. (Psychology Dept., University of California, Santa Barbara, Calif.).

8 adult human Ss were given a step-tracking task in which an occasional second signal within 50, 70, 90, 120, or 240 msec called for curtailing or reversing the first command. It was found for inter-signal intervals through 120 msec that the shorter the interval the greater was the reduction in amplitude and duration of the majority of responses, with no delay in the effect of the second signal. Where a larger change of response was called for, reversal rather than curtailment, there was a greater effect. A second signal occurring at the 240 msec interval (in almost all cases after the start of the response), had no detectable effect. Since the over-all RT was about 180 msec, it is evident that for at least the first two-thirds of the RT period the initial response is not typically impervious to the effect of a second signal. Contrary to the expectations of the uncommitted-period version of the hypothesis of substitutive grouping a reversing signal at the 50 msec interval did not yield many reversed responses. Moreover this view cannot accommodate the finding that for intervals through 120 msec, relatively few distributions of response amplitude can be accounted for by the summation of instances of response to the first signal alone and to the second signal alone. It is concluded that for these intervals, there were generally either overlapping responses to the 2 signals or else unitary responses in which the 2 signals were grouped to produce a combined effect.
R 8

29,197
Lawson, Everdina A. SPONTANEOUS SPEECH GENERATION. Quart. J. exp. Psychol., Aug. 1966, 18 (3), 254-259. (Phonetics Dept., University College, London, England).

A speech generation task was performed by bilingual Ss whilst they received irrelevant messages in one ear. The irrelevant messages varied in content as well as in language. Although these messages appeared to have a significant influence on the rate of speech, this variation was not consistent with any of the 3 hypotheses suggested. A further speech generation experiment was then carried out in which Ss received as irrelevant auditory input, in one ear, either a prose passage or "emotional" words repeated over a period of 1 min. Although the rate of speech did not seem to be affected by the irrelevant input, a memory test for words spoken, as distinct from words heard, seemed to indicate that the "emotional" words were significantly better recalled than the words from the prose passage. When a control experiment was performed with prose or repeated neutral words as auditory input, no such difference in recall was obtained. This result was seen as favouring Deutsch's model of the blocking of irrelevant speech.
R 5

29,198
Lawson, Everdina A. DECISIONS CONCERNING THE REJECTED CHANNEL. Quart. J. exp. Psychol., Aug. 1966, 18(3), 260-265. (Phonetics Dept., University College, London, England).

It was thought that the physical aspects of auditory stimuli were possibly transmitted via separate pathways from those transmitting the verbal aspects. 3 experiments were designed to test this hypothesis. In these experiments Ss had to perform a shadowing task and had to respond simultaneously on response keys to pips superimposed in either ear on verbal messages. The response to these pips was of increasing complexity, in that it was a simple reaction time which was measured in the first experiment, a choice reaction time in the second experiment and a more complex choice reaction time in the third experiment. Ss were able to perform these tasks although the increasing difficulty was reflected in longer reaction times and more errors. The reaction times to the pips presented to the ear which was not being shadowed were slower, and the errors, made to pips in both channels, were "false positives" rather than errors of omission. These results were taken as favouring the hypothesis.
R 5

29,199
Conrad, R. & Hull, A.J. THE ROLE OF THE INTERPOLATED TASK IN SHORT-TERM RETENTION. Quart. J. exp. Psychol., Aug. 1966, 18(3), 266-269. (Applied Psychology Research Unit, MRC, Cambridge, England).

It has been proposed that a single set of operations based on classical interference theory is adequate to describe the phenomena of both short- and long-term memory. An article by Keppel and Underwood argues that short-term forgetting is due to proactive interference and, by implication, not a result of trace decay. An experiment which varied retention interval and the nature of the interpolated task, gave results which indicate that when the amount forgotten and the nature of errors are considered, a decay model is supported, the proactive interference suggestion being untenable.
R 15

29,200
Thomas, E.A.C. ON DETERMINING PAIN THRESHOLDS USING THE LIMITING METHOD. Quart. J. exp. Psychol., Aug. 1966, 18(3), 270-272. (Mathematical Statistics Dept., University of Cambridge, Cambridge, England).

A model developed by Cane for the study of relative thresholds is modified to apply to absolute thresholds. It is assumed that the fluctuation in the S's sensation of a stimulus is uniformly distributed, and the model is used to estimate the threshold from data presented by several authors.
R 9

29,201
Annett, J. PAYOFF: A NEGLECTED FACTOR IN REACTION TIME MEASUREMENT. Quart. J. exp. Psychol., Aug. 1966, 18(3), 273-274. (Psychology Dept., Hull University, Hull, England).

This paper points out some implications of implicit or explicit payoffs in RT experiments. The instructions given the S in any psychophysical task are represented by a system of payoffs in which there is a fixed penalty for anticipations, and maximum positive score for responses immediately following stimulus onset which declines at an arbitrary rate as a function of elapsed time between onset and response. The instructions thus can be reduced to a simple numerical score which, combined with catch trial rate, represents the average utility of any response at a given time. This procedure can be applied to other cases of stimulus uncertainty, e.g., temporal uncertainty when onset is preceded by a warning signal at a variable interval. In general, it can be said that the utility of responses is invariably lowest at the beginning of the warning interval range and reaches a maximum towards the end of the range.

29,202
Evans, G.B. & Howarth, E. THE EFFECT OF GRIP-TENSION ON TACTILE-KINAESTHETIC JUDGEMENT OF WIDTH. Quart. J. exp. Psychol., Aug. 1966, 18(3), 275-277. (Psychology Dept., University of Alberta, Edmonton, Alberta, Canada).

The effect of various grip-tensions on the accuracy of kinaesthetic width judgements was tested. 40 first-year psychology students were used as Ss. Significant differences in accuracy between pressures were found in the descending adjustments with greatest accuracy at 1·0 kg. Some significant differences were found between pressures in ascending adjustments. All Ss overestimated on the descending and underestimated on the ascending trials at all pressure levels. Increased grip-tension was found to reduce the accuracy of width judgement in terms of constant error while affecting variance only slightly.
R 9

29,203
Morton, H.B. & Wilson, M.E. AN E.C.G. GALVONOMETER USED AS A SHUTTER. Quart. J. exp. Psychol., Aug. 1966, 18(3), 278-279. (Applied Electrophysiology Dept., National Hospitals, London, England & US Veterans Administration Hospital, Boston, Mass.).

This brief article describes a shutter which can be placed in the path of light from a continuously lighted high intensity light source. It is mechanically simple, sturdy, operates silently, and is easy to install. Also, it produces pulses which have brief rise and fall times and durations which may be varied over a wide range. It consists of a small piece of aluminum foil mounted on the writing arm of an ECG pen motor.

29,204
Baddeley, A.D. THE INFLUENCE OF ACOUSTIC AND SEMANTIC SIMILARITY ON LONG-TERM MEMORY FOR WORD SEQUENCES. Quart. J. exp. Psychol., Nov. 1966, 18(4), 302-309. (Applied Psychology Research Unit, MRC, Cambridge, England).

It has been shown that short-term memory (STM) for word sequences is grossly impaired when acoustically similar words are used, but is relatively unaffected by semantic similarity. This study tests the hypothesis that long-term memory (LTM) will be similarly affected. In Exp. 1 Ss attempted to learn one of 4 lists of 10 words. The lists comprised either acoustically or semantically similar words (A and C) or control words of equal frequency (B and D). Lists were learned for 4 trials, after which Ss spent 20 min. on a task involving immediate memory for digits. They were then asked to recall the word list. The acoustically similar list was learned relatively slowly, but unlike the other 3 lists showed no forgetting. Exp. 2 showed that this latter paradox can be explained by assuming the learning score to depend on both LTM and STM, whereas the subsequent retest depends only on LTM. Exp. 3 repeats Exp. 1 but attempts to minimize the effects of STM during learning by interposing a task to prevent rehearsal between the presentation and testing of the word sequences. Unlike STM, LTM proved to be impaired by semantic similarity but not by acoustic similarity. It is concluded that STM and LTM employ different coding systems.
R 18

29,205
Dixon, N.F. & Meisels, Linda. THE EFFECT OF INFORMATION CONTENT UPON THE PERCEPTION AND AFTER-EFFECTS OF A ROTATING FIELD. Quart. J. exp. Psychol., Nov. 1966, 18(4), 310-318. (University College, London, England & Grinnell College, Grinnell, Iowa).

From an investigation of movement after-effects (MAE) induced by a rotating field, data were obtained which suggest: a) that MAE are positively related to information content of the field, inspection time, and velocity (up to a certain maximum, beyond which they decline); b) that the potential for MAE can be preserved during an intervening dark period; c) that the duration of MAE tends to exceed that of the inspection time; d) when the angle subtended by the total field and that subtended by its individual elements are altered together, there is very little effect on MAE; e) MAE does not occur for what were stationary areas within the rotating field; f) following a fixation point which moves with the field does not abolish MAE; g) MAE shows interocular transfer, though diminished; h) a high information content field (black and white squares) resolves into oval forms and regular patterned fields into cross-like forms along diameters of identical elements. The results are consistent with the view that MAEs depend upon movement signalled by the retina/image rather than head/eye signalling system.
R 6

29,206
Grindley, G.C. & Townsend, Valerie. FURTHER EXPERIMENTS ON MOVEMENT MASKING. Quart. J. exp. Psychol., Nov. 1966, 18(4), 319-326. (Psychological Laboratory, Cambridge, England).

Voluntary attention to one of 2 static objects in the peripheral field of one eye makes this object more liable to masking by a moving object in the corresponding area of the field of the other eye (Exp. 1). Positive after images (and probably negative after images) are subject to (binocular) movement masking (Exp. 2). Movement masking can occur in the field of either eye, but with the displays so far tried the inhibitory influence of a moving object is less in the field of the eye to which it is shown than in the field of the other eye (Exp. 3).
R 8

29,207
Macrae, A.W. & Holding, D.H. TRANSFER OF TRAINING AFTER GUIDANCE OR PRACTICE. Quart. J. exp. Psychol., Nov. 1966, 18(4), 327-333. (University of Leeds, Leeds, England).

On a pursuit tracking apparatus presenting target courses of 3 levels of complexity, provision was made for either normal practice or forced-response guidance; the guidance training was gained by holding the control knob during automatic tracking. After 5 training trials on the most complex course, or on the simplest course, Ss were transferred to the intermediate course. The effects of guidance on the intermediate course were also examined. Normal practice on the simple course produced more transfer than normal practice on the most complex. Further, guidance on the complex course gave significantly better transfer than did practice on that course. The superiority of guidance is tentatively ascribed to the opportunity it provides for the development of anticipation.
R 9

29,208
Rabbitt, P.M.A. TIMES FOR TRANSITIONS BETWEEN HAND AND FOOT RESPONSES IN A SELF-PACED TASK. Quart. J. exp. Psychol., Nov. 1966, 18(4), 334-339. (Applied Psychology Research Unit, MRC, Cambridge, England).

In a self-paced task Ss responded to each of 4 equally probable signals with a different one of their 4 limbs. Response times were examined as a function of the 16 possible transitions between limbs. Repeated responses were shown to be faster than any other transitions, while responses following responses with an ipsilateral limb were relatively slow. The implications of these results for models for the "repetition effect" are discussed.
R 10

29,209
Oldfield, R.C. THINGS, WORDS AND THE BRAIN. Quart. J. exp. Psychol., Nov. 1966, 18(4), 340-353. (Institute of Experimental Psychology, University of Oxford, Oxford, England).

This paper discusses the experimental work mainly of the Medical Research Council Psycholinguistics Research Unit at Oxford. Language generation is examined via the identification and naming of objects as a function of name-frequency and object-familiarity. Comparisons are made among dysphasics and normals in terms of naming latencies. The findings are interpreted relative to the nature of one's word storage and retrieval system.
R 21

29,210
Von Sturmer, G. STIMULUS VARIATION AND SEQUENTIAL JUDGEMENTS OF DURATION. Quart. J. exp. Psychol., Nov. 1966, 18(4), 354-357. (Psychology Dept., Monash University, Victoria, Australia).

When a series of reproductions of an interval is made in the absence of a standard the judgements progressively lengthen. The similarity between stimulus conditions in this type of time estimation experiment and the conditions which produce a decrement in human vigilance is discussed. It is argued that failure to detect cues for the passage of time reduces the amount of time perceived to elapse. Reproduced judgements must consequently be increased in length to match remembered standards. The hypothesis is then made that the kind of variation in background stimulation which facilitates vigilance should increase the frequency of detection of cues for duration and reduce reproduced judgements. This hypothesis is tested with 80 Ss and a reversal of the serial reproduction effect is found on trials with changed background conditions.
R 11

29,211
Tune, G.S. ERRORS OF COMMISSION AS A FUNCTION OF AGE AND TEMPERAMENT IN A TYPE OF VIGILANCE TASK. Quart. J. exp. Psychol., Nov. 1966, 18(4), 358-361. (Psychology Dept., University of Liverpool, Liverpool, England).

40 Ss monitored a 40 min. series of 10-sec. intervals containing digits (spoken at the rate of 1 per sec.), each followed by 10-sec. silence. The task was to report whether or not 3 consecutive and different odd digits occurred. Responses were forced. The results showed that there was no correlation between either age or temperament and the number of correct detections made. Older Ss, however, made more errors of commission, and were less able to distinguish wanted from unwanted events. The younger and introverted Ss appeared to be more cautious. The data is discussed in terms of the arousal theory of vigilance performance.
R 14

29,212
Baddeley, A.D. SHORT-TERM MEMORY FOR WORD SEQUENCES AS A FUNCTION OF ACOUSTIC, SEMANTIC AND FORMAL SIMILARITY. Quart. J. exp. Psychol., Nov. 1966, 18(4), 362-365. (Applied Psychology Research Unit, MRC, Cambridge, England).

Exp. 1 studied short-term memory (STM) for auditorily presented 5 word sequences as a function of acoustic and semantic similarity. There was a large adverse effect of acoustic similarity on STM (72.5%) which was significantly greater ($p < 0.001$) than the small (6.3%) but reliable effect ($p < 0.05$) of semantic similarity. Exp. 2 compared STM for sequences of words which had a similar letter structure (formal similarity) but were pronounced differently, with acoustically similar but formally dissimilar words and with control sequences. There was a significant effect of acoustic but not of formal similarity. Exp. 3 replicated the acoustic similarity effect found in Exp. 1 using visual instead of auditory presentation. Again a large and significant effect of acoustic similarity was shown.
R 8

29,213
Gubisch, R.W. OVER-CONSTANCY AND VISUAL ACUITY. Quart. J. exp. Psychol., Nov. 1966, 18(4), 366-368. (Physiological Laboratory, Cambridge, England).

This note considers the possible influences of visual acuity upon size-constancy measurements. Given that the blur of the retinal image adds a fixed amount to the perceived size of a target, the percentage overestimation in judging size from such an image will decrease with increasing object size. Thus the estimated size of a small target is too large by an amount in fixed proportion to the optical blur present, the relation between overestimation and true size being hyperbolic.
R 5

29,215
Williams, C.E., Hecker, M.H.L., Stevens, K.N. & Woods, Barbara. INTELLIGIBILITY TEST METHODS AND PROCEDURES FOR THE EVALUATION OF SPEECH COMMUNICATION SYSTEMS. FINAL REPORT. Contract AF19(628) 5659, Proj. 2808, ESD TR 66 677, BBN Rep. 1442, Dec. 1966, 72pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

In further exploring the Modified Rhyme Test (MRT), a recently developed intelligibility test designed for the evaluation of speech communication systems under operational military conditions, research has been conducted in the following areas: a) the relation between MRT scores and other intelligibility test scores for various types and levels of speech distortion; b) the influence of the closed-response format and listening experience on MRT scores; and c) speaker intelligibility and the selection of speakers for recording the test lists. The present report describes the work undertaken in each of these areas. The ultimate objective of the work is the development of valid procedures for the efficient evaluation of speech communication systems. The major experimental results demonstrate that a) the relation between scores obtained with different intelligibility test materials is not unique but depends considerably on the type of speech distortion employed; b) neither the closed-response format nor prior listening experience appreciably affects MRT scores; and c) less intelligible speakers tend to be those whose voiceless consonants are generated with lower intensity, particularly in word-final position.
R 10

29,216
Peterson, G.E. RESEARCH ON SPEECH COMMUNICATION. AUTOMATIC SPEECH RECOGNITION. PROGRESS REPORT. Grant AF AFOSR 595 65, AFOSR 66 0186, Jan. 1966, 18pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.). (AD 478122)

The long-range objective of the research program with the Information Sciences Directorate is to conduct fundamental studies on the problems of speech communication and automatic speech recognition. Throughout the program of research, the work has been directed toward developing a more basic understanding of the essential structural units of speech, and in particular toward the transformation of the acoustical parameters of speech to a discrete code. The research is oriented toward the general problem of automatic speech recognition, namely the recognition of continuous speech.
R 27

29,217
Carhart, R. (Princ. Investigator). AUDITORY FUNCTION OF THE HEARING IMPAIRED. FORMAL PROGRESS REPORT II. Contract AF 41(609) 2643, Proj.-Task 775508, Dec. 1965, 57pp. Auditory Research Lab., Northwestern University, Evanston, Ill. (AD 478584)

The basic goal during the initial phases of the work has been to develop a discrimination test which could be administered to the same individual over and over without affecting either the slope of his articulation function for the materials or the level of his performance at the plateau of the function. Accordingly, 3 sub-experiments were performed: the first measured 10 normal hearing Ss articulation functions for 4 lists of N.U. Auditory Test No. 6-M in a quiet listening environment; the second stage examined the performance of Ss with sensorineural hearing impairments in quiet; the third experiment was again similar in design however, the articulation functions were obtained from normal hearing Ss in noise. The results of this series were seen as sufficiently positive to proceed to the next stage in which the effects of hearing loss of various types and degrees on the communicative efficiency of individuals in simulated AF environments will be evaluated.

29,219
Mayo, G.D. & Longo, A.A. TRAINING TIME AND PROGRAMED INSTRUCTION. J. appl. Psychol., Feb. 1966, 50(1), 1-4. (USN Air Technical Training Command, Memphis Air Station, Tenn.).

The hypothesis was tested that training time can be reduced by means of programed instruction, without loss in training quality. 226 US Navy and Marine Corps trainees in electronics fundamentals served as Ss. A matched group design was used in which a 31% time saving on the part of the programed instruction group was an integral part of the experiment. On the 2 measures of learning, which followed the instruction, the programed instruction group scored significantly higher ($p<.01$) on one, while no significant difference was found on the other. The hypothesis was considered to be sustained.
R 6

29,220
Bruvold, W.H. & Pangborn, Rose M. RATED ACCEPTABILITY OF MINERAL TASTE IN WATER. J. appl. Psychol., Feb. 1966, 50(1), 22-32. (University of California, Berkeley, Calif. & University of California, Davis, Calif.).

Solutions of 1000 and 2000 ppm (mg. per liter) of Na_2SO_4, $NaHCO_3$, $CaSO_4$, $MgSO_4$, NaCl, $CaCl_2$, $MgCl_2$, and Na_2CO_3 were rated on an acceptability scale in 3 separate studies. Results showed that the minerals ranked in acceptability approximately as listed. Implications of the findings were discussed mainly in regard to detection thresholds for the 8 minerals and consumer acceptance of naturally mineralized ground waters used for domestic supplies.
R 12

29,221
Johnson, E.M. & Payne, M.C., Jr. VIGILANCE: EFFECTS OF FREQUENCY OF KNOWLEDGE OF RESULTS. J. appl. Psychol., Feb. 1966, 50(1), 33-34. (Georgia Institute of Technology, Atlanta, Ga.).

For an hour Ss observed an oscilloscope on which 8 signals appeared per 15 min which they were to report. Knowledge of results was given after 0%, 25%, 50%, 75%, or 100% of the signals. Significant differences occurred between the number of targets detected by the 0% and 25% groups, the 25% and 50% groups, but none between the 50%, 75%, and 100% groups. The vigilance decrement was not significantly affected by frequency of KR.
R 13

29,222
Hunt, D.P. EFFECTS OF DISCRETE TRANSFORMATIONS OF CONTROLLER OUTPUTS ON HUMAN TRACKING PERFORMANCE. J. appl. Psychol., Feb. 1966, 50(1), 35-40. (University of Dayton, Dayton, Ohio).

4 groups of 8 Ss each performed a compensatory tracking task using an acceleration control system. Each group employed a different controller output transformation: 3-, 5-, 7-category, or continuous. Each S used 4 gain (G) levels. Both tracking accuracy and economy were measured. The number of output categories (C) significantly affected the economy ($p<.05$) but not the accuracy of performance. The G effects were significant for both accuracy ($p<.001$) and economy ($p<.001$). Accuracy improved and economy decreased monotonically over the lower 3 gains so that there was a trade-off between the 2 performance measures; at the highest gain both accuracy and economy were degraded. Although inspection of the accuracy data suggests that as the number of output categories increases the opti ' gain becomes higher, the G x C interaction was not significant.
R 9

29,223
Lockhart, J.M. EFFECTS OF BODY AND HAND COOLING ON COMPLEX MANUAL PERFORMANCE. J. appl. Psychol., Feb. 1966, 50(1), 57-59. (Pioneering Research Div., USA Natick Laboratories, Natick, Mass.).

12 United States Army enlisted men were tested on 3 manual tasks, knot-tying (KT), block-stringing (BS), and block-packing (BP), under 4 conditions: a) Control--Mean Weighted Skin Temperature (MWST) 90.0°F, Hand Skin Temperature (HST) 93.0°F; b) Cold Body--MWST 69.0°F, HST 90.4°F; c) Cold Hand--MWST 85.8°F, HST 45.7°F; and d) Cold Hand-Body--MWST 68.5°F, HST 45.8°F. The 3 cooling conditions had a differential effect across the 3 tasks. Cold Body was the only condition that did not result in significant decrements for all tasks. Knot-tying was unaffected by body cooling. The results were interpreted in terms of the differential effect of cooling the hand or body upon various aspects of complex manual performance.
R 4

29,224
Locke, E.A. THE RELATIONSHIP OF INTENTIONS TO LEVEL OF PERFORMANCE. J. appl. Psychol., Feb. 1966, 50(1), 60-66. (American Institute for Research, Washington, D.C.).

3 laboratory experiments are reported which stem from Ryan's approach to motivation. The fundamental unit is the "intention." The experiments examined the relationship between intended level of achievement and actual level of performance. A significant linear relationship was obtained in all 3 experiments: the higher the level of intention, the higher the level of performance. The findings held both between and within Ss and across different tasks. The implications for the explanation of behavior are discussed.
R 19

29,225
Howell, W.C. & Tate, J.D. INFLUENCE OF DISPLAY, RESPONSE, AND RESPONSE SET FACTORS UPON THE STORAGE OF SPATIAL INFORMATION IN COMPLEX DISPLAYS. J. appl. Psychol., Feb. 1966, 50(1), 73-80. (Ohio State University, Columbus, Ohio).

Immediate recall for spatial information was studied as a function of stimulus load under 2 display formats, 2 response formats, and 2 response set conditions. 4 groups of 10 Ss each served under 15 replications of all response-format, stimulus-load conditions; groups were distinguished on the basis of display format and set. Each S viewed either a spatial or tabular display of 14-26 geometrical stimuli for 16 sec.; he was then required to report--on either a tabular or spatial response form--the location of relevant stimuli. Correct responses and misplacement errors increased more rapidly for the spatial format as more stimuli were presented. Recoding from 1 display to the other response format did not yield serious decrements. Contrary to expectation, response set enhanced all conditions to a nearly equivalent degree. Results are interpreted in terms of the "chunking" hypothesis.
R 16

29,226
Baddeley, A.D. INFLUENCE OF DEPTH ON THE MANUAL DEXTERITY OF FREE DIVERS: A COMPARISON BETWEEN OPEN SEA AND PRESSURE CHAMBER TESTING. J. appl. Psychol., Feb. 1966, 50(1), 81-85. (Applied Psychology Research Unit, MRC, Cambridge, England).

Using a compression chamber, Kiessling and Maag (1962) showed a decline in manual dexterity at a pressure simulating 100 ft. of water. Impairment was slight (7.9%) and was assumed to be of little practical importance. The present study examines this conclusion by testing divers in the water. The manual dexterity and tactile sensitivity of 12 free divers were tested above the surface, and at 10 and 100 ft. below the surface. The dexterity test took 28% longer at 10 ft. and 49% longer at 100 ft. than on the surface, the differences between all conditions being significant ($p < .005$). Tactile sensitivity did not change. Replication in a dry pressure chamber showed an impairment of less than 6%, which though reliable ($p>.05$) was significantly smaller than that shown in the open sea ($p<.05$). Conclusions are: a) the impairment of manual dexterity at depth is considerable when tested under water; b) it is unwise to generalize from pressure chamber experiments to under water performance.
R 9

29,228
Peters, D.L. & McCormick, E.J. COMPARATIVE RELIABILITY OF NUMERICALLY ANCHORED VERSUS JOB-TASK ANCHORED RATING SCALES. J. appl. Psychol., Feb. 1966, 50(1), 92-96. (Occupational Research Center, Purdue University, Lafayette, Ind.).

This study compared the effectiveness with which job-task anchored equal-appearing interval scales could be used in contrast with scales anchored only by simple numerical benchmarks. 2 groups of judges rated identical lists of job-task statements in terms of both types of scales. Ratings were made on 5 sensory/physical dimensions of job activities. The reliabilities of ratings for all scales were computed by an analysis of variance approach. In a test of statistical significance across all 5 scale dimensions, it was found that job-task anchored scales could generally be used with significantly greater reliability than simple numerically anchored scales.
R 12

29,229
Johnston, W.A. TRANSFER OF TEAM SKILLS AS A FUNCTION OF TYPE OF TRAINING. J. appl. Psychol., April 1966, 50(2), 102-108. (Ohio State University, Columbus, Ohio).

5 groups varying in training context (team vs individual) and skill acquisition (individual, coordination, and communication skills) were compared at transfer on team (coordination of interceptions) and individual (number of interceptions) performance of a simulated radar-controlled aerial intercept task. Individual performance was unaffected by the training variables, but team performance was a positive function of the emphasis on coordination skills during training. When acquisition of coordination skills was held constant, context had no effect on transfer performance. Intrateam communications retarded performance but prohibiting these communications during training did not lessen their disruptive effect at transfer. This inhibitory influence of team communications reflected the verbal transmittal of information irrelevant to the task or more readily obtainable from the radar scopes.
R 9

29,230
Silver, C.A., Jones, J.M. & Landis, D. DECISION QUALITY AS A MEASURE OF VISUAL DISPLAY EFFECTIVENESS. J. appl. Psychol., April 1966, 50(2), 109-113. (Franklin Institute Research Laboratories, Philadelphia, Penn.).

A new gaming technique was employed in an attempt to evaluate more accurately the effectiveness of visual displays. 18 male university students acted as traffic managers for a hypothetical trucking concern. Trucking information was presented in map-plus-overlay displays and Ss manipulated trucks, drivers, and loads within the framework of the economic rules governing the trucking operation. A computer program was written which determined the profit in dollars of each Ss performance. 3 independent variables a) use of color, b) fact density, c) compression (ratio of symbols to facts) were used in this repeated measures design. The analysis of variance indicated that profit was a positive function of increasing fact density ($p<.001$), and that there was a significant interaction between fact density and color ($p<.001$), and fact density and compression ($p<.05$). The usefulness of this technique in differentiating among structurally different visual displays was discussed.
R 8

29,231
Briggs, G.E. & Johnston, W.A. STIMULUS AND RESPONSE FIDELITY IN TEAM TRAINING. J. appl. Psychol., April 1966, 50(2), 114-117. (Ohio State University, Columbus, Ohio).

Transfer performance of 2-man teams was observed in a simulated radar-controlled aerial intercept task following either high or low stimulus (S-) fidelity and either high or low response (R-) fidelity training treatments. Both high S- and high R-fidelity training treatments resulted in superior transfer task performance; however, the effects of high R-fidelity training were relatively brief. It was concluded that whereas both are desirable, it is less important to provide high R-fidelity training at least for tasks where the major output requires verbal communication skills.
R 3

29,232
Brown, I.D. AN ASYMMETRICAL TRANSFER EFFECT IN RESEARCH ON KNOWLEDGE OF PERFORMANCE. J. appl. Psychol., April 1966, 50(2), 118-120. (Applied Psychology Research Unit, MRC, Cambridge, England).

Gibbs and Brown (1955) reported that the motivational aspect of knowledge of results had a significant effect upon performance of a repetitive monotonous task, aside from its informative and rewarding aspects. In an experiment with 12 Ss, output on document copying was 25% higher when it was displayed on a digital counter than when the counter was covered. Chapanis (1964) duplicated the main features of the experiment by testing 16 Ss on the task of punching teletype tape and found there was no significant advantage in displaying output. The present note demonstrates that the discrepancy between these findings results from a difference between the experimental designs used. The 2-way asymmetrical transfer effects produced by Gibbs and Brown's design, in which Group I had condition K then NK, Group II had NK then K, show that knowledge of results may have a significant effect only when the task has previously been performed without it. The importance of other variables for future investigations of this topic are also briefly discussed.
R 3

29,233
Darlington, R.B. & Stauffer, G.F. USE AND EVALUATION OF DISCRETE TEST INFORMATION IN DECISION MAKING. J. appl. Psychol., April 1966, 50(2), 125-129. (Cornell University, Ithaca, N.Y.).

Elementary decision theory is applied to the problems of evaluating discrete tests or test items used to classify people into several categories, and choosing which of several treatments is best for persons falling within each response category. The technique explicitly considers the base rates of the various criterion groups and the relative seriousness of different types of errors of classification, as well as the proportion of each criterion group falling in each response category.
R 5

29,234
Neidt, C.O. & Meredith, Terry F. CHANGES IN ATTITUDES OF LEARNERS WHEN PROGRAMED INSTRUCTION IS INTERPOLATED BETWEEN TWO CONVENTIONAL INSTRUCTION EXPERIENCES. J. appl. Psychol., April 1966, 50(2), 130-137. (Colorado State University, Fort Collins, Colo.).

The purpose of this study was to determine the nature of changes in student attitudes when programed instruction is interpolated between conventional instruction experiences. 5 parallel forms of a 26-item Likert type attitude scale were administered in counterbalanced order to 70 airmen studying radiation detection and 53 airmen studying camera repair at Lowry Air Force Base. Both courses included several weeks of lecture, a programed unit, and several more weeks of conventional instruction. Students' attitudes were significantly more favorable during the programed unit in both courses. Changes were considerably more pronounced for the 17 highest ability students.
R 15

29,235
Hartson, L.D. A PRELIMINARY STUDY OF A TEST FOR AIR TRAFFIC CONTROLLERS. J. appl. Psychol., April 1966, 50(2), 138-142. (Oberlin College, Oberlin, Ohio).

A test, employing the analogies format, was constructed from diagrams representing jet aircraft on a radar scope. From the verbalized reactions to the problems presented by the test, of the air flight controllers who acted as Ss, sketches were prepared describing each S's attitudes and methods of handling the potential confrontations indicated. When these sketches were read to 3 members of the training staff of the Oberlin FAA Center each judge made a perfect score in identifying the Ss.

29,236
Friedlander, F. MOTIVATIONS TO WORK AND ORGANIZATIONAL PERFORMANCE. J. appl. Psychol., April 1966, 50(2), 143-152. (USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif.).

Measures of 3 types of motivation to work were related to 2 criteria of job performance, both of which reflect the degree to which the organization has rewarded individual behaviors. In the white-collar sample (N=1,047), which was composed largely of technical personnel, low performers were motivated primarily by the social environment of the job and, to a lesser extent, by the opportunity of gaining recognition through advancement, but few significant relationships were found between intrinsic self-actualizing motivations and job performance. In the blue-collar sample (N=421), no significant relationships were found between any of the motivational measures and job performance. With advancing age and tenure, work became more meaningful for high performers but less meaningful for low performers, although the importance of the social environment increased for both high and low performers.
R 17

29,237
Rorer, L.G., Hoffman, P.J., LaForge, Gail E. & Hsieh, K-C. OPTIMUM CUTTING SCORES TO DISCRIMINATE GROUPS OF UNEQUAL SIZE AND VARIANCE. J. appl. Psychol., April 1966, 50(2), 153-164. (Oregon Research Institute, Eugene, Ore.).

The accuracy with which a test classifies people, objects, or events as belonging to 1 of 2 groups depends upon: the distance between the means, the relative variability, and the relative size of the 2 groups. An analytical method is presented for determining the optimal cutting score when estimates of these parameters are available and when it can be assumed that the test scores are normally distributed for each of the 2 groups. In order to assess a test's incremental contribution to accuracy, the proportion of erroneous decisions to be expected on the basis of optimum cutting scores must be compared with the proportion of erroneous decisions to be expected on the basis of the base rates alone. It is shown that many situations exist in which "valid" tests cannot improve upon base-rate predictions. Tables are provided for a rapid determination of the optimal cutting score for a given condition; these tables also indicate the conditions under which base-rate predictions should be made and the proportion of erroneous decisions to be expected when the optimum strategy is used.
R 9

29,238
Brinkmann, E.H. PROGRAMED INSTRUCTION AS A TECHNIQUE FOR IMPROVING SPATIAL VISUALIZATION. J. appl. Psychol., April 1966, 50(2), 179-184. (Southern Illinois University, Edwardsville, Ill.).

This study investigated the feasibility of using a specially designed self-instructional program to teach the visualization of space relations. A 505-item program, using selected concepts of geometry to help condition the classes of behaviors specified as components of the visual-spatial functions, was administered to a group of 27 8th-grade pupils; a carefully matched control group, receiving only the pre- and posttests, continued with its regularly scheduled mathematical classwork presented in the conventional manner. Results indicated that the Ss receiving the program scored significantly ($p<.001$) higher than the control group. It was also indicated that the attitudes of the learner may be an important factor in the effectiveness of programed instruction.
R 7

29,239
Centers, R. & Bugental, Daphne E. INTRINSIC AND EXTRINSIC JOB MOTIVATIONS AMONG DIFFERENT SEGMENTS OF THE WORKING POPULATION. J. appl. Psychol., June 1966, 50(3), 193-197. (University of California, Los Angeles, Calif.).

A selected cross-section of the working population (N=692) was interviewed with respect to their job motivations. The extent to which extrinsic or intrinsic job components were valued was found to be related to occupational level. At higher occupational levels, intrinsic job components (opportunity for self-expression, interest-value of work, etc.) were more valued. At lower occupational levels, extrinsic job components (pay, security, etc.) were more valued. No sex differences were found in the value placed on intrinsic or extrinsic factors in general. However, women placed a higher value on "good co-workers" than did men, while men placed a relatively higher value on the opportunity to use their talent or skill.
R 14

29,240
Halpern, G. RELATIVE CONTRIBUTIONS OF MOTIVATOR AND HYGIENE FACTORS TO OVERALL JOB SATISFACTION. J. appl. Psychol., June 1966, 50(3), 198-200. (Educational Testing Service, Princeton, N.J.).

Ratings of 4 motivator job aspects, 4 hygiene job aspects, and overall job satisfaction were obtained from 93 male Ss who were equally satisfied with both the motivator and the hygiene aspects of their jobs. 2 of the job aspects (work itself and opportunity for achievement), both motivators, were sufficient to account for the variance in overall satisfaction.
R 2

29,241
Briggs, G.E. & Wiener, E.L. INFLUENCE OF TIME SHARING AND CONTROL LOADING ON TRANSFER OF TRAINING. J. appl. Psychol., June 1966, 50(3), 201-203. (Ohio State University, Columbus, Ohio).

The hypothesis was confirmed that in a tracking task low fidelity of control-device loading during training would result in near-100% transfer when time-sharing requirements are at a relatively low level, but it would result in significantly less than 100% transfer when such requirements are at a relatively high level.
R 3

29,242
Ash, P. A NOTE ON THE JUDGMENT OF SPEAKER EFFECTIVENESS. J. appl. Psychol., June 1966, 50 (3), 204-205. (Inland Steel Company, Chicago, Ill.).

Ratings of the effectiveness of the speaker at each of 14 meetings (attended by 445 participants, including some who attended more than 1 meeting) on an 8-item rating scale showed that a simple rating procedure can yield useful discrimination as to the excellence of public speaker addressed meetings. However, this discrimination is primarily on a general or overall factor, with little evidence of differentiation among such elements as the speaker's qualifications or ability, topic coverage, personal gain from meeting, or satisfaction of expectations. Ratings of "timeliness of topic" alone tended to be somewhat independent of the evaluation of the meeting itself. Ratings of the effectiveness of the speaker were not significantly correlated with attendance at the meetings: good speakers do not necessarily get large audiences, and vice versa.

29,243
Kugelmass, S. & Lieblich, I. EFFECTS OF REALISTIC STRESS AND PROCEDURAL INTERFERENCE IN EXPERIMENTAL LIE DETECTION. J. appl. Psychol., June 1966, 50(3), 211-216. (Hebrew University, Jerusalem, Israel).

Two different samples of police trainees were used to investigate: a) the effect of realistic stress in experimental lie detection; b) the possible interference with the GSR channel resulting from the simultaneous recording of blood pressure. It was found that: a) GSR detection results under stress were essentially similar to those obtained in mild experimental situations, and far superior in detection efficiency to analysis of heart rate changes. b) The introduction of a blood-pressure cuff inflated to 80 mm. Hg for the 90 sec of interrogation (similar to actual field measurement conditions) reduced the efficiency of detection of the GSR channel. c) There is some suggestion that GSR reactivity may be related to ethnic origin.
R 11

29,244
Worchel, P., Byrne, D. & Young, R.K. EVALUATION OF AN OBSTACLE DETECTOR FOR THE BLIND. J. appl. Psychol., June 1966, 50(3), 225-228. (University of Texas, Austin, Tex.).

This investigation was an attempt to evaluate the effectiveness of an electronic obstacle-detecting (O/D) device for the blind. Ss were 26 totally blind individuals. 3 series of training sessions on the O/D were conducted. Performance was assessed in 1 pretraining session with the customary mode of travel and 3 posttraining sessions with O/D. Ss were also given several psychological tests and 2 interviews. Using the O/D on a standard obstacle course, Ss took longer to walk than with customary aid, but errors were the same. Ss who walk unassisted made many fewer errors with the O/D than without it. For those Ss using a cane or a dog, the O/D was of little help. After more training on the use of the O/D, Ss reduced the time to walk the obstacle course while errors remained about the same. On the field tests Ss made fewer errors but took longer with the customary mode of travel than with the O/D. About 1/2 of Ss indicated a desire to own the instrument.
R 5

29,245
Harris, D. EFFECT OF EQUIPMENT COMPLEXITY ON INSPECTION PERFORMANCE. J. appl. Psychol., June 1966, 50(3), 236-237. (Autonetics Div., North American Aviation, Inc., Downey, Calif.).

62 experienced inspectors inspected 10 different items of electronic equipment covering a wide range of complexity. 8 or more inspectors inspected each item. Inspection performance was found to have an almost perfect inverse relationship with equipment complexity. r' between percentage of defects detected and pair comparison ratings of complexity was -.92; r' between percentage of defects detected and number of parts was -.91. The results indicated that equipment complexity has a significant detrimental effect on inspection performance and that this effect cannot be overcome by extending the amount of inspection time allotted.

29,246
Smith, R.L., Lucaccini, L.F., Groth, Hilde & Lyman, J. EFFECTS OF ANTICIPATORY ALERTING SIGNALS AND A COMPATIBLE SECONDARY TASK ON VIGILANCE PERFORMANCE. J. appl. Psychol., June 1966, 50(3), 240-246. (University of California, Los Angeles, Calif.).

This visual vigilance study simulated an industrial inspection task in which Ss were alerted to possible targets by a semiautomatic detection device. One experimental group was forewarned of possible targets by a buzzer with 1-sec foreperiod and rested between alerting signals. A 2nd experimental group worked on a problem-solving secondary task instead of resting between buzzes. A control group observed the display continuously. Other variables of interest were sex of observer, target type, and size of display window. It was found that: a) performance by alerted groups was far superior to that of controls and continued to improve throughout the task; b) a vigilance decrement was not in evidence in any condition; c) the problem-solving task did not interfere with detection performance; d) male and female Ss performed equally well; e) Ss engaged in the problem-solving task greatly underestimated the duration of the detection task and reported it "interesting" while the other groups estimated duration accurately and indicated boredom.
R 16

29,247
Friedlander, F. PERFORMANCE AND INTERACTIONAL DIMENSIONS OF ORGANIZATIONAL WORK GROUPS. J. appl. Psychol., June 1966, 50(3), 257-265. (USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif.).

Perceptions of group adequacy and interaction processes by 91 members of 12 work groups in an R&D organization were factor analyzed. 6 reliable dimensions evolved which cut across several previously defined constructs and differentiated the 12 work groups from each other beyond the .01 level by ANOVAs. Of the total group phenomena variance, 33% was accounted for by a single dimension of group effectiveness in problem solving. This dimension correlated negatively with a) the occupational and educational level of the group; b) the educational heterogeneity of the group; c) group size; and d) the level of the group in the organizational hierarchy. These findings suggest that different principles may govern traditioned organizational work groups vs ad hoc groups formed specifically for the purpose of an experiment.
R 21

29,248
Fealtock, J.B., Southard, J.F., Kobayashi, M. & Howell, W.C. ABSOLUTE JUDGMENT OF COLORS IN THE FEDERAL STANDARDS SYSTEM. J. appl. Psychol., June 1966, 59(3), 266-272. (Ohio State University, Columbus, Ohio).

3 experiments were conducted a) to determine the number of Federal Standards colors which normal and deuteranopic Ss can identify absolutely under a variety of viewing conditions, and b) to identify optimum subsets of these colors for information coding under various operational circumstances. Results suggest that under optimal circumstances Ss can identify 24 Federal Standard colors, a number far in excess of most earlier estimates. Furthermore, careful selection can provide a 10-color subset identifiable under even marginal lighting conditions by normal Ss, and an 8-color sebset identifiable even by deuteranopes. Discrepancies between these and earlier findings are explained primarily on the basis of insufficient color-label training.
R 12

29,249
Smith, Patricia C. & Curnow, R. "AROUSAL HYPOTHESIS" AND THE EFFECTS OF MUSIC ON PURCHASING BEHAVIOR. J. appl. Psychol., June 1966, 50(3), 255-256. (Cornell University, Ithaca, N.Y.).

This study replicates, in a naturalistic setting, a prior finding which supported that portion of the "arousal hypothesis" which predicts that a certain degree of noise will actually increase activity. Music was varied from loud to soft in 8 counterbalanced experimental sessions in 2 large supermarkets (N=1,100). The "arousal hypothesis" seems to account for the results: signficantly less time was spent in the markets during the loud session, although there was no significant difference in sales, nor in the customers' reported satisfaction.
R 7

29,250
Locke, E.A. & Bryan, Judith F. COGNITIVE ASPECTS OF PSYCHOMOTOR PERFORMANCE: THE EFFECTS OF PERFORMANCE GOALS ON LEVEL OF PERFORMANCE. J. appl. Psychol., Aug. 1966, 50(4), 286-291. (American Institutes for Research, Washington, D.C.).

An experiment stemming from Mace's work on the effects of performance standards on level of performance is reported. It was found that Ss given specific (but difficult) standards performed at a higher level on a complex psychomotor task than Ss told to "do their best," thus replicating Mace's finding with a computation task. In contrast to Mace's study where performance goals worked by prolonging effort during the latter part of the work periods, the standards intensified effort at all stages of the work periods in the present case.
R 9

29,251
Megargee, E.I., Bogart, Patricia & Anderson, Betty J. PREDICTION OF LEADERSHIP IN A SIMULATED INDUSTRIAL TASK. J. appl. Psychol., Aug. 1966, 50(4), 292-295. (University of Texas, Austin, Tex.).

Ss high and low in dominance were selected with the California Psychological Inventory (CPI) Dominance (Do) scale and confronted with a simulated industrial task which could be solved best by 1 person assuming a leader role and the other following his instructions. When the instructions emphasized the task, the High Do Ss did not assume the leader role significantly more often than the Low Do Ss. When leadership was emphasized, however, the High Do Ss assumed the leader role in 90% of the pairs. It is concluded that the CPI Do scale has predictive validity when leadership is made salient.
R 9

29,252
Woodhead, Muriel M. AN EFFECT OF NOISE ON THE DISTRIBUTION OF ATTENTION. J. appl. Psychol., Aug. 1966, 50(4), 296-299. (Applied Psychology Research Unit, MRC, Cambridge, England).

A paced search of a visual display was made in auditory conditions containing bursts of noise at either 68 db or 105 db. Each selected visual item required 2 types of response, crossing out and counting. The preferred activity in the quieter condition was counting. When the test instructions emphasized this aspect of the task, attention shifted further toward the preferred activity during loud noise. When the instructions emphasized searching, there were no significant differences between noise and quiet. It appears that although noise will not always induce a redistribution of the attention needed to respond equally often in 2 paced activities, when it does so, the preferred activity gains.
R 6

29,253
Conrad, R. SHORT-TERM MEMORY FACTOR IN THE DESIGN OF DATA-ENTRY KEYBOARDS: AN INTERFACE BETWEEN SHORT-TERM MEMORY AND S-R COMPATIBILITY. J. appl. Psychol., Oct. 1966, 50(5), 353-356. (Applied Psychology Research Unit, MRC, Cambridge, England).

An experiment on immediate recall of 8-digit sequence was carried out. Mode of recall was via a data-entry keyboard. 2 keyboard layouts were used, one of high, one of low compatibility. The low-compatibility keyboard required more time for entry and gave more errors. These extra errors were identified as being primarily memory rather than aiming errors. The results are discussed in terms of an interface between short-term memory and S-R compatibility; they are held to support a memory model involving a limited-capacity channel, and a practical design conclusion is suggested.
R 10

29,254
Singh, T.N. & Baumgartel, H. BACKGROUND FACTORS IN AIRLINE MECHANICS' WORK MOTIVATIONS: A RESEARCH NOTE. J. appl. Psychol., Oct. 1966, 50(5), 357-359. (University of Bhagalpur, India & University of Kansas, Lawrence, Kan.).

A correlational analysis of a number of questionnaire items assessing the importance of various aspects of the work situation showed 2 themes: one referred primarily to needs for advancement and the other to needs for security and stability in job and interpersonal relations. Level of educational achievement bears a positive relationship with advancement motivation. Age is, independently, negatively related to advancement needs. Trends exist to indicate converse relationships between education and age and the need for security and stability.
R 4

29,255
Schwartz, H.A. & Haskell, R.J., Jr. A STUDY OF COMPUTER-ASSISTED INSTRUCTION IN INDUSTRIAL TRAINING. J. appl. Psychol., Oct. 1966, 50(5), 360-363. (IBM Corporation, Poughkeepsie, N.Y.).

The study was undertaken to test the feasibility of remote computer-assisted instruction as an industrial training technique. 79 newly hired electronic technicians received their required training in basic data-processing principles through programmed texts, the standard method used for this presentation. 25 equivalent students received the same training through a keyboard-operated terminal device linked remotely to an IBM 1440 computer system. No significant differences in examination scores were obtained; however, there was a significant saving (approximately 10%) in the time required to complete the course. On an attitude questionnaire administered subsequent to the courses, both groups rated their respective method of instruction as approximately equal to regular classroom techniques in terms of effectiveness and desirability.
R 7

29,256
Rorer, L.G., Hoffman, P.J. & Hsieh, K-C. UTILITIES AS BASE-RATE MULTIPLIERS IN THE DETERMINATION OF OPTIMUM CUTTING SCORES FOR THE DISCRIMINATION OF GROUPS OF UNEQUAL SIZE AND VARIANCE. J. appl. Psychol., Oct. 1966, 50(5), 364-368. (Oregon Research Institute, Eugene, Ore.).

The accuracy with which a test classifies people, objects, or events as belonging to 1 of 2 groups depends upon the distance between the means, the relative variability, the relative size, and the shape of the distributions of the 2 groups. If the scores for each of the groups are normally distributed, tables for determining optimum cutting scores for a wide range of values of the other variables are now available. However, overall accuracy is an appropriate guide for decision making only when all correct classifications are equally beneficial and all incorrect classifications equally costly. A simple technique makes possible the utilization of the Rorer, Hoffman, and Hsieh tables when a different value is assigned to each of the outcomes.
R 14

29,257
Kirchner, W.K. A NOTE ON THE EFFECT OF PRIVACY IN TAKING TYPING TESTS. J. appl. Psychol., Oct. 1966, 50(5), 373-374. (Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

80 female job applicants completed a standard typing test as part of a regular job-selection procedure. Of these, 40 were tested individually, 40 in groups of 2 or more. When compared on test results, females tested alone typed almost 4 words per min. faster ($p \leq .01$) on the average. The same group had slightly fewer errors but the difference was not significant. Results suggested that privacy could have a direct effect on test performance.
R 5

29,258
Lincoln, R.S. & Konz, S.A. EFFECT OF SWITCH CONFIGURATION ON THE OPERATION OF A SWITCH MATRIX. J. appl. Psychol., Oct. 1966, 50(5), 375-382. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

In a series of 3 experiments the speed and accuracy of switch-matrix operations were determined for 5 different matrix configurations. Factors influencing performance included switch orientation (whether row or column), reach distance, and the type of symbol with which the switches were labeled. Response time was the only important performance measure. Error rates were negligible for all configurations.
R 5

29,259
Hammer, C.H. & Ringel, S. INFORMATION ASSIMILATION FROM UPDATED ALPHA-NUMERIC DISPLAYS. J. appl. Psychol., Oct. 1966, 50(5), 383-387. (USA Personnel Research Office, OCRD, Washington, D.C.).

The accuracy with which Ss could locate updated elements of information was studied as a function of use of coded vs uncoded updates, number of elements of information presented and number of elements of information updated. Selected findings demonstrate the value of coding as an information enhancement technique and the considerable effects of elements presented and updated. With uncoded displays a reduction in the percentage of responses as the number of updates increased may reflect a lessening of Ss' confidence in their ability to make correct responses even though their actual performance did not appear to suffer.
R 4

29,260
Rawls, J.R., Perry, O. & Timmons, E.O. A COMPARATIVE STUDY OF CONVENTIONAL INSTRUCTION AND INDIVIDUAL PROGRAMED INSTRUCTION IN THE COLLEGE CLASSROOM. J. appl. Psychol., Oct. 1966, 50 (5), 388-391. (Louisiana State University, Baton Rouge, La.).

The traditional college classroom teaching method of lecture and assigned readings was compared with an individual programed instructional method utilizing a programed text. Ss, 21 pairs, matched with regard to sex, age, intelligence test score, and hours of formal training in the biological sciences, were 1st tested upon completion of the physiological portion of an introductory psychology course. They were then retested 6 wk. later. No significant differences were found in performance on Test 1. However, the level of performance on Test 2 was significantly higher for the program-instructed group.
R 7

29,261
Weissenberg, P. & Gruenfeld, L.W. RELATIONSHIPS AMONG LEADERSHIP DIMENSIONS AND COGNITIVE STYLE. J. appl. Psychol., Oct. 1966, 50(5), 392-395. (New York State School of Industrial & Labor Relations, Cornell University, Ithaca, N.Y.).

Witkin's differentiation hypothesis served as a basis for the investigation of 3 propositions: a) field-dependent supervisors will show the highest "Esteem for the Least Preferred Co-worker" (LPC); b) field-dependent supervisors will be more "considerate" (C); and c) field-independent supervisors will be more "structure" (S) oriented. Witkin's Embedded Figures Test (EFT), Fiedler's Esteem for the Least Preferred Co-worker (LPC) instrument, and Fleishman's Leadership Opinion Questionnaire (LOQ) were administered to 73 civil service supervisors. The results established the existence of significant curvilinear relationships between EFT and LPC ($p<.03$), and between EFT and Consideration ($p<.02$). Individuals who were intermediate between extreme field dependence and extreme field independence discriminated most sharply between their most and least preferred co-workers. These findings point the way toward further research into leadership behavior using hypotheses derived from developmental psychology.
R 12

29,262
Jerdee, T.H. WORK-GROUPS VERSUS INDIVIDUAL DIFFERENCES IN ATTITUDE. J. appl. Psychol., Oct. 1966, 50(5), 431-433. (University of North Carolina School of Business Administration, Chapel Hill, N.C.).

The objective was to determine the relative magnitude of group and individual differences in job attitudes. Responses to a 20-item Likert-type attitude scale were obtained from 190 employees, sampled from 38 work groups in 3 manufacturing plants. The hypothesis that the work groups did not differ in job attitudes was tested by an analysis of variance. The observed work-group differences in attitudes were not significant, and the lowest and highest work-group means in each of the 3 plants were not significantly far apart. In these 3 plants at least, the more appropriate unit for administrative action or for research study on employee attitudes seems to be the individual, not the work group.
R 8

29,263
Coleman, E.B. & Hahn, S.C. FAILURE TO IMPROVE READABILITY WITH A VERTICAL TYPOGRAPHY. J. appl. Psychol., Oct. 1966, 50(5), 434-436. (Texas Western College, El Paso, Tex. & New Mexico State University, University Park, N.M.).

3 experiments found conventional horizontal typography to be superior to vertical. One experiment presented the stimulus tachistoscopically in a procedure quite similar to the procedure used in an earlier experiment that found vertical typography to be superior to conventional even with unpracticed Ss. 2 of the experiments used Ss who had been given practice reading 8,000 words printed in vertical typography.
R 6

29,264
Friedlander F. IMPORTANCE OF WORK VERSUS NONWORK AMONG SOCIALLY AND OCCUPATIONALLY STRATIFIED GROUPS. J. appl. Psychol., Dec. 1966, 50(6), 437-441. (Organizational Sciences Div., Case Institute of Technology, Cleveland, Ohio).

The importance of work-related vs. nonwork-related factors as opportunities for satisfaction was compared among low-, medium-, and high-status groups, and between white-collar and blue-collar occupational groups by analysis of questionnaire responses from 1,468 Civil Service resident employees of a Government community. The value hierarchy, in terms of increasing importance, was recreation, education, church, work-context, and work-content factors. Significant differences were found between the value systems of white-collar and blue-collar groups. However, no significant differences were found between low-, medium-, and high-status groups unless the occupational group of the employee was simultaneously considered. Then, differences between white-collar and blue-collar values were marked in the high-status level. Results are discussed in terms of the opportunities that various environmental stimuli present to contrasting occupational and status groups for effective and competent interaction with their environment.
R 11

29,265
Grace, Gloria L. APPLICATION OF EMPIRICAL METHODS TO COMPUTER-BASED SYSTEM DESIGN. J. appl. Psychol., Dec. 1966, 50(6), 442-450. (System Development Corporation, Santa Monica, Calif.).

This study provides information about the clarity and usefulness of printout formats designed for use by military nonprogrammer personnel. 3 printout formats containing the same information were designed. Verbal printout format presented information in words; Data Block printout format, in sets of data; Eidoform printout format, in maplike form. 23 men stationed at Phoenix Air Defense Sector served as Ss. Immediately following the experimental sessions, attitude information was collected in individual interviews. Printout formats and sets of interpretation questions were combined for analysis using a Latin-square design. Analysis of variance showed experimental treatment conditions, printout formats, and practice effect to be statistically significant. Differences due to sequence and test forms were not significant. Attitude results supported information measure findings.
R 11

29,266
Burg, A. VISUAL ACUITY AS MEASURED BY DYNAMIC AND STATIC TESTS: A COMPARATIVE EVALUATION. J. appl. Psychol., Dec. 1966, 50(6), 460-466. (Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.).

In order to provide, for the first time, definitive information on the relationship between static visual acuity and acuity for a moving target (dynamic visual acuity), both types of acuity were measured for 17,500 Ss, ages 16-92. The results show: a) acuity declines progressively with both increasing speed of target movement and advancing age; b) males have consistently better acuity (both static and dynamic) than females; and c) high intercorrelations exist between the static and dynamic tests, these correlations decreasing with increasing speed of target movement. These findings are presented primarily for their value in providing normative data to other researchers. Additional research is suggested to explain some of the relationships obtained in the study.
R 14

29,267
Briggs, G.E. & Johnston, W.A. INFLUENCE OF A CHANGE IN SYSTEM CRITERIA ON TEAM PERFORMANCE. J. appl. Psychol., Dec. 1966, 50(6), 467-472. (Ohio State University, Columbus, Ohio).

In a simulated ground-controlled aerial intercept task, 2-man teams of radar controllers transferred to either simple or complex criterion conditions following training under simple criteria. Upon transfer to simple criterion conditions, teams adapted performance rapidly to the new criterion; however, upon transfer to complex criteria, teams continued to emphasize that aspect of performance appropriate during the previous simple criterion conditions.
R 4

29,268
Williges, R.C., Johnston, W.A. & Griggs, G.E. ROLE OF VERBAL COMMUNICATION IN TEAMWORK. J. appl. Psychol., Dec. 1966, 50(6), 473-478. (Ohio State University, Columbus, Ohio).

A simulated radar-controlled aerial intercept task was used to examine verbal communication between teammates under verbal (communication necessary) and verbal-visual (communication unnecessary) conditions. Communication facilitated team performance only in the verbal condition. Team performance, however, was best in the verbal-visual condition. A transfer-of-training paradigm was employed to determine if verbal skills developed in one condition would transfer to the other condition. Differential transfer occurred neither in communication behavior nor in team performance. It was concluded that verbal communication, when not required by the task, plays an insignificant role in teamwork, and that this role apparently is not enhanced by verbal training.
R 10

29,269
Newman, R.I., Jr., Hunt, D.L. & Rhodes, F. EFFECTS OF MUSIC ON EMPLOYEE ATTITUDE AND PRODUCTIVITY IN A SKATEBOARD FACTORY. J. appl. Psychol., Dec. 1966, 50(6), 493-496. (California State College, Long Beach, Calif.).

An experiment was designed to look at the effects of 4 types of music, vs no music, on the quantity and quality of production and the attitude of workers engaged in the routine task of assembling and packing skateboards. Ss were 26 assembly-line personnel between the ages of 18 and 23. 4 types of music were played: dance, show, folk, and popular. These were contrasted with periods during which no music was played. Music conditions were balanced with respect to days of the week over a period of 5 wk. Results showed that, while employees had a highly favorable attitude toward music and thought they did more work with it, there was no change in measured productivity.
R 6

29,270
Ley, R. LABOR TURNOVER AS A FUNCTION OF WORKER DIFFERENCES, WORK ENVIRONMENT, AND AUTHORITARIANISM OF FOREMEN. J. appl. Psychol., Dec. 1966, 50(6), 497-500. (State University of New York, Albany, N.Y.).

The labor turnover rate of male production workers of a television picture-tube manufacturing company was studied with respect to: biographical data, work environment, and authoritarianism of foremen. It was found that workers who terminated their employment within 1 yr. were younger, had more jobs in the 2 yr. preceding their employment with the company, and had higher hourly wages on their last job, as compared with workers who maintained their employment for more than 1 yr. Although the turnover rate was found to be significantly higher on the 2nd and 3rd shifts as compared with the 1st shift, no difference in rates was found among the 6 work sections which differed considerably in terms of physical work conditions. The major factor found to be related to labor turnover was the degree of authoritarianism of the 12 foremen of the work sections, i.e., turnover rate correlated .76 with authoritarianism ratings of the foremen.
R 6

29,271
Prien, E.P. DYNAMIC CHARACTER OF CRITERIA: ORGANIZATION CHANGE. J. appl. Psychol., Dec. 1966, 50(6), 501-504. (University of Akron, Akron, Ohio).

Previous thought and research on criterion development emphasize: measurement problems related to scaling and analysis, problems created by the sponsor, values of the researcher, aspects of deriving a composite criterion, and the dynamic character of job requirements related to incumbent learning. There is an additional variable(s) to be considered, organization change and the effect of changing needs on the nature of the criteria of individual jobs. Job duties may remain static under these circumstances; only the relevance of performance changes.
R 17

29,272
McGrew, J.M., Marcia, J.E. & Wright, C.K. BRANCHING PROGRAM, TEXT, AND LECTURE: A COMPARATIVE INVESTIGATION OF INSTRUCTIONAL MEDIA. J. appl. Psychol., Dec. 1966, 50(6), 505-508. (State University of New York, Buffalo, N.Y.).

Most comparative studies of programs with conventional media have compared a linear program plus lecture condition with either a lecture-alone, program-alone, or text-alone. This design results in noncomparable treatment groups, since the experimental Ss may either be given more time to use the program or are exposed to the same material twice. The present study, utilizing a branching program, controls for these possible error factors. Based upon the performance of 66 undergraduate Ss, an analysis of covariance suggests that sheer repetition of material, regardless of the medium employed, is a significant factor influencing the outcome of comparative studies.
R 9

29,273
Allen, I.L. DETECTING RESPONDENTS WHO FAKE AND CONFUSE INFORMATION ABOUT QUESTION AREAS ON SURVEYS. J. appl. Psychol., Dec. 1966, 50(6), 523-528. (Sociology Department, University of Connecticut, Storrs, Conn.).

Opinion-attitude and market survey researchers often include in questionnaires a nonexistent item in a list of items on which attitudes and information levels are sought. These researchers assume that response to the phony item is evidence of invalid responses to other items. Verbal behavior of respondents claiming awareness of such a phony item is comparatively analyzed in evaluation of this practical technique. Data are interviews with 625 sample survey respondents. Respondents asserting awareness of the fictitious item are more likely a) to profess awareness of genuine items and b) to express favorable attitudes toward items. The technique permits a rough but workable estimation of response validity and does not greatly bias the sample's representativeness if invalid responses are dropped.
R 8

29,274
Hueting, J.E. & Sarphati, H.R. MEASURING FATIGUE. J. appl. Psychol., Dec. 1966, 50(6), 535-538. (Physiological Lab., University of Amsterdam, The Netherlands).

8 Ss between 19 and 23 yr. old performed an exercise during 11 min. on a bicycle ergometer on 13 days in succession. Not being aware of the systematic daily variations in the slope of the work load, all Ss showed significant correlations between subjective feelings of general physical fatigue--as expressed on different kinds of rating scales--and slope of work load. Regression equations satisfactorily describe linear relationships between load and fatigue. Factor analysis suggests a factor "increasing fatigue," and a factor "decreasing fitness."
R 10

29,276
Botwinick, J. & Thompson, L.W. PREMOTOR AND MOTOR COMPONENTS OF REACTION TIME. J. exp. Psychol., Jan. 1966, 71(1), 9-15. (Duke University, Durham, N.C.).

Reaction time (RT) was fractionated into premotor and motor components based upon the difference between EMG and finger-lift responses. EMGs were recorded from the extensor muscle of the responding forearm during measurement of simple auditory RTs of 54 Ss. The premotor time was that period from the presentation of the stimulus to the appearance of increased muscle firing, while the motor time was that period from this change in action potential to the finger-lift response. 4 preparatory intervals (PI), 0.5, 3.0, 6.0, and 15.0 sec., were used in both a regular and irregular series. Premotor time and RT were highly correlated and showed comparable variations as a function of PI and type of series. Motor time was poorly correlated with RT and was independent of PI and type of series. It was concluded that set, as inferred from the relations between RT and PI and type of series, is a premotoric process.
R 17

29,277
Robinson, D.N. VISUAL REACTION TIME AND THE HUMAN ALPHA RHYTHM: THE EFFECTS OF STIMULUS LUMINANCE, AREA, AND DURATION. J. exp. Psychol., Jan. 1966, 71(1), 16-25. (Queens College, Flushing, N.Y.).

Human Ss in a visual reaction-time experiment responded to stimuli of systematically varied luminance, area, and duration. RT, EEG alpha blocking latency, and alpha blocking duration were recorded and measured. The major findings were: a) Over a range of luminances (0.65-10.0 mL.) and exposure durations (10-200 msec.) constant I x t products result constant blocking latencies; i.e., Bloch's law. b) Constant products of I x A (Ricco's law) do not lead to constant blocking latencies beyond areas of 1°. c) RT decreases with increased luminance or area under equal-energy conditions and is independent of duration over the range of t employed. d) Blocking duration increases with stimulus duration but is unaffected by luminance. e) Correlations between RT and properties of the alpha rhythm are determined, in large part, by stimulus variables.
R 24

29,278
Schiller, P.H. & Smith, Marilyn C. DETECTION IN METACONTRAST. J. exp. Psychol., Jan. 1966, 71(1), 32-39. (Massachusetts Institute of Technology, Cambridge, Mass.).

This study investigated metacontrast under a variety of stimulus and response conditions. The results show that a) although the 1st stimulus in the metacontrast situation appears absent or very much darkened at certain intervals between the 1st and 2nd stimulus, it can be correctly detected by O employing both RT and forced-choice situations. b) When the luminance of the 1st stimulus is set low relative to that of the 2nd stimulus, a monotonic function is obtained for both detection errors and choice reaction time (CRT), with maximal errors and longest CRTs at the shortest interval between the stimuli. c) When the 2 stimuli are of equal luminance, increasing the rate of presentation to a point where the interval between 1st and 2nd stimuli within a pair equals the interval between successive pairs, increases the apparent brightness of the 1st stimulus.
R 16

29,279
Forrin, B. & Morin, R.E. EFFECT OF CONTEXTUAL ASSOCIATIONS UPON SELECTIVE REACTION TIME IN A NUMERAL-NAMING TASK. J. exp. Psychol., Jan. 1966, 71(1), 40-46. (Scarborough College, University of Toronto, Toronto, Ontario, Canada & Kent State University, Kent, Ohio).

The increase in reaction time (RT) with size of the stimulus set for selective response tasks involving the naming of 1 of n equiprobable numerals has been ascribed to variation in attributes of the stimulus sequence--reduced probability of signal presentation, increased mean intersignal interval, and heightened temporal uncertainty of signal occurrence. The present study provided an independent assessment of the effect upon selective RT of a 4th factor commonly confounded with the preceding 3: the presence of incompatible S-R associations in serial context with numeral-numeral pairs. The data indicate that requiring Ss to remain silent to a given subset of numerals, or to respond with the single designation "No" to members of that subset, produced longer reaction latencies to numerals to be named than would be predicted from properties of the stimulus sequence alone. An interpretation in terms of generalized response inhibition and response competition is examined.
R 14

29,280
Corcoran, D.W.J. PREDICTION OF RESPONSES TO MULTIDIMENSIONAL FROM RESPONSES TO UNIDIMENSIONAL STIMULI. J. exp. Psychol., Jan. 1966, 71(1), 47-54. (Applied Psychology Research Unit, MRC, Cambridge, England).

By dichotomizing 2 stimulus dimensions, A and B, 4 stimuli A+B+, A+B-, A-B+, and A-B-, can be constructed. The present problem is concerned with predicting the probability (P) that A-B- will be confused with A+B+, given the separate Ps of confusing A+B- and A-B+ with A+B+. On the assumption that A and B are sensorily independent it was hypothesized that the P of confusing A-B- with A+B+ equaled the product of the Ps of confusing A+B- and A-B+, divided by the P of correctly identifying A+B+. The hypothesis was tested using populations of 4, 8, and 16 stimuli synthesized from 2, 3, and 4 auditory dimensions. 12 separate groups were run under slightly different experimental conditions (N=176). The results were on the whole confirmatory.
R 4

29,281
Weene, P. & Held, R. CHANGES IN PERCEIVED SIZE OF ANGLE AS A FUNCTION OF ORIENTATION IN THE FRONTAL PLANE. J. exp. Psychol., Jan. 1966, 71(1), 55-59. (USAF Decision Sciences Lab., Hanscom AFB, Bedford, Mass. & Massachusetts Institute of Technology, Cambridge, Mass.).

Continuous subjective bisection of a right angle rotating through 360° in a frontal plane was performed by 10 Ss using the Békésy technique. The largest and most consistent constant errors in bisection, ranging up to 10°, occurred in upper-right and upper-left quadrants. Interindividual and interquadrant differences indicate that the constant errors cannot be attributed solely to the effect of the main axes of space. An influence of the distribution of oriented contours in Ss' normal visible environment is suggested.
R 6

29,282
Hinrichs, J.V. SHORT-TERM MEMORY WITH A GUESSING TECHNIQUE. J. exp. Psychol., Jan. 1966, 71(1), 89-95. (Stanford University, Palo Alto, Calif.).

The data from the 3 experiments demonstrate that the guessing technique is a useful method for examining the short-term retention abilities of human Ss. In particular, Ss were found to restrict their guesses to unpresented items of a serially presented list thereby improving the possibility of a correct guess near the end of the serial order. The main result of Exp. 1 demonstrated a very stable forgetting curve which was an increasing function of the number of intervening (retroactive) items and relatively independent, except for a primacy effect, of the number of prior (proactive) presentations. Exp. 2 showed the forgetting functions to be very sensitive to variation in the size of the to-be-remembered item. The third experiment found a small but consistent improvement in retention with increased presentation time. The modest magnitude of the differences in Exp. 3 is somewhat surprising in view of the potency usually attributed to the rehearsal factor, but other investigators have also found the differences due to rate of presentation to be small and often less consistent than in Exp. 3. In general, application of the guessing technique has produced results which are consistent with previous investigations, but within the framework of a single experimental paradigm and with increased stability due to the large number of observations easily obtained by this procedure.
R 14

29,283
Freeman, R.B., Jr. EFFECT OF SIZE ON VISUAL SLANT. J. exp. Psychol., Jan. 1966, 71(1), 96-103. (Pennsylvania State University, University Park, Penn.).

Two experiments were conducted to determine the generality of the finding by Stavrianos that judged slant of plane rectangular figures varies directly with size. In Exp. 1, equal-slant contours were obtained from 54 undergraduate Ss for 14 rectangles whose lengths varied in equal log steps from 1.0 to 42.2 cm with a reference stimulus of 7.5 cm. In Exp. 2, 72 Ss were tested on 9 rectangles varying linearly in 4-cm steps from 8 to 40 cm, with a 24-cm reference. Observation was monocular and under complete reduction conditions from a distance of 135 cm. The effect of size on judged slant was only partly reliable in Exp. 1, but highly significant in Exp. 2. The "size effect" was attributed to the "perspective" cue to slant which was shown to vary with physical size as well as slant, and was probably more discriminable in the stimuli in Exp. 2 than in Exp. 1.
R 8

29,284
Goldstein, I.L. EFFECTS OF STIMULUS COMPLEXITY AND RESTRICTIVE RESPONSES. J. exp. Psychol., Jan. 1966, 71(1), 104-108. (Ohio State University, Columbus, Ohio).

The purpose of the present study was to determine if the use of response classes or categories would facilitate the discriminating and counting of various complexities of stimulus displays. It was found that an increase in the number of response subclasses facilitated performance for displays with relatively few stimulus objects but hindered performance for displays with comparatively large numbers of stimulus objects. The degree of facilitation in scenes of medium complexity was dependent upon the time-limitation instructions given to the 60 Ss. Both response time and errors increased as a function of stimulus complexity, and response time also increased as response subclasses were added.
R 15

29,285
Singer, G. & Day, R.H. INTERLIMB AND INTERJOINT TRANSFER OF A KINESTHETIC SPATIAL AFTEREFFECT. J. exp. Psychol., Jan. 1966, 71(1), 109-114. (University of Sydney, Sydney, Australia & Monash University, Clayton, Victoria, Australia).

Transfer of a kinesthetic spatial aftereffect from the stimulated to the nonstimulated arm (interlimb) and from the stimulated to the nonstimulated group of joints in a single arm (interjoint) has been investigated in 2 experiments. In each case the effects were compared with those occurring within a single arm (intralimb) and joint group (intrajoint). In both experiments the kinesthetic task was that of judging the horizontal after movement of the extended limb across a slanted edge. The results show that whereas there were large intralimb and intrajoint aftereffects, the small interjoint effect was significant in 1 of 2 cases, and that neither of 2 interlimb aftereffects achieved significance. The data are discussed in terms of their relevance for theoretical issues including the principal explanations of kinesthetic aftereffects.
R 25

29,286
Mountjoy, P.T. NEW ILLUSORY EFFECT OF THE MÜLLER-LYER FIGURE. J. exp. Psychol., Jan. 1966, 71(1), 119-123. (Denison University, Granville, Ohio).

A group of 18 Ss instructed to equate the center points (apexes) of the Müller-Lyer arrowheads in the conventional manner was compared to groups instructed to equate the tips (upper or lower points). The upper- and lower-point groups exhibited a reversal of the usual direction of initial error and of the direction of change in magnitude of error as a function of trials. This finding is not consistent with the satiational interpretation of the usual decrements to the Müller-Lyer obtained with instructions to equate the apexes of the arrows. Attention is drawn to the alternative interpretation of these decrements as habituatory decrements.
R 9

29,287
Howell, W.C. TASK CHARACTERISTICS IN SEQUENTIAL DECISION BEHAVIOR. J. exp. Psychol., Jan. 1966, 71(1), 124-131. (Ohio State University, Columbus, Ohio).

Optional stopping behavior was studied for a task in which multiple perceptual discriminations were required and payoff declined with sequential information gathering. 36 experienced Ss served under 4 levels of difficulty (defined psychophysically) for riskless and risky problems; they were assigned randomly to 4 groups for investigation of monetary vs. nonmonetary incentives and 2 modes of varying difficulty. Findings indicate that decisions approximate maximum expected values (EVs) over a wide range of task situations but are most efficient for intermediate levels of difficulty and riskless conditions. Contrary to earlier reports, neither the kind of incentive nor the difficulty mode appears to have an appreciable effect on performance. It is suggested that subtle aspects of EV functions may have an important bearing upon optional stopping behavior.
R 12

29,288
Hay, J.C. & Pick, H.L., Jr. VISUAL AND PROPRIOCEPTIVE ADAPTATION TO OPTICAL DISPLACEMENT OF THE VISUAL STIMULUS. J. exp. Psychol., Jan. 1966, 71(1), 150-158. (Smith College, Northampton, Mass. & University of Minnesota, Minneapolis, Minn.).

The present study concerns the question of whether the optically displaced visual system always draws other systems into alignment with itself, or whether some kinds of prism exposure can induce an adaptation within the visual system itself. Our method involves studying the pattern of changes in several different sensory coordinations, and then inferring the locus of the adaptation. In Exp. I, Ss engaged in their normal activities during 6 wk. of continuous exposure to spectacle prisms. This exposure condition would seem to give the best opportunity for all possible adaptive mechanisms to operate. Changes in eye-hand and ear-hand coordination were measured throughout. In Exp. II, the battery of coordination tests was enlarged to isolate possible changes in the visual or auditory systems. Finally, Exp. III sought to identify the factors which determine the kind of adaptation that takes place. The pattern of changes observed indicated that a transient adaptation in the proprioceptive system is succeeded by a stable adaptation in the visual system. It was found that viewing the whole body during optical displacement, rather than just a part of it, serves to induce the visual adaptation.
R 10

29,289
Harrison, K. & Fox, R. REPLICATION OF REACTION TIME TO STIMULI MASKED BY METACONTRAST. J. exp. Psychol., Jan. 1966, 71(1), 162-163. (Vanderbilt University, Nashville, Tenn.).

Fehrer and Raab investigated the effects of metacontrast masking of a test flash upon the reaction time (RT) elicited and found that RT was determined solely by the luminance and duration of the test stimulus. The present experiment repeated the major portion of their study for both foveal and peripheral presentation conditions with asynchronies (Δt) between test (5-msec. duration) and mask (50-msec. duration) of 0, 25, 50, 75, and 100 msec. The data indicate that phenomenal diminution of the brightness of the test flash does not produce an increase in RT, a result consistent with that obtained by Fehrer and Raab.
R 1

29,290
Azuma, H. & Cronbach, L.J. CUE-RESPONSE CORRELATIONS IN THE ATTAINMENT OF A SCALAR CONCEPT. Amer. J. Psychol., March 1966, LXXIX(1), 38-49. (University of Tokyo, Tokyo, Japan & Stanford University, Stanford, Calif.

The present study examines how Ss use multiple cues in solving a scaled-concept problem. The desired response to each stimulus corresponds to a weighted sum of certain cue-variables. S is required on each trial to estimate the scale-value assigned to the stimulus by the (unknown) rule; he is then told the correct value. From the literature and the experiments it is suggested that scalar concepts may be more readily attained by identifying small subuniverses, to each of which some rule applies perfectly, than by starting with a general rule that applies to all stimuli but gives response-values that are only approximately correct. A more powerful method of analysis than the calculation of cue-response correlations is required to describe the operations S uses at any point in training. Over-all cue-response correlations calculated from training trials are at best a first approximation to the process by which a concept is attained.
R 15

29,291
Harris, W. & Buckner, D.N. A STUDY OF DIFFERENCES BETWEEN PERFORMANCE AND PSYCHOPHYSICAL JUDGMENTS. Amer. J. Psychol., March 1966, LXXIX(1), 50-61. (Human Factors Research, Inc., Los Angeles, Calif.).

The Ss judged the cumulative duration of 'time on' flashing light under different instructions. Under one condition, the 'objective' condition, the Ss judged 5 durations--9, 12, 15, 18, and 21 sec. with 'light on' during a 30-sec. period--on a 9-category scale. Under the other condition, the 'performance'-condition, the same stimuli were judged, but the Ss were led to believe that the 'light on' indicated the time a man operating a pursuit-rotor in another room was 'on target'; and they rated his performance on the same scale but with different names appropriate to performance. The following hypotheses were tested: a) Judgments of the same stimuli will have greater variance when made under the 'performance'-condition than when made under the objective condition; b) Ss with brief experience in performing the pursuit-rotor task will overestimate the value of stimuli representing performance, but judgments of Ss with greater experience will not be affected; c) judgments of stimuli representing performance will be less valid when performers are present during a judgmental session than when they are absent; and d) judgments will be influenced by the Ss' knowledge of the performers' school-achievement. Hypothesis (a) was confirmed in an analysis of 'stable' judgments--judgments of the last 5 stimuli in a series of 25, but not in an analysis of all judgments. Hypothesis (b) was partially confirmed in an analysis of stable judgments: All but the highest stimulus-value were overestimated under the performance-condition. The presence of the performers had no effect on the judgments, but the judgments were correlated with school-achievement of the performers. It was concluded that a more demanding judgmental task was indicated for further study of this problem.
R 3

29,292
Silver, C.A., Landis, D. & Messick, S. MULTIDIMENSIONAL ANALYSIS OF VISUAL FORM: AN ANALYSIS OF INDIVIDUAL DIFFERENCES. Amer. J. Psychol., March 1966, LXXIX(1), 62-72. (Franklin Institute Research Laboratories, Philadelphia, Penn.).

The primary goal of the present study was to identify the principal stimulus-dimensions utilized in the observation of geometrical figures. A secondary goal was to determine if there exists distinct sub-populations that make use of essentially different dimensions in their observations. Fifty women Os (observers) judged 30 black-on-white geometrical forms, using the multidimensional method of successive intervals. The data were analyzed by the Tucker-Messick individual differences model. Five distinct view points were found, none of which produced the same stimulus space as was obtained by analyzing the average ratings. Attneave's complexity metric, which is essentially a function of the number of sides, was found to be related to more of the dimensions than any of the other 3 metrics tested (angular variability, dispersion, and rotation). The implications of these findings for research on the metrics of visual form were discussed and suggestions made for subsequent investigations.
R 25

29,293
Krauskopf, J., Graf, V. & Gaarder, K. LACK OF INHIBITION DURING INVOLUNTARY SACCADES. Amer. J. Psychol., March 1966, LXXIX(1), 73-81. (Institute for Behavioral Research, Silver Spring, Md.).

This paper is concerned with the question of whether vision is inhibited during involuntary saccades. The basic experimental procedure was to present test-stimuli alternately during saccades; if there were inhibition, thresholds should be higher for targets presented during the saccades. Two indices of visual sensitivity were studied: measurement of the absolute threshold served as a representative detection task; and measurements of vernier -acuity were made because a task requiring the extraction of information from a complex display might show the effects of inhibition even if a simple task did not. The results provide no support for the hypothesis that inhibition occurs during saccades.
R 8

29,294
Binder, A., Wolin, B.R., Welchel, Rosemarie & Terebinski, S.J. UNCERTAINTY AND STAGE OF DECISION. Amer. J. Psychol., March 1966, LXXIX(1), 89-96. (Indiana University, Bloomington, Inc.).

The present experiment investigated the relationship between different relative frequencies of presentation during the learning of paired-associates and the point of recognition in a sequence of cues derived from the learned figures and providing gradually increasing object-specification. Three groups of Ss learned the names of 8 figures to a criterion and then were presented with sequences of abbreviated testing figures providing more and more cue-information relative to one of the learned figures. During the testing phase, each S was instructed to respond, in each of 4 sequences, with the name of the figure whenever he recognized it. The longer he waited before responding, the higher his score. The three groups differed in the information or uncertainty of the learning trials, calculated on the basis of relative frequencies of occurrence during learning. No difference among the three groups in score was found during the subsequent testing. When the responses during testing were divided into two categories--names given with high frequency and low frequency-- it was found that reduced uncertainty (high frequency) is associated with earlier responding in the sequence of cues.
R 11

29,295
Rath, G.J. RANDOMIZATION BY HUMANS. Amer. J. Psychol., March 1966, LXXIX(1), 97-103. (Northwestern University, Evanston, Ill.).

Three groups of 20 subjects each were used to write respectively; binary, decimal and alphabetic characters in a random fashion. They were found to be poor randomizers. Their biases include the preference for characters which are more common in their culture. There is a strong correlation between the preferences of the subjects for certain alphabetic characters when attempting to randomize them and the frequency of the characters in the English language. The finding that the subjects avoid repetitions and prefer alternation can be extended to decimal and alphabetic randomization by redefining alternation as the choice of an adjacent character in the natural sequence. Lastly, the rate of character generation is negatively correlated with the number of alternatives to be randomized.
R 17

29,297
Chatterjea, R.G. & Dasgupta, B. SCALE OF WEIGHT FROM FRACTIONATION AND MULTIPLICATION DATA. Amer. J. Psychol., March 1966, LXXIX(1), 116-119. (Brown University, Providence, R.I. & D.H. Training College, Calcutta, India).

An experiment was designed to compare psychophysical weight scales contructed from fractionation and multiplication judgment data. It was found that the subjective weight is a power function of physical weight whether the fractionation or multiplication method is used.
R 9

29,299
Brent, S.B. LINGUISTIC AND NONLINGUISTIC PROCESSES IN LEARNING AND MEMORY-INTERFERENCES. Amer. J. Psychol., June 1966, LXXIX(1), 181-194. (Wayne State University, Detroit, Mich.).

A paradigm of serial anticipation of retroactive interference was used to investigate rate of learning and amount of retroactive interference as a function of level of functional unity of the interpolated list and amount of practice on the interpolated task, in a 3 x 3 factorial design. Stimulus-lists were composed of conventional English words. Unity of the interpolated list was manipulated by varying the degree to which the serial ordering of items within segments of the lists was consistent with the semantic and syntactic rules of the language. While the results of t' e studies raise series of questions as to the role of degree of interpolated learning, per se, in retroactive interference, a parsimonious explanation of these findings can be achieved by assuming that learning a serial list of conventional words involves 2 distinct types of processes: a linguistic process and a nonlinguistic process. The linguistic process consists of applying the known rules of the language to those sequences of words whose order is consistent with these rules. The nonlinguistic process consists of discovering or inventing rules of relating sequences of words whose order does not conform with the linguistic rules. The distinction between linguistic and nonlinguistic processes manifests itself during both the interpolated learning and the recall-test of retroactive interference. This interpretation is based upon certain specific hypotheses concerning the operation of linguistic and nonlinguistic processes in learning and memory-interference. Each of these suggested hypotheses is amenable to an independent experimental evaluation in subsequent studies of this problem.
R 5

29,300
Magaro, P.A. THE EFFECT OF IMAGINED ANCHORS ON ADAPTATION-LEVEL. Amer. J. Psychol., June 1966, LXXIX(2), 195-204. (Northern Illinois University, DeKalb, Ill.).

The first experiment reported in this paper was an attempt to study imagery by the design previously employed in adaptation level studies in which the effect of an anchor stimulus was observed on an absolute judgment scale. The main result indicated that an imagined anchor has the same effect on a subjective scale of judgment as a presented anchor. The second experiment was done to discover if the shift was due to a change in Ss perception or to a change in Ss use of the response categories. The same design was used except, instead of using an imaged anchor, one group was presented with the anchor but did not judge it, while the other experimental group did the usual judging of the anchor. Results showed that only the judged group exhibited an anchor-effect, therefore, differing from the control group and the nonjudging group which did not differ and did not show the anchor effect. These results were interpreted in terms of an alternate hypothesis which considered the anchor having an effect on the response system rather than on perception. The point was made that predictions derived from theory and based on this procedure should be limited to the response categories and not to any "inner state."
R 17

29,301
Ono, H. DISTAL AND PROXIMAL SIZE UNDER REDUCED AND NONREDUCED VIEWING CONDITIONS. Amer. J. Psychol., June 1966, LXXIX(2), 234-241. (Stanford University, Stanford, Calif.).

The purpose of the experiment was to investigate whether there was a tendency to judge more readily distal or proximal size under reduced and non-reduced viewing conditions when no specific instructions were given. A task requiring S to form his own concept of the stimulus variable was employed. There were 4 experimental conditions. In the non-reduced-distal (NR-D) condition, S viewed the standard with binocular regard and with distance cues. S was required to associate the distal size of standard and comparison stimuli. In the non-reduced-proximal (NR-P) condition, S viewed the standard stimulus with binocular regard, and his task was to associate the proximal sizes. In the reduced-distal (R-D) condition, S viewed the standard stimulus under restricted viewing conditions with monocular regard and his task was the same as in the NR-D condition. In the reduced-proximal (R-P) condition, the viewing condition was the same as in the R-D condition and S's task was to associate the proximal sizes. It was found that under the non-reduced condition the Ss learned to associate the distal size more easily than the proximal size. This was thought to be due to the natural tendency of Ss to respond to the distal size rather than the proximal size under normal unrestricted viewing conditions. Under the reduced conditions, the Ss tended to associate more rapidly the proximal sizes of the standard and comparison stimuli. It is argued that S acquired or maintained retinal attitude under reduced conditions.
R 20

29,302
Bevan, W., Dukes, W.F. & Avant, L.L. THE EFFECT OF VARIATION IN SPECIFIC STIMULI ON MEMORY FOR THEIR SUPERORDINATES. Amer. J. Psychol., June 1966, LXXIX(2), 250-257. (Kansas State University, Manhattan, Kan.).

3 experiments involving a total of 251 Ss, examined the relationship between the recall of generic stimuli and the number of individual specimens used to represent such stimuli. The first 2 compared immediate recall after 2 different specimens had been presented with recall after the repeated presentation of a single specimen. In the first experiment the stimuli were colored photographs of common objects; in the second, common nouns with frequently associated adjectives. In both instances, more generic stimuli were named when 2 different specimens represented the stimulus than when a single specimen was repeated. The third experiment was a more elaborate one in which each generic stimulus was represented by from 1 to 4 specimens. Success in recall was positively related to the number of specimens presented. Furthermore, this difference in performance was enhanced with the passage of time. Memory loss after 2 to 4 days and after 3 weeks was greatest for the condition involving the repetition of the single specimen and decreased as the number of specimens used was increased.
R 14

29,303
Stilson, D.W. A PSYCHOPHYSICAL INVESTIGATION OF TRIANGULAR FORM. Amer. J. Psychol., June 1966, LXXIX(2), 258-264. (University of Colorado School of Medicine, Boulder, Colo.).

On the basis of confusions occurring on a test-trial in a paired-associate learning task, perceived dissimilarity of pairs of trianges was determined. The procedure was such that measured dissimilarity of the triangles was independent of their relative orientation. 4 physical measures were so defined that they are independent of area and applicable to polygons with any number of sides. The extent to which a linear function of the absolute differences between triangles on these 4 measures permitted the prediction of psychological dissimilarity was determined. For one sample of triangles, 53.4% of the variance in psychological dissimilarity was predictable and 42.5% was predictable in a second sample. The ratio of perimeter squared to area by itself predicted only 4% to 5% less variance in perceived dissimilarity than a linear function of all 4 physical measures.
R 20

29,304
McFarland, J.H. & Clarkson, F. PERCEPTION OF ORIENTATION: ADAPTATION TO LATERAL BODY-TILT. Amer. J. Psychol., June 1966, LXXIX(2), 265-271. (Antioch College, Yellow Springs, Ohio).

The purpose of the present study is to show that adaptative effects will occur with exposure to a tilted posture; there will be adaptative effects as measured by O's visual apparent vertical and his apparent longitudinal axis. The S was laterally tilted in a dark room (20° lift, 30° left and right or 40° left) then instructed to rotate a luminous line so it appeared either parallel with his longitudinal body-axis (ABP) or so it appeared vertical (AVP). 16 Ss were used for each degree of tilt. Measures were obtained before, during, and after 52.5 min of tilt (at 7.5 min intervals). With prolonged body-tilt, ABP approached physical body-position for all tilts. The direction of change in AVP varied as a function of magnitude, after 40° AVP moved opposite to body tilt though it was in the same direction for the lesser tilts. These effects of prolonged and constant lateral body-tilt, in the absence of a visual scene, were taken as a form of visual and proprioceptive adaptation to a change in typical proprioceptive stimulation. Prior to tilt, when the body was in a typical position, there was approximate zero difference between ABP and AVP. The stimulation provided during prolonged and constant lateral body-tilt affected the hypothesized reference system in a manner which redefines what constituted typical proprioceptive stimulation, and thus, indirectly, what constituted typical relations between proprioceptive and visual stimulation.
R 32

29,305
Newman, E.B. SPEED OF READING WHEN THE SPAN OF LETTERS IS RESTRICTED. Amer. J. Psychol., June 1966, LXXIX(2), 272-278. (Harvard University, Cambridge, Mass.).

An S was asked to read a display that consisted of a meaningful string of letters displaced one letter at a time to the left. In a given presentation, the display had a constant span of letters, from 8 down to a single letter and a constant rate at which new letters were added from 2 to 10 per sec. S read aloud all that he could see. The results showed a 10 to 1 difference in the amount correctly reported when there was context present (a string of 8 letters) than when 1 letter was present alone. Moreover, the longer spans were seen as letters of fixed form moving from right to left, while single letters underwent a plastic transformation. The results set a lower boundary on the size of the perceptual 'chunk' which is handled more or less as a unit in the process of recognition and further response.
R 1

29,306
Leibowitz, H.W. & Dato, R.A. VISUAL SIZE-CONSTANCY AS A FUNCTION OF DISTANCE FOR TEMPORARILY AND PERMANENTLY MONOCULAR OBSERVERS. Amer. J. Psychol., June 1966, LXXIX(2), 279-284. (Pennsylvania State University, University Park, Penn.).

An experiment on size-constancy as a function of distance is reported in which the matches made by a relatively large number of permanently monocular Os were compared with those made by normal Os viewing monocularly and binocularly. At each distance, the matches made under the 3 conditions were indistinguishable statistically. The results are consistent with the assumption that size-constancy for distant objects is mediated by learned monocular cues as well as by binocular cues. The discrepancy between these results and those of previous experiments is attributed to the difference in number of monocular cues available to O.
R 15

29,307
Cohen, H.B. SOME CRITICAL FACTORS IN PRISM-ADAPTATION. Amer. J. Psychol., June 1966, LXXIX (2), 285-290. (Stanford University, Stanford, Calif.).

Transfers of displacement after-effects (DAE) between hands as well as between center and periphery of each eye were investigated following brief exposure to a monocular prism. 20 Ss were tested for intermanual, and 8 for intraocular transfers. No intermanual transfer was found as long as the non-exposed, inactive hand was out of sight; however, transfer was present if the passive hand was visible during exposure of the active hand. Complete transfer of the DAE was found from exposed central areas to non-exposed peripheral areas of each eye. When, however, peripheral areas were exposed, DAEs were largely confined to the exposed periphery. These results cast doubt on any hypotheses which attribute the production of DAEs solely to proprioceptive and motor adjustments.
R 5

29,308
Moore, T.J. EFFECT OF LIGHT-PERCENTAGE, STIMULUS-LUMINANCE, EXPOSURE-DURATION AND THEIR INTERACTIONS UPON THE CFF THRESHOLD. Amer. J. Psychol., June 1966, LXXIX(2), 291-295. (University of Massachusetts, Amherst, Mass.).

4 groups of 8 Ss each served in this study. Each group received either an intermediate (7.72 mL) or a high (32.32 mL) value of luminance (I) and an exposure-duration (ED) of 0.5 or 1.5 sec at each of 3 stimulus-cycle values (P_L): 20, 50, 90%. The data were evaluated by analysis of variance. The main effects are similar to those which have been previously reported, with an increase in the level of I causing a rise in threshold and an increase in P_L causing a decrease. The existence of a significant I x P_L interaction is also congruent with previous reports. The most interesting results were those pertaining to the I x ED and I x ED x P_L interaction. From the form of these interactions it appears that the levels of I employed in the present study had no differential effect upon CFF threshold when an ED of 1.5 sec was employed. With an ED of 0.5 sec the usual effect of the higher I yielding the higher threshold was obtained. It is possible that for the shorter ED the contrast between the light and dark periods of each cycle was the primary basis for the judgment of flicker or fusion. Because of this the cycle with the greater contrast, i.e. the higher level of I, would be easier to perceive as flickering and would therefore result in a higher CFF threshold. The longer presentation-time may have enabled ʊ to adopt an alternate, more stable, judgment criterion, thus yielding approximately the same threshold for each of the 2 levels of I.
R 9

29,309
Ginsburg, N. LOCAL ADAPTATION TO INTERMITTENT LIGHT AS A FUNCTION OF FREQUENCY AND ECCENTRICITY. Amer. J. Psychol., June 1966, LXXIX(2), 296-300. (State University of New York, Oneonta, N.Y.).

Local adaptation is the change in critical flicker frequency due to exposure to an intermittent light. It was measured by subtracting the critical flicker frequency following an adapting stimulus from the score obtained prior to adaptation. Adaptation increased as the adapting stimulus was lowered in frequency to 20 cps below the critical flicker frequency. There was an increase of adaptation toward the periphery, leveling at 7°. It was suggested that the effect of frequency on local adaptation probably underlies both the ascending-descending difference in critical flicker frequency and the influence of the starting point, and that local adaptation depends on cortical cells that mediate the activity of retinal on-off fibers.
R 10

29,310
Kolers, P.A. READING AND TALKING BILINGUALLY. Amer. J. Psychol., Sept. 1966, LXXIX(3), 357-376. (Massachusetts Institute of Technology, Cambridge, Mass.).

Bilingual Ss were tested in several linguistic tasks with different kinds of material. Passages were prepared in unilingual, alternating, and mixed-language forms. The Ss were tested for comprehension, for ability to read aloud, to make precis, and to speak freely in these forms. Comprehension was found to be unaffected by the linguistic form of a message, but the other tasks showed decrements of the order of 20-40% when mixed text was articulated. The equivalence for comprehension of the form of the text, the occurrence of unique kinds of error in reading, and the problems of memory-search in generation were taken as evidence that the encoding and decoding of language are not symmetrical operations. The kinds of error made in reading aloud demonstrate, in turn, that reading cannot be described accurately only in terms of grapheme-phoneme translations.
R 17

29,311
Helson, H. & Masters, H.G. A STUDY OF INFLECTION-POINTS IN THE LOCUS OF ADAPTATION-LEVELS AS A FUNCTION OF ANCHOR-STIMULI. Amer. J. Psychol., Sept. 1966, LXXIX(3), 400-408. (Kansas State University, Manhattan, Kan.).

Inflection-points in the locus of ALs (adaptation-levels) were studied as a function of anchors varying from 1.56 to 2879 gm. or 1200:1 with series-stimuli of 100, 150, 200, 250, and 300 gm. Due to the fact that series AL is higher with zero anchor than with anchors below the series, including subliminal anchors, it was predicted from the weighted log mean definition that an inflection-point would be found with anchors below the series stimuli, and this deduction was verified experimentally. With anchors above the series stimuli, we expect a levelling off in their effectiveness from the definition of AI, but a slight drop in AL with the heaviest anchor suggests that there may also be an inflection-point at the high end of the stimulus-continuum as well as at the low end. Since larger muscle groups and a new mode of lifting are required with extremely heavy weights, it is not surprising that extremely heavy stimuli are less effective as anchors. The presence of inflection-points in the locus of ALs does not invalidate the weighted log mean definition; they merely point to the fact that the weighting coefficients for series, background (anchor), and residual stimuli are not constant over the whole stimulus-range. In view of the lability and complexity of receptor, central, and motor systems, it can hardly be expected that any psychophysical parameters will remain fixed over the entire range of stimulus-magnitudes. Inflection-points at the low end of the stimulus-continuum are expected only in the case of sense-modalities having a true zero. Such is not the case, e.g. in vision, where absence of stimulation in a part of the field gives rise to positive qualities like black or complementary colors. Changes in the weighting coefficients of series and background stimuli make possible quantitative determination of degrees of relevance of stimuli in the pooling process under various conditions.
R 10

29,312
Davidon, R.S. & Mather, J.H. CROSS-MODAL JUDGMENTS OF LENGTH. Amer. J. Psychol., Sept. 1966, LXXIX(3), 409-418. (Bryn Mawr College, Bryn Mawr, Penn.).

Judgments of relative apparent length were obtained with different standards in relation to the same series of bars, tactually or visually perceived. The modality of the standard and series, their order, and the method of judgment were varied. As measures of typical ipse- and cross-modal judgment, PSEs (point of subjective equality), and series ALs (adaptation level) were determined independently. It was found that visual judgments of length and those with active touch were comparable, that the cross-modal PSE varied with length of the standard approximately as did the ipse-modal PSE. The cross-modal PSE did not typically correspond to the neutral point of the series (as asserted by previous investigators), and the significant shifts in PSE occurred with little or no change in series AL. Variability differed, but the similarity of the mean inter- and intra-modal PSE was demonstrated with both absolute and comparative judgments. The interrelation of judgments could not be fully accounted for by a common schema, that is, by a single coordinate scale of reference for judgment of length.
R 15

29,313
Behar, I. & Adams, C.K. SOME PROPERTIES OF THE REACTION-TIME READY-SIGNAL. Amer. J. Psychol., Sept. 1966, LXXIX(3), 419-426. (USA Medical Research Lab., Fort Knox, Ky.).

Two experiments, derived from a conditioning model of the reaction-time task, examined CS (conditioned stimulus)-like properties of the RT (reaction time) ready-signal. In the first study, the intensity of the ready-signal was varied over a range of 60 db. with 3 different fore-periods. Both a within-Ss and a between Ss design was used. In the former, the reaction-times decreased significantly with an increase of the intensity of the ready-signal. The decrease was proportionate at each fore-period. The between-Ss conditions were not significant. In the second study, trace and delayed presentations of the ready-signals were compared, using a within-Ss design. Delayed ready-signals yielded significantly shorter reaction-times than did trace-signals at all fore-periods. Taken together, the results of the 2 studies clearly indicate that the ready-signal in the reaction-time task serves more than a mere function of cuing.
R21

29,314
Slovic, P. CUE-CONSISTENCY AND CUE-UTILIZATION IN JUDGMENT. Amer. J. Psychol., Sept. 1966, LXXIX(3), 427-434. (Oregon Research Institute, Eugene, Ore.).

Ss were asked to judge the intelligence of a person on the basis of 9 cues presented in profile form with the levels of each cue displayed as percentiles. Previous research with this task had determined that judgments of intelligence were based primarily on a linear combination of only 2 of these cues--High-school grade rating (HSR) and English effectiveness (EE). The consistency of a profile was defined in terms of the degree of agreement between these 2 cues. Each S judged 15 'consistent' profiles in which the percentile-difference between HSR and EE was rather small and 15 'inconsistent' profiles in which the percentile-difference was quite large. Consistent and inconsistent sets of profiles were analyzed separately by means of a multiple correlation model. The results indicated that an S's judgments were dependent upon both HSR and EE when these cues agreed with one another. When these cues, however, had contradictory implications, S relied upon only one of them. The other was consistently excluded from consideration. Cues other than HSR and EE were used to a greater extent when HSR and EE were in disagreement. These data call for a modification of the commonly accepted 'linear model' of information combination.
R 16

29,315
Scott, T.R. & Wood, Dorothy Z. RETINAL ANOXIA AND THE LOCUS OF THE AFTER-EFFECT OF MOTION. Amer. J. Psychol., Sept. 1966, LXXIX(3), 435-442. (US Veterans Administration Hospital, Columbia, S.C.).

The purpose of this study was to test whether a retinal component exists in visual after-effects of motion. An attempt was made to remove any influence of the stimulated retina by applying pressure to the eye, thereby temporarily interrupting retinal blood supply. The rate of the after-effect was measured by having S adjust the size of the test-stimulus after viewing a rotating spiral. The results showed that 'transferred' after-effect obtained by stimulating one eye and testing the opposite was significantly less than the monocular after-effect. While pressure-blinding has some significant effects on the after-effect rate under some of the conditions of the experiment, the pattern of these effects was not consistent with the hypothesis of a retinal locus for the processes involved in the after-effect of motion. It was concluded that if such retinal processes exist, they can account for only a very small fraction of the after-effect.
R 13

29,316
Pick, H.L., Jr. & Hay, J.C. GAZE-CONTINGENT ADAPTATION TO PRISMATIC SPECTACLES. Amer. J. Psychol., Sept. 1966, LXXIX(3), 443-450. (University of Minnesota, Minneapolis, Minn. & Smith College, Northampton, Mass.).

Adaptation to the gaze-contingent distortions produced by wedge-prisms was measured. Attention was focused on the tilting or shearing associated with vertical head-eye movements and the stretching and compression associated with lateral head-eye movements. In the course of 42 days of prism-exposure, small but statistically significant amounts of adaptation were shown for both these distortions by a variety of testing procedures.
R 6

29,317
Rubin, E.D., Ware, M.E. & Helson, H. ANCHOR-EFFECTS IN PITCH-LOCALIZATION. Amer. J. Psychol., Sept. 1966, LXXIX(3), 458-463. (Kansas State University, Manhattan, Kan.).

Typical anchor effects were found in pitch-localization: an anchor below the series-pitches displaced them upward, and an anchor above the series pitches displaced them downward with the maximal shifts occurring in series-stimuli nearest the anchors in accordance with the usual anchor-effects. It thus appears that pitch, supposedly a metathetic dimension, yields effects similar to loudness, a prothetic dimension, so far as localization is concerned. While it may be claimed that 'height' is not a metathetic dimension, Christman showed that satiating tones lower in pitch cause an upward displacement in perceived pitch, and higher satiating tones cause a downward displacement in perceived pitch. Whether the anchor-effects found in this study result from apparent position of the anchors relative to that of the series-tones, or from their effects on the pitch of the series-tones, or both, can only be answered by further experimentation. It thus appears that no distinction can be made between so-called metathetic and prothetic continua, so far as series- and anchor-effects in perception of pitch and apparent position in space are concerned. Furthermore, series- and anchor-effects appear to be the same with respect to pitch as they are in perception of loudness, brightness, and tactile-kinesthetic qualities.
R 6

29,318
Lit, A. & Vickers, W.M. THE EFFECT OF PRACTICE ON THE SPEED AND ACCURACY OF EQUIDISTANCE-SETTINGS. Amer. J. Psychol., Sept. 1966, LXXIX(3), 464-469. (Southern Illinois University, Carbondale, Ill.).

Two inexperienced Ss made about 3,000 settings in a two-rod apparatus designed to test the threshold for binocular depth-perception. The standard rod was located 100 cm. from S. The black targets were viewed against an illuminated background. The results were analyzed in terms of both the constant and the variable errors of the settings. Unknown to S, the response-time for each setting was also measured. The results show that the magnitude of the constant errors was initially roughly 3 times the threshold value and negative in direction for both Ss. However, the constant error gradually approached zero with practice but without benefit of knowledge of results. The variable errors were also high for one S and declined rapidly. They were constant for the other S. The response-time for each setting rapidly reached a value of 15 sec. The intercorrelations among the response variables are essentially zero for both Ss except, of course, for the expected positive correlation between the median response-time and its variability.
R 13

29,319
Andreassi, J.L. SKIN-CONDUCTANCE AND REACTION-TIME IN A CONTINUOUS AUDITORY MONITORING TASK. Amer. J. Psychol., Sept. 1966, LXXIX(3), 470-474. (USN Training Device Center, ONR, Port Washington, N.Y.).

Continuous measures of palmar skin-conductance (PSC) were taken as S responded to aperiodic auditory signals presented against a white noise background. Thirty-two reaction-time (RT) trials were taken for each of 16 Ss over a 40-min. session. The results indicated that Ss had significantly faster RTs on the 10 trials in which PSC was highest as compared to the RTs for the 12 middle and 10 lowest PSC trials. There were decreases in PSC as the experiment progressed. The sharp decrease in PSC between the first and second 10-min. segments of the experiment was accompanied by significant increase in RT. There was no upturn in RT at the highest levels of PSC and it was suggested that in certain situations S's level of arousal must be actively manipulated to achieve an inverted "U" relation between bodily activity level and performance.
R 8

29,320
Baddeley, A.D. TIME-ESTIMATION AT REDUCED BODY-TEMPERATURE. Amer. J. Psychol., Sept. 1966, LXXIX(3), 475-479. (Medical Research Council, Cambridge, England).

In the first of two experiments 20 Scuba divers were asked to count up to 60 at a 1-sec. rate at various times during a week of diving in cold sea water. Rate of counting was found to correlated significantly and positively with body-temperature, but not with pulse-rate or with order of test. A second experiment tested the hypothesis that this result was due to pre-dive anxiety causing S to count more rapidly before a dive. When other divers counted a minute before, and after a warm but stressful dive involving the placement of explosives, there was no change in counting rate. It may be concluded that body-temperature affects time-estimation in the manner predicted by Hoagland's chemical-clock hypothesis.
R 6

29,321
Olsson, J.E. & Furth, H.G. VISUAL MEMORY-SPAN IN THE DEAF. Amer. J. Psychol., Sept. 1966, LXXIX(3), 480-484. (Catholic University of America, Washington, D.C.).

Deaf and hearing adolescents and adults of both sexes were equated for age and intelligence and given tests in visual memory-span. Consistent results at both ages indicated that deaf and hearing performed alike with nonsense-forms, but that the deaf were inferior with digits. Both hearing and deaf Ss benefitted equally from high as compared to low associative value of forms and, with one exception, from simultaneous as compared to successive presentation. These specific results seem to support the role of previous experience rather than verbal mediation in immediate recall.
R 5

29,322
Bokander, I. A STEREOSCOPE DESIGNED FOR USE IN RESEARCH ON MOTIVATED PERCEPTION. Amer. J. Psychol., Sept. 1966, LXXIX(3), 485-487. (Lund University, Lund, Sweden).

This note describes a portable and easily maneuvered prism stereoscope in which the light intensities in the 2 picture fields can be varied independently, the adaptation light can be varied, and the exposure time can be made continuous or variable. It also has 2 geared rotary prisms of large aperture to allow individual adjustment of convergence. The instrument is further adjustable for height and may be tilted to any convenient angle.
R 2

29,323
Corcoran, D.W.J. A TEST OF SOME ASSUMPTIONS ABOUT PSYCHOLOGICAL SPACE. Amer. J. Psychol., Dec. 1966, LXXIX(4), 531-541. (Applied Psychology Unit, MRC, Cambridge, England).

Auditory stimuli were synthesized by dichotomizing the dimensions of Pitch A, Interruption-rate B, amplitude-modulation, C, amplitude of tone above masking noise D, and nature of the noise, E. Each of the 32 stimuli was compared with a standard drawn from the population and 73 Ss indicated the similarity between the standard and comparison stimulus by distance along a line (Group I) or by a number (Group II). 2 spatial and 1 probability-models were used to predict the judgments to stimuli differing in 2 or more dimensions from the standard, by considering the judgments to the stimuli differing in a single respect. The implications of the findings to the usefulness of spatial models of similarity was discussed.
R 6

29,324
Bevan, W., Avant, L.L. & Lankford, H.G. SERIAL REACTION-TIME AND THE TEMPORAL PATTERN OF PRIOR SIGNALS. Amer. J. Psychol., Dec. 1966, LXXIX(4), 551-559. (Kansas State University, Manhattan, Kan.).

This experiment examined the relationship between response-latency to serially-presented simple visual signals and the frequency-distribution of presentation-intervals within the stimulus-series, when mean duration, range of duration, and the number of different sized intervals was held constant. A total of 200 Ss (men) were tested with the following types of distributions: constant interval, normal variable interval, skewed variable interval, bimodel variable interval, and rectangular interval. No differences among the series means were obtained for any of the distributions. Response-times were shortest, however, for the mean as compared to the other intervals used in the adaptation-series. Ss also were given one additional test-trial. Response-latencies were shortest when this test-interval corresponded to the mean of the series, and was longer as the test-interval deviated from the mean. Again, the statistical structure had no relationship to response on the test-trial. Variability of response differed among the several types of distribution, but the significance of this variability is obscure. These results emphasize the role of the mean interval--in contrast to the statistical shape of the interval program--as a determinant of the occurrence of signals on successive trials.
R 23

29,325
Richards, W.J. & Livingston, P.V. METHOD, STANDARD DURATION, AND INTER-STIMULUS DELAY AS INFLUENCES UPON JUDGMENT OF TIME. Amer. J. Psychol., Dec. 1966, LXXIX(4), 560-567. (University of Arkansas, Fayetteville, Ark.).

Effects of method, standard duration, and delay interval upon time-estimation were measured by point of subjective equality (PSE), difference limen (DL), and semi-interquartile range (SIQ). The methods of limits and reproduction were employed. 32 Ss volunteered from undergraduate classes psychology. Each S participated in one method, all standard durations, and one delay-interval at each standard duration. Standard durations of 2, 8, & 16 sec, and delay-intervals of 2, 8, 16, & 25 sec were used. Major findings were: a) variance for the PSE for the method of reproduction was significantly greater than for the method of limits; b) standard stimulus duration affected judgments significantly for all measures except SIQ; c) as length of standard duration increased, constant error (CE) for the method of reproduction changed from positive to negative; for the method of limits, the trend was reversed; d) accuracy of discrimination as measured by DL and SIQ increased as standard duration increased.
R 7

29,326
Cook, M.L. AN EXACT TEST OF THE SIZE-DISTANCE INVARIANCE HYPOTHESIS. Amer. J. Psychol., Dec. 1966, LXXIX(4), 568-575. (Australian National University, Canberra, Australia).

It has often been suggested that visual space is so structured, that the ratio of perceived size to perceived distance is proportional to the corresponding ratio of physical size to distance. A common method of testing this hypothesis employs size and distance matching techniques. The validity of this procedure as an exact test of the hypothesis, is dependant upon certain assumptions which are not empirically justified. A modification of the usual technique is suggested which enables the hypothesis to be tested without making these assumptions. An experiment employing this procedure, under monocular viewing conditions, failed to confirm the hypothesis.
R 10

29,327
Irwin, F.W., Harris, A. & Harris, Judith R. COMPARISONS OF PREDICTIONS OF SINGLE RANDOM EVENTS WITH JUDGMENTS OF POPULATION BIAS. Amer. J. Psychol., Dec. 1966, LXXIX(4), 576-583. (University of Pennsylvania, Philadelphia, Penn.).

After observing samples from shuffled binary packs, Ss predicted the next card to be drawn or judged the direction of the bias of the packs. Predictions of single events were affected by the length and direction of the terminal runs of the samples (positive and negative recency-effects) and were not responsive to the direction of bias of the samples. Judgments of pack-bias tended to agree with the sample-bias and showed positive recency-effects that increased with the length of the terminal runs of the samples.
R 9

29,328
Over, R. A COMPARISON OF HAPTIC AND VISUAL JUDGMENTS OF SOME ILLUSIONS. Amer. J. Psychol., Dec. 1966, LXXIX(4), 590-595. (University of Otago, Dunedin, New Zealand).

In the present experiments, it has been asked whether variables which have been shown to influence the magnitude of visual illusions similarly influence haptic (tactile-kinesthetic) illusions. Both visual and haptic judgments made of the Müller-Lyer figure were found to be a function of the angle of the arrowheads. For both modes of judgment, a larger illusion was found for the bisection (inverted T) than the horizontal-vertical figure. The results suggest that theories which attempt to explain illusions in terms of processes which are specific to vision are invalid.
R 10

29,329
Schlesinger, I.M. & Melkman, Rachel. CHOICE REACTION-TIME AND SIZE OF STIMULUS-SET WHEN TRANSMITTED INFORMATION IS HELD CONSTANT. Amer. J. Psychol., Dec. 1966, LXXIX(4), 596-601. (Hebrew University, Jerusalem, Israel).

It is generally accepted that choice-reactions are a function of the amount of transmitted information. This paper advances the hypothesis that reaction-times are dependent also on the amount of stimulus-information when the latter is varied independently of transmitted information. In the present study, stimulus-information was varied by varying the number of alternative stimuli. In doing this it is necessary to keep stimulus-information and similarity unconfounded. This was done by letting the Ss discriminate between a set of familiar and a (subjectively) indefinitely larger set of unfamiliar stimuli. In such a 2-choice task, responses of 20 Ss to familiar patterns required significantly less time than responses to the unfamiliar patterns. Thus, the hypothesis was corroborated. A 'matching model' which was advanced to account for the effect of stimulus-information was tested by comparing response-times in 2 experimental conditions: a) when there were 4 alternative familiar patterns; and b) when the number of these patterns was only 2. Contrary to predictions derived from the model, the smaller number of alternatives was effective in reducing response-times only to familiar patterns.
R 14

29,330
Fulgosi, A. & Guilford, J.P. FLUCTUATION OF AMBIGUOUS FIGURES AND INTELLECTUAL FLEXIBILITY. Amer. J. Psychol., Dec. 1966, LXXIX(4), 602-607. (University of Zagreb, Zagreb, Yugoslavia & University of Southern California, Los Angeles, Calif.).

The hypothesis tested was that Thurstone's factor of rate of spontaneous fluctuation of ambiguous visual phenomena is identifiable with the intellectual-aptitude factor of divergent production of figural classes (DFC). 3 tests for each factor were administered to a sample of students and the intercorrelations were factor analyzed. The analysis showed the 2 factors to be clearly orthogonal. No relation was found between fluctuation-rate and scores for tests representing 2 other intellectual abilities that pertain to flexibility in thinking. The factor, fluctuation-rate, is probably a purely perceptual phenomena and apparently has nothing to offer toward the understanding of flexibility in thinking.
R 8

29,331
Clark, B. & Graybiel, A. PERCEPTION OF THE VISUAL HORIZONTAL IN NORMAL AND LABYRINTHINE DEFECTIVE OBSERVERS DURING PROLONGED ROTATION. Amer. J. Psychol., Dec. 1966, LXXIX(4), 608-612. (San Jose State College, San Jose, Calif. & USN School of Aviation Medicine, Pensacola Air Station, Fla.).

5 normal and 9 labyrinthine defective men were studied in a slow rotation room which produced a change in resultant force of 20° on them. The men faced in the direction of rotation and at 1-min intervals set a luminous line to the perceived horizontal in darkness for 1 hr. The results for the normal men confirmed an earlier study showing no systematic change in the perception of the visual horizontal after an initial lag. In contrast the labyrinthine defective (L-D) men showed a smaller, rapid, and then gradual change in the perception of the visual horizontal throughout the 1 hr of constant rotation. At the end of that period there was no significant difference between the 2 groups. These results are discussed in terms of a differential weighting of the synergistic information available to the 2 groups.
R 12

29,332
Grissom, R.J. FACILITATION OF MEMORY BY EXPERIENTIAL RESTRICTION AFTER LEARNING. Amer. J. Psychol., Dec. 1966, LXXIX(4), 613-617. (Princeton University, Princeton, N.J.).

It was predicted that a period of quiescence interpolated between learning and a retention test would facilitate memory. Ss who were confined to a bed within a soundproof and dark chamber for varying intervals after hearing a prose passage retained the material significantly better than did control Ss, who went about their daily affairs during the retention intervals. The differences were not readily attributable to rehearsal, so that an interpretation in terms of interference is favored. It is argued, however, that decay as a process influencing retention cannot be ruled out by the results. The treatment of the experimental and control Ss differed in no other respect than in experience during the retention interval. Steps taken to avoid stressing the restricted Ss were successful.
R 11

29,333
Spitz, H.H. DIFFERENTIAL EFFECTS OF CENTRAL AND LATERAL FIXATION ON AFTER-EFFECTS OF EXPANSION AND CONTRACTION. Amer. J. Psychol., Dec. 1966, LXXIX(4), 618-622. (Edward R. Johnstone Training & Research Center, Bordentown, N.J.).

After-effects of expansion of a centrally fixated spinning spiral are known to persist longer than after-effects of contraction. It was hypothesized that this difference results from adaptation to the frequent natural occurrence of small, perhaps subliminal, after-effects of contraction. The finding that the after-effects of expansion and contraction do not differ under lateral fixation is congruent with this hypothesis.
R 9

29,334
Law, J.R. & Crovitz, H.F. SUPPRESSION IN BINOCULAR VISION. Amer. J. Psychol., Dec. 1966, LXXIX(4), 623-627. (Duke University, Durham, N.C. & US Veterans Administration Hospital, Durham, N.C.).

Ss viewed Helmholz's crossed-bar stereogram and monocular-binocular variants of it. Duration of suppression in the horizontal bar was measured in 30-sec observational periods. Suppression-time was significantly reduced when a binocular superposable contour was available and it was not significantly changed when the superposable contours differed in color as compared to when they were identical in color--so long as the color seen was the color of the superposable vertical bar in the half-view not containing the horizontal bar. When that vertical bar was suppressed, little suppression of the horizontal bar occurred. The results imply a method for detecting suppression in those parts of the visual field containing identical contours.
R 9

29,335
Warm, J.S., Foulke, E. & Loeb, M. THE INFLUENCE OF STIMULUS-MODALITY AND DURATION ON CHANGES IN TEMPORAL JUDGMENTS OVER TRIALS. Amer. J. Psychol., Dec. 1966, LXXIX(4), 628-631. (University of Louisville, Louisville, Ky.).

The present study assessed the effects of variations in sensory content and nominal durations of intervals delimited by Ss on the tendency for these intervals to increase in magnitude over trials. The intervals to be produced were 0.5 sec., 3.0 sec., 7.0 sec., and 15.0 sec. The pressing of the response-key resulted in the following sensory inputs: a) auditory and tactual-kinesthetic, b) electrocutaneous and tactual-kinesthetic, c) tactual-kinesthetic alone. A significant linear increase over trials was noted at 15 sec. and an increase with significant linear and quadratic components was observed at at 7.0 sec.; at 0.5 and 3.0 sec., no significant trend over trials was apparent. The shape and slope constants of the gradient as well as absolute response magnitude showed no relation to the sensory stimulation employed.
R 12

29,336
Krusberg, R.J. & Zimmer, H. A PHOTOVOLTAIC PLETHYSMOGRAPH CALIBRATED FOR TISSUE-DENSITY. Amer. J. Psychol., June 1966, LXXIX(2), 304-308. (University of Georgia, Athens, Ga.).

This paper proposes a new and different solution to the problem of plethysmography. The photovoltaic cell provided the desired characteristics. The apparatus thus designed is described in some detail.
R 1

29,338
Kaplan, I.T. & Metlay, W. A SIMPLE METHOD FOR PHOTOGRAPHING EYE-MOVEMENTS. Amer. J. Psychol., Sept. 1966, LXXIX(3), 488-489. (New York University Medical Center, New York, N.Y.).

This note describes a simple method for photographing eye-movements. The novel feature of the technique is a mirror which reflects light from a slide projector onto S's eye. The reflected beam performs 3 functions: 1) It provides the bright illumination required for photographing the eye, 2) It marks the changing of the projected display onto the photographic record, and 3) It enables S to keep his head-position constant.

29,339
Schiffman, H.R. ACCURACY OF ESTIMATES. Amer. J. Psychol., Sept. 1966, LXXIX(3), p490. (Rutgers University, New Brunswick, N.J.).

In many studies, the deviations, or percentages or means derived from them, form the values of an analysis using a statistical technique which assumes that sampling is from a population that is normally distributed. The deviations from absolute value present, however, a 'half-normal' or one-sided distribution, since the algebraic sign is ignored. Hence a basic assumption is violated in these conditions. Even a very liberal interpretation of the 'robustness' of the assumption of normality cannot accommodate such usage. Either the data must be transformed to obtain distributional normality or the standard deviation must serve as a measure of over-all error. In any event, caution must be exercised when dealing with deviations computed without regard to algebraic sign.

29,341
Schneider, C.W. MONOCULAR AND BINOCULAR PERCEPTION OF VERTICALITY AND THE RELATIONSHIP OF OCULAR DOMINANCE. Amer. J. Psychol., Dec. 1966, LXXIX(4), 632-636. (Michigan State University, East Lansing, Mich.).

The perception of verticality was determined for 12 right-eyed and 12 left-eyed Os using the right eye, the left eye, and binocular vision. The apparent vertical was displaced to the right of true vertical when the right eye was used and to the left of true vertical when the left eye was used by all Os. Under the binocular viewing condition, the apparent vertical was displaced clockwise of true vertical by the right-eye dominant Os and counterclockwise of true vertical by the left-eye dominant Os.
R 11

29,342
Krusberg, R.J. & Zimmer, H. A PSYCHOPHYSIOLOGIC STIMULATOR: FLOATING CONSTANT-POWER. Amer. J. Psychol., Dec. 1966, LXXIX(4), 637-641. (University of Georgia, Athens, Ga.).

Various investigators have on repeated occasions expressed concern over the possibility that wattage, rather than voltage or amperage traditionally used, may be the current-characteristic most relevant to electrodermal stimulation. Definitive experimentation on this point has been hampered by the unavailability of a constant-power stimulator. Instead, the wattage dissipated through S has had to be calculated from the measurements of S's resistance and amperage or voltage. The instrument described here is intended to remedy these deficiencies and to arm the experimenter with means of establishing positive control over these independent variables.
R 7

29,364
Garn, S.M. NUTRITION IN PHYSICAL ANTHROPOLOGY. Amer. J. phys. Anthrop., May 1966, 24(3), 289-292. (Growth & Genetics Dept., Fels Research Institute, Yellow Springs, Ohio).

A concern with nutrition in its broadest sense, including the physical form of the dietary and the energy balance will occupy us more rather than less in the years to come, as we channel our interests to ascertain the directions of evolutionary and physiological change rather than limiting our endeavors to their simple description.
R 15

29,375
Westheimer, G. FOCUSING RESPONSES OF THE HUMAN EYE. Amer. J. Optom. & Arch. Amer. Acad. Optom., April 1966, 43(4), 221-232. (Neurosensory Lab., University of California, Berkeley, Calif.).

The accommodation system of the human eye is discussed. Several basic questions concerning accommodation responses are posed and the answers are depicted via optometer records. These questions include: a) When a sudden change in accommodation requirement is introduced, as by sudden presentation of near target, what does the response look like? b) Are these responses of the nature of saccadic eye movements which follow a predetermined course that cannot be altered once the movement has been initiated, or can they be modified during their course? c) Is there a steady-state error? d) How steady is the steady state? e) What is the response of the accommodation system to sinusoidal variations in target focus at various frequencies? and f) What is the open-loop response? The use of servoanalysis in understanding the focusing responses of the eye is considered.
R 5

29,382
Mitchell, D.E. A REVIEW OF THE CONCEPT OF "PANUM'S FUSIONAL AREAS". Amer. J. Optom. & Arch. Amer. Acad. Optom., June 1966, 43(6), 387-401. (Victorian College of Optometry, University of Melbourne, Melbourne, Australia).

The concept of "Panum's fusional areas" is discussed. An argument is given for treating the amount of retinal disparity, necessary to produce diplopia, as a spatial threshold. This threshold was termed the disparity threshold for diplopia. Previous investigations of Panum's areas are discussed in terms of this threshold.
R 44

29,383
Knoll, H.A. MEASURING AMETROPIA WITH A GAS LASER. Amer. J. Optom. & Arch. Amer. Acad. Optom., July 1966, 43(7), 415-418. (Bausch & Lomb, Inc., Rochester, N.Y.).

Ametropia of the eye can be determined subjectively by having a S view the moving pattern created by a helium-neon gas laser. The lens power that eliminates the motion of the pattern is a measure of the refractive error. Compared with the conventional subjective method, this new method indicated that the refractive errors for 7 Ss were slightly greater in hypermetropia or less in myopia for 15 of the 25 meridians tested. The sensitivity of the laser method was determined for 9 Ss and was found to be a quarter diopter or less for 29 of the 35 meridians tested.
R 4

29,384
Ball, R.J. & Bartley, S.H. FURTHER INVESTIGATIONS OF COLOR PERCEPTION UNDER TEMPORAL MANIPULATION OF PHOTIC STIMULATION. Amer. J. Optom. & Arch. Amer. Acad. Optom., July 1966, 43(7), 419-430. (Psychology Dept., Michigan State University, East Lansing, Mich.).

This paper reviews the vision research program being conducted at the Michigan State University Psychology Department. The area of emphasis has been in the temporal characteristics of photic energy impingement, and how they influence the perceptual outputs of brightness, hue, and saturation. The progress and continuity of the research efforts are indicated by the specific problem areas: phenomena associated with brightness enhancement, subfusional rates of intermittency, pulse train length--null period and stimulus duration, visual acuity and temporal characteristics of stimulus, intensity-wavelength-timing interrelationships, and color deficiency and temporal characteristics of the photic input.
R 53

29,385
Rengstorff, R.H. A STUDY OF VISUAL ACUITY LOSS AFTER CONTACT LENS WEAR. Amer. J. Optom. & Arch. Amer. Acad. Optom., July 1966, 43(7), 431-440. (USA Patterson Hospital, Fort Monmouth, N.J.).

In a random selection of 83 habitual corneal contact lens wearers entering the U.S. Army, over 50% had temporary visual acuity loss reversible at some time during a 21-day period after contact lens removal. 2 Ss had severe and possible permanent visual acuity loss attributed to gross personal neglect of accepted contact lens practices. The relationship of hygiene, contact lens design and temporal factors are discussed. Visual acuity loss was least in Ss with contact lenses less than 1 year, those with reduced wearing habits and those who sought evaluation every 6 months.
R 6

29,392
Kent, P.R. VISION UNDERWATER. Amer. J. Optom. & Arch. Amer. Acad. Optom., Sept. 1966, 43 (9), 553-565. (USN Submarine Medical Center, New London, Conn.).

Experiments were performed at the Naval Submarine Medical Center comparing visual resolution, and size and distance judgments underwater, with the same measures in air. The underwater visibility of fluorescent vs. non-fluorescent pigments was also investigated. Under the experimental conditions it was found that: a) At short range, visual resolution of a target in water was better than in air at the same physical distance; b) except at short ranges, both size and distance were overestimated underwater compared to air viewing; c) fluorescent pigments were found to be more visible underwater than non-fluorescent types.
R 5

29,394
Hamilton, J.E. LUMINANCE AND THE MOON ILLUSION. Amer. J. Optom. & Arch. Amer. Acad. Optom., Sept. 1966, 43(9), 593-604. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A comparison of luminance with the magnitude of the moon illusion measurements was made using 20 Ss. The magnitude of the moon illusion varies inversely as the amount of luminance in the background of sky surrounding the moon. The magnitude of the moon illusion varies directly as its contrast with the surrounding sky. However, when a dim horizon moon was compared to a bright zenith moon of the daytime sky and a bright horizon moon compared to a dim zenith moon of the daytime sky, the horizon moon was always apparently larger than the zenith moon. Nearness of the moon to the terrain appears to affect the apparent size of the moon more than the luminance of the moon or its contrast with the sky background.
R 4

29,396
Sarver, M.D. COMPARISON OF SMALL AND LARGE CORNEAL CONTACT LENSES. Amer. J. Optom. & Arch. Amer. Acad. Optom., Oct. 1966, 43(10), 633-651. (School of Optometry, University of California, Berkeley, Calif.).

80 Ss were fitted with corneal contact lenses using the method of direct measurement. One eye of each S was fitted with a small, thin lens having a base curve with a median value of 0.37 D "steeper than K." The other eye was fitted with a larger diameter modified contour lens having a base curve with a median value equal to the "flat K" reading of the cornea. Because of the marked similarity between each S's eyes this constituted a matched-pairs study. Efforts were made to obtain an optimum wearing result with each lens. Ss were asked to choose between the 2 lenses at the termination of the study and to describe the symptoms experienced with each lens. 48 Ss (60% of the sample) preferred the small lens over the large lens, 25 Ss (31% of the sample) preferred the large lens over the small lens, and 7 Ss (9% of the sample) had no lens preference. Significantly more Ss experienced blur, flare, and edge reflections with the small lens than with the large lens (Chi-square, $p < 0.02$), while significantly more experienced spectacle blur, discomfort, and photophobia with the large lens than with the small lens (Chi-square, $p < 0.05$). The results thus demonstrate a greater patient preference for the small, thin lens over the modified contour lens, and fewer symptoms of discomfort associated with wearing the small lens.
R 16

29,397
Jani, S.N. THE AGE FACTOR IN STEREOPSIS SCREENING. Amer. J. Optom. & Arch. Amer. Acad. Optom., Oct. 1966, 43(10), 653-657. (Optometry Div., Indiana University, Bloomington, Ind.).

This study examined the relationship between stereopsis and age. The data from 1,207 observers (615 males, 592 females) were used. The Flashlight Diastereo Test was the screening device; it was administered to volunteers during the Indiana State Fair Vision Screening Demonstration in 1962. The observers considered were "visually normal" except for the possibility of failing the stereopsis test alone, e.g., visual acuity better than 20/40, astigmatism less than 1.00 D.C., myopia less than 0.50 D.S., etc. The data were categorized in 10-year age groups from 0-9 to 70-79. The percentage failing the stereopsis test was examined by Chi Square; the data suggest a positive relationship between age and stereopsis.
R 13

29,399
Allen, M.J. A NOTE ON RANDOM VISUAL MOTION - A VISUAL AFTER EFFECT. Amer. J. Optom. & Arch. Amer. Acad. Optom., Oct. 1966, 43(10), 664-665. (Optometry Div., Indiana University, Bloomington, Ind.).

When a large uniform surface is viewed after several minutes of alternating full field stimulation of the 2 retinas at about 7 1/2 cycles per sec., an instability of the perceived surface occurs. The uniform surface appears to break down into multiple smaller areas that are of a different appearance and that move about slightly and independently. This produces an appearance at first of ripples on water in a swimming pool. However, because they seem to be independent in the 2 eyes, the sensation soon becomes 3 dimensional as if looking at the surface through small clouds of transparent turbulent fog. The disturbance develops gradually and is estimated to require 10 sec. to reach its peak, whereupon it persists at full effect for perhaps 5 sec. and then begins its decline to zero, which takes perhaps 10 sec. more. Higher illumination levels on the uniform surface increases the strength of the after effects.

29,402
Freeman, R.D. ALIGNMENT DETECTION AND RESOLUTION AS A FUNCTION OF RETINAL LOCATION. Amer. J. Optom. & Arch. Amer. Acad. Optom., Dec. 1966, 43(12), 812-817. (School of Optometry, University of California, Berkeley, Calif.).

Vernier and resolution acuities were determined for 2 Ss at retinal loci of 0.75, 2, 6, 12, and 20° peripherally under constant experimental conditions. The results indicate that both acuities diminish with eccentricity at approximately the same rate. The findings reaffirm the notion that extra-foveal visual acuity is principally limited by factors other than optical.
R 10

29,406
Murray, R.H. THERMAL TRANSIENTS TO 205°C (400°F). BIOCHEMICAL AND HEMATOLOGICAL EFFECTS IN HUMAN SUBJECTS. Aerospace Med., Jan. 1966, 37(1), 11-15. (Indiana University Cardiopulmonary Laboratory, Wright-Patterson AFB, Ohio).

In order to evaluate the hematological and metabolic effects of brief, intense, thermal stress, 6 clothed human Ss were exposed to thermal transients 20 min. in duration, wall temperature rising 28°C (50°F)/min. to peaks of 205°C (400°F) with subsequent passive wall-cooling. There was no evidence of hemolysis, and blood cellular elements showed only nonspecific "stress" and hemoconcentration effects. There were no significant changes in serum electrolytes, blood sugar, total protein or protein electrophoresis. There was in increase in tidal volume without an increase in respiratory rate, an example of heat hyperpnea, causing an increase in blood O_2 and a fall in CO_2 values with consequent increase in pH. Lactic acid rose slightly and a small amount of excess lactate was generated. Lactic dehydrogenase activity decreased although there was no demonstrable change in the LDH isozymes.
R 24

29,407
Farmer, R.A., Donnell, A.M., Jr. & McCann, J.P. AIR TRAINING COMMAND EJECTION EXPERIENCE, 1 JANUARY 1962 TO 31 DECEMBER 1964. Aerospace Med., Jan. 1966, 37(1), 28-31. (USAF Air Training Command, Hq., Office of the Surgeon, Randolph AFB, Tex.).

The solo pilot has no responsibility to another occupant, no cause for assuring that his student or his instructor comprehends the emergency and is prepared to eject. When emergencies occur at very low altitudes little can be done to increase the likelihood of successful escape. Analysis of ATC's ejection experience for flying experience of the ejectees is relatively straightforward. Assessment of the training of the flyers in ejection procedures, parachute landing falls and parachuting is more difficult. Only 5 of the ejectees had not received ejection seat firing training. 1 of these men was unsuccessful. 3 men had not had procedural training in the seat utilized. 1 of these was unsuccessful. It is felt that such small numbers have relatively little significance. The incidence of difficulties during and after ejection, parachuting and landing has alerted us to train all of our flyers as well as possible in the skills and procedures of ejection-parachute escape. The Air Training Command of the USAF has compiled a comparatively good record for ejection success during the last 3 years. The rates of ejections and of major aircraft accidents for this command are significantly less than those of the entire USAF. Successful ejection rates for the years 1960-1964 compare favorably with USAF rates to which ATC rates contribute.
R 3

29,408
Greenleaf, J.E., Matter, M., Jr., Bosco, J.S., Douglas, L.G., et al. EFFECTS OF HYPOHYDRATION ON WORK PERFORMANCE AND TOLERANCE TO $+G_z$ ACCELERATION IN MAN. Aerospace Med., Jan. 1966, 37(1), 34-39. (Ames Research Center, NASA, Moffett Field, Calif.).

9 men were water depleted up to 6.9% of their body weight during controlled 5-day dietary periods and then subjected to various physical performance tests, including grayout tolerance while undergoing $+G_z$ −3.0G/min. acceleration, to define set points (the per cent hypohydration where functional deterioration begins). Hypohydration refers to a depletion of body water. The following set points were observed: isometric muscular strength--greater than 4%; modified Harvard step-test--4 to 4.5%; submaximal O_2 intake--greater than 4%; and $+G_z$ −3.0G/min. centrifugation--greater than 4%. Total body reaction time decreased with hypohydration. The concept of free circulating water was suggested as a possible explanation for the diversity of results regarding the effects of water depletion of bodily deterioration and work performance.
R 33

29,409
Dowd, P.J., Moore, E.W. & Cramer, R.L. EFFECTS OF FLYING EXPERIENCE ON THE VESTIBULAR SYSTEM: A COMPARISON BETWEEN PILOTS AND NONPILOTS TO CORIOLIS STIMULATION. Aerospace Med., Jan. 1966, 37(1), 45-47. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Certain flight maneuvers, as when an aircraft is banking and turning, were simulated by the USAFSAM biaxial stimulator. Subjective responses for pilots were markedly different from nonpilots. A "threatening" maneuver for the pilots was preferred as "exciting" by the nonpilots. Significant differences were found between pilots and nonpilots in the rate of decay of nystagmus in response to 2 different simulated maneuvers. Such nystagmic differences are discussed with reference to their sensations. Results indicated that flying experience or flight training produced such differences.
R 12

29,410
Gillingham, K.K. TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS USING CORIOLIS EFFECT TO ASSESS ROTATION. Aerospace Med., Jan. 1966, 37(1), 47-51. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

It is common knowledge that the semicircular canals, once they have equilibrated to an angular velocity, cannot respond to that motion, be it pitch, roll, or yaw. By employing self-induced Coriolis stimulation, however, one can perceive otherwise undetectable rotation. How accurately this can be done is studied by determining the psychophysical functions for the discrimination of direction or rotation at different yaw velocities. We have found that Ss with minimal training can perceive accurately angular velocities slower than the 4-min. turn of instrument flight, despite the fact that velocities of much greater magnitude remain unperceived until the Coriolis acceleration is induced. The potential use of this and similar maneuvers as a means of countering spatial disorientation is discussed.
R 18

29,411
Stevens, P.M., Miller, P.B., Gilbert, C.A., Lynch, T.N., et al. INFLUENCE OF LONG-TERM LOWER BODY NEGATIVE PRESSURE ON THE CIRCULATORY FUNCTION OF MAN DURING PROLONGED BED REST. Aerospace Med., April 1966, 37(4)Sec. I, 357-367. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Exposure to lower body negative pressure for 8 hrs. a day during a 4-week period of absolute bed rest has been shown to significantly maintain orthostatic intolerance and plasma volume. A mean plasma volume loss of 332 cc was seen in the control Ss who were at pure bed rest while test Ss exposed daily to L.B.N.P. during bed rest showed no significant change from baseline. Following bed rest, resting recumbent heart rates were significantly higher in control Ss but unchanged in the test Ss; orthostatic heart rates although higher in both groups increased significantly less in the test Ss. Following bed rest the incidence of syncope was significantly higher in the control Ss but was unchanged from before bed rest in the test Ss. Hemodynamic cardiovascular measurements suggest that in response to acute sustained L.B.N.P. following bed rest, test Ss have a smaller increase in heart rate while the cardiac index decreases less than in the controls. Resting recumbent forearm blood flow is lower following 4 weeks of bed rest with L.B.N.P. than following bed rest alone. The increase in venous tone which occurs in response to acute exposure to L.B.N.P. is not apparent following pure bed rest but persists following bed rest with L.B.N.P. conditioning. Potential mechanisms responsible for these findings and their implications are discussed.
R 21

29,412
Torphy, D.E. EFFECTS OF SHORT-TERM BED REST AND WATER IMMERSION ON PLASMA VOLUME AND CATECHOLAMINE RESPONSE TO TILTING. Aerospace Med., April 1966, 37(4)Sec. I, 383-387. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The urinary excretion of norepinephrine and epinephrine measured in 5 Ss when tilted to 44° after 6 hrs. of either normal activity, recumbent, (bed rest) inactivity or immersed inactivity showed the same expected rise regardless of the preceding condition. This suggested that vasoconstrictive response to orthostasis, as evidenced by norepinephrine excretion, is not impaired by 6 hrs. of immersion. Plasma volume measured before and after 6 hrs. of normal activity, recumbent (bed rest) inactivity, immersed activity, and immersed inactivity showed mean plasma volume changes of +114 ml, -146 ml, -284 ml and -290 ml respectively, indicating recumbency reduces plasma volume and immersion reduces it further. Negative pressure breathing was not present during immersion. Fluid volume loss is considered as a possible primary cause of orthostatic intolerance following water immersion experiments.
R 26

29,413
Vogt, F.B., Mack, Pauline B. & Johnson, P.C. TILT TABLE RESPONSE AND BLOOD VOLUME CHANGES ASSOCIATED WITH THIRTY DAYS OF RECUMBENCY. Aerospace Med., Aug. 1966, 37(8), 771-777. (Nelda Childers Stark Lab., Texas Woman's University, Denton, Tex.).

Five healthy adult males were studied during a 30-day bed rest experiment. Repeated tilt table tests, using an English-saddle type of support, were conducted before and after the period of recumbency to determine the response of the Ss. Radioisotope blood volume determinations were made prior to the study, during the study, and during the recovery phase. These tests were performed in conjunction with a study designed primarily to evaluate the musculoskeletal changes that occur as a consequence of prolonged bed rest. The results indicate that definite cardiovascular deconditioning occurs after 30 days of bed rest and that almost complete recovery is achieved after 2 weeks of ambulatory activity. The study also demonstrates that blood volume decreases in the first few days of bed rest and returns toward normal at the end of the 30-day bed rest period.
R 13

29,415
Harper, C.R., Keehan, J.E. & Kidera, G.J. INTERMEDIATE VISION TESTING OF AIRLINE PILOTS. Aerospace Med., Aug. 1966, 37(8), 841-843. (United Airlines Training Center, Denver, Colo.).

The intermediate visual acuity of 50 senior airline pilots was tested. All Ss had minimal or no accommodative ability as measured by the Prince Rule. Objectively 2 methods were used: a) the visual acuity in each eye at 30 in. was tested using the trifocal chart of American Optical; b) the amount of artificial accommodation or plus sphere required for 30 in. was measured by use of the dynamic cross cylinder test. Subjectively, the pilot in a dark room was shown a simulated DC-8 instrument panel at 30 in. With red and white illumination at the intensity he desired, the comparative acuity was demonstrated with and without correction of plus sphere. At 30 in., which is a mean distance taken from various aircraft utilized by United Air Lines, all Ss related significantly blurring of vision without sphere correction. With proper correction, all Ss appreciated significant improvement in the clarity of the instrument panel and printed testing material. Recommendations are made for pilot education concerning intermediate vision.
R 2

29,416
Fascenelli, F.W. & Lamb, L.E. BIOMEDICAL MONITORING DURING DYNAMIC STRESS TESTING: II. THE LEVY HYPOXIA TEST. Aerospace Med., Sept. 1966, 37(9), 923-927. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Apparently healthy aircrew members between the ages of 25 and 35 years were studied with the Levy hypoxia test during dynamic stress test monitoring technics. The principal changes noted were those associated with arterial O_2 desaturation. The compensatory mechanisms to short term hypoxia were accomplished by the cardiovascular system and measurements indicated that this was achieved through increased cardiac output. The increased cardiac work and arterial O_2 desaturation combined to present a significant stress test for the adequacy of coronary circulation.
R 3

29,417
Fascenelli, F.W. & Lamb, L.E. BIOMEDICAL MONITORING DURING DYNAMIC STRESS TESTING: III. MAXIMUM EXERCISE TOLERANCE, ERGOMETER. Aerospace Med., Sept. 1966, 37(9), 928-935. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Apparently healthy aircrew members between the ages of 25 and 35 years were studied during a maximum exercise tolerance test using dynamic stress testing monitoring technics. The median exercise time on the ergometer was 12 min., more than 84% of the Ss performed between 10 and 14 min. In healthy adult males the exercise limit is usually set by the cardiac output since the ventilatory requirements are far below the limits of maximum breathing capacity tests.
R 3

29,418
Fascenelli, F.W. & Lamb, L.E. BIOMEDICAL MONITORING DURING DYNAMIC STRESS TESTING: IV. FLACK TEST. Aerospace Med., Sept. 1966, 37(9), 935-939. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Apparently healthy aircrew members between the ages of 25 and 35 years were studied with the Flack Test using dynamic stress test monitoring technics. The heart rate shows a classic response to the Flack Test. Some of the integrated intervals showed a continuing decrease during the recovery period. The reason for these changes are not evident at this time.
R 2

29,419
Fascenelli, F.W. & Lamb, L.E. BIOMEDICAL MONITORING DURING DYNAMIC STRESS TESTING: V. TILT TABLE ORTHOSTATIC TOLERANCE TEST. Aerospace Med., Sept. 1966, 37(9), 939-942. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Apparently healthy aircrew members between the ages of 25 and 35 were studied with a tilt table procedure using dynamic stress test monitoring technics. The principal changes noted were those directly related to the change in heart rate and a shortening of mechanical systole.
R 6

29,420
Rennie, B.B. SOME EXPERIMENTAL RESULTS ON DOCKING DYNAMICS OBTAINED FROM MODEL TESTS. J. Spacecraft & Rockets, Jan. 1966, 3(1), 34-39. (Boeing Company, Seattle, Wash.).

A simulator program using scale models of space vehicles was used to investigate docking dynamics. The test program involved scale models of a simple fixed-cone and a floating-cone docking mechanism mounted on air-bearing-supported dynamically scaled vehicle models. Equations of motion of the vehicle models are derived and expressions are obtained for acceleration as a function of time after impact for representative values of initial velocity, spring rate, and damping constant. Test results show that compliance of the floating cone effectively reduces peak impact loads. For example, with a relative velocity at impact of 0.5 fps, the peak impact load with the softest configuration of floating cone was only 1/6 the load measured with the fixed-cone configuration. Test results also show that compliance of the floating cone improves docking effectiveness. Flexibility in rotation and lateral translation helps to compensate for misalignment at impact. Such flexibility is not necessary if angular misalignment is less than 5° but is essential for misalignment as large as 10°.
R 4

29,421
Summers, L.G., Shea, R.A. & Ziedman, K. UNAIDED VISUAL DETECTION OF TARGET SATELLITES. J. Spacecraft & Rockets, Jan. 1966, 3(1), 76-84. (TRW Systems, Thompson Ramo Wooldridge, Redondo Beach, Calif.).

Analytical studies were conducted to estimate target intensity and line-of-sight (LOS) angular rate ($\dot{\theta}$, mrad/sec) for rendezvous maneuvers with sun-illuminated satellites in a star field, and experiments provided estimates of the operator's detection time (τ, sec). Calculated target intensities (I_t, stellar magnitude) for 2- to 20 ft-diam spheres varied from -2 to +8 for a 100-naut-mile range. For a typical transfer orbit, $\dot{\theta}$ varies from 0.783 mrad/sec to -0.4 and then back to 0 for relative inertial coordinates. The first experiments investigated the effects of $\dot{\theta}$ and I_t on the cumulative detection probability P_τ for various star-field backgrounds. In the second practice session of this experiment, the cumulative probability within 150 sec P_{150}, averaged for all target intensities, varied from 0.45 for $\dot{\theta} = 0.2$ mrad/sec to 0.92 for $\dot{\theta} = 3.2$ mrad/sec; and P_{150}, averaged for all $\dot{\theta}$, varied from 0.50 for $I_t = 5$ to 0.70 for $I_t = 2$ (brightest). The second experiment showed the effect of practice in 4 sessions (2 values each of $\dot{\theta}$ and I_t) using the same star-field background. The time for $P_\tau = 0.50$ varied from 60 to 175 sec during the first session but only from 25 to 45 sec in the fourth session.
R 8

29,422
Burton, J.R. & Hayes, W.E. GEMINI RENDEZVOUS. J. Spacecraft & Rockets, Jan. 1966, 3(1), 145-147. (McDonnell Aircraft Corporation, St. Louis, Mo.).

This note describes the concepts and equipment for performing the rendezvous and docking operations between the Gemini and Agena vehicles.
R 2

29,423
Tannas, L.E., Jr. MANUAL ENTRY GUIDANCE. J. Spacecraft & Rockets, Feb. 1966, 3(2), 175-181. (Martin Company, Baltimore, Md.).

A guidance technique utilizing a new display approach, including feasibility study results, is presented for the manual guidance of a lifting entry vehicle. The capability to manually stabilize the trajectory and maneuver the vehicle to the desired range is derived through the use of a graphical display of the trajectory in terms of drag and velocity squared. The practical aspects of parameter sensing, computing, displaying, and manual controlling are investigated in detail. A block diagram is presented showing, for a constant-L/D-type vehicle, the sensor and computer requirements for both down-range and cross-range control. All the display requirements, trajectory graph, roll attitude, down-range-to-go, and cross-range error, are integrated into a single display. Simulation results are presented showing entries under manual control. An error analysis is presented for down-range control showing that the range can be controlled to within 10 naut miles. It is concluded that a completely manual guidance entry for superorbital and suborbital velocities is both feasible and practical.
R 8

29,424
Maltby, L.J. DESIGN AND EVALUATION TESTS OF A FULL-SCALE PROTOTYPE DOCKING MECHANISM. J. Spacecraft & Rockets, Feb. 1966, 3(2), 187-192. (Menasco Manufacturing Company, Burbank, Calif.).

Design features of the prototype mechanism are described, and results of evaluation tests on the RCD (rendezvous, closure, and docking) simulator at the Martin Company, Denver, are presented. The mechanism consists of a ring structure on one vehicle and 4 pivoted arms on the other. The arms are contacted by the ring and swing about their pivots against the resistance of shock absorbers. Hooks are propelled along the arms until they latch to the ring. Actuators pull the vehicles into alignment and lock them together. The locks are released by actuators, the hooks withdraw, and the shock absorbers push the vehicles apart. Approximately 0.1 lb of nitrogen is used by the actuators during one docking cycle. Evaluation tests simulated docking a 6000-lb vehicle with a 20,000-lb vehicle with 12 degrees of freedom. Closing velocities ranged from 0.1 to 2.4 fps during 96 runs covering 58 combinations of initial contact conditions. Successful engagements were obtained for all conditions except those in which the velocity was too low to release the hooks. The vehicles rebound and lose contact if immediate acquisition is not obtained.
R 2

29,425
Kullas, A.J. WHAT IS A MAN-RATED BOOSTER? J. Spacecraft & Rockets, Feb. 1966, 3(2), 270-273. (Martin Company, Denver, Colo.).

Man-rating is emphasized as those elements of today's state of the art such as: a) part or component traceability to insure design integrity, reliability, and configuration control b) extra care in the design and manufacture of equipment; and c) an explanation of all the anomalies in the handling and testing of the equipment in component, subsystem, or total system form; and, in addition, a design for which possible malfunctions have been assessed and in which the pilot is given alternate choices in both mission and equipment so that his judgments are brought to assist in the performance of the mission. He is given a guidance and control capability (possibly coupled with a thrust control capability), a malfunction detection system, margins of safety that are consistent with the degree of risk and his speed of reaction, and a design where no single cause is likely to result in a catastrophic system failure. He has a vehicle that has been flight tested in the design conditions.
R 1

29,426
Cheatham, D.C. & Heckler, C.T. HANDLING QUALITIES FOR PILOT CONTROL OF APOLLO LUNAR-LANDING SPACECRAFT. J. Spacecraft & Rockets, May 1966, 3(5), 632-638. (Manned Spacecraft Center, NASA, Houston, Tex.).

Piloted simulations of the lunar-landing maneuver were conducted at the Manned Spacecraft Center to determine control problems and required handling qualities of lunar-landing spacecraft. The studies examined control problems and handling qualities required to complete the final approach to landing starting from ranges of 2000 to 3000 ft from the desired landing site. Results of the simulation studies indicated that satisfactory handling qualities could be obtained with control powers of the order of 10 deg/sec^2 for the rate command control using proportional firing thrusters, and that control powers of the order of 5 deg/sec^2 provided satisfactory handling qualities for the rate command control system employing on-off thruster firing logic. Within a satisfactory range of maximum rate command and control power available, the pilots tolerated equivalent time constants up to 1 sec in the proportional system and equivalent time constants of the order of 3 sec in the on-off thruster logic control system. In addition, the simulation studies showed that the direct on-off logic control system (no rate feed-back) would probably not provide satisfactory control handling qualities for the lunar landing.
R 4

29,427
Draper, C.S. THE ROLE OF INFORMETICS IN MODERN FLIGHT SYSTEMS. J. Spacecraft & Rockets, June 1966, 3(6), 769-779. (Aeronautics & Astronautics Depts., Massachusetts Institute of Technology, Cambridge, Mass.).

Informetics, the necessary information-using counterpart of effectetics which is itself the application of materials and resources to produce desired results, has only recently been given the place of importance it requires in the conception, design, construction, and use of operating systems. The paper presents a development and discussion of the basic concepts associated with informetics from the generalized viewpoint of flight vehicle systems. The Wright brothers made particularly significant contributions to aeronautical technology in the then very new area of informetics. The trains of thought and the patterns of design they started at the turn of the century are still basic factors in the progress of today's very large aeronautical and astronautical activities. Progress in these areas of human interest has been especially spectacular in recent years, a result which has depended not only on actual advances in technology, but also very much on the growing realization that well-engineered informetics to match vehicles is not an optional matter but is a fundamental and essential element in the effective performance of any operating system. Illustrations of the principles involved are based on flight vehicle systems ranging from the Wright Flyer to the Apollo spaceship soon to be used for manned trips to the moon. It is shown that a common pattern of effectetics and informetics may be applied to flight systems of all kinds. In these patterns, informetics plays a role equal in importance to that of effectetics. This fact is being ever more widely recognized and certainly will stimulate the development of new systems for flying within and beyond the atmosphere. It is important to note that the functional pattern discussed in the paper may be applied not only to flight vehicles but to operating systems of all kinds ranging from single human beings to industrial complexes, armies, and whole nations.
R 1

29,428
Whitby, C.M. IMAGE-RELATED SCANNING SYSTEMS FOR VISUAL SIMULATION. J. Spacecraft & Rockets, June 1966, 3(6), 788-792. (Bell Aerosystems Company, Buffalo, N.Y.).

Need has existed for continuously controllable simulated space scenes consisting of target vehicles and celestial bodies. This paper presents a technique referred to as image-related scanning, for generating such scenes. The systems described have the advantage of scanning only the area of the scene where important data are concentrated. This allows increased resolution in portions of the scene as necessary to perform the tasks assigned to the simulator. In this respect the technique is compared to the eye, which also has high resolution in a small area of the total field of view. The equipment has been successfully applied to the Gemini Mission Simulator for rendezvous and docking training.

29,429
Allen, C.H., Jr., Doty, A.B., Jr. & McCormick, E.C. SPACE FLIGHT SIMULATOR FOR U.S. AIR FORCE AEROSPACE RESEARCH PILOT SCHOOL. J. Spacecraft & Rockets, June 1966, 3(6), 793-799. (USAF Aerospace Research Pilot School, Edwards AFB, Calif.).

The T-27 space flight simulator is to be used in the training of flight crews for space research missions. This paper discusses its design, the measured performance of its system elements, and its use for training and research. Major components are the computer system, visual system, motion system, crew station, and instructor station. A hybrid computer system that can adapt to any computational problem arising in the simulation of various vehicles and subsystems is utilized. Real-time solutions with accuracies of one part in 7×10^{13} and systems with response times of 0-80 cps can be simulated. A virtual image visual system provides an out-the-window view of the star field, rendezvous vehicle, and earth scene as viewed from an earth-orbiting flight of 100 to 1000 naut miles. Three separate image generation schemes were utilized to provide the visual inputs to the image assembly and display equipment. A motion system gives initial acceleration cues and vehicle attitude sensations throughout the simulations. Acceleration onset rates of 50 deg/sec^2 in pitch, 100 deg/sec^2 in roll, and 100 deg/sec^2 in yaw are possible. The cockpit contains modular displays and controls that provide for training in a variety of vehicles of various configurations.

29,430
Lanzkron, R.W. & Fischer, W.C. CHECKOUT CRITERIA AND GROUND SUPPORT EQUIPMENT FOR THE APOLLO SPACECRAFT. J. Spacecraft & Rockets, June 1966, 3(6), 805-809. (Manned Spacecraft Center, NASA, Houston, Tex.).

The basic criteria for checkout of the Apollo spacecraft are: a) provide for astronaut safety and assure the accomplishment of mission objectives; b) demonstrate that no malfunctions exist within the vehicle at the time of launch; c) provide for monitoring and analysis of critical functions in such a manner that anomalies can be recognized and assessed in time for remedial action; and d) demonstrate to the maximum extent practicable operational suitability of vehicles and their associated ground support equipment. This paper discussed how they can be accomplished in a methodical way. Early in the program, during the initial design, it was recognized that a need existed to accomplish this task. A three-pronged effort was initiated: a) definition of a checkout flow allowing checkout of all subsystems to an environment and level commensurate with the flight requirements; b) design of the ground equipment so as to assure minimum penalty in terms of flyaway weight; and c) design of the airborne equipment so as to allow adequate checkout.
R 3

29,431
Grodsky, M.A., Moore, H.G. & Flaherty, T.M. CREW RELIABILITY DURING SIMULATED SPACE FLIGHT. J. Spacecraft & Rockets, June 1966, 3(6), 810-817. (Martin Company, Baltimore, Md.).

This paper describes a simulation experiment designed to obtain improved estimates of pilot reliability for manned space flight. An integrated mission simulation technique was utilized for the seven-day lunar mission. Trained test-pilot personnel, realistic displays, vehicle dynamics operational procedures, etc., were incorporated into the simulation. The preliminary results indicated no statistically significant degradation in performance from premission levels during the seven-day lunar mission, with the exception of certain mid-course correction switching phases. However, it was suggested that the large pre-mission variance might have covered some significant effects. A comparison was conducted between the present simulation data and other data available in the literature. The results of this comparison indicated fairly large differences in estimated reliability, which suggested a review of current modes of estimating reliability and the possible importance of an integrated mission simulation technique in the determination of pilot reliability in those situations in which inflight evaluation is not possible.
R 9

29,432
Kallay, N. EXPERIMENTAL REQUIREMENTS AND SPACE STATION DESIGN SPECIFICATIONS. J. Spacecraft & Rockets, June 1966, 3(6), 854-858. (Douglas Aircraft Company, Inc., Santa Monica, Calif.).

A method is presented to relate specifications of an orbiting research laboratory to experimental program requirements and mission flexibility. An application of this method is illustrated using the experimental program requirements developed as part of the Manned Orbiting Research Laboratory (MORL) study. The characteristics of an "average" experiment are presented. Crew size (9 men), experimental volume (1650 ft^3), power (2 kw), and logistics system weight delivery capability (~25,000 lb experimental weight/yr) are related to the proposed work load expressed in terms of the number of typical experiments to be performed. (80/yr for 6-man crew). The requirements are then summarized for a Saturn IB-launched MORL with a lunar orbit potential, if Saturn V-launched. To test the efficiency of an orbiting research facility so specified, facility load factors are presented for a time-phased sequence of experiments.
R 1

29,433
Pierson, W.R. & Geller, R.E. ORBITAL MAINTENANCE. J. Spacecraft & Rockets, June 1966, 3(6) 941-942. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

The present series of investigations has been concerned with the effects of a low-friction environment on certain of man's anticipated space operations. The lack of friction, however, is but one component of weightlessness and all of the effects of the absence of gravity are not inferred from these studies. The mock-ups used represented bodies with a much larger mass than the subject; hence, any force applied to orbital equipment moved the astronaut, by its reaction, away from the equipment. Although this relationship well may be the typical case in the space age, it does not represent the situation where neither the man nor the equipment are fixed or the situation where zero-reaction tools are used without tethering. Therefore, this is a case of argument for the use of a tethered system. The results of the present study indicate the difficulties of attaining a true earth relationship between man and equipment in space, and the usual relationship probably will be where they are partially fixed with relation to each other. However, the experiments do indicate, that, through the development of suits, tethers, etc., in conjunction with service and assembly design criteria for space equipment, the problems of space maintenance and orbital assembly operations can be solved for either zero or partial g situations.
R 8

29,434
Baily, N.A. & Sondhaus, C.A. RADIATION DOSIMETRY ABOARD MANNED SPACE VEHICLES. J. Spacecraft & Rockets, Aug. 1966, 3(8), 1245-1251. (Hughes Research Laboratories, Malibu, Calif. & California College of Medicine, Los Angeles, Calif.).

Measurements neccessary to characterize radiation exposure in space besides total dose are dose rate, distribution of dose in tissue, and local density of energy deposition, the latter generally characterized by the quality linear energy transfer (LET). In routine low-level exposures to known qualities of radiation on earth, measurement of total dose alone usually suffices to define an exposure; moreover, the known relation of dose in tissue for most radiations permits the measurement to be made in air or at the surface of the body and the tissue dose to be inferred from this. In contrast, the highly variable, high-energy particulate radiation of solar or cosmic origin entering the small metal-enclosed volume of air containing the astronaut can be expected to produce a buildup of secondaries, which depend on the local geometry. Hence, either direct tissue dose and LET measurement or a means of relating instrumental data to these is necessary in each case of space radiation exposure. Dose information required for this purpose can be acquired by relatively unsophisticated and highly reliable tissue equivalent instrumentation. Such instrumentation should give reliable values of the absorbed dose and some coarse breakdown of the LET spectra of the incident radiation in at least a sufficient number of ranges to allow weighting for changes of radiobiological effectiveness of the various LET groups.
R 14

29,435
Jennings, D.C. WATER-COOLED SPACE SUIT. J. Spacecraft & Rockets, Aug. 1966, 3(8), 1251-1256. (United Aircraft Corporation, Windsor Locks, Conn.).

Water was circulated as a heat transport fluid for space suit cooling as an improvement over cooling by ventilation. Ventilation cools by displacement of water vapor containing latent heat from perspiration. Water has the advantage of a much larger heat-capacity than an equal volume of water vapor over the same temperature difference. This fact makes heat removal from a space suit possible at significant savings in weight and power. A series of experiments was performed on men working in liquid cooled garments. These garments were of a type that utilized conductive cooling of the skin by direct contact, and heat transport by circulating water. Feasibility of the concept was demonstrated and pertinent design factors were identified. A major benefit was gained in the suppression of sweating while maintaining comfort. The consequent reduction of body moisture loss is important for long missions at high activity. The results show a cooling capacity able to maintain body temperature equilibrium at metabolic rates in excess of 2000 Btu/hr with comfort. Moisture loss from sweating has been held to 100 cm^3/hr at 1600 Btu/hr in an insulated environment during treadmill testing. Body temperature was independent of water temperature and flow rate over broad ranges of physical activity.
R 7

29,436
Stalony-Dobrzanski, J. RE-ENTRY GUIDANCE AND CONTROL USING TEMPERATURE RATE FLIGHT CONTROL SYSTEM. J. Spacecraft & Rockets, Oct. 1966, 3(10), 1441-1449. (Norair Div., Northrup Corporation, Hawthorne, Calif.).

The use of temperature rate represents a unique appraoch to the design of control and guidance system for re-entry vehicles. The main design objective achieved in this sytem is the separation of vehicle safety from the task of accurate navigation. The safety portion of the Temperature Rate Flight Contol System (TRFCS), utilizing thermocouples as primary sensors rather than the normally used inertial instruments, is very simple and therefore reliable. TRFCS provides short-period stability for the vehicle as well as trajectory control, which results in minimizing temperature peaks and limiting of maximum dynamic pressure and g loads. Around this basic temperature rate autopilot are closed navigation and guidance loops. A failure in the navigation system, which of necessity is a piece of complex equipment, will not affect at all the safety features mentioned. In emergency, in case of automatic system failure, TRFCS can be flown manually. This consists essentially of flying constant temperature rates. The stability and performance of the over-all system was demonstrated by extensive analog and digital simulations, some of which included the pilot in the loop. Following analytical phase, the sensor and electronic hardware were developed. TRFCS recently has been flight tested successfully on the Aerothermodynamic Elastic Structural Systems Environment Test (ASSET) vehicle.
R 7

29,437
Secord, T.C. & Bonura, M.S. LIFE SUPPORT SYSTEMS DATA FROM SIXTY-TWO DAYS OF TESTING IN A MANNED SPACE LABORATORY SIMULATOR. J. Spacecraft & Rockets, Oct. 1966, 3(10), 1527-1533. (Douglas Aircraft Company, Inc., Santa Monica, Calif.).

This paper summarizes the 62 days of Phase I testing in a program for the engineering development of completely closed and integrated life support (LSS) and environmental control (ECS) systems usable for a variety of spacecraft. The LSS representative of a 30-day mission was installed within a double-walled space cabin simulator and was operated by a 4-man crew in a 7-psia N_2-O_2 atmosphere for a 12-day check-out test and a 30-day test. Subsequently, LSS performance and human comfort data were obtained in 20 days of manned testing in both He-O_2 and N_2-O_2 atmospheres at pressures of 5, 7, & 10 psia. Crew repair, maintenance, and operational requirements for the LSS were evaluated. The data have been used for improving equipment, engineering methods, and a generalized LSS and ECS computing program in Fortran language. One important result of the tests was that in a vehicle of the size represented by the simulator there was time to troubleshoot and repair failures of equipment. Thus, requirements for redundancy of components can be reduced.
R 10

29,438
French, F.W. RADIATION SHIELDING OF MANNED MARS VEHICLES. J. Spacecraft & Rockets, Oct. 1966, 3(10), 1544-1546. (Avco Corporation, Lowell, Mass.).

One of the most important design considerations for manned deep space missions is providing protection for the astronauts against the ionizing radiations they will encounter. In this note, estimates are made of the radiation shielding requirements for manned Mars vehicles on missions of one to 3 years duration in the relatively near term time period (early 1980's). Radiations considered in the analysis are the solar flare proton event and the galactic cosmic ray components. For the former, the crew is assumed shielded by a minimum-size "storm cellar," whereas for the latter they are assumed shielded only by the vehicle's shell.
R 5

29,440
Outman, V. & Wang, E.S.J. SIMULATION TESTING IN A SPACE ENVIRONMENT--AN ASSESSMENT. J. Spacecraft & Rockets, Dec. 1966, 3(12), 1697-1710. (McDonnell Aircraft Company, St. Louis, Mo.).

Since space simulation testing is a young technology, further advancement in facilities and techniques is inevitable as space probes become more advanced. Presently, in the area of pressure simulation, the 10^{-} torr range prevails as the lowest working pressure; however, working pressures in the 10^{-} to 10^{-} range are expected in the not-too-distant future. In addition, sensor instrumentation will be required to measure directional molecular flux. In the area of solar radiation, considerable effort will be required to perfect monitoring instrumentation. Other problems mentioned in this survey, such as vacuum measurement and contamination control, require solutions and standards established for use by the entire industry. The need for flight test data designed for comparison with specific ground test data has been demonstrated. Such data will provide valuable information for directing the evolution of improved testing techniques and the generation of more meaningful test results. The scattered flight test data available to date are not specific enough to serve this purpose. Testing under combined environments currently has limited application except in the area of thermal-vacuum testing. Further refinement of testing techniques for the other environments is expected to broaden and increase the effort in this field. For example, thermal model testing is being widely studied; and, although a workable solution still has to be developed to solve the problems associated with complex test specimens, the concept is promising--especially for developmental testing. As space missions become longer and penetrate deeper into space, many other space environments will be simulated in ground test facilities. Solar wind simulation and micro-meteorite simulation are pertinent examples of future simulation parameters. Although no extensive test facility is currently available for planetary simulation, activity in this area is also expected to expand. R 105

29,441
New, J.C. & Timmins, A.R. EFFECTIVENESS OF ENVIRONMENT-SIMULATION TESTING FOR SATELLITES. J. Spacecraft & Rockets, Dec. 1966, 3(12), 1711-1715. (Goddard Space Flight Center, NASA, Greenbelt, Md.).

The philosophy and purpose of ground simulation tests for unmanned spacecraft, as used at the Goddard Space Flight Center, is reviewed. Laboratory test results are presented from 16 prototype and 48 flight spacecraft. The summarized results show a 4-1 ratio in problems per spacecraft for prototype compared to flight models, and for both models the simulated space test has revealed the largest number of problems. A comparison of the number of space problems with test problems on the same spacecraft shows no correlation and shows that 100% trouble-free operation was not obtained on any spacecraft. Data from simulated space testing of 270 experiments for an observatory program show an exponential relationship of malfunctions with time. The curve can be used to estimate the number of problems that will be detected by varying the test time but cannot be extrapolated to long-term (days) testing. The data from the systems test of a complete observatory under simulated space conditions show failures occurring after 12 days of testing and verify the need for long-term systems tests.
R 3

29,442
Mills, E.S. SPACESUIT SYSTEMS AND PENALTIES FOR INTER-PLANETARY MISSIONS. J. Spacecraft & Rockets, Dec. 1966, 3(12), 1738-1744. (Douglas Aircraft Company, Inc., Santa Monica, Calif.).

An integrated spacesuit, suit-loop, and backpack system for intravehicular operation on long-duration, interplanetary missions is described. The system is sufficiently flexible to meet spacecraft requirements and to permit graceful degradation of vehicle and subsystem performance. It incorporates 2 loops, one for each pressurized compartment or airlock. Hard- and soft-suit concepts for extravehicular operation are compared. Man/system material balances are presented to show makeup and processing requirements for various operating conditions. Configurations of a life-support system are developed to demonstrate the differences between intravehicular operation with or without spacesuits and extravehicular operation with spacesuits and backpacks. Expendable backpack requirements are integrated into the material balances to indicate the over-all penalties. Improvement in backpack designs are suggested in an effort to reduce unacceptable makeup penalties.
R 18

29,443
Newmann, T.W. AUTOMATED LABORATORIES FOR SCIENTIFIC EXPLORATION OF MARS. J. Spacecraft & Rockets, Dec. 1966, 3(12), 1749-1755. (Philco-Ford Corporation, Palo Alto, Calif.).

The concept of automated laboratories, for use in planetary exploration, is described. It is a new approach to the organization and integration of the functional elements of space payloads, fundamentally different from those previously employed in U.S. unmanned spacecraft. The concept initially was developed in response to recommendations of bioscientists for a scientific payload that would permit investigations to be carried out in a sequential fashion, with the results of early experiments influencing the direction and nature of subsequent experimentation. The use of automated laboratories involves the employment of a complement of basic analytical laboratory equipment in alternative sequences of operation as dictated by the nature of the experiment in progress. Many of the essential features of this concept have been developed in great depth in connection with payloads for exobiological research; however, the concept is not limited to such payloads. The general features that apply to all scientific planetary research are described. Although the principal motivation for development of automated laboratories was improved scientific return from space missions, substantial systems engineering advantages in the areas of weight, reliability, and program development have been demonstrated for the concept and also are described.
R 6

29,444
Bartholomew, C.S. & Porter, D.C. RELIABILITY AND STERILIZATION. J. Spacecraft & Rockets, Dec. 1966, 3(12), 1762-1766. (Boeing Company, Seattle, Wash.).

Relationships between the electronic reliability requirements and spacecraft sterilization requirements have been studied. An optimistic view on the compatibility of the reliability and sterilization requirements for present electronic systems is projected. The demands for reliability and long life have created parts immune to temperature damage well above the time temperature dose requirements for sterilization. Exceptions exist such as certain classes of capacitors where the sterilization time temperature dose is clearly damaging. Step stress data identifying the damage threshold over a broad range of time temperature dosage is used to illustrate the wide margin above the sterilization requirement for certain part types. The possibility is examined of more effectively utilizing the resources available for heat sterilization compatibility verification by broadening the objective to better identify the damage thresholds and the relationships of environments and failure mechanisms. Decontamination with ethylene oxide gas is examined. The few problems that exist appear to be primarily caused by the water vapor used with ethylene oxide rather than the ethylene oxide itself.
R 3

29,445
Taylor, D.H. LATENCY COMPONENTS IN TWO-CHOICE RESPONDING J. exp. Psychol., Oct. 1966, 72(4) 481-487. (Reading University, Reading, England).

Donders' (1868) classical b- and c-reactions were compared with 2 similar conditions in which stimulus discrimination was reduced to the detection of perfectly detectable stimuli, so enabling the latencies associated with stimulus discrimination and response choice to be studied separately. An additive hypothesis of RT components would predict that these latency distributions should add together in the full 2-choice situation. In each of the 4 conditions, 8 Ss each gave 32 RTs. Latency distributions were described by their minima and 1st 3 moments. The data were consistent with the additive hypothesis. The component latency distributions could be fitted by a negative binomial function.
R 14

29,446
Karlin, L. DEVELOPMENT OF READINESS TO RESPOND DURING SHORT FOREPERIODS. J. exp. Psychol., Oct. 1966, 72(4), 505-509. (New York University, New York, N.Y.).

Simple RT as a function of foreperiod duration was determined for 6 foreperiod distributions characterized as leptokurtic, bimodal, or rectangular. S's inability to maintain a peak level of readiness geared to the most frequently occurring foreperiod suggested a "ballistic" type of preparation which was relatively independent of the conditional probability of occurrence of the stimulus during the foreperiod.
R 6

29,447
Shaffer, L.H. SOME EFFECTS OF PARTIAL ADVANCE INFORMATION ON CHOICE REACTION WITH FIXED OR VARIABLE S-R MAPPING. J. exp. Psychol., Oct. 1966, 72(4), 541-545. (Applied Psychology Research Unit, MRC, Cambridge, England).

Two experiments are reported on 2-choice reaction with variable S-R mapping. In the task a signal, I, designates a mapping relation between signal, M and response, R. Both I and M can be random variables in a trial sequence. In some conditions a value of I or of M or a neutral light was given in advance, with either 1/4- or 1/2-sec. foreperiod. Response time was examined as a function of the advance alerting and of the transition from the previous trial. Both were significant variables and there was an interaction between them indicating distinct phases in the choice process. It was also shown that with a neutral advance signal there is an optimal foreperiod in the interval 0-1/2 sec. with fixed mapping but not with variable mapping.
R 5

29,448
Drevenstedt, Jean. RECALL AS A FUNCTION OF QUANTITY AND ENCODED CLUSTERING OF ITEMS ELICITED UNDER TWO METHODS OF PRESENTATION. J. exp. Psychol., Oct. 1966, 72(4), 551-557. (Vanderbilt University, Nashville, Tenn.).

Visual symbols in a 3 x 3 diagonal-shaped display were presented sequentially to 45 Ss, who were then cued to recall the entire set of stimuli or selected parts. Partial reports were varied both in size (3 and 6 symbols) and degree of organization among the symbols (Sampling Methods I, II, III). Main effects of both report size and sampling method were found significant ($p<.01$). As predicted, however, partial recall by temporally and spatially organized item clusters yielded higher retention estimates than either total recall or partial recalls of a comparable quantity of items, randomly selected or merely spatially grouped. Accuracy of recall increased as a positive monotonic function of decrease in the number of temporal-spatial clusters elicited. The data appeared to indicate that degree of clustering among symbols in a partial report has a more facilitative effect upon retrieval than mere size of the report. A second experiment ($N=41$), using a simultaneous presentation of items, yielded relative retention estimates which were lower than those of Exp. I, but generally consistent with the prior findings.
R 10

29,449
Keyfitz, N. SAMPLING VARIANCE OF DEMOGRAPHIC CHARACTERISTICS. Hum. Biol., Feb. 1966, 38(1), 22-41. (University of Chicago, Chicago, Ill.).

During the necessarily long period in which civil registration systems are being built up in presently underdeveloped countries, mortality and fertility data will be obtained by samples, in general area samples. It is difficult to calculate explicit formulae for the variances of such demographic characteristics as the expectation of life, the projected population, and the intrinsic rate of natural increase because these are very complex functions of the original observations. Following the suggestions of Deming and others on the propagation of error, the paper derives the variances of some common demographic statistics, using a chain of successive differentiations. It then goes on to show, with an example, how the propagation of error may be traced through by computer. This procedure would give numerical estimates of variance in complex cases where the explicit derivatives would be tedious or impracticable to work out.
R 12

29,450
Parízková, Jana & Eiselt, E. BODY COMPOSITION AND ANTHROPOMETRIC INDICATORS IN OLD AGE AND THE INFLUENCE OF PHYSICAL EXERCISE. Hum. Biol., Dec. 1966, 38(4), 351-363. (Physical Culture Research Institute, Prague, Czechoslovakia).

Anthropometric indicators and body composition were examined in 170 men divided into 4 groups; trained and untrained, younger and older than 65 years. Significantly higher values in those practicing than those not practicing physical exercise in the absolute amount of lean body mass and in circumferences of the thigh and forearm in the younger group of trained men were found. This difference disappeared after 65 years. Lower values of the chest circumference during inspiration relative to expiration in trained men suggest a prevention of reduced mobility of the chest in trained old men.
R 26

29,451
Schenker, A.W. FINGER JOINT MOTION: A NEW, RAPID, ACCURATE METHOD OF MEASUREMENT. Military Med., Jan. 1966, 131(1), 22-29.

A new and practical approach to the measurement of finger joint motion is presented, based on the principle that when one bone moves with respect to the adjacent one, the path thus traced is approximately the arc of a circle. This is not rigorously true, especially with respect to large joints. However, when dealing with small joints the error is so insignificant, as to render such measurements within a clinical accuracy to plus or minus two degrees. Having obtained such an arc the angle it subtends is readily determined as the basis of a geometrical consideration. No anatomical landmarks are involved and the digits are not encumbered with any instrumentation. Yet the measurement is simple, rapid and accurate.
R 1

29,452
Rasch, P.J., Otott, G.E., Brown, M., Wilson, I.D., et al. EVALUATION OF A NEW COMBAT CONDITIONING COURSE. Military Med., Feb. 1966, 131(2), 130-136. (USN Medical Field Research Lab., Camp Lejeune, N.C.).

Three platoons of Marine recruits at Parris Island served as Ss for a study in which the effects of a combined circuit-interval training program were compared with those of the physical training program now in use at that Depot, as measured by a battery of 5 tests recommended by Fleishman. The results obtained from 11 hours of circuit-interval training equalled those from 29 hours of the conventional program. No significant correlation was found between scores in physical performance and in the General Information Test (GIT). It is believed that the circuit can be bettered. Further studies will be undertaken toward this end and toward improving and verifying the criteria by which the results are evaluated.
R 8

29,455
Palmisano, W.A. & Peczenik, A. SOME CONSIDERATIONS OF MICROWAVE HAZARDS EXPOSURE CRITERIA. Military Med., July 1966, 131(7), 611-618. (USA Environmental Hygiene Agency, Edgewood Arsenal, Md. & USA Office of the Surgeon, Hq., Fort Sam Houston, Tex.).

Microwave exposure criteria have been examined from the standpoint of biological effects. Although some unusual and unexplained effects have been reported and studied, the prime effect has been heating and the prime organ at risk is the eye. The lens is subject to cataract formation upon short massive or prolonged minimal repeated direct exposure exceeding safe limits. The exhaustive investigations of Zaret are examined. It is emphasized that wave guide systems, radar and diathermy are remarkably safe provided that they are used in accordance with recommended safety standards. Current Army Standards permit personnel exposure of 10 mw/cm^2 based on average power density and prohibit exposure over 100 mw/cm^2 for any length of time. The Army is expected to adopt the formula $TP = 6000/w^2$ for determination of permissible exposure time in minutes during any one-hour exposure.
R 21

29,457
Faust, K.J., & Beckman, E.L. EVALUATION OF A SWIMMER'S CONTACT AIR-WATER LENS SYSTEM. Military Med., Sept. 1966, 131(9)Part 1, 779-788. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

A study of underwater vision using a swimmer's face mask and a contact air-water lens system compared with normal vision in air as a control showed that the contact lens system gave excellent underwater visual fields whereas the standard swimmer's face mask gave greatly reduced visual fields. Underwater visual acuity obtained with the contact lens was comparable to or slightly better than with the face mask, and had the added advantage of incorporating corrections for refractive errors. In operational testing, the underwater contact lenses were worn up to three hours in sea water and gave improved underwater vision. Factors which were found to limit the general use of the underwater contact lens were: the individual fitting required, the significant conjunctival irritation which occurred in sea water, and the halation and blurred vision which occurs at variable times whenever scleral lenses are worn for extended periods. On the basis of this evaluation the underwater contact lenses were judged to be of value for specialized use when a face mask would be disadvantageous.
R 15

29,458
Withers, J.N. PERSONAL PROTECTION DURING THE BOMBING OF THE VICTORIA BOQ. Military Med., Oct. 1966, 131(10), 1285-1289. (USA 17th Field Hospital, San Francisco, Calif.).

When the Victoria BOQ (Bachelor Officers' Quarters) was bombed by VC (Viet Cong) terrorists on April 1, 1966, 141 officers were injured, the majority receiving treatment at the 17th Field Hospital. A study was then conducted by this hospital to determine the methods the blast victims used to protect themselves and the type and extent of injuries they received. Based on this information, recommendations were made in order to increase the safety of the BOQ's and BEQ's (Bachelor Enlisted Quarters) and to provide the best methods of personal protection for the occupants. These recommendations are being implemented in Saigon and should serve equally as well in other areas of the world where terrorist activities may be expected against our fighting men.

29,459
Snyder, R.G. TERMINAL VELOCITY IMPACTS INTO SNOW. Military Med., Oct. 1966, 131(10), 1290-1298. (US Civil Aeronautical Research Institute, FAA, Oklahoma City, Okla.).

Incidents concerning non-fatal terminal velocity free-falls from great heights into snow are noted, including falls from 18,000 and 23,000 feet without parachutes. Documentation of Soviet airborne jumps from low-slow flying aircraft prior to and during World War II is briefly reviewed. The Civil Aeronautical Research Institute (CARI) free-fall files, providing data on approximately 25,000 fatal and survivable free-falls over a 2-yr period, list only 22 snow impacts in which injury or death occurred. 3 of these were from heights of over 1000 feet, and no injury was noted under 40 feet (50 ft/sec impact velocity). A detailed case history is presented concerning an impact into snow at terminal velocity resulting from a zero-altitude ejection from an A4E jet fighter, in which impact occurred prior to parachute deployment. The only injuries were a fractured femur, fractured ankles, and upper arm contusions, probably received in striking a tree. Despite initial impact exceeding 180 ft/sec it was calculated that the time duration of deceleration was .35 sec and magnitude only 14.4 G. These cases demonstrate the excellent attenuation properties of snow for impact survival.
R 20

29,460
Spotnitz, M. AIR POLLUTION RESPIRATORY SYNDROMES: A MILITARY MEDICAL PROBLEM. Military Med. Dec. 1966, 131(12), 1499-1503. (Pulmonary Disease Service, Fitzsimons General Hospital, Denver, Colo.).

A new military medical problem has been created by the assignment of personnel to areas of very high air pollution such as Japan and possibly other areas such as Europe. In these places, the symptoms of asthma, acute bronchitis and chronic obstructive lung disease are adversely effected. The role of air pollutants is to further inflame the bronchial tree already irritated by a variety of factors. Thus, banal bronchial infections in otherwise healthy individuals may be temporarily greatly intensified while the patient is breathing polluted air. When high level air pollution is superimposed on asthma or chronic lung disease, the symptoms may be so severe and continuous that the afflicted individuals can no longer function effectively. Even asymptomatic heavy cigarette smokers had measurable impairment of pulmonary function after residence of one or more years in the Tokyo area. Preventive measures include: exclusion of individuals with asthma and chronic obstructive lung disease from assignment to highly polluted areas, location of military bases in suburban areas and installation of air filtering devices in buildings.
R 6

29,461
Colcolough, H.L. PULMONARY EDEMA OF HIGH ALTITUDE: A REVIEW OF CLINICAL AND PATHOLOGICAL CONSIDERATIONS. Military Med., Dec. 1966, 131(12), 1504-1509. (USA Research Institute of Environmental Medicine, Natick, Mass.),

This review represents the majority of clinical and pathological material published since Hurtado's original description of acute pulmonary edema of altitude in 1937. Its identity as a clinical entity seems well established. In the cases from South America the greatest incidence is in persons previously acclimatized to high altitude whereas the data from India is predominantly in acutely exposed young adult males. In most instances there was an initial latent period of 12-72 hours before the onset of symptoms. Increasing dyspnea, orthopnea and productive cough usually indicated the onset of acute pulmonary edema. There have been approximately 540 cases of acute pulmonary edema attributed to high terrestrial altitude. Of these there were 31 deaths reported and 19 autopsies performed. In addition to congestion and edema which were universally present a significant number of cases showed intraalveolar fibrin, thrombi, and hyaline membranes. Inhibition of the pulmonary plasminogen activator system has been suggested as the source of the hyaline membranes. This review has not included the literature which deals with the normal physiologic adjustments of resident man at high altitude. A considerable body of literature exists in this area and has recently been reviewed by Hurtado. Relatively little systematic work has been done on acute pulmonary edema of altitude. Its poorly understood pathogenesis requires further clinical and pathologic investigation. It may be a significant problem whenever large numbers of unacclimatized individuals are rapidly transported to terrestrial altitudes above 8,000 to 10,000 feet.
R 34

29,462
Buchanan, J.M. AUTOMATED HOSPITAL INFORMATION SYSTEMS. Military Med., Dec. 1966, 131(12), 1510-1512. (US Veterans Administration Hospital, Washington, D.C.).

This article briefly and informally describes more of the problems of setting up an Automated Hospital Information System related to patient care programs.

29,463
Finck, P.A. EXPOSURE TO CARBON MONOXIDE: REVIEW OF THE LITERATURE AND 567 AUTOPSIES. Military Med., Dec. 1966, 131(12), 1513-1539. (USAF Institute of Pathology, Washington, D.C.).

Part of the literature on carbon monoxide and 567 autopsied cases from the files of the AFIP were reviewed. In acute fatal CO poisoning, the diagnosis can be made by the analysis of the blood or tissue that contains blood. The tissue from an acute case retains its cherry-red color in formalin for a few days, in contrast to tissue from a case not exposed to CO, which loses its red color within a few hours. Such a criterion is by itself a useful, practical qualitative test when no other means of analysis are available. In delayed deaths, the proof of exposure to CO depends on the analysis of an air sample taken at the scene. The lesions encountered do not allow a specific diagnosis of CO poisoning.
R 42

29,464
Fitts, P.M. & Radford, Barbara K. INFORMATION CAPACITY OF DISCRETE MOTOR RESPONSES UNDER DIFFERENT COGNITIVE SETS. J. exp. Psychol., April 1966, 71(4), 475-482. (University of Michigan, Ann Arbor, Mich.).

Previous findings on the interrelations of speed, amplitude, and accuracy of movements support the conclusion that the human motor system has a relatively constant information capacity over rather wide limits. The 2 experiments here reported examine extensions of of this conclusion by comparing (a) movements that are initiated at S's convenience vs. movements following a 2-choice reaction time, and (b) the effects of variations in instructions and payoffs emphasizing speed vs. accuracy. It is concluded that (a) there is little or no benefit in spending additional time in preparation for the initiation of a skilled movement; only an increase in the time actually spent in executing a movement is of value in increasing accuracy, and (b) within limits, the information capacity of the human motor system is relatively invariant under changing cognitive sets for speed vs. accuracy.
R 22

29,465
Kaplan, I.T., Carvellas, T. & Metlay, W. VISUAL SEARCH AND IMMEDIATE MEMORY. J. exp. Psychol., April 1966, 71(4), 488-493. (Ophthalmology Dept., New York University Medical Center, New York, N.Y.).

Two experiments examined the relationship between search time and number of targets searched for. The 1st experiment photographed S's eye movements as he compared 2 groups of letters to determine whether one was a subset of the other. The time spent searching the containing set increased in proportion to the number of target letters in contained. In this case, search time included the time spent recognizing all the targets. The 2nd experiment photographed S's hand movements as he canceled just-learned target letters in English text. Here search time was measured so that it excluded the accummulation of recognition times. Search time still increased with the number of targets being sought.
R 6

29,466
Lee, W. & Garner, W.R. PREDICTION AND ESTIMATION OF A RANDOM FLUCTUATION. J. exp. Psychol., April 1966, 71(4), 516-520. (University of California, Berkeley, Calif. & Johns Hopkins University, Baltimore, Md.).

Forty Ss had to (a) estimate successive pointer settings on a blank scale, or (b) in addition to the preceding, predict future pointer settings on the same scale. Each successive pointer position was generated by adding a random sample from a normal distribution to the last pointer position. 2 series of settings were used which differed in the standard deviation of the random fluctuation, and therefore in amount of sequential constraint. Error of estimation was less for the series with greater sequential constraint. The standard deviation of Ss' predictions around the last estimation roughly equaled the standard deviation of the pointer fluctuations.
R 6

29,467
Ellis, H.C. & Feuge, R.L. TRANSFER OF PREDIFFERENTIATION TRAINING TO GRADIENTS OF GENERALIZATION IN SHAPE RECOGNITION. J. exp. Psychol., April 1966, 71(4), 539-542. (University of New Mexico, Albuquerque, N.M.).

This experiment was designed to test the assumption that gradients of generalization in shape recognition, following paired-associates (PA) labeling practice, differed as a function of the meaningfulness of the response labels employed during PA practice. Following various conditions of PA practice, Ss were given a 30-item recognition test which consisted of both the shapes in the PA list and systematic distortions of these shapes along a dimension of similarity. No differences in gradients of false recognitions (selection of the distorted shapes) as a function of the meaningfulness of the PA label were obtained except for conditions of 2 PA trials. In contrast, observation pretraining alone yielded a significantly flatter gradient of false recognitions. In addition, the gradients became progressively steeper with increased amounts of PA practice.
R 6

29,468
Kahneman, D. TIME-INTENSITY RECIPROCITY UNDER VARIOUS CONDITIONS OF ADAPTATION AND BACKWARD MASKING. J. exp. Psychol., April 1966, 71(4), 543-549. (Hebrew University, Jerusalem, Israel).

Conditions under which duration-intensity reciprocity holds for acuity performance were investigated. Reciprocity fails to hold for the resolution of a Landolt C at 40 mL.Xmsec. when it is immediately followed or preceded by a 2-sec. flash of 1 mL.: performance then increases with exposure duration. Reciprocity holds when the interval between target and flash is increased to 1.5 sec. When the target is superimposed on the adapting field, reciprocity is found, but the critical duration is considerably shorter. The results are discussed in terms of recent theorizing which attributes masking by light to effects of brightness summation. The existence of an additional interference effect is indicated. The nature of this interference is discussed, with emphasis on the close simularity found between results for forward and backward masking by light.
R 28

29,469
Dyal, J.A. EFFECTS OF DELAY OF KNOWLEDGE OF RESULTS AND SUBJECT RESPONSE BIAS ON EXTINCTION OF A SIMPLE MOTOR SKILL. J. exp. Psychol., April 1966, 71(4), 559-563. (Texas Christian University, Fort Worth, Tex.).

Following 10 no knowledge of results (KR) trials Ss were trained for 40 trials in a line-drawing task under conditions of immediate, delayed, or no KR. These training trials were followed by 40 trials with no KR (extinction). Analysis of the type of error made during extinction (overshooting or undershooting the correct 3-in. line) revealed that the type of response depended on the training conditions (immediate vs. delayed) and original response bias of S. Delayed-KR resulted in an increased frequency of errors of the same type as the original response bias. Immediate KR resulted in a tendency to make errors in the direction opposite the original response bias. The interaction between delay of KR and S's response bias argues for the analysis of S's response bias in future experiments.
R 12

29,470
Uhlaner, J.J. OPTIMALITY OF PERCEPTUAL DECISION CRITERIA. J. exp. Psychol., April 1966, 71 (4), 564-569. (University of Colorado, Boulder, Colo.).

Statements of signal detectability theory have implied that Ss place their decision cutoffs in such a fashion as to maximize the expected value (EV) of their decisions. Using a 2-choice discrimination task involving judgment of the tilt of lines, the decision cutoffs of 22 naive Ss were evaluated under 3 conditions: a) balanced payoffs and equiprobable alternative stimuli; b) unbalanced payoffs; c) unbalanced alternative stimuli. Each condition required different cutoffs for the maximization of EV. Although Ss' cutoff placement was influenced by the relevant factors, i.e., by the relative payoff yielded by the alternative decisions and by the relative probability of the stimulus alternatives, the influence was not sufficiently strong to maximize EV.
R 7

29,471
Verrillo, R.T. EFFECT OF SPATIAL PARAMETERS ON THE VIBROTACTILE THRESHOLD. J. exp. Psychol. April 1966, 71(4), 570-575. (Sensory Communication Lab., Syracuse University, Syracuse, N.Y.).

Some spatial parameters involved in the excitation of mechanoreceptors in glabrous skin were investigated. The extent of protrusion by the contactor into the skin, the gradient and curvature of displacement produced by the contactor and contactor configuration, and the threshold for vibration as a function of frequency and contactor area were studied. Thresholds for vibration decrease in direct proportion to the extent of protrusion by the contactor. An inverse relation exists between the vibrotactile threshold and the contactor area, having a slope of 3 db. per doubling of area. Thresholds are relatively unaffected by changes in the gradient and curvature of the displacement. Differences in slope between small and large contactors are interpreted as evidence that there may be more than one receptor system in glabrous skin responsive to mechanical deformation.
R 18

29,472
Thompson, J.H. WHAT HAPPENS TO THE STIMULUS IN BACKWARD MASKING? J. exp. Psychol., April 1966, 71(4), 580-586. (Gonzaga University, Spokane, Wash.).

Four propositions generated from a luminance summation-contrast reduction hypothesis advanced to account for backward masking were tested. 4 Ss identified stimulus letters of A, T, and U over several conditions. A stimulus with a high contrast ratio was followed by 1 of 4 luminances in a homogeneous second field, after 1 of 6 delay periods. Ss also responded to 4 sets of stimuli with different contrast ratios, with pre- and postexposure fields dark. The data supported 4 hypotheses: a) Masking effects are proportional to masking field luminance; b) Masking effects decrease with an increase in time separation between the stimulus and masking fields; c) Resultant contrast ratios from summated stimuli can be predicted and should produce the same recognition accuracy as single stimuli with equivalent contrast ratios; d) Time-intensity reciprocities exist when recognition accuracy is plotted, within limits expected from CFF data and other summation studies. The theory that backward masking can be accounted for by a luminance summation-contrast reduction process receives extremely strong support from the present study.
R 15

29,473
Fehrer, Elizabeth. EFFECT OF STIMULUS SIMILARITY ON RETROACTIVE MASKING. J. exp. Psychol., April 1966, 71(4), 612-615. (Brooklyn College, Brooklyn, N.Y.).

The hypothesis that conditions which favor apparent movement also favor retroactive masking of the stimulus presented first was tested. Similarity between first and second stimuli has previously been shown to be a determinant of apparent movement. The present study was concerned with the effect of such similarity on backward masking. The test stimuli were letter arrays; the masking stimuli: a) vertical lines separating the letters; and b) boxes and grids surrounding the letters. Similarity was defined in terms of the ratio of letter to mask height and complexity. Accuracy of letter identification was found to be inversely related to the degree of similarity between test and masking stimuli.
R 14

29,475
Scott, T.R., Lavender, A.D., McWhirt, R.A. & Powell, D.A. DIRECTIONAL ASYMMETRY OF MOTION AFTEREFFECT. J. exp. Psychol., June 1966, 71(6), 806-815. (US Veterans Administration Hospital, Columbia, S.C.).

It is well known that in spiral aftereffect, apparent centrifugal motion is greater than apparent centripetal motion. It has recently been proposed that this asymmetry results from differential eye movements during the inspection period. Centrifugal and centripetal aftereffects were measured concurrently with eye movements. The postulated differential in eye movements was not found. The asymmetry was found to be present in waterfall illusion as well as in spiral aftereffect with the degree of asymmetry increasing as a function of distance from the fovea out to about 20°. Prolonged exposure to spirals rotating in both directions over a period of 4 days brought about a significant reduction in the amount of asymmetry suggesting that this phenomenon may be a result of environmental adaptation.
R 15

29,476
Alexander, L.T. & Cooperband, A.S. VISUAL DETECTION OF COMPOUND MOTION. J. exp. Psychol., June 1966, 71(6), 816-821. (System Development Corporation, Santa Monica, Calif.).

Results of previous studies suggest that under certain geometric conditions the rate of change of the relative bearing (ω) between 2 moving objects is used as a cue to predict their future positions in space. 4 Os were studied in 4 situations representing an abstraction of these geometric conditions. Their task was to detect a rotary motion superimposed on translational motion. The results indicate that ω was the primary cue used in this task; detection performance was a linear function of ω.
R 8

29,477
Sanders, A.F. & van Borselen, J.W. CONTINUING MEMORY AND INFORMATION PROCESSING. J. exp. Psychol., June 1966, 71(6), 844-848. (Institute for Perception, RVO-TNO, Soesterberg, The Netherlands).

Digits of the set (2, 3, 4, 6) were successively and randomly presented to Ss, who were instructed to respond to each 2 and 3 after any 2 new digits had passed, and not to respond to 4 and 6. Performance improved with practice. Training in a condition where a warning signal was given at times that response was to be made, had no transfer effect on the no-warning signal condition, suggesting the importance of remembering moments to recall. It is hypothesized that Ss in the no-warning signal condition have a storing bias to all new material. This was tested by asking Ss to react nondelayed to 4 and 6, together with the existing tasks. Performance in the warning signal condition was better in that case, but not when the additional task was non-perceptual. RT of 4 and 6 proved much delayed, suggesting incompatibility between rehearsal and direct reaction processes.
R 10

29,478
Fitts, P.M. COGNITIVE ASPECTS OF INFORMATION PROCESSING: III. SET FOR SPEED VERSUS ACCURACY. J. exp. Psychol., June 1966, 71(6), 849-857. (University of Michigan, Ann Arbor, Mich.).

This study examines the capacity of Os to adapt to changes in the relative emphasis on speed vs. accuracy of responses. 3 matched groups of 6 Os each were trained for 3 days in a choice reaction-time (RT) task, with feedback indicating both speed and accuracy. Emphasis on speed decreased mean RT but increased errors. A control group, working without an exact payoff or immediate feedback, showed somewhat greater within- and between-S variability than did either the speed or accuracy groups and was at an intermediate level on all performance measures. Similar distributions of RTs were found for correct responses and for errors as was predicted by a sequential sampling and decision model of choice RT. RT distributions for all Os were approximately normal under a set for speed, but under accuracy instructions some Os gave highly skewed distributions.
R 21

29,479
Uttal, R.W. & Krissoff, Madelon. EFFECT OF STIMULUS PATTERN ON TEMPORAL ACUITY IN THE SOMATOSENSORY SYSTEM. J. exp. Psychol., June 1966, 71(6), 878-883. (University of Michigan, Ann Arbor, Mich.).

The ability to distinguish a gap in a repetitive train of electrical pulse stimuli applied to the skin is a function of the pattern of the stimulus sequence. The purpose of this experiment was to describe the effects of stimulus amplitude, stimulus interval, stimulus numerosity, and the position of the gap in the stimulus train on the threshold for gap detection. The results of these experiments indicated that while stimulus intensity did not affect the threshold, all the other 3 parameters produced interesting and significant effects.
R 12

29,480
Winnick, Wilma A. EFFECT OF INSTRUCTIONAL SET AND AMOUNT OF FIRST LEARNING ON NEGATIVE TRANSFER. J. exp. Psychol., June 1966, 71(6), 920-923. (Queens College, City University of New York, Flushing, N.Y.).

A mixed (A-B, X-Y; A-B, A-B_r) list was used to study the effect of two kinds of instructions on paired-associate learning of negative transfer (A-B_r) and control (X-Y) materials. Two levels of first learning, to 50% and 100% criteria, were employed as the basis for differences in interference in second learning. The data revealed overall differences in learning for the negative transfer and control pairs and indicated that the amount of first learning was related to these differences. Although some effect of instructions was apparent in the learning curves, analysis of variance of the trials to criterion and error data turned up no significant effects of instructions alone or in interaction with the other variables. Comparisons are made with the study by Schwartz (J. exp. Psychol., 1963, 66, 127-132) of instructional set in a retroactive interference situation.
R 2

29,481
Leibowitz, H.W., Toffey, Sharon E. & Searle, J.L. INTENSITY-TIME RELATIONSHIP AND PERCEIVED SHAPE. J. exp. Psychol., July 1966, 72(1), 7-10. (Pennsylvania State University, University Park, Penn.).

The effect of exposure duration on perceived shape was determined for intensity-time combinations which were adjusted to produce an equal amount of effective photolytic energy in accordance with the reciprocity relationship. Matched shape tends to remain constant for the shorter exposure durations, but increases with exposure duration, particularly above the critical duration of .1 sec. The results are interpreted as reflecting the importance of temporal summation within the visual system in the perception of shape, and the critical contribution of time, independent of intensity, in the manifestation of the tendency toward shape constancy.
R 12

29,482
Zahn, T.P. & Rosenthal, D. SIMPLE AUDITORY REACTION TIME AS A FUNCTION OF THE RELATIVE FREQUENCY OF THE PREPARATORY INTERVAL. J. exp. Psychol., July 1966, 72(1), 15-19. (National Institute of Mental Health, Bethesda, Md.).

Simple auditory reaction time (RT) was investigated in relation to the length and relative frequency of each member of 2 pairs (1 and 3 sec. and 3 and 10 sec.) of preparatory intervals (PI) presented in an irregular sequence. For each pair, RT on trials with the shorter of the 2 PIs was a decreasing function of the relative frequency of that PI, even when the length of the PI on the preceding trial (PPI) was controlled. The detrimental effects of long PPIs were greater for the longer than for the shorter pair of PIs. The effects of relative frequency are attributed to "expectancy," and the effects of the PPI are attributed to its influence on time estimation.
R 8

29,483
Eriksen, C.W., Munsinger, H.L. & Greenspon, T.S. IDENTIFICATION VERSUS SAME-DIFFERENT JUDGMENT: AN INTERPRETATION IN TERMS OF UNCORRELATED PERCEPTUAL ERROR. J. exp. Psychol., July 1966, 72(1), 20-25. (University of Illinois, Urbana, Ill.).

Two studies are reported concerning the relation between identification of a single tachistoscopically presented stimulus and the discrimination of pairs of stimuli presented at comparable exposure durations. The results of both studies show that accuracy of identification of a single item is higher than accuracy of discrimination of 2 items as same or different. A simple model is proposed which assumes errors of identification of 2 simultaneous forms are independent. The predictions based upon the model fit the obtained accuracy scores and permit the prediction of simultaneous discrimination accuracy on the basis of single identification thresholds.
R 4

29,484
Eriksen, C.W. INDEPENDENCE OF SUCCESSIVE INPUTS AND UNCORRELATED ERROR IN VISUAL FORM PERCEPTION. J. exp. Psychol., July 1966, 72(1), 26-35. (University of Illinois, Urbana, Ill.).

A model is presented for determining perceptual independence, defined as when information received on 2 successive form stimulations does not interact and the internal perceptual system error present on the separate stimulations is uncorrelated. 2 experiments are reported where the same stimulus form is presented on different foveal areas with lags between the stimulations of 0-1500 msec. A 3rd experiment presented different forms on the 2 stimulations. All 3 experiments indicate that the successive inputs are independent even when separated by lags of less than 1 msec. The results are interpreted in terms of uncorrelated error or sensitivity at any given moment in time for different elements in the visual perceptual system represented by different foveal areas.
R 7

29,485
Verrillo, R.T. VIBROTACTILE THRESHOLDS FOR HAIRY SKIN. J. exp. Psychol., July 1966, 72(1), 47-50. (Sensory Communication Lab., Syracuse University, Syracuse, N.Y.).

Absolute vibrotactile thresholds were determined as a function of stimulus frequency and contactor area on the hairy skin of the volar forearm. Thresholds for vibration decrease in direct proportion to the contactor area with a slope of -3 db. per doubling of area. When plotted as a function of frequency these data yield a U-shaped curve with a slope of -12 db. in lower frequencies and +9 db. in frequencies above 220 cps. Both these findings confirm previous data obtained on glabrous skin. Some differences between hairy and glabrous skin were found and discussed. Evidence is presented in support of a hypothesis advanced in earlier papers which suggests that there may be 2 types of mechanoreceptors in cutaneous tissue.
R 4

29,486
Beck, J. EFFECT OF SURROUND SIZE ON THE PERCEPTION OF TEXTURE PATTERNS. J. exp. Psychol., July 1966, 72(1), 68-75. (Harvard University, Cambridge, Mass.).

The purpose of the present experiments was to carry out parametric studies of the effect of the surround on figure-ground organization. The legibility of the embedded symbols provides an objective though indirect index of the effect of the surround. 3 related experiments were performed which examined symbol legibility as a function of surround size. Exp. I varied the visual angle subtended by the stimulus. Exp. II varied both the visual angle and the stimulus exposure time. Exp. III held the visual angle constant and varied both the exposure duration and the way of embedding the symbol. 3 control experiments were also conducted to evaluate the significance of the average luminance of the surround, the connectivity of the surround, and the physical size of the stimulus. Over a range of experimental conditions legibility was found to improve with increasing surround size. The form of the relationship varies with the size of the symbol, the exposure time, and the way in which the symbol is embedded. Phenomenally, as the size of the surround increases, those elements of the halftone pattern which can be assimilated to the surround are partialed out to form a single framework in relation to which the symbol is seen. The results are discussed in connection with the effect of the surround on figure-ground organization.
R 8

29,487
Noble, M., Trumbo, D., Ulrich, L. & Cross, K. TASK PREDICTABILITY AND THE DEVELOPMENT OF TRACKING SKILL UNDER EXTENDED PRACTICE. J. exp. Psychol., July 1966, 72(1), 85-94. (Kansas State University, Manhattan, Kan.).

The influence of task predictability upon the organization of responses was studied in the context of an irregular step-function tracking task. Task predictability was determined by the proportion of elements in a 12-unit sequence that were repeated each time the sequence was presented. Proportions employed were 1.00, 0.83, 0.75, 0.67, and 0.00. Separate groups of 9 Ss each were assigned to conditions. There were 820 repetitions of the 12-unit sequence during training and 80 repetitions after a 3-mo. retention interval. Measures of absolute integrated error showed that performance efficiency was positively related to proportion of repeating elements; differences among means were significant. The relations suggested by plotting information measures against integrated error were similar but differed in detail. Differences in integrated error among conditions were related to specific indexes of temporal and spatial error. There were substantial losses after the 3-mo. retention interval, with the greatest absolute and relative losses for the more predictable tasks.
R 3

29,488
Lockhead, G.R. EFFECTS OF DIMENSIONAL REDUNDANCY ON VISUAL DISCRIMINATION. J. exp. Psychol., July 1966, 72(1), 95-104. (Johns Hopkins University, Baltimore, Md.).

Absolute judgments of line lengths and line positions, under easy and difficult viewing conditions, were obtained when the stimulus dimensions were varied separately, together and perfectly correlated, and together and uncorrelated. Results showed that a redundancy gain is obtained--performance is better--from correlated dimensions and that this gain is independent of sensory limitation. Analyses suggest that redundancy gains are obtainable only when stimulus dimensions are integral and that dimensions may also have to be continuous. An empirical method of measuring the amount of integrality of stimulus dimensions is suggested.
R 17

29,489
Lathrop, R.G. FIRST-ORDER RESPONSE DEPENDENCIES AT A DIFFERENTIAL BRIGHTNESS THRESHOLD. J. exp. Psychol., July 1966, 72(1), 120-124. (Chico State College, Chico, Calif.).

Prior studies have shown the existence of significant sequential dependencies at the visual absolute threshold. Results of the current study indicate no such relationship at a differential brightness threshold. A tentative hypothesis advanced to account for these results assumes that, with initially subthreshold stimuli, reticular activity is low and excitability of cells in the visual cortex increases. With a now suprathreshold input, reticular activity facilitates further visual stimuli until adaptation occurs. With adaptation, stimuli are again subthreshold and the cycle begins again. This hypothesis may account for contradictory findings concerning intersensory stimulation.
R 8

29,490
Briggs, G.E. & Rockway, M.R. LEARNING AND PERFORMANCE AS A FUNCTION OF THE PERCENTAGE OF PURSUIT COMPONENT IN A TRACKING DISPLAY. J. exp. Psychol., Feb. 1966, 71(2), 165-169. (Ohio State University, Columbus, Ohio & USAF Systems Command, Research & Training Div., Lackland AFB, Tex.).

Ss trained on either a 0%, 25%, 50%, 75%, or 100% pursuit display and then transferred to either a 0% or a 100% pursuit display in a simple positioning tracking task. During training there was significant improvement in performance for each increment in percentage of pursuit component; during transfer there were no differences among groups within each transfer condition. It was concluded that percentage of pursuit has primarily a performance, not a learning effect.
R 4

29,491
Freeman, R.B., Jr. ABSOLUTE THRESHOLD FOR VISUAL SLANT: THE EFFECT OF STIMULUS SIZE AND RETINAL PERSPECTIVE. J. exp. Psychol., Feb. 1966, 71(2), 170-176. (Pennsylvania State University, University Park, Penn.).

Slant thresholds were obtained for 14 sizes of textureless rectangles positioned at 1 of 35 slants at 5° intervals from -85° to +85°. 42 Ss, 3 per rectangle, served as observers. Threshold slant decreases as a monotonic, decelerating function of size. Threshold retinal perspective increases as a power function (with an exponent of about 1.6) of visual angle subtense of the slanted rectangle at threshold slant.
R 11

29,492
Jones, F.N. & Woskow, M.J. SOME EFFECTS OF CONTEXT ON THE SLOPE IN MAGNITUDE ESTIMATION. J. exp. Psychol., Feb. 1966, 71(2), 177-180. (University of California, Los Angeles, Calif. & University of California, Davis, Calif.).

Magnitude estimates of the loudness of 1000-cps tones were obtained under 18 different conditions; i.e., all possible combinations of a) high, medium, or low standard stimulus; b) high, medium, or low sets of comparison stimuli; and c) presence or absence of the standard stimulus before each judgment. 10 Ss served in each condition. Curves of the form $\psi = aI^b$ were fitted to the average data for each of the 18 conditions. The coefficients are not of central interest, but there are significant effects upon the exponents which represent genuine contextual effects. Inspection of the exponents indicates that slopes are least when the remoteness of the standard is such as to extend the apparent subjective scale, greatest where S does not have experience with more than a limited range. This result is compatible with known effects of the range. The results are explainable as due to S's tendency to apply the same range of numerals to whatever physical range is presented. A change in subjective 0 is also a possible explanation. It must also be pointed out that the context effects seem less severe than in, e.g., the method of bisection.
R 12

29,493
Dimond, S.J. FACILITATION OF PERFORMANCE THROUGH THE USE OF THE TIMING SYSTEM. J. exp. Psychol., Feb. 1966, 71(2), 181-183. (Trinity College, Dublin, Ireland).

2 tasks were performed continuously and simultaneously. The temporal distribution of signals on one task was varied, so that the signals were either regular or irregular. The Ss after some delay came eventually to appreciate the signal regularity, and RT performance improved. At the same time, this improvement on one task was reflected in considerable improvement on another task performed simultaneously, which could not be explained solely in terms of decreased response latency.
R 7

29,494
Rule, S.J. & Little, J.W. EFFECT OF A COMPOSITE INSTRUCTIONAL SET ON RESPONSES TO COMPLEX SOUNDS. J. exp. Psychol., Feb. 1966, 71(2), 200-202. (University of Alberta, Edmonton, Alberta, Canada & Veneklasson & Associates, Los Angeles, Calif.).

72 Ss rated sounds under noisiness, annoyance, or composite instructions. Composite instructions were instructions in which both noisiness and annoyance were used as terms. 4 factors of sound were investigated: a) overall intensity; b) fundamental tone frequency; c) fundamental tone intensity; and d) overtone intensity. An analysis of the interactions between instructional set and stimulus variables supported the previous findings that instructions set Ss to give different emphasis to stimulus factors. The data further indicated that the emphasis given to different stimulus factors under the composite instructional set was a compromise between the emphasis given under noisiness and annoyance sets presented independently.
R 1

29,495
Overton, W. & Wiener, M. VISUAL FIELD POSITION AND WORD-RECOGNITION THRESHOLD. J. exp. Psychol., Feb. 1966, 71(2), 249-253. (Clark University, Worcester, Mass.).

Right vs. left visual field recognition-threshold behavior was investigated by use of monocular rather than binocular viewing condition for English words at 2 distances from fixation. While right visual-field locations were better recognized than left, the findings suggest this to be attributable to the effects in the left hemiretina of the left eye and more specifically to the effect of the most distant stimulus position. Several explanations including a "selective neural training" and trace-scanning "post-exposure process" were discussed. None of the present explanations appear to account satisfactorily for all of the data in the present study.
R 13

29,496
Murphy, L.E. ABSOLUTE JUDGMENTS OF DURATION. J. exp. Psychol., Feb. 1966, 71(2), 260-263. (University of Arizona, Tucson, Ariz.).

An informational analysis was used to determine the maximum number of durations that Ss can identify. 20 Ss made absolute judgments of 3 to 9 auditory durations. The results indicate that, for durations in the range of .5 to 5.0 sec, accurate judgments were made for each of 6 to 7 durations; on the other hand, with intervals selected from a .1 to 1.0 sec range, only 4 to 5 durations could be identified accurately. Knowledge of past results was found to aid in judgments in the .5 to 5.0 sec range. The number of stimulus durations, knowledge of results, and range of durations were each found to have a significant effect on information transmission.
R 8

29,497
Rabbitt, P.M.A. ERRORS AND ERROR CORRECTION IN CHOICE-RESPONSE TASKS. J. exp. Psychol., Feb. 1966, 71(2), 264-272. (Section on Aging, National Institutes of Health, Bethesda, Md.).

The latencies of responses preceding errors, of errors, of responses made to correct errors, and of responses following error correction were examined in a 4-choice and in 2 10-choice continuous-performance choice-response tasks (groups of 17 and 18 young Ss). Latencies of responses preceding errors were not different from the mean latency for all correct responses. Errors and responses correcting errors were 100-150 msec faster than equivalent correct responses ($p < .01$). The first correct response following error correction was slower than other, equivalent, correct responses. No aftereffects of committing an error upon response rate were observed beyond the 2 responses following error correction. An attempt was made to classify errors into different, causally related types, and some practical and theoretical implications of the results are described.
R 5

29,498
Rudov, M.H. DIMENSIONALITY IN HUMAN INFORMATION STORAGE. J.exp. Psychol., Feb. 1966, 71(2), 273-281. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

An investigation was carried out to determine if error factors resulted from performance of an information processing task involving visual memory. It was found that reading 1 line from memory of a rectangular matrix of letters, after a short delay following their tachistoscopic exposure, did result in positional errors perpendicular to, parallel to, and diagonal to the direction of scan when S was reading leftwards or rightwards across a row or upwards or downwards in a column. Evidences for error factors of form and sound were also found. Further investigations showed that the error pattern changed when the matrices were distorted by offsetting alternate rows or columns of the matrix. The results were interpreted as evidence of information being stored in independent dimensions.
R 6

29,499
Irwin, F.W. & Snodgrass, Joan G. EFFECTS OF INDEPENDENT AND DEPENDENT OUTCOME VALUES UPON BETS. J. exp. Psychol., Feb. 1966, 71(2), 282-285. (University of Pennsylvania, University Park, Penn.).

60 male and 60 female Ss bet whether or not they would draw a marked card from each of 35 packs of 10 marked and blank cards. There were 1, 3, 5, 7, or 9 marked cards in each pack. Drawing a marked card had 7 values--independent outcomes (IOs)--in the range ±10¢ for one group and ±50¢ for another; drawing a blank card had 0 IO. Ranges of permissible bets--dependent outcomes (DOs)--were ±2 or ±10¢ for the 1st group and ±10 or ±50¢ for the 2nd group. It was found that: a) the relative frequencies of bets on marked cards were higher with positive than with negative IO in all subgroups; b) this effect appeared to be relative to the range of IO; c) it tended to be related to DO negatively at extreme probabilities and positively at .5; and d) it did not show a reliable sex difference. The evidence was indecisive as to whether the effect increased monotonically with IO.
R 11

29,500
Reynolds, D. TIME AND EVENT UNCERTAINTY IN UNISENSORY REACTION TIME. J. exp. Psychol., Feb. 1966, 71(2), 286-293. (Michigan State University, East Lansing, Mich.).

Prior bisensory studies in reaction time (RT) have not obtained a pure speed measure of response latency. Errors in tracking tasks and differential latencies to bisensory stimuli are confounded with pure response latency; such results cannot adequately explain the psychological refractory period (PRP). Using pairs of visual stimuli, event uncertainty was held at 0 while temporal uncertainty was manipulated. Results show: a) a general rise in mean 1st RT as a function of interstimulus intervals (ISI) length; b) the PRP seems inversely related to "practice" of Ss; c) some evidence for extinction of competing responses accounting for the shapes of the RT curves. A competing response theory was offered to explain PRP, thought a special case of the "Temporary Inhibition of Response" phenomenon.
R 18

29,501
Lindsay, R.K. & Lindsay, Jane M. REACTION TIME AND SERIAL VERSUS PARALLEL INFORMATION PROCESSING. J. exp. Psychol., Feb. 1966, 71(2), 294-303. (University of Texas, Austin, Tex.).

Two experiments were conducted in which Ss gave 1 of 3 responses to each stimulus in a random sequence prepared from 32 distinct stimuli which assumed 1 of 2 levels for each of 5 dimensions. The sequence was constructed so that 2 of the 32 stimuli occurred with probability 1/3 each and the remaining 30 stimuli occurred with probabilities summing to 1/3. Ss were instructed to respond by depressing a -key to one of the high frequency stimuli, and a +key to the other, and a 0 key to any of the remaining 30. Results support the hypothesis that frequently occurring stimuli may be identified as total patterns, perhaps by some sort of template matching which compares all dimensions simultaneously. However, the results also suggest that the template matches are made serially, and infrequent (or unfamiliar) stimuli are identified by a serial examination of stimulus dimensions.
R 19

29,502
Voss, J.F SERIAL ACQUISITION AS A FUNCTION OF ITEM PROBABILITY AND SEQUENTIAL PROBABILITY. J. exp. Psychol., Feb. 1966, 71(2), 304-313. (University of Pittsburgh, Pittsburgh, Penn.).

4- or 8-unit serial lists were presented in which item probability, defined as the probability ratio of 2 items which occurred at a particular serial position (Exp. I and II), and sequential probability, defined as the 1st-order conditional probability of the items at adjacent serial positions (Exp. III), were manipulated. The latter variable involved variation in the probability of occurrence of adjacent associations, thereby providing for study of the importance of adjacent associations in serial learning. The major results indicated: a) as number of probabilistically varied serial positions increased, acquisition decreased; b) number of probabilistic serial positions interacted with probability ratio; c) sequential probability was significant for the 8-unit list, primarily at latter stages of learning. The results were interpreted to indicate that serial learning consists of 4 processes: a) immediate serial memory; b) item learning; c) item placement; d) learning of sequential associations.
R 8

29,503
Adams, J.A. & Dijkstra, S. SHORT-TERM MEMORY FOR MOTOR RESPONSES. J. exp. Psychol., Feb. 1966, 71(2), 314-318. (University of Illinois, Urbana, Ill. & Free University, Amsterdam, The Netherlands).

Two experiments were conducted on short-term memory for simple linear, graded motor responses, with length of retention interval and number of practice repetitions or reinforcements as basic variables. The spread of retention intervals was from 5 to 120 sec for both experiments, and number of reinforcements as 1, 3, and 6 in Exp. I and 1, 6, and 15 in Exp. II. Absolute error was the primary performance measure. Both experiments found error to be an increasing function of retention interval. Number of reinforcements was a significant variable only for the wider range of values in Exp. II, with error being a decreasing function of the variable. Results were considered parallel to those of corresponding studies on short-term memory for verbal responses. Interpretation was in terms of a rapidly decaying memory trace that becomes increasingly stable with reinforcement.
R 13

29,504
Dillon, P.J. STIMULUS VERSUS RESPONSE DECISIONS AS DETERMINANTS OF THE RELATIVE FREQUENCY EFFECT IN DISJUNCTIVE REACTION-TIME PERFORMANCE. J. exp. Psychol., March 1966, 71(3), 321-330. (McGill University, Montreal, Quebec, Canada).

In a typical disjunctive reaction-time (DRT) task, one cannot separate the relative contributions of stimulus and response events to decisions underlying performance. In the present study, use of a conditional DRT technique permitted independent variation of stimulus and response frequencies. The effects of these variations on response latency and GSR were studied in 4 experiments, on a total of 96 Ss. An inverse relation between RT (and GSR) and frequency of the response alternatives, but not of the corresponding stimulus alternatives, was demonstrated. It is suggested that models of DRT performance should stress response-selection, rather than stimulus-identification, factors in decision processing.
R 12

29,505
Jones, A. & MacLean, Marilyn. PERCEIVED DURATION AS A FUNCTION OF AUDITORY STIMULUS FREQUENCY. J. exp. Psychol., March 1966, 71(3), 358-364. (University of Pittsburgh, Pittsburgh, Penn.).

Ss made absolute magnitude estimations of durations ranging from 8 to 250 sec. Auditory clicks were broadcast during each trial at frequencies ranging from 0 to 10 clicks/sec. Magnitude estimations were found to be an increasing function of click frequency from 0 to 1.50 per sec., thereafter declining slightly. The magnitude of this "frequency effect" was found to be a decreasing monotonic function of duration. For durations of 8 sec., the mean magnitude estimation was displaced upward 13% by an increase in frequency from .25 to 1.50 per sec. The comparable alterations of 13- and 24-sec. estimations were 12% and 4%, respectively. Although Ss' mean absolute error of estimation for single trials was 45%, mean errors computed algebraically over either 2 or 6 trials were only ±6-9%. Estimations were an almost perfect linear function of duration, the pooled slopes for 3 experiments being 1.000, .974, and 1.056, with an overall mean of 1.01.
R 7

29,506
Gescheider, G.A. RESOLVING OF SUCCESSIVE CLICKS BY THE EARS AND SKIN. J. exp. Psychol., March 1966, 71(3), 378-381. (University of Virginia, Charlottesville, Va.).

When 2 successive clicks are presented to the ears either a single sound image or 2 successive sound images is perceived, depending on the temporal difference between the 2 stimuli. In agreement with previous findings, the time difference necessary for binaurally resolving 2 equally loud clicks was 1.8 msec. The comparable monaural threshold was 1.6 msec. When the fingertips were stimulated the pulses had to be separated by 10-12.5 msec., depending on the locus of stimulation. In both auditory and cutaneous stimulation manipulation of the intensity relationship between the 1st and delayed stimulus produced large changes in thresholds. As the delayed stimulus was attenuated from 0 to 15 db., the threshold rapidly increased, but when the 1st stimulus was attenuated from 0-20 db., the threshold decreased slightly at 5-10 db., and then began to increase gradually.
R 10

29,507
Wickelgren, W.A. PHONEMIC SIMILARITY AND INTERFERENCE IN SHORT-TERM MEMORY FOR SINGLE LETTERS. J. exp. Psychol., March 1966, 71(3), 396-404. (Massachusetts Institute of Technology, Cambridge, Mass.).

172 Ss copied a list of proactive interference (PI) letters, then copied a single letter to be recalled later, then copied a list of retroactive interference (RI) letters, and then attempted recall of the single letter. The length (0, 4, 8, or 16 letters) and phonemic similarity (0, 25, 50, 75, or 100% similar letters) of the PI and RI lists were varied systematically. Both PI and RI were demonstrated in short-term memory (STM) for single letters ($p<.001$). RI continued to increase with increasing length of RI list; PI did not increase appreciably beyond 4 letters. Both PI and RI increased with increasing phonemic similarity of the PI and RI lists for low and medium degrees of similarity of the other interference list, RI or PI list, respectively ($p<.001$). The findings suggest a 2-factor theory of forgetting in STM, involving retrieval interference and decay or storage interference.
R 16

29,508
Oyama, T. & Hsia, Y. COMPENSATORY HUE SHIFT IN SIMULTANEOUS COLOR CONTRAST AS A FUNCTION OF SEPARATION BETWEEN INDUCING AND TEST FIELDS. J. exp. Psychol., March 1966, 71(3), 405-413. (Chiba University, Chiba City, Japan & Columbia University, New York, N.Y.).

Each of 2 color-normal Ss was instructed to adjust a monochromator illuminating a foveally fixated 4° circular test field to give a "best" blue, green, and yellow in ascending and descending determinations; a red setting was obtained only in an ascending sequence, i.e., in order of increasing wavelength. Settings were made in the presence and absence of a 30° circular surround (inducing field) of each of the same 4 colors. A compensatory shift in wavelength setting for the contrast-induced tinge occurred almost always in the direction of the inducing color; this trend was observed under varying conditions of separation between the inducing and test fields, ranging from 0° to 8°. Over this entire range of separation, another trend was observed that the amount of shift decreased as the separation increased.
R 20

29,509
Corballis, M.C. MEMORY SPAN AS A FUNCTION OF VARIABLE PRESENTATION SPEEDS AND STIMULUS DURATIONS. J. exp. Psychol., March 1966, 71(3), 461-465. (McGill University, Montreal, Quebec, Canada).

Digit-span series were presented on 3 films, one to each of 3 groups of 20 Ss. In Film 1, presentation speed was varied between series. In Film 2, it was varied within series as well. In Film 3, it was varied between series only, but degree of variability between series was more extreme than in Films 1 or 2. Stimulus duration was varied in all 3 films. When stimulus durations were long, number correct was higher the slower the presentation speed, but when stimulus durations were short, there was a tendency for this trend to be reversed in Films 1 and 2, though not in Film 3. Implications of these findings are discussed.
R 12

29,510
Bevan, W. & Turner, E.D. VIGILANCE PERFORMANCE WITH A QUALITATIVE SHIFT IN VERBAL REINFORCERS. J. exp. Psychol., March 1966, 71(3), 467-468. (Kansas State University, Manhattan, Kan.).

Sequel to an earlier experiment, this study examined the effect of a qualitative shift in verbal reinforcers upon the detection of an auditory signal. Visual presentation of the word "Right" as reinforcement for correct responses or "Wrong" for errors produced a 30% improvement in performance. Furthermore, a shift from one qualitative type of reinforcement to the other at the midpoint of the experimental session resulted in an additional 40% increase in performance efficiency on the 2nd half. This last was taken as evidence of a qualitative contrast effect.
R 1

29,511
Agnew, N. McK., Pyke, Sandra & Pylyshyn, Z.W. ABSOLUTE JUDGMENT OF DISTANCE AS A FUNCTION OF INDUCED MUSCLE TENSION, EXPOSURE TIME, AND FEEDBACK. J. exp. Psychol., May 1966, 71(5), 649-654. (University of Saskatchewan, Saskatoon, Saskatchewan, Canada).

With knowledge of results as a between-group variable, and with 2 levels of induced muscle tension and 2 levels of exposure time as within-group variables, 36Ss were tested for accuracy and response bias in an absolute judgment of distance task. Both knowledge of results and long exposure time significantly facilitated accuracy of judgments and reduced response bias. Induced muscle tension significantly facilitated accuracy of judgments, and interacted with knowledge of results yielding greatest facilitation under the no-feedback condition.
R 17

29,512
Hahn, J.F. VIBROTACTILE ADAPTATION AND RECOVERY MEASURED BY TWO METHODS. J. exp. Psychol., May 1966, 71(5), 655-658. (University of Virginia, Charlottesville, Va.).

Tactile adaptation to sinusoidal vibration of 200 μ peak-to-peak amplitude on the index fingerpad was measured by absolute threshold and matching methods. The temporal course of adaptation was the same in both cases, with adaptation still progressing after 25 min., but threshold change was always greater than the change in subjective magnitude by a factor of 2.8. Recovery from adaptation was somewhat more rapid for subjective magnitude than it was for absolute threshold. The concept of "stimulus failure" as originally formulated does not account for the data, but some modification of it may do so.
R 11

29,513
Williams, Judith A. SEQUENTIAL EFFECTS IN DISJUNCTIVE REACTION TIME: IMPLICATIONS FOR DECISION MODELS. J. exp. Psychol., May 1966, 71(5), 665-672. (McGill University, Montreal, Quebec, Canada).

Among the effects showing that decisions in serial disjunctive reaction time (DRT) tasks are dependent upon sequential structure of the signal series are latency differences between responses to repeated (Sa following Sa) and changed (Sb following Sa) signals. The present study examines sequence effects and their implications for decision models. 4 DRT experiments were performed (total N=159). In Experiment I, each of 8 groups showed a significant sequence effect in the direction of lower latencies for responses to changed than to repeated signals. Experiments II and III showed that this effect could not be attributed to either peripheral (retinal) fatigue or Ss' guessing habits. In a 4th experiment, latencies were markedly lengthened when signal sequence and response sequence were varied independently. A trial-to-trail comparison process is proposed to account for the present results, and as a useful supplement to existing decision models.
R 5

29,514
Morant, R.B. & Aronoff, J. STARTING POSITION, ADAPTATION, AND VISUAL FRAMEWORK AS INFLUENCING THE PERCEPTION OF VERTICALITY. J. exp. Psychol., May 1966, 71(5), 684-686. (Brandeis University, Waltham, Mass.).

Using an electrically controlled rod and frame apparatus, 16 Ss were exposed to various conditions of tilts of the rod alone, frame alone, and rod and frame together. Increased exposure time resulted in increased shifts in the position of apparent vertical in the rod alone and frame alone conditions but not in the rod and frame together conditions. Aftereffects measured on the rod alone, after viewing the rod and frame together, were found equivalent to those obtained after viewing the rod alone. This finding was supported in a 2nd experiment using longer exposure periods. 2 different mechanisms must be postulated to explain these effects.
R 6

29,515
Nazzaro, J.R. & Todorov, J.C. INFLUENCE OF LUMINANCE ON A TWO-CHOICE DECISION TASK. J. exp. Psychol., May 1966, 71(5), 696-699. (Universidade de Brasilia, Rio de Janiero, Brazil, South America).

The influence of differing levels of luminance on probability of response was investigated 63 Ss were given 200 trials in a 2-choice guessing task. The lights appeared according to a random schedule. 2 groups were used, 1 receiving reinforcement in the proportions 75:25 and the other 50:50. Within each group 3 different luminance conditions were used: right light brighter than left, right light dimmer than left, and both lights equal. Greater luminance with the more frequent light produced greater response frequency than when both lights were equal. Lower luminance with the more frequent light produced lower response frequency. When both lights appeared equally often, luminance had no effect on response frequency. The data were interpreted in terms of magnitude of reinforcement, and in the increased formation of response sets.
R 12

29,516
Clarkson, J.K. & Deutsch, J.A. EFFECT OF THRESHOLD REDUCTION ON THE VIBRATO. J. exp. Psychol., May 1966, 71(5), 706-710. (Sheffield University, Sheffield, England & New York University, New York, N.Y.).

The effect of induced change in DL (difference limen) of pitch on the frequency and amplitude of the vibrato was measured and a correlation was sought between the amount of vibrato and DL reduction by stimulation. 13 untrained male Ss took part in a 5 stage experiment: 1) samples of vibrato recorded; 2) frequency DL for 180 cps (cycles per second) established; 3) S binaurally stimulated by 180 cps note for 5 min.; 4) repetition of stage 1; and 5) repetition of stage 2. A strong correlation was found between vibrato amplitude and change in threshold. Though there was a large effect of DL reduction on amplitude of vibrato, there was no effect on vibrato frequency. The results suggest that there is a compensation in the rate of change of corrective movement in this skill.
R 3

29,517
Herman, L.M. & Bahrick, H.P. INFORMATION ENCODING AND DECISION TIME AS VARIABLES IN HUMAN CHOICE BEHAVIOR. J. exp. Psychol., May 1966, 71(5), 718-724. (Queens College, Flushing, N.Y. & Ohio Wesleyan University, Delaware, Ohio).

Paired-comparison wagers were offered to Ss under 2 different methods of encoding decision-parameter information. Method 1 provided S with a set of 4 elements of nonindependent parameter information, Method 2 with a subset comprised of 2 independent elements. Ss' choices showed significantly closer correspondence to an EV-maximization decision rule under Method 2, for both independent groups and repeated-measures designs. With repeated measures, it was found that given sufficient decision time, Method 2 transferred positively to Method 1, with the opposite true (negative transfer) when order of administration was reversed. It was concluded that the basic problem for S in choice situations is the selection of decision rules rather than of decision alternatives. Decision rules may then be asymmetrically transferrable across different encoding methods.
R 10

29,518
Singer, G. & Day, R.H. SPATIAL ADAPTATION AND AFTEREFFECT WITH OPTICALLY TRANSFORMED VISION: EFFECTS OF ACTIVE AND PASSIVE RESPONDING AND THE RELATIONSHIP BETWEEN TEST AND EXPOSURE RESPONSES. J. exp. Psychol., May 1966, 71(5), 725-731. (University of Sydney, Sydney, Australia & Monash University, Clayton, Victoria, Australia).

Adaptation and aftereffect to prism-induced spatial transformation of vision has been investigated in 2 experiments and a control series. In Experiment I kinesthetic-muscular responses without vision preceded and followed similar responses with prismatically transformed vision during an exposure phase, and in Experiment II a passive and active swinging movement of the arm was introduced during exposure. In the 4 control experiments responses were made without transformed vision during exposure. Significant aftereffects occurred in Experiments I and II but in neither did they vary in magnitude as a function of either passive or active responses during exposure, relation of test to exposure responses, or to type of response made during the test phase. No significant effects occurred in the control experiments. The significantly smaller mean aftereffect for Experiment II suggested that aftereffects from spatially transformed vision are largely a function of the spatial relationships between test and exposure responses.
R 10

29,519
Pew, R.W. ACQUISITION OF HIERARCHICAL CONTROL OVER THE TEMPORAL ORGANIZATION OF A SKILL. J. exp. Psychol., May 1966, 71(5), 764-771. (University of Michigan, Ann Arbor, Mich.).

A 2-state relay control system in which S controls the position of a continually moving target with 2 response keys is employed to test the validity of concepts of hierarchical organization in skill development. As training progresses with this task Ss tend to develop strategies for improving their performance which imply control of the effect of an ongoing sequence of responses rather than execution of each response as a separate unit. Interresponse-time analysis reveals 2 distinctive modes of performance, designated the open-loop mode and the modulation mode, both of which imply higher-level control of the timing of response sequences but that achieve this control in 2 different ways.
R 6

29,521
Binder, A., Wolin, B.R. & Terebinski, S.J. LEADERSHIP IN SMALL GROUPS: A RESOLUTION OF DISCORDANCE. J. exp. Psychol., May 1966, 71(5), 783-784. (New York University, New York, N.Y.).

One condition of a prior experiment by the present authors (Binder, Wolin & Terebinski, 1965; HEIAS No. 25,790) yielded fits far more discrepant from a theoretical model that other conditions. The deviant condition was 753 in which the numbers refer to the probabilities of each member of the group, when leader, being reinforced. Repeating the condition with varied reinforcement schedules for different groups provided fits between obtained and predicted results comparable to those for other conditions. This condition does not present unique problems for the model.
R 1

29,522
Brown, J.H. MAGNITUDE ESTIMATION OF ANGULAR VELOCITY DURING PASSIVE ROTATION. J. exp. Psychol., Aug. 1966, 72(2), 169-172. (USA Medical Research Lab., Fort Knox, Ky.).

Using an adaptation of the Stevens' scaling technique, 25 Ss estimated subjective angular velocity during constant angular acceleration in darkness. Acceleration intensities varied from $3°/sec^2$ to $24°/sec^2$, with stimulus durations ranging from 10 sec. to 80 sec. The exponent of the power function relating the subjective and intensive dimensions is on the order of 1.0.
R 7

29,523
Sekuler, R.W. & Bauer, J.A., Jr. ADAPTATION TO PRISMATIC DISPLACEMENTS: HAND POSITION AND TARGET LOCATION. J. exp. Psychol., Aug. 1966, 72(2), 207-212. (Massachusetts Institute of Technology, Cambridge, Mass.).

Interpretation of studies of prismatic changes in the apparent relationship between hand and eye may be complicated by possible sources of artifact, including failure to control the position of S's hand during prism viewing. In the study reported S used a stylus to mark the location of virtual image targets before and after viewing the marking hand through prisms. Differences between pre- and postexposure markings measured the effect of the intervening exposure. Independent variables included the direction in which prism displaced seen objects, position of the marking hand during exposure, and location of the targets to be marked. Although all 3 factors proved highly significant ($p<.005$), the effect of prism orientation was about 4 times as great as the other effects. The implications of these findings for research on prism adaptation are discussed.
R 7

29,524
Posner, M.I. & Konick, A.F. ON THE ROLE OF INTERFERENCE IN SHORT-TERM RETENTION. J. exp. Psychol., Aug. 1966, 72(2), 221-231. (University of Wisconsin, Madison, Wisc.).

In a series of experiments the similarity between items presented on a given trial (II) and on successive trials (PI) is systematically manipulated in conjunction with the difficulty of the information processing interpolated between presentation and recall. The results of the studies indicate that under conditions where forgetting proceeds independently of the effects of interpolated task similarity it depends upon similarity among stored items and upon the difficulty of the interpolated processing. The effectiveness of interference does not appear to vary directly with the difficulty of interpolated processing but it is more closely related to the time material is in store. These results are compatible with the view that interfering items work spontaneously during the retention interval to disrupt the original trace (Acid Bath) rather than merely competing at the time of recall.
R 13

29,525
Weisstein, Naomi. BACKWARD MASKING AND MODELS OF PERCEPTUAL PROCESSING. J. exp. Psychol., Aug. 1966, 72(2), 232-240. (Committee on Mathematical Biology, University of Chicago, Chicago, Ill.).

The decision between parallel and serial operations in perceptual processing has always been made on the basis of whether or not, as a visual array size increases, there is a total increase in time from presentation to report. The results from this type of design are ambiguous: no operation within the perceptual processing sequence itself is measured, thus it is equally likely that additional operations are being added or that the operations are repeating themselves. A design using U-shaped backward-masking functions provided a measure of an operation occurring within the processing sequence; the duration over which this operation occurred for arrays of different sizes reflected the type of processing occurring. There was an increase in masking range as array size increased; thus, no strict parallel processing occurs. Since these increases were not whole multiples of the increase in array size, the processing is not serial, item-by-item. These results have some general implications for visual backward masking.
R 9

29,526
Leibowitz, H.W. & Meneghini, Kathleen A. SHAPE PERCEPTION FOR ROUND AND ELLIPTICALLY SHAPED TEST OBJECTS. J. exp. Psychol., Aug. 1966, 72(2), 244-249. (Pennsylvania State University, University Park, Penn.).

In order to determine whether the phenomenon of shape constancy as observed with circular test objects is influenced by a tendency to respond in terms of a familiar circular shape, matches were obtained for a round and 2 elliptically shaped test objects. With this procedure, shape constancy for a round test object is manifested by matches which are rounder than the retinal image, but for elliptical objects, the tendency toward constancy requires the matches to be less round than the retinal image. The data, obtained in 2 experiments involving variation of angle of rotation and exposure duration, indicate that the constancy phenomenon is toward the true shape of the test object and that circularity is not a factor. These results emphasize the importance of cues, present during observation, as mediators of shape constancy.
R 14

29,527
Wickelgren, W.A. CONSOLIDATION AND RETROACTIVE INTERFERENCE IN SHORT-TERM RECOGNITION MEMORY FOR PITCH. J. exp. Psychol., Aug. 1966, 72(2), 250-259. (Massachusetts Institute of Technology, Cambridge, Mass.).

Ss listened to a standard tone for 2, 4, or 8 sec., followed by an interference tone lasting 2, 4, or 8 sec., followed by a comparison tone lasting 2 sec., followed by a 4-sec. period in which they decided whether the standard and comparison tones were the same or different and stated their confidence on a scale from 1 to 5. Operating characteristics were approximately straight lines on normal-normal paper, and d' values were computed for each condition for each of 10 Ss. The d' value for a condition is a measure of the difference in strength of the correct and incorrect comparison tones at the time of the test, greater d' meaning more accurate performance. By this measure, trace strength increased with longer duration of the standard tone, decreased with longer duration of the interference tone, and generalized to adjacent tones.
R 18

29,528
Wasserman, G.S. BRIGHTNESS ENHANCEMENT IN INTERMITTENT LIGHT: METHODS OF MEASUREMENT. J. exp. Psychol., Aug. 1966, 72(2), 300-306. (Massachusetts Institute of Technology, Cambridge, Mass.).

Brightness enhancement was measured under 4 conditions of judgment (simultaneous or successive comparisons and in the presence or absence of an adapting field) in a 2 x 2 factorial design. Brightness enhancement was greater for successive comparisons than for simultaneous comparisons. Enhancement was also favored when the adapting field was removed during the comparisons. The greatest amount of enhancement, then, was found when the intermittent light was isolated in space and time from all other stimuli, thus contradicting the suggestion that brightness enhancement might be an interaction artifact. However, these results also demonstrate that brightness enhancement is sensitive to the presence of other stimuli. Introspections of Os suggest that subjective colors were produced to a greater degree during simultaneous comparisons than during successive comparisons.
R 17

29,529
Ebenholtz, S.M. ADAPTATION TO A ROTATED VISUAL FIELD AS A FUNCTION OF DEGREE OF OPTICAL TILT AND EXPOSURE TIME. J. exp. Psychol., Nov. 1966, 72(5), 629-634. (Connecticut College, New London, Conn.).

3 groups of 8 Ss each were exposed to optically rotated visual fields of 10, 20, and 32°, respectively, for a total adaptation time of 4 hr. The magnitude of adaptation was a linear function of optical tilt and a negatively accelerated function of time. The highest rate of adaptation per unit of time occurred within the 1st hour. Alternative theoretical accounts of the time rate of adaptation were discussed.
R 14

29,530
Hay, J.C. & Pick, H.L., Jr. GAZE-CONTINGENT PRISM ADAPTATION: OPTICAL AND MOTOR FACTORS. J. exp. Psychol., Nov. 1966, 72(5), 640-648. (Smith College, Northampton, Mass. & University of Minnesota, Minneapolis, Minn.).

Vision can adapt for some optical distortions that vary with the direction of gaze, in particular for the variable image stretching and shearing caused by prism spectacles. These 2 adaptations were studied using both vertically and horizontally oriented adaptation prisms, thereby untying the type of image distortion from the type of correlated eye movement. Exp. I showed the mechanisms of the 2 adaptations to differ, the shearing adaptation being critically dependent on the orientation of the correlated eye movements. In Exp. II, the shearing adaptation was found not to be the exact complement of the optical shearing: the apparent tilting of some image lines was reduced (positive adaptation), while the apparent countertilting of other image lines was increased (negative adaptation). It was concluded that the adaptation to prismatic image shearing is a rotation, most probably a change in the patterning and registration of torsional eye movements.
R 13

29,531
Braunstein, M.L. SENSITIVITY OF THE OBSERVER TO TRANSFORMATIONS OF THE VISUAL FIELD. J. exp. Psychol., Nov. 1966, 72(5), 683-689. (University of California, Irvine, Calif.).

Motion-picture sequences representing 2- or 3-dimensional textures rotating or translating with respect to X, Y, or Z and displayed through polar or parallel projections were generated by a computer technique. 32 Ss selected physical models of the textures and manipulated these according to the perceived motions. Responses to the various transformations corresponded to findings in studies of motion parallax, stereokinetic depth, and the kinetic depth effect, while method of projection accounted for differences between the findings of Es using the same transformations. The results supported the meaningfulness of a psychophysics of depth perception based on a mathematical analysis of transformations of the visual field.
R 13

29,532
Johnston, W.A., Howell, W.C. & Goldstein, I.L. HUMAN VIGILANCE AS A FUNCTION OF SIGNAL FREQUENCY AND STIMULUS DENSITY. J. exp. Psychol., Nov. 1966, 72(5), 736-743. (Ohio State University, Columbus, Ohio).

16 practiced Os monitored an 8 x 8 matrix for 4 successive 100-min. sessions and detected, located, and identified additions and deletions of alpha-numeric stimuli. Signal frequency (60 and 150 per session) was varied between Ss, and stimulus density (4, 8, 16, and 32 stimuli) within Ss. Identification accuracy and detection latency were the most sensitive measures, revealing a vigilance decrement followed by an end spurt. Monitoring performance was poorest overall and the decrement largest under low frequency 32 density, was poorer for deletions than for additions, and was better at the mean than extreme inter-signal intervals. These trends were based on short-term wanderings of attention, operationally defined as missed signals and very long detection latencies, rather than on changes in absolute sensitivity.
R 18

29,533
Bersh, P.J. & Garvin, E.A. A PSEUDOCONDITIONING EFFECT ON REACTION TIME. J. exp. Psychol., Nov. 1966, 72(5), 744-750. (USA Personnel Research Office, OCRD, Washington, D.C. & North Central Massachusetts Mental Health Center, Fitchburg, Mass.).

This experiment was performed a) to compare the effect upon reaction time of paired and unpaired presentations of the reaction-time signal and electric shock and b) to determine whether use of a ready signal changes any observed effect. 4 groups of 10 Ss each were run accordingly. Heart rate was also recorded as a means of gauging the progress of acquisition of aversive properties by the reaction-time signal. The major findings were: a) The slowing of reaction time occurs as a pseudoconditioning phenomenon. b) This slowdown is reduced or eliminated by the use of a ready signal. c) The ready signal also prevents heart-rate conditioning.
R 12

29,534
Nickerson, R.S. RESPONSE TIMES WITH A MEMORY-DEPENDENT DECISION TASK. J. exp. Psychol., Nov. 1966, 72(5), 761-769. (USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.).

4 experiments were conducted to determine the time required to make some simple memory-dependent decisions. S's task was to decide whether any of the items of a memorized check list were contained in a visually displayed search list, and to register his decision as quickly as possible by pressing 1 of 2 response keys. RT varied directly both with the number of items in the check list and the number in the search list, and inversely with the number of items common to both lists. Practice reduced RT across conditions, and it also decreased, but did not eliminate, the effects of the independent variables. Decreases in RT with practice were accompanied, in most cases, with increases in the frequency of errors.
R 7

29,535
Sternheim, C.E. & Boynton, R.M. UNIQUENESS OF PERCEIVED HUES INVESTIGATED WITH A CONTINUOUS JUDGMENTAL TECHNIQUE. J. exp. Psychol., Nov. 1966, 72(5), 770-776. (University of Rochester, Rochester, N.Y.).

The hue-wavelength relation was investigated using a color-naming technique which enabled Ss to assign numerical weights to component hues associated with the long wavelength part of the spectrum. Ss were found capable of giving more information than when using more quantal methods, with a high degree of reliability. Red, orange, yellow, and green were evaluated on the basis of criteria established for the uniqueness of perceived hue. Evidence was presented which indicated that the hue associated with the color name orange is not unique in all aspects. It was concluded that the hues associated with the long wavelength part of the spectrum could be adequately described without the orange response category.
R 9

29,536
Montague, W.E. & Lappin, J.S. EFFECTS OF CODING STRATEGY ON PERCEPTUAL MEMORY. J. exp. Psychol., Nov. 1966, 72(5), 777-779. (University of Illinois, Urbana, Ill.).

Haber (HEIAS No. 23,245) found that groups using different encoding strategies differed in accuracy of stimulus description. He hypothesized that encoding from a decaying memory trace could produce such results since one strategy took longer to execute. The present study attempted to determine whether Haber's results were due to a decaying trace. 2 groups of 13 Ss participated; each used one of the 2 coding strategies to describe the stimulus--objects code or dimensions code. Neither under conditions replicating his with brief stimulus presentation nor under conditions where no tracy decay was possible did performance differ as a function of strategy. It does not seem likely that trace decay is a factor in such stimulus encoding.
R 3

29,537
Green, R.T. & Courtis, M.C. INFORMATION THEORY AND FIGURE PERCEPTION: THE METAPHOR THAT FAILED. Acta psychol., Amsterdam, Jan. 1966, 25(1), 12-36. (University College, London, England).

In order to apply information theory legitimately to figure perception at least 4 principles must be observed: the scanning sequence, the alphabet of signs, and the grain or mosaic of the display must all 3 be defined, and the transition probabilities between the elements must be objective. Not one of these conditions can be met in genuine figure perception. Figure perception, as it occurs naturally, does not involve the scanning of a mosaic of elements in a manner analogous to a television camera dealing with a grained photographic print. A study of the practice of professional cartoonists indicates that the percipient is called upon to respond to partial cues, drawing on his past experience to fit the whole into a schema that "makes sense" of the display. In other words, we would do better to talk of perceptual strategies, as if the percipient were engaged in a search for the perceptual hypothesis that will best organize the raw sensory data. The sorts of hypotheses he entertains, and where he looks within the display for relevant cues, must depend on the task as presented to and conceived by the percipient, and on the percipient's past experience.
R 34

29,538
Knowles, J.B., Purves, Caroline & Oliver, J.E. THE EFFECT OF INSTRUCTIONS ON THE REPORTED DURATION OF A SPIRAL AFTER-EFFECT. Acta psychol., Amsterdam, Jan. 1966, 25(1), 94-100. (Clinical Psychiatry Research Unit, MRC, Graylingwell Hospital, Chichester, England).

These data confirm the "instruction effect" reported by Holland (1961); both his and our own study clearly demonstrate that modifying the instructions which precede administration of the Archimedes spiral influences the duration of the after-effect subsequently reported by the S. Emphasizing the accuracy with which the judgment should be made, significantly increases the duration of the spiral after-effect (SAE). However, the results of the present study, in which repeated trials were given following the change of instruction, suggest that this effect may be only temporary. Although instructions were found to influence the duration of the SAE, the preliminary observation that extraverts and introverts appeared to respond differentially to "accuracy" instruction was not borne out by the subsequent study.
R 7

29,539
Altman, I. ASPECTS OF THE CRITERION PROBLEM IN SMALL GROUP RESEARCH. I. BEHAVIORAL DOMAINS TO BE STUDIED. Acta psychol., Amsterdam, March 1966, 25(2), 101-131. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

In this paper the general criterion question regarding small group behavior, namely, "How is the group doing?" was expanded to include questions concerning the total behavior of group members as they worked on a task, i.e., their interpersonal behavior, their goal-contributory behavior as well as those behaviors directly related to task performance. Thus, the criterion question was defined to include a very broad range of behaviors which conceptually and sequentially link to each other and which eventually interact and combine to affect final group output. From such a starting point an attempt was made to develop a general "language" of behavior which would include under its umbrella the vast numbers of types of behaviors possible, would link them to one another and which could be applied over a variety of situations. The advantages and limitations of such a general behavior classification system were discussed, specifically with respect to the description of ongoing social interaction in small group situations.
R 57

29,540
Bertelson, P. & Renkin, A. REACTION TIMES TO NEW VERSUS REPEATED SIGNALS IN A SERIAL TASK AS A FUNCTION OF RESPONSE-SIGNAL TIME INTERVAL. Acta psychol., Amsterdam, March 1966, 25(2), 132-136. (Universite libre de Bruxelles, Brussels, Belgium).

Previous experiments showed that serial choice RT is longer on the trials where the stimulus is different from the preceding one. The influence on this phenomenon of the duration of the time-lag between the end of the response and the arrival of the next signal was examined. 16 Ss gave 600 responses on each of 4 sessions on a self-paced 2-choice task, where they responded with one of 2 keys to the presentation of one of 2 shapes. Response-signal intervals of 50, 200, 500 and 1000 msec were presented, following both a regular and an irregular procedure. Under both procedures, the difference between RTs to new and 2 repeated stimuli was shown to decrease with the passage of time.
R 8

29,541
Altman, I. ASPECTS OF THE CRITERION PROBLEM IN SMALL GROUP RESEARCH. II. THE ANALYSIS OF GROUP TASKS. Acta psychol., Amsterdam, Aug. 1966, 25(3), 199-221. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

This paper considered the generic criterion question "How well is a group functioning" from the point of view of the task or setting within which groups operate. The thesis was offered that an understanding of group functioning required a specification of the underlying properties of group tasks to allow mapping between results obtained on different tasks, and to permit mapping between behavior processes and task characteristics. For this purpose, it was proposed that tasks be described and differentiated in terms of the behaviors involved in their performance. The general behavior language proposed in an earlier paper was then applied to the description of group tasks, along with other dimensions specifying relationships between task participants, e.g., hierarchical linkages, dependency linkages, temporal linkages, etc. The proposed approach is limited in several ways, e.g., it does not map adequately between different molar-molecular levels, does not immediately handle certain derived task characteristics such as difficulty and complexity. However, it has the heuristic value of describing tasks and behavior in a common language, provides a multidimensional system for comparing tasks and precisely specifying where they are alike and different, and has the potentiality for describing a large variety of tasks.
R 18

29,542
Sanders, A.F. EXPECTANCY: APPLICATION AND MEASUREMENT. Acta psychol., Amsterdam, Nov. 1966, 25(4), 293-313. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

It is argued that the unsatisfactory status of the expectancy concept is mainly due to a lack of quantitative data. In a variety of psychological topics expectancy phenomena have been demonstrated but not systematically measured. A concised review of the results is presented--the New Look movement, aspiration level, probabilistic concept formation and a number of reaction time issues. This is followed by a discussion of more recent work on the measurement of subjective probability on the basis of numerical estimation or rating. The studies on frequency estimation and Bayesian revision of opinion are especially considered in this respect. It is concluded that, in spite of a number of methodological problems, the time seems ripe to apply the estimation procedure as a more general measurement technique in situations where expectancy appears to be important.
R 89

29,543
Stanley, G. APPARENT SHRINKAGE OF A ROTATING ARC AS A FUNCTION OF LUMINANCE RELATIONS BETWEEN FIGURE AND SURROUND. Acta psychol., Amsterdam, Nov. 1966, 25(4), 357-364. (Psychology Dept., University of Western Australia, Perth, Australia).

When white arcs of circles on black backgrounds and black arcs on white backgrounds are rotated, white on black arcs appear to shrink in length and black on white arcs appear to lengthen. This effect is a function of the absolute size of the arc.
R 5

29,544
Wallace, G.K. THE EFFECT OF BACKGROUND ON THE ZÖLLNER ILLUSION. Acta psychol., Amsterdam, Nov. 1966, 25(4), 373-380. (Psychology Dept., University of Reading, Reading, England).

Measurements of the Zöllner illusion were made for 3 different background patterns and at 5 different distances. For 2 background patterns of wavy lines the illusion was severely reduced at short viewing distances. There was, however, a marked increase in the illusion with increased viewing distance. This was true to a much less extent for the control straight line pattern. The nature of this effect is analysed and its significance discussed.
R 5

29,546
Leibowitz, H. & Toffey, S. THE EFFECT OF ROTATION AND TILT ON THE MAGNITUDE OF THE POGGENDORF ILLUSION. Vision Res., Feb. 1966, 6(1/2), 101-103. (Pennsylvania State University, University Park, Penn.).

The present experiment investigates some variables which, from preliminary observations, were expected to influence the magnitude of the Poggendorf illusion. Specifically, the rotation of the figure in the frontal plane and the tilt of the entire figure away from the subject are investigated. The data indicate that the magnitude of the Poggendorf illusion is strongly dependent on both the orientation and tilt of the test-object. Apparently, the angular relationships with respect to the observer, as well as within the figure, are important variables in determining the magnitude of the illusion. It is not now possible to specify the mechanisms which subserve this phenomenon. However, the magnitude of the effect produced by orientation and tilt reflects the operation of variables which must ultimately be incorporated into the body of our knowledge of perception before this illusion can be adequately understood.

29,547
Canter, Mathilda B. & Fleming, D.E. CORTICAL POTENTIALS EVOKED IN MAN BY BRIEF PHOTIC STIMULUS TRAINS: PERCEPTUAL-ELECTROPHYSIOLOGICAL CORRELATES. Vision Res., April 1966, 6(3/4), 199-206. (US Veterans Administration Hospital, Phoenix, Ariz.).

Human occipital responses evoked by trains of 4 consecutive pulses of light varying in rate of presentation and pulse-to-cycle fraction were recorded from scalp. Perceptual reports were simultaneously obtained. Electrical responses were computer-averaged, and peak delays and amplitudes of consistent wave components were analyzed. At 5 & 10 c/s a distinct complex was recorded to each light pulse, while at 20 & 30 c/s a single complex was recorded to the entire stimulus train. For the 2 main wave components analyzed, highest amplitudes were recorded in the second pulse response, with amplitude generally greater at 10 than at 5 c/s. Pulse-to-cycle fraction significantly affected peak delay values, with briefest latencies at PCF 0·03, and briefer latencies at 10 than at 5 c/s. Correlations between verbal reports of number of flashes seen and evoked potential record were demonstrated for all 5 and 30 c/s conditions.
R 13

29,548
Kahneman, D. TIME-INTENSITY RECIPROCITY IN ACUITY AS A FUNCTION OF LUMINANCE AND FIGURE-GROUND CONTRAST. Vision Res., April 1966, 6(3/4), 207-215. (Psychology Dept., Hebrew University, Jerusalem, Israel).

The visibility of Landolt Cs was studied for equal-energy presentations of different durations, at 3 levels of energy. 7 different conditions of presentation were used, differing in mode of presentation (black-on-grey, white-on-grey and white-on-black) and in level of figure-ground contrast. The analysis shows that the critical duration (t_c) depends on the luminance-duration product for the brighter part of the exposed field, and is best understood as a property of luminance. The U-shaped variation of t_c as a function of energy is tentatively attributed to scotopic and photopic mechanisms. Differences between t_c for acuity and for brightness discrimination are explained by the effect of the adapting field in the latter task.
R 19

29,549
Mellerio, J. OCULAR REFRACTION AT LOW ILLUMINATION. Vision Res., April 1966, 6(3/4), 217-237. (Physiological Optics Dept., Institute of Ophthalmology, London, England).

A survey of literature concerned with ocular refraction at reduced illuminations reveals that most eyes become myopic with approaching darkness. The 3 causes of this myopia are considered and evidence for a night near response presented. The pupil steady state light response, as reported by several authors, was examined and found to contain irregularities. It is shown that the cause of these irregularities cannot be the duality of retinal receptor input, but that it probably lies with the night near response.
R 80

29,550
Richards, W. ATTENUATION OF THE PUPIL RESPONSE DURING BINOCULAR RIVALRY. Vision Res., April 1966, 6(3/4), 239-240. (Psychology Dept., Massachusetts Institue of Technology, Cambridge, Mass.).

This brief letter provides a record, obtained during binocular rivalry, of the correlation between the attenuated pupil response and the apparent brightness of flashes presented to one eye.
R 6

29,551
Baumann, C. SCOTOPIC PHOTOMETRY OF THE XENON ARC. Vision Res., April 1966, 6(3/4), 241-243. (W.G. Kerckhoff-Institute der Max-Planck-Gesellschaft, Bad Nauheim, Germany).

Xenon light is particularly suitable for threshold measurements in the scotopic range of vision. This letter recommends further investigations to discover the physical and technical possibilities of standardizing the Xenon arc so that values of maximum luminous efficiency are identical under both scotopic and photopic conditions. Such a uniform system of photometry would greatly simplify measurements within the field of physiological optics.
R 8

29,552
Cole, B.L., Henry, G.H. & Nathan, J. PHENOTYPICAL VARIATIONS OF TRITANOPIA. Vision Res., June 1966, 6(5/6), 301-313. (Victorian College of Optometry, University of Melbourne, Melbourne, Australia).

The colorimetric investigation of 6 tritans is reported. The tritans are all members of the one family and three have been shown to be tritanopes. The other 3 tritans are trichromatic and have a defect which could be diagnosed as tritanomaly. It is postulated on the basis of this result and an examination of the tritanomals reported in the literature that tritanomaly is not the result of a separate allelomorph and the term incomplete tritanopia may be preferable. Spectral mixture data, purity thresholds and extended Rayleigh matches are also reported for some of the tritans. 2 incomplete tritanopes exhibit evidence of an alteration system raising doubts as to the adequacy of the simple loss theory of tritanopia.
R 19

29,553
Akita, Munehira & Graham, C.H. MAINTAINING AN ABSOLUTE TEST HUE IN THE PRESENCE OF DIFFERENT BACKGROUND COLORS AND LUMINANCE RATIOS. Vision Res., June 1966, 6(5/6), 315-323. (Columbia University, New York, N.Y.).

Measures are made of changes in test wavelength required to compensate for a contrast effect introduced by a background color. The test hue remains constant when the contrast effect is modified by a shift of the test wavelength, usually toward the direction of the background. Ratio of test-to-background luminance has an imprecisely specifiable influence on compensatory wavelength changes in the test area. Wavelength settings for similar test hues made in a dark surround at 2 levels of luminance, 1·1 and 12·0 mL, demonstrate a Bezold-Bricke shift due to intensity level.
R 11

29,554
Wist, E.R. & Gogel, W.C. THE EFFECT OF INTER-OCULAR DELAY AND REPETITION INTERVAL ON DEPTH PERCEPTION. Vision Res., June 1966, 6(5/6), 325-334. (USA Medical Research Lab., Fort Knox, Ky. & Psychology Dept., University of California, Santa Barbara, Calif.).

Observers viewed a continuously illuminated, binocular standard stimulus, adjacent to which appeared a briefly illuminated, binocular comparison stimulus. Using the method of adjustment, observers positioned the comparison stimulus in depth so that it appeared equidistant to the standard stimulus under conditions in which an interocular delay in stimulation occurred with respect to the comparison stimulus. It was found that: a) little change in equidistance settings occurred with delays of 32 msec or less, but that with larger delays the apparent position of the comparison stimulus shifted away from the observer; b) increasing the time interval between successive pairs of comparison stimulus presentations from 150 to 300 msec resulted in a similar shift in apparent position; c) there was an interaction between delay and repetition interval such that the repetition interval had a larger effect on equidistance settings for longer delays. The results were interpreted as supporting the notion of a continuum between stereoscopic-binocular and monocular stimulation. Physical simultaneity was not a necessary condition for stereopsis.
R 21

29,555
Kruger, L., Schwassmann, H.O. & Siminoff, R. ELECTROLUMINESCENT LAMPS FOR VISUAL STIMULUS PRESENTATION. Vision Res., June 1966, 6(5/6), 349-351. (Anatomy Dept., University of California, Los Angeles, Calif.).

The panels consist of thin (1/16 in. or 1/32 in.) plastic sheets available in a range of sizes and shapes. They provide homogeneous "white" light over long periods of use compared with tungsten filaments, although their ageing is accelerated by excitation at high voltages or frequencies. Commercially available panels excited by 60-400 c/s a.c. at 0-400 V provide an extensive range of intensities. Brightness of the surface (8 ft-L at 400 c/s, 110 V a.c.) can be continuously graded without shifting colour temperature over the entire range, thereby avoiding the need for neutral density filters. No appreciable heat is generated by the lamp; stray light is eliminated; and the limitations of mechanical shutters are avoided by pulsing the lamps for rapid rise and decay. No ballasts, starters, or other auxiliary electrical equipment is required for operating the lamp directly from line current.
R 4

29,558
Gerrits, H.J.M., de Haan, B. & Vendrik, A.J.H. EXPERIMENTS WITH RETINAL STABILIZED IMAGES. RELATIONS BETWEEN THE OBSERVATIONS AND NEURAL DATA. Vision Res., Aug. 1966, 6(7/8), 427-440. (Medical Physics Dept., University of Nijmegen, Nijmegen, The Netherlands)

Experiments with retinal stabilized images are described using the technique developed by Iarbus. Also experiments are performed with stabilized objects surrounded by a non-stabilized background and with moving objects (in one or all directions) on a stabilized background offering the opportunity to observe the "on" and "off" activities separately. In addition the static pupil-reaction has been investigated. It is concluded that the origin of the observed stabilization effects is presumably not to be sought in the retina but rather in a higher center of the visual system. The results show that we cannot obtain a continuous sensation of brightness from short transient neuronal activities. However, the normal continuous activities of "on" and "off" fibers along a stimulus border is responsible for the preservation of the central activity and thereby for the perception of continuous brightness over the stimulus field. The "on" activity at "light on" serves to rapidly build up a perceptual activity in the "higher center." In the same way the "off" activity at "light off" rapidly builds up an activity in the "higher center" which neutralizes the "on" activity. The same principle holds for the color system. The importance of the contour for the preservation of the perception of a non-stabilized stimulus is demonstrated. Differences between stabilized and non-stabilized objects, as well as residual brightness after stabilization, are discussed.
R 28

29,559
Mitchell, D.E. RETINAL DISPARITY AND DIPLOPIA. Vision Res., Aug. 1966, 6(7/8), 441-451. (Victorian College of Optometry, University of Melbourne, Melbourne, Australia).

The usual explanation of the disparity-diplopia relationship in terms of retinal fusional areas (Panum's fusional areas) is discussed. Measurements were made of the size of Panum's areas at the fovea, using a method of constant stimuli with flash presentation of the test target to prevent fusional eye movements from influencing the results. Under these conditions little inter- or intra-individual variation was found. In contrast to previous studies, little meridional difference was observed in the amount of disparity necessary to elicit diplopia. Various factors are suggested to explain the relatively large amount of disparity that must be introduced between the two ocular images before diplopia is perceived.
R 36

29,560
Matin, L., Pearce, D., Matin, Ethel & Kibler, G. VISUAL PERCEPTION OF DIRECTION IN THE DARK: ROLES OF LOCAL SIGN, EYE MOVEMENTS, AND OCULAR PROPRIOCEPTION. Vision Res., Aug. 1966, 6(7/8), 453-469. (Psychology Dept., Columbia University, New York, N.Y.).

Ss performing monocularly in an otherwise dark room reported the direction at which a flash (6 msec duration, 3·5 min visual angle, randomly located along the horizontal in the frontal parallel plane) appeared relative to a fixation target extinguished 3 sec earlier. Although the Ss attempted to maintain the eye in the same position as during the prior fixation period, large involuntary eye movements (monitored by a contact-lens technique) during the 3 sec dark interval caused a given flash target to strike the retina to the left of the fovea on some trials, and to the right on others. The report of flash direction depended strongly on the sign and magnitude of this varying retinal signal independently of the physical location of the flash target. The standard deviation of the function relating report of flash direction to the retinal signal was approximately half of the standard deviation of the function relating the report to physical target location. No evidence was found that proprioceptive signals regarding the eye movements systematically influenced the reports of flash direction. The accuracy of the report of the physical location of the target was thus limited by the S's ability to maintain his eye close to the original fixation position.
R 25

29,561
Palmer, D.A. THE SIZE OF THE HUMAN PUPIL IN VIEWING THROUGH OPTICAL INSTRUMENTS. Vision Res., Aug. 1966, 6(7/8), 471-477. (National Physical Laboratory, Teddington, England).

The size of the human pupil has been measured under conditions of Maxwellian view. When the light flux was concentrated within an artificial pupil smaller than the natural pupil, the latter was often larger than might be expected from the assumption that the size depended only on the flux entering the eye. It is postulated that Maxwellian view may cause a break in a physiological "servo-loop" governing the size of the pupil. The relevance of this effect to the design of optical instruments is discussed.
R 5

29,562
Engel, G.R. & Howatt, M.R. THE GLOW MODULATOR AS A SOURCE FOR RECTANGULAR LIGHT FLASHES. Vision Res., Aug. 1966, 1(7/8), 479-481. (Defence Research Medical Labs., Toronto, Ontario, Canada).

This note describes an electronic circuit to control the current fed to the glow modulator so that it can be maintained at a constant low value and produce accurate rectangular flashes as required in vision experiments conducted in the dark.
R 2

29,563
Granda, A.M. & Biersdorf, W.R. THE SPECTRAL SENSITIVITY OF THE HUMAN ELECTRORETINOGRAM DURING THE TEMPORAL COURSE OF DARK-ADAPTATION. Vision Res., Oct. 1966, 6(9/10), 507-516. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

Threshold curves derived from the b-wave of the ERG show similarities to analogous psychophysical data. There is an immediate decrease in threshold for the first minute and then a leveling off at about 8-12 min depending on the color of the stimulus light. For shorter wave-lengths there is a clear break in the curve, the threshold decreasing again and becoming asymptotic between 22 and 30 min. This total change of threshold covers a range of over 3 log units. With longer wavelengths, the break in the curve is scarcely evident. Peak latency curves of threshold responses show pronounced breaks for all tested wavelengths. The a-waves show little evidence of breaks. Spectral curves derived early in dark-adaptation show a characteristic scotopic function plus a long wavelength process for the b-wave. The a-wave at this time shows scotopic plus elevated middle and long wavelength activity. For both waves, with more time in the dark, the longer wavelength processes tend to diminish in sensitivity. The spectral curves here tend to conform more closly to the scotopic function.
R 16

29,564
Van Den Brink, G. & Reijntjes, G.A. SPATIAL AND TEMPORAL FACILITATION IN VISION. Vision Res., Oct. 1966, 6(9/10), 533-551. (Neurophysiology Dept., University of Groningen, Groningen, The Netherlands).

Several research-workers in psychophysical visual experiments have noticed that a large stimulus at threshold level is often seen in its entirety. If we consider this observation in connexion with current theories on the visual threshold mechanism, it can only be explained by supposing the existence of a mechanism that facilitates subliminal activity whenever a supraliminal effect is present in the retinal image. Experiments were undertaken to study the spatial and temporal aspects of this facilitation mechanism. The distance and the time within which it is active exceed the distance and time within addition of subliminal effects occurs , to a degree that depends upon the experimental conditions which determine the density of retinal activity elicited by the stimulus.
R 27

29,565
Bryngdahl, O. PERCEIVED CONTRAST VARIATION WITH ECCENTRICITY OF SPATIAL SINE-WAVE STIMULI. SIZE DETERMINATION OF RECEPTIVE FIELD CENTRES. Vision Res., Oct. 1966, 6(9/10), 553-565. (Research Div., Xerox Corporation, Rochester, N.Y.).

The perceived brightnesses of the maxima and minima in a sinusoidally varying luminance distribution in space, has been examined by supra-threshold techniques. The stimulus variables were the eccentricity and the spatial wavelength of the sine-wave pattern. The psychophysical method used and the measurements performed are described. The sine-wave patterns had 50% intensity modulation and an average luminance corresponding to 63 trolands. A clear dependence of the extreme response levels upon retinal location was found; the maximum perceived contrast as well as the spatial wavelength for which this maximum occurs, increases with increasing distance from the fovea centralis. An estimation of the size of the receptive field centre is given. A sensitivity distribution within the receptive field consisting of the difference between two Gaussian distributions is assumed. The horizontal diameter of the receptive field centre was found to vary from 20μ at the fovea centralis to 100μ at 10° eccentricity.
R 22

29,566
Walraven, P.L. & Bouman M.A. FLUCTUATION THEORY OF COLOUR DISCRIMINATION OF NORMAL TRICHROMATS. Vision Res., Oct. 1966, 6(9/10), 567-586. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

The De Vries and Rose hypothesis concerning visual discrimination has been extended to the colour discrimination of normal trichromats. This hypothesis states that a luminance difference ΔB is just above threshold when ΔB just exceeds the statistical fluctuations in background luminance B, which are proportional to $B^{1/2}$. The colour difference required for the threshold is related to the statistical fluctuations in the rates of absorption of quanta by the three colour components in the visual system. A revision of the Thomson-Wright curves has been used as an estimate of the three cone sensitivity curves. A derivation of the shape of these curves is given in an appendix. A transformation from the Young-Helmholtz scheme into the Hering scheme is introduced to account for the independent variation of red-green and yellow-blue discrimination with visual angle. Furthermore it is assumed that with increasing luminance the blue system has to be given an increasing weight in hue discrimination. This has been experimentally verified with a deuteranope. The apparent tritanomaly of normal subjects at low luminance has to be considered as a case of pseudotritanomaly. A satisfactory description of wavelength discrimation at low and high luminance and of the MacAdam ellipses is derived from this theory.
R 45

29,567
Trotter, J.R. THE GEOMETRICAL OPTICS OF THE BLISTER EFFECT. Vision Res., Oct. 1966, 6 (9/10), 587-596. (Australian National University, Canberra, Australia).

The blister effect occurs when a distant scene is viewed through the gap formed by the tips of finger and thumb, held an inch or so in front of one eye, the other eye being closed. As the tips are brought closer together, one being further from the eye, a bulge seems to grow on the more distant one, which appears to touch the other even though the the tips are not felt to touch. This effect is examined here, and many detailed aspects of it are shown to be in accord with the distribution of light on the retina. It is thus not a visual illusion, as some have supposed.
R 1

29,568
Vaughan, H.G., Jr., Costa, L.D. & Gilden, L. THE FUNCTIONAL RELATION OF VISUAL EVOKED RESPONSE AND REACTION TIME TO STIMULUS INTENSITY. Vision Res., Dec. 1966, 6(11/12), 645-656. (Albert Einstein College of Medicine, New York, N.Y.).

Latency of the average visual evoked response (VER) and motor reaction time (RT) were studied as a function of stimulus intensity for brief photic stimuli subtending 4° and 1·5° of visual angle in 2 Ss. Both VER latency and RT showed an accelerating increase for each tenfold diminution in intensity down to the region of foveal threshold. Below foveal threshold no responses were obtained for the 1·5° stimuli; there was an inflexion in the VER latency and RT curve of responses to the 4° stimuli. Over the photopic range of intensities, VER latency and RT were closely described by power functions varying in exponent from -0·29 to -0·44. The values for VER were -0·36 for the 4° stimuli and -0·40 for the 1·5° stimuli, which were significantly different ($p<0.01$). Although latency of VER was the same for both Ss for each stimulus condition, RT showed a consistent difference between Ss of about 25 msec. RT is considered to be determined by at least 2 independent mechanisms. The first, retinal in location, follows a power function of intensity; the second is related to variability in efferent processes.
R 29

29,569
Shipley, T., Jones, R.W. & Fry, Amelia. INTENSITY AND THE EVOKED OCCIPITOGRAM IN MAN. Vision Res., Dec. 1966, 6(11/12), 657-667. (Ophthalmology Dept., University of Miami School of Medicine, Miami, Fla.).

Individual differences in the waveforms of the visually evoked occipitograms in 3 trained observers have been shown to persist over 4-5 log units of stimulus intensity. In addition, some differences in the waveforms evoked by different monochromatic lights are reported for color-normal observers. The waveforms for one deuteranomalous observer are indistinguishable despite changes in both wavelength and intensity. In the normal observers, however, the waveforms do change as a function of intensity. For some colors these changes are such as to transform the responses for one wavelength into those for another. For some other colors, waveform differences persist despite intensity changes.
R 11

29,570
Westheimer, G. THE MAXWELLIAN VIEW. Vision Res., Dec. 1966, 6(11/12), 669-682. (Neurosensory Lab., University of California School of Optometry, Berkeley, Calif.).

Optical questions arising in the so-called Maxwellian View method of illuminating the retina have been analyzed theoretically. Problems discussed in detail include those of photometry, of magnification, of focus, and finally of pupil size insofar as it relates to the transmission of spatial frequencies in coherent and incoherent illumination.
R [illegible]

29,571
Ekman, G. TEMPORAL INTEGRATION OF BRIGHTNESS. Vision Res., Dec. 1966, 6(11/12), 683-688. (Psychological Labs., University of Stockholm, Stockholm, Sweden).

The relation between stimulus duration and perceived brightness of light flashes was studied on the basis of data previously published by Raab. A re-analysis of the data made it possible to demonstrate a simple logarithmic time/brightness relation. This relation has recently been found for the perception of pain, elicited by electrical stimulation, and for loudness of a pure tone. The logarithmic relation between stimulus duration and perceived intensity thus appears to possess a certain inter-modal generality. Finally, various aspects of the interaction of time and intensity as factors in brightness perception were tentatively described and discussed.
R 9

29,572
Wasserman, G.S. BRIGHTNESS ENHANCEMENT AND OPPONENT-COLORS THEORY. Vision Res., Dec. 1966, 6(11/12), 689-699. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

An opponent-colors analysis of brightness enhancement is presented which postulates that enhancement is a manifestation of wavelength-dependent transient retinal activity in the 2 chromatic systems of opponent-colors theory. This transient activity occurs at those wavelengths which are perceived as unique hues. Brightness enhancement was measured as a function of wavelength, and the location of the unique hues in the spectrum was also determined. Enhancement was found to be maximal for wavelengths that were perceived as unique hues, and minimal or absent for other wavelengths.
R 42

29,573
Teller, Davida Y., Andrews, D.P. & Barlow, H.B. LOCAL ADAPTATION IN STABILIZED VISION. Vision Res., Dec. 1966, 6(11/12), 701-705. (Neurosensory Lab., University of California School of Optometry, Berkeley, Calif.).

The increment threshold for a small stimulus superimposed upon adapting spots of various diameters was measured under scotopic conditions in the peripheral retina. Confirming Westheimer (1965) (HEIAS No. 27,105), it was found that adapting spots of about 1° diameter raise the threshold more than either larger or smaller spots. This experiment was repeated using a stabilized-image technique to avoid movements of the adapting field over the retina. The reduction of threshold with increase of the adapting spot diameter above 1° was found to be more pronounced with stabilization than without. Hence, Westheimer's phenomenon cannot be explained by eye movements and temporal exictability changes, and must be attributed to physiological interactions within the visual system.
R 11

29,574
Michael, J.A. & Jones, G.M. DEPENDENCE OF VISUAL TRACKING CAPABILITY UPON STIMULUS PREDICTABILITY. Vision Res., Dec. 1966, 6(11/12), 707-716. (Aviation Medical Research Unit, McGill University, Montreal, Quebec, Canada).

Variable, narrow bandwidths of random noise were used to determine the ability of the human visual tracking system to maintain fixation on moving visual stimuli of various degrees of predictability. The results indicate that there is a continuous relationship between stimulus predictability and tracking capability; the less predicatable the stimulus motion the greater the phase shift between stimulus and response at a given frequency. Thus, a predictive component in the system seems to compensate for the relatively poor performance capabilities of the system operating in the unpredictive mode and permits maximally accurate following with the patterns of head and target movements encountered in real life.
R 15

29,575
Efron, R. & Wolfe, E. AN UNUSUAL FORM OF NIGHT-BLINDNESS ASSOCIATED WITH INCREASED STEREOSCOPIC ACUITY. Vision Res., Dec. 1966, 6(11/12), 717-724. (US Veterans Administration Hospital, Boston, Mass. & Retina Foundation, Boston, Mass.).

An unusual anomaly of vision is described in which there is an increased stereoscopic acuity in the central parts of the visual field associated with a defective dark-adaptation curve in the same regions. A combined analysis of data of stereoscopic acuity and dark-adaptation experiments supports the contention that the condition is due to a greatly enlarged rod-free region exceeding 10° in size. The performance in stereoscopic acuity suggest that this same region has an abnormally high concentration of cones.
R 4

29,576
Payne, W.H. REACTION TIME AS A FUNCTION OF RETINAL LOCATION. Vision Res., Dec. 1966, 6 (11/12), 729-732. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.).

The limited data given in the earlier studies on RT vs. retinal location are misleading. The conclusion that RT increases directly with the distance from the fovea along the horizontal meridian is unwarranted, in view of the present data. Rather, there is a decrease in RT at the point along the horizontal meridian where the sum of the rods and cones is most numerous (i.e. 17°). The minimum RT not at the fovea, occurs on the retinal area corresponding to the blind spot of the other eye. Otherwise, these data are completely compatible with the Rains and Poffenberger data; only the additional points investigated here change their conclusions. The RTs along the 45-225° meridian do not resemble those collected along the horizontal meridian. These curves can be obtained under a wide variety of stimulating conditions. It is only important that the stimulus not be excessively bright or very dim.
R 3

29,577
Bornschein, H., Wichterle, O. & Wündsch, L. A CONTACT LENS ELECTRODE FOR COMPARATIVE ERG STUDIES. Vision Res., Dec. 1966, 6(11/12), 733-734. (General & Comparative Physiology Dept., University of Vienna, Vienna, Austria).

Small contact lenses may be made from a soft, flexible, and electrically conductive material. Adhering like a sucker on the corneal surface of eyes strongly different in size, one and the same lens may be used in comparative ERG studies of different species.
R 8

29,578
Von Bekesy, G. TASTE THEORIES AND THE CHEMICAL STIMULATION OF SINGLE PAPILLAE. J. appl. Physiol., Jan. 1966, 21(1), 1-9. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

A simple chemical stimulator was developed which permitted the placement of one droplet of fluid on the side of a single papilla. The Ss were usually able to determine the quality of a salty, sour, sweet, or bitter test solution for each papilla. The quality to which each papilla was sensitive did not change when the test solutions were placed on different areas of the wall of the papilla. Furthermore, the taste quality did not change with the concentration of the solution, even when the sensation magnitude was increased. There were some papillae which were a combination of 2 or even 3 different papillae. Such combinations occurred mainly on the edge of the tongue and on the soft and hard palates. A photographic map of the tip of the tongue was made and every papilla was marked with its reported quality. It turned out that each papilla gave the same quality response for chemical and for electrical stimulation. This seems to indicate that single papillae are sensitive only to one specific taste quality. Unfortunately, the technique for observing this phenomenon is very time consuming. mostly because adaptation makes long intervals necessary between observations even of threshold values.
R 22

29,579
Schneider, R.A., Schmidt, C.E. & Costiloe, P.J. RELATION OF ODOR FLOW RATE AND DURATION TO STIMULUS INTENSITY NEEDED FOR PERCEPTION. J. appl. Physiol., Jan. 1966, 21(1), 10-14. (Medicine Dept., University of Oklahoma Medical Center, Oklahoma City, Okla.).

To ascertain the influence of stimulus flow rate and duration on olfactory perception on n-butane in nitrogen, thresholds were measured in 8 adults for 16 combinations of 4 flow rates (10, 20, 40, 80 ml N_2/sec) and 4 durations (0.25, 0.50, 1.00, and 2.00 sec). Expressed as total amount of odorant, thresholds were highest at the fastest flow rates and longest durations. Expressed as concentration of odor, thresholds were highest at the slowest flow rates and shortest durations. Analysis of variance showed that flow rate and duration separately and flow-duration interaction significantly contributed to the observed variance. It was concluded that the critical condition for perception is that sufficient odor molecules strike the end organ within a given period of time and that this condition could be defined as a critical intranasal odor rate or as a critical intranasal concentration.
R 9

29,580
Tipton, C.M. & Karpovich, P.V. EXERCISE AND THE PATELLAR REFLEX. J. appl. Physiol., Jan. 1966, 21(1), 15-18. (Physiological Research Lab., Springfield College, Springfield, Mass.).

The relationship between muscular activity and patellar reflex time (the time from the striking of the patellar tendon to the beginning of leg extension) of the right leg was investigated on male Ss between the ages of 17 and 50 yrs. Riding a friction bicycle for 5 or more min or performing 600 or more ipsilateral or contralateral extensions was associated with shortened times; but, only the former was changed significantly. The Jendrassik maneuver before and after exhaustive exercise shortened reflex time; however, the postexercise readings did not approach pre-exercise times. Reflex times tended to shorten with training. The results demonstrated that reflex time will shorten or lengthen, depending upon the amount of exercise performed.
R 29

29,581
Richardson, D.W., Kontos, H.A., Shapiro, W. & Patterson, J.L., Jr. ROLE OF HYPOCAPNIA IN THE CIRCULATORY RESPONSES TO ACUTE HYPOXIA IN MAN. J. appl. Physiol., Jan. 1966, 21(1), 22-26. (Medicine Dept., Virginia Medical College, Richmond, Va.).

The role of hypocapnia in the circulatory response to acute hypoxia was investigated in 18 healthy men. Cardiac output increased by 76%, heart rate increased by 25%, and arterial pressure did not change significantly in 9 Ss who breathed 8% oxygen in nitrogen for 7-8 min. Addition to this inspired gas mixture of sufficient carbon dioxide to raise arterial pCO_2 to 1's control value reduced the circulatory changes, but raised arterial oxygen tension from an average of 37 to 52 mm Hg as a result of increased ventilation. Abolition of hypocapnia without change in arterial oxygen tension, by reducing oxygen concentration from 9 to 7% when CO_2 was added to inspired gas, produced no change in the circulatory responses to hypoxia in 12 Ss. Thus, hypocapnia does not appear to be responsible for the increase in cardiac output, heart rate, and forearm blood flow which accompany acute arterial hypoxia.
R 23

29,582
Brick, I. CIRCULATORY RESPONSES TO IMMERSING THE FACE IN WATER. J. appl. Physiol., Jan. 1966, 21(1), 33-36. (Physiology Dept., Queen's University, Belfast, Northern Ireland).

Simultaneous measurements were made of heart rate and forearm blood flow in man during 1-min periods of breath holding while immersing the face in water, breath holding alone, and immersion of the face alone while continuing to breathe through a breathing tube. Breath holding while immersing the face in water and breath holding alone resulted in almost identical responses. In each case heart rate fell by about 15% and forearm blood flow fell by about 20%. The response to water touching the face was similar but smaller, heart rate and forearm blood flow both falling by about 10%. It was concluded that both water touching the face and breath holding contribute toward the reduction in heart rate and forearm blood flow found on immersing the face in water, the major contribution coming from the breath holding.
R 20

29,583
Bevegard, S., Freyschuss, Ulla & Strandell, T. CIRCULATORY ADAPTATION TO ARM AND LEG EXERCISE IN SUPINE AND SITTING POSITION. J. appl. Physiol., Jan. 1966, 21(1), 37-46. (Clinical Physiology Dept., Karolinska Sjukhuset, Stockholm, Sweden).

In 6 healthy, young males the adaptation to arm, leg, and combined arm and leg exercise was studied by cardiac catheterization in supine and sitting position. The hemodynamic and ventilatory responses were equal during leg exercise and when more muscle groups participated as during combined arm and leg exercise. During exercise with the arms, however, total ventilation, heart rate, and lactate formation were significantly higher for a given oxygen uptake. With arm exercise the systolic, diastolic and mean pressures in the aorta increased more in relation to the cardiac output than when the legs participated in the work. The observed differences in circulatory adaptation during arm versus leg exercise indicate higher sympathetic tone during arm exercise. The effect of body position was more pronounced during arm exercise only than when the legs took part in the work. In the sitting position the stroke volume did not increase on transition from rest to arm exercise when the legs were passive.
R 31

29,584
Samueloff, S.L., Browse, N.L. & Shepherd, J.T. RESPONSE OF CAPACITY VESSELS IN HUMAN LIMBS TO HEAD-UP TILT AND SUCTION ON LOWER BODY. J. appl. Physiol., Jan. 1966, 21(1), 47-54. (Mayo Clinic & Mayo Foundation, Rochester, Minn.).

The "occluded" limb technique was used for continuous monitoring of reflexly mediated changes in venous tone in 10 normal Ss. Tilting to 70° head up and exposure of the lower part of the body to subatmospheric pressure (60 mm Hg) caused a transient increase in venous pressure in the hand, foot, and forearm whose circulation was arrested, in contrast to a maintained decrease in forearm blood flow. On return to the horizontal or release of suction, another transient rise in venous pressure often occurred in association with an increase in forearm blood flow. The transient venous responses could not be related to the redistribution of blood caused by these procedures. It seems that reflex changes in tone of the capacity vessels in the limbs are not an essential part of the compensatory vascular responses for maintenace of systemic arterial blood pressure in the upright position, although the transient increase in tension of the walls of the capacity vessels may aid the resistance vessels in reducing the rate of pooling of blood in dependent parts.
R 31

29,585
Lee, T.D., Jr., Lindeman, R.D., Yiengst, M.J. & Shock, N.W. INFLUENCE OF AGE ON THE CARDIOVASCULAR AND RENAL RESPONSES TO TILTING. J. appl. Physiol., Jan. 1966, 21(1), 55-61. (Gerontology Branch, National Institute of Health, Bethesda, Md.).

Healthy male Ss, age 19 to 82, had simultaneous measurements of cardiac and renal function preceding, during, and following 45° head-up tilt. Both cardiac output and renal blood flow decreased with age in the resting supine position. The decrease in the renal fraction of the cardiac output with age was small and not statistically significant. 15 of 21 Ss tolerated 1 hr of head-up tilt. Urine flow, glomerular filtration rate, renal blood flow, and electrolyte excretion fell with tilting in both young and old Ss. Stroke volume fell and heart rate, diastolic arterial pressure, and peripheral vascular resistance increased in both age groups. Cardiac index fell significantly only in the old Ss while systolic and mean arterial pressures increased with tilt only in the young Ss. No significant differences in response to tilt were observed between the young and old Ss.
R 29

29,586
Siri, W.E., Van Dyke, D.C., Winchell, H.S., Pollycove, M., et al. EARLY ERYTHROPOIETIN, BLOOD, AND PHYSIOLOGICAL RESPONSES TO SEVERE HYPOXIA IN MAN. J. appl. Physiol., Jan. 1966, 21(1), 73-80. (Donner Lab., University of California, Berkeley, Calif.).

Serum and urinary erythropoietin, plasma-iron turnover, and various physiological parameters were systematically measured in a human S exposed 4 days to 405.6 mm Hg (simulated 16,400 ft) following rapid decompression. Serum erythropoietin became detectable at 12 hr, reached maximum concentration on the 3rd day, and fell to low levels on the 4th. Plasma-iron turnover and hemoglobin synthesis followed a similar pattern, although elevated rates persisted for some time after return to sea-level pressure. The rise and fall in serum erythropoietin correlated with other physiological changes occurring during acute acclimatization, including marked changes in cardiac and pulmonary function, subsidence of severe hypoxic symptoms, and increased serum protein-bound iodine, oxygen consumption, urinary excretion of adrenocortical steroids, and concentration of all blood cells except erythrocytes in peripheral blood. No significant changes occurred in total red cell and plasma volumes nor in the measured blood and urinary electrolute and enzyme concentrations.
R 24

29,587
Greenleaf, J.E., Averkin, E.G. & Sargent, F., II. WATER CONSUMPTION BY MAN IN A WARM ENVIRONMENT: A STATISTICAL ANALYSIS. J. appl. Physiol., Jan. 1966, 21(1), 93-98. (Ames Research Center, NASA, Moffett Field, Calif.).

Twenty-two metabolic variables were examined using stepwise linear regression analysis for their possible relationship to voluntary water consumption in 87 young men. 6 variables: a) mean daily urinary vol; b) serum osmolarity; c) lying pulse rate; d) mean daily urinary Cl; e) mean daily urinary K; and f) rate of sweating accounted for 62% of the variation in water intake. The addition of the remaining 16 variables accounted for only 71% of the variation. An equation was constructed that estimated water intake from these 6 variables. The anions, particularly Cl, might be of greater importance in influencing drinking than has been previously realized. The data suggest that some combination of body osmolarity and body fluid volume is associated with voluntary water intake in man.
R 28

29,588
Dill, D.B., Hall, F.G. & Van Beaumont, W. SWEAT CHLORIDE CONCENTRATION: SWEAT RATE, METABOLIC RATE, SKIN TEMPERATURE, AND AGE. J. appl. Physiol., Jan. 1966, 21(1), 99-106. (Physiology Dept., Indiana University, Bloomington, Ind.).

The concentration of chloride in sweat was studied in 12 men and 31 boys at Boulder City, Nevada, in June and July 1964. 5 of the men had participated in similar studies at Boulder City in 1932 or 1937. Chloride concentration tended to increase with sweat rate but bore little relation, if any, to skin and rectal temperatures. In most Ss it was lower after acclimatization than it was in winter or spring at Bloomington, Indiana, or Santa Barbara, California. Individuals walking under the same conditions with the same sweat rate vary widely in chloride concentration in sweat. This is clearly directly related to age, as indicated by both cross-sectional and longitudinal observations. There are wide differences at the same age that may be inborn: One S and his son have unusually high sweat chloride while another S and his son have unusually low sweat chloride.
R 18

29,589
Wyndham, C.H., Strydom, N.B., Morrison, J.F., Williams, C.G., et al. FATIGUE OF THE SWEAT GLAND RESPONSE. J. appl. Physiol., Jan. 1966, 21(1), 107-110. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

Sweat rates and rectal temperatures were measured on 10 men at the end of each of the 5 hr of exposure to 10 different environmental conditions and 5 different rates of metabolic heat production, i.e., a total of 50 different experimental conditions. The mean sweat rates were plotted against the mean rectal temperatures of the 10 men for each hour, and curves with a double exponential function were found to be a good fit to the data. From these curves it is clear that the duration of exposure to heat has the effect of: a) diminishing the sensitivity of the sweat rate response to rise in internal body temperature; and b) decreasing markedly the maximum capacity of the sweat response to a relatively high increase in internal body temperature, i.e., 103 F. These two response characteristics, a diminution in sensitivity and a decrease in maximum capacity, are unequivocal evidence of fatigue of the sweat glands.
R 12

29,590
Kraning, K.K., II, Belding, H.S. & Hertig, B.A. USE OF SWEATING RATE TO PREDICT OTHER PHYSIOLOGICAL RESPONSES TO HEAT. J. appl. Physiol., Jan. 1966, 21(1), 111-117. (Occupational Health Dept., University of Pittsburgh, Pittsburgh, Penn.).

Two acclimatized male Ss were exposed to graded combinations of exercise and environmental temperature to determine whether physiological cost, in terms of rectal temperature (T_r) and heart rate (HR), is different per kcal of exercise metabolism (M) and per kcal of heat stress from the environment (HS). Data of Robinson on 4 Ss exposed under a variety of conditions were examined in the same way. The effect of a unit of M on HR in the 6 Ss was about twice as great as the effect of a unit of HS, but the effect of a unit of M on T_r was not significantly different from the effect of a unit of HS. In 30 combinations tried on one S cardiac output was found to increase by different amounts for equal amounts of M and HS. This suggests that no two combinations of M and HS elicit the same combination of HR, cardiac output and T_r.
R 16

29,591
Bevegard, B.S. & Shepherd, J.T. REACTION IN MAN OF RESISTANCE AND CAPACITY VESSELS IN FOREARM AND HAND TO LEG EXERCISE. J. appl. Physiol., Jan. 1966, 21(1), 123-132. (Physiology Section, Mayo Clinic & Mayo Foundation, Rochester, Minn.).

The reaction of resistance and capacity vessels in forearm and hand to leg exercise was studied in normal Ss. Following a transient increase in forearm blood flow (strain-gauge plethysmograph) and decrease in arterial blood pressure with onset of exercise, the flow remains at the pre-exercise value or, with severe exercise (1,200 kg-m/min), decreases to less than half that value as arterial pressure increases. These changes in forearm flow resulted from dilatation followed by constriction of muscle vessels, and with moderate to severe exercise a gradual dilatation of vessels in forearm skin as deduced from changes in oxygen saturation of blood from forearm muscle and skin veins. The resistance vessels in the hand constricted with onset of exercise and dilated again toward the end of the exercise period. The capacity vessels constricted with onset of exercise: the constriction persisted throughout exercise and was graded like that of the resistance vessels in muscle to the work load. These vessel reactions were mediated by sympathetic fibers and could be blocked in the forearm by local heating. The venomotor reflex might be elicited by the muscle contractions.
R 23

29,593
Belding, H.S., Hertig, B.A. & Kraning, K.K. COMPARISON OF MAN'S RESPONSES TO PULSED AND UNPULSED ENVIRONMENTAL HEAT AND EXERCISE. J. appl. Physiol., Jan. 1966, 21(1), 138-142. (Occupational Health Dept., University of Pittsburgh, Pittsburgh, Penn.).

Men walked for 3 hr while exposed to square pulses of environmental heat at 55 and 30 C, under conditions which permitted free evaporation of sweat. The pulses involved heat loads, M + R + C, of 750 and 250 kcal/hr, alternated at intervals of 30, 15 and 7.5 min. The average hourly sweat rate, heart rate, and skin and rectal temperatures during the pulsed exposures were similar to those observed in steady exposures at an environmental temperature midway between. Similarly, when the same 3 Ss walked alternately at speeds of 5.6 and 2.0 km/hr in a constant environment at 46 C, with total heat load at 560 and 440 kcal/hr, their average responses were not different from those observed at a steady pace with a metabolic rate midway between. Thus, within the limits of the study, a time-weighted average of conditions of unsteady exposures was usable for predicting over-all physiologic strains. Examination of data from the unpulsed exposures revealed that the sweat produced was highly correlated with calculated M + R + C.
R 14

29,594
Sipple, J.H. & Gilbert, R. INFLUENCE OF PROPRIOCEPTOR ACTIVITY IN THE VENTILATORY RESPONSE TO EXERCISE. J. appl. Physiol., Jan. 1966, 21(1), 143-146. (State University of New York Upstate Medical Center, Syracuse, N.Y.).

To study the influence of proprioceptor activity in the ventilatory responses to exercise, ventilation was measured during fast and slow bicycle pedaling at equivalent work rates. The transient and steady-state ventilations were similar for comparable levels of oxygen consumption at each pedaling speed. It is concluded that the speed of leg motion does not affect the ventilatory response to exercise independent of the total work load. If the proprioceptor stimulus is frequency dependent, these results indicate that proprioceptor activity has little influence in the ventilatory response to exercise. The results do not rule out the possibility of a combination of frequency and force acting as a proprioceptor stimulus to ventilation.
R 11

29,595
Hall, J.F., Strobl, W.W. & Buehring, W.B. EFFECTS OF VARIOUS GASES ON HANDGEAR INSULATION. J. appl. Physiol., Jan. 1966, 21(1), 163-166. (USAF Biomedical Lab., Wright-Patterson AFB, Ohio).

The effect of gases having different thermal conductivities on the thermal insulation of handgear was investigated. Experimental mittens with special plastic spacer interliners of various thicknesses were sealed between gas-impermeable outer and inner shells and filled, first with room air (as control), then various experimental gases, and thermal insulation was measured on a copper hand. Experimental gases included carbon dioxide, Freon 12, and helium. Comparative results are presented in terms of percentage insulation change; clo/inch; conductivity (K) values; and the measured thermal insulation (clo) values. Prior to all tests each mitten was evacuated (13 cm Hg) to remove all entrapped air, then filled without contamination with the control or experimental gas. Gas within the handgear was maintained at a constant positive pressure (.5 cm water) throughout each experiment. Mean measurements show significant increases (13-32%) of thermal insulation for Freon 12 and carbon dioxide, with decreased insulation observed with helium. Significance and some practical application of these results for protective clothing design is shown.
R 7

29,596
Sendroy, J., Jr. & Collison, H.A. DETERMINATION OF HUMAN BODY VOLUME FROM HEIGHT AND WEIGHT. J. appl. Physiol., Jan. 1966, 21(1), 167-172. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

A previously developed method of graphical determination of human body volume from measurements of height and weight has been extended for utilization from a limited range to one spanning the development of the male and female form from infant to adult. Equations best suited to express the relations of weight and height to show body volume and surface area over the periods of the life span for W/H = 0.04-0.1, 0.1-0.2, and 0.2-0.8, were found to be, respectively, for males: $V/S = 57.26\ (W/H)^{0.494} + 0.254$, $V/S = 50.6\ (W/H)^{0.436}$, and $V/S = 60.20\ (W/H)^{0.562}$; and for females $V/S = 60.36\ (W/H^{0.507} + 0.254$, $V/S = 51.1\ (W/H)^{0.429}$, and $V/S = 62.90\ (W/H)^{0.578}$. A statistical evaluation and comparison with results of almost 1900 physical measurements taken from the literature indicate that this approach provides results acceptable for most clinical purposes, and is much more convenient and rapid than other, conventional methods of arriving at indices of body composition (volume, specific gravity, density, and body fat). The method permits the simultaneous determination of human body surface area as previously described.
R 40

29,597
Sullivan, S.F., Patterson, R.W. & Papper, E.M. ARTERIAL CO_2 TENSION ADJUSTMENT RATES FOLLOWING HYPERVENTILATION. J. appl. Physiol., Jan. 1966, 21(1), 247-250. (Anesthesiology Dept., Columbia University, New York, N.Y.).

Anesthetized, paralyzed human Ss were hyperventilated for 2 hr. At the end of this period, arterial CO_2 tension, Pa_{CO_2}, changed less than 1 mm in 15 min. Following a step decrease in ventilation, Pa_{CO_2} was measured serially until the change was less than 1 mm in 10 min, i.e., for periods up to 70 min. An equilibrium value was not reached in the limited duration of these studies, however an estimate of this value can be made. The data are represented as the sum of 2 exponential functions, with rate constants k_1 and k_2 whose average values are 0.46 min^{-1} and 0.030 min^{-1}.
R 9

29,598
Agostoni, E., Gurtner, G., Torri, G. & Rahn, H. RESPIRATORY MECHANICS DURING SUBMERSION AND NEGATIVE-PRESSURE BREATHING. J. appl. Physiol., Jan. 1966, 21(1), 251-258. (Physiology Dept., New York State University, Buffalo, N.Y.).

During submersion up to the neck the expiratory reserve volume of the sitting S is reduced to 11% of the vital capacity in air, the same decrease is obtained breathing from a tank at -20.5 cm H_2O. The decrease of lung volume is mainly due to the cranial displacement of the abdomen; although at the end of spontaneous expirations during submersion the diaphragm is stretched almost as far as at full expiration, it is relaxed, whereas during a full expiration it contracts. The end-expiratory pressures across the rib cage, the diaphragm, and the abdominal wall are: -19, -14, and -13 cm H_2O during submersion, and -23.5, -11.5, and -12 during NPB. Notwithstanding the lack of the gravitational effect of the abdomen during submersion, the shape of the chest wall is almost the same as during negative-pressure breathing because of the low compliance of the rib cage. During submersion the airways resistance increases by 58% because of the lung volume decrease; during negative-pressure breathing it increases by 157%, the extra increase being due to the compression of the extrathoracic airways.
R 34

29,599
Cavagna, G.A. & Margaria, R. MECHANICS OF WALKING. J. appl. Physiol., Jan. 1966, 21(1), 271-278. (Istituto di Fisiologia Umana, University of Milan, Milan, Italy).

The vertical and frontal components of the push exerted by the foot on the ground, walking at different speeds (3-12 km/hr), have been measured by means of a sensitive platform: the work against gravity, W_v, and the work due to velocity changes in forward direction, W_f, have been calculated. The characteristic patterns of W_v and W_f as a function of speed have been analyzed. The external work per step, $W_{tot} = W_v + W_f$, must be sustained by muscular activity; both W_v and W_f alone, on the contrary, are not directly related with muscular activity, as the rigid skeletal structures make possible the transformation of kinetic energy into potential, and vice versa. 2 phases, in which the muscles perform external positive work, are evidenced in the step cycle; these are separated by 2 interposed phases in which negative work is performed.
R 6

29,600
Lambertsen, C.J. & Gelfand, R. BREATH-BY-BREATH MEASUREMENT OF RESPIRATORY FUNCTIONS: INSTRUMENTATION AND APPLICATIONS. J. appl. Physiol, Jan. 1966, 21(1), 282-290. (Pharmacology Labs., University of Pennsylvania, School of Medicine, Philadelphia, Penn.).

Study of dynamic as well as stable-state ventilatory responses to changes in respiratory stimuli are becoming increasingly important in attempts to explore the control of pulmonary ventilation. Instrumentation is described for accurate automatic measurement of breath-by-breath respiratory minute volume (V_E), respiratory frequency (f), and tidal volume (V_T). Use of the instrument in the study of pharmacological actions and in the investigation of physiological mechanisms is described. The action of a recycling, water-sealed, dual spirometer unit upon a potentiometer provides a voltage accurately proportional to tidal volume. An electromechanical divider unit simultaneously measures the period (P) of a respiration and computes respiratory minute volume and respiratory frequency on a breath-by-breath basis as the ratios $V_T/P = \dot{V}_E$ and $1/P = f$. Appropriate voltages are sampled and clamped at the end of each breath for recording. As described, tidal volumes in the range 0-4 liters and respiratory frequencies from 7-110 breaths/min can be measured with an accuracy of ±2% of full scale easily attainable. Also described is an electronic tidal volume accumulator which permits measurement of time-averaged values.
R 20

29,601
Kaufman, W.C. & Pittman, J.C., Jr. QUANTITATIVE RADIOMETRIC MEASUREMENT OF SKIN TEMPERATURE. J. appl. Physiol., Jan. 1966, 21(1), 302-304. (USAF Biomedical Lab., Wright-Patterson AFB, Ohio).

Although infrared thermograms have been employed for assessing skin temperatures for some time, precise quantitative measurements have been lacking. A simple radiometer has been constructed and a method devised by which the surface temperature of the forearm and hand can be precisely measured. The instrument has a precision of ±0.1 C. Measurements show the variation of the front surface of the forearm in neutral thermal conditions to be, at extremes, +1.7 C and −2.3 C from the mean. Temperature patterns vary to some degree when the hand is heated or cooled. The magnitude of the variations is essentially unchanged during heating but is approximately doubled during cooling.
R 7

29,602
Nagle, F.J., Naughton, J. & Balke, B. COMPARISONS OF DIRECT AND INDIRECT BLOOD PRESSURE WITH PRESSURE-FLOW DYNAMICS DURING EXERCISE. J. appl. Physiol., Jan. 1966, 21(1), 317-320. (Medicine & Physiology Depts., University of Oklahoma Medical Center, Norman, Okla.).

Two healthy men, 40 and 57 years of age, underwent right-sided cardiac catheterization and retrograde supra-aortic catheterization: a) to compare direct intra-aortic blood pressures with those recorded simultaneously by auscultation of the brachial artery; and b) to study the pattern of pressure and flow dynamics during work at moderate, strenuous, and maximal intensities. In most instances systolic pressures measured by auscultation were in close agreement with the directly recorded measurements. The indirectly measured diastolic pressures were consistently higher than the directly recorded values in one subject and they were consistently lower than the directly measured diastolic pressures for the other subject. Neither the muffling nor the cessation of sound could be closely identified with minimal intra-aortic pressures. Systolic and mean pressures, minute flow, stoke volume, and A-V oxygen difference increased with greater work intensities.
R 13

29,603
Falchuk, K.H., Lamb, T.W. & Tenney, S.M. VENTILATORY RESPONSE TO HYPOXIA AND CO_2 FOLLOWING CO_2 EXPOSURE AND $NaHCO_3$ INGESTION. J. appl. Physiol., March 1966, 21(2), 393-398. (Physiology Dept., Dartmouth Medical School, Hanover, N.H.).

The ventilatory responses to hypoxia and CO_2 were studied in 3 young adult males under normal conditions, following exposure to 5 or 6% CO_2 for 48 hr, and following the ingestion of 50 g $NaHCO_3$ per day for 3 days. With both respiratory acidosis and metabolic alkalosis, the Ss hypoventilated when breathing room air. In both conditions the CO_2 ventilatory response curves were displaced from the control position to higher P_{CO_2} values on the abscissa, and although the response to small increments of alveolar CO_2 tension was small compared to control, the maximum slopes, at high CO_2 tensions, were as great or greater than control. The hypoxic ventilatory response curve in the 2 test situations, if compared with control at equivalent $P_{A_{CO_2}}$, whowed a diminished response; but if the comparison was made with $P_{A_{CO_2}}$ held at the particular level selected when breathing room air in all cases, then there was no difference. If the interaction of hypoxic and CO_2 stimuli to ventilation was evaluated by comparing the maximal slopes of the CO_2 response curves, the interaction of hypoxia and CO_2 was absent following both CO_2 exposure and bicarbonate ingestion.
R 13

29,604
Lamb, T.W., Falchuk, K.H., Mithoefer, J.C. & Tenney, S.M. MECHANICAL AND CHEMICAL VENTILATORY STIMULUS INTERACTION AT LOW AND HIGH ALTITUDES. J. appl. Physiol., March 1966, 21(2), 399-403. (Physiology Dept., Dartmouth Medical School, Hanover, N.H.).

The interaction of mechanical and chemical ventilatory stimuli in supine unanesthetized human Ss was studied at sea level and at high altitude. When graded total-body vibratory stimuli were added to a pre-existing condition of normal alveolar gas tensions, hypoxia, or hypercapnia, a precise multiplicative, or proportional ventilatory response was seen. Conversely, graded increments of alveolar carbon dioxide tension produced by the addition of CO_2 to the inspired air resulted in steeper ventilatory response curves to CO_2 during constant vibration than during rest, and the slopes of these curves were also related in the same precise multiplicative manner. Although the ventilatory response to vibration alone remained almost unchanged after acclimatization at high altitude, the proportionate change in slope of ventilatory response to CO_2 caused by vibration at sea level did not persist. Under all conditions when mechanical stimuli were added to chemical stimuli, a proportionate control was demonstrated, but when CO_2 was added to mechanical stimuli the multiplicative relationship which had been demonstrated at sea level was no longer apparent at high altitude.
R 9

29,605
Lamb, T.W. & Tenney, S.M. NATURE OF VIBRATION HYPERVENTILATION. J. appl. Physiol., March 1966, 21(2), 404-410. (Physiology Dept., Dartmouth Medical School, Hanover, N.H.).

Total-body vibration in supine, unanesthetized humans was studied at different frequencies up to 6.6 cycles/sec. In roughly one-third of 24 Ss, ventilation increased more than did metabolism, resulting in a lowering of alveolar P_{CO_2}. The fall in $P_{A_{CO_2}}$ was highly reproducible, persistent, and quantitatively related to the intensity of the vibratory stimulus. No isolated anatomical site for reception of the stimulus to ventilation was found. The response seemed rather to depend on the whole experience of vibration. While it could not be inhibited by direct voluntary control, vibration-induced hyperventilation disappeared with light general anesthesia. Hyperventilation tended to occur only in those Ss who characteristically had low resting respiratory frequencies and a low ventilatory responsiveness to CO_2. Large individual differences in ventilatory response to CO_2 which were observed at rest were found to disappear during vibration. The ventilatory response to vibration had many of the characteristics of a classical Pavlovian conditional response.
R 18

29,606
Downes, J.J. & Lambertsen, C.J. DYNAMIC CHARACTERISTICS OF VENTILATORY DEPRESSION IN MAN ON ABRUPT ADMINSTRATION OF O_2. J. appl. Physiol., March 1966, 21(2), 447-453. (Pharmacology Lab., University of Pennsylvania School of Medicine, Philadelphia, Penn.).

The dynamic response characteristics of the oxygen sensitive peripheral chemoreflex component of the human respiratory control system were measured by determining the magnitude and time course of respiratory depression following the abrupt, sustained administration of oxygen at a fixed, elevated $P_{A_{CO_2}}$. In 6 Ss, inhalation of CO_2 in 16% O_2 resulted in an average control $\dot{V}_E$ of 22.6 liters/min at a $P_{A_{CO_2}}$ of 49 mm Hg and $P_{A_{O_2}}$ of 104 mm Hg. The $F_{I_{O_2}}$ was then abruptly changed from 0.16 to 0.94, while $P_{A_{CO_2}}$ was held constant by adjustment of $F_{I_{CO_2}}$. $\dot{V}_E$, V_T, f and $P_{A_{CO_2}}$ were determined on a breath-by-breath basis. A depression of $\dot{V}_E$ induced by oxygen became evident, on the average, 2.8 sec after the rise in $F_{I_{O_2}}$, and reached an average maximal depression of 12.3% below control $\dot{V}_E$ with an average time constant of 5.3 sec. At a higher constant $P_{A_{CO_2}}$ of 55 mm Hg an average depression of $\dot{V}_E$ to 13.2% below the control level occurred. Values for average delay time and time constant were similar to those observed at the lower P_{CO_2}. The data indicate the contribution and time course of the oxygen sensitive component of respiratory control in resting man.
R 32

29,607
Pelzer, Anne-Marie & Thomson, M.L. EFFECT OF AGE, SEX, STATURE, AND SMOKING HABITS ON HUMAN AIRWAY CONDUCTANCE. J. appl. Physiol., March 1966, 21(2), 469-476. (Occupational Health & Applied Physiology Dept., London School of Hygiene & Tropical Medicine, London, England).

Regressions for respiratory airflow conductance against age and height have been calculated from measurements made by body plethysmograph in 82 normal Ss aged 17-82 years. The specific conductance (conductance/lung volume) was independent of age, height, and sex and had a log-normal distribution. The distribution of conductance was also log-normal in both sexes. However, males with the lowest conductance deviated from this pattern, probably because they compensated by increasing their thoracic gas volume during the test. The airway conductance as measured by this technique was lower in old than in young smokers but rose significantly with age in male nonsmokers; as a result, the conductance of the group as a whole was maintained in the elderly. This unexpected stability of conductance throughout life may have been partly due to increasing inequality of time constants in the lung and partly to adaptive increase in thoracic-gas volume (TGV). The specific conductance (conductance /TGV) showed a barely significant rise in old nonsmokers and was maintained in the group as a whole. However the correction for TGV is incomplete because of a positive intercept on the conductance versus TGV graph. The forced expiratory volume and, to a lesser extent, the peak flow, fell with age.
R 20

29,608
Hyatt, R.E. & Flath, R.E. RELATIONSHIP OF AIR FLOW TO PRESSURE DURING MAXIMAL RESPIRATORY EFFORT IN MAN. J. appl. Physiol., March 1966, 21(2), 477-482. (Physiology Section, Mayo Clinic & Mayo Foundation, Rochester, Minn.).

The relationship between esophageal pressure and rate of change of lung volume during maximal effort was studied at various degrees of thoracic inflation in 4 normal Ss. An inverse relationship was obtained. Relating these findings to measurements of maximal respiratory flow of air indicates that, in a given subject, inspiratory flow at all volumes and expiratory flow at near-total lung capacity are potentially limited by the muscular apparatus. Maximal expiratory flow at lesser lung inflations is much less dependent on subject effort and is limited basically by the mechanical properties of the lung.
R 10

29,609
Bouhuys, A., Proctor, D.F. & Mead, J. KINETIC ASPECTS OF SINGING. J. appl. Physiol., March 1966, 21(2), 483-496. (Physiology Dept., Harvard School of Public Health, Boston, Mass.).

Volume events were analyzed during singing, together with esophageal and gastric pressures, in pressure-volume diagrams. During singing and talking up to 90% of the vital capacity may be used without conscious efforts to increase tidal volume. Subglottic pressure (Ps) was obtained by subtracting, from pleural pressure (Ppl), the static lung recoil pressure at the same lung volume. Ps increased with loudness when sustained tones were sung; airflow rate increased in two and decreased in one S. A steady Ps during sustained tones requires a continually and gradually changing effort, at first inspiratory and finally entirely expiratory. During singing of soft tones the diaphragm is often relaxed even though net inspiratory muscle effort is required. Apparently, the actions of the diaphragm and of other inspiratory muscles may become dissociated during singing in the upright posture: To maintain Ppl below relaxation values, even though the diaphragm is relaxed, inspiratory muscles other than the diaphragm increase rib-cage volume, the relaxed diaphragm ascends, the zero reference level for abdominal pressure descends, and the decreased Ppl is balanced by an increased hydraulic pull of the abdominal contents upon the diaphragm.
R 29

29,610
Jørgensen, M., Molbech, S. & Johansen, S.H. EFFECT OF DECAMETHONIUM ON HEAD LIFT, HAND GRIP, AND RESPIRATORY MUSCLE POWER IN MAN. J. appl. Physiol., March 1966, 21(2), 509-512. (Cardio-Respiratory Lab., Cophehagen County Hospital, Gentofte, Denmark).

In human volunteers the degree of muscular depression in respiratory function, expressed as maximal inspiratory and expiratory pressures and flows, was compared to strength in head lift and hand grip following partial neuromuscular blockade with decamethonium. In all experiments the respiratory functions were consistently much less affected than head lift and hand grip. Hand grip was more affected than head lift, in contradistinction to previous results with d-tubocurarine chloride. The results demonstrate that respiration is relatively well preserved when curarization is carried to the point at which the peripheral muscle strength required for head lift and hand grip is nearly abolished.
R 14

29,612
Cinkotai, F.F., Thomson, M.L. & Guyatt, A.R. EFFECT OF APPREHENSION ON PULMONARY DIFFUSING CAPACITY IN MAN. J. appl. Physiol., March 1966, 21(2), 534-538. (Occupational Health & Applied Physiology Dept., London School of Hygiene & Tropical Medicine, London, England).

The effect of apprehension on diffusing capacity ($D_{L_{CO}}$) of the lung for carbon monoxide was investigated in 10 students, 1 hr before and 1 hr after the announcement of their final B.Sc. (Honours) examination results. After hearing the results the $D_{L_{CO}}$ and systolic blood pressure fell significantly by 7.7% ($P < 0.001$) and 8.2% ($P < 0.001$), respectively. The diastolic blood pressure showed no significant change and the fall in heart rate was only significant after excluding one result. It is concluded that the students were apprehensive about their performance at the examination until they heard the results, and that this caused the relative increase in $D_{L_{CO}}$ and cardiovascular indices observed. It is likely that these effects were mediated through the release of adrenaline, and possibly noradrenaline, which has been shown to increase $D_{L_{CO}}$ when administered to man by infusion.
R 25

29,613
Cinkotai, F.F. & Thomson, M.L. DIURNAL VARIATION IN PULMONARY DIFFUSING CAPACITY FOR CARBON MONOXIDE. J. appl. Physiol., March 1966, 21(2), 539-542. (Occupational Health & Applied Physiology Dept., London School of Hygiene & Tropical Medicine, London, England).

The pulmonary diffusing capacity for carbon monoxide ($D_{L_{CO}}$), measured in 24 normal Ss at 2-hr intervals, fell progressively throughout the day at a rate of 1.2%/hr between 9:30 AM and 5:30 PM, and at 2.2%/hr between 5:30 and 9:30 PM. This fall was apparently not caused by initial apprehension, practice in the measurement technique or ambient change, nor was it associated with maintenance of the erect posture since a comparable fall (1.65%/hr) was shown between 10:00 AM and 4:00 PM by 5 Ss who lay in bed and were measured in the recumbent posture. The change in $D_{L_{CO}}$ appears to be a diurnal rhythm resembling that in hematocrit and urinary catecholamine excretion.
R 21

29,615
Chien, S., Usami, S., Simmons, R.L., McAllister, F.F., et al. BLOOD VOLUME AND AGE: REPEATED MEASUREMENTS ON NORMAL MEN AFTER 17 YEARS. J. appl. Physiol., March 1966, 21(2), 583-588. (Hemorheology Lab., Columbia College of Physicians & Surgeons, New York, N.Y.).

Plasma volume was determined with T-1824 in 41 male Ss (average age 41) and compared with the results obtained on the same Ss 16-17 years ago. In more than two-thirds of the Ss, plasma volumes measured 16-17 years apart agreed within 5% and the mean plasma volume of the group remained constant. Since the hematocrit and serum protein concentration also showed no significant changes, the calculated blood volume, cell volume, and total serum protein all remained essentially unchanged. Since there was a mean gain in weight of approximately 10%, the volume measurements expressed as milliliters per kilogram weight showed an average decrease by about 10%. Volume measurements expressed as milliliters per square meter surface area also decreased slightly. Volume measurements in milliliters per centimeter height remained essentially unchanged. It is suggested that height is a better parameter than weight or surface area for expressing volume measurements in normal Ss.
R 18

29,616
Dill, D.B., Hall, F.G., Hall, K.D., Dawson, C., et al. BLOOD, PLASMA, AND RED CELL VOLUMES: AGE, EXERCISE, AND ENVIRONMENT. J. appl. Physiol., March 1966, 21(2), 597-602. (Anatomy & Physiology Dept., Indiana University, Bloomington, Ind.).

Observations have been made on blood components of 7 men in the hot desert and on 2 of them at 3,800 m 1 week after leaving the desert. Similar observations made in the desert on Dill 32 years before are recorded. No notable change occurred in blood components at rest during the first days in the desert; even in a bout of exercise there generally were no changes. In 2 men who engaged in frequent strenuous exercise during a 5-week period there was a decline in total red cell volume and an increase in plasma volume with no change in blood volume. These 2 men, Phillips age 34 and Dill age 73, then made the transition to the Barcroft laboratory with a decrease in barometric pressure from 694 to 485 mm Hg and in maximum temperature from above 40 to about 15 C. Phillips showed an increase in hemoglobin concentration and a decrease in plasma volume. Dill had a decrease in hemoglobin concentration and an increase in plasma volume. In the light of this and other evidence it appears that the response of plasma volume in the first days at high altitude is to decline in youth and to increase in age. From age 41 to age 73, Dill's plasma volume has decreased about one-sixth and red cell volume about 6%.
R 23

29,617
Andrew, G.M., Guzman, Carole A. & Becklake, Margaret R. EFFECT OF ATHLETIC TRAINING ON EXERCISE CARDIAC OUTPUT. J. appl. Physiol., March 1966, 21(2), 603-608. (Cardiorespiratory Service, McGill University, Montreal, Quebec, Canada).

In 4 college athletes and 4 nonathletic freshmen measurements were made of ventilation, O_2 consumption, cardiac output, and heart rate at 3 submaximal levels of exercise before, and again after, a period of athletic training. In both groups there was a decrease in heart rate, cardiac output, and minute ventilation at any given work load. Oxygen consumption was unaffected and therefore the arterial-venous O_2 difference was increased. Before training, the athletes differed from the nonathletes in having a lower minute ventilation, a larger stroke volume at the two external work loads studied, and a slower heart rate at the higher load. These differences persisted after training, when it was found also that the athletes had lower values for cardiac output at equal exercise loads.
R 28

29,618
Klausen, K. CARDIAC OUTPUT IN MAN IN REST AND WORK DURING AND AFTER ACCLIMATIZATION TO 3,800 M. J. appl. Physiol., March 1966, 21(2), 609-616. (Anatomy & Physiology Dept., Indiana University, Bloomington, Ind.).

Cardiac output ($\dot{Q}$) during rest and work was determined by a CO_2 method at an altitude of 3,800 m. The change of $\dot{Q}$ was followed on 3 Ss during the first 8-12 days at altitude, and in rest and two work levels in 5 Ss after 3-4 weeks of acclimatization. $\dot{Q}$ was increased on the first day at 3,800 m to a maximum in 2 young Ss, and decreased the following days to values slightly lower than at sea level. In the old S no change of $\dot{Q}$ was found in rest while in work a slow increase was seen the first 3 days to a plateau, which was maintained until the last day at 3,800 m. After 3-4 weeks of acclimatization it was found that $\dot{Q}$ was slightly below its sea level values both in rest and at the two work levels. The change of $\dot{Q}$ is discussed in relation to changes in other circulatory functions and in blood characteristics.
R 30

29,619
Wurster, R.D., McCook, R.D. & Randall, W.C. CUTANEOUS VASCULAR AND SWEATING RESPONSES TO TYMPANIC AND SKIN TEMPERATURES. J. appl. Physiol., March 1966, 21(2), 617-622. (Physiology Dept., Loyola University, Chicago, Ill.).

Nude Ss were placed alternately in cool and warm climate chambers. Continuous measurements were made of cutaneous volume pulses in 5 areas, sweating in 8 areas, tympanic membrane temperature (T_{tm}) and oral temperature (T_o). A weighted mean skin temperature (T_{ms}) was electronically computed from temperature of 12 skin areas. T_{tm} and T_{ms} were independently varied to evaluate their relative importance in control of sudomotor and vasomotor responses. a) With T_{ms} constant at levels between 33-34 C, T_{tm} was raised as much as .3 C without appearance of sweating; b) With T_{tm} decreased, T_{ms} was raised with full sweat recruitment; c) With T_{ms} constant at 37 C and T_{tm} elevated above control levels, complete sweat recruitment and large volume pulse amplitudes were observed. Under these conditions, T_{ms} was rapidly lowered, resulting in inhibition, but not cessation, of sweating and some reduction in volume pulse amplitudes; d) With T_{tm} maintained above control levels, sweating was fully suppressed when T_{ms} rapidly fell. These results during nonsteady states indicate that neither T_{tm} nor T_{ms} may be considered solely responsible for onset or cessation of thermolytic processes. However, both have relevance to central nervous control of body temperature.
R 12

29,620
Geschickter, E.H., Andrews, Patricia A. & Bullard, R.W. NOCTURNAL BODY TEMPERATURE REGULATION IN MAN: A RATIONALE FOR SWEATING IN SLEEP. J. appl. Physiol., March 1966, 21(2), 623-630. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

Body temperature, rate of sweating (resistance hygrometry), and depth of sleep (EEG) were studied in 8 normal Ss (men and women) age 21-24 years; 14 nights of sleep were included in 40-hr observations at comfortable ambient temperatures. An increased foot skin temperature prior to falling asleep and an outbreak of sweating activity early in the sleeping period were consistently observed; 90% of the sweating during sleep occurred prior to reaching the diurnal low temperature. Individual variations in amount of sleep-sweating activity and duration of latency between onset of sleep and onset of sweating correlated with the rectal temperature (T_r) at the onset of sleep ($r = .93$ and $-.76$, respectively). Latency of sweating also correlated with body size as did the time lapsed between increasing foot skin temperature and the initiation of sleep ($r = -.80$ and $.90$, respectively). Reduction of T_r was associated with nocturnal sleep but not with afternoon naps though sleep-linked sweating occurred in both instances. The data are consistent with the concept that thermostatic set point lowering is relegated to the habitual sleeping hours. The diurnal low T_r is discussed as a regulated response that provides for respite from the metabolic wear entailed in higher daily temperatures.
R 16

29,621
Garden, J.W. PLASMA AND SWEAT HISTAMINE CONCENTRATIONS AFTER HEAT EXPOSURE AND PHYSICAL EXERCISE. J. appl. Physiol., March 1966, 21(2), 631-635. (USN Medical Field Research Lab., Camp Lejeune, N.C.).

Plasma and sweat histamine concentrations were determined in a group of healthy adult males before and after a period of daily walking on a motor-driven treadmill under hot environmental conditions. A comparison of the values before and after exercise during 10 days of repeated heat exposure was made. Plasma histamine concentrations were also determined on groups of comparable Ss before and after walking on the treadmill in a cool environment, exercises on the Universal Gym (a training device designed for muscular development), and a 600-yard run. Plasma histamine concentration was found to increase significantly during exercise in hot environmental conditions and the daily increase becomes significantly less after 10 days. No changes were noted in the total sweat histamine excretion during heat exposure or the plasma histamine concentrations under the other conditions of physical exercise studied. The significance of these findings to the role of histamine in cardiovascular regulation is discussed.
R 14

29,622
Strydom, N.B., Wyndham, C.H., Williams, C.G., Morrison, J.F., et al. ACCLIMATIZATION TO HUMID HEAT AND THE ROLE OF PHYSICAL CONDITIONING. J. appl. Physiol., March 1966, 21(2), 636-642. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

Five mine laborers with underground experience were acclimatized to work for 5 hr daily at a set rate under temperature conditions of 93 F WB and 97 F DB and wind velocity of 150 ft/min. Rectal temperatures and pulse rates decreased within the first 4-5 days, but sweat rates reached a maximum value only on the 10th day. As both the maximum work capacity and the oxygen intakes of the Ss during work changed during the acclimatization period, it was difficult to determine the relevant influences of physical training and acclimatization. 5 raw recruits were, therefore, first subjected to the same conditions of heat stress, thereafter trained under cool conditions to the task for 3 weeks, and again studied in the climatic room. Training resulted in only partial acclimatization and brought the raw recruits to the same state of tolerance as that of the experienced miners on their first exposure in the climatic room. It can be concluded that although training may improve performance under conditions of heat it certainly cannot replace acclimatization.
R 16

29,624
Garden, J.W., Wilson, I.D. & Rasch, P.J. ACCLIMATIZATION OF HEALTHY YOUNG ADULT MALES TO A HOT-WET ENVIRONMENT. J. appl. Physiol., March 1966, 21(2), 665-669. (USN Medical Field Research Lab., Camp Lejeune, N.C.).

Thirty-eight young adult males were exercised daily for 2 weeks during the winter and early spring months on a motor-driven treadmill at 3.5 mph located in a heat chamber maintained at 98 F dry bulb and 90 F wet bulb. 12 Ss walked for 50 min followed by 10 min rest in the heat; 13 Ss walked 50 min, rested 10 min, walked 30 more min, and rested a final 10 min; 13 Ss walked 50 min, rested 10 min, walked 50 more min, and rested a final 10 min. A modified Balke performance test was administered before heat exposure and at the end of each week. Physiological parameters including rectal temperatures, heart rates, sweat loss and sweat electrolytes were used as measures of acclimatization. It was found that the daily exposure to heat for 2 hr and 1 2/3 hr produced acclimatization. Daily exposure to heat for 1 hr resulted in significant alterations in sweat rate and sweat electrolytes but not in heart rate or body temperature. Several differences between physiologic adjustment to a hot-wet as contrasted with hot-dry climates were observed and are discussed.
R 9

29,625
Craig, F.N. & Cummings, E.G. DEHYDRATION AND MUSCULAR WORK. J. appl. Physiol., March 1966, 21(2), 670-674. (USA Chemical Research & Development Labs., Edgewood Arsenal, Md.).

Nine men walked to exhaustion at 3.5 mph on an inclined treadmill in a room at 46 C dry bulb and 23 C wet bulb, before and after 6 hr of sweating at rest. On days with and without restriction on water intake, respectively, the dehydration was 4.3 and 1.9% of the body weight; the walking time was reduced by 48 and 22%; and maximal oxygen intake was reduced by 27 and 10%. Subjective end points were validated by the attainment of nearly the same heart rates before and after dehydration. At comparable times in the walks there was no significant change in oxygen intake or respiratory exchange ratio associated with dehydration. Reduction in walking time was better correlated with increase in rectal temperature (0.84), decrease in fraction of carbon dioxide in expired air during work (0.82), and increase in heart rate in standing before work (0.82), than with dehydration (0.63). Impairment of performance was attributed to circulatory inadequacy elsewhere than in the working muscles.
R 13

29,626
Kilburn, Kaye H. MUSCULAR ORIGIN OF ELEVATED PLASMA POTASSIUM DURING EXERCISE. J. appl. Physiol., March 1966, 21(2), 675-678. (Medicine Dept., Duke University Medical Center, Durham, N.C.).

In healthy Ss plasma potassium (K) concentrations increased from resting levels of 3.8 mEq/liter to 5 mEq/liter during treadmill walking with average O_2 consumptions of 2 liters/min. Whole blood K levels increased similarly as arterial blood hydrogen (H) ion concentration increased 5.9 nmoles/liter and bicarbonate levels decreased 1.6 mEq/liter. Similar changes occurred in ambulatory patients walking to produce O_2 consumptions of 1,200 ml/min. Plasma draining from the exercising forearms of similar Ss contained 0.7 mEq/liter more K than did arterial plasma. Whole blood K concentration CO_2 tension, H ion and bicarbonate levels were elevated in such venous blood but arterial blood levels were unchanged. It is postulated that exercise produced acidosis in muscle cells, that some K was exchanged for H ions, and both were released from striated muscle. This is most consistent with the increased H ion concentration of arterial blood during moderate systemic exercise and in blood draining from the exercising forearm. However, in view of the small fraction of change in muscle K required to produce a large increase in extracellular K, other mechanisms may explain the liberation of K into venous blood during exercise.
R 15

29,627
Bryan, A.C., Milic-Emili, J. & Pengelly, D. EFFECT OF GRAVITY ON THE DISTRIBUTION OF PULMONARY VENTILATION. J. appl. Physiol., May 1966, 21(3), 778-784. (RCAF Institute of Aviation Medicine, Toronto, Ontario, Canada).

Regional variations in lung volume and in the distribution of ventilation have been measured with Xe^{133} during normal gravity and during increased positive ($+G_z$) acceleration on a human centrifuge. All Ss were studied at +1 G_z, 3 at +2 G_z, and one at +3 G_z. At +1 G_z the top of the lung was relatively more expanded than the bottom but the increment in volume (i.e. ventilation) is greater at the bottom than the top when inspiring above functional residual capacity. During increased acceleration these regional differences were magnified. In addition, the static pressure-volume curves were measured on each S using different balloon depths during normal and increased acceleration. The shape of the static pressure-volume curve did not change significantly during increased acceleration. The probable cause of the regional differences in volume and ventilation which have been demonstrated is a gradient of static transpulmonary pressure down the lung. This gradient appears to be related to the weight of the lung, since it has been shown to be proportional to the magnitude of the acceleration. Extrapolation of the data to the o G condition indicates that in weightlessness the regional lung volumes and ventilation distribution should be uniform.
R 18

29,628
Gilbert, R., Baule, G.H. & Auchincloss, J.H., Jr. THEORETICAL ASPECTS OF OXYGEN TRANSFER DURING EARLY EXERCISE. J. appl. Physiol., May 1966, 21(3), 803-809. (State University of New York Upstate Medical Center, Syracuse, N.Y.).

A mathematical model consisting of a series of differential equations was designed to study oxygen transfer at the alveolar-capillary membrane during the transition from rest to steady-state exercise. Both continuous, constant ventilation at a fixed lung volume and breath-to-breath analysis with a fixed frequency were studied. The resulting curve of the time course of oxygen transfer was compared to the curve of oxygen transfer at the mouth. The alterations in the curves produced by changes in cardiac output, tissue metabolism, blood volume, and alterations in the breathing pattern are presented and discussed. The calculation of oxygen transfer at the alveolar-capillary membrane was shown to be relatively independent of the breathing pattern.
R 19

29,629
Auchincloss, J.H., Jr., Gilbert, R. & Baule, G.H. EFFECT OF VENTILATION ON OXYGEN TRANSFER DURING EARLY EXERCISE. J. appl. Physiol., May 1966, 21(3), 810-818. (State University of New York Upstate Medical Center, Syracuse, N.Y.).

A mathematical computation and analytical circuit have been devised which permit the computation of oxygen transfer at the alveolar-capillary membrane ($\dot{V}_D$) on a breath-to-breath basis. Results with this circuit in 5 normal Ss gave 90% response times of .89-1.58 min when Ss began to walk at 2.7 km/hr on a 10% grade. These results were similar to measurements obtained with a similar circuit employing 4 different patterns of ventilatory increase with exercise. It is concluded that the way in which ventilation changes with exercise has little effect on $\dot{V}_D$. Another observation of the present study was the demonstration of configurations in the curve of $\dot{V}_D$ versus time which were distinctive to individual Ss and were to some extent also independent of the way in which ventilation changed in relation to the onset of exercise.
R 18

29,630
Damato, A.N., Galante, J.G. & Smith, W.M. HEMODYNAMIC RESPONSE TO TREADMILL EXERCISE IN NORMAL SUBJECTS. J. appl. Physiol., May 1966, 21(3), 959-966. (US Public Health Service Hospital, Cardiopulmonary Lab., Staten Island, N.Y.).

Cardiac output, stroke volume, heart rate, arteriovenous oxygen difference, and mean pulmonary artery pressure were determined in 24 normal male volunteer Ss using the direct Fick method. A change in body posture from supine rest to standing rest is accompanied by a fall in cardiac output and stroke volume and an increase in oxygen consumption, heart rate, and A-V oxygen difference. No change in mean pulmonary artery pressure occurred. With initiation of mild treadmill exercise, stroke volume increased to supine resting values or slightly higher. Increasing the workload to submaximal levels resulted in further smaller increases in stroke volume. However, heart rate now was predominant in increasing cardiac output. Mean pulmonary artery pressures during treadmill exercise exceeded normal supine and standing resting values.
R 12

29,631
Stolwijk, J.A.J. & Hardy, J.D. PARTITIONAL CALORIMETRIC STUDIES OF RESPONSES OF MAN TO THERMAL TRANSIENTS. J. appl. Physiol., May 1966, 21(3), 967-977. (John B. Pierce Foundation Laboratory, New Haven, Conn.).

Men dressed in shorts were exposed for 1 hr at 28 C, then quickly transferred to environments of 33, 38, 43, and 48 C for 2 hr, and finally transferred to 28 C for 1 hr. Continuous measurements were made of tympanic, rectal, and average skin temperatures, metabolic rate, and weight loss due to evaporation of sweat. Sweating responded to sudden changes in environmental temperature before appreciable changes occurred in either the tympanic or rectal temperatures. During the transient phases and steady states for environments of 33 and 38 C the evaporative heat loss correlated best with the skin temperature. Stimulation of internal receptors alone, as indicated by the tympanic temperature, cannot account for the evaporative heat loss changes observed in these experiments. The total evaporative heat loss in these experiments could be considered as roughly the summative actions of the thermal stimulation of the skin and internal receptors with a relative weighting of 1:4.
R 41

29,632
MacFarlane, W.V., Howard, Beth, Morrison, J.F. & Wyndham, C.H. CONTENT AND TURNOVER OF WATER IN BANTU MINERS ACCLIMATIZING TO HUMID HEAT. J. appl. Physiol., May 1966, 31(3), 978-984. (Australian National University, Canberra, Australia).

Water content and turnover were determined with tritiated water in 10 Bantu from Angola, acclimatizing during 1 week to work at 86 F and for the second week to 90 F wet-bulb temperature in a deep Rand mine. Water content averaged 77% of body weight initially. This fell while average weight increased during exposure to heat. There was no general increase in water turnover amongst these tropical Bantu during acclimatization. Water turnover ranged from 73 to 162 ml/kg per 24 hr during work in the heat with a high coefficient of variation in water turnover between Ss. The average volume of water used was 6.07 liters/24 hr in the first week, 6.78 liters/24 hr in the second week. Functional individuality of responses was apparent. Those Ss in whom body temperature was well controlled increased water turnover, while those with oral temperatures frequently above 101 F during work, decreased turnover by 11%. Urinary sodium concentration was reduced relative to potassium during the first 3 days of exposure to each temperature.
R 19

29,634
Bouhuys, A., Pool, J., Binkhorst, R.A. & Van Leeuwen, P. METABOLIC ACIDOSIS OF EXERCISE IN HEALTHY MALES. J. appl. Physiol., May 1966, 21(3), 1040-1046. (Clinical Physiology Lab., University Hospital, Leiden, The Netherlands).

Lactic acid (LA), pH, standard bicarbonate (SB), and base excess (BE) in arterialized capillary blood, respiratory quotient (R) and "excess CO_2" were measured in submaximal and maximal work tests. Comparison of indices of exercise acidosis showed: a) High values of R and of excess CO_2 were associated with high LA values, but the reverse was not always true; b) A lesser degree of metabolic acidosis after maximum work in older Ss appeared from the LA, pH, SB, BE, and excess CO_2 data, but not from the R values; c) A lesser degree of metabolic acidosis after a training period (4 Ss) was shown by LA, pH, SB, and BE but not by R and excess CO_2; d) Changes of SB in blood underestimate, while changes of BE in blood overestimate the amounts of acid added to blood during exercise. These discrepancies can be explained from the behavior of the buffer systems of blood and tissues; e) Direct determination of LA in blood remains the most accurate and reliable index of the development of a metabolic acidosis during exercise.
R 24

29,635
Young, D.R., Pelligra, R. & Adachi, R.R. SERUM GLUCOSE AND FREE FATTY ACIDS IN MAN DURING PROLONGED EXERCISE. J. appl. Physiol., May 1966, 21(3), 1047-1052. (Biotechnology Div., Ames Research Center, NASA, Moffett Field, Calif.).

Studies have been conducted to study postabsorptive energy metabolism under 2 levels of physical activity, resting or treadmill walking, for periods of up to 24 hr duration. During resting conditions, the serum glucose at first declined and then stabilized at a level of 73 mg/100 ml. The level of serum free fatty acids (FFA) reached a steady-state level of 1.1 meq/liter. Similar trends occurred during treadmill walking, but they differed in magnitude. During work, the level of serum glucose declined to 66 mg/100 ml and thereafter remained constant; Serum FFA reached a constant level of 2.4 meq/liter. The RQ (respiratory quotient), serum lactate, serum nonprotein nitrogen, and urinary nitrogen were similar during both test conditions. Under the conditions of the experiment a constant rate of influx and extraction of glucose as well as FFA from the blood was attained.
R 30

29,636
Richardson, Martha. PHYSIOLOGICAL RESPONSES AND ENERGY EXPENDITURES OF WOMEN USING STAIRS OF THREE DESIGNS. J. appl. Physiol., May 1966, 21(3), 1078-1082. (US Department of Agriculture, Clothing, & Housing Research Div., Washington, D.C.).

To determine the effect of differences in architectural designs for stairways on the energy expenditure, heart rate, and other cardiovascular responses of women when using stairs, 3 different combinations of riser heights and tread widths were tested by using an adjustable stairstep treadmill especially developed for this purpose. Energy expenditures of 8 women were significantly different for using stairs of 3 designs, with a mean cost of 7.8, 13.3, and 15.3 (mean, 12.1) for ascending; and 5.3, 7.4, and 8.4 (mean 7.1) cal/kg-m vertical distance for gentle, intermediate, and steep (27°, 38°, and 40°) slopes, respectively. Pulse rate and systolic blood pressure also varied significantly with stair design, with these responses ranking the designs in the same order as did energy expenditure.
R 19

29,637
Grimby, G., Nilsson, N.J. & Saltin, B. CARDIAC OUTPUT DURING SUBMAXIMAL AND MAXIMAL EXERCISE IN ACTIVE MIDDLE-AGED ATHLETES. J. appl. Physiol., July 1966, 21(4), 1150-1156. (Clinical Physiology Dept., University of Göteberg, Göteberg, Sweden.).

In well-trained middle-aged (45-55 yrs) athletes, oxygen uptake, cardiac output (dye-dilution technique), heart rate, and arterial blood pressure were determined at rest in the supine and sitting positions, and during submaximal and maximal exercise in the sitting position. The heart volume was measured at rest (prone). The maximal oxygen uptake was 3.56 liters/min and the maximal cardiac output 26.8 liters/min. The stroke volume was 19% lower at rest supine than during exercise and reached an average maximal value of 163 ml. The relation between maximal stroke volume and heart volume does not differ from what is found in young individuals. The arteriovenous oxygen difference was 45 ml/liter at rest supine, but increased only to 133 ml/liter during maximal exercise. The low arteriovenous oxygen difference seems to be the main limiting factor for the oxygen uptake and might be explained by the relatively low hemoglobin concentration combined with peripheral factors.
R 24

29,638
Dagenais, G.R., Oriol, A. & McGregor, M. HEMODYNAMIC EFFECTS OF CARBOHYDRATE AND PROTEIN MEALS IN MAN: REST AND EXERCISE. J. appl. Physiol., July 1966, 21(4), 1157-1162. (Joint Cardiorespiratory Service, McGill University, Montreal, Quebec, Canada).

Changes in cardiac output ($\dot{Q}$), heart rate (HR), blood pressure (Pb), and oxygen consumption ($\dot{V}o_2$) were observed for 4.5 hr following carbohydrate or protein-rich meals. Observations were made at rest and during light exercise (300 kg-m/min). In 8 control Ss who fasted for the same length of time there was no change in Pb or HR but there were small increments in $\dot{Q}$ and $\dot{V}o_2$ both at rest and exercise during the last 1.5 hr of study. 8 Ss consumed a protein-rich meal. At rest there were increment of $\dot{Q}$ (+2.44 liters/min, 46%), systolic Pb (+10 mm Hg, 9%), and $\dot{V}o_2$ (+79 ml/min, 31%). These changes were significantly greater than those of the fasting Ss at equivalent times and were maximal from 180 to 270 min. During exercise each parameter was increased by approximately the same quantity. 8 Ss consumed a carbohydrate-rich meal. At rest there were increments of $\dot{Q}$ (+1.66 liters/min, 34%), systolic Pb (+10 mm Hg, 9%) and $\dot{V}o_2$ (+63 ml/min, 22%), but maximal values were reached earlier, (within the first 1.5 hr). These changes were again significantly greater than those observed in the fasting Ss. The increments which followed carbohydrate ingestion were of comparable magnitude and timing during exercise.
R 28

29,639
Dill, D.B., Myhre, L.G., Phillips, E.E., Jr. & Brown, D.K. WORK CAPACITY IN ACUTE EXPOSURES TO ALTITUDE. J. appl. Physiol., July 1966, 21(4), 1168-1176. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

4 men ranging in age from 19 to 74 were subjects in 3 Balke tests on the von Döbeln ergometer at each of 4 pressures, 740, 535, 485, and 455 mm Hg, the last 3 pressures being in the altitude chamber without prior acclimatization. The effects of training on altitude performance were balanced out and, at the same time, training effects were assessed. Observations made included work capacity, $\dot{V}_E$ max, $\dot{V}o_2$ max, R, the time course of heart rate, blood pressure, and $\dot{V}_E$; in recovery, heart rate and blood pressure were observed for 5 min. Blood was obtained for lactate in the 6th min of recovery. Taking $\dot{V}o_2$ max at 740 as 100 the relative values were 90 at 535, 86 at 485, and 81 at 455. $\dot{V}_E$ max was independent of altitude as was maximum blood pressure. Maximum heart rate was slightly but significantly less at 455 than at 740. Lactate was not significantly less at 455 than at 740. It appears that in the first stage of acclimatization in chronic exposures to altitude, performance is inferior to that in acute exposures.
R 16

29,640
Klausen, K., Robinson, S., Michahel, E.D. & Myhre, L.G. EFFECT OF HIGH ALTITUDE ON MAXIMAL WORKING CAPACITY. J. appl. Physiol., July 1966, 21(4), 1191-1194. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

Maximal work capacity was measured on 5 Ss before, during and after a 5-week sojourn at an altitude of 3,800 m. A modification of the Balke test was used having the Ss riding a bicycle ergometer to complete exhaustion. On the 1st day at high altitude it was found that maximal values of O_2 uptake, ventilation (STPD), heart rate, and respiratory exchange ratio, obtained during the last minute of work, were lower than at sea level. During the following 5 weeks at 3,800 m a further decrease of the maximal heart rate was seen and increases in the average maximal values of ventilation at STPD (14%), O_2 consumption (4%), blood lactate (12%), and work capacity on the ergometer (7%) were observed. Maximal values of O_2 uptake, ventilation, blood lactate, and work capacity were significantly higher upon return to sea level than in the control experiments before ascending to 3,800 m. This increase in maximal work performance is explained as the combined result of the stay at high altitude and the increased physical activity during the stay at high altitude.
R 17

29,641
Cain, S.M. & Dunn, J.E., II. LOW DOSES OF ACETAZOLAMIDE TO AID ACCOMMODATION OF MEN TO ALTITUDE. J. appl. Physiol., July 1966, 21(4), 1195-1200. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Five men were decompressed to a pressure altitude of 4,270 m after pretreatment with 750 mg of acetazolamide and, in a separate run, a placebo in a "double-blind" study. They remained there about 6 hr and sets of measurements, beginning 1 and 3 hr after ascent, were made to compare with a ground-level control. Similarly, 6 men were decompressed to 4,880 m where only one set of measurements was made beginning 1 hr after ascent. In a third series, 3 men stayed at 4,270 m for 5 days. In the short-term experiments, standard bicarbonate, pH, and alveolar Pco_2 were significantly lowered by pretreatment with acetazolamide. Insignificant increases were noted in alveolar Po_2 and ventilation. In the 5-day experiments similar results were found on the first day at altitude, but on the second and third days highly significant increases in ventilation and alveolar Po_2 were measured when Ss had been pretreated with acetazolamide. On the fourth and fifth days at altitude, all differences between placebo- and acetazolamide-treated Ss had disappeared. Correction of respiratory alkalosis did appear to increase ventilation and alveolar Po_2 but the full effect was not seen until the second day at altitude.
R 12

29,642
Sibbons, J.L.H. ASSESSMENT OF THERMAL STRESS FROM ENERGY BALANCE CONSIDERATIONS. J. appl. Physiol., July 1966, 21(4), 1207-1217. (Geography Dept., Sheffield University, Sheffield, England).

The problem of evaluating the thermal stress to which the human body is exposed has been examined theoretically using the energy balance approach. In the steady state a solution is obtained for the nude body in terms of a special variable, the equivalent operative temperature related to wall and air temperatures and to the moisture content of the air. This solution is extended under certain restricting conditions to a clothed surface. The total stress is shown to consist of the sum of environmental and metabolic terms. Although the solution obtained is compatible, in the zone of evaporative regulation, with different combinations of skin temperature and humidity, an explicit mean solution for conditions at the skin is obtainable by introducing a formulation given by Hatch. This method leads to the recognition of 4 distinct steady-state regimes designated as the operative, free evaporation, restricted evaporation, and wet skin regimes in order of increasing severity of heat. Under conditions where equilibrium cannot be permanently maintained the thermal stress is expressible in terms of a standard cooling power related to the rate of heat debt or accumulation of the body.
R 66

29,643
McElhaney, J.H. DYNAMIC RESPONSE OF BONE AND MUSCLE TISSUE. J. appl. Physiol., July 1966, 21(4), 1231-1236. (Biomechanics Lab., West Virginia University, Morgantown, W.Va.).

That material properties depend on the rate of loading has long been known. The purpose of this experiment was to study the mechanical response of bone and muscle tissue to impacts of varying velocity. An air gun-type testing machine was developed, capable of performing constant velocity compression tests with strain rates up to 4,000/sec. Adjustable stops are provided that allow predetermined strains to be applied to miniature specimens. High-frequency response instrumentation utilizing a piezoelectric load cell and a capacitance displacement transducer was used. Load and displacement histories of various materials including bone, muscle tissue, aluminum, and nylon were measured over a wide range of strain rates. Results are presented in the form of stress-strain diagrams at selected strain rates. A critical velocity was noted for bone in the neighborhood corresponding to a strain rate of 1/sec. A stress, strain, strain-rate surface representation of the data is suggested and similarities between the dynamic response of bone, nylon, and aluminum noted. The variation of the ultimate strength of bone with strain rate was found to be satisfactorily represented by an exponential.
R 21

29,644
Myhre, L.G. & Kessler, W.V. BODY DENSITY AND POTASSIUM 40 MEASUREMENTS OF BODY COMPOSITION AS RELATED TO AGE. J. appl. Physiol., July 1966, 21(4), 1251-1255. (Anatomy & Physiology Dept., Indiana University, Bloomington, Ind. & Bionucleonics Dept., Purdue University, Lafayette, Ind.).

The body fat content of 100 males ranging in age from 15 to 87 years was estimated from body density and potassium 40 methods. Body density was determined by underwater weighing and measurement of residual volume; potassium 40 activity was measured by a whole-body 4-pi liquid scintillation counter. Results obtained by the 2 methods agreed well, the correlation being 0.87. The potassium 40 method, however, gave values that were higher than the corresponding values obtained from body density in 82 of the cases. The mean differences between the estimates of body fat obtained from the 2 methods were highly significant. These differences were greater in the older subjects; the relation of age to the magnitude of these differences was statistically significant. It is suggested that this discrepancy depends on an increase with aging in the ratio of proteins low in potassium, as in connective tissue, to proteins high in potassium, as in muscle. Such replacement would lead to an underestimate of lean body mass by the scintillation counting procedure but would not affect the estimate obtained by densitometry.
R 25

29,645
Cerretelli, P., Sikand, R. & Farhi, L.E. READJUSTMENTS IN CARDIAC OUTPUT AND GAS EXCHANGE DURING ONSET OF EXERCISE AND RECOVERY. J. appl. Physiol., July 1966, 21(4), 1345-1350. (Physiology Dept., New York State University, Buffalo, N.Y.).

Muscular exercise is characterized by an increase in O_2 uptake and CO_2 output, and by increases in ventilation and cardiac output. This study was conducted in order to determine the rate at which these 4 functions readjust during onset of exercise and recovery and how the arterial and venous blood gases are affected. The Ss exercised on a treadmill and the various variables were measured at frequent intervals, the cardiac output being determined by a modification of Kim's technique. When expressed in relation to the over-all steady-state change, the rate of change of the 4 functions considered ($\dot{V}co_2$, $\dot{V}o_2$, $\dot{V}_E$, and $\dot{Q}$) was found to be independent of the work load. Changes in $\dot{V}o_2$ are more rapid than changes in $\dot{V}co_2$. The changes in $\dot{V}_E$ are rapid at first, exceeding the rate of change in gas exchange, and later parallel the changes in $\dot{V}co_2$. Similarly, $\dot{Q}$ exhibits a rapid initial change which decreases later. Since the initial phase is more rapid than the metabolic changes, the readjustment in cardiac output at the onset of exercise must be under neurogenic influence.
R 15

29,646
Kasch, F.W., Phillips, W.H., Ross, W.D., Carter, J.E.L., et al. A COMPARISON OF MAXIMAL OXYGEN UPTAKE BY TREADMILL AND STEP-TEST PROCEDURES. J. appl. Physiol., July 1966, 21(4), 1387-1388. (Physical Education Research Lab., San Diego State College, San Diego, Calif.).

Estimations of maximal oxygen uptake by a treadmill and step-test procedure were obtained on 12 subjects within a 7-day period. Expressed in milliliters per minute per kilogram STPD, treadmill values ranged from 40.2 to 54.1, with a mean of 48.3 and a standard deviation of 4.5. The step-test values ranged from 37.2 to 56.0, with a mean of 48.0 and a standard deviation of 5.1 ml/min per kg STPD. The coefficient of correlation between treadmill and step-test scores was +.95. From this and a negligible difference of means of 0.24 ml/min per kg the results of the 2 procedures were practically identical. Test-retest by 5 subjects using the step-test procedure showed a mean difference favoring the second test of 1.5, with a greatest difference of 1.6 ml/min per kg. Because of its apparent reliability, economy, safety, and versatility in accommodating a wide age range of normal and impaired subjects, the step-test procedure is preferred.
R 6

29,647
Milhorn, H.T., Jr. & Scheel, K.W. AN ANALOG COMPUTER PROGRAM AND ASSOCIATED CIRCUITRY FOR VENTILATORY CALCULATIONS. J. appl. Physiol., July 1966, 21(4), 1389-1392. (Biomedical Engineering Section, University of Mississippi Medical Center, Jackson, Miss.).

An analog computer program and the associated circuitry necessary for the breath-by-breath calculation of: a) respiratory airflow rate; b) tidal volume; c) respiratory period; d) minute ventilation; and e) alveolar ventilation is presented. The airflow rate is picked up from a transducer and used to perform the desired calculations. It is also used to trigger the integrators in the computer circuit to zero at the beginning of each expiration, thus initiating a new set of calculations for the next breath.
R 3

29,648
Murray, R.H., Bowers, J.A. & Goltra, E.R. COMPARISON OF FOOTBOARD AND SADDLE SUPPORTS FOR ORTHOSTATIC TESTS ON A TILT TABLE. J. appl. Physiol., July 1966, 21(4), 1409-1411. (Indiana University Cardiopulmonary Lab., Wright-Patterson AFB, Ohio).

Using a standardized protocol controlling environmental, subject, and observer variables, 20 healthy young men were tilted head up to 60° for 20 min on 2 occasions to compare the responses using a footboard and a saddle as support devices for the body. By comparing symptoms and changes in heart rate, systolic, diastolic, mean, and pulse pressures, there was no significant difference between the responses to tilting using these devices. Under the conditions of this study, these 2 methods can be considered identical tests of cardiovascular response to orthostasis.
R 10

29,649
Atkins, A.R. & Nünlist, A. A PRECISION CONSTANT WORK-RATE ERGOMETER. J. appl. Physiol., July 1966, 21(4), 1427-1430. (Transvaal & Orange Free State Chamber of Mines Research Organisation, Johannesburg, South Africa).

A description is given of a new type of bicycle ergometer designed specifically for accurate measurement of low work rates. A specially designed pedal wheel with 1 spoke to which strain gauges are attached for measuring the input torque ensures that chain and bearing losses are allowed for. An automatically controlled electromagnetic brake ensures that a constant work rate is maintained over a very wide range of speeds.
R 2

29,650
Singh, M. & Karpovich, P.V. ISOTONIC AND ISOMETRIC FORCES OF FOREARM FLEXORS AND EXTENSORS. J. appl. Physiol., July 1966, 21(4), 1435-1437. (Physiological Research Lab., Springfield College, Springfield, Mass.).

A special electrically operated dynamometer was designed for continuously measuring and recording the maximum effective concentric, eccentric, and isometric forces of forearm flexors and extensors, along with the degrees of the elbow angle. The data thus obtained were used to study the interrelationship between all of these forces. The eccentric forces of flexors and extensors were 32.65% and 14.22% greater than the concentric forces, respectively. The isometric force of flexors was 41.64% greater than the isometric force of extensors. The eccentric force of extensors was significantly lower than the isometric and concentric force at the elbow angle of 140°. Equations for each force curve were developed.
R 5

29,651
Holmgren, A. & Åstrand, P-O. D_L AND THE DIMENSIONS AND FUNCTIONAL CAPACITIES OF THE O_2 TRANSPORT SYSTEM IN HUMANS. J. appl. Physiol., Sept. 1966, 21(5), 1463-1470. (Clinical Physiological Lab., Kungliga Gymnastiska Centralinstitutet, Stockholm, Sweden).

Pulmonary diffusing capacity was measured during exercise, with steady-state technique in 10 healthy young men and women and related to a number of measures of body sizes, static dimensions, and functional capacities of the lungs and of the cardiovascular system. The static dimensions of the lungs were determined as total lung capacity and its subdivisions. The functional capacity of the lungs was measured as the maximal voluntary ventilation and ventilation during determination of maximal oxygen uptake. The static dimensions of the cardiovascular system were determined by the total hemoglobin, blood volume, stroke volume of the heart, and hemoglobin concentration. The functional capacity of the cardiovascular system was measured as the maximal cardiac output and maximal heart rate. D_{LCO} was significantly correlated to all these variables. The highest correlation coefficient was to total hemoglobin. Elimination of the influence of hemoglobin concentration eliminated the difference between sexes. The results demonstrate that a high diffusing capacity is accompanied by a high aerobic capacity, large lungs with a large ventilatory capacity, and a large cardiovascular system with a large maximal cardiac output.
R 16

29,652
Caldwell, P.R.B., Lee, W.L., Jr., Schildkraut, H.S. & Archibald, E.R. CHANGES IN LUNG VOLUME, DIFFUSING CAPACITY, AND BLOOD GASES IN MEN BREATHING OXYGEN. J. appl. Physiol., Sept. 1966, 21(5), 1477-1483. (USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Four volunteers were placed in a controlled environmental chamber and breathed 98% oxygen at 760 mm Hg pressure for 30, 48, 60, and 74 hr, respectively. There was a fall in vital capacity which was rapidly progressive after 60 hr of exposure and three subjects exposed longer than 30 hr had drops in pulmonary diffusing capacity. The alveolar-arterial oxygen difference ranged from 59-to 121 mm Hg with an average of 89 mm Hg. Chest X-rays revealed no abnormal shadows in the lung fields and physical examination showed no apparent abnormalities. Interpreted in the light of observations in animals exposed to the same conditions, these changes are explained on the basis of alveolar edema formation and an alteration in the air-blood barrier. A fifth volunteer who breathed air in the same chamber for 6 days showed no changes in lung volumes, diffusing capacity, or blood gases.
R 24

29,656
Craig, A.B., Jr. & Dvorak, Maria. THERMAL REGULATION DURING WATER IMMERSION. J. appl. Physiol., Sept. 1966, 21(5), 1577-1585. (Physiology Dept., University of Rochester School of Medicine & Dentistry, Rochester, N.Y.).

Ten Ss were studied during head-out immersion in 9 different water temperatures ranging from 24 C to 37 C. The period of immersion at each temperature was 1 hr, during which time various body temperatures, pulse rate, blood pressure, and $\dot{V}o_2$ (oxygen consumption at the tissue level, liters/min) were observed. In water temperatures less than 35.6 C there was a reduction in central body temperature despite the fact that vasomotor controls of heat loss were evident. Increased heat production was noted if the water temperature was 30 C or less. Water temperatures of 36 C or more imposed a heat stress on the S causing an increase in the pulse rate and pulse pressure. It is suggested that there is a very narrow range of water temperature (35.0-35.5 C) which can be considered as "neutral."
R 20

29,657
Wyndham, C.H., Strydom, N.B., Morrison, J.F., Bredell, G.A.G., et al. A TEST OF THE EFFECTIVENESS OF ACCLIMATIZATION PROCEDURES IN THE GOLD MINING INDUSTRY. J. appl. Physiol., Sept. 1966, 21(5), 1586-1588. (Human Sciences Lab. & Physical Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

A standard heat stress test has been used to compare the effectiveness of acclimatization procedures. The test comprises a 4-hr exposure at 90 F (with the air almost saturated with water vapor) at an air velocity of 80 ft/min. During this period the men work at an oxygen consumption of 1 liter/min (5 cal/min). A statistical technique, based upon the standard deviations of rectal temperatures, heart rates, and sweat rates, is presented for judging whether the results from the men under test are significantly different from either highly acclimatized or unacclimatized groups of men. The test has been applied in an assessment of the standards of acclimatization achieved in a number of centers where laborers are acclimatized for service in the gold mining industry, and the results indicate its effectiveness for this purpose.
R 6

29,658
Stenberg, J., Ekblom, B. & Messin, R. HEMODYNAMIC RESPONSE TO WORK AT SIMULATED ALTITUDE 4,000 m. J. appl. Physiol., Sept. 1966, 21(5), 1589-1594. (Physiology Dept., Kungliga Gymnastiska Centralinstitutet, Stockholm, Sweden).

Oxygen uptake, pulmonary ventilation, cardiac output (dye-dilution technique), blood pressure (intra-arterial), oxygen content of arterial blood, and blood lactic acid concentration were determined in 6 men, 19-36 years of age, during submaximal and maximal work on a bicycle ergometer at sea level and after 10-60 min exposure to P_B 462 mm Hg in an altitude chamber (simulated altitude 4,000 m, 13,115 ft). With the arterial oxygen saturation reduced from 96 to 70% maximal oxygen uptake was reduced to 72% of that at sea level, i.e., 3.46 and 2.50 liters/min, respectively. Maximal values for pulmonary ventilation were 118 and 124 liters/min, cardiac output 23.2 and 23.7 liters/min, heart rate 184 and 186 beats/min, stroke volume 126 and 127 ml, $(A-V)O_2$ diff 108 and 146 ml at simulated altitude and at sea level, respectively. Integrated mean arterial blood pressure was lower during work in hypoxia. At submaximal work the heart rate, cardiac output, and pulmonary ventilation were significantly elevated during hypoxia. Moderate acute hypoxia does not seem to interfere with cardiac performance or the tissues' capacity to extract oxygen from the blood during exercise.
R 20

29,660
Kamon, E. ELECTROMYOGRAPHY OF STATIC AND DYNAMIC POSTURES OF THE BODY SUPPORTED ON THE ARMS. J. appl. Physiol., Sept. 1966, 21(5), 1611-1618. (Ergonomics & Cybernetics Dept., College of Technology, Loughborough, England).

Surface electrodes were used to record electrical activity of muscles of 3 gymnasts during an exercise sequence on a pommeled horse. The body was supported on the arms in a static position followed by a sideways swing. The muscles studied were: trapezius, serratus anterior, latissimus dorsi, teres major, infraspinatus, pectoralis major, deltoideus, biceps brachii, triceps brachii, flexor carpi radialis, extensor carpi radialis brevis, rectus abdominis, obliquus externus abdominis, and erector spinae. The rhythmical interplay of the right and left group muscles and the marked sudden bursts of activity of specific duration and sequence indicated the co-ordination and skill required to accomplish the movements. The electromyogram was reproducible in each individual and between subjects. The change in the intensity of electrical activity enabled comparison of muscle action to maintain static positions, to activate movements, and to control accelerated swings. The most active muscles were the anterior deltoid and the depressors, i.e., triceps brachii, pectoralis major, latissimus dorsi, and trapezius. The muscle activity for trunk movement over the fixed arms is discussed in relation to traditional anatomical terminology.
R 9

29,661
Margaria, R., Aghemo, P. & Rovelli, E. MEASUREMENT OF MUSCULAR POWER (ANAEROBIC) IN MAN. J. appl. Physiol., Sept. 1966, 21(5), 1662-1664. (Istituto di Fisiologia Umana, University of Milano, Milano, Italy).

A test for the maximum anaerobic power, or the maximal work performance, in a short burst of maximal activity in man has been devised. It consists of measuring with an electronic clock the vertical component of the maximum speed with the subject running up an ordinary staircase. Mechanical energy is given in kg-m/kg sec and it amounts to 1.6 for young fit subjects of 20-30 years of age; it decreases with age to about 0.8 at 70 years. The efficiency of this exercise is about 0.25 and therefore the energy requirement amounts to about 50 kcal/kg hr. The test does not require a particular skill either from the operator or from the subject, the time required is very short, the only apparatus needed is a watch sensitive to 0.01 sec, and the data obtained are very reproducible.
R 3

29,663
Custance, A.C. A SELF-BALANCING SCALE FOR WEIGHING HUMAN SUBJECTS. J. appl. Physiol., Sept. 1966, 21(5), 1675-1676. (Defence Chemical, Biological & Radiation Labs., Ottawa, Ontario, Canada).

A method for the elimination of judgment in determining human weight losses is described. A mercury switch, mounted on the scale beam, is used to adjust the content of a counterweight in the form of a water reservoir through a solenoid valve. The difference in volume of water in the before and after exercise situations is a measure of the subject's water loss.

29,664
Murray, R.H. CARDIOPULMONARY EFFECTS OF BRIEF, INTENSE THERMAL EXPOSURES. J. appl. Physiol., Nov. 1966, 21(6), 1717-1724. (Indiana University Cardiopulmonary Lab., Wright-Patterson, AFB, Ohio).

To evaluate the cardiovascular and respiratory effects of brief, intense heat stress, 6 clothed human Ss were exposed to 2 20-min thermal pulses (reaching 150 and 205 C) with indwelling arterial and venous catheters and an expired-air collection system; wall temperatures rose 28 C/min. The 205 C exposures approached tolerance limits; average skin temperatures reached 42.5 C, rectal temperatures rose 0.5 C, sweat rate exceeded 1 liter/hr, and weakness and presyncopal symptoms were common. Heart rate and cardiac output rose to peak levels quickly, followed by progressive increases in systolic blood pressure, systolic ejection rate, and central venous pressure values, as circulation time, diastolic blood pressure, and systemic vascular resistance fell gradually. Estimated plasma volume fell approximately 8%. Respiratory rate remained unchanged, while tidal volume rose along with arterial oxygen content and pH as carbon dioxide content fell; oxygen consumption rose slightly. 2 Ss bled into subcutaneous tissues at catheterization sites 4-6 hr after the exposures.
R 71

29,665
Hood, W.B., Jr., Murray, R.H., Urschel, C.W., Bowers, J.A., et al. CARDIOPULMONARY EFFECTS OF WHOLE-BODY VIBRATION IN MAN. J. appl. Physiol., Nov. 1966, 21(6), 1725-1731. (USAF Environmental Stress Branch, Wright-Patterson AFB, Ohio).

Supine whole-body x-axis sinusoidal vibration in 4 human volunteers was found to produce increases in mean arterial blood pressure, heart rate, cardiac output, oxygen consumption, and minute volume of ventilation. These physiologic effects were more marked at 1.2 g peak acceleration than at 0.6 g and at 8 and 10 cycles/sec than at frequencies to either side of this range. The changes observed were shown to be similar to those produced either by passive movement of the relaxed extremities or by mild muscular exertion. It is postulated that whole-body vibration elicits these changes by reflex stimulation of muscular contraction, and that such a mechanism may play a role in producing the physiologic effects of active muscular exercise.
R 31

29,666
Consolazio, C.F., Nelson, R.A., Matoush, L.O. & Hansen, J.E. ENERGY METABOLISM AT HIGH ALTITUDE (3,475 m). J. appl. Physiol., Nov. 1966, 21(6), 1732-1740. (USA Fitzsimons General Hospital, Medical Research & Nutrition Lab., Denver, Colo.).

Maximal work capacity ($\dot{V}o_2$) on the bicycle ergometer was decreased in 3 groups of men, one group acclimated to sea level, and 2 groups acclimated to 1,610 m. At 3,475 m, maximal $\dot{V}o_2$ (oxygen consumption at the tissue level, liters/min) in milliliters per kilogram body weight per minute was reduced by 17% for the sea level group, and by 10% for the group from 1,610 m. Although there was a difference of approximately 7% in $\dot{V}o_2$ between sea level and 1,610 m, there was no measurable beneficial effects of acclimatization at 1,610 m in improving maximal work at 3,475 m. Maximal work capacity and maximal $\dot{V}o_2$ did not improve over a 20-day period at altitude. $\dot{V}_E$ (ventilation, liters/min STPD and BTPS) STPD (standard temperature and pressure, dry) was decreased, and $\dot{V}_E$ BTPS (body temperature and pressure, saturated) increased on arrival at altitude with a gradual increase in both during prolonged exposure. Pulse rates at rest, and moderate exercise, were consistently high at high altitudes, whereas the maximal pulse rates gradually declined. Oxygen consumption at the basal, sitting rest, and moderate exercise states was not markedly changed by altitude. The physiological cause for the cessation of maximal work at altitude remains obscure. Under the conditions of this study: a) the 1,610-m elevation did not seem to be beneficial in improving the maximal work at 3,475 m; b) a 20-day acclimatization period at 3,475 m did not result in a superior submaximal or maximal work performance on return to sea level; and c) individuals can adequately perform submaximal work even after the initial high-altitude exposure.
R 19

29,667
Surks, M.I., Chinn, K.S.K. & Matoush, L.O. ALTERATIONS IN BODY COMPOSITION IN MAN AFTER ACUTE EXPOSURE TO HIGH ALTITUDE. J. appl. Physiol., Nov. 1966, 21(6), 1741-1746. (USA Fitzsimons General Hospital, Medical Research & Nutrition Lab., Denver, Colo.).

Body composition was measured in 5 young males, residents of Denver, Colorado (5,280 ft altitude) before, during, and after 8 days on the summit of Pikes Peak, Colorado (14,100 ft altitude). Body weight progressively decreased during the altitude period resulting primarily from a decrease in body fat as estimated by measurements of body density, creatinine excretion, and total body potassium (K) from K^{40} counting). No changes were observed in total body water (W), lean body mass, protoplasmic mass (M_3), and bone mineral, all of which were derived from the same measurements. Although M_3 was unchanged, calculations based on creatinine excretion and K showed an increase in nonmuscle protein at the expense of muscle protein. Attempts to measure W directly, employing deuterium oxide dilution, were unsuccessful possibly due to uneven distribution of this isotope in the body water compartments at high altitude. A highly significant decrease ($P < 0.001$) in plasma volume after 4 and 8 days at altitude provided direct evidence for altered water distribution in this environment.
R 16

29,668
Ramaswamy, S.S., Dua, G.L., Raizada, V.K. & Dimri, G.P., et al. EFFECT OF LOOSENESS OF SNOW ON ENERGY EXPENDITURE IN MARCHING ON SNOW-COVERED GROUND. J. appl. Physiol., Nov. 1966, 21 (6), 1747-1749. (Defence Research Laboratory, Landour, India).

The caloric requirements of walking on loose deep snow were determined in 12 young soldiers at an altitude of 2,270 m in North India. Oxygen requirements increased linearly with the depth of the snow until the imprints of the feet reached a depth of 37 cm. The oxygen requirements (in liters) for a 60-kg man covering the distance of 1 km was found to be expressed by the equation: $Y = 9.0 + 1.27 \times X^{1.038}$, where X stands for the depth (in cm) of the foot impression. When the latter exceeded 37 cm, the oxygen requirements seemed to rise asymptotically in spite of the fact that the walking speed was slowed up by the increasing depth of snow. This was explained as a consequence of the enormous increase in the swinging movements of the body. The respiratory stress during walking on loose snow was comparable to that experienced when running on snow-free ground at 8 km/hr or marching with a 70-lb. load at 6 km/hr.
R 2

29,669
Grimby, G., Nilsson, N.J. & Sanne, H. REPEATED SERIAL DETERMINATION OF CARDIAC OUTPUT DURING 30 MIN EXERCISE. J. appl. Physiol., Nov. 1966, 21(6), 1750-1756. (Clinical Physiology Dept., University of Göteborg, Göteborg, Sweden).

Cardiac output was determined with the dye-dilution technique at rest supine, sitting, and during 30 min exercise at 600 or 900 kpm/min on a bicycle ergometer. Cardiac output and stroke volume were lower at rest in the sitting than in the supine position and increased considerably during the first 2 min of exercise. Cardiac output continued to increase during the first 7 min and was then fairly stable at both work loads, with a mean variation coefficient of 6.2%. The stroke volume fell slightly after 7 min of work. Bandaging the legs increased the stroke volume at rest and during exercise in the sitting position. The effect of previous exercise was analyzed at 2 work tests 2 hr apart. The heart rate was significantly higher at rest and during exercise at the second examination but the cardiac output did not change significantly.
R 26

29,670
Saltin, B. & Hermansen, L. ESOPHAGEAL, RECTAL, AND MUSCLE TEMPERATURE DURING EXERCISE. J. appl. Physiol., Nov. 1966, 21(6), 1757-1762. (Physiology Dept., Kungliga Gymnastika Centralinstitutet, Stockholm, Sweden).

Esophageal, rectal, and muscle temperatures were measured during submaximal work of 1 hr duration in 5 males and 2 females with large differences in maximal oxygen uptake. Average oxygen uptake on the 3 submaximal work loads were 1.07, 2.09, and 2.98 liters/min, corresponding to 26, 51, and 69% of the maximal oxygen uptake. The esophageal temperature was at the 3 work loads 37.29 $\pm$ 0.08, 38.01 $\pm$ 0.04, and 38.49 $\pm$ 0.10 C, respectively. The rectal and the quadriceps temperatures were at the end of each work period in average 0.14 C and 0.70 C, respectively, higher than the corresponding esophageal temperatures. The core temperature, and probably also the temperature in the working muscle, was found to be set according to the relative work load of the individual and not to the absolute work load performed. Skin and esophageal temperatures and sweating rates were recorded in 2 Ss exercising on a 52% work load, respectively, in the same environment. The weighted mean skin temperature and the esophageal temperature were identical in the 2 Ss during work. The sweating rate was related to the external work load performed.
R 16

29,671
Adrian, Marlene J., Singh, M. & Karpovich, P.V. ENERGY COST OF LEG KICK, ARM STROKE, AND WHOLE CRAWL STROKE. J. appl. Physiol., Nov. 1966, 21(6), 1763-1766. (Physiological Research Lab., Springfield College, Springfield, Mass.).

The net energy costs of the leg kick, arm stroke, and whole stroke of the crawl were determined and formulas for the calculation of oxygen requirement derived. Results showed that for a given speed the energy cost of the leg kick was 2 to 4 times greater than that of the arm stroke and whole stroke. The energy cost of the arm stroke was less than that of the whole stroke up to a velocity of 3.35 ft/sec. The formulas for oxygen consumed per minute derived from tests on the best swimmer are: O_2 for the legs = $1.32\ V^{2.05}$; O_2 for the arms = $V^{3.95}/20.42$; and O_2 for the whole stroke = $V^{2.70}/4.38$ (V = velocity, ft/sec). The energy cost given here pertains to actual swimming and not to conventional swimming, which consists not only of swimming but of a dive and push-offs which inflate the so-called average velocity. The efficiency of the leg kick ranged from .05-1.23%, whereas the arm stroke ranged from .56-6.92%. The efficiency of the whole stroke was slightly higher than that reported in other studies and ranged from 1.71-3.99%. Results obtained substantiate opinions of swimming coaches that in long-distance crawl swimming the leg action should be reduced to a minimum.
R 12

29,672
Gisolfi, C., Robinson, S. & Turrell, E.S. EFFECTS OF AEROBIC WORK PERFORMED DURING RECOVERY FROM EXHAUSTING WORK. J. appl. Physiol., Nov. 1966, 21(6), 1767-1772. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

The oxygen debt and the rate of lactate removal were determined in 4 physically fit men during recovery following exhausting runs on the treadmill. In one type of experiment the Ss rested throughout recovery, while in another they performed aerobic work for 35 or 50 min immediately following the exhausting run and then rested. The results include a reduction of 1-2 liters in the oxygen debt and a substantial increase in the rate of lactate removal when aerobic work was performed during recovery following exhausting work as compared with values observed when the Ss rested during recovery. It is also significant that, following payment of the alactacid oxygen debt, the rate of removal of the respiratory oxygen debt per gram of lactate removed was different at different stages of recovery. The data suggest that a greater fraction of the lactate may have been utilized as fuel during the exercising recovery so that the proportion of lactate resynthesized to glycogen would be reduced and this would presumably reduce the oxygen debt.
R 16

29,673
Rowell, L.B., Kraning, K.K., II, Evans, T.O., Kennedy, J.W., et al. SPLANCHNIC REMOVAL OF LACTATE AND PYRUVATE DURING PROLONGED EXERCISE IN MAN. J. appl. Physiol., Nov. 1966, 21(6), 1773-1783. (Cardiology Div., University of Washington School of Medicine, Seattle, Wash.).

To determine the time course of hepatic-splanchnic lactate and pyruvate uptake during exercise, estimated hepatic blood flow (EHBF) was determined in 6 normal men by constant infusion of indocyanine green during prolonged (60-70 min) treadmill exercise requiring 48-70% of maximum $\dot{V}o_2$ (oxygen consumption at the tissue level, liters/min). Arterial and hepatic venous lactate and pyruvate concentrations peaked by the 10th min of exercise and decreased thereafter ($t\ 1/2$ = 22-33 min). EHBF was reduced 50-70%; nevertheless, splanchnic $\dot{V}o_2$ increased with time while splanchnic lactate uptake averaged 0.77 $\pm$ 2.5% of estimated total body lactate per minute, or 46% of the lactate removed in 60 min. Splanchnic CO_2 production could account for oxidation of only a small fraction of lactate removed by this region, making gluconeogenesis a likely major pathway. Arterial lactate/pyruvate ratios and "excess" lactate (Huckabee) decreased with time while hepatic venous values increased. During milder exercise one man showed proportionally smaller splanchnic lactate removal rate. We conclude that the lactate-oxygen debt relationship during exercise is time dependent while oxygen debt is not.
R 46

29,674
Hardy, J.D. & Stolwijk, J.A.J. PARTITIONAL CALORIMETRIC STUDIES OF MAN DURING EXPOSURES TO THERMAL TRANSIENTS. J. appl. Physiol., Nov. 1966, 21(6), 1799-1806. (John B. Pierce Foundation Lab. & Physiology Dept., Yale University School of Medicine, New Haven, Conn.).

Three young men dressed in shorts were exposed for 1 hr at a neutral temperature of 28 C, then quickly transferred for a 2 hr exposure at 22 or at 18 C, followed by another hour at 28 C. Similar transfers were made between 18 and 22 C, and 43 C. The effect of a 4-hr exposure at 18 and at 13 C was also studied. Tympanic membrane temperature, rectal and average skin temperature, metabolic rate, and evaporative heat loss were measured. Heat balances were made for each 5-min period by partitional calorimetry. During exposures to air temperatures 43 C (sweat freely evaporated) the total increase in body heat content was limited to less than 30 kcal/m^2. In the cold (13-18 C) net heat loss continued at the rate of 20-40 kcal/m^2 per hr even at the end of a 2-hr exposure when the body heat content had already decreased by 100 kcal/m^2. Shivering was not observed at 18 C after 2 hr. Sweating occurred if the average skin temperature was above 33.5 C and the tympanic membrane temperature was above 36.6 C at the same time. Evaporative heat loss during the thermal transients and the steady state could be accounted for by the product, $[70\ (T_{skin} - 33.5)\ X\ (T_{ear} - 36.6)]$ kcal/m^2 per hr if both terms are positive.
R 10

29,675
Dempsey, J.A., Reddan, W., Rankin, J. & Balke, B. ALVEOLAR-ARTERIAL GAS EXCHANGE DURING MUSCULAR WORK IN OBESITY. J. appl. Physiol., Nov. 1966, 21(6), 1807-1814. (Pulmonary Function Lab., University Hospitals, University of Wisconsin, Madison, Wisc.).

Various aspects of alveolar-arterial gas exchange in 13 obese (110-190 kg, 31-50% body fat) and 13 normal, healthy, sedentary young adults were compared at rest, at moderate and severe levels of steady-state work at similar metabolic rates, and at "maximum" work intensities. The majority of obese Ss were capable of meeting the rising requirement for CO_2 elimination during moderate, severe, and all-out work. In only 1 of 13 cases was the work of breathing elevated--or sensitivity to respiratory stimuli reduced--to such an extent that pulmonary ventilation was depressed and hypercapnia resulted. Alveolar-to-arterial O_2 transport was limited in varying degrees, and measured values of steady-state $D_{L_{CO}}$ were consistently reduced in the majority of obese Ss during moderate and severe levels of work. It was proposed that the basic disorder in O_2 and CO exchange in obesity was one of nonuniform ventilation distribution with reduction in the effective alveolar-capillary interface.
R 45

29,676
Dempsey, J.A., Reddan, W., Balke, B. & Rankin, J. WORK CAPACITY DETERMINANTS AND PHYSIOLOGIC COST OF WEIGHT-SUPPORTED WORK IN OBESITY. J. appl. Physiol., Nov. 1966, 21(6), 1815-1820. (Pulmonary Function Lab., University Hospitals, University of Wisconsin, Madison, Wisc.).

Selected cardiopulmonary responses of 14 obese and 14 normal, healthy, sedentary males were compared with specific reference to: a) the "physiological cost" of performing identical intensities of external work on the bicycle ergometer; and b) the capacity of the oxygen transport systems during "maximal" work. The obese S's energy expenditure per unit of work load on the bicycle ergometer was markedly increased. The greater "relative intensity" of moderate work in the obese was reflected in a higher level of anaerobic work, elevated blood pressure, heart rate, and pulmonary ventilation, and an exaggerated alveolar-arterial Po_2 difference. The maximum quantity of oxidative energy available for muscular work was severely reduced in obesity. Excessive fatness contributed to this decrement in work capacity directly, through its presence as an inert, noncontributory load, and indirectly, through its apparent interference with over-all maximum circulatroy-respiratory function. Interference with alveolar-arterial exchange of O_2 or CO_2 during moderate and severe work was not of sufficient magnitude to warrant the implication of ineffective pulmonary function as a major limitation to maximum oxygen transport in the majority of obese Ss.
R 25

29,677
Lord, G.P., Bond, G.F. & Schaffer, K.E. BREATHING UNDER HIGH AMBIENT PRESSURE. J. appl. Physiol., Nov. 1966, 21(6), 1833-1838. (USN Medical Research Lab., Groton, Conn.).

The acute effect of high ambient pressure on expiratory airflow was studied in healthy adult males in the ambient pressure range from 1.0 to 7.0 atmospheres absolute pressure (Ata) using a hyperbaric chamber. Changes in flow were assessed with the maximum expiratory flow-volume curve. The decrease in flow was compared to that occurring in dense high molecular weight gas mixtures. In addition, expiratory gas flow was studied in 3 men during 12 days at 7.0 Ata in 90% helium. The findings demonstrate that::a) high ambient pressure and high molecular weight gas of equal density produce similar changes in expiratory flow; b) in the pressure range from 1.0 to 4.0 Ata in air the greatest decrease in maximum expiratory flow occurs at high lung volumes, while from 4.0 to 7.0 Ata the greatest flow change occurs at low lung volumes; c) the long-term changes in expiratory flow in high-pressure helium can be explained by the change in physical properties of the breathing mixture; and 4) there are no clinically apparent untoward effects from prolonged high-pressure helium breathing.
R 21

29,678
Longobardo, G.S., Cherniack, N.S. & Fishman, A.P. CHEYNE-STOKES BREATHING PRODUCED BY A MODEL OF THE HUMAN RESPIRATORY SYSTEM. J. appl. Physiol., Nov. 1966, 21(6), 1839-1846. (Cardiorespiratory Lab., Presbyterian Hospital, New York, N.Y.).

The present report describes a mathematical model of the human respiratory system in which Cheyne-Stokes breathing can be elicited under circumstances comparable to those in which it occurs spontaneously. This is based on experimental data obtained by others on human Ss. In the accompanying paper, the validity of the model is tested on experimental Cheyne-Stokes breathing produced in dogs in this laboratory.
R 21

29,679
Rautaharju, P.M., Wolf, H., Pilronen, P., Äikäs, E., et al. THERMAL STRESS AND THE ELECTROCARDIOGRAM: A TECHNICAL STUDY. J. appl. Physiol., Nov. 1966, 21(6), 1875-1879. (Biophysics Lab., Dalhousie University, Halifax, Nova Scotia, Canada).

The electrocardiographic response to thermal stress was studied in 8 adult men whose average esophageal temperature rose to 38.3 C during exposure. Average transient computing (ATC) techniques were used for noise reduction. A technique was developed for longitudinal monitoring and display of computed data in a condensed form whereby the beat-to-beat variations of the monitored variable as well as a weighted average of its past values are recorded on a single channel of a direct-writing paper recorder. Exposure to ambient heat produced a decrease in magnitude of the horizontal plane ventricular gradient and large but inconsistent shifts in its spatial orientation. QRS area vectors were unchanged and no significant effects were noted in the fine structure of the QRS. The R-R intervals shortened by a factor of 1.7 during the heat stress and the variability of the R-R intervals reduced by a factor of 4-4; these changes far surpass those expected from temperature coefficient effects alone, and potential mechanisms involved are discussed.
R 19

29,680
Burns, D.C. & Golinick, P.D. AN INEXPENSIVE FLOATING-MESH ELECTRODE FOR EKG RECORDING DURING EXERCISE. J. appl. Physiol., Nov. 1966, 21(6), 1889-1891. (Research Lab., Washington State University, Pullman, Wash.).

An electrode suitable for recording an interpretable electrocardiogram from a man performing heavy exercise is described. The electrode is inexpensive, easily constructed, and its mechanical and electrical characteristics permit EKG recording without filtering or signal modification. Electrode data are given and sample tracings presented.
R 8

29,681
McCrady, J.D., Hinds, M.H., Geddes, L.A. & Vallbona, C. CORRELATED INPUT-OUTPUT STIMULATOR FOR EXPERIMENTAL PHYSIOLOGY. J. appl. Physiol., Nov. 1966, 21(6), p1897. (Physiology Dept., College of Veterinary Medicine, Texas A & M University, College Station, Tex.).

The brief note describes a method for coupling the strength of stimulus with the depth of respiration which was developed out of work by the authors in which variations in duration, frequency, and strength of conventional electrical stimuli did not produce the change in heart rate normally associated with respiration. (HEIAS)
R 4

29,683
Bergman, N.A. MEASUREMENT OF RESPIRATORY RESISTANCE IN ANESTHETIZED SUBJECTS. J. appl. Physiol., Nov. 1966, 21(6), 1913-1917. (Anesthesiology Div., University of Utah College of Medicine, Salt Lake City, Utah).

Theoretical calculations predict that volume of gas in the thorax should vary exponentially with time during a passive exhalation. It should, therefore, be possible to calculate respiratory resistance without measuring gas flow rates by determination of the time constant of a passive exhalation. In the present study the essentially exponential character of passive exhalations in anesthetized, paralyzed patients was experimentally verified. Mean respiratory resistance, calculated from simultaneous measurement of transthoracic pressure and gas flow in 12 anesthetized Ss was 5.8 cm H_2O/liter per sec at a flow of 0.5 liter/sec. In the same Ss, respiratory resistance calculated using total compliance and time constant of exhalation was 5.5 cm H_2O/liter per sec. Calculation or respiratory resistance in anesthetized, paralyzed, or otherwise apneic Ss using total compliance and time constant of exhalation is a valid, simple, and objective method which eliminates necessity for measuring gas flow rates. Magnitude of resistance in anesthetized Ss in the present study is in close agreement with that reported by several other investigators in conscious Ss.
R 10

29,684
Taub, H.A. DIAL-READING PERFORMANCE AS A FUNCTION OF FREQUENCY OF VIBRATION AND HEAD RESTRAINT SYSTEM. FINAL REPORT. Contract AF 33(657) 11729, Proj. 7231, Task 723101, AMRL TR 66 57, CAL Rep. WH 1838 E 2, April 1966, 21pp. USAF Aerospace Medical Research Labs., Wright Patterson AFB, Ohio. (Avionics Dept., Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

Dial-reading performance under vibration was investigated at 6, 11, and 15 cps, + 1 G_x (acceleration vector of gravity) $\pm$1. 1 g_x (vibration) with 3 X-axis head restraint configurations (a rigid restraint system, a piston-spring damper system and a spring (only) isolator system) and 2 Z-axis head restraint configurations (head locked in Z-axis and head allowed to move freely in the Z-axis). 10 Ss were tested. The results indicated that less decrements in performance occurred at 6 cps than at 11 and 15 cps. Further, the use of the X-axis piston-spring damper isolation system resulted in significantly less errors as compared to the X-axis rigid restraint system. At 15 cps, where all 3 X-axis head configurations could be compared, there was no difference in performance with the piston-spring and spring (only) systems, while both resulted in less errors than the rigid system. Finally, the Z-axis restraint system has an effect upon performance only at 15 cps. The data suggested that allowing the head to move freely in the Z-axis at 15 cps resulted in less errors than when the head was locked in the Z-axis.
R 16

29,685
Seeman, J.S., Smith, F.H. & Mueller, D.D. A TECHNIQUE TO INVESTIGATE SPACE MAINTENANCE TASKS. Contract NASA PR T 18811 G, Proj. 7184, Task 718405, AMRL TR 66 32, April 1966, 11pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (George C. Marshall Space Flight Center, NASA, Huntsville, Ala.).

A series of preliminary studies was performed to determine if a high-fidelity ground-based simulation of zero gravity is necessary to obtain valid information about zero-G maintenance performance. Removal and replacement of a prestart solenoid valve on a rocket engine was selected as the basic maintenance task to be studied. The time scores for laboratory performance of the task were compared with scores obtained from Ss operating on the task during periods of transient weightlessness in a KC-135 aircraft. Modified hand tools, a tool box, and a worker tethering system were developed for use in the experiment. Major conclusions were that the factor contributing most to performance decrement in space maintenance was performance was less than the effect of suit pressure level, and, in this instance, it would not have been necessary to introduce zero-G conditions to conduct a meaningful study of space maintenance performance.
R 1

29,686
Kent, P.R. & Weissman, S. VISUAL RESOLUTION UNDERWATER. BuMed. Proj. MF022.03.03 9010.09, Rep. 476, May 1966, 7pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn.

Visual resolution in air and underwater were compared using Landolt Ring targets and a self-luminous, water- and pressure-proof target mount. SCUBA diving masks were worn during the tests, both in water and in air. Comparisons were also made while viewing above and below surface targets through a periscope from a surface position. In both instances, visual resolution in clear water was better than in air at the same actual target distance, when apparent luminances were equated for the 2 conditions. In most cases, the improvement while wearing the SCUBA mask fell below predictions based on the magnification of the target image underwater. The reasons for this were ascribed to fogging of the mask underwater, and the lack of sufficiently small targets for some observers. The difference in resolution between air and underwater viewing through the periscope was nearer to that predicted by theoretical computations.
R 3

29,687
Jerger, J. (Ed.). MODERN DEVELOPMENTS IN AUDIOLOGY. 1963, 446pp. Academic Press, New York, N.Y. (Houston Speech & Hearing Center, Houston, Tex.).

The goal of this book is to present a broad coverage of the more significant research events of the past 10 years in the area of audiology. Topics covered in the various chapters are: measurement of hearing by bone conduction; automatic audiometry; functional hearing loss; measurement of hearing in children; electrophysiologic audiometry; middle-ear reflexes in man; auditory fatigue and masking; auditory adaptation; central hearing processes; theory of signal detectability.
R many

29,688
Naylor, T.H., Balintfy, J.L., Burdick, D.S. & Chu, K. COMPUTER SIMULATION TECHNIQUES. 1966, 352pp. John Wiley & Sons, Inc., New York, N.Y. (Duke University, Durham, N.C.).

The purpose of this book is to provide a detailed treatment of the methods and procedures involved in planning and designing computer simulation experiments as well as the theory on which these methods are based. Chapter 1 defines concepts, Chapter 2 outlines a 9-step procedure for planning experiments. The next 7 chapters elaborate on these steps. Techniques for generating random numbers, generation of stochastic variates, computer models, simulation languages, and the problems in verification and experimental design are among the topics considered.
R many

29,689
Bilodeau, E.A. (Ed.). ACQUISITION OF SKILL. 1966, 539pp. Academic Press, New York, N.Y. (Psychology Dept., Tulane University, New Orleans, La.).

This book contains the papers presented at a conference held in 1965. The book begins with a history of research on the acquisition of skill, both motor and verbal. The second chapter is on selective learning, and motor involvement is deliberately held to a minimum. The next chapter covers the topic of individual differences. A succession of chapters follows in which the motor literature, and some verbal, is covered, but in which the authors make more of a point of speaking to the issues of learning (e.g. attention, facilitation and interference, feedback, and retention). Chapters 8 & 9 are more frankly motor, dealing with tracking and moving, respectively. The last chapter serves as a critical review of the whole book.
R many

29,690
Burian, H.M. & Jacobson, J.H. (Eds.). CLINICAL ELECTRORETINOGRAPHY. Proceedings of the Third International Symposium, Illinois, October 1964. 1966, 376pp. Symposium Publications Div., Pergamon Press, New York, N.Y. (University of Iowa College of Medicine, Iowa City, Iowa & Cornell University Medical College, Ithaca, N.Y.).

This volume includes a series of papers on various aspects of electroretinography: equipment, measurement techniques, and analyses of ERG responses to various stimuli. Retinal mechanisms and the clinical significance of various ERG abnormalities are topics covered in some of the papers. The relation between ERGs and occipital responses is another matter considered in this book.
R many

29,691
Joint Clothing Council, Ltd. WOMEN'S MEASUREMENTS AND SIZES. 1957, 134pp. Her Majesty's Stationery Office, London, England.

This book presents the results of a survey of body measurements carried out in England in 1951 during which about 5,000 women between the ages of 18 and 70 were measured. The object of the study was to assist clothing manufacturers on sizing but the detailed analyses add to the existing literature on anthropometry. The measuring technique is described and average measurements for women of different ages is given, with an account of the relationship between the various measures. The values for each body type are set out in a series of size charts for women of varying height, hip, and bust measurements.

29,692
Suedfeld, P. INFORMATION PROCESSING: THE EFFECTS OF DIFFERENTIAL PATTERN COMPLEXITY AND INPUT RATE. Psychon. Sci., Oct. 1966, 6(6), 249-250. (Rutgers-The State University, New Brunswick, N.J.).

Pattern complexity was shown to interact with input rate in affecting information processing. Under high rate, Ss did better on simple than on complex problems; under moderate rate, the reverse was true. High-rate Ss also recalled fewer clues, and used a smaller proportion of the clues they did recall.
R 5

29,693
Koplin, J.H. & Davis, J. GRAMMATICAL TRANSFORMATIONS AND RECOGNITION MEMORY OF SENTENCES. Psychon. Sci., Oct. 1966, 6(6), 257-258. (Vanderbilt University, Nashville, Tenn.).

A recognition memory task was adapted for the measurement of rated similarity among members of a syntactically related sentence family. A prism model of these relationships was partially supported. An additional factor (paraphrasing) was shown to contribute to significant similarity ratings. 2 advantages of the recognition memory technique are: a) the active role played by Ss in rating each sentence on a confidence scale; and b) aural presentation.
R 3

29,694
Johnston, W.A. SELF-EVALUATION IN A SIMULATED TEAM. Psychon. Sci., Oct. 1966, 6(6), 261-262. (Ohio State University, Columbus, Ohio).

S received feedback purported to represent his individual or team tracking performance relative to average ability. The "average ability" criterion was made lenient, moderate, or stringent. After the session, S estimated his individual ability. Under individual instructions, S's estimate agreed with his feedback. Under team instructions, S accepted credit for good scores (lenient criterion) but blamed his "partner" for poor scores (stringent criterion).
R 5

29,695
Joslyn, W.D. & Banta, T.J. MODIFYING SPEED OF GROUP DECISION MAKING WITHOUT AWARENESS OF GROUP MEMBERS. Psychon. Sci., Oct. 1966, 6(6), 297-298. (University of Wisconsin, Madison, Wisc. & University of Cincinnati, Cincinnati, Ohio).

Contingent reinforcement successfully modified speed of decision making by 2-person groups. Depending on the reinforcement contingency, groups either increased or decreased decision time relative to control groups given non-contingent reinforcement on matching schedules. As far as could be determined from post-experimental questionnaires and interviews, none of the Ss had insight into the reinforcement contingency. The results suggest that the basic operant conditioning paradigm may be applicable to the modification of interdependent behavior patterns in free-responding groups even though the members of the group are unaware that they are adjusting their interaction patterns to fit the external situation.
R 6

29,696
Levonian, E. ATTENTION AND CONSOLIDATION AS FACTORS IN RETENTION. Psychon. Sci., Oct. 1966, 6(6), 275-276. (University of California, Los Angeles, Calif.).

The skin resistances of Ss (61 high school students) were recorded during a 10-min. instructional film, and Ss were tested for retention of information immediately after (short-term) and 1 wk. after (long-term) the film. Resistance decrements which preceded information presentation (pre-decrements) led to short-term and long-term retention, whereas post-decrements led to reminiscence. These results were interpreted in terms of attention and consolidation.
R 8

29,697
Madsen, M.C. & Drucker, J.M. IMMEDIATE MEMORY BY MISSING SCAN AND MODIFIED DIGIT SPAN. Psychon. Sci., Oct. 1966, 6(6), 283-284. (University of California, Los Angeles, Calif.).

The experiment was designed to determine whether the superiority of missing scan over modified digit span retention is due to either storage or retrieval processes. Ss tried to recall either all numbers or a missing number from finite sets with retrieval method instructions given either before or after stimulus presentation. Results indicate that the relative superiority of missing scan retention is diminished when Ss are instructed after stimulus presentation. Superior retention estimates by the missing scan method were attributed largely to different storage processes under the 2 conditions.
R 3

29,698
Laughery, K.R. & Pinkus, A.L. SHORT-TERM MEMORY: EFFECTS OF ACOUSTIC SIMILARITY, PRESENTATION RATE AND PRESENTATION MODE. Psychon. Sci., Oct. 1966, 6(6), 285-286. (New York State University, Buffalo, N.Y.).

The effects of 4 variables on short-term memory were studied: Presentation Rate (20, 60, or 180 items/min.), Presentation Mode (visual or auditory), Acoustic Similarity (High, BCDEGPTVZ or Low, HJLOQRWXY), and Length of Sequence (6 or 8 items). Performance varied inversely with the Length of Sequence and Acoustic Similarity and directly with Presentation Rate. A significant Presentation Rate by Presentation Mode interaction was explained on the basis of less available time for rehearsal at the fast presentation rate due to the time required for the implicit translation from visual input to the storage of auditory cues.
R 10

29,699
Fox, W.L. & Rogers, C.A., Jr. FORGETTING OF A SIMPLE MOTOR TASK. Psychon. Sci., Oct. 1966, 6(6), 301-302. (University of Arizona, Phoenix, Ariz.).

Severe motor-skills forgetting was shown in a simple printing task. Decrements were attributed in large part to retroactive interference produced via a training procedure previously proposed. Interpretation was in terms of conflicting sets. Inadequacies of traditional indices of motor forgetting were emphasized.
R 7

29,700
Corman, C.D., Bostic, W.D. & Wickens, D.D. THE EFFECT OF THE POSITION OF STIMULUS CUEING ON SHORT-TERM MEMORY. Psychon. Sci., Oct. 1966, 6(6), 305-306. (Ohio State University, Columbus, Ohio).

Ss were presented with 2 potential items on each of a series of short-term memory (STM) trials. On some trials, Ss knew which item was to be recalled before item presentation; on other trials, they did not. Although the procedure precluded rehearsal, prior knowledge of which item was to be recalled facilitated that recall. Ss' reports indicated this knowledge was utilized through the association of the to-be-remembered item with an "encoder."
R 2

29,701
Webb, W.B., Agnew, H.W., Jr. & Sternthal, H. SLEEP DURING THE EARLY MORNING. Psychon. Sci., Oct. 1966, 6(6), 277-278. (University of Florida, Gainsville, Fla.).

The intrasleep EEG characteristics of Ss who returned to sleep in the early morning more closely resemble the sleep characteristics which occur late in a full nights sleep rather than the sleep which occurs at the onset of nocturnal sleep. It would appear that sleep does not simply "recycle" with sleep onset.
R 6

29,702
Grier, J.B. AUDITORY REACTION TIME AS A FUNCTION OF STIMULUS INTENSITY AND RISE TIME. Psychon. Sci., Oct. 1966, 6(6), 307-308. (Northern Illinois University, De Kalb, Ill.).

Six levels of stimulus intensity were combined factorially with 6 different rise times in an auditory reaction time experiment using a 1000 cps tone. Rise time had a simple effect on responses; the longer the rise time, the slower the responses. The magnitude of this effect was larger than could be accounted for by the fact that slower rising tones take longer to reach threshold. Intensity interacted with rise time so that for fast rises (0.5 msec.) intensity had no influence on the speed of reactions. It was only as the rate of loading the auditory system became more gradual that an intensity-reaction time function was obtained.
R 4

29,703
Immergluck, L. RESISTANCE TO AN OPTICAL ILLUSION, FIGURAL AFTER-EFFECTS, AND FIELD DEPENDENCE. Psychon. Sci., Oct. 1966, 6(6), 281-282. (San Francisco State College, San Francisco, Calif.).

The ability to resist geometric illusions is shown to be related both to measures of field independence and to figural after-effect potency. Ss who demonstrated figural after-effects on a particular task, in contrast to those who did not, were able to counteract a presented visual illusion and were also clearly identified as field-independent on a pertinent perceptual task. Consonant with the evidence of previously reported related studies, the present findings continue to show that individual differences in figural after-effect potency are systematically related to a wider gamut of perceptual and behavioral response categories.
R 6

29,704
Harcum, E.R. & Smith, N.F. STABILITY OF ERROR DISTRIBUTIONS WITHIN TACHISTOSCOPIC PATTERNS. Psychon. Sci., Oct. 1966, 6(6), 287-288. (College of William & Mary, Williamsburg, Va. & University of Rhode Island, Kingston, R.I.).

To investigate possible commonality of mechanisms in tachistoscopic pattern perception and in serial learning, we attempted to produce an isolation effect, frequently found in serial learning, in the perceptual task. Reference markers were placed within binary visual patterns in some exposures, and for particular blocks of exposures reference lines were reproduced on the responding templates. In some exposures special precautions were taken to prevent fixational errors. The distributions of errors among elements never varied. Thus, the perceptual curve was stable in spite of the manipulation of certain external variables. The absence of an isolation effect was attributed to observer's critical lack of foreknowledge about the locus of isolation.
R 5

29,705
Tees, R.C. & More, Linda K. IDENTICAL FIGURES, EXPOSURE TIME AND DISAPPEARANCE PHENOMENA UNDER REDUCED STIMULATION CONDITIONS. Psychon. Sci., Oct. 1966, 6(6), 289-290. (University of British Columbia, Vancouver, British Columbia, Canada).

The extent to which 2 identical stimuli in a 3-element design disappear together under reduced stimulation conditions was found to be significantly greater than other possible paired disappearances. Moreover, during the course of 3 observational sessions, the proportion of identical-pair disappearances increased significantly.
R 9

29,706
Flock, H.R., Tenney, J.H. & Graves, D. DEPTH INFORMATION IN SINGLE TRIANGLES AND ARRAYS OF TRIANGLES. Psychon. Sci., Oct. 1966, 6(6), 291-292. (York University, Toronto, Ontario, Canada).

When 6 obtuse triangles varying in angular height from 75° to 10° were presented singly at 6 different slants, slant judgments were at chance level. When the view of an array of triangles was varied from 82° to 40° to 22° for the same 6 slants, the accuracy of slant judgments correspondingly varied. It was concluded that arrays of triangles carry information about their spatial orientation even though the individual elements of the array do not.
R 4

29,707
Bishop, H.P. SEPARATION THRESHOLDS FOR BAR TARGETS PRESENTED WITH COLOR CONTRAST ONLY. Psychon. Sci., Oct. 1966, 6(6), 293-294. (Tufts University, Medford, Mass.).

Separation threshold scores for rectangular bar targets with combination of red, yellow, green and blue targets and grounds were obtained. Threshold scores were low, with small differences between scores obtained with the different color combinations.
R 4

29,709
McCormack, P.D., Haltrecht, E.J. & Hannah, T.E. MONITORING EYE MOVEMENTS IN NONLEARNING SITUATIONS. Psychon. Sci., Nov. 1966, 6(8), 371-372. (Carleton University, Ottawa, Ontario, Canada).

1 group of Ss was given 2 exposures of a 28-item verbal paired-associates (PA) list and was required to attempt to learn by the method of recall. Another group was asked to pronounce the stimuli when they appeared alone. Eye movements were monitored throughout the task for all Ss. The findings were consistent with a 2-stage interpretation of verbal PA learning.
R 5

29,710
Turvey, M.T. THE EFFECTS OF REHEARSING ANALYZED INFORMATION UPON THE RETRIEVAL OF UNANALYZED INFORMATION. Psychon. Sci., Nov. 1966, 6(8), 365-366. (Ohio State University, Columbus, Ohio).

Ss were required to recall unanalyzed information whilst in the process of remembering an analyzed sequence of items. Remembering the analyzed sequence by use of rehearsal did not reduce the availability of unanalyzed information. The data were discussed with respect to theoretical interpretations of rehearsal and a model was proposed emphasizing the separation of analyzed and unanalyzed information stores.
R 11

29,711
Bryden, M.P. SHORT-TERM MEMORY FOR UNBALANCED DICHOTIC LISTS. Psychon. Sci., Nov. 1966, 6(8), 379-380. (University of Waterloo, Waterloo, Ontario, Canada).

Ss heard dichotic lists in which 4 numbers were presented to 1 ear and, at the same time, 2 numbers were presented to the other ear. Consistent with a decay theory of immediate memory, accuracy on the 2-number series decreased as a function of time since presentation. Variations in recall order indicated that the order of report is determined only after all the material has been heard.
R 8

29,712
Rabbitt, P. RECOGNITION: MEMORY FOR WORDS CORRECTLY HEARD IN NOISE. Psychon. Sci., Nov. 1966, 6(8), 383-384. (Applied Psychology Research Unit, MRC, Cambridge, England).

The increase in effort necessary to correctly identify words over degraded communications channels has been shown to be reflected in lowered efficiency on simultaneously-performed non-verbal secondary tasks. 2 experiments show that a similar loss of efficiency may be observed for operations performed on the material shadowed. Recognition memory is poorer for words correctly shadowed over a degraded channel.
R 5

29,713
Woodhead, Muriel M. SIMPLE REHEARSAL STRATEGIES FOR SHORT-TERM RECALL. Psychon. Sci., Nov. 1966, 6(8), 385-386. (Applied Psychology Research Unit, MRC, Cambridge, England).

4 separate groups of Ss were assigned differing rehearsal strategies by which to memorize the randomized words of a sentence in the orders presented. Ss made less errors in recall after vocal rehearsal than after non-vocal. Reading the words aloud twice without increasing the presentation time did not appear to delay the decay of the memory trace. Duplicated vocal and silent rehearsals appeared to have undefined intermediate roles.
R 3

29,714
Lindley, R.H. RECODING AS A FUNCTION OF CHUNKING AND MEANINGFULNESS. Psychon. Sci., Nov. 1966, 6(8), 393-394. (California State College, Fullerton, Calif.).

Trigrams of high or low meaningfulness were paired with 1-chunk or 2-chunk recoding cues in short-term memory. The presence of either 1-chunk or 2-chunk cues reduced but did not eliminate the effects of meaningfulness on trigram recall.
R 2

29,715
Lindley, R.H. WORDS AND PRONUNCIATION AS CODING AIDS. Psychon. Sci., Nov. 1966, 6(8), 395-396. (California State College, Fullerton, Calif.).

In Exp. I after an initial presentation of 1 or 2 to-be-recalled trigrams, experimenter either spelled the items pronounced them, or said related words. Pronunciation did not facilitate recall, whereas the related words did. Exp. II showed that the failure to find facilitatory effects of pronunciation in Exp. II showed that the failure to find facilitatory effects of pronunciation in Exp. I was due to whether experimenter or subject did the spelling and pronouncing.
R 3

29,716
Purohit, A.P. EFFECT OF UNEXPECTED INCREASE IN STIMULUS INTENSITY ON REACTION TIME OF HAND WITHDRAWAL. Psychon. Sci., Nov. 1966, 7(8), 387-388. (Queen's University, Kingston, Ontario, Canada).

Latencies of hand withdrawal to a weak stimulus (RTw) and to a strong stimulus, the intensity of which was increased unexpectedly (RTs) were obtained from 32 male and 32 female Ss. Most Ss showed facilitatory effect in their RTs. This and other results have been discussed with reference to the findings of an earlier study in which Ss were required to press a reaction time key in the same situation. A modification of curvilinear theory of performance has been suggested.
R 2

29,717
Adams, C.K. & Behar, I. STIMULUS CHANGE PROPERTIES OF THE RT READY SIGNAL. Psychon. Sci., Nov. 1966, 6(8), 389-390. (USA Medical Research Lab., Fort Knox, Ky.).

2 studies tested the generality of the Perkins-Logan hypothesis in the reaction-time experiment. Both studies used a parametric design with 4 ambient (intertrial) intensities of white noise ranging from 0 to 90 dB in all combinations with the same 4 intensities used as ready signals. The results were consistent with the Perkins-Logan interpretation of stimulus intensity effects as magnitude of change (increase and decrease) produced a highly significant effect in both studies. However, RTs (reaction-time) were shorter when ready signals were decreases rather than increases in intensity (significant in one study).
R 5

29,718
Crowder, R.G. VISUAL PRESENTATION OF STIMULI IN IMMEDIATE MEMORY. Psychon. Sci., Dec. 1966, 6(10), 449-450. (Yale University, New Haven, Conn.).

Simultaneous (SM) and sequential (SQ) visual presentation of consonant series varying in length were compared as a function of stimulus duration and presentation rate, respectively. A systematic dependence of recall upon these parameters was demonstrated for 2 measures of performance. Second for second, SM presentation was found to be more efficient than SQ.
R 7

29,719
Haltrecht, E.J. & McCormack, P.D. MONITORING EYE MOVEMENTS OF SLOW AND FAST LEARNERS. Psychon. Sci., Dec. 1966, 6(10), 461-462. (Carleton University, Ottawa, Ontario, Canada).

Eye Movements of slow and fast learners were monitored as they studied a 7-item paired-associates (P-A) list. The findings were consistent with a 2-stage interpretation of verbal learning. The slow learners appeared to take longer in Stage 1, a relatively brief process, and to experience considerable difficulty in Stage 2.
R 6

29,720
Kravitz, J.H. & Wallach, H. ADAPTATION TO DISPLACED VISION CONTINGENT UPON VIBRATING STIMULATION. Psychon. Sci., Dec. 1966, 6(10), 465-466. (Swarthmore College, Swarthmore, Penn.).

In 2 experiments Ss were exposed to a prismatically displaced view of their right hand resting on a board that could be made to vibrate. Groups receiving vibration achieved significantly more adaptation as measured by a pointing test than control groups who did not.
R 3

29,721
Fox, R. & Check, R. FORCED-CHOICE FORM RECOGNITION DURING BINOCULAR RIVALRY. Psychon. Sci., Dec. 1966, 6(10), 471-472. (Vanderbilt University, Nashville, Tenn.).

Forced-choice form recognition thresholds were obtained for both eyes concurrently under rivalry suppression and nonsuppression and for a nonrivalry control condition. Suppression produced a significant decrement in recognition; nonsuppression and nonrivalry did not differ significantly. These data support the hypotheses that suppression represents an inhibitory state and that nonsuppression represents a state of normal visual sensitivity.
R 3

29,722
Tolin, P. THE INFLUENCE OF STIMULUS UNCERTAINTY IN A REACTION TIME SITUATION. Psychon. Sci., Dec. 1966, 6(10), 473-474. (University of Iowa, Iowa City, Iowa).

Forty-eight Ss participated in an experiment designed to test the effects of stimulus uncertainty on reaction time (RT). The results were interpreted as supporting the notion of increasing RT as a function of monitoring difficulty, rather than stimulus uncertainty.
R 2

29,723
Watkins, W.H. PHOTIC FACILITATION OF TONAL SIGNAL DETECTION IN A FORCED-CHOICE SITUATION. Psychon. Sci., Dec. 1966, 6(10), 477-478. (USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.).

As Ss performed a tone detection task, background noise was reduced at possible signal presentation times. When a light stimulus intensified at those times, detectability of the tonal signal was higher than with a "dimming," or a constant light. The magnitude of intersensory facilitation was less than for experiments without acoustic time specification reported earlier.
R 3

29,724
Jones, E.C. & Narver, R.L. EFFECTS OF VOLUNTARY AND INVOLUNTARY MEDIATION ON ESTIMATES OF SHORT TIME INTERVALS. Psychon. Sci., Dec. 1966, 6(12), 505-506. (Texas Christian University, Fort Worth, Tex.).

Ss estimated 5 sec. and 20 sec. intervals via the method of production or reproduction. Different groups of Ss were either given no instructions as to the bases on which to estimate, were told to count their pulses, or were instructed to orally count "one-thousand-one, one-thousand-two, etc." Ss were trained with and without knowledge of results. Correlations between group means over trials suggest that the method of production may be mediated by involuntary processes, but that reproduction of 20 sec. intervals may be mediated by other processes.
R 5

29,725
Evans, S.H. & Mueller, M.R. VARGUS 9: COMPUTED STIMULI FOR SCHEMA RESEARCH. Psychon. Sci., Dec. 1966, 6(12), 511-512. (Texas Christian University, Fort Worth, Tex. & Augusta College, Augusta, Ga.).

A method is presented for producing stimuli by sampling from a defined population in such a way that each stimulus may be regarded as a set of measurable deviations from a prototype. Procedures are described for the measurement and control of two population characteristics derived from information theory: stimulus channel capacity and redundancy. An interval scale measure is presented for describing individual stimuli with respect to conformity to the prototype.
R 6

29,726
Mayzner, M.S., Tresselt, M.E. & Cohen, A. PRELIMINARY FINDINGS ON SOME EFFECTS OF VERY FAST SEQUENTIAL INPUT RATES ON PERCEPTION. Psychon. Sci., Dec. 1966, 6(12), 513-514. (New York University, New York, N.Y.).

A study was made of the effects of presenting to the visual system a string of very fast sequential inputs, employing a computer-based CRT display system. The results showed that for either 5 or 10 inputs (i.e., all Xs, random letters, letters forming a word, or small line segments) approximately the first half of these sequentially presented inputs were not perceived, if display order was irregular and display input rate was fixed at certain values between clear simulataneity and clear sequentiality.
R 7

29,727
Vaught, G.M. & Newman, S.E. THE EFFECTS OF ANXIETY ON MOTOR-STEADINESS IN COMPETITIVE AND NONCOMPETITIVE CONDITIONS. Psychon. Sci., Dec. 1966, 6(12), 519-520. (Albion College, Albion, Mich.).

20 high-anxiety (HA) and 20 low anxiety (LA) were selected from 101 males who had taken the Manifest Anxiety Score (MAS). The Ss were further divided into competitive and noncompetitive subgroups and administered a simple motor steadiness test. It was found that LA Ss made fewer errors than HA Ss in the steadiness test and that competition exacerbated performance differences between HA and LA Ss.
R 3

29,728
McFarland, J.H. THE INFLUENCE OF EYE MOVEMENTS ON A NEW TYPE OF APPARENT VISUAL MOVEMENT. Psychon. Sci., Jan. 1966, 4(2), 51-52. (Antioch College, Yellow Springs, Ohio).

When the sides of a contour triangle are sequentially presented, Ss report a sequential "flow" of brightness within the sides or a sequential "growth" of the sides. Modal report of this movement occurs in all three sides when the inter-side intervals are equal and 100 msec. Increasing the probability of contour scanning eye movements leads to an increase in this type of apparent visual movement.
R 17

29,729
Fernald, C.D. & Moore, J.W. VESTIBULAR SWAY: PARAMETERS OF THE ELICITING STIMULUS. Psychon. Sci., Jan. 1966, 4(2), 55-56. (University of Massachusetts, Amherst, Mass.).

Postural sway was elicited in human Ss using various combinations of low frequency-low amplitude sinusoidal electrical stimulation at the mastoid processes. Amount of sway was a V-shaped function of the stimulus frequency at low amplitude and an inverted V function at the higher amplitude. Amplitude-frequency combinations optimal for eliciting overall sway were different from those most suitable for use in conditioning.
R 2

29,730
Premack, D. & Collier, G. DURATION OF LOOKING AND NUMBER OF BRIEF LOOKS AS DEPENDENT VARIABLES. Psychon. Sci., Jan. 1966, 4(2), 81-82. (University of California, Santa Barbara, Calif. & Rutgers University, Brunswick, N.J.).

Two intensive properties of looking are sensitive to such variables as practice, difficulty, and reinforcement, commonly used in discrimination studies. The large difference between initial looking durations and those observed at the time of the reversals in the discrimination reversal problem suggest that perhaps a 2 stage problem is involved in looking. The first is familiarization with the range of stimuli involved, the second is the solution of the problem, the latter requiring briefer or fewer looks since it requires only a selection from a limited number of possibilities.
R 2

29,731
Attneave, F. & Olson, R.K. INFERENCES ABOUT VISUAL MECHANISMS FROM MONOCULAR DEPTH EFFECTS. Psychon. Sci., Feb. 1966, 4(4), 133-134. (University of Oregon, Eugene, Ore.).

2 depth "cues", radial patterning and relative length were presented in sufficiently pure form to permit inferences about underlying data-processing operations. Over 18 O's, the former property yielded a strong depth impression, the latter a weaker one. Depth effects from dot patterns were dependent on perceptual grouping of dots into radial lines.
R 2

29,732
Verrillo, R.T. VIBROTACTILE SENSITIVITY AND THE FREQUENCY RESPONSE OF THE PACINIAN CORPUSCLE. Psychon. Sci., Feb. 1966, 4(4), 135-136. (Syracuse University, Syracuse, N.Y.).

Threshold responses to vibratory stimuli are compared for psychophysical and electrophysiological experiments. There is a striking similarity between the 2 sets of data. The hypothesis that a duplex mechanism for taction is supported and there is compelling evidence that the Pacinian corpuscle is the neural transducer of vibratory stimuli.
R 12

29,733
Reid, J.B. THE EFFECT OF ASYMMETRIC STIMULATION ON THE APPARENT MEDIAN PLANE. Psychon. Sci., Feb. 1966, 4(4), 141-142. (University of Oregon, Eugene, Ore.).

An experiment was conducted to determine the effects of an asymmetrical, distractor stimulus placed at varied distances from the objective median plane on the amount of shift of the apparent median plane. A non-monotonic relationship was found between degree of asymmetry and amount of shift. Although all degrees of asymmetry effected a shift in apparent median plane, the largest shift occurred when the distractor stimulus was asymmetrical by 40°.
R 1

29,734
Messick, D.M. & Repoport, A. A SUPPLEMENTARY STUDY OF RESPONSE UNCERTAINTY AND RELATIVE EXPECTED VALUE IN MULTIPLE-CHOICE DECISION BEHAVIOR. Psychon. Sci., Feb. 1966, 4(4), 143-144. (University of California, Santa Barbara, Calif. & University of North Carolina, Chapel Hill, N.C.).

Data from a prefious study are reanalyzed. The study is typical 10-choice probability learning task including 1500 trials. The results demonstrate the feasibility of decomposing multiple-choice decision behavior into 2 distinct processes. The first process is concerned with the uncertainty of the response distribution, and the second process is concerned with the allocation of the responses to the available alternatives.
R 5

29,736
Bishop, H.P. SEPARATION THRESHOLDS FOR COLORED BARS WITH AND WITHOUT LUMINANCE CONTRAST. Psychon. Sci., Feb. 1966, 4(6), 223-224. (Tufts University, Medford, Mass.).

Separation thresholds for rectangular bar targets were obtained for certain combinations of black, white and colored targets and grounds. Relatively low threshold separation scores were obtained with colored targets against white grounds with targets and ground equated in luminance. The results suggest that color contrast is sufficient but less efficient than luminance contrast for visual acuity.
R 5

29,737
Sticht, T.G. & Foulke, E. REACTION TIME TO ELECTROCUTANEOUS ONSET AND OFFSET STIMULATION. Psychon. Sci., Feb. 1966, 4(6), 213-214. (University of Louisville, Louisville, Ky.).

Reaction times were obtained from 2 Ss to the onset (beginning) and offset (cessation) of 70cps AC electrocutaneous stimuli of 3 sensation levels: low, medium and high. The results indicated that onset was faster than offset reaction times at all 3 intensity levels.
R 6

29,738
Wilkinson, R.T., Morlock, H.C. & Williams, H.L. EVOKED CORTICAL RESPONSE DURING VIGILANCE. Psychon. Sci., Feb. 1966, 4(6), 221-222. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

In a conventional vigilance situation a relationship has been found between the averaged evoked cortical response to the vigilance stimuli and the Ss' ability to detect occasional, slight changes in these stimuli. The pattern of change in the evoked response that accompanied failures of detection suggested lowered arousal rather than distracted attention as the cause.
R 13

29,739
Levy, C.M. & Murphy, P.H., III. THE EFFECTS OF ALCOHOL ON SEMANTIC AND PHONETOGRAPHIC GENERALIZATION. Psychon. Sci., Feb. 1966, 4(6), 205-206. (University of Florida, Gainesville, Fla.).

1 group of normal college males was given a moderate amount of alcohol prior to conditioned discrimination training of a voluntary response. A control group was given a placebo drink. The Placebo Ss later showed the usual superiority of semantic over phonetographic generalization. Alcohol completely reversed this relationship.
R 6

29,740
Stanley, G. THE APPARENT SIZE OF ENTOPTIC AFTER-IMAGES. Psychon. Sci., March 1966, 4(8), 289-290. (Indiana University, Bloomington, Ind.).

34 male Ss made size and distance estimates of an after-image observed with closed eyes. Size estimates showed small variability, but distance estimates were highly inconsistent. To account for the consistent size estimates it is tentatively proposed that although the subjective impression is of boundless space, with eyes closed the sensory system acts as if the eyes are fixated at a finite rather than infinite distance.
R 3

29,741
Dunn, B.E. PERCEIVED SLANT AS A FUNCTION OF DIRECTION OF REGARD. Psychon. Sci., March 1966, 4(8), 297-298. (University of Alberta, Calgary, Alberta, Canada).

4 groups of Ss viewed trapezoid shaped transparencies in a tachistoscopic device. Each group estimated that slant of the stimulus when it was photographed. 2 groups looked up at the transparencies, 2 down. The results indicated that direction of regard alone was insufficient to influence the perceived slant. As in previous studies, relative midpoint height of the vertical edges of the trapezoid was a depth cue as was end ratio. The results were considered in terms of muscle involvement and shape invariance hypothesis.
R 8

29,742
Behrendt, T. & Raymond, R. AFTER-IMAGE FUSION. Psychon. Sci., March 1966, 4(8), 299-300. (Ophthalmology Dept., Jefferson Medical College, Philadelphia, Penn.).

A new aspect of the complex of after-image phenomena is described, it consists of the appearance of lines connecting initially separated after-images, if they are observed against a flickering background. These lines appear during the fading of the after-image. The after-images were produced by various configurations of Xenon flashes, the flickering background by a standard photostimulator. The phenomena was called after-image fusion not to be confused with binocular fusion. The report is qualitative. The main conclusion reached is the actual existence of the fusion phenomenon. Possible influences of conditioning or suggesting were debated and thought of small importance. The phenomenon casts some doubts on the simple mechanistic retinal origin of the after-images.
R 5

29,743
McBurney, D.H. & Lucas, J.A. GUSTATORY CROSS ADAPTATION BETWEEN SALTS. Psychon. Sci., March 1966, 4(8), 301-302. (University of Tennessee, Knoxville, Tenn.).

Adaptation of the tongue to any of 4 different salts tested lowered the estimated magnitude of some other salts, contrary to previous reports. A separate mechanism is not required to code the taste of each salt.
R 8

29,745
Elmer, E.O. & Senter, R.J. PREDICTION OF COMPLEX VERBAL LEARNING. Psychon. Sci., April 1966, 4(10), 339-340. (University of Cincinnati, Cincinnati, Ohio).

Estes' (1959) linear stimulus sampling model was modified to predict response probability on trial n on the basis of response probability on trial 1. The model was employed to predict three learning functions for a group of Ss learning a poem. Statistical analysis indicated high predictive power. The theoretical functions, based on observation of performance after 5 min. of practice accounted for 99% of the trials variance over 35 min. of performance The findings are discussed in terms of applied and theoretical considerations.
R 2

29,746
Hoats, D.L. & Gerjuoy, Irma R. ASSOCIATIVE SYMMETRY WITH TWO CONDITIONS OF PERCEPTUAL ORGANIZATION. Psychon. Sci., April, 1966, 4(10), 341-342. (Edward R. Johnstone Training & Research Center, Bordentown, N.J.).

College Ss were run on a paired-associate task using colors and numerals embedded in "good-fitting" and "poor-fitting" geometric figures. Symmetry of association was demonstrated, but there was no effect of fittingness upon either forward or backward associations.
R 5

29,747
Suedfeld, P. & Streufert, S. INFORMATION SEARCH AS A FUNCTION OF CONCEPTUAL AND ENVIRONMENTAL COMPLEXITY. Psychon. Sci., April 1966, 4(10), 351-352. (Rutgers, The State University, New Brunswick, N.J.).

Individuals operation at complex and at simple levels of conceptual structure played a tactical game for 3 1/2 hr. periods. There was a negative relationship between information input and subsequent information search. Conceptually simple Ss, while generally requesting more information, wanted feedback about ongoing events; complex Ss requested information about new aspects of the game.
R 5

29,748
Katz, L. A TECHNIQUE FOR THE STUDY OF STEADY-STATE SHORT-TERM MEMORY. Psychon. Sci., April 1966, 4(10), 361-362. (University of Connecticut, Storrs, Conn.).

Steady-state short term memory (STM) was studied by a method in which S was required to keep track of the randomly changing response member of each of 5 stimulus words. On each of 220 consecutive presentations, S had to recall the response last paired with a given stimulus and then had to learn a (possibly) new response to the same stimulus. A measure of S's STM was his proportion of correct recalls as a function of the number of items intervening between successive appearances of a given item. Results suggest that the method gives a stable measure of STM. Specifically, proactive effects appeared to be constant throughout the sequence of presentations.
R 4

29,749
Howe, M.J.A. CONSOLIDATION OF WORD SEQUENCES AS A FUNCTION OF REHEARSAL TIME AND CONTEXTUAL CONSTRAINT. Psychon. Sci., April 1966, 4(10), 363-364. (University of Sheffield, Sheffield, England).

This study aimed to examine the effects of contextual constraint (CC) on short-term memory for words. 24 Ss read and then rehearsed lists of 6 words which were either random or second-order approximations to English. They carried out a subtracting task before attempting recall of each list. Recall varied directly with time available for rehearsal (0, 3 and 6 sec. being used). At all rehearsal times constrained sequences were better recalled than randomly ordered word lists. A construction-at-recall explanation is not entirely satisfactory, and it is suggested that CC also affects the way in which lists are stored.
R 7

29,750
Stanek, R.J. A NOTE ON THE RELATION BETWEEN THE OPTIC DISC AND THE BLIND SPOT. Psychon. Sci., April 1966, 4(10), 347-348. (University of Santa Clara, Santa Clara, Calif.).

The optic disc is sometimes said incorrectly to lie in a position below the fovea. This misconception arises from neglecting the inversion of the retinal image. The blind spot, regarded as a position in the visual field, in fact lies below the point of fixation, but the anatomical counterpart of the blind spot, the optic disc, lies above the fovea. It is suggested that the term optic disc be used anatomically and the term blind spot be used only to refer to an area in the visual field.
R 10

29,751
Tanner, T.A., Jr., Patton, R.M. & Atkinson, R.C. THE EFFECT OF SIGNAL INTENSITY ON COMPARATIVE JUDGMENTS OF AUDITORY DURATIONS. Psychon. Sci., April 1966, 4(10), 353-354. (Ames Research Center, NASA, Moffett Field, Calif.).

Human Ss made comparative judgments of the duration of 2 tones in a forced-choice situation. Pairs of tones with either the same or different intensities were presented with durations from 0.5 to 1.6 sec. Comparisons were more accurate when the 2 tones were of the same intensity than when they were of different intensities, and were most accurate when the tones were of higher intensities. The results are compared with previous findings relating comparative judgments of duration to sensory modality.
R 3

29,752
Pitz, G.F. THE SEQUENTIAL JUDGMENT OF PROPORTION. Psychon. Sci., April 1966, 4(12), 397-398. (Southern Illinois University, Carbondale, Ill.).

Ss gave percentage estimates of proportion, which were revised after each event during the presentation of a sequence of binary events. Responses exhibited constant errors of overestimation of proportions greater than .5 and underestimation of proportions less than .5. Both verbal and nonverbal responses were used, the constant error being somewhat greater for nonverbal responses. There was a tendency for the constant error to decrease as the number of events between revisions was increased.
R 5

29,753
Schiffman, H.R. A COMPARISON OF THE ENGLISH AND METRIC SYSTEM IN A LENGTH ESTIMATION TASK. Psychon. Sci., April 1966, 4(12), 399-400. (Rutgers University, New Brunswick, N.J.).

Size estimates by English and metric system users were compared on a length estimation task. The results indicated that some differences exist between estimates of the 2 measurement system users but not in a systematic direction. A discussion was made that the unit of measure that one memorially constructs to estimate length may be greater than the basic unit.
R 1

29,754
Pollack, R.H. EFFECT OF FIGURE-GROUND CONTRAST AND CONTOUR ORIENTATION ON THE TEMPORAL RANGE OF APPARENT MOVEMENT. Psychon. Sci., April 1966, 4(12), 401-402. (Institute for Juvenile Research, Chicago, Ill.).

The range of interstimulus intervals permitting the detection of apparent movement was investigated as a function of figure-ground contrast of the stimuli and also as a function of the contour orientations of the stimulus figures. It was found that the greatest interval ranges occurred when figure-ground contrast was maximal and when the contours of the figures were parallel to each other. The younger of the 2 Ss showed wider ranges throughout.
R 7

29,755
Woodring, Ann V. & Alluisi, E.A. EFFECTS OF CHOICE-FIGURE ROTATION ON THE VISUAL PERCEPTION OF FORM. Psychon. Sci., April 1966, 4(12), 403-404. (University of Louisville, Louisville, Ky.).

56 Ss responded in a paper-and-pencil figure-cancellation task to 4-by-4 metric figures. Both random and constrained or "Redundancy-1" figures were used with both rotated and nonrotated choice figures. In terms of speed and accuracy of cancellation, perceptual performance with random figures was better than with constrained, and performance with nonrotated choice figures was better than with rotated. A significant interaction of figure type with rotation indicated that the detrimental effects of choice-figure rotation were especially large when imposed on constrained figures. The effect of choice-figure rotation is interpreted as similar to other "noise" effects that make filtering a necessary part of S's task.
R 11

29,756
Marshall, A.J. & Di Lollo, V. DISTORTION OF PARALLEL LINES IN GEOMETRICAL FIELDS AS A FUNCTION OF SIZE OF THE DISPLAY. Psychon. Sci., April 1966, 4(12), 405-406. (University of Western Australia, Perth, Australia).

The illusory distortion of 2 parallel lines on the Hering, Wundt, and Orbison fields was studied as a function of the size of the display. The Hering and Wundt fields yielded complementary illusions which developed with the size of the display. The Orbison field yielded a lesser amount of illusion and different development.
R 4

29,757
Coren, S. ADAPTATION TO PRISMATIC DISPLACEMENT AS A FUNCTION OF THE AMOUNT OF AVAILABLE INFORMATION. Psychon. Sci., April 1966, 4(12), 407-408. (Stanford University, Stanford, Calif.).

The amount of information available during a pointing response while wearing displacing prisms was varied by allowing the arm to remain free or by constraining it to a track. There was significant adaptation in both conditions and the adaptation for the unconstrained or high information group was significantly greater.
R 4

29,758
Verrillo, R.T. TACTION THRESHOLDS FOR SHORT PULSES. Psychon. Sci., April 1966, 4(12), 409-410. (Sensory Communication Labs., Syracuse University, Syracuse, N.Y.).

Absolute taction thresholds for short pulses are determined for different pulse-repetition rates and sizes of contactor. It is shown that cutaneous mechanoreceptors summate energy increments resulting from an increase in repetition rate and in the size of the contactor. Discrepancies between measurements obtained using short pulses and sine waves are discussed. The results are consistent with the hypothesis that a duplex mechanism of mechanoreception exists over most of the body surface.
R 8

29,759
Blackman, R. THE EFFECT OF THE ORIENTING REACTION ON DISJUNCTIVE REACTION TIME. Psychon. Sci., April 1966, 4(12), 411-412. (McGill University, Montreal, Quebec, Canada).

Eighty Ss performed a visual or auditory disjunctive reaction time (DRT) task in which some of the task stimuli were preceded, at irregular intervals, by an intense visual or auditory "orienting stimulus." Initially the orienting stimuli impaired speed of response, but on subsequent presentations produced shorter DRTs than when no orienting stimulus was given. It is suggested that the warning signal used in RT experiments may influence performance not only as a result of the information it carries, but also because it may elicit an orienting reaction.
R 7

29,760
Kohfeld, D.L. THE PREDICTION OF PERCEPTUAL-MOTOR LEARNING FROM INDEPENDENT VERBAL AND MOTOR MEASURES. Psychon. Sci., April 1966, 4(12), 413-414. (University of Illinois, Urbana, Ill.).

Forty male college students were administered motor and verbal pretests and were given learning trials on a criterion task which required both motor and verbal skills. The pretests were employed as predictors to determine the relationship of verbal and motor abilities to early and late stages of perceptual-motor performance. It is suggested that verbal comprehension is more important early in perceptual-motor learning while motor skill is more critical in later learning.
R 6

29,761
Moray, N. & Jordan, Ann. PRACTICE AND COMPATABILITY IN 2-CHANNEL SHORT-TERM MEMORY. Psychon. Sci., April 1966, 4(12), 427-428. (University of Sheffield, Sheffield, England).

Eleven Ss were required to listen to 3 pairs of digits presented dichotically. The member of each pair arrived simultaneously at opposite ears. They were asked to recall them either vocally, alternating between the ears, or manually on a keyboard which allowed them to respond to both ears at once. Contrary to Broadbent's earlier findings, very high levels of recall can be achieved in both conditions when the presentation rate is as high as 2 signals/ear/second.
R 10

29,762
King, W.L. & Hayes, M.C. THE SUN ILLUSION: INDIVIDUAL DIFFERENCES IN REMEMBERED SIZE AND DISTANCE JUDGMENTS. Psychon. Sci., May 1966, 5(2), 65-66. (Dalhousie University, Halifax, Nova Scotia, Canada).

College students judged, from memory, the relative size of the sun at the horizon and at the zenith, the relative distance to the sun at each position, and the relative distance to the sky at each position. 2 major types of Ss were identified. The more numerous type remembered the sun at the horizon as larger and closer than the zenith sun; the other remembered the sun at the horizon as larger and more distant than the zenith sun. For the more numerous type, the size and distance judgments were negatively correlated; for the other type they were positively correlated.
R 5

29,763
Carlson, W.A. & Eriksen, C.W. DICHOPIC SUMMATION OF INFORMATION IN THE RECOGNITION OF BRIEFLY PRESENTED FORMS. Psychon. Sci., May 1966, 5(2), 67-68. (US Veterans Administration Hospital, Danville, Ill. & University of Illinois, Urbana, Ill.).

Visual form identification was studied under conditions where the forms to be identified were presented briefly to the right and left eyes alone, to the right and left eye simultaneously on corresponding areas, and to the right and left eye sequentially on corresponding areas. The results suggest the following conclusions: a) successive stimulation of the 2 eyes is better than either eye alone if the stimulation falls on corresponding areas; b) successive stimulation of corresponding areas is about identical to simultaneously stimulated corresponding areas; and c) the amount of gain in identification accuracy resulting from stimulation to the 2 eyes was not greater than can be attributed to 2 independent opportunities to perceive.
R 6

29,764
Purohit, A.P. SOME CORRELATES OF INHIBITION-FACILITATION EFFECT ON REACTION-TIME DUE TO UNEXPECTED INCREASE IN STIMULUS INTENSITY. Psychon. Sci., May 1966, 5(2), 53-54. (Queen's University, Kingston, Ontario, Canada).

Ss who showed an inhibitory effect in reacting to an auditory stimulus, the intensity of which was increased unexpectedly, were compared with Ss who showed a facilitatory effect in reacting to a similar stimulus. No difference was noticed between the 2 groups in introversion, anxiety-neuroticism and autonomic lability measures. There was a significant negative correlation between latency of reaction to a weak stimulus and inhibition-facilitation effect. This result is discussed interms of the curvilinear performance theory of activation and an alternative explanation is offered.
R 14

29,765
Derks, P.L. & Freeman, L. RECALL OF SIMULTANEOUSLY AND SUCCESSIVELY PRESENTED INFORMATION. Psychon. Sci., May 1966, 5(2), 51-52. (College of William & Mary, Williamsburg, Va.).

In order to examine the reported similarity in error distribution for recall of successively and simultaneously presented material, the 2 conditions were compared under total and partial report procedures. However, in this study, omission errors were predominantely at the front of the list for successive presentation and to the right for simultaneous presentation with both report procedures. Further investigation of successive presentation total report showed mislocation errors shifted toward the rear of the list relative to omission errors. These results lend some support to descriptions of memory which include a "reception" stage and an "organization" stage. The similarity in error distributions for successive and simultaneous presentations results in part from similar organizational strategies.
R 3

29,766
Dale, H.C.A. & Gregory, M. EVIDENCE OF SEMANTIC CODING IN SHORT-TERM MEMORY. Psychon. Sci., May 1966, 5(2), 75-76. (Applied Psychology Research Unit, MRC, Cambridge, England).

An effect of semantic similarity in short-term memory was demonstrated and was compared with the effect of acoustic similarity. In free recall, using the RI (retroactive inhibition) paradigm, semantic similarity between OL (original learning) and IL (interpolated learning) increased intrusions from IL, but decreased omissions. By contrast, acoustic similarity caused both IL - intrusions and omissions to increase.
R 6

29,767
Groninger, L.D. NATURAL LANGUAGE MEDIATION AND COVERT REHEARSAL IN SHORT-TERM MEMORY. Psychon. Sci., June 1966, 5(4), 135-136. (University of Illinois, Urbana, Ill.).

The short-term effects of natural language mediators and covert repetitions were studied using high and low meaningfulness CCC_S (consonant consonant consonant) with a presentation time of 2 sec., a retention interval of 30 sec., and an interpolated activity of counting backward by threes. Each S was given 4 items of the same level of meaningfulness. There were 96 Ss in each group. Natural language mediators (NLM_S) and covert rehearsal were both significant factors in recall, NLM_S were found to deter proactive inhibition.

29,768
Dale, H.C.A. & Gregory, M. EVIDENCE OF SEMANTIC CODING IN SHORT-TERM MEMORY. Psychon. Sci., June 1966, 5(4), 153-154. (Applied Psychology Research Unit, MRC, Cambridge, England).

An effect of semantic similarity in short-term memory was demonstrated and was compared with the effect of acoustic similarity. In free recall, using the RI (retroactive inhibition) paradigm, semantic similarity between OL (original list) and IL (interpolated list) increased intrusions from IL, but decreased omissions. By contrast, acoustic similarity caused both IL-intrusions and omissions to increase.
R 6

29,769
Beach, L.R. & Swenson, R.G. INTUITIVE ESTIMATION OF MEANS. Psychon. Sci., June 1966, 5(4), 161-162. (University of Michigan, Ann Arbor, Mich.).

Three groups of Ss made intuitive estimates of the means of lists containing 3, 5, and 7 numbers, symmetric and skewed distributions, and low, medium, and high variance. Accuracy was found to be extremely high but it decreased as the number of numbers and their variance increased.
R 6

29,771
McKinney, J.P. LATERAL ASYMMETRY IN THE STABILITY OF THE VISUAL FIELD. Psychon. Sci., June 1966, 5(4), 175-176. (Smith College, Northampton, Mass.).

Visual targets of low intensity fragment and disappear when fixated in the dark. The present study uses this phenomenon to study the relative perceptual stability of the left and right visual fields. Results indicate a right field superiority.
R 13

29,772
Willis, F.N., Jr. INITIAL SPEAKING DISTANCE AS A FUNCTION OF THE SPEAKER'S RELATIONSHIP. Psychon. Sci., June 1966, 5(6), 221-222. (University of Missouri, Kansas City, Mo.).

Distances between individuals were recorded at the moment conversation began. The distances were then related to the relationship between the individuals and to their sex, age and race. Groups differing in these characteristics were found to differ reliably in initial speaking distance. Student experimenters were approached more closely by their friends than by their parents whose approach was similar to that of strangers. Speaking distance was suggested as part of an operational definition of interpersonal relations.
R 6

29,773
Conrad, R., Baddeley, A.D. & Hull, A.J. RATE OF PRESENTATION AND THE ACOUSTIC SIMILARITY EFFECT IN SHORT-TERM MEMORY. Psychon. Sci., June 1966, 5(6), 233-234. (Applied Psychology Research Unit, MRC, Cambridge, England).

Ss attempted to recall sequences of 6 consonants drawn from either an acoustically similar set (B C D G P Q T V), or from a relatively dissimilar set (H K M P R S W Y). Letters were presented visually at a rate of 60 or 120 letters per min. Performance was impaired by acoustic similarity ($p<.001$) but there was no effect of rate of presentation and no interaction between rate and similarity. This does not support a limited channel capacity interpretation of the acoustic similarity effect.
R 10

29,774
Bishop, H.P. SEPARATION THRESHOLDS FOR COLORED BARS WITH VARIED LUMINANCE CONTRAST. Psychon. Sci., June 1966, 5(6), 237-238. (Tufts University, Medford, Mass.).

Separation threshold scores were obtained for colored rectangular bar targets of constant luminance presented against a white ground varied in luminance. Maximum separation scores were obtained at nominal zero luminance contrast with red and blue targets; and at greater than nominal zero luminance contrast with yellow and green targets.
R 2

29,775
Cleary, A. A BINOCULAR PARALLAX THEORY OF THE GEOMETRIC ILLUSIONS. Psychon. Sci., June 1966, 5(6), 241-242. (Birkbeck College, University of London, London, England).

A new theory of the geometric illusions is presented. 3 perceptual processes are described, tending to reduce binocular parallax anomalies for environments containing overlaid objects. Inappropriate operation of these processes gives rise to the illusions. The effects of environmental training on the illusions are considered. Results from cross-cultural studies are cited and used to test a prediction from the theory concerning the magnitudes of cross-cultural differences for 2 forms of the vertical-horizontal illusion.
R 6

29,777
Dinnerstein, Dorothy, Curcio, F. & Chinsky, J. CONTEXTUAL DETERMINATION OF APPARENT WEIGHT AS DEMONSTRATED BY THE METHOD OF CONSTANT STIMULI. Psychon. Sci., June 1966, 5(6), 251-252. (Rutgers University, New Brunswick, N.J.).

The contextual determination of apparent weight is here confirmed with a constant-stimuli procedure. S, judging weights lifted in his right hand, makes a short set of successive comparisons between a standard (s) and a series of variable (v) weights. Simultaneously, he lifts his left hand non-judged context-weights (cws) which provide differing backgrounds for s and v respectively. The cws prove to exert consistent effects on the apparent heavinesses of the judged weights, as reflected in the frequency with which every v in the series is judged lighter vs heavier than s.
R 5

29,778
Beach, L.R. & Peterson, C.R. SUBJECTIVE PROBABILITIES FOR UNIONS OF EVENTS. Psychon. Sci., July 1966, 5(8), 307-308. (University of Michigan, Ann Arbor, Mich.).

Ss estimated probabilities of events and of the unions of those events in 3 different tasks. Probability estimates for the unions were approximately equal to the sum of the estimates for the component events, a relation demanded by probability theory.
R 5

29,779
Sheridan, J.A., Cimbalo, R.S., Sills, J.A. & Alluisi, E.A. EFFECTS OF DARKNESS, CONTRAST ILLUMINATION, AND SYNCHRONIZED PHOTIC STIMULATION ON AUDITORY SENSITIVITY TO PULSED TONES. Psychon. Sci., July 1966, 5(8), 311-312. (University of Louisville, Louisville, Ky.).

Pulsed-tone thresholds at 5 frequencies (250, 500, 1000, 2000, and 6000 Hz) were obtained from 20 Ss under 3 conditions of visual surround: darkness, normal ambient illumination, and relatively high-intensity-tone-synchronized photic stimulation. Auditory sensitivity to the highest frequency was lowered by visual stimulation of both types.
R 9

29,780
Mayzner, M.S., Tresselt, M.E., Adler, S., Cohen, A., et al. SHORT-TERM RETENTION, PRESENTATION RATE, AND NUMBER OF DISPLAY CYCLES. Psychon. Sci., July 1966, 5(8), 317-318. (New York University, New York, N.Y.).

Previous work of Bugelski, Mayzner and Schoenberg, and Murdock has shown that if total display time is held constant, trade offs may be found between number of display cycles (i.e. the number of times a list is repeated before recall is requested) and display presentation rates. The present study extends these earlier findings by showing that for the short-term retention of a string of 20 digits, trade offs may be obtained over the range from 1 display cycle and a presentation rate of 8 sec. per digit to 16 display cycles and a presentation rate of 1/2 sec. per digit. A breakdown does apparently occur with 32 display cycles and a presentation rate of 1/4 sec. per digit, where clear input registration is apparently degraded by the rapidly changing display.
R 5

29,781
Erlick, D.E. HUMAN ESTIMATES OF STATISTICAL RELATEDNESS. Psychon. Sci., Aug. 1966, 5(10), 365-366. (USAF Aeorspace Medical Research Labs., Wright-Patterson AFB, Ohio).

Degree of statistical relatedness between events is an independent variable used by many psychologists investigating concept formation, cue utilization, reinforcement theory and decision theory. Evidence is presented which indicates there is a discrepancy between human estimates and statistical estimates of relatedness.
R 14

29,782
Freides, D. & Phillips, Patricia. POWER LAW FITS TO MAGNITUDE ESTIMATES OF GROUPS AND INDIVIDUALS. Psychon. Sci., Aug. 1966, 5(10), 367-368. (Lafayette Clinic, Detroit, Mich. & Wayne State University, Detroit, Mich.).

Differential sensitivity to grit and weight stimuli was compared for lateral differences using power law coefficients based on unanchored magnitude estimations. Ss were 120 college students run in a parametric design with sex, handedness, and order of testing right and left controlled. Findings on lateral differences were unreliable. Power law functions were shown to fit group (N=10) data consistently but not individuals. These results indicate that without specification of several implicated variables, the use of unanchored magnitude estimations (UME) and the power law to compare sensory functions in individuals is of dubious validity.
R 12

29,783
Stanley, G. HAPTIC AND KINESTHETIC ESTIMATES OF LENGTH. Psychon. Sci., Aug. 1966, 5(10), 377-378. (Indiana University, Bloomington, Ind.).

22 students made magnitude estimates of the lengths of rods held between their index fingers (haptic condition) and also estimates of the separation of their index fingers without the rods present (kinesthetic condition). The rods ranged in length from 0.70 to 33 in. increasing in length by approximately equal logarithmic steps. The exponents of the power functions for magnitude estimates of length under haptic and kinesthetic conditions were 1.05 and 0.94 respectively.
R 7

29,784
Mayzner, M.S., Tresselt, M.E., Adler, S., Cohen, A., et al. SHORT-TERM RETENTION OF DIGITS: A FUNCTION OF ITEM DISTRIBUTION WITH RESPECT TO TIME. Psychon. Sci., Aug. 1966, 5(10), 403-404. (New York University, New York, N.Y.).

In the present study 20 single digits were presented sequentially during a 40 sec. display period and 5 conditions of input timing distributions were examined, employing a computer-based CRT display system. In 1 condition the 20 digits were distributed evenly through time at a rate of 2 sec. per digit. In the other 4 conditions the 20 digits were presented at a rate of 1 sec. per digit and the remaining 20 sec. was distributed in various ways throughout the total 40 sec. display period. The results showed very significant effects as a function of varying the input timing distributions and plots of the serial position curves revealed a highly systematic multi-bowing effect which strongly suggests that input "chunking" is time-locked to input timing distributions.
R 5

29,785
Grier, J.B. REACTION TIME TO "TONE-OFF". Psychon. Sci., Aug. 1966, 5(10), 385-386. (Northern Illinois University, De Kalb, Ill.).

15 college students gave reactions to both the onset and end of a 1000 cps tone. After a few initial trials in which the Ss seemed to be adjusting to the novelty of responding at a signal's end, reaction times were significantly shorter to the end of the tone than to its onset.
R 4

29,786
Miller, Louise B. THE INFLUENCE OF NKOR, SEX, AND TASK ON VISUAL PATTERN DISCRIMINATION. Psychon. Sci., Aug. 1966, 5(12), 459-460. (University of Louisville, Louisville, Ky.).

College students learned 2 visual discriminations, one designed to be easier for males, and one designed to be neutral in difficulty for the sexes. One group learned in the typical "be correct" situation, with knowledge-of-results (KOR) on each trial. The other group learned to "be consistent" with no KOR (NKOR). KOR was not helpful, and results suggested that it may be detrimental when the task is difficult and consists primarily of perceptual differentiation.
R 7

29,787
Moray, N. CULTURAL DIFFERENCES IN STATISTICAL APPROXIMATIONS TO ENGLISH. Psychon. Sci., Aug. 1966, 5(12), 467-468. (University of Sheffield, Sheffield, England).

The relatively small amount of material which has been prepared for use in experiments on statistical approximations to English means that there may be marked differences in its statistical properties from one sample to another. The present paper investigates the relation between the source of the sample and the amount of repetition which occurs at any leve of approximation, showing marked disparities between American and English samples.
R 6

29,788
Wilkinson, R.T., Edwards, R.S. & Haines, E. PERFORMANCE FOLLOWING A NIGHT OF REDUCED SLEEP. Psychon. Sci., Aug. 1966, 5(12), 471-472. (Applied Psychology Unit, MRC, Cambridge, England).

6 Ss worked a full day, mainly on vigilance and calculation tests, for 2 successive days in each of 6 successive weeks. On the preceding nights they were allowed 0, 1, 2, 3, 5, or 7 1/2 hr. sleep varying according to the week of testing. Less than 5 hr. sleep on a single night impaired vigilance; less than 3 impaired calculation.
R 9

29,789
Dember, W.N. & Nelberg, A. INDIVIDUAL DIFFERENCES IN SUSCEPTIBILITY TO VISUAL BACKWARD MASKING. Psychon. Sci., Sept. 1966, 6(2), 49-50. (University of Cincinnati, Cincinnati, Ohio).

This study investigated the reliability of individual differences in susceptibility to visual backward masking. 17 college students were assigned "maskability" measures derived from data collected 2 days apart. Depending on the measures used, the rank order correlation between the 2 sets of measures varied from .79 to .92, indicating highly reliable individual differences.
R 2

29,790
Nosanchuk, T.A. & Hare, R.D. WORD-RECOGNITION THRESHOLD AS A FUNCTION OF PRETEST SENSITIZATION. Psychon. Sci., Sept. 1966, 6(2), 51-52. (University of British Columbia, Vancouver, British Columbia, Canada).

The hypothesis that the administration of a questionnaire sensitizes a respondent to relevant issues and concepts was examined. Ss presented with information in the form of a questionnaire were found to have lower word-recognition thresholds to related concepts than did Ss who had been presented with the same information in statement form, thus supporting the hypothesis.
R 5

29,792
Suboski, M.D. BISENSORY SIGNAL DETECTION. Psychon. Sci., Sept. 1966, 6(2), 57-58. (Indiana University, Bloomington, Ind.).

In an experiment comparing unimodal with bimodal signal detection, groups of Ss performed a 4-alternative spatial forced-choice visual and a "yes-no" auditory task either singly or simultaneously. The results were a significant decrement in bisensory visual discriminability and a comparable decrement in bisensory auditory performance, with little evidence for other interactions between tasks.
R 12

29,793
Loeb, M., Behar, I. & Warm, J.S. CROSS-MODAL CORRELATIONS OF THE PERCEIVED DURATIONS OF AUDITORY AND VISUAL STIMULI. Psychon. Sci., Sept. 1966, 6(2), p87. (USA Medical Research Lab., Fort Knox, Ky.).

Ratings of duration were obtained for auditory and visual signals ranging from 1 to 5 sec. The inter-modal correlations were moderately large and of an order of magnitude comparable to the intra-modal correlations. Results were considered to support the notion of mechanisms for judgment of time common to various sensory modalities.
R 8

29,794
Pappas, B.A. & Suboski, M.D. RECOGNITION OPERATING CHARACTERISTICS AS A FUNCTION OF PRIOR RECALL CONFIDENCE. Psychon. Sci., Sept. 1966, 6(2), 83-84. (Queen's University, Kingston, Ontario, Canada).

Ss rated their confidence in the correctness of their response in a recall-recognition RTT paired-associates paradigm. For items correct on T_1, T_2 recognition operating characteristics (ROC) showed increasing recognition accuracy as a function of T_1 confidence. Items incorrect on recall produced an ROC indicating nonrandom performance on T_2. The results are interpreted as opposing an all-or-none theory of paired-associates learning.
R 7

29,795
Dansereau, D.F. & Gregg, L.W. AN INFORMATION PROCESSING ANALYSIS OF MENTAL MULTIPLICATION. Psychon. Sci., Sept. 1966, 6(2), 71-72. (Carnegie Institute of Technology, Pittsburgh, Penn.).

A difficulty factor based on a count of the subprocesses normally involved in "paper and pencil" multiplication (e.g., "multiply," "add," "carry," and "hold") was found to be highly correlated with the solution times of problems solved mentally. Time for solution appeared to be independent of whether the S did the problems silently or aloud.
R 5

29,796
Baird, J.C. EFFECTS OF STIMULUS-NUMEROSITY UPON DISTANCE ESTIMATES. Psychon. Sci., Oct. 1966, 6(4), 133-134. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

A psychophysical approach was used to evaluate the results of reducing the number of stimuli in the visual field upon distance estimates. It was expected that decreases in numerosity would be accompanied by decreases in the magnitude of distance estimates. Numerosity reduction did have a slight but significant effect in the expected direction.
R 5

29,797
Baird, J.C. EFFECTS OF STIMULUS-HETEROGENEITY UPON DISTANCE ESTIMATES. Psychon. Sci., Oct. 1966, 6(4), 135-136. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

This study evaluated the result of a reduction in the number of types of stimuli (heterogeneity) in the visual field upon distance estimates. Heterogeneity reduction led to significantly shorter distance estimates when a standard consisted of unequal numbers of stimulus-types, but not when they were equally represented.
R 2

29,798
Shaffer, Olivia & Wallach, H. ADAPTATION TO DISPLACED VISION MEASURED WITH THREE TESTS. Psychon. Sci., Oct. 1966, 6(4), 143-144. (Swarthmore College, Swarthmore, Penn.).

Adaptation to laterally displacing prisms was produced by walking a narrow hallway for 1/2 hr. 3 tests given before and after adaptation showed a significant adaptation effect. Pointing to a visual target and pointing straight ahead in darkness showed apparently equal adaptation, while a visual forward direction test measured a smaller effect.
R 5

29,799
Dunn, B.E. SOME GEOMETRIC BASES FOR PERCEIVED SLANT. Psychon. Sci., Oct. 1966, 6(4), 147-148. (University of Calgary, Calgary, Alberta, Canada).

Fifty-seven trapezoids varying along dimensions of length, height, and shape were presented to 16 Ss. Each S estimated the slant of the stimulus in 3 dimensions which produced each trapezoidal 2-dimensional projection. A multiple regression equation was derived from the data showing that the perceived slant around a vertical axis was a function of the difference between the width of the long vertical end and the short vertical end, the length of the stimulus and RMH. Other possible formulations were discussed.
R 11

29,800
Ball, T.S. & Wilsoncroft, W.E. COMPLEX STIMULI AND APPARENT MOTION. Psychon. Sci., Oct. 1966, 6(4), 187-188. (Pacific State Hospital, Pomona, Calif.).

A novel type of apparent motion was encountered when Ss were shown a single light alternating with 4 other lights arranged in the form of a diamond. Ss reported the loss of one light in the array as the entire diamond form appeared to move back and forth.
R 4

29,801
Williams, Maureen Y., Ross, J. & Di Lollo, V. SENSORY CONTRAST EFFECTS IN THE JUDGMENT OF LIFTED WEIGHTS. Psychon. Sci., Oct. 1966, 6(4), 137-138. (University of Western Australia, Perth, Australia).

Contrast effects based on changes in the sensory characteristics of lifted weights were demonstrated. 2 groups of 10 Ss were trained to select 3 reference weights. Ss then lifted either a heavy "shift" series (Group H) or a light "shift" series of weights (Group L), and were then required to reproduce the original reference weights. After the shift Group H selected heavier weights and Group L lighter weights than in the pre-shift settings.
R 5

29,802
Bieri, J., Kujala, K. & Atkins, A.L. STIMULUS SALIENCY AND ANCHORING: TEMPORAL AND END STIMULUS EFFECTS. Psychon. Sci., Oct. 1966, 6(4), 145-146. (University of Texas, Austin, Tex.).

Two characteristics considered to influence the saliency of an anchor stimulus are its natural end stimulus quality and its temporal relation to the target stimulus. Using physical and social continua which differed in these respects, greater anchoring effects were observed when more salient anchors were used.
R 5

29,803
Braud, W.G. & Holborn, S.W. TEMPORAL CONTEXT EFFECTS WITH TWO JUDGMENTAL LANGUAGES. Psychon. Sci., Oct. 1966, 6(4), 151-152. (University of Iowa, Iowa City, Iowa).

One hundred forty-four Ss judged the durations of 5-sec. test tones after pre-exposure to either long (30 sec.), short (0.5 sec.), or no pretraining tones. Half of the Ss made duration judgments in terms of a "situationally relative, novel, arbitrary, and restricted" 7-point rating scale; half of the Ss estimated durations directly in seconds--a well-practiced, "absolute, extensive, and extra-experimentally anchored" judgmental language. Direct estimation in seconds did not show temporal contrast effects, while judgments in terms of the rating scale did show such effects. It was suggested that these effects were not perceptual, but were contributed by a semantic or linguistic process operative in the rating situation but not in the direct estimation task.
R 3

29,804
Oiman, R. FAST GUESSES IN CHOICE REACTION TIME. Psychon. Sci., Oct. 1966, 6(4), 155-156. (University of Pennsylvania, University Park, Penn.).

A model which describes the effect fast guesses must have on observable choice latencies and probabilities is developed, strengthened, and tested with encouraging results. With the model, it is possible to estimate "true" decision times and probabilities without requiring error-free performance in discriminative reaction time.
R 1

29,805
Nishisato, S. REACTION TIME AS A FUNCTION OF AROUSAL AND ANXIETY. Psychon. Sci., Oct. 1966, 6(4), 157-158. (McGill University, Montreal, Quebec, Canada).

In a visual discrimination task the S's momentary arousal, reflected by spontaneous changes in skin potential (GSR), contributed significantly to the intra-individual fluctuation of reaction time; chronic anxiety level, measured by an inventory scale, contributed significantly to inter-individual fluctuation. Both high anxiety and arousal were associated with longer reaction time. The present negative relation between response speed and GSR arousal and the previously reported positive relation between response speed and EEG desynchronization may result from different phases of arousal.
R 4

29,806
Rydberg, S., Kashdan, R. & Trabasso, T. RECORDING OF TACTILE OBSERVING RESPONSES FOR THE STUDY OF SELECTIVE ATTENTION. Psychon. Sci., Oct. 1966, 6(4), 197-198. (University of California, Los Angeles, Calif.).

Apparatus is described, complete with circuit diagram, which provides continuous measurement of selective attention to spatially separate, tactile stimuli. Tactile and other responses to physical objects are recorded electrically. This permits direct observation of each observing response throughout the duration of a trial. An ink-on-paper record yields types, durations, frequencies, patterns, latencies and correctness of responses. This device has potential usage in both learning and psychophysical experimentation, particularly on the direction and/or degree of attention. Some preliminary data in a discrimination learning task are given which show that Ss spend less time touching irrelevant stimuli near terminal learning.
R 1

29,807
Sulzer, J.L. & Levy, C.M. GOAL AND ERROR TRAINING METHODS IN THE LEARNING OF A POSITIONING RESPONSE. Psychon. Sci., Oct. 1966, 6(4), 179-180. (Newcomb College, Tulane University, New Orleans, La. & University of Florida, Gainesville, Fla.).

Three hundred twenty Ss were given 2 Training trials with one of 3 Goal Training Methods or 5 Error Training Methods prior to 6 Test trials with no IF. The Error trained Ss performed consistently worse during Testing, suggesting that the widely used Error Training techniques are not necessarily the most efficacious.
R 5

29,808
Miller, Louise B. LEARNING A VISUAL PATTERN DISCRIMINATION WITH, AND WITHOUT, KOR. Psychon. Sci., Oct. 1966, 6(4), 199-200. (University of Louisville, Louisville, Ky.).

Using the differential method, 168 college students learned 2 visual pattern discriminations of equivalent difficulty--one under a no knowledge-of-results (NKOR) condition and one with knowledge-or-results (KOR) for correct responses. Ss required more trials in the KOR condition than in the NKOR condition on the first task. KOR by Order was significant at the .001 level. Males were more adversely affected than females, although the patterns were previously established as equivalent in difficulty for the sexes. KOR by Sex was significant at the .025 level. Results are discussed in terms of the nature of the task and transfer effects.
R 7

29,809
Petre, R.D. & Galloway, C. THE EFFECTS OF COMPETITION AND NONCOMPETITION ON PERFORMANCE OF A MOTOR TASK. Psychon. Sci., Aug. 1966, 5(10), 399-400. (University of Kansas Medical Center, Lawrence, Kan.).

3 male adults participated in a study of the effects of competition on a complex motor skill which had been acquired to a high level of proficiency. Each S served as his own control under a noncompetition condition and then competed with each of the other 2 Ss. A very significant ($p<.001$) performance decrement occurred; however, certain factors other than competition could be partially responsible.
R 3

29,810
Lundstedt, S. INTERPERSONAL RISK THEORY. J. Psychol., Jan. 1966, 62(First Half), 3-10. (Psychology Dept., Western Reserve University, Cleveland, Ohio).

The willingness of an individual to give away personal influence and control is an important and basic social process. This special form of social interaction and exchange underlies many other basic forms of social behavior, such as socialization, leadership, superior-subordinate relations, and the traditional social contact. Former concepts which described this social behavior were noted to be somewhat tautological. An alternate theory based on the concept of interpersonal risk (IR) is offered instead to reduce the need to use such terms as trust, confidence, reliance, and dependence, in propositions which explain the process of giving away personal influence and control over others. IR theory utilizes the framework of decision theory and applies it to this particular form of social interaction.
R 13

29,811
King, H.E. THE RETENTION OF SENSORY EXPERIENCE: V. VARIATION OF THE STANDARD STIMULI. J. Psychol., Jan. 1966, 62(First Half), 15-22. (Western Psychiatric Institute & Clinic, University of Pittsburgh, Pittsburgh, Penn.).

The accuracy with which human subjects can reproduce sensory experiences of brightness, flash-rate, loudness, pitch, and duration has been observed for systematically varied stimulus values. Standard stimuli, chosen from the middle portion of their possible ranges, were matched by the method of successive comparison by manual adjustment of variable stimuli following one minute of delay. The matches made to original (standard) stimuli methodically reflected their original value for all sensory dimensions explored. The uniformity and accuracy observed in matching graded stimuli are taken to be alternate expressions of basic human ability to retain and reapproximate a variety of sensory values experienced only briefly and under controlled laboratory conditions.
R 8

29,812
Teichner, W.H. & Price, Leah M. EYE AIMING BEHAVIOR DURING THE SOLUTION OF VISUAL PATTERNS. J. Psychol., Jan. 1966, 62(First Half), 33-38. (Tufts University, Medford, Mass. & Harvard University, Cambridge, Mass.).

Although there are available a fairly large number of eye-movement studies and quite a large number of problem-solving and concept-formation studies, there seem to be no experiments in which eye-movement data were obtained while the subject (S) was presented with a specific problem requiring the development of a unique concept. The intention here was to obtain a first set of data of this sort and with it to explore the usefulness of the general approach. The problems used were 12 letter sequence: 4 easy, 4 moderate, and 4 difficult. S's task was to supply the letter that would appear next if the sequence were extended; 3 experimental conditions were tested: unlimited time, mild speed stress, blur with unlimited time. Polaroid photographs using the Mackworth Eye Camera were obtained. Measures used were number of fixations, distances between fixations, and runs. A very consistent result was the finding of more forward than backward movements in the first five seconds and more backward than forward ones in the second five seconds. The results suggest a narrowed attentional field and a heightened attention to detail with slight blurring and with mild speed stress. They suggest the same process as associated with correct solutions even in the absence of stress. The results also suggest a systematic change in the problem-solving strategy from information-gathering in the early time period to memory-refreshing and verification in the later one.
R 4

29,813
Ward, R.J., Powell, E.J., Schorzman, M.H. & Benveniste, R.J. AN EVALUATION OF HUMAN PERFORMANCE DURING EXPOSURE TO ELEVATED HEAT AND HUMIDITY. J. Psychol., Jan. 1966, 62(First Half), 83-87. (Anesthesiology Dept., University of Washington School of Medicine, Seattle, Wash.).

Forty-four soldiers participated in an evaluation of performance during exposure to increased heat and humidity. Determination of performance capability was made by measuring the flicker-fusion frequency (FFF) of each subject. FFF was chosen because it is an accurately measurable indicator of cerebral function. It is independent of the IQ. Subjects were initially tested under comfortable environment conditions. Group I (15 subjects) and Group II (14 subjects) were placed for 3 hours in a room with a temperature of 82°F and 70 per cent relative humidity. At the end of 2 hrs., Group I subjects were given an unannounced difficult civics test and told that the results of the test would be important to them. At the end of the third hour, the final FFF was measured in both groups. Group III was given the same unannounced civics test, but in a room with normal temperature and humidity (74°F and 40 per cent humidity). Group I had a mean FFF decrease of 2.03 fps. Group II had a mean FFF decrease of 1.29 fps. Group III had a mean FFF decrease of .57 fps. It is concluded that one's mental capabilities are blunted by mental stress and hot, humid environmental conditions. This blunting exceeds that found after medication with commonly prescribed soporifics. The adverse environmental conditions themselves caused moderate depression of function. Mental stress alone caused clinically insignificant depression of function.
R 17

29,814
Plutchik, R. & Bender, H. ELECTROCUTANEOUS PAIN THRESHOLDS IN HUMANS TO LOW FREQUENCY SQUARE-WAVE PULSES. J. Psychol., March 1966, 62(Second Half), 151-154. (Psychology Dept., Hofstra University, Hempstead, N.Y. & Matrix Corporation, Arlington, Va.).

This study obtained electrocutaneous pain thresholds for stimuli in the range of 1-15 pulses/sec (pps). Pulse trains were 5 sec. long and rest intervals were 30 sec. long with rates of 1, 3, 6, 10, and 15 pps. Twenty college students served, 10 males and 10 females. S reported the stimulus as "just noticeably unpleasant or painful" -- the latter was taken as the pain threshold. Males have a consistently higher pain threshold for all rates. The threshold is highest at 1 pps and gradually decreases; the slope of the curve suggests this trend continues at rates greater than 15 pps. The implication here is that the threshold is not determined by the energy in a single pulse but by some function of pulse height, duration, and repetition rate.
R 11

29,815
Judy, C.J. POTENTIAL VALUE OF EDUCATIONAL BACKGROUND DATA IN THE SELECTION AND CLASSIFICATION OF MILITARY PERSONNEL. J. Psychol., March 1966, 62(Second Half), 195-200. (USAF Personnel Research Lab., Lackland AFB, Tex.).

Correlational techniques were used to examine the relationships between selected educational background variables and final school grade in five technical courses conducted for Air Force student officers. The conclusion was reached that the relationships are high enough to demonstrate the general usefulness of background information on college education for predicting technical school performance, and the the validity of educational information may be expected to approach or surpass that which can be demonstrated for a current selection and classification test.
R 3

29,816
Stewart, D.K. A NOTE ABOUT COMMUNICATION RESEARCH. J. Psychol., March 1966, 62(Second Half), 201-203. (Research Dept., Campbell-Ewald Company, Detroit, Mich.).

This note is concerned with the direction of communication research today-- its trend away from the products of the communication process itself, viz., ideas and meanings. That communication entails the existence of some physical symbol complex, its intended meaning, and some mind interpreting that complex, is one of the scientific laws governing communication research. Any psychological explanation of communication lies in the logical conjunction of true propositions explicating such relations.
R 7

29,817
Haines, R.F. & Bartley, S.H. A STUDY OF CERTAIN VISUAL EFFECTS OCCASIONED BY FACTORS OF SO-CALLED GLARE. J. Psychol., March 1966, 62(Second Half), 255-266. (Psychology Dept., Michigan State University, East Lansing, Mich.).

A small target moving in the frontal plane was made to disappear and reappear by passing it behind a larger fixed target of much greater luminance. The angular positions at which this disappearance and reappearance occurred were measured. These positions indicated that the fixed target was, in effect, larger than physical measurements of it would signify. Since a luminous target casts not only its expected image upon the retina but also a tapering amount of stray illumination, this stray illumination makes a target image a tapered rather than an abrupt affair and covers a greater retinal area than expected. The moving images of other less intense targets, as they approach the peripheral region of the taper of the fixed target, may be obscured just as when they fall nearly at its center. Hence, objects producing these images may be made to disappear and reappear at positions over a greater angular extent in the frontal plane than otherwise expected. This was found to be the case in the present investigation. Three levels of intensity for the fixed retinal image were used, and the positions of disappearance and reappearance were different for each, in the way expected.
R 17

29,818
Teichner, W.H. & Sadler, E. LOUDNESS ADAPTATION AS A FUNCTION OF FREQUENCY, INTENSITY, AND TIME. J. Psychol., March 1966, 62(Second Half), 267-278. (Psychology Dept., Tufts University, Medford, Mass. & Autonetics, North American Aviation, Inc., Anaheim, Calif.).

The method used did not provide results in agreement with previous studies. In contradiction to these studies, intensity did not affect the amount of adaptation obtained; frequencies above 1000 cps (cycles per second) did affect adaptation; adaptation was complete within .25 minutes and the amount of adaptation obtained was relatively small. It was demonstrated, however, that loudness was the basis of the judgments made and that the amount of adaptation is independent of whether the subject makes equal-loudness settings or double-loudness settings.
R 17

29,819
Schneider, C.W. & Bartley, S.H. CHANGES IN SENSORY PHENOMENA AND OBSERVER CRITERIA AT LOW RATES OF INTERMITTENT PHOTIC STIMULATION. J. Psychol., May 1966, 63(First Half), 53-66. (Psychology Dept., Michigan State University, East Lansing, Mich.).

The present paper points out the fact that as the rate of intermittent photic stimulation is reduced from CFF to the point at which each member of the train of pulses is greatly enough separated from the others temporally to function as an isolated single pulse, the target changes its appearance in a marked way. This whole span can be divided into several ranges. All frequencies above, let us say, approximately 8 or 10 pulses per second, produce fields which possess either a perfectly steady brightness or a steady brightness component predominant enough to enable comparison in brightness with a field produced by a continuous, uniform photic imput. But, as frequencies drop below the range just mentioned, various changes occur in what is seen. These changes disenable the kind of direct comparison just indicated. From this point on, as frequency is reduced, the observer uses either the bright phase of the cycle or attempts to "average" the values of the two phases, in attempting to find some brightness in the intermittent field to match to the steady field. This "averaging" is not a direct sensory observation but a kind of judgment, and thus at low frequencies a vascillation between two operations occurs. This paper also discusses the consequences of not recognizing the fact that more than one major phenomenon is involved in the intermittency span. Such consequences include the misinterpretation of brightness results and and the unfounded criticism of the brightness enhancement theory put forth to account for brightness enhancement and related phenomena.
R 31

29,820
Gengerelli, J.A. & Parker, C.E. SPECTROGRAPHIC ANALYSIS OF ELECTROENCEPHALOGRAMS UNDER CONDITIONS OF ALERTNESS AND RELAXATION. J. Psychol., May 1966, 63(First Half), 67-72. (Psychology Dept., University of California, Los Angeles, Calif.).

Analyses of human EEGs were made with a spectrum analyzer under conditions of perceptual alertness and of relaxation. The range of frequency components studied was from zero to 30 cps. Comparison of the spectrograms obtained under the two conditions showed a marked diminution in the amplitude of frequency components below 15 cps, but no increases anywhere in the spectrum. In some subjects, there was diminution in amplitude in the high frequency components also, but this change was quite small.
R 7

29,821
Le Furgy, W.G. THE INDUCTION OF ANCHORING EFFECTS IN ABSOLUTE JUDGEMENTS THROUGH DIFFERENTIAL REINFORCEMENT. J. Psychol., May 1966, 63(First Half), 73-81. (Child Development & Family Relationships Dept., Cornell University, Ithaca, N.Y.).

Thirty female undergraduate Ss were exposed to a series of 15 circles of increasingly different diameters. For the two experimental groups, the 5 circles at each end of the continuum were given affective connotations through a process of differential reinforcement. Subsequently, the 15 original stimuli plus 14 intermediate stimuli were judged by the method of single stimuli. The results showed that, relative to a control group, the experimental Ss tended to shift their response scales in the direction of the positively reinforced segment of the continuum, with regard to both response frequency and size estimation.
R 11

29,822
Talland, G.A. VISUAL SIGNAL DETECTION, AS A FUNCTION OF AGE, INPUT RATE, AND SIGNAL FREQUENCY. J. Psychol., May 1966, 63(First Half), 105-115. (Psychiatry Dept., Harvard University Medical School, Boston, Mass.).

Men aged between 20 and 69 years were tested for accuracy in signal detection in a visual search task over periods of 30, 36 or 48 minutes. Ss had to press a key whenever the digit 4 appeared in a display that changed continuously and showed randomly varied patterns of 9 or fewer digits. Displays remained in view for one of 3 intervals and changed irregularly, at one of 3 mean rates. One-fifth of displays contained the digit four. At the mean rates of 54 or 27 displays per minute performance did not change progressively with age up to 60 years. At a mean rate of 109 displays per minute errors of omission increased stepwise with each successive decade between the 20's and 60's. Errors by incorrect response did not show a systematic trend with age. The aging effect observed is attributed to a slowing down of scanning and decision processes which match the incoming message with a model. Performance tended to improve from the initial to the final phase, but this effect did not hold up with age. Increased signal frequency as well as a higher rate of event change reduced accuracy at all ages. Performance at the fast rate exerted a favorable delayed effect on signal detection at a slower rate with the younger and middle aged Ss; performance at the slowest rate showed an adverse delayed effect. These observations are considered in relation to expectancy and arousal theories of vigilance.
R 13

29,823
Simkins, L. EFFECTS OF STIMULUS CONDITIONS AND RESPONSE CONTINGENCIES ON THE DEVELOPMENT AND MAINTENANCE OF A PERCEPTUAL DISCRIMINATION. J. Psychol., July 1966, 63(Second Half), 201-218. (Psychology Dept., University of Missouri, Kansas City, Mo.).

The purpose of this study was to determine the effects of 2 classes of variables that may be associated with the development and maintenance of a perceptual discrimination. The 2 classes of variables were stimulus cues and response consequences. There were 3 phases in this experiment: base-line, discrimination, and extinction. Each subject participated in all 3 phases. The perceptual discrimination task consisted of presenting random patterns of lights that also varied in number. The S had to learn to make a discrimination based on the number of lights presented. One purpose of this study was to determine what effect a history of presence or absence of lights and certain response consequences would have on the rate of acquisition of a subsequent perceptual discrimination. The behavioral history was referred to as the baseline phase in this study. During the baseline phase the Ss' response contingencies were independent of the number of lights presented. The purpose of the second or discrimination phase was to determine the effects of 4 different combinations of response consequences on the development of the perceptual discrimination. During this phase the response consequences were contingent on the number of lights presented to the subject. During the 3rd or extinction phase the response contingencies were withdrawn and the purpose was to determine what effects the baseline and discrimination conditions had on the maintenance of the perceptual discrimination. The results indicated that baseline stimulus conditions (lights vs. no lights) affected rates of response during discrimination but did not have significant effects on error reduction or on the extinction phase performance. The response contingencies programmed during the discrimination phase accounted for the major differences in performance during both the discrimination and the extinction phases.
R 11

29,824
Bartley, S.H. A COMPARISON BETWEEN CERTAIN RETINAL AND CORTICAL ACTIVITIES UNDERLYING VISION. J. Psychol., July 1966, 63(Second Half), 275-286. (Psychology Dept., Michigan State University, East Lansing, Mich.).

The foregoing studies have served pretty well to isolate and compare one of the essential differences between retinal and cortical activity. While both systems are flexible enough to manifest quite varied reactions or activities, they both display certain characteristics which when examined serve to explain the kinds of results obtained in neurophysiological records and visual observation itself. The present paper has demonstrated some of these characteristics. In general, it appears that the elements of the retina under undisturbed conditions are not continuously active and inclined toward repetiveness, whereas certain elements of the cortex involved in the response to imputs via the optic nerve are repetitive. This very difference seems to go a long way in accounting for the differences in the records obtained from retina and cortex. The discussion of these results has included some indication of what might be expected of visual observation under similar imput conditions. These expectations and the findings seem to agree pretty well.
R 27

29,826
King, H.E. THE RETENTION OF SENSORY EXPERIENCE: VI. STIMULUS REPETITION AND INTERFERENCE EFFECTS. J. Psychol., Sept. 1966, 64(First Half), 59-61. (University of Pittsburgh School of Medicine, Pittsburgh, Penn.).

As none of the main conditions explored produced a reliable difference in matching performance, the series as a whole may be summarized readily: neither repeated exposure to a standard tone stimulus, nor the interposing of irrelevant sound during delay to reproduction, exerted noticeable influence on judgments of matched equivalence made after brief delay. Stated positively, these findings are in harmony with conclusions drawn in earlier experimentation with sensory retaining. That is to say, the accuracy with which simplified sensory percepts can be reproduced following brief or prolonged delay--viz., brightness, flash-rate, visual duration, and the like has been shown to have its counterpart in the high degree of accuracy with which varied values of such standard stimuli can be matched following short delay. The findings of the 2 current experiments, although they represent a limited sampling only, would seem to indicate that the firmness of the "trace," or strength of the original impression, is such that it is expressed also in its resistance to influences that might be thought to either aid (repetition) or hinder it (interference). The opposing trends observed for conditions of high or low tone interference compared with white noise interposition may reflect the different anchoring influence of sound-tone as against sound-noise: i.e., the interference effect of a sound with "meaning" (another pitch that relates to the identifiable pitch of the standard stimulus) as opposed to a sound stimulation with less identifiable "meaning" (white noise being a wide-frequency sound spectrum). This possible difference in anchoring interference in sensory-retaining, for the present experiments serve more as a sample or guide to the interactions that may occur than as a broad scale demonstration of effect.
R 5

29,827
Stewart, D.K. COMMUNICATION AND MEANING. J. Psychol., Sept. 1966, 64(First Half), 95-100. (Campbell-Ewald Company, Detroit, Mich.).

"Meaning" is analyzed as the experience of order. The "experience" is strictly psychological, the "order" is strictly ideational. "Meaning" therefore, refers to a specific disposition of mind wherein certain of its ideas exist in harmonious juxtaposition to each other. Only ideas are the objects of meaning. Physical phenomena, such as words, cannot be meaningful per se. "Meaning" is a distinctly human property, a mind property; and the attribution of this property to physical phenomena can result in research that is irrelevant to the objective of human communication. Only ideas can provide meaning, and no single idea is meaningful in itself. This conjunction says that whereas ideas are the objects of meaning, meaning is not a property of those ideas. Rather, it is the case that meaning is a function of the mind having ideas as arguments. In other words, there are no "meaning" ideas per se. A given set of ideas does not "view" itself as being in a "meaning" disposition. "Meaning" is a product of two or more ideas existing in harmonious juxtaposition to each other. The fact of their existence in harmony is what is meaningful. But "meaningful" to what? To the mind. According to the hypothesis offered here, the term "meaning" is another way to talk about the ability of the mind to juxtapose its ideas. Sometimes these juxtapositionings are harmonious (meaningful) and sometimes they are not.
R 8

29,828
Baer, D.J. HEIGHT, WEIGHT, AND PONDERAL INDEX OF COLLEGE MALE SMOKERS AND NONSMOKERS. J. Psychol., Sept. 1966, 64(First Half), 101-105. (Psychology Dept., Boston College, Boston, Mass.).

A sample of 143 Heavy Smokers, 106 Light-Moderate Smokers, 32 Former Smokers, and 124 Nonsmokers was compared to their body height, weight, and ponderal index. Although no differences were found among the groups in their weight and ponderal index, Heavy Smokers were significantly taller (.05 level) than the other three groups. Former Smokers were one-half inch shorter, while Heavy Smokers were one-half inch taller than Light-Moderate Smokers and Nonsmokers. Univariate as well as multivariate statistical procedures revealed similar outcomes.
R 11

29,829
Gibson, J.J. THE PROBLEM OF TEMPORAL ORDER IN STIMULATION AND PERCEPTION. J. Psychol., March 1966, 62(Second Half), 141-149. (Graduate Psychological Labs., Cornell University, Ithaca, N.Y.).

The concept of memory in its relation to perception is a muddle. If we accept the fact of sequential perception, rejecting the fiction of momentary pattern-perception, matters become more intelligible, If perception involves the apprehension of a changing world, not a frozen one, the problem is that of detecting invariants under transformation. The permanence can be isolated just because the perspectives change. The latter do not have to be stored up and put together in a composite. The mechanism of perceptual learning is one in which the nervous system resonates to the invariants of the stimulus flow, as Lashley suspected, not one of storage and retrieval of engrams. The recalling of the past, the capacity (in some persons) to summon memory images into consciousness, may well be a quite incidental accompaniment of learning, not its basis.
R 8

29,830
Castore, C.H. & Streufert, S. THE PERCEPTION OF EXPERIMENTALLY INDUCED FAILURE. Psychon. Sci., Feb. 1966, 4(4), 137-138. (Rutgers, The State University, New Brunswick, N.J.).

A simulated decision making environment was used to examine the relationship between experimentally induced failure and Ss perceptions of success and failure. The obtained relationship between induced and perceived failure was generally linear, with a significant higher order trend. The implications of these findings for homeostatic and adaptation level theories of perception are considered.
R 14

29,832
Cole, M., Keller, L. & Korzh, Nina N. SOME CROSS-CULTURAL DATA ON PROBABILITY LEARNING. Psychon. Sci., Feb. 1966, 4(6), 211-212. (Yale University, New Haven, Conn.).

Extended training in a probability learning task was given to 17 Ss from 2 non-western cultures. Ss came from Moscow University, USSR and Cuttington, Liberia, a small rural African town. Long-term probability matching was obtained in both groups. However, the trial-to-trial changes in response proportions varied markedly between groups; Liberian Ss tended to follow the reinforcing events, while responses by the Russian Ss depended more heavily on their own preceding responses. Some negative recency effect was obtained for both groups. This effect decreased somewhat over trials, but was still present at the termination of training.
R 3

29,833
Bower, G.H. PROBABILITY LEARNING OF RESPONSE PATTERNS. Psychon. Sci., Feb. 1966, 4(6), 215-216. (Stanford University, Stanford, Calif.).

A 4-light, 4-key probability learning task was altered by having S predict which 2 of the 4 lights would occur each trial. The question is whether S's habit hierarchy is best represented as composed of 4 single-key habits from which 2 responses are successively selected, or composed of 6 unitary response-pair habits from which 1 pair is selected per trial. The data favor the latter representation, since the asymptotic proportions of response pairs matched the corresponding light-pair probabilities.
R 2

29,834
Dorfman, D.D. & Miller, R. THE EFFECT OF LIGHT ON SOUND INTENSITY GENERALIZATION AFTER TWO-STIMULUS DISCRIMINATION TRAINING. Psychon. Sci., April 1966, 5(10), 337-338. (San Diego State College, San Diego, Calif.).

This study determined if a sound intensity generalization gradient is displaced laterally if extraneous light intensity is changed from training to test after 2-stimulus discrimination training. The results agreed with previous studies on 3-stimulus discrimination training in that: a) when Ss were trained in the absence of a light, introduction of the light on generalization-test trials displaced the generalization gradient toward the weaker sound intensities; and b) when Ss were trained in the presence of a light, omission of the light on generalization-test trials displaced the gradient toward the larger sound intensities.
R 4

29,835
Lykken, D.T., Miller, R.D. & Strahan, R.F. GSR AND POLARIZATION CAPACITY OF SKIN. Psychon. Sci., April 1966, 4(10), 355-356. (University of Minnesota, Minneapolis, Minn.).

By applying a square voltage pulse to skin through GSR electrodes and observing the voltage waveform across a small series resistance, the conductivity of skin may be seen to decrease sharply (e.g., by 80% or more) during the first 50 to 500 μsec. to a steady-state or DC value. At the end of the pulse, a back polarization voltage may be observed across the skin, equal to, e.g., 80% of the pulse voltage and opposite in polarity. During the GSR this polarization voltage decreases, producing an increase in apparent DC conductance, while the initial peak conductance does not change. This indicates that the GSR involves a change in polarization capacity of some membrane(s) in the epidermis.
R 5

29,836
Binder, A. PROCESS OF COMPONENT AND PATTERN LEARNING. Psychon. Sci., April 1966, 4(12), 415-416. (New York University, New York, N.Y.).

The process of discrimination among stimuli on the basis of cue patterns or their partially relevant subsets was traced by independent tests spread over the course of learning. While the cue subsets seemed most important during early trials, the full patterns rapidly started dominating as discrimination accuracy on the basis of common subsets actually decreased.
R 1

29,837
Marlatt, G.A., Lilie, D., Selvidge, B.D., Sipes, M.D., et al. CROSS-MODAL GENERALIZATION TO TONE AND LIGHT IN HUMAN EYELID CONDITIONING. Psychon. Sci., May 1966, 5(2), 59-60. (Indiana University, Bloomington, Ind.).

Cross-modal generalization was examined with an experimental design permitting an assessment of non-associative factors. It was found that relative to Ss receiving the orthodox unimodal conditioned stimulus (CS) in extinction, cross-modal Ss demonstrated about 60% generalization. Furthermore, cross-modal conditioned responses (CRs) were significantly greater in frequency than those given by cross-modal non-associative control Ss given unpaired CS and unconditioned stimulus (US) presentations in acquisition.
R 8

29,838
Evans, S.H. & Edmonds, E.M. SCHEMA DISCRIMINATION AS A FUNCTION OF TRAINING. Psychon. Sci., July 1966, 5(8), 303-304. (Texas Christian University, Fort Worth, Tex.).

With knowledge of results Ss learned to distinguish between the presence and the absence of a schema and to distinguish between different schemata. Since a schema may be regarded as a statistical concept, the results also show that humans readily learn statistical concepts.
R 9

29,839
Pezzoli, Jean A. & Moore, J.W. CONDITIONED VESIBULAR SWAY AS A FUNCTION OF CS-UCS INTERVAL. Psychon. Sci., Aug. 1966, 5(12), 461-462. (University of Massachusetts, Amherst, Mass.).

Three groups of 18 human male Ss received vestibular sway conditioning at conditioned stimulus (CS)-unconditioned stimulus (UCS) intervals of .02, .5, or 2 sec. The 2 shorter intervals were most effective in combating various sources of CS-inhibition in the situation, but extinction in these groups was rapid.
R 4

29,841
Andreassi, J.L. SOME PHYSIOLOGICAL CORRELATES OF VERBAL LEARNING TASK DIFFICULTY. Psychon. Sci., Sept. 1966, 6(2), 69-70. (USN Training Device Center, ONR, Port Washington, N.Y.).

Eight Ss learned 3 lists of nonsense syllables (0%, 53% and 100% association value) on 3 successive days while several physiological variables were recorded. Ss showed significant increases in both palmar skin conductance and heart rate with the 100% list as compared with the 53% and 0% lists. These findings were interpreted in terms of greater degrees of physiological arousal during periods of superior performance.
R 5

29,843
Buckhout, R. & Grace, T. THE EFFECT OF FOOD DEPRIVATION AND EXPECTANCY ON HEART RATE. Psychon. Sci., Oct. 1966, 6(4), 153-154. (Washington University, St. Louis, Mo.).

Ss fasted for 24 hr. after being on a controlled diet. Group A expected to fast for 24 hr. and had HR measured with food cues present. Group B expected to fast for 36 hr. and were tested without food cues. At the 24 hr. mark, Group A showed significantly higher heart rate. It was concluded that significant HR arousal occurs in deprived human beings anticipating immediate satiation.
R 6

29,844
Fischer, Gloria J. ISOLATION AND PERCEPTUAL ORGANIZATION IN INCIDENTAL LEARNING. Psychon. Sci., Oct. 1966, 6(4), 141-142. (Washington State University, Pullman, Wash.).

When isolated by contrasting color and size, the middle syllable in a 9-item list was recalled more often in both intentional (INT) and incidental learning (INC). An isolation effect in INC also occurred at position 2, when items 2, 5 and 9 were isolated. None was found when items 4, 5, and 6 were isolated, but only in the latter condition did many Ss accurately perceive (describe) the objective list-structure. Those who did (in both INT and INC) subsequently recalled fewer syllables than Ss who had not grouped according to the objective visual structure. This was also the case for recall of isolated items only. Findings support an isolation effect in INC, but are not consistent with a Gestalt interpretation that isolation effects are contingent upon perception of structure or sub-structure engendered by visual isolation.
R 7

29,845
Hintzman, D.L. TABLES OF RANDOM LETTERS. Psychon. Sci., June 1966, 5(6), 253-254. (Stanford University, Stanford, Calif.).

2 tables of computer-generated random letters are presented. 1 consists of 2,000 random letters sampled "with replacement"; all 26 letters are equally likely at any given entry. The other consists of 100 random permutations of the 26 letters of the alphabet; sampling was "without replacement."

29,846
Botwinick, J. & Thompson, L.W. COMPONENTS OF REACTION TIME IN RELATION TO AGE AND SEX. J. genet. Psychol., June 1966, 108(Second Half), 175-183. (Medical Psychology Dept., Duke University, Durham, N.C.).

Reaction time was segmented into 2 component parts, premotor time and motor time. The reaction times and the components were analyzed in relation to 4 preparatory intervals within an irregular series and a regular series. These functions were then compared among subgroups comprising elderly males, elderly females, young adult males and young adult females. The reaction times were segmented by the method of Weiss. Electromyograms were recorded from the extensor muscle of the responding forearm during measurement of reaction time. The time between stimulus presentation and occurrence of increased muscle firing was the premotor time; the motor time was the reaction time minus the premotor time. Premotor times, motor times, and , therefore, reaction times were found to be slowed in advanced age. Interactions between age and sex were not significant ($p > .05$), indicating that whatever the antecedent mechanisms of the slowing process with advanced age may be, they may be the same for men and women.
R 10

29,847
Friedman, H. MEMORY ORGANIZATION IN THE AGED. J. genet. Psychol., Sept. 1966, 109(First Half), 3-8. (US Veterans Administration Hospital, Syracuse, N.Y.).

An attempt was made to comprehend the memory functioning of senescent subjects within the framework of a general developmental law that has proved useful in a study dealing with the structural aspects of visual perception in a similar population. The hypothesis was that healthy aged subjects, when compared to a matched group of young adult subjects, would function in terms of memory organization at a level that would reflect less differentiation and hierarchic integration than that possessed by the young adults. The expectation would then be that retention of presented material that exceeded an individual's capacity would be closer to such capacity level in a young adult group than would be the case in a group of aged subjects. All possible pairs of subjects, matched for sex and capacity level, were obtained from a pool of 13 young adult subjects, 20 to 34 years of age, and a pool of 14 healthy, active, aged subjects, 60 to 81 years of age. Three possible criteria for capacity level were determined, thus allowing for 3 sets of matched subjects with 9, 10, and 6 pairs respectively. Randomized alphabetic letters, 4 through 12 in a series length, were presented singly. Series lengths were also randomized and replicated twice to provide 36 series of letters. Upon completion of presentation, subjects were asked to repeat the letters verbally in order of presentation. Analyses of variance indicated that, regardless of criterion of capacity level used, the aged group performed significantly poorer than the young group when the individual capacity level was exceeded by 1 through 5 or 6 letters. The importance of the organizational factor was highlighted when the results were scored without concern for correctness of order and no statistically significant differences between groups were observed. The findings could then be understood within a genetic framework that can describe senescent memory functioning in terms of reversal in the developmental memory pattern with concomitant re-emergence of genetically lower levels of organization.
R 9

29,848
Kastenbaum, R. ON THE MEANING OF TIME IN LATER LIFE. J. genet. Psychol., Sept. 1966, 109 (First Half), 9-25. (Cushing Hospital, Framingham, Mass.).

This discussion on the meanings of time in later life is developed around the following topics: temporal experience before advanced age, delay of gratification in later life, "old age" as the unexpected, two meanings of futurity, living in the past, time and death in later life, and the inheritance and the challenge.
R 38

29,849
Page, H.A., Elfner, L.F. & Jamison, Nancy. AUTOKINETIC EFFECT AS A FUNCTION OF INTERMITTENCY OF THE LIGHT SOURCE. Psychol. Rec., April 1966, 16(2), 189-192. (Kent State University, Kent, Ohio).

The latency of the autokinetic illusion was observed as it related to the rate of intermittency of the stimulus light. Rates of flicker from 2 to 10 cps were presented. Lowest latency was noted for the 10 cps condition. The function generated appears remarkably similar to that observed by Spigel (1963) with displacement as a dependent variable. Results are discussed in terms of the phenomenon of brightness enhancement and the effect of flicker on the perceived contour of the stimulus.
R 6

29,850
Folkins, C. & Lenrow, P.B. AN INVESTIGATION OF THE EXPRESSIVE VALUES OF GRAPHEMES. Psychol. Rec., April 1966, 16(2), 193-200. (University of California, Berkeley, Calif.).

It was shown that graphemes, grouped according to articulation location, were rated differentially by English speaking Ss along three semantic differential dimensions--evaluation, potency, and activity. Front consonants were rated as more pleasant than back consonants, but no differences were noted on the other two factors for consonants. Front vowels were rated as less powerful and more active than back vowels, but no difference was noted on the evaluative factor. Other descriptive dimensions proved to differentiate expressive values of sound groups. Thus, voiced consonants were rated as more potent than nonvoiced consonants. Tense vowels were rated as more pleasant, potent, and active than lax vowels. A multiple factor approach to description and interpretation of phonetic symbolism was suggested as most consistent with these data.
R 13

29,851
Bixenstine, V.E. & O'Reilly, E.F., Jr. MONEY VERSUS ELECTRIC SHOCK AS PAYOFF IN A PRISONER'S DILEMMA GAME. Psychol. Rec., July 1966, 16(3), 251-264. (Kent State University, Kent, Ohio).

In the first part of a 2-part study, it was found that the amount of shock endured is grossly linear to the exchange value in cents and that clear distinctions are made between amounts of shock by 11 male and 11 female Ss drawn from sophomore college classes. In the second part a new sample of 40 male and 40 female Ss was introduced by like-sexed pairs to a 2-choice Prisoner's Dilemma-type game with money and shock as payoff. Half of the pairs received money, then the shock payoff; half of the pairs received shock, then the money payoff. Contrary to expectation, no difference was observed between shock and money games when other factors were held constant. However, in contrast to games with money alone as payoff, the level of cooperative choice was rather high, and a significant sex effect emerged with male pairs being significantly more cooperative than female. The shock-then-money sequence provoked most clearly the sex difference. Other observations suggest that women are less tolerant of shock and, thus, provoked more into a competitive posture thereby than are men.
R 15

29,852
Bartz, A.E. REACTION TIME AND COMPLEXITY OF SUBSEQUENT RESPONSES. Psychol. Rec., July 1966, 16(3), 313-321. (Concordia College, Moorhead, Minn.).

Two series of experiments were designed to investigate the delay in RT as a function of S's expectancy of future responses. The first series (Time Relation) investigated the effect of lengthening the time interval between pairs of choice RTs and comparing S's response to the first signal with his response to a single signal. Interval was not significant and, in addition, this series of experiments failed to replicate the results of earlier investigators who found a significant delay. The second series (Complexity) investigated the effect of making S's multiple responses increasingly complex and comparing his first response of this multiple set to his response to a single signal. Complexity level was not a significant variable. However, there now was a significant difference between a single response and the first response of a multiple set. The results of the two series were interpreted as being due to a difference in S's expectancy.
R 5

29,853
Shephard, R.J. INITIAL 'FITNESS' AND PERSONALITY AS DETERMINANTS OF THE RESPONSE TO A TRAINING REGIME. Ergonomics, Jan. 1966, 9(1), 3-16. (Chemical Defence Experimental Establishment, Ministry of Defence, Porton Down, Wilts, England).

Ventilatory and cardiac responses to the riding of an electrically braked bicycle ergometer have been investigated in young male Ss during a variety of short intensive training regimes involving both maximal and sub-maximal work. In most experiments rides were repeated thrice daily for 1 or 2 weeks. With 'maximal effort' rides of 5 min duration there was an increase in the rate of working over the training period. This was greater in a group performing one ride per day than in a second group (with slightly greater initial working capacity) performing 3 rides per day. In both groups the increase in rate of working was sufficient to mask any improvement in relative cardiorespiratory performance (V/min/watt). With longer periods (15 or 30 min) of heavy but sub-maximal work there was a progressive reduction of both the ventilatory and the cardiac response to exercise, and calculations suggested that the efficiency of muscular work was also increased. The magnitude of these changes could be related to initial 'fitness.' Changes in respiratory quotient with repetition of the sub-maximal rides suggest that the ventilatory response to exercise was initially in excess of metabolic demand, but that this over-breathing passed as the S became 'habituated' to the task. Changes of ventilatory response could be related to personality type as assessed by the Maudsley Personality Inventory. Excess ventilatory work can itself limit performance and for this reason personality and psychological approach to successive work periods can influence both initial working capacity and also the response to a training regime.
R 18

29,854
Wyndham, C.H., Morrison, J.F., Williams, C.G., Strydom, N.B., et al. INTER- AND INTRA-INDIVIDUAL DIFFERENCES IN ENERGY EXPENDITURE AND MECHANICAL EFFICIENCY. Ergonomics, Jan. 1966, 9(1), 17-29. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

Differences in oxygen consumption between individuals and also within individuals on 4 different tasks and at 2 rates of energy expenditure were examined. Criteria are proposed for indicating differences in physiological 'skill' between individuals and in some tasks such differences were found. Weight was found to be correlated with maximum oxygen intake, the factor which sets a limit to the maximum level of endurance work, and is also correlated with oxygen consumption in 2 of the tasks. It is considered that differences between individuals in maximum oxygen intake is more important than are differences in oxygen consumption in tasks requiring prolonged physical effort. Gross mechanical efficiencies were estimated in order to compare the mean efficiencies of this group of men when performing different tasks.
R 12

29,855
Hilgendorf, L. INFORMATION INPUT AND RESPONSE TIME. Ergonomics, Jan. 1966, 9(1), 31-37. (Aeronautical Research Laboratories, Melbourne, Australia).

A study of the relationship between information input and response times used visually presented, discrete symbols from 6 alphabets of up to 1000 alternatives and a key-pressing response. It was found that reaction time (RT) varied directly with information content ($\log_2 n$) with no tendency to deviate from a straight line at high levels of n. 3 further experiments are suggested.
R 21

29,856
Murrell, K.F.H. & Kingston, P.M. EXPERIMENTAL COMPARISON OF SCALAR AND DIGITAL MICROMETERS. Ergonomics, Jan. 1966, 9(1), 39-47. (Welsh College of Advanced Technology, Cardiff, Wales).

Three digital micrometers (2 German and 1 American) were compared for speed and accuracy of reading, using as Ss 89 journeymen and 16 apprentices from the engineering industry. It was found that untrained apprentices performed very badly on the Standard micrometer, but on two of the digital micrometers they were substantially more accurate than either the trained apprentices or the journeymen using the Standard micrometer; the latter made on the average 3.7% errors, the great majority of these being misreadings by 5, 10, 25 or 100 thous. These same journeymen using digital micrometers made errors of 0.05%. Manipulation and reading time on the digital micrometers was less than on the Standard, one being 25% less. A supplementary analysis by age showed that, contrary to expectation, the performance of an older group of Ss, aged between 50 and 64 years, did not improve more with the use of digital micrometers than that of the younger Ss. In fact, their performance improved the least.
R 4

29,857
Brown, I.D. SUBJECTIVE AND OBJECTIVE COMPARISONS OF SUCCESSFUL AND UNSUCCESSFUL TRAINEE DRIVERS. Ergonomics, Jan. 1966, 9(1), 49-56. (Applied Psychology Research Unit, MRC, Cambridge, England).

Twenty-two men were tested at weekly intervals during their 5 weeks' course of instruction in bus-driving. The use of the vehicle's controls and time taken over a standard circuit in traffic were recorded at each test, and the trainees' reserve capacity was measured by scoring their performance on a subsidiary auditory task. Details were available of previous driving experience with other vehicles and the trainees were also subjectively assessed at weekly progress checks given by experienced examiners. The object was to compare scores obtained by trainees who passed the independent driving test for Public Service Vehicles, given at the end of their course, with the scores of those who failed. Success on the P.S.V. test was significantly related to previous experience of any kind ($p=0.004$), and to the result of the progress check given after 14 days' training ($p=0.0002$). The reserve capacity of the successful group was significantly greater than that of the unsuccessful, at the first test given on the 7th day ($p<0.025$). At no stage during training could the 2 groups be discriminated on the objective measurements made directly on driving performance. The relative merits of these methods of assessing driving potential are briefly discussed, with a view to the design of simple selection tests for professional drivers.
R 7

29,858
Johansson, G. & Rumar, K. DRIVERS AND ROAD SIGNS: A PRELIMINARY INVESTIGATION OF THE CAPACITY OF CAR DRIVERS TO GET INFORMATION FROM ROAD SIGNS. Ergonomics, Jan. 1966, 9(1), 57-61. (Psychology Dept., University of Uppsala, Uppsala, Sweden).

It was found that the mean percentage of road signs recorded by 5 Ss over the course of a 105 mile long car journey under optimal conditions was of the order of 90% of signs passed. It was found that the mean percentage of drivers recording a road sign was 47% of those who passed it. (This figure is based on percentages obtained for 5 different road signs, the number of drivers involved being about 1000.) On analysing the data for these 5 signs, it was found that there was a significant difference between the percentage of drivers recording each one. This difference was postulated as being due to the degree of urgency of the information contained in each sign (as based on past experience), i.e., the more urgent the information, the higher the percentage of drivers recording the sign.

29,859
Pugh, L.G.C.E. & Chrenko, F.A. THE EFFECTIVE AREA OF THE HUMAN BODY WITH RESPECT TO DIRECT SOLAR RADIATION. Ergonomics, Jan. 1966, 9(1), 63-67. (Human Physiology Div., Medical Research Council Labs., London, England).

Methods of determining the effective radiation area for direct solar radiation have been compared. It was shown that the ratio of effective area to total surface area is directly proportional to the cosine of solar altitude for all the methods considered.
R 9

29,860
Baker, R.A. & Ware, J.R. THE RELATIONSHIP BETWEEN VIGILANCE AND MONOTONOUS WORK. Ergonomics, March 1966, 9(2), 109-114. (USA Human Resources Research Division No. 2, Fort Knox, Ky.).

40 Ss worked for 2 hrs each at 4 different routine and monotonous tasks: a) a simple vigilance task, b) a bean-sorting task, c) a simple assembly task, and d) a 2-digit addition task. S's performance was scored in terms of signals detected or number of work units produced and in terms of signals missed or number of errors made. The coefficients of concordance (Kendall's W) were statistically significant. Intercorrelations among the 4 tasks, however, showed that S's vigilance performance contributed to the overall agreement among the measures. It was concluded S's performance on the sorting task, for example, was predictable from their performance on assembling and adding. Vigilance performance, however, was not predictable from behaviour on the other tasks. The vigilance task, therefore, appears to contain elements not found in other monotonous work. It is suggested that 2 of these unique aspects are the lack of automaticity and the inability of S to control or pace his work rate.
R 9

29,861
Dirken, J.M. INDUSTRIAL SHIFT WORK: DECREASE IN WELL-BEING AND SPECIFIC EFFECTS. Ergonomics, March 1966, 9(2), 115-124. (Netherlands Institute for Preventive Medicine, Leyden, The Netherlands).

By means of a standardized and validated inventory approximately 600 shift workers and 1200 non-shift workers were investigated. The inventory consisted of dichotomous questions concerning essentially vague complaints of somatic and psychosomatic nature. The conclusions of this investigation were as follows. To a certain degree a stereotyped pattern of complaints exists. This pattern is the same in shift workers and in non-shift workers, in several types of industry and probably also in several districts. To a slight degree the pattern is typical for a factory. The data do not indicate that complaints about nervousness and gastro-intestinal disorders occur more frequently in shift workers than in non-shift workers. It was found, however, that there was a significant decrease in general well-being. This difference is smaller after the elimination of influences originating from environmental load and ageing, but the slight influence of shift work, though not specific, remains. It is probable that the negative effects of shift work are partly veiled by the fact that a selection of workers has occurred so that shift workers tend in some respects to be stronger and healthier than non-shift workers. In view of the large numbers and industrial diversity of the shift workers and non-shift workers investigated in this study, the main conclusion is that for subjective well-being in both its somatic and psychological aspects shift work can in general probably hardly be called a problem.
R 5

29,862
Hammerton, M. & Tickner, A.H. AN INVESTIGATION INTO THE COMPARATIVE SUITABILITY OF FOREARM, HAND AND THUMB CONTROLS IN AQUISITION TASKS. Ergonomics, March 1966, 9(2), 125-130. (Applied Psychology Research Unit, MRC, Cambridge, England).

Performance of Ss on a set of 2-dimensional velocity control acquisition tasks was measured when the control was operated by thumb, hand, and forearm. 4 control conditions--high and low sensitivity with 0 and 2 sec exponential lag--were used. 6 groups, each of 6 naval ratings, acted as Ss; and the 3 limb-segments were compared under all conditions. It was found that, under the easiest condition, there was no significant difference between the controls; but in the most difficult, hand was superior to both forearm ($p<0.001$) and thumb ($p<0.01$), whilst thumb was superior to forearm ($p<0.01$).
R 4

29,863
Nichols, P.J.R., Morgan, R.W. & Goble, R.E.A. WHEELCHAIR USERS--A STUDY IN VARIATION OF DISABILITY. Ergonomics, March 1966, 9(2), 131-139. (Nuffield Orthopaedic Centre, Oxford, England).

This paper describes a method of studying the variation of space requirement between different wheelchair users. 20 wheelchair patients performed the 5 tasks which made up the specific task of opening a door. Their space requirements were analysed statistically according to their functional disability and the variations between groups of patients calculated. The variations between wheelchair measurements accounted for half the variation between patients. Allowing for this and observer errors, it was not possible to bring the standard deviation much below 4 in. Variations also depended on the difficulty of the task; but different patients find different tasks more difficult. Although there is some correlation between skill and functional disability, psychological factors also played a large part in the few patients who did badly. While this experiment furnishes no direct information about space requirements of wheelchair users, it establishes a possible technique for such experiments; the problems involved in sampling patients for further experiments are discussed.
R 4

29,864
Shephard, R.J. & Callaway, S. PRINCIPAL COMPONENT ANALYSIS OF THE RESPONSES TO STANDARD EXERCISE TRAINING. Ergonomics, March 1966, 9(2) 141-154. (Chemical Defense Experimental Establishment, Ministry of Defense, Porton Down, Wilts, England).

Common elements governing the responses to a standard programme of exercise 'training' have been investigated by the statistical technique of principal component analysis. Convergence of the data was checked by a pilot trial on a desk calculator and 3 definitive computer analyses were then carried out. The first and second computer analyses were based on a wide range of measurements of pulse rate, respiratory minute volume, and personality. 6 components accounted for 70% of the variance of the data. These were tentatively identified as: a) cardiac response to exercise; b) resting state; c) ventilatory changes with training; d) and e) influence of personality on resting state and exercise response; and f) body size. Components a) and e) were related to the S' initial physical fitness. For the third computer analysis several measurements shown to be redundant were excluded and specific metabolic measurements were included. 6 components then described 77% of the variance. The initial metabolic cost of exercise was represented in components a) and b) and changes with training in component d). Fitness was correlated most closely with the initial oxygen cost of exercise, and was also more closely related to pulse than to ventilatory measurements, and to results on Day 1 than to changes during training. Selection and weighting of parameters to yield an optimum objective assessment of physical fitness are discussed.
R 6

29,865
Underwood, C.R. & Ward, E.J. THE SOLAR RADIATION AREA OF MAN. Ergonomics, March 1966, 9(2) 155-168. (Human Physiology Div., National Institute for Medical Research, London, England).

The amount of solar energy incident upon the body surface can be calculated if the intensity of the beam and the area of the body projected sunwards are known. A photographic method is described which has been developed for the measurement of the areas of the body in the standing posture which are projected in a direction normal to the solar rays. 25 male and 25 female Ss were studied, whose surface areas ranged from 1·30 m^2 to 2·20 m^2. The effective radiating areas are related to the surface area of the body and this relationship is substantially independent of body size and shape. An equation has been found which enables the radiating area to be computed for any angle of altitude and orientation of the body with respect to the direction of the sun.
R 8

29,866
Biggs, N.L. DIRECTIONAL GUIDANCE OF MOTOR VEHICLES--A PRELIMINARY SURVEY AND ANALYSIS. Ergonomics, May 1966, 9(3), 193-202. (Mathematics Dept., University of Southampton, Southampton, England).

The task of driving is discussed in theoretical terms, with special reference to the visual information required by the driver in steering. The visual field of an observer in motion is considered in detail and some relevant quantities are obtained. Finally, some suggestions are made as to the method by which drivers follow the road; and the application of these hypotheses to practical situations is discussed.
R 14

29,867
Denton, G.G. A SUBJECTIVE SCALE OF SPEED WHEN DRIVING A MOTOR VEHICLE. Ergonomics, May 1966, 9(3), 203-210. (Road Research Lab., Ministry of Transport, Harmondsworth, England).

An experiment is described which attempts to establish a subjective scale of speed, or more precisely of passive locomotion, such as that experienced by the driver of a motor vehicle. By a method in which the S is required to produce a speed which in his opinion bears a given proportional relation to the standard speed presented, speed expressed as a sensation Ψ and real speed S are tested for a possible power law relation of the form $\Psi = KS^n$. It is found that n is not a constant, but has a definite correlation with speed. The time taken by Ss to change from one speed to another is also positively correlated with speed. The implications of these facts are discussed. A more suitable mathematical model is derived from the transformed data from which it is possible to predict performance for sensation ratios other than those tested. Some possible applications of the findings to the study of driver behaviour, and their relevance to speeding offences and accident rate at the ends of motorways, are given.
R 13

29,868
Davis, D.R. RAILWAY SIGNALS PASSED AT DANGER: THE DRIVERS, CIRCUMSTANCES AND PSYCHOLOGICAL PROCESSES. Ergonomics, May 1966, 9(3), 211-222. (Mental Health Dept., University of Bristol, England).

A group of 34 drivers who had passed railway signals at danger was examined medically and questioned about the circumstances in which the signal had been passed. A conjectural explanation was formulated for each incident. Poor sight appeared to be a relevant factor in one case. Organic dementia, suspected but not confirmed, was possibly a factor in 2 cases. 3 drivers were suffering from anxiety symptoms amounting to illness; in a further 8 cases psychiatric symptoms not amounting to illness were regarded as relevant. There were special circumstances in 3 cases. Several psychological processes were thought to have played a part in causing the errors, and these are discussed under the headings: panic reaction, false expectations, preoccupation and distraction, responses to the wrong signal, relaxation after stress, and timing errors. It is argued that dangers arise from ergonomic faults, especially when drivers' efficiency has fallen off.
R 2

29,869
Sharkey, B.J., McDonald, J.F. & Corbridge, Lynn G. PULSE RATE AND PULMONARY VENTILATION AS PREDICTORS OF HUMAN ENERGY COST. Ergonomics, May 1966, 9(3), 223-227. (Human Performance Lab., University of Montana, Missoula, Mont.).

This study compared the usefulness of the pulse rate and ventilation rate in the prediction of energy cost. 4 young men were exercised at 6 grades on the motor-driven treadmill in order to derive data for regression equations, one to predict oxygen consumption from pulse rate data and the other using the ventilation rate. Separate equations were derived for each S. The precision of prediction was then tested in 3 work tasks including treadmill walking while holding a weight in a static contraction, cycling the bicycle ergometer and hand-cranking the ergometer. Although large mean differences in percentage error were recorded in the pulse rate prediction, they were not statistically significant, probably due to large individual variations. The differences in ventilation rate prediction were significant and indicated the need for using closely related activities when deriving the predictive equations. Prediction accomplished with the ventilatory data resulted in smaller errors than did the pulse rate predictions.
R 12

29,870
Duncan, K.D. EFFECTS OF AN ARTIFICIAL ACCLIMATIZATION TECHNIQUE ON INFANTRY PERFORMANCE IN A HOT CLIMATE. Ergonomics, May 1966, 9(3), 229-244. (Army Personnel Research Establishment, Surrey, England).

The performance of an infantry company was first assessed on a 3-day exercise in this country. Its 12 sections were then divided into 2 treatment groups. The experimental group, consisting of the 6 odd-numbered sections, was subjected to an artificial acclimatization routine consisting of physical exercises in an improvised hot chamber. The control group, consisting of the 6 even-numbered sections, performed the same exercises in a room of similar proportions at ambient temperatures. After approximately 2 weeks of these training regimes, the company was immediately flown to Aden where its performance under considerable stress was assessed during a 7-day exercise in the desert. Of 8 performance tests only 3 indicated beneficial effects of artificial acclimatization. The most impressive difference between the 2 groups was in the number of casualties, most of which occurred during marching tests. Casualty incidence was 3 times greater in the control group, both for heat casualties and for all casualties regardless of the disorder diagnosed. There are indications that the marching speed of the Ss who carried on may also have been improved by artificial acclimatization. Statistically significant differences in favour of the artificially acclimatized group were also observed on 2 other performance tests: crossing obstacles and carrying water jerrycans at the run. Questionnaire responses indicated that, by the end of the desert exercise, the individual S's estimates of his section's effectiveness and his feelings of loyalty to it were more adversely affected in the control group.
R 16

29,871
Gray, Florence E., Hanson, J.A. & Jones, F.P. POSTURAL ASPECTS OF NECK MUSCLE TENSION. Ergonomics, May 1966, 9(3), 245-256. (Institute for Psychological Research, Tufts University, Medford, Mass.).

Postural responses of 7 male and 7 female Ss were compared during sitting, lifting, preparing to stand, standing, standing on tip-toes, and deep breathing. The responses were measured in terms of the linear and angular displacement of the head and the differential activity of 2 groups of neck muscles. The data were given statistical treatment. Significant differences were found in the behaviour of the 2 groups of msucles and in the responses of male and female Ss. It is suggested that the postural aspect of responses should be taken into consideration if neck-muscle tension is used as an index of activation level or anxiety.
R 4

29,872
McLaughlin, G.H. COMPARING STYLES OF PRESENTING TECHNICAL INFORMATION. Ergonomics, May 1966, 9(3), 257-259. (Northampton College of Advanced Technology, London, England).

A group of 64 undergraduates showed no significantly greater ability to locate information in a well-produced technical pamphlet than a similar group using a poorly printed, verbose version. However, Ss spontaneously declared that they would not have read the poor version voluntarily. When the test was repeated with 16 less motivated Ss, the group using the poor version performed significantly worse than that using the more readable version.

29,873
Holding, D.H. & Macrae, A.W. RATE AND FORCE OF GUIDANCE IN PERCEPTUAL-MOTOR TASKS WITH REVERSED OR RANDOM SPATIAL CORRESPONDENCE. Ergonomics, July 1966, 9(4), 289-296. (Psychology Dept., University of Leeds, Leeds, England).

Using a serial tracking task with reversed relationship between stimulus lights and control lever, comparison was made of the effects of 4 combinations of guided training. These consisted of complete response-forcing, or of partial response-forcing (hinting), both of which were administered at faster and slower tracking rates. The speed of movements made during training had a marked effect on transfer to normal practice, although only the first trial was affected by the degree of forcing. In a second experiment, with zero correlation between the lever and light positions, the hinting technique appeared more effective than complete response-forcing. Both guidance methods produced more learning than an equivalent amount of normal practice. These and earlier results lead to the generalization that guidance becomes more effective as the complexity of perceptual-motor translation processes is increased.
R 7

29,874
Jamieson, G.H. INSPECTION IN THE TELECOMMUNICATIONS INDUSTRY: A FIELD STUDY OF AGE AND OTHER PERFORMANCE VARIABLES. Ergonomics, July 1966, 9(4), 297-303. (Research on Occupational Aspects of Ageing Unit, MRC, University of Liverpool, Liverpool, England).

A field study was undertaken to investigate the problems of inspection in the telecommunications industry, and to assess the effect of age on inspection performance. The main inspection tasks, at the final assembly stage, were analyzed in terms of sensory discrimination, and records were kept of individual efficiency by quality control sampling techniques. The study also included information on an organizational factor which was found to affect performance. The main findings were as follows. Performance differences, where they existed, favoured the older inspectors; efficiency in the visual inspection of telephone racks was improved when inspection was isolated from production; inspection tasks requiring absolute judgments by vision were significantly more erroneous than were inspection tasks requiring absolute judgments by kinaesthesis; a predominance of inspection errors could be attributed to judgments based on gram gauges which demand a response to bi-sensory (visual and kinaesthetic) cues.
R 8

29,875
Malhotra, M.S., Ramaswamy, S.S., Dua, G.L. & Sengupta, J. PHYSICAL WORK CAPACITY AS INFLUENCED BY AGE. Ergonomics, July 1966, 9(4) 305-316. (Defense Institute of Physiology & Allied Sceicnes, Madras, India).

Studies were carried out on 879 healthy soldiers of ages ranging from 18-45 years to assess the effect of age, if any, on physical work capacity. These Ss were in a fairly controlled state of nutrition and physical training. A battery of tests was administered under outdoor conditions as well as in the laboratory. It was found that all the physical function tested, such as speed of running, abdominal muscle strength, agility, arm and shoulder muscle strength and capacity for short bursts of activity, started to show deterioration after 30 years, and the process was progressive thereafter. Judged from these performances the Ss seemed to fall into 3 distinct age groups, viz. 18-30, 31-37, & 38-43. The Ss above 43 years were too few to be considered for analysis. The mean maximum oxygen consumption was found to be 47.7 ml/kg/min in the 18-30 years group, and it was reduced to 45.8 and 42.1 ml/kg/min for the 2 higher age groups respectively. Excess lactic acid build-up due to a standard stepping exercise was also found to increase with age, and the tolerance time in endurance tasks was found to reduce with increasing age. Performance in the running test correlated highly with the values for maximum oxygen consumption and endurance stepping, thereby indicating that even simple outdoor tests like running can be effectively used for assessing the physical work capacity, especially under field conditions.
R 10

29,876
Davies, B.T. SENSITIVITY OF JOINT ROTATION. Ergonomics, July 1966, 9(4), 317-324. (Engineering Production Dept., University of Birmingham, Birmingham, England).

It has been suggested many times that operators in industrial tasks opt for a certain position of a limb in the belief that the position allows exertion of maximum control. One factor affecting this chosen position may well be that the sensitivity of joint rotation is greater in one position than another. An experiment is described whereby limbs are moved passively (i.e. forearm and foot) in 2 different directions, from 3 different starting positions and at 6 different accelerations. The likely factor to which a subject responds from the alternatives--acceleration, velocity, degree of angular rotation--has been sought. Results indicate that Ss respond to acceleration and that starting position and direction of movement have a distinct bearing on sensitivity.
R 13

29,877
Begbie, G.H. THE EFFECTS OF ALCOHOL AND OF VARYING AMOUNTS OF VISUAL INFORMATION ON A BALANCING TEST. Ergonomics, July 1966, 9(4), 325-333. (Physiology Dept., University Medical School, Edinburgh, Scotland).

A new kind of dynamic balancing test has been devised. 8 Ss carried out experiments in which the effects of alcohol and the effects of varying amounts of visual information on sway and oscillation were studied. It was concluded that peripheral vision was a crucial factor in the effective performance of the test, and it was noted that quite modest amounts of alcohol could produce a deterioration in performance. The provision of extra visual information about the effectiveness of response had a beneficial effect.
R 14

29,878
Welford, A.T. THE ERGONOMIC APPROACH TO SOCIAL BEHAVIOUR. Ergonomics, Sept. 1966, 9(5), 357-369. (St. John's College, Cambridge, England).

This lecture is an attempt to consider the suggestion that ergonomists should look at social behavior in their own terms and as an extension of their own field of study. 3 groups of problems seem most amenable to an ergonomics approach. They essentially involve questions of how individual capacities and limitations determine firstly, social relationships and organization, secondly, personality characteristics, and thirdly, motives. Because of the present state of social psychology, it seems the time is ripe to take a fresh look at the problems, in more fundamental terms than hiterto employed. Some significant beginnings have already been made, such as those of Argyle and Crossman at Oxford who look at social behavior as a form of skilled performance, and by Belshon at Bristol, on managerial skills.
R 47

29,879
Wyndham, C.H., Morrison, J.F. Williams, C.G., Heyns, A , et al. THE RELATIONSHIP BETWEEN ENERGY EXPENDITURE AND PERFORMANCE INDEX IN THE TASK OF SHOVELLING SAND. Ergonomics, Sept. 1966, 9(5), 371-378. (Transvaal and Orange Free State Chamber of Mines, Johannesburg, South Africa).

An examination is made of the relationship between the energy expenditure in litres of oxygen consumed per min, as measured by the physiologist, and the performance index, as assessed by the work-study engineer. The data used in the analysis were obtained from 16 Bantu labourers engaged in shovelling sand at 4 different rates of work into a mine car of 1 ton capacity. A close relationship between M oxygen consumption and M performance index over the range of work levels was found. A linear model appeared to describe the relationship between these 2 variables adequately. The particular linear relationship between the variables was, however, dependent on the observer, i.e. the lines for the 2 work-study engineers were different from each other. A performance index value of about 75 was found to be equivalent to an oxygen consumption of about 1.5 litres per minute. This is 50% of the average Bantu mine labourer's maximum oxygen intake and, on physiological grounds, this is the rate of work which the Bantu labourer can maintain easily for a shift of 6-8 hours. However, it appears from the results of these preliminary studies that men working at a performance index value of 100 (i.e. well motivated in the work-study sense) are liable to work at a rate which is about 70% of the maximum oxygen intake. This would be excessive for the average labourer. The existence of this close relationship is most encouraging and means that the work-study engineer would be able to relate his assessments to rates of energy expenditure and hence estimate the physical effort of men engaged on heavy manual labour.
R 9

29,880
Grieve, D.W. & Gear, Ruth J. THE RELATIONSHIP BETWEEN LENGTH OF STRIDE, STEP FREQUENCY, TIME OF SWING AND SPEED OF WALKING FOR CHILDREN AND ADULTS. Ergonomics, Sept. 1966, 9(5), 379-399. (Human Biomechanics Lab., National Institute for Medical Research, London, England).

50 males and females between 1 and 35 yrs of age were studied during locomotion. During the first few months of walking the step frequency bears no apparent relationship to the speed of walking. A log-log regression equation describes the adult relationship better than a linear equation. A few adolescents were better described by a linear equation and either log-log or linear equations can be used for children. The product of maximum step frequency and the square root of the stature is approximately constant after 5 yrs of age. The time of swing initially shows a positive regression with the time for a complete cycle of one leg. The child abandons this pattern in favour of an approximately constant time of swing and by 4—5 yrs of age the negative linear regression of the adult appears. The time of swing is usually much less than half the natural period of either the whole leg about the hip or of the lower leg and foot about the knee. The effects of wearing shoes upon step frequency and time of swing were investigated.
R 17

29,881
Michon, J.A. TAPPING REGULARITY AS A MEASURE OF PERCEPTUAL MOTOR LOAD. Ergonomics, Sept. 1966, 9(5), 401-412. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Numerous methods have been devised to measure perceptual load. Unfortunately the concept itself is ill-defined, which makes different approaches practically incomparable. The central problem is the ordering of tasks of different types. Most methods compare tasks that differ only in one variable, such as speed or input/output uncertainty. There are however methods which can be applied to a wider range of tasks. One such approach observes the timing of successive actions: load will cause 'traffic control' problems in the central nervous system (CNS), so that actions will be executed in an irregular fashion. The use of irregularity as a measure of perceptual load depends on the availability of a 'functional' descriptive system of behavior, as opposed to current 'phenomenal' systems like those of time and motion study. A convenient substitute is that of measuring the irregularity of a subsidiary performance. Key tapping was found to satisfy certain methodological requirements. Some experiments evaluating this method are discussed.
R 16

29,882
Jerison, H.J. REMARKS ON COLQUHOUN'S: "THE EFFECT OF 'UNWANTED' SIGNALS ON PERFORMANCE IN A VIGILANCE TASK." Ergonomics, Sept. 1966, 9(5), 413-416. (Behavior Research Lab., Antioch College, Yellow Springs, Ohio).

Colquhoun's 1961 experiment is interpreted as emphasizing the discrimination phase of a complex task in which the detection of a signal is followed by the discrimination of one of its features. His conclusion that signal probability determines vigilance performance is supported by research from this laboratory with a simple detection task. In our research the probability is redefined as the ratio of signals to attention-eliciting stimuli, and the latter stimuli must be presented at high rates (15 or more times per min). His results with the complex task suggest an effect of signal probability on search and scanning patterns during prolonged visual work.
R 5

29,883
Colquhoun, W.P. THE EFFECT OF 'UNWANTED' SIGNALS ON PERFORMANCE IN A VIGILANCE TASK: A REPLY TO JERISON. Ergonomics, Sept. 1966, 9(5), 4170419. (Applied Psychology Research Unit, MRC, Cambridge, England).

Jerison's remarks (Ergonomics, 1966, 9, 413) are discussed in relation to the results of a further experiment on 'unwanted' signals in which: a) the original interaction between the effects of signal probability and signal disc location was not observed; and b) it was demonstrated that a search requirement is not a necessary condition for eliciting the main effects previously found.
R 4

29,884
Parker, T.C. & Keenan J.J. THE RELATIONSHIP OF PERSONAL CHARACTERISTICS TO TELEPHONE DIALLING PERFORMANCE. Ergonomics, Nov. 1966, 9(6). 449-458. (Dunlap & Associates, Inc., Darien, Conn.).

An exploratory study of relationships between selected personal characteristics and telephone dialling performance of 81 Ss was conducted. Personal characteristics included age, education, near-vision abilities, work style, psychomotor skill and short-term memory ability. Dialling performance variables included dialling speed and several types of digit errors. The relationships among the measures were investigated using factor analytic and regression techniques. The results of the study indicated that dialling speed was significantly related to age, memory ability and psychomotor skill. Dialling speed stability was related to memory ability, psychomotor skill and visual ability. Dialling accuracy was related to age, work style and visual ability.
R 18

29,885
Annett, J. TRAINING FOR PERCEPTUAL SKILLS. Ergonomics, Nov. 1966, 9(6), 459-468. (Psychology Dept., University of Hull, Hull, England).

Three perceptual tasks, the estimation of visual 'numerousness', visual acuity and the auditory detection of a signal in noise, were used to show the effects of various kinds of training. Comparisons were made between simple practice, knowledge of results, cuing techniques and the use of easier material. Cuing was found to be equivalent to, or better than, knowledge of results, and training on easy material was least successful. It is tentatively concluded that the reinforcement paradigm is not appropriate for these perceptual skills and that a simple association principle is adequate.
R 11

29,886
Thylén, J.O. THE EFFECT OF INITIAL POINTER POSITION RELATIVE TO THE CONTROL ON DIRECTIONAL RELATIONSHIPS IN THE PRESENCE OF TWO CONFLICTING STEREOTYPES. Ergonomics, Nov. 1966, 9(6), 469-474. (Stockholm, Sweden).

A variable liable to affect display-control relationships is treated in this article. It is shown that the strength of the stereotype known as Warrick's Principle, the expectation that a pointer will move in the same direction as that part of the control nearest to the display, is reduced as the pointer is set off to either side of the control knob. In an arrangement with the knob above a horizontal display this reduction may cause a reversal of an operator's expectation of directional relationship at a pointer position not very far from the knob. It is maintained, however, that this effect of pointer position is not likely to influence expectation in an unambiguous arrangement of display and control.
R 5

29,887
Davis, P.R. & Troup, J.D.G. EFFECTS ON THE TRUNK OF ERECTING PIT PROPS AT DIFFERENT WORKING HEIGHTS. Ergonomics, Nov. 1966, 9(6), 475-484. (Royal Free Hospital School of Medicine, London, England).

The effects on lumbar movement and intra-abdominal pressure of erection of hydraulic props by 3 methods at different working heights have been studied. Lifting in a squatting position and when on one knee was accompanied by greater trunk stress than when kneeling on both knees. At 3 ft 6 in. (107 cm) working height the magnitudes of lumbar movements and abdominal pressure increases were much less than those at 4 ft 6 in. (137 cm), a difference greater than could be explained by consideration of external work done. The results indicate that the optimum method of prop erection has yet to be evolved, and show that prop erection at 4 ft 6 in. (137 cm) working height by some methods may be unduly hazardous.
R 11

29,888
Allen, J.G. AEROBIC CAPACITY AND PHYSIOLOGICAL FITNESS OF AUSTRALIAN MEN. Ergonomics, Nov. 1966, 9(6), 485-494. (New South Wales Division of Occupational Health, Sydney, Australia).

The aerobic capacities and physiological fitnesses of 321 Australian men were determined by a sub-maximal bicycle ergometer test. The results are for use when evaluating the physiological cost of work in industrial processes. The survey revealed that fitness was independent of occupation but was dependent upon age. Participation in regular moderate sport had little effect on fitness, but intensive sporting training was associated with superior fitness. Reduced fitness was associated with overweight, but underweight did not result in superior fitness. Some fitness figures from other countries are quoted.
R 15

29,889
Thompson, S.H. & Sharkey, B.J. PHYSIOLOGICAL COST AND AIR FLOW RESISTANCE OF RESPIRATORY PROTECTIVE DEVICES. Ergonomics, Nov. 1966, 9(6), 495-499. (Human Performance Lab., University of Montana, Missoula, Mont.).

Using one of 3 respiratory protective devices or a 'no mask' control, 5 male Ss were tested at grades of 0, 5 and 10% and a constant speed of 3.5 miles per hour for a total of 12 tests per man. Exercise heart rates and recovery oxygen consumption values were recorded. Air flow resistance values were determined in laboratory bench tests. The resistance of the devices did not significantly alter the exercise pulse rates but did significantly increase the recovery oxygen consumption, particularly at the higher work levels. Recovery oxygen consumption values and the air flow resistance figures were positively related at the higher levels of work. It is suggested that the relationship offers further support for the use of laboratory bench tests as an estimator of the added physiological burden imposed on the wearer.
R 9

29,890
Laporte, W. THE INFLUENCE OF A GYMNASTIC PAUSE UPON RECOVERY FOLLOWING POST OFFICE WORK. Ergonomics, Nov. 1966, 9(6), 501-506. (Physical Education Institute, University of Ghent, Ghent, Belgium).

The influence of a gymnastic pause and of a passive pause after work was compared in the Post-Cheque Office in Brussels. A group practising some light gymnastic movements and a control group taking a passive rest, each composed of 40 Ss, were examined by a test battery consisting of the flicker fusion frequency test. Wechsler's digit symbol test, a hand dynamometer test, and Piéron's tremor test. The tests were carried out before and after the pause. The results were interpreted to mean that hand steadiness improved, that general fatigue and fatigue of the eyes diminished, that the girls worked faster, and that muscular strength was greater after the gymnastic pause than after the passive pause.
R 14

29,891
Andrews, R.B. THE ADDITIVITY OF VALUES OF ENERGY EXPENDITURE OF SIMULTANEOUSLY PERFORMED SIMPLE MUSCULAR TASKS. Ergonomics, Nov. 1966, 9(6), 507-515. (University of California, Los Angeles, Calif.).

A study was carried out to compare the sum of independently determined net rates of energy expenditure for 2 or 3 simple muscular tasks and the net rate of energy expenditure for the simultaneous performance of the same tasks. 3 simple tasks were used: one-armed cranking of an ergometer, one-armed static pulling against resistance, and walking. 8 configurations representing all possible combinations of the simple tasks were examined. The results showed that for 7 of the 8 configurations, the sum of the net rates of energy expenditure for the simple tasks significantly exceeded the net rate of energy expenditure for simultaneous performance. For 4 of these configurations, the discrepancy was 20% or larger. The results are discussed in terms of kinesiology, i.e., the science of movement of the body, and their implications for both work design and possible systems of standard metabolic data.
R 4

29,892
Denton, G.G. 'MOVING ROAD SIMULATOR'--A MACHINE SUITABLE FOR THE STUDY OF SPEED PHENOMENA INCLUDING MOTION AFTEREFFECT. Ergonomics, Nov. 1966, 9(6), 517-520. (Road Research Lab., Ministry of Transport, Harmondsworth, England).

Since vision plays a very large and important part in the overall skill of driving a vehicle, it is worth while to attempt to simulate much of the visual task in the laboratory. This note describes a machine which is capable of simulating some of the visual aspects of driving. By treating motion 'after-effect' as a compensatory tracking task, it appears that reasonably accurate measurement of this phenomenon as a function of time and stimulus magnitude is possible. Technical details of the system are given and some of its possible uses are discussed.

29,893
Boeder, P. SINGLE BINOCULAR VISION IN STRABISMUS. Amer. J. Ophthal., Jan. 1966, 61(1), 78-86. (Ophthalmology Dept., University of Iowa, Iowa City, Iowa).

The single binocular vision in concomitant strabismus is analyzed under the hypothesis that it is achieved with a response shift in the deviating eye and (normal) retinal correspondence. The regularly occurring suppression areas, and the resulting division of the binocular field between the fixating eye and the deviating eye, are shown to be direct consequences of the response shift. These well-known facts of squint vision, therefore, constitute most powerful additional evidence in support of the existence of a response shift and (normal) retinal correspondence in concomitant strabismus.
R 5

29,894
Fletcher, Mary C. & Silverman, S.J. STRABISMUS, PART I. A SUMMARY OF 1,110 CONSECUTIVE CASES. Amer. J. Ophthal., Jan. 1966, 61(1), 86-94. (Ophthalmology Dept., Baylor University College of Medicine, Houston, Tex. & Orthoptic-Pleoptic Unit, Methodist Hospital, Houston, Tex.).

A total of 1,110 consecutive cases of strabismus have been analyzed in detail and classified accordingly. We have found no definite relationship between age of onset of esotropia and the final acquisition of fusion. In our experience the results of surgical treatment of intermittent exotropia (divergence excess) are much more satisfactory than the surgical treatment of nonaccommodative esotropia. Pure exotropia has often been found to be associated with other central nervous system disorders. The results of treatment of partially accommodative esotropia are far better than those obtained in nonaccommodative esotropia. Persistent amblyopia despite adequate occlusion is very common and acts as an insurmountable obstacle to fusion, as well as to stable alignment of the eyes. Secondary (consecutive) exotropia is more common than hitherto realized. Long-term follow-up will likely reveal a greater incidence.
R 3

29,895
Heaton, J.M. THE PAIN IN EYESTRAIN. Amer. J. Ophthal., Jan. 1966, 61(1), 104-112. (Physiological Optics Dept., Institute of Ophthalmology, London, England).

The theory that the pain of eyestrain is due to fatigue of the ocular muscles is examined. 33 patients with pain due to eyestrain had 0.25% eserine solution instilled into their eyes. It was found that in the majority of cases the pain due to the eserine was different from their eyestrain pain. 16 out of 33 patients developed their typical eyestrain pain as well as eserine pain. This group was predominantly female and had a high incidence of anxiety or depression in association with their eyestrain. 10 patients with eyestrain pain had 0.05% hyoscine solution instilled into their eyes. This did not prevent the development of pain nor clear it up when it had developed. The general nature of pain is briefly discussed and it is pointed out that the experience of pain cannot be adequately understood in terms of peripheral stimulation alone. It is also shown that there is no satisfactory evidence that either the ciliary muscles or the extraocular muscles become unduly fatigued in eyestrain and that, even if they did, they would not produce the pain that is characteristic of eyestrain. In conclusion it is shown that there are fairly satisfactory explanations for some types of pain in eyestrain but that a lot more research which takes account of the patient's relationship to his visual world is required in this area.
R 17

29,896
Burian, H.M. & Lawwill, T. ELECTRORETINOGRAPHIC STUDIES IN STRABISMIC AMBLYOPIA. Amer. J. Ophthal., March 1966, 61(3), 422-430. (ERG Lab., University of Iowa College of Medicine, Iowa City, Iowa).

This paper reports a study in which the electric response from normal and amblyopic eyes was recorded under carefully controlled conditions. No difference between the amblyopic eye and the normal fellow eye was found in the responsiveness of the retinas, using various methods of stimulation. It is concluded that there either are, in fact, no differences or that our technical means are still not sufficiently refined to uncover any existing differences. Since electrophysiologic methods would seem to offer the only means of resolving the problem whether or not the retina is involved in the mechanism underlying amblyopia, the studies are being continued.
R 9

29,897
Nawratzki, Ilse, Auerbach, E. & Rowe, Hemda. AMBLYOPIA EX ANOPSIA. THE ELECTRICAL RESPONSE IN RETINA AND OCCIPITAL CORTEX FOLLOWING PHOTIC STIMULATION OF NORMAL AND AMBLYOPIC EYES. Amer. J. Ophthal., March 1966, 61(3), 430-435. (Vision Research Lab., Hadassah University, Hospital & Medical School, Jerusalem, Israel.).

The ERG and the evoked occipital response to photic stimulation were measured in 36 Ss with strabismic amblyopia and the results obtained from stimulation of the amblyopic eye were compared with those from the good eye. The latency and amplitude of the ERG were practically equal in the amblyopic eye and the good eye. The latency of the primary response in the evoked occipital potential was significantly greater than normal on stimulation of the amblyopic eye while it agreed in the good eye with values obtained in normal Ss. In the majority of cases, the amplitudes of the evoked potentials obtained from stimulation of the amblyopic eye were smaller than from the normal eye. The agreement between the lengthening in the latency of the evoked occipital response and the prolongation of the perception time in the amblyopic eye is emphasized.
R 20

29,898
Casanovas, J. THE UNTOWARD INFLUENCE OF ASTIGMATISM ON THE STATEMENT OF VISUAL ACUITY. Amer. J. Ophthal., May 1966, 61(5)Part 2, 1059/119-1062/122. (University Eye Clinic, Barcelona, Spain).

When measuring the visual acuity with letters or, more importantly, with optotypes with one or several openings, the presence of astigmatism leads to very different results depending on whether the direction of the axis conforms with or is perpendicular to that of the openings. In order to avoid inexactness, compact optotypes (cross, star, square and circle) are recommended. Changes in illumination and light sense have a less disturbing influence with these optotypes and the Jackson cross-cylinder test becomes still more reliable.
R 3

29,899
Lawwill, T. THE FIXATION PATTERN OF THE LIGHT-ADAPTED AND DARK-ADAPTED AMBLYOPIC EYE. Amer. J. Ophthal., June 1966, 61(6), 1416-1419. (ERG Lab., University of Iowa College of Medicine, Iowa City, Iowa).

A method has been presented, employing an infrared illuminating device, for the observation of the fixation pattern in light-adapted and dark-adapted amblyopic eyes. Using this device in 20 patients with eccentric fixation, no change in the fixation pattern of the light-adapted and dark-adapted amblyopic eye was noted. However, the oscillatory movements of attempted fixation were considerably greater in frequency, amplitude and randomness when fixation was tested with ordinary, bright ophthalmoscopic devices than with the infrared device.
R 3

29,900
Penner, R. & McNair, J.N. ECLIPSE BLINDNESS. Amer. J. Ophthal., June 1966, 61(6), 1452-1457. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

Environmental factors associated with eclipse retinitis epidemics were enumerated. The retinal changes of solar retinitis were classified into 3 ophthalmoscopically separate stages. Comparison of initial vision and the visual acuity 6 months posteclipse revealed that the visual prognosis was almost always better than 20/50. In the involved eyes followed for 6 months, whether or not protection was claimed to have been used and whether or not systemic steroids were administered, the chance of recovery of 20/20 visual acuity was approximately 50%. Prior existing muscle imbalance or amblyopia resulted in the solar retinitic lesion being generated in the dominant eye. The absence of retinal burns in severely ametropic eyes was noted. No increased incidence of solar burn was detected in deeply pigmented eyes or heavily pigmented individuals. Various forms of ineffective protective measures were catalogued.
R 8

29,901
Elenius, V. & Karo, T. PERIPHERAL VISUAL THRESHOLDS AND AREA SUMMATION: EXAMINED BY KINETIC PERIMETRY IN THREE NIGHT-BLIND SUBJECTS. Amer. J. Ophthal., June 1966, 61(6), 1509-1513. (Ophthalmology Dept., University of Turku, Turku, Finland).

A Goldmann perimeter (provided with extra neutral filters) and the method of kinetic perimetry have been used for measurements of peripheral visual thresholds and area summation in the eyes of 3 night-blind Ss and in normal controls. Data are presented to show measurements made by using the standard background luminance (3.15 mL) of the Goldmann perimeter, as well as a reduced background luminance (0.032mL). It has been shown that, in a case of stationary congenital night blindness, the photopic thresholds were within normal limits, whereas in mesopic conditions the threshold were clearly higher than normal. In 2 siblings with slowly progressing tapetoretinal degeneration, both the photopic and mesopic thresholds were clearly higher than normal.
R 7

29,902
Tomovic, R. & McGhee, R.B. A FINITE STATE APPROACH TO THE SYNTHESIS OF BIOENGINEERING CONTROL SYSTEMS. IEEE Trans. on Hum. Factors in Electronics, June 1966, HFE-7(2), 65-69. (Unversity of Belgrade, Belgrade, Yugoslavia & Electrical Engineering Dept., University of Southern California, Los Angeles, Calif.).

The design of devices capable of duplicating the function of human extremities has become increasingly important in science, industry, and medicine. This paper presents an approach to the synthesis of control systems for such machines which results in extremely simple finite state controllers. The technique proposed rests on the definition of a new type of actuator, called a cybernetic actuator, which possesses the property of producing continuous controlled motion from an input which may assume only 4 distinct states. The application of such actuators to bioengineering systems is illustrated by the design of a control system for an artificial leg.
R 9

29,903
Phillips, L.D., Hays, W.L. & Edwards, W. CONSERVATISM IN COMPLEX PROBABILISTIC INFERENCE. IEEE Trans. on Hum. Factors in Electronics, March 1966, HFE-7(1), 7-18. (University of Michigan, Ann Arbor, Mich.).

Ss were presented with data, described as the simulated output of a computerized radar system, consisting of dots that could fall in any 1 of 12 sectors. They were told that the process generating the data might be in any 1 of 4 mutually exclusive states. Displays showed for each state how likely it was that each dot would fall in each sector; an auxiliary display showed the prior probabilities of each of the 4 states. Ss were required to estimate posterior probabilities of each state after each datum; comparison of these estimates with the correct values calculated from Bayes' theorem provided the dependent variables. Ss typically made estimates whose sums increased as a function of the amount of data; data analyses were therefore based on normalized estimates. The predominant finding was that estimates were conservative; Ss failed to become anything like as certain as they should have been. Whether the sequences of data were ordered or scrambled made no difference to the performance. Auxiliary experiments showed that an artificial constraint on where the stimulus dots could appear made no difference to the results, that sequential vs. nonsequential presentation of data made little difference to performance, and that increasingly ambiguous data produce increasingly non-Bayesian performance.
R 15

29,904
Peterson, C.R. & Phillips, L.D. REVISION OF CONTINUOUS SUBJECTIVE PROBABILITY DISTRIBUTIONS. IEEE Trans. on Hum. Factors in Electronics, March 1966, HFE-7(1), 19-22. (Engineering Psychology Lab., University of Michigan, Ann Arbor, Mich.).

Ss observed sequences of data drawn from binomial populations. After each observation in a data sequence Ss divided the continuum of proportions, from 0 to 1, into 3 intervals such that each interval was equally likely to contain the population proportion. The boundaries of the subjective intervals were generally quite similar to the corresponding boundaries of the Bayesian posterior distributions, especially after the first few observations in each data sequence. However, a theoretical conservative S, accumulating information at the rate of only 1/2 datum per observation, also generated boundaries quite near the Bayesian boundaries. This degree of conservatism in the revision of a continuous subjective probability distribution does not preclude a relatively high degree of accuracy in the placement of credible interval boundaries.
R 9

29,905
Slovic, P. VALUE AS A DETERMINER OF SUBJECTIVE PROBABILITY. IEEE Trans. on Hum. Factors in Electronics, March 1966, HFE-7(1), 22-28. (Oregon Research Institute, Eugene, Ore.).

This study explored the manner in which the desirability of an event influences its judged probability. Ss gave probability estimates for each of 5 events, only one of which could occur. Monetary payoffs, ranging from lose $5 to win $5, were contingent upon which event did occur. Desirability was found to bias probability estimates in a complex manner which varied systematically between Ss and between estimation trials. In general, it made estimates less reasonable. Rewards for accuracy did not reduce value biases. Instead, they encouraged "risk-reducing pessimism." Individual differences were an important source of variance. Some Ss were consistently optimistic. Others were quite pessimistic.
R 10

29,906
Beach, L.R. ACCURACY AND CONSISTENCY IN THE REVISION OF SUBJECTIVE PROBABILITIES. IEEE Trans. on Hum. Factors in Electronics, March 1966, HFE-7(1), 29-37. (University of Michigan, Ann Arbor, Mich.).

Using Bayes' theorem as the normative model, 4 experiments examined the consistency with which subjective probabilities were revised in light of additional data. Consistency was found to be extremely high under all experimental conditions, and it was shown to be independent of the accuracy of Ss' subjective probabilities; Ss apparently apply a revision rule that is similar to Bayes' theorem to whatever subjective probabilities they possess at the moment regardless of the accuracy of their probabilities.
R 19

29,907
Schum, D.A., Goldstein, I.L. & Southard, J.F. RESEARCH ON A SIMULATED BAYESIAN INFORMATION-PROCESSING SYSTEM. IEEE Trans. on Hum. Factors in Electronics, March 1966, HFE-7(1), 37-48. (Aviation Psychology Lab., Ohio State University, Columbus, Ohio).

This report describes 3 experiments on Bayesian diagnostic systems. A system simulation facility provides the dynamics of a real-time environment in which the military activities of a fictitious adversary are portrayed. On the basis of intelligence data describing events in this hostile environment, a threat-evaluation team provides diagnoses regarding the threat posed by deployments of hostile military forces. The diagnoses are in the form of posterior probability estimates. The estimates made by men are compared with those caluclated on the basis of a modification of Bayes' theorem. The inputs for these calculations are P(D / H) estimates produced by the same individuals who estimated the posterior probabilities. The results encourage further research on automated Bayesian hypothesis-selection procedures in threat-diagnosis systems.
R 5

29,908
Kaplan, R.J. & Newman, J.R. STUDIES IN PROBABILISTIC INFORMATION PROCESSING. IEEE Trans. on on Hum. Factors in Electronics, March 1966, HFE-7(1), 49-63. (Rand Corporation, Santa Monica, Calif.).

This paper outlines a theory of Probabilistic Information Processing and describes 3 experimental studies testing that theory. The theory is based on certain principles of Bayesian statistical decision theory and is designed as an aid to human diagnostic decision-making. The experiments were concerned with certain types of military diagnostic decisions. In general, the experimental results support the theory. The implications of the theory for practical applications are discussed and suggestions are made for future research.
R 11

29,909
Gould, J.D. & Schaffer, A. VISUAL MONITORING OF MULTI-CHANNEL DISPLAYS. IEEE Trans. on Hum. Factors in Electronics, June 1966, HFE-7(2), 69-76. (IBM Research Center, Yorktown, N.Y.).

These studies were concerned with assessing the ability of untrained Ss to monitor alphanumeric multi-channel displays for signals based upon the simultaneous values of all the channels. The number of channels to be monitored (8, 12, 16, or 24), the range of values per channel (2, 4, or 8), and the number of different signals, or critical sequences, to watch for (8, 16, or 24) were varied in 3 experiments. In Exp I time between changes in the display was 10 sec, in Exp II it was 5 sec, and in Exp III it was 2.5 sec. Exp I indicated that Ss, when monitoring 8 channels, correctly detected over 95% of the signals. In Exps I & II, Ss made 80% or more correct detections when watching up to 16 channels. Performance continued to decrease with a further increase in the number of channels to be watched and with a further increase in the rate of display change. Levels per channel were important only when either 16 or more channels were monitored or when the display changed every 2.5 sec. As the number of different critical sequences (signals) for which Ss watched increased, correct responses decreased significantly, although this variable exerted the least effect upon performance.
R 21

29,910
Pew, R.W. PERFORMANCE OF HUMAN OPERATORS IN A THREE-STATE RELAY CONTROL SYSTEM WITH VELOCITY-AUGMENTED DISPLAYS. IEEE Trans, on Hum, Factors in Electronics, June 1966, HFE-7(2), 77-83. (Psychology Dept., University of Michigan, Ann Arbor, Mich.).

A one-dimensional 3-state relay control task in which human operators served as the active switching and equalization element was employed to compare performance in 3 display conditions and to derive measures of performance that might prove useful for further development of models of human tracking behavior. 2 displays which provided explicit velocity information in the form of a unidimensional error-velocity vector superimposed on a compensatory error display and 2-dimensional phase-plane display of error velocity vs. displacement were shown to enhance learning over that produced by the usual compensatory display of error, but only with the highest value of system gain, 30 cm/sec^2. An analysis of Ss' initial transient response represented as mean switching points in the phase-plane revealed remarkably little variability and switching performance close to that of an optimal minimum-time controller. Finally, in this and 2 subsidiary experiements, a measure of time to process visual feedback about the ongoing response process was derived that may provide a first step toward linking discrete reaction-time results to continuous manual-control performance.
R 6

29,911
Seeley, H.F. & Bliss, J.C. COMPENSATORY TRACKING WITH VISUAL AND TACTILE DISPLAYS. IEEE Trans, on Hum, Factors in Electronics, June 1966, HFE-7(2), 84-90. (Medical School, St. Thomas's Hospital, London, England & Stanford Research Institute, Menlo Park, Calif.).

An investigation has been made into the feasibility of a tactile display for compensatory tracking. 3 displays, one continuous and 2 quantized, were used to compare performance. These consisted of an oscilloscope, a 7 by 7 array of neon lights, and a 7 by 7 array of specially developed airjet stimulators. A variable delay was incorporated into the error-analysis program to determine the value of delay for which the error is a minimum. For all the tested combinations of display gain and command signal bandwidth, the mean-squared error showed a well-defined minimum for an appropriate compensating delay. At these minima, the mean-squared errors for the quantized displays were comparable. The variation of minimum mean-squared error with display gain indicated the importance of directional over magnitude information in tracking with quantized displays.
R 8

29,912
Sheridan, T.B. THREE MODELS OF PREVIEW CONTROL. IEEE Trans. on Hum, Factors in Electronics, June 1966, HFE-7(2), 91-102. (Massachusetts Institute of Technology, Cambridge, Mass.).

This paper discusses a means to describe and eventually to predict the response of a human or artificially intelligent controller which a) has a constrained preview of the actual input course and which b) observes the successive target values as being of non-uniform importance. 3 examples are : driving an automobile in traffic, a blind pedestrian using a cane or electronic obstacle detector, and remote manipulation of solid objects using artificial sensors and effectors. 3 models are presented which characterize constrained preview control better than can conventional transfer function techniques.
R 10

29,913
Deininger, R.L., Billington, Marjorie J. & Riesz, R.R. THE DISPLAY MODE AND THE COMBINATION OF SEQUENCE LENGTH AND ALPHABET SIZE AS FACTORS IN KEYING SPEED AND ACCURACY. IEEE Trans. on Hum. Factors in Electonics, Sept. 1966, HFE-7(3), 110-115. (Bell Telephone Laboratory, Inc., Holmdel, N.J.).

4 combinations of sequence length and keyset size were selected to give 22.3 bits of information per sequence in each case. 2 visual display conditions were used with each of the 4 combinations: a continuous display where the sequence remained in view throughout keying, and an on-demand display where the sequence disappeared once keying started but could be made to reappear when the S pressed a button. Results indicate that keying was faster and more accurate with the short sequences and the large keyset, in contrast with the long sequences and the small keyset. These differences were particularly large where the on-demand display was used.
R 17

29,914
Skolnick, A. STABILITY AND PERFORMANCE OF MANNED CONTROL SYSTEMS. IEEE Trans. on Hum. Factors in Electronics, Sept. 1966, HFE-7(3), 115-124. (USN Deep Submergence Systems Project, Washington, D.C.).

This study demonstrates that the human-operator transfer function approach may be generalized; from a variety of published experimental data, "capability bounds" upon the transfer function parameters are formed. With such ranges defined, these parameters, forming a type of variable structure, can be used as a mapping function to display in the complex plane the boundaries of human adaptive capacity. These boundaries contain a collection of "critical points" which, used in conjunction with the plant Nyquist contour, permit interpretation of system stability characteristics. Experimental verification of the theory is obtained from previously published empirical studies. A man-monitored system configuration also appears to be susceptible to such stability analysis. Control of varying-parameter plants is studied and a solution to the "best" performance problem proposed. The notion of a "vector" performance index is introduced and the design for a "best-overall" compensator to meet specifications upon a varying-parameter plant is obtained by using a "direct search" method (especially suited to the electronic computer). This method incorporates a "pattern strategy" to aid in finding the next set of trial values for the compensator; the strategy affords rapid convergence to a solution, as is demonstrated by an example.
R 21

29,915
McDonnell, J.D. A PRELIMINARY STUDY OF HUMAN OPERATOR BEHAVIOR FOLLOWING A STEP CHANGE IN THE CONTROLLED ELEMENT. IEEE Trans. on Hum. Factors in Electronics, Sept. 1966, HFE-7(3), 125-128. (Systems Technology, Inc., Hawthorne, Calif.).

A most important time-varying problem in manual control systems is that of a step change in the controlled element, as typified by, say, a stability augmenter failure in a manned aircraft. This communication describes an experimental investigation aimed at understanding human operator behavior during such a change, and the determination of some limitations on operator descriptions and measurement methods which might be employed. If the operator were to continue tracking with unchanged characteristics immediately following the controlled element change, 1 of 2 conditions would prevail: the new closed-loop system would be stable, or the new closed-loop system would be unstable until some operator adjustment was made. It is hypothesized that differences in transitional behavior will reflect these 2 categories of transitions. Measures of operator behavior are taken to be maximum error and time to maximum error following the transition. In addition, the subjective measure of recognition time, or the time required for the S to realize a change has occurred, is noted. An evaluation of the conventional quasi-stationary model of an operator for transitional behavior description is made via data from the time histories. The model proves unsatisfactory, in general, although interesting observations on operator stationarity are noted.
R 7

29,917
Jex, H.R., McDonnell, J.D. & Phatak, A.V. A "CRITICAL" TRACKING TASK FOR MANUAL CONTROL RESEARCH. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 138-145. (Systems Technology, Inc., Hawthorne, Calif.).

A "critical" tracking task is developed in which a human operator is required to stabilize an increasingly unstable first-order controlled element up to the critical point of loss of control. Servo theory and operator describing function measurements are used to validate the basic assumptions, and an automatically paced critical task mechanization is described. The results show that the task does constrain the operator's behavior as intended, and that the critical instability depends primarily on the operator's effective time delay while tracking. A number of applications for the critical task are reviewed, including secondary workload research, control and measurement of operator and controlled element gain, and display research.
R 21

29,918
Gibbs, C.B. THE EFFECT OF MINOR ALCOHOL STRESS ON DECISION PROCESSES IN A STEP-TRACKING TASK. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 145-150. (Mechanical Engineering Div., National Research Council, Ottawa, Ontario, Canada).

20 men were tested in step-input tracking. Minor stress was imposed by moderate alcohol dosage and an incompatible directional relation between control and display. Some target movements demanded a response in an improbable direction and posed a choice between long delay in response and a movement in the wrong direction. The duration of response latency (rl) and the number of directional errors revealed a S's preference for accuracy or speed and his ability to estimate probabilities. Directional errors, response latencies, and eye movements were recorded before and after drinking, when breathanalyzer (ba) readings were zero, and at 0.05% and 0.1% ba levels, which may be produced in a man weighing 160 lbs by drinking 2 and 4 12 oz bottles of beer, respectively. Alcohol caused a progressive increase in rls and errors ($p < 0.01$); there was no evidence for a threshold below which alcohol has no adverse effect. The test emphasized the markedly different effects of the same alcohol dosage on the skill of different Ss, but habitual drinkers obtained no undue advantage on the test. The task was learned quickly and extensive practice did not reduce the discriminatory power of the test. The effects of a dose producing a 0.05% ba reading were not significantly different in an ascending or descending series of levels of intoxication. The alcohol dosages tested had no significant effect on simple reaction time.
R 18

29,919
Fenton, R.E. AN IMPROVED MAN-MACHINE INTERFACE FOR THE DRIVER-VEHICLE SYSTEM. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 150-157. (Communication & Control Systems Lab., Ohio State University, Columbus, Ohio).

A control stick with a built-in tactile aiding device was tested in a simulated car-following situation. The tactile device gave the driver of a following car information--headway and relative velocity--concerning the state of a lead car. Experimental results (relative velocity and headway variance) with the simulator were compared with those obtained using conventional automobile controls in a similar situation. Sizeable reductions in these quantities, 55 and 85%, respectively, were obtained when the tactile display was partially quickened. Some evidence indicated that the driver behaved as an amplifier when using such a display.
R 9

29,920
Carbonell, J.R. A QUEUEING MODEL OF MANY-INSTRUMENT VISUAL SAMPLING. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 157-164. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

In the present paper we will discuss the task of a pilot (namely of a high performance jet plane) sampling the information given to him by the instruments on his panel. We will present a model that attempts to explain and match the behavior of pilots under actual flight conditions. This model is based on the concept of the different instruments competing for the attention of the pilot. Some may be unimportant under a given flight condition, but many should be looked at, the urgency of doing so being measured by the risk incurred if the corresponding value is beyond a certain threshold. Costs are assigned to each instrument; at each sampling instant the decision as to what instrument to look at is based on comparing for the different instruments the combined effect of both the probability of exceeding the threshold and a cost of exceeding that threshold. Effectively, the instruments queue for the pilot's attention; the instrument with the highest priority at each instant is then served (looked at).
R 14

29,921
Brazeal, E.H., Jr. & Booth, T.L. OPERATOR NOISE IN A DISCRETE SIGNAL DETECTION TASK. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 164-173. (Research Labs., United Aircraft Corp., East Hartford, Conn. & Electrical Engineering Dept., University of Connecticut, Storrs, Conn.).

Man's ability to detect visual signals in noise is the concern of this paper. An operator is presented a computer generated 2 dimensional binary--or "dot"--display and is asked to indicate the presence or absence of a "signal." Previously developed signal-detectability theory is expanded. A model of the operator as a threshold detector hampered by a Gaussian noise source is developed. The noise source is defined by 2 parameters--first and second moment operator factors, ε, and γ. The most important parameter, γ, is investigated experimentally and found to be essentially independent of signal to noise ratio, SNR. This is interpreted to mean that the noise source decrements the actual SNR by 2 to 3 dB and that the operator sets a near optimum decision threshold as a function of SNR.
R 6

29,922
Costello, R.G. & Higgins, T.J. AN INCLUSIVE CLASSIFIED BIBLIOGRAPHY PERTAINING TO MODELING THE HUMAN OPERATOR AS AN ELEMENT IN AN AUTOMATIC CONTROL SYSTEM. IEEE Trans. on Hum. Factors in Electronics, Dec. 1966, HFE-7(4), 174-181. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y. & Electrical Engineering Dept., University of Wisconsin, Madison, Wisc.).

This paper comprises a bibliography of some 200 entries, selected from a total collection of almost 500 references pertaining to the human operator, which are concerned specifically with modeling the human operator as an element in an automatic control system. To enable systematic utilization of the material, the important papers are classed in Section A, the Bibliography Subject Index, under major subheads, and then arranged chronologically within each subject category. Included within these categories are many of the original papers dealing with human operator models, including British and U.S. classified reports produced after World War II, which have since been declassified. Up-to-date private-industry reports, which are generally difficult to learn of or locate, are included, as is a wealth of material stemming from federal agencies, principally NASA. Section B comprises the actual bibliography.
R 236

29,923
Senders, J.W. A RE-ANALYSIS OF THE PILOT EYE-MOVEMENT DATA. IEEE Trans. on Hum. Factors in Electronics, June 1966, HFE-7(2), 103-106. (Bolt, Berenek & Newman, Inc., Cambridge, Mass.).

A model for the distribution of attention among multiple information sources presented in an earlier paper (HEIAS No. 24,897) is applied to data on pilot eye-movements from earlier studies. Using the measured time spent on each instrument, the transition model of attention was tested. The results of this test show that the transition model does not predict within reasonable error (from the theoretical point of view) the "link values" observed in flight. However, the constraints on transitions imposed by frequency of sampling enforce a general adherence to the model. As a result, although it is almost surely the case that scanning patterns exist, they must co-exist with the demands of arithmetic.
R 10

29,924
Gengerelli, J.A. FACTORS AND FACTOR ANALYSES. J. Psychol., Nov. 1966, 64(Second Half), 159-166. (Psychology Dept., University of California, Los Angeles, Calif.).

What is required for the factorial analysis of any set of n psychological tests is the availability of another set of tests that intercorrelate .10 or less with one another. By incorporating this latter set into the original battery of n tests and applying the above procedure, we determine to what extent the battery is described by the (quasi) orthogonally interrelated tests; if this is satisfactory, we proceed to determine the factor loadings. This implies that systematic efforts should be made to cull from the literature, and to construct, psychological tests whose mutual intercorrelations are negligible. The devising of tests of psychological functions that intercorrelate negligibly presents an important challenge to psychology. It makes operational realities of "factors" that otherwise must remain abstract conceptual entities.
R 9

29,925
Bartley, S.H. & Ball, R.J. THE STUDY OF TARGET SIZE IN PRODUCTION OF BRIGHTNESS, HUE, AND SATURATION FOR INTERMITTENT PHOTIC STIMULATION IN THE RED END OF THE VISIBLE SPECTRUM. J. Psychol., Nov. 1966, 64(Second Half), 241-247. (Psychology Dept., Michigan State University, East Lansing, Mich.).

The present paper reports the effects obtained with intermittent photic stimulation when target area, PCF, and wavelength from 650 mμ to 710 mμ were varied. It was found that hue shifts as well as brightness shifts were produced as this range of wavelengths was traversed. The target areas used did not essentially change brightness. This was interpreted that brightness was not differentially dependent upon cones and rods. Desaturation decreased as the range was traversed, but since luminosities at all wavelenghts were not the same, this trend may have been partially dependent upon this fact. A PCF of 3/4 produces very little desaturation at any wavelength. Very definite hue shifts were produced as the range was traversed. In the wavebands centered at 680 mμ and 690 mμ, the two phases of the intermittency cycle produced separate hues, which were seen to lie in separate planes. This was a phenomenon similar to one earlier found in achromatic stimulation.
R 4

29,926
Davis, G.A. & Manske, Mary E. AN INSTRUCTIONAL METHOD FOR INCREASING ORIGINALITY. Psychon. Sci., Sept. 1966, 6(2), 73-74. (University of Wisconsin, Madison, Wisc.).

College Ss were instructed to imagine themselves within a particular situation and to list uses for a given object within that situation. These Ss produced a larger total number of ideas, a larger number of original (unique) ideas, a larger proportion of original-to-total ideas, a larger number of "good" ideas, and a greater proportion of good-to-total ideas than Ss not receiving the situations instructions.
R 3

29,927
Loewenton, E. & Luce, R.D. MEASURING EQUAL INCREMENTS OF UTILITY FOR MONEY WITHOUT MEASURING UTILITY ITSELF. Psychon. Sci., Sept. 1966, 6(2), 75-76. (University of Pennsylvania, University Park, Penn.).

Let (A, P) denote the commodity bundle consisting of $A and some other commodity P. With P and Q fixed, then for any A determine that B for which S is indifferent between (A,P) and (B,Q). If utility is additive over the components, each money difference induces the same utility difference. 2 choices for P and Q, all jazz records of equal monetary value, and 2 levels for A, 53¢ and $5.03, were studied. One S did not maintain consistent indifference points, 2 exhibited constant marginal utility, and 2 exhibited diminishing marginal utility.
R 4

29,929
Rose, R.J. ANXIETY AND AROUSAL: A STUDY OF TWO-FLASH FUSION AND SKIN CONDUCTANCE. Psychon. Sci., Sept. 1966, 6(2), 81-82. (University of Illinois, Urbana, Ill.).

The relationship of clinical anxiety level to 2 indicants of arousal was evaluated in 40 drug-free patients. A range-corrected index of skin conductance and the threshold for 2-flash fusion were used; both measures showed significant correlations with anxiety level.
R 8

29,931
Faucheux, C. & Mackenzie, K.D. TASK DEPENDENCY OF ORGANIZATIONAL CENTRALITY: ITS BEHAVIORAL CONSEQUENCES. J. exp. Soc. Psychol., Oct. 1966, 2(4), 361-375. (Laboratoire de Psychologie Sociale de la Sorbonne, Paris, France & Carnegie Institute of Technology, Pittsburgh, Penn.).

This experiment aims at demonstrating the task dependency of organizational structure and the intervening nature of organizational variables between task and structure. 2 types of tasks are used. Task A is routine and deductive and Task B is nonroutine and has some inferential components. Each group is given a series of both tasks. Half of the groups start with Task A and half start with Task B. Centrality and performance measures, subjective evaluations, and content analysis of communications differed between the 2 tasks and were not dependent upon the order in which the tasks are performed. The nature of the task, in this experiment, dominates the behavior of the groups. The results support the conclusion that organization structure is a dependent variable intervening between task and behavior.
R 23

29,932
Flament, C. & Apfelbaum, Erika. ELEMENTARY PROCESSES OF COMMUNICATION AND STRUCTURATION IN A SMALL GROUP. J. exp. Soc. Psychol., Oct. 1966, 2(4), 376-386. (Laboratoire de Psychologie Sociale d'Aix-en-Provence, France & Laboratoire de Psychologie Sociale de la Sorbonne, Paris, France).

A controlled experiment was performed to analyze group characteristics related to socio-affective values of communication. 20 groups of 4 adolescent male Ss sent 200 messages, with assigned values of 0 or 1, when and to whom they chose. Analysis of the sheer numbers of messages sent and received, without taking account of their value, was shown to be unenlightening. However, the non-0 messages explained the observed phenomena in terms of coalition formation and evolution. Postexperimental sociometric data were found to be predictably related to the patterns of communication. The simple model proposed, though it appears quite promising, needs further experimentation to test its usefulness.
R 2

29,933
Laughlin, P.R. & Johnson, H.H. GROUP AND INDIVIDUAL PERFORMANCE ON A COMPLEMENTARY TASK AS A FUNCTION OF INITIAL ABILITY LEVEL. J. exp. Soc. Psychol., Oct. 1966, 2(4), 407-414. (Loyola University, Chicago, Ill.).

In a test of predictions from a complementary model of group problem solving which considers initial ability level, 255 college students were administered the Concept Master Test. After being categorized as high (H), middle (M), or low (L) ability, they retook the test individually or working with a partner of one of the 3 ability levels. Major results were: a) over all conditions, pair-groups improved more on the second test than individuals; b) H Ss improved when working with H partners over H Ss working alone or with M or L partners; c) M Ss improved when working with H or M partners over M Ss working alone or with L partners; d) L Ss working with H partners improved over L Ss working alone or with M or L partners, and L Ss working with M partners improved over L Ss working alone or with L partners. Results were interpreted as supporting the complementary model.
R 6

29,934
Nisbett, R.E. & Schachter, S. COGNITIVE MANIPULATION OF PAIN. J. exp. Soc. Psychol., July 1966, 2(3), 227-236. (Columbia University, New York, N.Y.).

The experiment tests the notion that naturally occurring states of physiological arousal are manipulable in the same way that drug-induced arousal states have proven to be. The state of arousal studied is that produced by pain from electric shock. All Ss were given a placebo before the shock experience and half were told that the side effects would cause arousal symptoms such as palpitation, tremor, etc. The other half expected no such symptoms. Ss believing themselves to be in an artificial state of arousal failed to attribute their shock-created arousal to the shock, and found the shock less painful and were willing to tolerate more of it. This "relabeling" of a naturally occurring state was shown to occur only for Ss in a relatively low state of fear.
R 6

29,935
Fiedler, F.E. THE EFFECT OF LEADERSHIP AND CULTURAL HETEROGENEITY ON GROUP PERFORMANCE: A TEST OF THE CONTINGENCY MODEL. J. exp. Soc. Psychol., July 1966, 2(3), 237-264. (University of Illinois, Urbana, Ill.).

An experiment was conducted a) to compare the performance of 96 culturally and linguistically homogeneous and heterogeneous 3-man teams under powerful and weak leadership positions and on 3 types of tasks varying in structure and requirements for verbal interaction; and b) to test a previously described Contingency Model of Leadership Effectiveness. Homocultural and heterocultural groups differed in performance only on the highly verbal task. Heterogeneous groups, despite obvious communication difficulties and culturally divergent backgrounds, performed about as well on the structured and nonverbal tasks as did homogeneous groups. Groups led by recruit leaders performed as well as groups directed by petty officers. Thus, neither the military leadership training and experience nor the position power of petty officers contributed to the effectiveness of these groups. These findings have considerable potential implications for leadership training programs and evaluation of the communication variable in affecting group productivity. The experiment clearly supported the hypothesis derived from the Contingency Model that the specific leadership style required for effective group performance is contingent upon the favorableness of the group-task situation. As in previous research, groups under managing, task-controlling (low LPC) leaders performed best in very favorable group-task situations as well as in group-task situations which were relatively unfavorable or very unfavorable. Permissive, considerate, group-oriented leaders performed best in situation intermediate in favorableness.
R 22

29,936
Bauer, B.B. & Torick, E.L. EXPERIMENTAL STUDIES IN UNDERWATER DIRECTIONAL COMMUNICATION. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 25-34. (CBS Laboratories, Stamford, Conn.).

Previously, a scheme was suggested for sensing directional perception underwater by receiving sound with two back-to-back cardioid pattern receptors connected to earphones via a crosscoupling network that restores normal interaural delays. To test this scheme, 2 experiments were performed: a) Observers under water used calibrated earphones while the experimenter topside adjusted relative voltages to the crosscoupling network to simulate the bicardioid receptor array. The observers under water sensed direction with an accuracy comparable to that obtained with previous in-the-air experiments; b) 2 miniature hydrophone transducers were mounted 10 cm apart and were interconnected with a symmetrical phase-shift network to produce an array with a polar pattern equivalent to 2 back-to-back cardioid transducers, over a frequency range of 200-2500 cps. With this array in variable orientation relative to an underwater projector, and with topside observers listening through earphones equipped with a crosscoupling network, the orientation of the array was readily ascertainable.
R 8

29,937
Bauer, B.B. & Torick, E.L. CALIBRATION AND ANALYSIS OF UNDERWATER EARPHONES BY LOUDNESS-BALANCE METHOD. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 35-39. (CBS Laboratories, Stanford, Conn.).

Recent experiments in underwater directional communication necessitated the use of earphones with uniform response characteristics. 2 earphones from headset P-120-PQC-1 were calibrated underwater by the loudness-balance method at 50 dB above 1000 cps threshold sound-pressure level (SPL). A 25-dB range in response was observed in the frequency interval of 200-3000 cps, with principal resonance at 600 cps. Equalization was provided, after considering the 50-phon loudness contour, resulting in uniform response over the interval of 200-2500 cps. The experiment sheds some light on the role of tympanic versus bone-conduction modes in underwater listening, and suggests a receiver design with uniform frequency response and 40-times greater efficiency than the P-120-PQC-1.
R 3

29,938
Allen, W.B., Stewart, J.L., Zarnowitz, R.M. & Brandon, M.K. PSEUDORANDOM SIGNAL-CORRELATION METHODS OF UNDERWATER ACOUSTIC RESEARCH. II. INSTRUMENTATION. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 62-73. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.).

A discussion is presented of a correlation signal-processing system for studying the distortion of underwater acoustic signals, and some of the preliminary observations obtained with this equipment are given. The system uses a 100-cps-bandwidth pseudorandom signal and both 5- and 25-sec averaging times; this gives a simultaneous time resolution of 0.01 sec and frequency resolutions of 0.2 and 0.04 cps. DElay LIne TIme Compressors (DELTICs) provide a high search rate in time (range). A difference-frequency correlator, employing a bank of 11 bandpass filters as averagers, provides search over ±- and ±0.2-cps Doppler frequency shifts, respectively. The effects have been observed of clipper normalization in the presence of multipaths and the degradation of the correlation owing to reflections at high angles from a violently moving ocean surface.
R 10

29,939
Shor, S.W.W. ADAPTIVE TECHNIQUE TO DISCRIMINATE AGAINST COHERENT NOISE IN A NARROW-BAND SYSTEM. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 74-78. (USN Anti-Submarine Warfare Systems Project Office, Department of the Navy, Washington, D.C.).

It is shown how to use the mathematical method of steep descent to adjust the time delays and shading of an arbitrary array of hydrophones to increase the signal-to-noise ratio and to discriminate against coherent interference. Since the method requires only about 4M correlations at each step for each beam to which it is applied, where M is the number of hydrophones, it can probably be realized in real time in those narrow-band systems to which it is suited. The results of a computer modeling of the method are presented in which, by filtering the output of the hydrophones of a 23-element array, it is found possible to eliminate the effect of an interfering signal 40 dB stronger than the desired signal and offset by 15° from it in bearing.
R 1

29,940
Usher, T., Jr. SIGNAL DETECTION BY ARRAYS WITH ARBITRARY PROCESSORS AND DETECTORS. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 79-86. (Unholtz-Dickie Corporation, Hamden, Conn.).

The signal-detection characteristics of local arrays of transducers that are used to detect the presence of a plane-wave random signal in an isotropic noise background are analyzed for the situation in which the transducers are followed by identical nonlinear processors. The resulting signals are summed and detected by a square-law device with a low-pass filter. The performance of this system is compared to that for a system with linear processors and a square-law detector. Also analyzed are the signal detection characteristics of an array with linear processors and a non square-law detector. The performance is also compared to that for the linear system with a square-law detector. Results indicate that, for maximum output signal-to-noise (S/N) ratio, the system with linear processors and a square-law detector is optimum for both situations considered above. The degradation in performance caused by deviations from the optimum is not great, however. On an output-signal basis, defined by the difference between "on target" and "off target" output, the linear processor provides an optimum system, if there is a choice of processor function. However, no optimum exists when the processor is linear and there is a choice of detector function.
R 13

29,941
Babkoff, H. & Sutton, S. END POINT OF LATERALIZATION FOR DICHOTIC CLICKS. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 87-102. (Biometrics Research, New York State Department of Mental Hygiene, New York, N.Y. & Columbia University, New York, N.Y.).

A series of experiments was undertaken to systematically study one aspect of binaural interaction for dichotically presented clicks--the end point of lateralization, which is referred to in this paper as the lag-click threshold (Δt_2). The results of experiments in which click parameters were manipulated are presented in Sec. III. These results indicate that the lag-click threshold is decreased by an increase in the sensation level (SL) of both clicks, by an interaural intensity asymmetry favoring the lag click, or by a decrease in the low-frequency components of both clicks. The results of experiments in which the background-noise parameters were manipulated appear in Sec. IV. As the SL of binaural broad-band noise (125-8000 cps) is increased to 30 dB, the lag-click threshold decreases; but as the noise level is increased further, the lag-click threshold increases. The finding of a minimum point at 30 dB is related to the broad spectrum of the noise. One-octave bandwidths of noise produce monotonic functions. A 1-oct low-frequency band of noise presented either to both ears or to the ear receiving the lead click, decreases the lag-click threshold, while a 1-oct high-frequency band of noise presented either to both ears or to the ear receiving the lead click increases the lag-click threshold. Finally, a 1-oct low-frequency or high-frequency band of noise presented to the ear receiving the lag click produces a substantial increase in the lag-click threshold. The results are discussed briefly in terms of the available physiological literature and a model is proposed.
R 20

29,942
Bilger, R.C. REMOTE MASKING IN THE ABSENCE OF INTRA-AURAL MUSCLES. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 103-108. (Bioacoustics Lab., Eye & Ear Hospital, Pittsburgh, Penn.).

To ascertain the role of the stapedial reflex in remote masking, remote and contralateral remote masking were studied on separate groups of listeners who had had their stapedius muscles excised surgically. In addition, separate groups of listeners who had audiometrically and otoscopically normal ears were used to obtain control data. The results of these studies show that neither remote nor contralateral remote masking depends upon the stapedial reflex; both, however, do vary with degree of hearing loss. In the case of remote masking, an orderly relation was found to exist between the amount of remote masking and the sensation level (SL) of the masker (re hearing levels (HL) at 1000 and 1500 cps). This, along with exaggerated remote masking in cases of sensorineural loss, supports the earlier explanations of remote masking solely in terms of cochlear mechanics. For contralateral remote masking, the relationship between masking and hearing loss was not as orderly as that for remote masking. The absence of a systematic relationship between SL of the masker and onset or amount of contralateral remote masking suggests it to be a central rather than a peripheral phenomenon.
R 8

29,943
Davis, H. & Zerlin, S. ACOUSTIC RELATIONS OF THE HUMAN VERTEX POTENTIAL. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 109-116. (Central Institute for the Deaf, St. Louis, Mo.).

The average amplitude of the slow, diffuse, nonspecific electrical response of the human cortex, called the V potential, evoked by tone pips or by tactile stimuli to thumb and forefinger, follows a power law with exponent about 0.24 (re sound pressure). The variability of the responses is great, across both trials and Ss. If auditory or tactile stimuli are judged equally strong, across frequency or modality, the V potentials tend to be equal. Both the latency and the amplitude of the V potential are independent of the rise time of a tone burst, at least up to 100 msec. The amplitude also remains nearly constant as the duration of the plateau of a burst, with rise and fall times of 5 msec, is varied from 2 to 320 msec. An off response that closely resembles the on response in waveform, latency, and amplitude appears at the end of any burst that is long enough, but an off response that follows an on response by 1 sec or less is much reduced in amplitude, and so is an on response that too closely follows an off response. The V potential is a response to change in stimulation either on or off.
R 29

29,944
Silbiger, H.R. & Elliott, D.N. AUDITORY THRESHOLD LOCATION AND UNCERTAINTY AS A FUNCTION OF TONE PARAMETERS AND FATIGUE. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 117-124. (Auditory Research Lab., Wayne State University, Detroit, Mich.).

The relationship of auditory threshold location for various pulsed and continuous tones was investigated, using a Bekesy audiometer. It was found that for periods from 250 to 750 msec an increase in repetition rate results in a decrease in threshold, independent of the duty cycle. This relationship was maintained after a TTS_{6-10} (temporary threshold shift) of 20 dB. The pen-excursion size, however, was found to be a function of the pulse length, during TTS_{6-10}, with the longer pulse giving the greatest reduction in pen-excursion size (PES); continuous tones yield the highest thresholds and the greatest reduction in pen-excursion size, with under normal conditions and under TTS_{6-10}. It therefore appears that threshold location and pen-excursion size may be independently manipulated. The differences in threshold location are thought to be owing to an increase in the ability to make tone present-absent decisions during interruptions, while the decreases in pen-excursion size during TTS may be owing to the perception of the increased rate of loudness growth.
R 13

29,945
Tillman, T.W., Johnson, R.M. & Olsen, W.O. EARPHONE VERSUS SOUND-FIELD THRESHOLD SOUND-PRESSURE LEVELS FOR SPONDEE WORDS. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 125-133. (Auditory Research Lab., Northwestern University, Evanston, Ill.).

This experiment sought to establish the difference between earphone and sound-field measures of spondee threshold SPL (sound-pressure level). Recorded spondee words were delivered to both a conventional and an insert-type earphone as well as to a single-loudspeaker that generated the signal in the sound field. Monaural spondee threshold SPL's were established for both normal hearing and hypoacousic Ss under the 3 listening conditions. The intensity level of the spondee words under the 3 conditions was expressed as the SPL of an "equivalent" speech spectrum noise. For both groups of Ss, the mean sound-field threshold SPL was about 7.5 dB lower than that measured under the conventional earphone and approximately 12.5 dB lower than that established under the insert-type earphone. These results tend to confirm the reality of the "missing 6 dB." Further, they indicate that the difference between minimum audible pressure (MAP) and minimum audible field (MAF) is a product of both diffraction and "closed-ear" effects. The latter effect appears to vary as a function of the volume of air enclosed by the pressure transducer.
R 17

29,946
Zerlin, S. INTERAURAL TIME AND INTENSITY DIFFERENCE AND THE MLD. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 134-137. (Central Institute for the Deaf, St. Louis, Mo.).

Masking-level differences (MLD) for a 600-cps low-pass transient were explored as a function of: a) interaural time difference (Δt); b) interaural intensity difference (ΔI); c) combinations of Δt and ΔI. Masking-level difference here is the difference between two levels of coherent noise (N_0), one required to mask a given condition of click, the other to mask a binaural in-phase click (S_0). a) MLD increases with signal Δt in a manner similar to that for interaural phase differences of the tonal frequency within the filtered transient. Furthermore, for larger values of Δt, where the transients no longer overlap in time, the MLD decreases in a manner suggesting temporal integration of two brief signals. b) As signal ΔI increases, MLD approaches a limiting value of about 7 dB, for signal monaural (S_m) condition. An interaural intensity difference of 24 dB yields and MLD of 6 dB, still a decibel or so short of the monaural value. c) When ΔI is combined with Δt greater than 0.4 msec, the MLD decreases as ΔI increases, no matter whether the louder signal is leading or lagging in time.
R 3

29,947
Kryter, K.D. & Williams, C.E. MASKING OF SPEECH BY AIRCRAFT NOISES. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 138-150. (Bolt Beranek and Newman, Inc., Cambridge, Mass.).

Word intelligibility tests at various intensity levels were administered to a crew of trained listeners in the presence of recorded noise from jet and propeller-driven aircraft. The noise was that which would be present outdoors and in a house as the result of engine runup operations and if aircraft were flying overhead shortly after takeoff and prior to landing. According to visual inspection of the data, methods of measuring or evaluating aircraft noise predict the results of the speech tests in the following order of merit, from best to worst: a) articulation index (AI); b) perceived noise level in PNdB; c) speech-interference level (SIL); d) noise criteria (NC); e) over-all sound-pressure level (SPL A scale); and f) over-all SPL C scale. The differences among PNdB, SIL, NC, and db(A), in this regard, are probably not significant according to these tests.
R 11

29,948
Ohman, S.E.G. COARTICULATION IN VCV UTTERANCES: SPECTROGRAPHIC MEASUREMENTS. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 151-168. (Speech Transmission Lab., Royal Institute of Technology, Stockholm, Sweden).

In this paper, the formant transitions in vowel + stop consonant + vowel utterances spoken by Swedish, American, and Russian talkers are studied spectrographically. The data suggest a physiological model in terms of which the VCV articulations are represented by a basic diphthongal gesture with an independent stop-consonant gesture superimposed on its transitional portion. This interpretation necessitates a reevaluation of the locus theory proposed by the workers of the Haskins Laboratories. Some conclusions about the general nature of the neural instructions behind the VCV gestures are discussed.
R 24

29,949
Tillotson, J.G. ATTENUATION OF SOUND OVER SNOW-COVERED FIELDS. J. Acoust. Soc. Amer., Jan. 1966, 39(1), 171-173. (Physics Dept., Acadia University, Wolfville, Nova Scotia, Canada).

Preliminary measurements of the attenuation of sound propagated over a field covered with a new fall of snow are presented, for frequencies in the audio band. At 800 cps, the characteristic impedance of fresh snow has been determined as $Z_2=|z_2|e^{-j\phi}=1.83-j0.27$. The complex propagation constant $K_2=\alpha+j\beta=0.10+j0.27$ has been measured as well. The attenuation measurements have been made at different source heights above the snow field. Where complete data are available, reasonable correlation exists between theory and experiment.
R 6

29,950
Deatherage, B.H. EXAMINATION OF BINAURAL INTERACTION. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 232-249. (Tracor Incorporated, Austin, Tex.).

The study of binaural interaction may be conveniently divided into 3 areas: anatomy, physiology, and psychology. These areas, while furnishing large amounts of data, have not yet provided enough information to make possible a complete theory of binaural interaction. Several partial theories are discussed, 2 experiments are reported, the results of the experiments set in perspective, and the problems of the construction of a full theory of binaural interaction are presented. A Bibliography is appended.
R 160

29,951
Henning, G.B. FREQUENCY DISCRIMINATION OF RANDOM-AMPLITUDE TONES. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 336-339. (Defence Research Medical Labs., Toronto, Ontario, Canada).

The ability of human observers to discriminate frequencies of tones between 1000-15,000 cps was measured in a temporal 2-alternative forced-choice discrimination experiment. On each trial, one of the test tones, selected at random, was attenuated by a random amount ranging from 8 to 20 dB in 2-dB steps. Comparison of the results of this experiment with those of previous experiments in which fixed-amplitude tones were used, indicates little difference between the observers' abilities to discriminate frequencies of fixed- and random-amplitude tones at 1000 cps. Discrimination with random-amplitude tones becomes relatively poorer, however, as frequency is increased. For example, the classical data show a frequency just-noticeable difference (jnd) of 40 cps at 10,000 cps; in the present experiment, with random-amplitude signals, the observers were unable to achieve 75% correct responses until ΔF was 300 cps.
R 10

29,952
Pfafflin, Sheila M. & Mathews, M.V. DETECTION OF AUDITORY SIGNALS IN REPRODUCIBLE NOISE. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 340-345. (Bell Telephone Laboratories, Inc., Murray Hill N.J.).

Twelve reproducible noises were used as stimuli in a 2-interval forced-choice signal-detection experiment. The noises were stored numerically in a PB250 computer that converted them to sound during the experiment by means of a digital-to-analog converter. The 240 numbers specifying a noise were sampled at a rate of 2500 numbers/sec, generating a 96-msec stimulus. A sinusoidal signal with a period of 8 samples/cycle was added to one noise on half the trials. Spectral analyses were computed for all stimuli. On nonsignal trials, biases to particular noises were found that could be explained in part, but not entirely, by differences between the noise pairs in energy around the signal frequency. Performance on signal trials was related to the energy difference between the stimuli in the region near the signal frequency, but was not entirely accounted for by this variable. Special characteristics of certain noises appear to affect the S's response when these noises appear in either signal or nonsignal trials. Additional experiments further defined various aspects of these findings, but did not establish the origin of the biases.
R 8

29,953
Tove, P.A., Norman, B., Isaksson, L. & Czekajewski, J. DIRECT-RECORDING FREQUENCY AND AMPLITUDE METER FOR ANALYSIS OF MUSICAL AND OTHER SONIC WAVEFORMS. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 362-371. (Physics Institute, Uppsala University, Uppsala, Sweden).

The notation of frequency and time relations in the study of musical phenomena produced by single unisonous instruments or song is discussed. The nature of the pertaining electrical waveforms in recorded music of this type, and especially the possibilities of extracting the fundamental and measuring and recording its frequency (pitch) is treated. A transistorized instrument performing this function and having fast response to changes in frequency is described. The output from this meter is fed to a fast ink recorder to show the frequency variations on a convenient diagram as an objective form of music printing, or "visible music." As a complement, the original waveform is rectified and plotted logarithmically in a second channel on the recorder to show the amplitude variation. The frequency compass covered in a single registration is normally a single octave, which can start at any consecutive minor-third interval (frequency ratio 6/5) in the range A_1 (55 cps) to A_6 (1760 cps). Changes with time can be recorded with a detail down to about 0.01 sec, and frequency differences of a small fraction of a half-tone can be measured. The dynamic range of the registration of amplitude is $\gtrsim$40 dB. A third trace on the recorder is a 50-cps waveform used for time marking. The frequency and amplitude levels of the registration can be checked with a calibrator. This is a self-stepping oscillator giving 7 tones, each of 1 sec duration and separated by whole-tone intervals. Thus, it covers one octave and this can be chosen to start at 55, 110, ..., or 1760 cps. The amplitude calibration is logarithmical with manually chosen levels.
R 14

29,954
Singh, S. & Black, J.W. STUDY OF TWENTY-SIX INTERVOCALIC CONSONANTS AS SPOKEN AND RECOGNIZED BY FOUR LANGUAGE GROUPS. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 372-387. (Ranchi University, India & Ohio State University, Columbus, Ohio).

Twenty-six intervocalic consonants were recorded by 3 speakers of each of 4 languages--Hindi, English, Arabic, and Japanese--and heard by 24 speakers of each of them. The data were treated in 2 ways: a) An analysis of variance indicated that listening groups differed and that consonants were unequal in their intelligibility and showed statistically significant interactions between speakers and consonants, between listeners and consonants, and among consonants, listeners, and speakers. All speakers spoke better and all listeners listened better when saying and hearing sounds of their native language; b) A quantitative procedure employed by Miller and Nicely was adapted to ascertain which features were retained by the listeners in their error responses and whether or not these were similar from one language group to another. All consonants were classified in a binary manner in relation to each of 7 channels into which the voice communication network was subdivided. The unusual outcome lay in the ranks of the 7 channels in terms of the extents to which they were correctly preserved in the responses. A single rank order in this regard was duplicated for all the listening groups: a) nasality; b) place; c) liquid; d) voicing; e) duration; f) friction; and g) aspiration.
R 8

29,955
Wickelgren, W.A. DISTINCTIVE FEATURES AND ERRORS IN SHORT-TERM MEMORY FOR ENGLISH CONSONANTS. J. Acoust. Soc. Amer., Feb. 1966, 39 (2), 388-398. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

Errors in short-term recall of 23 English consonants were tabulated and related to 3 distinctive-feature systems. The consonants were always presented in initial position in a consonant-vowel diagram, and the vowel was always /a/. Ss were instructed to copy a list of consonants as it was being presented, followed by recall of the list. Perceptual errors were excluded from the recall-error matrix by scoring for recall only correctly copied consonants. The data were also analyzed in such a way as to eliminate differences in response bias for different consonants. Having controlled for response bias, each feature system makes predictions about the rank order of different intrusion errors in recall. Each of the 3 feature systems was significantly more accurate than chance in these predictions, but the most accurate system was one developed in the present study. This system is a slightly modified version of the conventional phonetic analysis of consonants in terms of voicing, nasality, openness of the vocal tract (manner of articulation), and place of articulation. The results suggest that a consonant is coded in short-term memory, not as a unit, but as a set of distinctive features, each of which may be forgotten at least semiindependently.
R 9

29,956
Dirks, D.D. & Carterette, E.C. INTELLIGIBILITY OF SPEECH PRESENTED TO THE RIGHT OR LEFT EAR IN BINAURAL NOISE. J. Acoust. Soc. Amer., Feb. 1966, 39(2), 401-402. (University of California, Los Angeles, Calif.).

As part of a systematic study of ear dominance, for a continuum of sounds from speech to nonspeech, intelligibility scores for phonetically balanced (PB) words were obtained from 7 listeners. White noise was presented in phase at each ear while speech was delivered to either the right or left ear. No significant differences were found between right-and left-ear presentations under these conditions. This result is contrary to the findings of an earlier study, but is essentially identical to a more recent investigation.
R 8

29,957
Kryter, K.D., Ward, W.D., Miller, J.D. & Eldredge, D.H. HAZARDOUS EXPOSURE TO INTERMITTENT AND STEADY-STATE NOISE. J. Acoust. Soc. Amer., March 1966 39(3), 451-464. (Stanford Research Institute, Menlo Park, Calif.).

The paper contains graphs of maximum sound-pressure levels and durations of exposures that would be tolerable and examples of the use of these graphs in addition to background information and a discussion of the rationale, assumptions, limitations, and general problems pertinent to the development and application of a damage-risk criterion and related exposure contours.
R 22

29,958
Shaw, E.A.G. EARCANAL PRESSURE GENERATED BY A FREE SOUND FIELD. J. Acoust. Soc. Amer., March 1966, 39(3), 465-470. (Applied Physics Div., National Research Council, Ottawa, Ontario, Canada).

The pressure levels generated at the entrance to the earcanal by progressive waves from a point source at a distance of 1 m have been measured for a group of 10 Ss. Individual curves are presented for all 10 Ss at 6 azimuthal angles of incidence. Measurements at 0°, 45°, 90°, and 180° cover the frequency range 0.2-14 kcps. Measurements at 270° and 315° extend to 8 kcps. The average earcanal-versus-free-field pressure levels are in good agreement with Wiener's data over the common frequency range. Certain features (maxima at 2.4 and 13 kcps, minima at 4 and 10 kcps) appear to be relatively independent of angle of incidence. Others (peak at 7 kcps) have strong azimuthal dependence. Normal modes of the concha may have an important role in the 6-to 10-kcps region.
R 11

29,959
Shaw, E.A.G. EARCANAL PRESSURE GENERATED BY CIRCUMAURAL AND SUPRAAURAL EARPHONES. J. Acoust. Soc. Amer., March 1966, 39(3), 471-479. (Applied Physics Div., National Research Council, Ottawa, Ontario, Canada).

The hearing thresholds of 4 Ss have been measured at 9 audiometric frequencies from 0.125 to 8 kcps with a probe microphone placed in the external ear. The probe-tube pressures at hearing threshold are found to be substantially the same with the 4 different earphones used to generate the tone. The earcanal response curves of 3 circumaural and 2 supraaural earphones coupled with a group of 10 Ss have been measured over a 0.2- to 15-kcps frequency range. The groups of curves have been normalized with respect to reference response curves obtained with suitable couplers. The 5 groups of earphone response curves are found to have much in common with one another and with curves of earcanal pressure generated by a free sound field, using the same group of Ss; there are also significant differences. The relationships are thought to shed much light on the acoustic behavior of earphone systems. Average response curves for the 5 earphones permit the transfer of coupler pressure at hearing threshold; data for TDH39/MX41AR and HA10 earphones are in good agreement with published subjective data. Intra-subject range (average range of pressure with repeated measurements on a single S) varies from 0.2 to 10 dB, depending on earphone type and frequency. In conclusion, it is suggested that existing earphone systems, though well-adapted for speech communication, may not provide ideal coupling for more-exacting applications.
R 20

29,960
Eisler, H. MEASUREMENT OF PERCEIVED ACOUSTIC QUALITY OF SOUND-REPRODUCING SYSTEMS BY MEANS OF FACTOR ANALYSIS. J. Acoust. Soc. Amer., March 1966, 39(3), 484-492. (Psychological Labs. University of Stockholm, Stockholm, Sweden).

The factor analytic model, as here applied, conceives of a numerical quality judgment of a certain program played by a given reproducing device as a weighted sum of a measure of the quality of the different reproducing properties (e.g., purity of transients, full treble) possessed by the device in question. The weights constitute measures of the requirements made by the particular program on these properties. Factor analysis splits a raw-data matrix --consisting of, e.g., quality judgments for a number of combinations of program-loudspeaker systems--into 2 matrices: a factor-loading matrix consisting of the weights and a factor-score matrix consisting of the quality of the reproducing properties. The rank of these matrices (number of factors) reflects the number of dimensions (properties) that implicitly enter into the listener's judgments. 4 listeners judged, on a 7-point scale, the quality of 24 programs (music, speech, traffic noise, etc.) played on 10 sound-reproducing systems of highly different general quality. The data were factor-analyzed (component analysis of covariances), and factor loadings for the programs and factor scores for the loudspeaker systems were computed. 9 factors were extracted and rotated, and 7 of them tentatively interpreted (sound level, purity of transients, environmental information, bass boost, full-treble reproduction, high-treble relative midrange, disturbing directional effects). An attempt at validation showed good agreement between factor scores (reproducing properties) for the 4 listeners in spite of variation of preferences between listeners reflected in the factor loadings. Despite technical imperfections, it is concluded that factor analysis is a useful instrument for the assessment of acoustical properties.
R 6

29,961
Lindsay, R.B. THE STORY OF ACOUSTICS. J. Acoust. Soc. Amer., April 1966, 39(4), 629-643. (Brown University, Providence, Rhode Island).

The historical progress of the science of acoustics is surveyed from the earliest recorded phenomena and theories to the present status of the subject. Considerable attention is paid to the development of both mathematical and experimental tools for studying the production, propagation, and reception of sound, particularly in the 18th and 19th centuries. The impact of Rayleigh's work on modern acoustics is estimated. Contemporary developments are treated only briefly. The endeavor has been made to refer in almost all cases to original sources.
R 79

29,962
Cox, H. LINEAR VERSUS LOGARITHMIC AVERAGING. J. Acoust. Soc. Amer., April 1966, 39(4), 688-690. (David Taylor Model Basin, Washington, D.C.).

Consider n data samples $\{x_1, \ldots, x_n\}$ such that $0 < L \leq x_i \leq U < \infty$. Let $K = U/L$; then it is shown that independent of n a lower bound on the ratio of the geometric mean to the arithmetic mean of the data samples is given by $\left[\ln K/(K-1)\right] K^{\{(1/\ln K)-1/(K-1)\}}$. This bound is useful in acoustic signal processing since it limits the amount of deviation that can be attributed to averaging logarithms vice taking the logarithm of the average of the data samples. Both methods are currently in use at facilities specializing in the processing of acoustic data. For a K of 10 dB, for example, the geometric mean is less than 1.5 dB below the arithmetic mean.

29,963
Bos, C.E. & deBoer, E. MASKING AND DISCRIMINATION. J. Acoust. Soc. Amer., April 1966, 39(4), 708-715. (Ear, Nose & Throat Clinic, Wilhelmina Hospital, Amsterdam, The Netherlands).

With the same experimental technique, 2 sets of related experiments have been performed. In one, a band of random noise is used to mask a pure tone. In the other experiment, the intensity difference limen for the band of noise has been determined. Thresholds for masking and discrimination were obtained with help of a Békésy audiometer. A large range of bandwidths (5-12,000 cps) and 5 central frequencies (500, 1000, 2000, 4000, & 8000 cps) have been employed. Both sets of data agree qualitatively with data appearing in the literature. From the discrimination data, it appears that, for small bandwidths, inherent intensity fluctuations of bands of noise determine the maximum intensity discrimination. These fluctuations should influence the masking situation to the same degree. The similarity of masking and discrimination thresholds in the region of small bandwidth lends support to this prediction. Thus, it is argued why masking data should not be judged in terms of a fixed standard (as Fletcher has done) in order to arrive at values for the critical bandwidth. If one judges masking data in terms of the discriminatory power that the ear exhibits for the masking noise employed, one arrives at critical-bandwidth data much more in line with generally accepted data. The accuracy with which these can be determined is so poor that one should consider masking experiments of this kind as totally unsuited to measure the critical bandwidth.
R 15

29,964
Elfner, L. & Perrott, D.R. EFFECT OF PROLONGED EXPOSURE TO A BINAURAL INTENSITY MISMATCH ON THE LOCUS OF A DICHOTICALLY PRODUCED TONAL IMAGE. J. Acoust. Soc. Amer., April 1966, 39(4), 716-719. (Kent State University, Kent, Ohio).

An experiment is reported on the effect of 6 consecutive 21-min periods of exposure to frequencies of 700, 1000, or 3000 cps, dichotically presented with a 50-dB interaural intensity imbalance, on the subsequent locus of the dichotically produced auditory image of the same frequencies. Significant differences in the locus of the auditory image were found among the test frequencies. There was a differential effect on the locus of the image of the test frequencies as a function of the frequency of the saturation tone. No significant changes were noted in the sensitivity of the auditory system to the frequencies employed. No changes in pitch were reported, although preexperimental instructions did not direct attention to this phenomenon. The results are discussed in terms of several theoretical models for localization.
R 10

29,965
Green, D.M. INTERAURAL PHASE EFFECTS IN THE MASKING OF SIGNALS OF DIFFERENT DURATIONS. J. Acoust. Soc. Amer., April 1966, 39(4), 720-724. (Psychology Dept., University of Pennsylvania, Philadelphia, Penn.).

The detectability of a pulsed, 250-cps sinusoid in noise was measured under 3 interaural phase conditions and at 3 durations. The conditions were: a) signal and noise in 1 ear only, S_mN_m; b) signal in 1 ear and the same in-phase noise in both ears, S_mN_0; c) signal in both ears, but with a 180° phase difference, and the same in-phase noise in both ears, $S_\pi N_0$. The detectability of the signal was about 9 dB better in Condition 2 than in Condition 1, and about 7 dB better in Condition 3 than in Condition 2. The difference in detectability is slightly dependent on signal duration, the largest difference appearing at the shortest duration. The psychometric functions were essentially the same in all conditions, except for an attenuation constant. The results are contrasted with 2 theories used to account for the binaural effects; some discrepancy between both theories and the results are noted.
R 14

29,966
Stevens, S.S. POWER-GROUP TRANSFORMATIONS UNDER GLARE, MASKING, AND RECRUITMENT. J. Acoust. Soc. Amer., April 1966, 39(4), 725-735. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

A masking stimulus, either visual or auditory, raises the exponent of the psychophysical function relating sensation to stimulus. This power transformation applies only to the part of the function that is influenced by the masking stimulus. Since a given masking noise affects only weaker stimuli, the result is a discontinuous loudness function, which resembles the discontinuous brightness function produced by a glare. The loudness functions for low-frequency stimuli resemble those obtained under masking, as do also the recruitment functions in hard-of-hearing ears.
R 21

29,967
Ward, W.D. USE OF SENSATION LEVEL IN MEASUREMENTS OF LOUDNESS AND TEMPORARY THRESHOLD SHIFTS. J. Acoust. Soc. Amer., April 1966, 39(4), 736-740. (Otolaryngology Dept., University of Minnesota, Minneapolis, Minn.).

The hypothesis that equal sensation levels (SL) of stimulation give rise to equivalent loudnesses in normal observers is disproven by showing that recruitment often occurs near threshold even in normal ears. Since neither constant sound pressure levels (SPL) nor constant SL's including 0 dB SL (threshold itself), can be assumed to produce equal loudness, it is suggested that observers be equated at the most comfortable listening level (MCL).
R 6

29,969
Bishop, D.E. REDUCTION OF AIRCRAFT NOISE MEASURED IN SEVERAL SCHOOL, MOTEL, AND RESIDENTIAL ROOMS. J. Acoust. Soc. Amer., May 1966, 39(5) Part 1, 907-913. (Bolt Beranek & Newman, Inc., Los Angeles, Calif.).

Field noise-reduction measurements in 21 school, motel, and residential rooms during flyovers of jet and propellor aircraft are described. The measured noise reduction for most rooms was found to lie within or near the range of moderate noise-reduction values observed in previous measurements of houses and wood-frame air-base buildings. Sizeable differences in room noise-reduction values were observed during successive aircraft flyovers. For jet-aircraft flyovers, the root-mean-square value of the standard deviations for noise-reduction measurements in school and motel rooms was 2.7 PNdB. For the 4 residential rooms studied, a root-mean-square value for the standard deviations of 3.4 PNdB was observed.
R 7

29,970
Harbert, F. & Young, I.M. AMPLITUDE OF BEKESY TRACINGS WITH DIFFERENT ATTENUATION RATES. J. Acoust. Soc. Amer., May 1966, 39(5) Part 1, 914-919. (Jefferson Medical College, Philadelphia, Penn.).

Amplitude measurements of threshold fixed-frequency Békésy tracings were made for interrupted and continuous tones on normal and pathological ears. Comparison of 4 attenuation rates (1, 2, 4, & 8 dB/sec) on the same subjects indicates that bottoms of spikes were at similar sound-pressure levels (SPL) for different attenuation rates both for interrupted and continuous tones, while the tops and midpoint of spikes were at significantly different levels as attenuation rate varied. Standard audiometry thresholds related best with the SPL of bottoms of spikes of pulsed-tone tracings in both normal and pathological ears. Doubling the attenuation rate changes amplitude in the ratio of about 1 to 1.62 and increases pen reversals per unit time in the ratio of approximately 1 to 1.23. This is true for both interrupted- and continuous-tone tracings for all frequencies in both normal and pathological ears. Separation between interrupted- and continuous-tone tracings in pathological ears is not significantly different for various attenuation rates when measured between bottoms of spikes for different attenuation rates.
R 19

29,971
Rosenberg, A.E. PITCH DISCRIMINATION OF JITTERED PULSE TRAINS. J. Acoust. Soc. Amer., May 1966, 39(5) Part 1, 920-928. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Listeners are presented with pulse-train stimulus pairs and asked to judge whether they can hear a difference between them. The interval between pulses is a random variable, identically and independently distributed for each stimulus of a pair. 2 distributions are observed: one, nominally Gaussian, and the other, nominally the distribution of the amplitude of a sinusoidal wave whose phase in uniformly distributed. The principal experimental parameters are the mean interval between pulses and root-mean-square deviation or jitter about this interval. The stimuli of each pair are identical in other respects--pulse shape (50-μsec pulse width), loudness (30 or 35 dB sensation level)--but differ in polarity pattern. 2 pattern combinations are observed. For the range of mean pulse intervals investigated, 5-15 msec, the stimuli of each pair are generally discriminable when unjittered. However, the results indicate that, when jittered in amounts greater than 1 or 1.5 msec, the stimuli may be rendered nondiscriminable. This critical amount of jitter coincides with a flattening of the power-density spectra of the stimuli for frequencies greater than 250 or 200 cps. On the basis of this result and the results of other investigations, it is hypothesized that the correlates of discrimination for unjittered or lightly jittered stimuli are distinct neural volley patterns associated with basilar-membrane activity in the 300- to 1000-cps region.
R 8

29,972
Hecker, M.H.L. & Williams, C.E. CHOICE OF REFERENCE CONDITIONS FOR SPEECH PREFERENCE TESTS. J. Acoust. Soc. Amer., May 1966, 39(5) Part 1, 946-952. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

Preference tests used in the evaluation of speech-communication systems typically employ as reference conditions different levels of one type of distortion, produced by a single reference system. A new preference tests has been developed to explore the possible advantages of using several reference systems that represent fundamentally different types of distortions. The new test was experimentally compared with the more conventional test, and it was found that the preference judgments obtained with the new test exhibited a significantly smaller variance among the listeners. This finding suggests that, by using several reference systems that represent an appropriate variety of distortions, preference tests can be constructed that are more efficient than those developed to date.
R 11

29,973
Pickett, J.M. & Coulter, D.C. STATISTICS OF F2 ADJACENT TO CONSONANTS AND PREDICTION OF F2 ONSETS. J. Acoust. Soc. Amer., May 1966, 39(5) Part 1, 953-959. (Research Div., Melpar, Inc., Falls Church, Va.).

The purpose was to evaluate ways of predicting the onset frequency of the second vowel formant (F2) following consonant constrictions. Spectrograms of 604 constrictions were measured to obtain the frequency and slope of F2 offset just prior to each constriction, the duration of each constriction, and the frequency of F2 onset after the constriction. 3 types of F2 onset prediction were applied to each constriction: a) holding the F2 offset frequency; b) linear extrapolation of F2 offset slope; and c) exponential extrapolation of the offset slope. Statistical analyses of these data indicated that linear extrapolation gave poor results, that holding predictions were superior to predicting merely the modal onset, and that exponential extrapolations were better than holding offsets under certain conditions of offset slope and frequency region. Articulatory place and complexity of consonant constriction were found to be related to prediction error.
R 8

29,974
Hubbard, H.H. (Chm.). SONIC-BOOM SYMPOSIUM. J. Acoust. Soc. Amer., May 1966, 39(5) Part 2, 80pp. (Langley Research Center, NASA, Hampton, Va.).

The papers presented at the first symposium on sonic booms constitute this issue of the Journal of the Acoustical Society of America. Reports dealing with sonic boom generation, propagation, prediction, and measurements were given as well as reports on the effects of sonic booms on people, buildings, and communities.
R Many

29,986
Campbell, R.A. AUDITORY INTENSITY PERCEPTION AND NEURAL CODING. J. Acoust. Soc. Amer., June 1966, 39(6), 1030-1033. (Western Reserve University, Cleveland, Ohio).

Threshold signal-to-masker ratios for 3 sinusoids (250, 1000, and 4000 Hz) presented in a masker of corresponding frequency set to various levels were gathered and are presented. The masker was either continuous or pulsed-on-only during both signal intervals. The block up-and-down, 2-interval, forced-choice psychophysical procedure was used. The relation between the obtained thresholds, and: a) the level of the masker; b) whether the masker was continuous or pulsed; c) other previously reported data for noise signals and maskers are especially considered. A discussion of these data as reflecting auditory nerve activity, loudness adaptation, increase of uncertainty and/or, a "drifting filter" is offered.
R 14

29,987
Campbell, R.A., Hutton, C.L. & Stuckey, C.W. COMPUTERIZED INVESTIGATION OF THRESHOLD-DECISION PHENOMENON. J. Acoust. Soc. Amer., June 1966, 39(6), 1034-1036. (US Veterans Administration Outpatient Clinic, Atlanta, Ga.).

Threshold determination within the framework of the block up-and-down, 2-interval, forced-choice (BUDTIF) method has been investigated using a computerized Monte Carlo technique. Two aspects of the results are presented in preliminary fashion: a) In a block up-and-down threshold-estimating method, modifications that yield minimal variance within individual runs may not automatically be assumed to yield minimal variance between successive threshold estimates; b) The optimal number of trials per block was the smallest that yields a valid solution depending on the target performance level; use of a memory of more than one block for level-change decisions is not indicated.
R 2

29,988
Carhart, R., Tillman, T.W. & Johnson, K.R. BINAURAL MASKING OF SPEECH BY PERIODICALLY MODULATED NOISE. J. Acoust. Soc. Amer., June 1966, 39(6), 1037-1050. (Auditory Research Lab., Northwestern University, Evanston, Ill.).

The interference with intelligibility of monosyllabic words produced by continuous white noise, by modulated white noise, and by continuous speech (single talker) was studied during homophasic (NOSO) and antiphasic (NπSO) listening. 5 signal-to-masker ratios, 4 modulation rates, and 4 magnitudes of modulation were used. Reception in the continuous noise was characterized by steeply sloping intelligibility functions and a 4.5-dB masking-level difference favoring antiphasic listening. Reception in modulated noise changed with the rate and depth of modulation. A 7-dB modulation yielded intelligibility functions highly comparable to those for continuous noise having the same average level. By contrast, more extreme modulation (14, 21 dB, and complete interruption) produced better intelligibility under both homophasic and antiphasic conditions than did continuous noise. This effect was particularly great when noise was completely interrupted either 4 or 20 times/sec, under which circumstances intelligibility remained above 80% in a speech-to-noise ratio of −24 dB. The advantage of antiphasic over homophasic listening, or masking-level difference, was fairly similar for all conditions of modulated noise, averaging 3.9 dB. When the masking signal was a single competing talker, the antiphasic advantage dropped to 3.3 dB, and the intelligibility function did not duplicate any of the functions obtained in white noise, either continuous or modulated. Nonetheless, individual sets of conditions occurred where masking by speech and by modulated noise yielded equivalent performance, but the depth of modulation required for this equivalence varied with the speech-to-masker ratio being employed.
R 17

29,989
Carterette, E.C., Friedman, M.P. & Wyman, M.J. FEEDBACK AND PSYCHOPHYSICAL VARIABLES IN SIGNAL DETECTION. J. Acoust. Soc. Amer., June 1966, 39(6), 1051-1055. (University of California, Los Angeles, Calif.).

144 observers, divided into 8 groups of 18 each, were run in a 2-alternative, temporal, forced-choice auditory-signal-detection task. At each of 2 signal intensities, 4 levels of information feedback were used. No feedback (NF); correct feedback on every trial (F100), on three-fourths (F75), or half (F50) of the trials, with incorrect feedback on remaining trials. The results were that: a) NF and F100 led to higher probability of correct responding P(C) than either F75 or F50 for both signal intensities; b) P(C) for NF was higher under the higher intensity but lower under the lower intensity than for F100; c) on trials immediately following trials on which observer's response and feedback agreed, detection rates were higher and false-alarm rates were lower than following disagreement trials, whereas these differences were close to zero for F50. It is argued that feedback leads the observer to change his criterion following disagreements. The effect of this variability is to depress the mean detectability index d' of signal-detectability theory.
R 19

29,991
Korn, T.S. HUMAN SIDETONE: MEASUREMENT OF THE FREQUENCY RESPONSE AND EQUALIZING DEVICES. J. Acoust. Soc. Amer., June 1966, 39(6), 1063-1068. (Laboratoire Acoustique, Universite Libre de Bruxelles, Brussels, Belgium).

The author gives the method for measuring the frequency response of the human sidetone (self-listening) as related to the normal "objective" communication between 2 Ss. When the frequency response of the sidetone is known, it becomes feasible to produce equalizing devices allowing the speaker to hear himself in the same objective tonality as he is heard by his listeners. These devices are very useful in phonetic correction practice.
R 10

29,995
Atherley, G.R.C., Lord, P. & Power, J. NOTE ON THE DATA LOGGING OF AUDIOMETRIC MEASUREMENTS. J. Acoust. Soc. Amer., June 1966, 39(6), 1183-1184. (Acoustics Group, Royal College of Advanced Technology, Salford, England).

Modifications to a Rudmose ARJ-4 are described that permit thresholds to be presented as a binary decimal code on punched tape suitable for processing by a digital computer.
R 4

29,996
Knight, J.J. NORMAL HEARING THRESHOLD DETERMINED BY MANUAL AND SELF-RECORDING TECHNIQUES. J. Acoust. Soc. Amer., June 1966, 39(6), 1184-1185. (Institute of Laryngology & Otology, University of London, London, England).

Data are presented relating to the thresholds of 3 different samples of normally hearing Ss, which indicate that the British standard and recommended ISO reference zero for audiometers is insufficiently stringent by approximately 3 dB over the frequency range 0.5 to 6 kcps. Determinations of threshold, made with the same audiometer and the same earphone placement, by a conventional manual method and by a self-recording method showed the latter to give an average threshold more sensitive than the manual usage gave by less than 1 dB. The inaccurate nature of current procedures for audiometer calibration employing a single subjective correction for all receivers of a particular pattern is stressed.
R 8

29,997
Rice, C.G. & Coles, R.R.A. NORMAL THRESHOLD OF HEARING FOR PURE TONES BY EARPHONE LISTENING WITH A SELF-RECORDING AUDIOMETRIC TECHNIQUE. J. Acoust. Soc. Amer., June 1966, 39(6), 1185-1187. (Audiology Group, University of Southampton, Hampshire, England).

Two independent series of measurements of normal auditory threshold have been carried out with fixed-frequency self-recording audiometers. The results are in close agreement with each other, but yield threshold levels that are distinctly more acute than the International Standard reference levels (ISO-R.389: 1964), the exact difference varying somewhat according to different methods of application of the standard to TDH-39: MX-41/AR earphones. Possible reasons for the more-acute thresholds are discussed.
R 14

29,998
Whittle, L.S. & Delany, M.E. EQUIVALENT THRESHOLD SOUND-PRESSURE LEVELS FOR THE TDH39/MX41-AR EARPHONE. J. Acoust. Soc. Amer., June 1966, 39(6), 1187-1188. (National Physical Laboratory, Teddington, England).

Recent subjective threshold calibrations of a range of audiometric earphones permit direct comparison of their equivalent threshold sound-pressure levels on various artificial ears and couplers. Values of equivalent normal threshold sound-pressure level, compatible with ISO Recommendation R.389, are given for the TDH39/MX41-AR earphone on an NBS type 9A coupler.
R 5

29,999
Hecker, M.H.L., Stevens, K.N. & Williams, C.E. MEASUREMENTS OF REACTION TIME IN INTELLIGIBILITY TESTS. J. Acoust. Soc. Amer., June 1966, 39(6), 1188-1189. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

The possible advantages of including measurements of reaction time in speech-intelligibility tests are discussed. Such procedures are likely to provide independent measures of the performance of speech-communication systems and to increase the sensitivity of conventional intelligibility tests. A preliminary experiment employing an automated version of a multiple rchoice test is used to illustrate this approach.
R 3

30,000
Singh, S., Brokaw, Sonia, P. & Fricke, J.E. EFFECTS OF BANDPASS-FILTERED NOISE UPON THE INTELLIGIBILITY OF FILTERED SPEECH. J. Acoust. Soc. Amer., June 1966, 39(6), 1189-1190. (Ranchi University, India).

Intelligibility scores were obtained from 240 listeners for monosyllabic words. In Exp. I, noise was introduced at the lowest end of the spectrum and, in Exp. II, at the highest. Throughout the listening task, speech was presented through one of four "equally contributing intelligibility bands" (quarter-bands) of the speech spectrum: 300-760, 760-1450, 1450-2550, and 2550-7000 cps. Intelligibility in the channels (quarter-bands) at the opposite ends from the noise was superior in the experimental condition to that in the control, the control being characterized by no introduction of noise. Thus, effects similar to previously reported studies of release from masking were evident.
R 6

30,002
Dirks, D.D. & Norris, Jane C. SHIFTS IN AUDITORY THRESHOLDS PRODUCED BY IPSILATERAL AND CONTRALATERAL MASKERS AT LOW-INTENSITY LEVELS. J. Acoust. Soc. Amer., July 1966, 40(1), 12-19. (Center for the Health Sciences, University of California, Los Angeles, Calif.).

The present investigations were conducted to determine and describe some of the acoustic parameters of central masking. Shifts in threshold were observed during the following monotic and dichotic conditions: a) pulsed-pulsed, in which both test signal and masker were pulsed simultaneously; b) pulsed-continuous, in which the test tone was pulsed but the masker was continuous; and c) continuous-continuous, in which both test tone and masker were steady. Test signals of 250,1000, and 4000 cps were used. It was found that the degree of threshold shift resulting from central masking factors was dependent on the temporal presentation of the test signal and masker (whether pulsed or steady). Threshold shifts due to central masking increased with frequency and were related to the spectrum level of the masker The largest shifts in threshold werefound for a 4000-cps test signal when the masker was a pure tone close in frequency. In these instances, lateralization of the test signal toward the midline was observed as the threshold shift increased and, at times, subjects were unable to distinguish between the test tone and pure-tone masker. Although the results can be explained on the basis of central masking factors, the manner in which the subjects traced their thresholds during the condition where both test signal and masker tone were continuous suggested that all observed shifts in threshold may not be due to masking alone.
R 7

30,003
Egan, J.P. & Benson, W. LATERALIZATION OF A WEAK SIGNAL PRESENTED WITH A CORRELATED AND WITH UNCORRELATED NOISE. J. Acoust. Soc. Amer., July 1966, 40(1), 20-26. (Hearing & Communication Lab., Indiana University, Bloomington, Ind.).

When a strong signal is presented monaurally, listeners can easily lateralize the sound. However, if noise is added to both ears, there may be uncertainty as to which ear received the signal. This uncertainty was measured over a range of signal energies with perfectly correlated noise (NO) and with uncorrelated noise (NU). In the main experiment, the monaural signal occurred on each trial, and this signal was presented to either the right or left ear by random determination during the single observation interval. Listeners responded "right" or "left". Measures of signal detection were also secured with the monaural signal under release from masking (NO) and without such release (NU). With uncorrelated noise (NU), the listener requires only slightly greater signal energy (1-2 dB) in order to lateralize as well as he can detect. With correlated noise (NO), the psychometric function for lateralization is not only displaced considerably toward higher signal energies, relative to those required for detection, but the slope of the function for lateralization is smaller than that for detection. When a monaural signal is easily detected in uncorrelated noise, it is also easily lateralized. However, when the signal is strong enough to be readily detected with correlated noise, it is still poorly lateralized.
R 12

30,004
Elfner, L. & Homick, J.L. SOME FACTORS AFFECTING THE PERCEPTION OF CONTINUITY IN ALTERNATELY SOUNDED TONE AND NOISE SIGNALS. J. Acoust. Soc. Amer., July 1966, 40(1), 27-31. (Kent State University, Kent, Ohio).

Three experiments are reported that employed 78 normally hearing college students who demonstrated an ability to concentrate on an interrupted white noise that alternated with a tonal burst. The purpose of these experiments was to investigate the effects of the duration of the white noise and the frequency of the tonal burst on the perception of continuity under monaural and dichotic presentation. The effect of the number of noise pulses in the stimulus interval was also investigated. The results showed that under monaural presentation the perception of continuity was affected by both the duration of the noise and the frequency of the tone. Only the duration variable was significant under dichotic presentation. The number of noise pulses in the stimulus interval significantly affected the perception of continuity.
R 8

30,005
Harris, J.D. MASKED DL FOR PITCH MEMORY. J. Acoust. Soc. Amer., July 1966, 40(1), 43-46. (USN Submarine Medical Center, Groton, Conn.).

This paper reports differential sensitivity for pitch memory of pure tones as frequencies from 0.125 to 2 kcps are progressively raised above white noise adjusted to a 50% masking effect at the 45-dB sensation level of the tone. The Weber fraction (DF/F) improves with some negative acceleration through 2 kcps both in favorable and in unfavorable masking levels, but below about 0.5 kcps the sensitivity progressively deteriorates. The Weber fraction is related linearly to loudness, the loudness of tones in noise being specified by balancing to a 1-kcps tone in quiet. However, tones in noise exhibit poorer Weber fractions than tones at the same loudness but with no mask. Thus, the noise introduces a brake on sensitivity not only by loudness reduction but by an additional mechanism. The number of distinguishable pitches between 0.125-2 kcps is reduced from 548 for tones in quiet at 45 dB sensation level, to only 170 for tones in noise at a very unfavorable (signal-to-noise) S/N ratio (tones 5 db over the 50% masking point.)
R 15

30,006
Hood, J.D. & Poole, J.P. TOLERABLE LIMIT OF LOUDNESS: ITS CLINICAL AND PHYSIOLOGICAL SIGNIFICANCE. J. Acoust. Soc. Amer., July 1966, 40(1), 47-53. (Otological Research Unit, MRC, National Hospital, London, England).

In the normal hearing S, a sensation of unpleasant loudness is invariably associated with intensities of the order of 100 dB within the frequency range 500-4000 cps. This is referred to as the loudness-discomfort level (LDL). The intensity distribution of LDL has been established in a large group of Ss with unilateral end-organ deafness, in all of whom the presence of loudness recruitment had been verified by means of the alternate binaural loudness balancing procedure. In these, the distribution was similar to that of a normal-hearing group. By contrast, the LDL's of Ss with conductive or nerve-fibre deafness exceeded the maximum available audiometer intensity of 120 db. The test, therefore, is of particular value in establishing the presence or absence of loudness recruitment in bilateral deafness. These findings suggest a physiological limit of loudness perception, the theoretical implications of which are discussed.
R 7

30,007
Klatt, D.H. & Peterson, G.E. REEXAMINATION OF A MODEL OF THE COCHLEA. J. Acoust. Soc. Amer., July 1966, 40(1), 54-61. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.).

A model of cochlear mechanics is specified by a set of differential equations that relate pressures and displacements in the inner ear. The assumptions implicit in the equations are considered in this paper. The equations are solved by a straightforward difference-equation approximation on a digital computer. An equivalent electronic circuit was constructed in order to examine certain of the characteristics of the model. The response of the model is compared to physical data from a number of experiments.
R 14

30,008
Rabiner, L.R., Laurence, C.L. & Durlach, N.I. FURTHER RESULTS ON BINAURAL UNMASKING AND THE EC MODEL. J. Acoust. Soc. Amer., July 1966, 40(1), 62-70. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

This paper reports the results of further experiments on the binaural unmasking of tones masked by broadband Gaussian noise and further theoretical work on the EC model of binaural unmasking. Data are presented on binaural unmasking for interaural time delays and/or phase shifts in the noise, and for statistically independent noise, at a variety of tone frequencies. Many aspects of these data cannot be interpreted by the preliminary version of the model, and consideration is given to some possible revisions of the model.
R 24

30,009
Scharf, B. & Hellman, Rhona P. MODEL OF LOUDNESS SUMMATION APPLIED TO IMPAIRED EARS. J. Acoust. Soc. Amer., July 1966, 40(1), 71-78. (Psychology Dept., Northeastern University, Boston, Mass.).

The loudness of complex sounds composed of 3 or 4 pure tones was measured as a function of the over-all spacing ΔF between the lowest and highest components. The measured relation between loudness and ΔF was compared to calculations from Zwicker's model of loudness summation. In 8 ears with a conductive impairment, loudness summated normally and as predicted by the model; loudness remained approximately constant as a function of ΔF near threshold and increased with ΔF beyond the critical band at higher sensation levels. In 8 ears with a cochlear impairment, loudness did not change with ΔF at any tested sensation level. This invariance of loudness was not predicted by the model nor was it found in 6 normal ears tested in the presence of a 90-dB uniform masking noise intended to simulate the cochlear impairment. Under masking, loudness summated as predicted. The unexpected results in cochlear pathology were ascribed, tentatively, to a possible widening of the critical band.
R 21

30,010
Schroeder, M.R. RESIDUE PITCH: A REMAINING PARADOX AND A POSSIBLE EXPLANATION. J. Acoust. Soc. Amer., July 1966, 40(1), 79-81. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

The residue pitch of an amplitude-modulated carrier wave with fixed carrier frequency decreases for small increases in modulation frequency. This surprising experimental finding can be accounted for by considering the effect of phase modulation, synchronous and antiphasic with the amplitude modulation, on the temporal fine structure of the signal or its spectrum. Some conversion of amplitude modulation into phase modulation is known to occur in the mechanical response of the basilar membrane. However, for phase modulation to account fully for the pitch matches reported in the literature, additional amplitude-to-phase conversion must occur either in the mechanical-to-neural transduction or in the neural processing.
R 9

30,011
Bishop, D.E. JUDGMENTS OF THE RELATIVE AND ABSOLUTE ACCEPTABILITY OF AIRCRAFT NOISE. J. Acoust. Soc. Amer., July 1966, 40(1), 108-122. (Bolt Beranek & Newman, Inc., Los Angeles, Calif.).

Ss selected from airport neighborhoods judged the acceptability of noise produced by actual aircraft flyovers and by recorded flyover signals on both a relative and absolute (category) basis. Judgments were compared with the maximum perceived-noise level occurring during the flyovers. For a given perceived-noise level, little difference between ratings of takeoff and approach noise or live and recorded noise signals was observed. In the relative-judgment tests, a larger change in perceived-noise levels (16 PNdB) was required for a doubling, or halving, of the acceptability rating than the 10 PNdB originally assumed in developing the perceived-noise-level scale. In making category judgments of noise acceptability, a distinct shift between outdoor and indoor judgments occurred. Comparison with previous judgments of aircraft noise, employing different category scales, suggests relatively good agreement as to the noise levels at which a significant degree of dissatisfaction with the noise environment is expressed.
R 15

30,012
Stevens, K.N., House, A.S. & Paul, A.P. ACOUSTICAL DESCRIPTION OF SYLLABIC NUCLEI: AN INTERPRETATION IN TERMS OF A DYNAMIC MODEL OF ARTICULATION. J. Acoust. Soc. Amer., July 1966, 40(1), 123-132. (Electrical Engineering Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

Measurements of formant frequencies throughout the vocalic portions of a number of phonemically symmetric consonant-vowel-consonant utterances have been performed using spectrum-matching techniques implemented on a digital computer. The contours representing the first 2 formants as a function of time are described in terms of several parameters, including initial and final frequencies, midpoint frequencies, durations, and measures of curvature. The data illustrate the manner in which each of these parameters is influenced by the features of the vowel and by place of articulation of the adjacent consonants. The results provide evidence that diffuse tense vowels in English are characterized by diphthongal asymmetric articulatory motions, whereas nondiffuse vowels are not, and that the influence of the consonantal environment on the articulation of the vowel is greater for lax vowels than for tense vowels. Some general statements are made concerning the extent to which contiguous vowels and consonants influence each other's production.
R 28

30,013
Reddy, D.R. SEGMENTATION OF SPEECH SOUNDS. J. Acoust. Soc. Amer., Aug. 1966, 40(2), 307-312. (Computer Science Dept., Stanford University, Stanford, Calif.).

A program for segmentation of an acoustical continuum of speech sounds into discrete parts suitable for further analyses is described. The speech wave is read into the computer using an A-D converter. Analysis is performed directly on the acoustic waveform using an IBM-7090. The pattern-recognition techniques used to segment the acoustic waveform into sustained and transitional parts are discussed. Some results obtained by the computer program are given.
R 3

30,014
Atal, B.S., Schroeder, M.R., Sessler, G.M. & West, J.E. EVALUATION OF ACOUSTIC PROPERTIES OF ENCLOSURES BY MEANS OF DIGITAL COMPUTERS. J. Acoust. Soc. Amer., Aug. 1966, 40(2), 428-433. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

A method employing a digital computer for evaluating the acoustic properties of enclosures is described. Specially shaped tone bursts, generated on the computer, are radiated into the enclosure under study. The sound-pressure responses at different locations in the enclosure are recorded on a magnetic tape. The data are converted into digital form by an analog-to-digital converter and are processed by the digital computer. The processing by the computer includes filtering (to improve signal-to-noise ratio), envelope detection, and evaluation of different quantities having subjective or physical significance. A microfilm plotter attached to the computer is used to plot the results. Among the quantities evaluated are reverberation times based on different portions of the decay; direct, early, and reverberant energies; and directional distribution of sound-energy flux (diffusion). The different quantities are evaluated both as a function of frequency and location in the enclosure. Spatial and frequency averages of the different quantities are also evaluated.
R 9

30,015
Schroeder, M.R., Atal, B.S., Sessler, G.M. & West, J.E. ACOUSTICAL MEASUREMENTS IN PHILHARMONIC HALL (NEW YORK). J. Acoust. Soc. Amer., Aug. 1966, 40(2), 434-440. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

The acoustics of Philharmonic Hall in New York were evaluated by a new method utilizing a digital computer. Measurements were made before, during, and after a 4-phase alteration program of the Hall. The following quantities were studied: a) reverberation times based on the earlier and later portions of the decay; b) energies of the direct sound and of reflections from the suspended ceiling; c) "early" energies (energies arriving within 50 msec of the direct sound) and "reverberant" energies (arriving after 50 msec); d) directional distributions of the early energies; e) ratios of early-to-reverberant energies; f) intensities of reflections from the rear wall; g) the over-all ambient noise level of the Hall. Reverberation times in the octave band 500-1000 Hz, for the main floor, based on the earlier and later portions of the decay, were found to be 1.9 and 2.1 sec, respectively, for the Hall in its original state. In the present state of the Hall, the main floor has a reverberation time of approximately 1.8 sec for both early and later portions of the decay, thus indicating a more exponential decay process. The early and early-plus-reverberant energies on the main floor showed a deficiency at low frequencies before the alterations; now, they have a relatively flat spectrum. For an early state of the Hall, the directional distribution of the early energy was close to that expected for a diffuse sound field on the second terrace, but deficient in lateral reflections on the main floor. For the present state of the Hall, the directional distribution of the early energy is less dependent on position, but there are still relatively more lateral reflections on the second terrace than on the main floor in the midfrequency range (250-1000 Hz).
R 11

30,017
Campbell, R.A. & Lasky, Elaine Z. INSTRUMENTAL METHOD FOR IMPROVED INTENSITY DISCRIMINATION DATA. J. Acoust. Soc. Amer., Aug. 1966, 40(2), 445-446. (Western Reserve University, Cleveland, Ohio).

When investigating the ability of humans to detect intensity changes of acoustic stimuli, the fluctuations of typical psychoacoustic laboratory apparatus and the limitations of measuring instruments can easily yield random intensity errors (±0.1 dB) that are of the same order of magnitude as the difference limens obtainable (0.2-0.3 dB). In the proposed method, the required small intensity changes in the variable stimulus are obtained by combining two waveforms with only one waveform constituting the standard. The intensity difference between the two stimuli, or the increment in the variable stimulus owing to the addition of the second signal, can then be calculated from the voltage or sound-pressure ratio in decibels of the two waveforms. As an example of the improvement of precision, if this ratio is maintained within 0.1 dB, the precision of the resulting increment can be 0.002 dB for an intensity increment of 0.2 dB. Tables and formulas for calculating both the increments or decrements resulting from the in-phase or 180° out-of-phase combination of identical waveforms and the increments from the combination of independent waveforms are outlined.
R 2

30,018
Chaney, R.B., Jr. & Webster, J.C. INFORMATION IN CERTAIN MULTIDIMENSIONAL SOUNDS. J. Acoust. Soc. Amer., Aug. 1966, 40(2), 447-455. (USN Electronics Lab., Bureau of Ships, San Diego, Calif.).

Twelve sonar-trained and 12 untrained listeners identified 5 physically similar dimensions (quality, inflection, duration, relative frequency, and source) of speech sounds and of sonar signals. Response times, accuracy, and information-rate measures support a hypothesis that perception is more dependent upon prior experience than upon physical properties of signals per se. A second hypothesis was also supported; it suggested that difficulty in identifying each of the 5 dimensions would be rank-ordered differently, both as a function of signal type and listener experience. Auxiliary findings included an apparent superiority of the right ear for listening to speech sounds and of the left ear for other kinds of sounds. Other results suggested that a short-term memory phenomenon was occurring.
R 20

30,019
Flanagan, J.L. & Watson, B.J. BINAURAL UNMASKING OF COMPLEX SIGNALS. J. Acoust. Soc. Amer. Aug. 1966, 40(2), 456-472. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Binaural-masked thresholds were measured for periodic 100-μsec rectangular pulses of period T. Signal parameters were pulse rate (10, 50, 100, 250, and 1000 pps), interaural phase difference (0 and π rad), and interaural time difference (0-5 msec). Spectral content of the signal was controlled by addition or subtraction of phase-locked harmonic components and by high-pass and low-pass filtering (cutoff frequencies 300, 600, 1200, and 2400 cps). Broad-band, interaurally in-phase, masking noise at 60 dB sensation level was used throughout. The signals were transduced by headphones, and the masked thresholds were determined by a modified Bekesy technique. The difference between threshold for a given test condition and threshold for the signal in-phase condition is defined as the masking-level difference (MLD), or the binaural release from masking. For all pulse rates, maximum release from masking obtains for an interaural time of 1.5 msec or T/2 whichever is smaller. The greatest binaural unmasking occurs for a pulse rate of 250pps and is less at higher or lower rates. For all tonal cases (pulse rates of 250 pps and higher) the release from masking is found to relate primarily to the fundamental component. Elimination of the fundamental substantially reduces the MLD. At the lowest pulse rate, high-pass filtering of the signal also reduces the MLD to a small value. The largest MLD's are found for signal conditions that give rise to basilar-membrane motion near the 300-cps place and that lead to interaural time differences of about 1.5 msec in the neural activity originating from these places. The same interaural disparity at higher-frequency places produces substantially smaller MLD's. The MLD therefore appears specific to membrane place as well as to interaural time difference.
R 17

30,020
Schulman, A.I. & Mitchell, Rhoda R. OPERATING CHARACTERISTICS FROM YES-NO AND FORCED CHOICE PROCEDURES. J. Acoust. Soc. Amer., Aug. 1966, 40(2), 473-477. (Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass.).

Operating characteristics were obtained in yes-no (YN) and two-alternative forced-choice (2AFC) experiments in auditory signal detection. Four listeners used a six-point scale of confidence ratings with each of these psychophysical methods. An extreme rating (1 or 6) indicated high confidence that the signal was or was not presented (in YN) or that the signal occurred in the first or second observation interval (in 2AFC). The two possible events in both YN and 2AFC were equally likely. The signal was a sinusoid of 1000 cps presented for 0.10 sec against a continuous background of noise. Testing was conducted at E/N_0's of 7.9 and 15.8. When plotted on double-probability paper, linear operating characteristics provided good fits to the data points obtained from both the YN and 2AFC procedures. The 2AFC operating characteristics, in addition, had slopes near unity. The theory of signal detectability (TSD) correctly predicts a unit slope for the operating characteristics of 2AFC and linear operating characteristics for both YN and 2AFC. New indices of detectability D_{YN} and D_{FC} are proposed to replace the traditional measures to which they are easily related. Each of these new indices is merely the perpendicular distance from a linear operating characteristic to the origin; according to theory, the ratio D_{FC}/D_{YN} should equal $\sqrt{2}$. The eight ratios obtained in these experiments had a mean of 1.46, lending apparent support to TSD.
R 7

30,021
Ward, W.D. TEMPORARY THRESHOLD SHIFT IN MALES AND FEMALES. J. Acoust. Soc. Amer., Aug. 1966 40(2), 478-485. (Hearing Research Lab., University of Minnesota, Minneapolis, Minn.).

Various measurements of temporary threshold shift (TTS) from high-intensity tones and noises were made on 24 male and 25 female young normal-hearing adults. Significantly more TTS was produced in males by low-frequency stimuli (below 1000 cps) and significantly less by high-frequency stimuli (above 2800 cps). No differences between sexes in TTS from low intensities (40 dB SL), in auditory adaptation (perstimulatory fatigue at 1000 cps), in rate of recovery from a fixed value of TTS, or in TTS produced by impulse noise could be demonstrated. It is suggested that these results all imply that males and females do not differ in intrinsic fragility of sensory structures on the basilar membrane, but that women have more-efficient middle-ear muscles than men.
R 19

30,022
Young, J.R. ENERGY SPECTRAL DENSITY OF THE SONIC BOOM. J. Acoust, Soc. Amer., Aug. 1966, 40(2), 496-498. (Stanford Research Institute, Menlo Park, Calif.).

The energy spectral density of ideal sonic-boom pressure signatures has been computed and equations have been developed for the asymptotic behavior of the spectra at high and low frequencies. For systems with essentially high-frequency response characteristics, the system will be basically sensitive to peak overpressure and not to N-wave duration. Low-frequency systems will be sensitive to both duration and peak overpressure. Experimental data are cited to corroborate these conclusions based on the theory.
R 3

30,023
McCue, J.J.G. AURAL PULSE COMPRESSION BY BATS AND HUMANS. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 545-548. (Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass.).

Some misconceptions about pulse compression, current in the literature, are described and corrected. The discussion centers on the possible use of pulse compression by bats, but includes some calculations on dispersion in the Peterson-Bogart model of the human cochlea. Recent findings on the resistance of bats to jamming are noted.
R 16

30,024
Schroeder, M.R. COMPLEMENTARITY OF SOUND BUILDUP AND DECAY. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 549-551. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Sound buildup and decay in an enclosure are shown to be complementary. A simple sound-decay meter, based on this complementarity, is described. Jordan's measure of "steepness" of the sound buildup is shown to equal the amplitude of the squared-impulse response at a fixed delay (typically 40 msec).
R 5

30,025
de Boer, E. INTENSITY DISCRIMINATION OF FLUCTUATING SIGNALS. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 552-560. (Physical Lab., Wilhelmina Hospital, Amsterdam, The Netherlands).

In this paper, the theoretical aspects of the fluctuations inherent in random noise are discussed, insofar as these influence detection of random signals. Brief elucidations of the fundamentals of statistical detection theory and of sampling theory are given. The model developed for the detection process closely follows a proposal by Green, but with the major exception that a kind of internal noise is supposed to be involved in the process. The auditory mechanism is assumed to measure the average intensity of the signal presented over a certain time T. In doing so, the evaluation is hampered by random activity so that the measurement is carried out less accurately than possible. The detection finally involves a likelihood-ratio decision procedure. The theory explains experimental thresholds of random-noise signals very well. Agreement with data on thresholds of very short noise bursts is less convincing. Finally, the theory explains very elegantly why experimental psychometric functions for wide-band signals have the same slope as those for narrow-band signals. Instances in which higher slopes are reported for experimental psychometric functions for wide-band signals can most likely be traced down to having involved experimental procedures that leave too much uncertainty in the listener's observations.
R 14

30,027
Lau, A.W. DESCRIPTIVE ANALYSIS OF DOPPLER DISCRIMINATION AS A FUNCTION OF VARIATIONS IN DIMENSIONS OF THE SONAR ECHO. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 565-569. (USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif.).

Subjects were drilled and tested on their ability to judge sonar Doppler. Synthetic sonar echoes were systematically varied with respect to type of Doppler, echo duration, the rate of echo onset, and relative signal strength, and superimposed upon a sea-recorded reverberation pattern. The purposes of the study were to 1) identify the effects that variations in echo length, echo onset, and relative signal strength have upon the ability to discriminate Doppler correctly; and 2) evaluate the effect that training has upon the improvement of Doppler discrimination. Results indicated that performance was significantly improved by training. Although Doppler discrimination was significantly affected by echo duration and the relative intensity of the echo, the interactions among the echo dimensions appeared to be largely the result of various perceptual or response biases toward no Doppler echoes.
R 7

30,028
McClellan, M.E. & Small, A.M., Jr. TIME SEPARATION PITCH ASSOCIATED WITH NOISE PULSES. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 570-582. (University of Iowa, Iowa City, Iowa).

Previous research has shown that time separation pitch (TSP) is elicited by the monaural presentation of 2 ac or dc pulse trains, one train delayed with respect to the other, and is related to the reciprocal of time separation between leading edges of proximal pulses of the 2 trains. TSP has not been observed previously using uncorrelated noise pulses. On the assumption that TSP is mediated by an autocorrelational process, it was predicted that TSP would obtain using correlated-noise pulses that were produced by an "acoustic delay" system. Uncorrelated-noise pulses served as a control condition. Subjects matched the pitch of a pure tone to the pitches associated with the pulse trains. The results were as predicted. A TSP-like effect arising from continuous-noise samples was discussed and shown to be identical to TSP and, therefore, consonant with an autocorrelational theory. It was concluded that, at least for noise stimuli, temporally discrete waveforms are not necessary to elicit TSP perception; however, a high correlation between temporally adjacent waveforms is necessary to "trigger" TSP perception.
R 22

30,029
Olsen, W.O. & Carhart, R. INTEGRATION OF ACOUSTIC POWER AT THRESHOLD BY NORMAL HEARERS. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 591-599. (Auditory Research Lab., Northwestern University, Evanston, Ill.).

Threshold responses for seven durations of 250-, 1000-, and 4000-cps and white noise were determined for 32 normal-hearing persons. The time parameters and spectral characteristics of the stimuli were carefully specified. The following results were obtained: a) There was no significant difference between the male or female groups employed here with regard to their threshold response to short-duration acoustic stimuli; b) The decrease in intensity required for threshold response as a function of stimulus length was a real difference when the stimulus was systematically doubled in length from 10 to 500 msec; c) Changes in the intensity necessary for threshold response resulting from changes of signal length were highly similar for 250-, 1000-, and 4000-cps and white-noise stimuli of more than 50 msec in length, but there was an excessive increase in intensity needed for response when 250-cps stimuli were made shorter than 50 msec in duration; d) Test-retest reliability of threshold response to short-duration acoustic stimuli was excellent; e) The model proposed by Garner and Miller (J. Exp. Psychol. 37, 293-303, 1947) accurately described the mean threshold data obtained in this investigation.
R 29

30,030
Sondhi, M.M. & Guttman, N. WIDTH OF THE SPECTRUM EFFECTIVE IN THE BINAURAL RELEASE OF MASKING. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 600-606. (Bell Telephone Laboratories, Inc. Murray Hill, N.J.).

In an experiment concerned with the binaural masking-level difference phenomenon, an attempt was made to determine the extent of the masker spectrum effective in the release of masking. The experiment utilized a uniform power-spectrum noise separated into 2 bands differing in interaural phase--an "inner" band surrounding the test signal and "outer" band. Binaural masking-level phase differences (BMLD's) were traced as functions of the interaural signal phase (0 and π rad), the relative phase of the bands (0 and π rad), and the bandwidth of the inner band. It was found that a narrow inner band homophasic with respect to signal phase could destroy much of the release of masking owing to the heterophasic outer band. The converse was not true; a wide heterophasic band (125 and 200 cps centered at 250 and 500 cps, respectively) was required to produce significant release. These results depart significantly from predictions of the equalization-cancellation theory of binaural masking and furthermore do not support an assumption that BMLD is a function of the interaural noise crosscorrelation coefficient only.
R 9

30,031
Atherley, G.R.C., Lord, P. & Walker, J.G. BASIS FOR THE DESIGN OF A CIRCUMAURAL EARPHONE SUITABLE FOR MAP DETERMINATIONS. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 607-613. (Acoustics Group, Royal College of Advanced Technology, Salford, England).

A source of error using supraaural earphones in the determination of auditory thresholds appears, in part, to be associated with the changes in position of the earphone relative to the ear. The authors have investigated the possibility of constructing a circumaural device that will reduce this error. The design is based on a study of the standing-wave modes that occur in the cavity. The reduction of these by means of a double-cavity system and suitable damping material strategically positioned is discussed. Experimental results are reported that show that displacement sideways of this circumaural earphone on a flat-plate coupler by as much as 1.25 cm from the central position produces a variation in response of only 1 dB up to 6 kcps and 6 dB between 6 and 8 kcps.
R 10

30,032
Christiansen, H.M., Schweizer, L., Sethy, A. & Hoffenreich, F. NEW CORRELATION VOCODER. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 614-620. (Siemens and Halske AF Cenral Laboratories, Munich, West Germany).

A correlation vocoder is described that uses delay lines composed of simple all-pass RC or RLC sections. The synthesizer of the correlation vocoder is represented as a time-variable filter whose response is controlled by the "channel signals" derived in the analyzer. It is shown that the all-pass delay line, having a phase delay that decreases with increasing frequency, gives the vocoder a spectral resolution better adapted to the properties of speech than does a delay line with constant delay. In particular, when RCL sections are used, the spectral resolution approximates that of a spectrum-channel vocoder. Results of a quality test are given. An "opinion scale" was used that rates the subjective quality between zero (bad) and four (excellent). An experimental RLC vocoder received a rating of 1.35 for male speech as compared to 1.55 for a typical spectrum-channel vocoder and 1.75 for ordinary telephone speech.
R 12

30,033
Golden, R.M. IMPROVING NATURALNESS AND INTELLIGIBILITY OF HELIUM-OXYGEN SPEECH, USING VOCODER TECHNIQUES. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 621-624. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Previous analysis of helium speech has shown that the peculiar characteristic of this speech is due primarily to changes in formant frequencies of the speaker. Changes in the fundamental pitch frequency of the speaker are small and usually can be neglected. Computation of the resonant frequencies of the vocal tract, as a function of the gas mixture occupying the tract, gives a reasonable estimate of the changes that can be expected in the formant frequencies. A modified channel vocoder was designed to restore approximately the normal values of the talker's formant frequencies, while preserving his fundamental pitch frequency. This "formant-restoring vocoder" (FRV) separates the spectral energy of the helium speech into a number of narrow bands, which then amplitude-modulate lower-frequency pitch harmonics derived directly from the helium speech. Helium speech from Sealab II was processed by an FRV simulated on a digital computer. Results of several simulations indicated that considerable improvement in naturalness and intelligibility of helium speech can be achieved.
R 10

30,034
MacLean, D.J. ANALYSIS OF SPEECH IN A HELIUM-OXYGEN MIXTURE UNDER PRESSURE. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 625-627. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Tape recordings made in the helium-oxygen atmosphere of the USN Sealab II have been analyzed by spectrographic techniques. The divers breathing this gas mixture have an unusual voice quality often characterized as "Donald Duck" speech. The Sealab experiment permitted speech analysis of divers living in such an atmosphere for several days. A study of the recorded data has led to the following observations: a) formant shifts are responsible for the unusual quality of the helium-oxygen speech; b) the formant shifts are nonlinear--the first-formant shift being greater than the higher ones; c) energy associated with fricative sounds has also been observed to shift upward; d) pitch or fundamental frequency changes are usually not significant; e) after several days in the preponderantly helium atmosphere of Sealab, changes occurred in the speech quality that made it sound more natural.
R 5

30,035
Presti, A.J. HIGH-SPEED SOUND SPECTROGRAPH. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 628-634. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

A new sound spectrograph is described that incorporates many new and unique automatic features. The mechanical assembly includes a tape-handling system for continuous record and playback. An integral part of the mechanical assembly is a tape scanner and marking drum. The scanner can repeatedly scan any 2.4-sec segment of tape for spectrographic analysis, and the tape may be automatically advanced in sequence for analysis of continuous segments of the recording. A high speedup ratio enables a spectrogram to be made in 80 sec. Three basic types of spectrograms can be made: a) the normal display of time versus frequency with intensity shown as blackness; b) an amplitude-contour display; and c) a cross-sectional amplitude display.
R 9

30,036
Singh, S. CROSSLANGUAGE STUDY OF PERCEPTUAL CONFUSION OF PLOSIVE PHONEMES IN TWO CONDITIONS OF DISTORTION. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 635-656. (Ohio State University, Columbus, Ohio).

The intelligibility of / p t k b d g / as spoken and heard by native speakers and listeners of Hindi and English and the relationship of this intelligibility to the transitions of consonants to vowels in CV (consonant-vowel) monosyllables were investigated. Phoneme boundaries were determined. A measure of intelligibility was obtained in terms of information transmitted per stimulus for 4 and 2 separate channels and a composite channel. The separate channels represented distinctive linguistic features. Redundancy was quantified through a comparison of the information transmitted by these systems. There was uniformity among the 4 speaking-listening groups in information transmitted at 6 points of temporal segmentation and in 20 different bandwidths, as well as similarity in the importance of channels. Models of linearity were set to assess information as a function of: a) time; b) width of the frequency band; and c) lower frequency of the frequency band. Multiple correlations of 0.83 in the case of a, b, and c, of 0.83 in the case of a and b, and of 0.77 in the case of a and c were found.
R 6

30,037
Weiss, M.R., Vogel, R.P. & Harris, C.M. IMPLEMENTATION OF A PITCH EXTRACTOR OF THE DOUBLE-SPECTRUM-ANALYSIS TYPE. J. Acoust. Soc. Amer., Sept. 1966, 40(3), 657-662. (Federal Scientific Corporation, New York, N.Y.).

A new technique of pitch extraction has been implemented that makes use of the double spectrum analysis of speech signals. In contrast to previous applications of this method of extracting pitch, the system described here operates in real time, it does not require the use of a computer, important system parameters such as "processing period" can be changed manually or adaptively, and the use of logarithmic compression is optional. When logarithmic compression is employed, the pitch extractor represents a real-time implementation of the "cepstrum" technique. The performance characteristics are described and illustrated for practical field conditions, including poor signal-to-noise ratios.
R 8

30,038
Green, D.M. SIGNAL-DETECTION ANALYSIS OF EQUALIZATION AND CANCELLATION MODEL. J. Acoust. Soc. Amer., Oct. 1966, 40(4), 833-838. (Psychology Dept., University of Pennsylvania, Philadelphia, Penn.).

An analysis of the equalization and cancellation model from a signal-detection standpoint is presented. At low frequencies, say 250 cps, one can neglect the time-error parameter because any slight phase error is small as compared with the period of a sinusoid and all the error in the binaural mechanism can be treated as small-amplitude error. Using this assumption, it is possible to derive the equations presented in the text. Three main conclusions can be drawn from this analysis: a) The signal-detection analysis generates the same equations as Durlach's signal-to-noise-ratio approach, except for a multiplicative factor that reflects the accuracy of the monaural energy measurement; b) The parameter associated with the amplitude error because of the multiplicative factor, is different from Durlach's by a factor of 5; c) The new analysis predicts that shortening the signal duration or decreasing the noise bandwidth will increase the size of the masking-level difference. Both effects have been observed.
R 12

30,039
Hodge, D.C. & McCommons, R.B. RELIABILITY OF TTS FROM IMPULSE-NOISE EXPOSURE. J. Acoust. Soc. Amer., Oct. 1966, 40(4), 839-846. (USA Human Engineering Labs., Aberdeen Proving Ground, Md.).

A comprehensive damage-risk criterion (DRC) for impulse-noise exposure is needed, and it is desirable to state the DRC in terms of allowable TTS (temporary threshold shift), since TTS is both a valid and convenient measure of noise effects on hearing. This is possible only if TTS is also a reliable measure. Four TTS-reliability studies are reported. The following conclusions are reached: a) Individual subject's TTS's are not sufficiently reliable to permit generalization of impulse-noise effects; b) Group mean TTS varies only slightly across a series of exposures and is considered to be a reliable (consistent, repeatable) measure. This is true for the exposure of normal-hearing subjects to different impulse-noise conditions, for the TTS's of subnormal-hearing subjects, and for frequencies representative of the whole range of human hearing; c) The formulation of an impulse-noise DRC should be based on group data (means, quartiles, etc.). Samples should be as large as possible and should be representative of the population to which generalization of results is desired.
R 17

30,040
Hodge, D.C. & McCommons, R.B. ACOUSTICAL HAZARDS OF CHILDREN'S "TOYS". J. Acoust. Soc. Amer., Oct. 1966, 40(4), p911. (USA Human Engineering Labs., Aberdeen Proving Ground, Md.).

Measurements of impulse noises produced by 4 toy firearms are presented. It is suggested that these "toys" constitute a potential hazard to children's hearing.
R 6

30,041
Gardner, M.B. EFFECT OF NOISE, SYSTEM GAIN, AND ASSIGNED TASK ON TALKING LEVELS IN LOUD-SPEAKER COMMUNICATION. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 955-965. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Results of the present study show that the specification of talking levels in vocal communication is meaningful only to the extent that the conditions involved are also specified. This is true for both face-to-face communication and for communication over a two-way loudspeaker system--the latter forming the principal basis of the experimental results to be presented. For this type of communication, the test participants made a relatively small, reversible adjustment of their vocal outputs over a range of system gain from +10 to -40 dB re unity. On the other hand, there was always a unidirectional change (increase) in talking level with increasing noise to effect a compensation within 3 dB of optimum listening level over a noise-level range of 37 dB. The above results were supplemented by repetition-rate data and by appraisals of the degree of acceptability of the communication achieved under various test conditions for participants communicating in pairs over the system (one individual at each terminal). Over all, the data indicate the importance of operating under as favorable a noise condition as possible and the maintenance of system gain (as defined) at, or slighty below, unity for such use of this type of communication facility.
R 21

30,042
Li, K.P., Dammann, J.E. & Chapman, W.D. EXPERIMENTAL STUDIES IN SPEAKER VERIFICATION, USING AN ADAPTIVE SYSTEM. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 966-978. (Systems Development Div., IBM Corporation, Poughkeepsie, N.Y.).

This paper describes an investigation of the capability of a two-level adaptive linear threshold element (LTE) system to perform speaker discriminations. The study also includes an investigation of discriminating a speaker from an unknown population. The problem has been confined to the verification of an utterance as that of an expected informant. The environment of the experiments is discussed, and the experimental system is described. At the first-level LTE, 4 different kinds of training have been developed for effective transformation and data reduction. At the second-level LTE, different training conditions and different decision processes are investigated and evaluated. Over 90% accuracy is obtained in separating a known speaker from impostors.
R 13

30,043
Ohman, S.E.G. PERCEPTION OF SEGMENTS OF VCCV UTTERANCES. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 979-988. (Speech Transmission Lab., Royal Institute of Technology, Stockholm, Sweden)

Perceptual confusions among Swedish consonants in VC (vowel-consonant) and CV (consonant-vowel) syllables are investigated. The stimuli were produced by splitting natural VCCV utterances in two halves at various points in time. The initial and final stimuli so obtained were used for two separate listening tests. The perceptual errors associated with the various VC and CV stimuli of any given VCCV utterance are analyzed with respect to the manner, place, and voicing features of the intervocalic consonant. Explanations of these errors in terms of acoustic and linguistic properties of the stimuli are attempted.
R 10

30,044
Clack, T.D. EFFECT OF SIGNAL DURATION ON THE AUDITORY SENSITIVITY OF HUMANS AND MONKEYS (MACACA MULATTA). J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1140-1146. (C.W. Schilling Auditory Research Center, Inc., Groton, Conn.).

The changes in absolute sensitivity of monkeys and humans are compared as a function of signal duration. Pure-tone thresholds, both monaural and binaural, were obtained from the 2 monkeys (Macaca mulatta) using a single-lever, go-no go, shock-avoidance conditioning procedure. The monaural thresholds for the 7 women were determined under similar acoustic and behavioral conditions. The signal durations sampled were from 10 to 1500 msec at frequencies between 250 and 8000 cps. The results show that: a) the rate of change in threshold as a function of signal duration is linear with a slope dependent upon frequency--slope is highest below 1000 cps for both humans and monkeys; b) although the integration rates for humans and monkeys are nearly identical at 2000 and 4000 cps, they differ at the frequency extremes. An attempt is made to show that these results do not depend upon the critical-ratio differences of the ears but are related to long-term sensitivity.
R 15

30,045
Crane, H.D. MECHANICAL IMPACT: A MODEL FOR AUDITORY EXCITATION AND FATIGUE. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1147-1159. (Stanford Research Institute, Menlo Park, Calif.).

An auditory model is developed in which hair-cell excitation is based on mechanical impact of the cochlear hairs against the tectorial membrane, and auditory fatigue is based on a relatively slow mechanical bending of the tectoral membrane to conform to the deflection envelope. In this model, the cochlear system is treated basically as a spatially distributed, mechanical, envelope-detection system. Some novel mechanical vibration and impact devices that led to the development of this picture of hair-cell excitation are discussed. It is shown that the model can explain, and is consistent with, a relatively wide range of auditory data such as pitch and threshold shifts with pure-tone fatigue, modulation of a steady high-frequency tone by a simultaneous low-frequency tone, and very rapid high-frequency cutoff in "tuning curves" recorded from single auditory fibers. The model leads to a reinterpretation of such features as pitch sharpening, missing fundamentals, and fatigue. No new data are presented, although new experiments are suggested by the model.
R 13

30,046
Dallos, P.J. & Johnson, K.R. INFLUENCE OF RISE-FALL TIME UPON SHORT-TONE THRESHOLD. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1160-1163. (Auditory Research Lab., Northwestern University, Evanston, Ill.).

Thresholds for short-duration 1000-Hz tones were obtained from 8 listeners. The rise-fall times of the trapezoid-shape tone pips were varied between 0-40 msec, while the equivalent duration was held constant at a number of values. It was demonstrated that, as long as the equivalent duration was unchanged, the rise-fall time had no effect upon auditory threshold.
R 3

30,047
Eijkman, E., Thijssen, J.M. & Vendrik, A.J.H. WEBER'S LAW, POWER LAW, AND INTERNAL NOISE. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1164-1173. (Medical Physics Dept., University of Nijmegen, Nijmegen, The Netherlands).

Psychophysical experiments concerning the differential sensitivity of the ear for a 1000-cps tone are analyzed. The hypothesis that Weber's law is a case of multiplicative noise was tested. Multiplicative noise exists in systems with fluctuating gain. It can be shown that systems with multiplicative noise displaying Weber's law $\Delta I/I$=CONSTANT possess a power function that relates the relevant neural activity and the stimulus magnitude. The experiments deny, however, a fluctuating gain as the only explanation of Weber's law. The experiments are better described by assuming that observers choose their sensitivity in accordance with the range of stimulus intensities. The internal noise, measured as an equivalent ΔI in the experiment, depends on the range to which the observer has tuned in. A multirange-meter model is discussed, which obeys Weber's law and also shows a restricted class of input-output relations.
R 13

30,048
Stuckey, C.W., Hutton, C.L. & Campbell, R.A. DECISION RULES IN THRESHOLD DETERMINATION. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1174-1179. (US Veterans Administration Hospital, Atlanta, Ga.).

Threshold determination within the framework of the Block Up-and-Down, Two-interval, Forced-choice (BUDTIF) method has been investigated. A computerized Monte Carlo technique was used to permit varying certain procedural parameters while maintaining an invariant "listener". The basic approach involved a comparison of the threshold means and variances obtained for a representative set of parameter values. That set of parameters yielding minimum between-mean threshold variance and minimal bias was sought. Parameters considered and general results included: a) number of trials per run -- inversely related to between-mean threshold variance, b) number of trials per block -- directly related, with a critical minimum size depending on target performance level, c) number of blocks used in each level-change decision--directly related, d) initial stimulus level--no effect, if reasonably close to true threshold, and e) method of calculating thresholds--no clear effect. Parameters that yielded minimum variance within individual runs tended to yield maximum variance between successive threshold estimates.
R 4

30,049
Swigart, Elca, PITCH OF A PERIODICALLY INTERRUPTED TONE. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1180-1185. (Ohio State University, Columbus, Ohio).

A series of tone pulses was produced by periodically interrupting a 1000-Hz tone (carrier frequency). Each interruption was 1 msec (one wavelength of the carrier frequency). The duration of the tone pulses was varied by increasing or decreasing the interruption rate. Listeners matched continuous tones to the interrupted tones under 3 conditions: a) binaurally at a low intensity; b) monaurally at a low intensity; and c) monaurally at a high intensity. Results show that the stimuli that elicited responses corresponding to the carrier frequency contained individual pulses of longer duration than those stimuli which elicited matches to the interruption rate. Comparison of the duration of individual pulses of interrupted tones with the duration of tone "pips" in studies relating to pitch to tonal duration revealed similarities in the stimulus duration necessary to detect the pitch of the carrier frequency. Order of presentation of stimuli significantly affected responses. Listeners receiving the stimuli in an ascending order (tone pulses of shorter to longer duration) required pulses of longer duration to respond to the carrier frequency than did listeners receiving the stimuli in a descending order.
R 10

30,050
Gambardella, G. & Trautteur, G. TIME-FREQUENCY ANALYSIS IN THE HEARING PROCESS. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1187-1189. (Gruppo di Cibernetica del C.N.R. di Napoli, Naples, Italy).

The hypothesis that a temporal waveform analysis is performed along the basilar membrane is considered and proved wrong, on the basis of a comparison between the uncertainty principle in Fourier analysis and the time-frequency relations in the cochlea, obtainable from experimental data. A suggestion is introduced in the conclusions for an appropriate electrical model of the cochlea, which could prove useful for both Fourier and waveform analyses of speech.
R 4

30,051
Riach, W.D. & Sheposh, J.P. SUPPLEMENTARY OBSERVATIONS ON THE CENTRAL FACTOR IN AUDITORY FATIGUE. J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1190-1192. (Auditory Research Lab., Wayne State University, Detroit, Mich.).

The results from studies concerned with central factor in auditory fatigue have been discursive. The original study of the authors was replicated in order to determine whether the amount and kind of background information made available to the E would effect the outcome. Two groups of E's were employed. One group was given background information that supported only the central factor effect in auditory fatigue, while the other group was presented with all of the previous findings. In general, the data reflected the E's attitude.
R 8

30,052
Scharf, B. COMMENTS ON "MASKING AND DISCRIMINATION". J. Acoust. Soc. Amer., Nov. 1966, 40(5), 1192-1193. (Psychology Dept., Northeastern University, Boston, Mass.).

Previous studies of the critical band of masking clearly indicate that the size of the critical band is about like that measured by Zwicker and others in over half a dozen types of experiments. Amplitude fluctuations of narrow-band noise do make the precise determination of the size of the critical band in masking experiments difficult, but not impossible, as shown by the work of Hamilton.
R 18

30,054
Cohen, A., Kylin, B. & LaBenz, P.J. TEMPORARY THRESHOLD SHIFTS IN HEARING FROM EXPOSURE TO COMBINED IMPACT/STEADY-STATE NOISE CONDITIONS. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1371-1380. (US Department of Health, Education & Welfare, Cincinnati, Ohio).

Temporary threshold shifts (TTS) in pure-tone hearing acuity are reported for 15 subjects exposed in separate 15-min periods to taped impact sounds (played back at 124- to 127-dB peak sound-pressure level (SPL)), to 3 levels of filtered (75- to 1200-cps) steady-state noise (90, 100, 110 dB SPL), and to combinations of the recorded impact sounds with each level of the steady-state noise. TTS's from all such exposures were typically small, with the largest shifts occurring in the 1000- to 3000-cps frequency range. When combined with 90- and 100-dB steady-state noise, the impacts caused less threshold shift than when presented alone. Such TTS reductions were believed due to the relatively greater ability of the steady-state noise to arouse and sustain the acoustic reflex with its consequent sound-attenuation effect. The addition of the 110-dB steady-state noise did not induce a similar result quite possibly because this exposure, by itself, caused threshold shifts equal to or exceeding those of the impact sounds. More-effective stimulation of the acoustic reflex was believed responsible for findings showing less TTS for combined impact/steady-state noise than from exposure to just the steady-state component of the combination. Indirect measures of acoustic-reflex response (contralateral remote masking (CRM)) generally indicated that those ears with a strong reflex response show less noise-induced shift. Correlations between TTS from impact and from steady-state noise for the subject group indicated some degree of positive correspondence limited to frequencies of 2000 cps and below and strongest for those subjects with a poor reflex response as shown by their CRM data.
R 19

30,055
Durlach, N.I. ON THE APPLICATION OF THE EC MODEL TO INTERAURAL JND'S. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1392-1397. (Communications Sciences Center, Massachusetts Institute of Technology, Cambridge, Mass.).

This paper reports some preliminary results of an attempt to apply the equalization and cancellation (EC) model of binaural unmasking to data on interaural just-noticeable differences (jnd's). The interaural dimensions that are considered are time, amplitude, frequency, and decorrelation.
R 12

30,056
Johnstone, J.R. & Johnstone, B.M. ORIGIN OF SUMMATING POTENTIAL. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1405-1413. (Physiology Dept., University of Western Australia, Nedlands, Western Australia).

The relationship between sound and cochlear potentials is considered in the light of von Bekesy's observations of movement of the cochlear partition and Davis' variable-resistance theory of hair-cell function. An equation is derived relating hair angle to basilar-membrane movement. The equation is $\phi = \arcsin(Y_\alpha + \cot\phi_\alpha)$, where ϕ is the hair angle and is proportional to basilar-membrane movement. ϕ is the resting hair angle. Y is the ratio of the distance between basilar membrane and hair-cell apex to the distance between tectorial membrane and hair-cell apex. It is shown that the sigmoidal shape of this function leads to a linear dependence of microphonics on sound intensity, generation of harmonics, and production of positive and negative summating potentials by inner and outer hair cells, respectively. The behavior of the cochlear potentials, including the effect of sound pressure in reversing summating potential polarity, effect of cochlear pressure changes, and reversal of summating potential polarity with anoxia, is also accounted for. A mechanical model of the organ of Corti, used to illustrate our theory, is described, together with results obtained from the model.
R 18

30,057
McFadden, D. MASKING-LEVEL DIFFERENCES WITH CONTINUOUS AND WITH BURST MASKING NOISE. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1414-1419. (Hearing & Communication Lab., Indiana University, Bloomington, Ind.).

Psychometric functions were obtained for several interaural phase combinations with both continuous and burst masking noise. In the burst conditions, the signal (400 cps, 125 msec) and the wide-band masker (45 dB/cycle) were gated simultaneously; in the continuous conditions, only the signal was gated. Performance on burst NO-SO (that is, the interaural phase shift of both the masking noise and the signal is zero degrees) was only about 0.5 dB worse than that on continuous NO-SO, but the masking-level differences (MLD's) for NO-Sπ (that is, the masking noise has a zero phase shift, the signal noise a 180 degree phase shift), Nπ-SO, NO-Sm, and Nπ-Sm (that is, the masking noise has a 180 degree phase shift, the signal noise is monaural), were 4-6 dB smaller with burst than with continuous noise. In an additional experiment, the noise burst (NO) was gated 0, 75, 150, 250, 400, 600, and 1000 msec before the onset of the signal (Sπ). These MLD's increased gradually between 0 and 600 msec and then leveled off at approximately the value obtained with a continuous masker. A single-interval YES-NO procedure was used in these experiments. When 2-alternative forced choice was used, the difference between continuous and burst noise was considerably diminished.
R 6

30,058
Rubinstein, M., Feldman, B., Fischler, H., Frei, E.H., et al. MEASUREMENT OF STAPEDIAL-FOOTPLATE DISPLACEMENTS DURING TRANSMISSION OF SOUND THROUGH THE MIDDLE EAR. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1420-1426. (Otolaryngological Dept., Government Hospital, Tel Hashomer, Israel).

The frequency response of stapedial-footplate vibration during sound conduction was measured on fresh cadaver specimens. Specially designed and adapted instruments made these measurements possible at sound levels lower than those causing discomfort to living subjects (84-114 dB), and with a continuous frequency sweep between 100 cps and 10 kcps. The results show a similarity with the curves of subjective ear sensitivity, suggesting a dependence of the over-all sensitivity of the ear on the middle-ear frequency response. Linear increase of vibration amplitude with sound level was found to exist up to around 104 dB; above this sound level, there is a gradual limiting of the stapedial excursions. Speculations on energy transfer from the middle to the inner ear showed nearly optimal matching between them. The influence of the aging process of the specimens is discussed.
R 9

30,059
Bricker, P.D. & Pruzansky, Sandra. EFFECTS OF STIMULUS CONTENT AND DURATION ON TALKER IDENTIFICATION. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1441-1449. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Sixteen listeners attempted to identify the talker listening to speech samples of varying duration and content. The samples, recorded by 10 different talkers, were of 5 types: excerpted vowels, excerpted consonant-vowel (CV) sequences, monosyllabic words, disyllabic nonsense words, and sentences. Identification accuracy improved directly with the number of phonemes in the sample even when duration was controlled. Stimulus-response matrices differed substantially between the 2 vowels ((a) and (i)) used in the vowel and CV samples: relative identifiability of the talkers, response preference, and error patterns were all found to depend on vowel type. Confusion matrices for a given vowel exhibit definite asymmetries. In a limited additional study, subsets of listeners made identifying responses with the tapes reversed; performance deteriorated on even the briefest excerpts. The results pose some difficulties for a model of talker-identification behavior based on attributes of voice quality.
R 7

30,060
Cooke, J.P. & Beard, Sarah E. SPEECH INTELLIGIBILITY FOR SPACE VEHICLES, USING NITROGEN OR HELIUM AS THE INERT GAS. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1450-1453. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A laboratory investigation was carried out to help evaluate verbal-communication intelligibility in a man-rated altitude simulator when either helium or nitrogen was added to the oxygen atmosphere. Some 8 operators and 37 male subjects were tested with a total of 16 500 random word events at pressures of 5 psia (pounds pressure per square inch, absolute), using 70:30 mixture of O_2:He or O_2:N_2 mixtures and also 100% oxygen at 3.5 psia. An increased lack of intelligibility has been known to occur as gas densities have been reduced. Differences in test scores following the substitution of helium in place of nitrogen at the pressures and mixtures employed resulted in no increased loss of intelligibility other than that associated with the reduced gas density, although some modification of speech can be detected by listeners.
R 16

30,061
Grimm, W.A. PERCEPTION OF SEGMENTS OF ENGLISH-SPOKEN CONSONANT-VOWEL SYLLABLES. J. Acoust. Soc. Amer., Dec. 1966, 40(6), 1454-1461. (Ohio State University, Columbus, Ohio).

This study was undertaken to determine the effect upon perception of deleting different numbers of 10-msec segments from the initial part of each of a set of consonant-vowel syllables. The scores that were analyzed were proportions of correct identifications of the residual elements by panels of listeners. The outcome was expressed in terms of correct identifications at each duration of the stimuli. Both the correct and error responses were studied to determine the relationship of voicing, manner of release (plosiveness and fricativeness) and place of articulation, to the identification of the stimuli. The results of the experiment indicate that the present procedure is feasible for studying the intelligibility of syllables and their constituent phonemes, and that the voicing manner of release, and place of articulation of the consonant remain evident when the syllable is truncated at the initial end to commence 50 msec before the peak intensity of the vowel of the syllable. The listeners were able to detect correct place of articulation more accurately than either voicing or manner of release as greater amounts of the initial part of a syllable were removed. The responses were related to the threshold of detectability.
R 15

30,084
Hunter, C.G. AROMATIC SOLVENTS. Ann. occup. Hyg., Oct. 1966, 9(4), 191-198. (Tunstall Lab., Shell Research Ltd., Sittingbourne, England).

Aromatic solvents are widely used in industry and are recognized as possessing slight to moderate toxicity during acute, local and systemic exposures. In prolonged industrial exposures, the question of systemic intoxication from absorption of the vapour of benzene and solvents containing benzene demands evaluation in terms of occupational hygiene, susceptibility of the individual workman and the mechanisms of injury. Further research into the absorption and metabolism of aromatic solvents will help elucidate questions of occupational exposures and specific diseases in workmen.
R 17

30,085
Llewellyn, O.P. HALOGENATED HYDROCARBONS USED AS SOLVENTS. Ann. occup. Hyg., Oct. 1966, 9(4), 199-208. (British Celanese, Ltd., Spondon, England).

This article gives a brief resume of the physiological effects on humans of halogenated hydrocarbons used as solvents. These are methylene chloride, methyl chloride, trichloroethylene, carbon tetrachloride, perchloroethylene, and 1,1,1 trichloroethane.

30,086
Gardner, A.W. ALIPHATIC SOLVENTS. Ann. occup. Hyg., Oct. 1966, 9(4), 209-214. (Medical Dept., Esso Refinery, Faeley, England.).

This review briefly indicates the broad classes of aliphatic solvents and the main problems associated with each. The aliphatic solvents can be classified as nitroparaffins, alcohols, ketones, aldehydes, ethers, esters, glycols and derivatives, and petroleum solvents. Threshold limit values are given for a number of compounds.
R 4

30,087
Cooke, M.A. SKIN PROTECTION AGAINST SOLVENTS. Ann. occup. Hyg., Oct. 1966, 9(4), 215-221. (Albright & Wilson (Mfg.) Ltd., Birmingham, England).

A review of routes of percutaneous absorption, and dermal lesions produced by solvents, is presented as a basis for the study of cutaneous damage by solvents and procedures for the elimination of such damage. The importance of avoiding skin contact wherever practicable is stressed.
R 12

30,088
Adcock, L.H. TRENDS IN SOLVENT ANALYSIS. Ann. occup. Hyg., Oct. 1966, 9(4), 223-229. (Printing, Packaging & Allied Trades Research Association, Leatherhead, England).

Improved methods for the analysis of complex mixtures of solvents have followed developments in gas chromatographic and infra-red spectroscopic techniques. Under gas chromatography the following topics are discussed and their importance illustrated: capillary columns, temperature programming, detector design and selectivity of response, sample collection and syringe reactions. Under infra-red, the following: special applications, and rapid scanning spectrophotometers.
R 9

30,089
Luxon, S.G. RECENT DEVELOPMENTS IN THE USE OF SOLVENTS. Ann. occup. Hyg., Oct. 1966, 9(4), 231-234. (Chemical Branch, H.M. Factory Inspectorate, London, England).

The need to quantify the hazards during the use of solvents is discussed and the considerations affecting the choice of safer solvent mixtures including threshold limit values, dilution volumes and flammability are indicated. The need to carry out an assessment of the hazards before a solvent mixture is used is stressed.

30,090
Edmonds, A. TOXICITY OF VAPOURIZING LIQUIDS. Ann. occup. Hyg., Oct. 1966, 9(4), 235-242. (Mond. Div., Imperial Chemical Industries, Ltd., Runcorn, England).

This paper reviews some of the toxic-properties of vapourizing liquids used in fire fighting.
R 7

30,091
Kazantzis, G. SOME ASPECTS OF HEPATIC PATHOLOGY. Ann. occup. Hyg., Oct. 1966, 9(4), 243-248. (Medicine Dept., Middlesex Hospital, London, England).

Only a few of the large number of organic solvents in use today are known to be liver poisons. Some solvents are believed to give rise to liver damage but objective evidence of a causal relationship in men is sometimes difficult to obtain, and some of these difficulties are discussed. It is possible that some solvents may damage the liver in specially vulnerable groups. The organic solvents which are known hepatic poisons, like carbon tetrachloride, may produce all degrees of liver damage, from fatal massive necrosis to cellular dysfunction unaccompanied by clinical illness but evidenced by sensitive biochemical tests. Hepatic intracellular enzymes released into the circulation provide the most sensitive indication of liver injury and measurement of serum levels of these enzymes together with electron microscopic examination of the liver cell is helping to elucidate the mechanism of the toxic action of these solvents.
R 9

30,098
Goldstein, J.H., Clahane, Aurora C. & Sanfilippo, Stephanie. THE ROLE OF THE PERIPHERY IN BINOCULAR VISION. Amer. J. Ophthal., Oct. 1966, 62(4), 702-706. (Ophthalmology Div., New York State University Downstate Medical Center, Brooklyn, N.Y.).

The periphery significantly contributes to the binocular relationship and if it is destroyed even while maintaining good central vision, disruption in this relationship occurs. This has been shown in patients with retinitis pigmentosa with loss of field down to 10 degrees or less from fixation as compared with a control group with full fields.
R 21

30,099
Fishman, R.S. THE VISUAL-EVOKED CORTICAL RESPONSE IN NIGHT BLINDNESS. Amer. J. Ophthal., Dec. 1966, 62(6), 1166-1170. (Ophthalmology Dept., University of Florida, Gainesville, Fla.).

Visual-evoked cortical responses were elicited from 2 patients with severe night blindness. Unlike the ERG, the visual-evoked response reflects photopic activity primarily and, especially, the photopic function of the cone-dense retina at the posterior pole. Therefore, it is potentially a useful objective test of macular function.
R 12

30,105
Haun, R.D., Jr. ADVANCES IN LASERS AND MASERS. Industr. Res., June 1966, 8(7), 59-66. (Westinghouse Electric Corporation Research Laboratories, Pittsburgh, Penn.).

During the 6 hears since its first demonstration, the laser has grown from a low-efficiency, low-energy-output laboratory curiosity to a large number of different devices having a broad spectrum of useful properties. It seems quite likely that devices nearly developed will be procured in quantity for industrial, medical, and military applications in the next 2 years.

30,108
Saunders, J.J. VACUUM AND CRYOGENICS IN AEROSPACE. Industr. Res., Sept. 1966, 8(10), 64-69. (Martin Co., Denver, Colo.).

Overall, space environment chambers in the U.S. are rapidly approaching obsolescence. Test techniques required for the integrity and reliability of spacecraft are becoming more sophisticated and are creating demands that cannot be met completely with present chambers. In part, the obsolescence is due to inadequate conceptual and experimental effort by the aerospace industry to demand what could have been provided by the vacuum, cryogenic, and optical industries. Acquisition and development of skills to do so were not fast enough in many cases to be able to make specifications for flexibility, effectiveness, and low operating cost. The reasons for this obsolescence and the outlook for the future are discussed.

30,109
Rozsahegyi, I. & Roth, B. PARTICIPATION OF THE CENTRAL NERVOUS SYSTEM IN DECOMPRESSION. Industr. Med. Surg., Feb. 1966, 35(2), 101-110. (Institute of Industrial Medicine, Budapest, Hungary & Charles University, Prague, Czechoslovakia).

The central nervous system displays a great vulnerability in decompression sickness. It may be damaged, not only in cases of manifest caisson disease of neurological form, but very often without clinical neurological signs and symptoms or without any mark of decompression sickness at all. It could be demonstrated that in cases without manifest clinical signs of decompression sickness, a lasting damage of the nervous system may start (similar to the chronic osteoarthropathy of caisson workers, i.e. aseptic necrosis of bones) and the probability of permanent lesion increases in a high degree, when signs of decompression sickness of any (not only neurological) form are present. If the recompression in the medical lock is not effective, the possibility of recovery is very poor. In prevention it is worthwhile to consider reduction of time spent in compressed air, to prevent saturation of so-called "slow tissues," such as the white matter of the nervous system.
R 7

30,110
Industrial Medicine and Surgery. SAFETY FACTORS IN THE WORKER'S ENVIRONMENT. Industr. Med. Surg., April 1966, 35(4), 248-285.

This article includes several papers delivered to the National Safety Congress at Chicago in October 1965: The Miracle Mile, Accident Prevention in Heavy Industry, Engineering Safety into Material Handling Jobs, Solutions to the Paper Mill Noise Problem, Improving the Worker's Emotional Environment, Dust Hazards Related to Health, Occupational Accident Prevention in the United Kingdom, The Gray Area, and Compensation for Hearing Loss. (HEIAS)
R 17

30,111
Brown, I.D. EFFECTS OF PROLONGED DRIVING UPON DRIVING SKILL AND PERFORMANCE OF A SUBSIDIARY TASK. Industr. Med. Surg., Sept. 1966, 35(9), 760-765. (Applied Psychology Research Unit, MRC, Cambridge, England).

The present experiment was to control the duration and type of driving, to include subjects with a wide range of driving ability and to score their performance at intervals during the driving spell using a subsidiary task which would be little affected by learning. Accordingly 16 Ss, from 25 to 63 years of age, with from 3 to 29 years of driving experience, participated. The main finding is that prolonged driving had very little effect upon driving performance as measured in the experiment and upon reserve capacity as measured on the subsidiary task of random generating, compared with a control condition of intermittent driving. The general conclusion must be that driving which is prolonged for up to 12 hours is likely to have an extremely small effect upon the ability of the driver to perform the perceptual and motor skills involved in his task. However, it must be noted that driving under real conditions on the road may produce decrements in performance, as a result of lowered arousal, which did not show up under the more stimulating experimental conditons, where the subjects necessarily knew when testing was carried out.
R 22

30,112
McDermott, G.J. CONTROLLING AND EVALUATING DATA PROCESSING OPERATIONS. J. Industr. Engng., Jan. 1966, XVII(1), 22-24. (New York Shipbuilding Corp., New York, N.Y.).

The proposed method incorporates a coding system for all programs and jobs, all operations, and all operators; and a "Data Processing Activity Record" card, which is used by every operator to report his daily activities. These activities are later summarized by machine into a report that is used for scheduling manpower and machines, cost controlling and future program or job cost estimating.

30,113
Hauser, N., Barish, N.N. & Ehrenfeld, S. DESIGN PROBLEMS IN A PROCESS CONTROL SIMULATION. J. Industr. Engng., Feb. 1966, XVII(2), 79-86. (Industrial Engineering Dept., New York University, New York, N.Y.).

This article is concerned with the study of methods and problems relating to the simulation of the stochastic output of a process control simulation. Aspects which are treated include questions of efficiency and stopping rules for deciding on the length of simulation run to achieve a desired confidence level for estimates. Some of the problems of computer computation are considered, and methods for solving them are suggested.
R 18

30,114
Shattuck, G.A. & Worden, T.C. LEARNING CYCLE CALCULATOR. J. Industr. Engng., Feb. 1966, XVII(2), 92-98. (International Business Machines Corporation, New York, N.Y.).

This article describes and illustrates a slide rule, called a Learning Cycle Calculator which can be used to determine intermediate performance goals within a learning cycle or to determine the learning cycle. The Calculator is based on the learning model where the cumulative average unit costs are log-linear with respect to cumulative production and is applicable to those situations in which a resource is expended at a fixed rate relative to elapsed work time. The analytical development of the Calculator scales is given and several illustrations are presented.
R 1

30,115
Jelinek, R.C. & Steffy, W. USE OF MULTI-VARIATE TECHNIQUES FOR THE ANALYSIS OF WORK MEASUREMENT DATA. J. Industr. Engng., Feb. 1966, XVII(2), 106-111. (University of Michigan, Ann Arbor, Mich.).

The authors observe that, whereas statistical multi-variate analysis techniques have been successfully applied in economics and business, work measurement data analysis remains limited because these techniques generally have not been adopted by Industrial Engineers. Both the single equation and the simultaneous system of equations models are discussed. The use of these techniques for formula construction and for the study of indirect labor and delays is illustrated.
R 17

30,116
Marchbanks, J.L. DAILY AUTOMATIC RESCHEDULING TECHNIQUE. J. Industr. Engng., March 1966, XVII(3), 119-125. (USAF Air Materiel Area, Kelly AFB, Tex.).

The motivation, concepts, and mechanics of the Daily Automatic Rescheduling Technique (DART) are described. DART is a technique for minimizing in-work flow time (project duration) and maximizing utilization of time-consumed production resources within flow-time constraints. Differences between DART and standard critical path programs are discussed.
R 7

30,117
Nadler, G. & Seidel, M.J. THE MEASUREMENT OF INFORMATION IN A CONTINUOUS PROCESS. J. Industr. Engng., March 1966, XVII(3), 150-156. (Industrial Engineering Div., University of Wisconsin, Madison, Wisc. & Alton Box Board Company, Alton, Ill.).

The continuous information content of tasks in 3 similar continuous processes using analog signals is measured and compared with job evaluation criteria. The information content is evaluated statistically before comparison with rank order conventional job evaluation. The results indicate that an Information Content Analysis can be used to measure task difficulty in a process using continuous analog outputs.
R 11

30,118
Conte, J.A. A STUDY OF THE EFFECTS OF PACED AUDIO-RHYTHM ON REPETITIVE MOTION. J. Industr. Engng., March 1966, XVII(3), 163-169. (University of Missouri, Columbia, Mo.).

The study described was propounded to determine if it is possible to provide a bio-physical driving force that will stimulate the operator in repetitive tasks to work at a rhythm that is comfortable, yet more productive than the rhythm he would normally set for himself. Using a metronome to pace a peg-board task, average cycle time was decreased by 9 to 17% and the variance of cycle times decreased. It is concluded that the development of actual applications of paced audio-rhythm in the modern industrial work plant may prove a powerful tool for increased productivity for the operators performing highly repetitive tasks.
R 11

30,119
Davis, E.W. RESOURCE ALLOCATION IN PROJECT NETWORK MODELS-A SURVEY. J. Industr. Engng., April 1966, XVII(4), 177-188. (Industrial Administration Dept., Yale University, New Haven, Conn.).

It is the purpose of this article to review the various solutions that have been proposed for each of the three cases of the resource allocation problem and to attempt an assessment of progress to date as well as point out potential future courses of development. The review is limited to solution techniques described in the open literature and is aimed more at a presentation of the basic concept and approach involved in each technique than a detailed examination of the computational steps involved.
R 40

30,120
Mehra, M., Nair, K.P.K. & Vartak, M.N. QUALITY INCENTIVE: A GAME THEORETIC APPROACH. J. Industr. Engng., April 1966, XVII(4), 192-196. (Indian Institute of Technology, Bombay, India.).

This article considers lot-production and inspection of the lots by acceptance sampling (involving only nondestructive tests) by attribute. For quality improvement, incentive to the operator is introduced and it is linked with the acceptance sampling inspection scheme. The situation is represented by a game, and the optimal strategies of the management and the operator are obtained by solving the game. The wage, inclusive of incentive, is computed from the game. Practical aspects for implementation of the quality incentive and suggestions for further work are discussed.
R 4

30,121
Weindling, J.I. SOME ASPECTS OF THE DESIGN OF TASK ORIENTED SOCIAL STRUCTURES. J. Industr. Engng., June 1966, XVII(6), 302-307. (Drexel Institute of Technology, Philadelphia, Penn.).

The design of organizational units is considered in the context of mechanical design procedures. Stages of development of design procedures are outlined, "human materials" data are discussed, and research in human organization is described. The validity of laboratory experimentation and unreasoned application of mathematical formalism are questioned.
R 25

30,122
Poock, G.K. & Weiner, E.L. MUSIC AND OTHER AUDITORY BACKGROUNDS DURING VISUAL MONITORING. J. Industr. Engng., June 1966, XVII(6), 318-323. (Industrial Engineering Dept., University of Michigan, Ann Arbor, Mich. & University of Miami, Coral Gables, Fla.).

In this article, the use of background music to enhance performance on a monotonous task is explored first by a review of the literature on background music from both laboratory and industrial studies and then by a report of the results of an experiment in which several musical and other auditory backgrounds were used. In the experiment an attempt was made to evaluate both popular and unpopular music, based on a survey of music preferences. In addition, a group in which the subjects could select their audio background at any time during the experimental session was included. The results cast further doubt on the claims that are made for the beneficial effects of background music, even in monotonous visual tasks in which audition plays no direct part.
R 19

30,123
Didis, S.K. & Carpenter, C.E. SIMULATION STUDY OF A TEST EQUIPMENT CALIBRATION AND CERTIFICATION SYSTEM. J. Industr. Engng., Aug. 1966, XVII(8), 437-441. (Boeing Company, Seattle, Wash. & Weyerhaeuser Company, Tacoma, Wash.).

The development, operation and results of a computer simulation of The Boeing Company's general purpose test equipment calibration and certification (Cal/Cert) system is discussed. Some advantages and disadvantages in using simulation to analyse this type of system are indicated.
R 2

30,124
Mann, L., Jr. TOWARD A SYSTEMATIC MAINTENANCE PROGRAM. J. Industr. Engng., Sept. 1966, XVII(9), 461-473. (Louisiana State University, Baton Rouge, La.).

Applications of Industrial Engineering to the maintenance function in the process industries are discussed. The uses of work measurement and statistical methods are described and exemplified, particularly applications of the several distribution functions. Other topics covered are: centralized versus decentralized organizations; steps in an effective program; centralized responsibility, controls and records; contract maintenance; centralized shop work; maintenance incentives; training programs; and relations with other departments.
R 8

30,125
Kabak, I.W. APPLICATION OF PROBABILITY: AN ANALYSIS OF A MAINTENANCE PROCEDURE. J. Industr. Engng., Sept. 1966, XVII(9), 480-484. (Graduate School of Business Administration, New York University, New York, N.Y.).

This article demonstrates that a probability analysis can be used profitably in conjunction with management considerations for evaluating a maintenance procedure; in this case the testing of transmission trunks in the communications industry. Expressions are derived for the delays that a maintenance worker would encounter. Two probability-oriented figures of merit, or measures of effectiveness, are presented and illustrated for the procedure under study.
R 4

30,126
Smalley, H.E. HOSPITAL INDUSTRIAL ENGINEERING. J. Industr. Engng., Oct. 1966, XVII(10), 511-518. (Georgia Institute of Technology, Atlanta, Ga.).

The objectives of the Industrial Engineering function are to serve the hospital by the application of Industrial Engineering principles, to communicate useful knowledge and information to hospital personnel and to extend and apply knowledge through research efforts. Hospital Industrial Engineering is a staff function serving the interests of progressive hospital administration and dedicated to the service, education and research goals of the hospital. This professional approach to organized methods improvement has the responsibility of advising and assisting hospital management in an attempt to maximize the productivity of management systems used to attain hospital goals.

30,129
Markle, D.M. & Zaner, Annette. THE DETERMINATION OF "GAIN REQUIREMENTS" OF HEARING AIDS: A NEW METHOD. J. aud. Res., Oct. 1966, 6(4), 371-377. (Seton Hall University, South Orange, N.J.).

The hearing aid performance of 19 patients with bilateral sensorineural losses were evaluated with the average acoustic gain of the hearing aid set: a) to approximate the unaided speech reception threshold (SPL) and; b) to amplify the intensity of average-intensity conversational speech to the unaided most-comfortable-listening level (MCL). Under each condition, discrimination scores (DS) were obtained for soft, average and loud speech. For these subjects, DS were reliably improved with gain related directly to unaided MCL rather than to [redacted]

30,131
Stong, R.A., Chant, V.G., Forshaw, S.E. & Neely, K.K. SPEAKING AND LISTENING THROUGH THE HEAD: II. THE INTELLIGIBILITY OF SPEECH RECORDED IN NOISE. J. aud. Res., Oct. 1966, 6(4), 385-391. (Defence Research Medical Labs., Toronto, Ontario, Canada).

In environments where ambient noise level does not exceed 120 db. bone-conduction (bc) transducers can be used to transmit speech. A high-sensitivity bc transducer was found comparable to a standard noise-cancelling ac transducer in picking up speech in environments where the level of noise was either 110 or 120 db. Experimental prototype bc transducers, when used on the upper lip, were found to be significantly more effective in picking up intelligible speech than a commercially available high-sensitivity transducer.
R 7

30,132
Locke, J.L. & Richards, A.L. TYPE V BÉKÉSY AUDIOGRAMS IN NORMAL HEARERS. J. aud. Res., Oct. 1966, 6(4), 393-395. (Ohio University, Athens, Ohio & Western Michigan University, Kalamazoo, Mich.).

The test and retest sweep-frequency Békésy audiograms of 24 normal young adults exhibited many patterns classified as Type V, suggesting that a less intense continuous-than interrupted-tone tracing is a normal phenomenon. The Type V pattern is a hypacusic ear may reflect a disorder in which continuous and pulsed tones are not differentially affected.
R 8

30,133
Foulke, E. & Sticht, T.G. LISTENING RATE PREFERENCES OF COLLEGE STUDENTS FOR LITERARY MATERIAL OF MODERATE DIFFICULTY. J. aud. Res., Oct. 1966, 6(4), 397-401. (University of Louisville, Louisville, Ky.).

College students naive with respect to accelerated speech determined their preferred listening rate for a simple prose selection by means of the Tempo Regulator, a device that permits continuous variation in word rate without distortion in vocal pitch or quality. The mean preferred listening rate was 207 words/min, a rate well above the speech rates typically reported in the literature. From previous data on blind persons, the authors feel it is likely that with experience in listening to accelerated speech, even faster word rates would be preferred with sighted persons also.
R 7

30,134
Simon, G.R. & Northern, J. L. AUTOMATIC NOISEBAND AUDIOMETRY. J. aud. Res., Oct. 1966, 6(4), 403-407. (US Veterans Administration Hospital, Denver, Colo.).

Tracking audiometry threshold measures and tracing patterns for pure tones and narrow noisebands centered on audiometric frequencies were compared for normal-hearing and 2 groups of sensori-neural hearing loss subjects (Ss). No significant differences in hearing levels were demonstrated for normal-hearing Ss. Those with hearing loss demonstrated significantly more acute thresholds for noisebands than for pure tones located in the center of the bands. Tracing patterns for both types of signal, although not significantly different for the normal-hearing and 1 group of hearing-loss Ss were significantly different for those listeners who demonstrated a Jerger Type II tracing pattern for pure-tone discrete frequency tracing.
R 3

30,135
Harbert, F., Weiss, Betty G. & Wilpizeski, C.R. SOME EFFECTS OF STIMULUS PARAMETERS ON THE MEASUREMENT OF SUPRATHRESHOLD AUDITORY ADAPTATION. J. aud. Res., Oct. 1966, 6(4), 409-418. (Otolaryngology Dept., Jefferson Medical College, Philadelphia, Penn.).

Suprathreshold auditory adaptation in normal-hearing subjects was measured by means of a simultaneous loudness balance procedure. Parameters studied were stimulus duration, amplitude modulation, quality and pulse repetition rate of the adapting stimulus, and attenuation rate of the comparison stimulus. At the end of a four-min period of continuous stimulation, a 200 pps stimulus train produced about 7 db more adaptation than an 800 c/s pure tone. Rate of adaptation was greater for the 200 pps stimulus during the first min of stimulation. The other parameters had, at best, a very weak effect on adaptation. Although individual subjects are reliable in test-retest performance, there is such a high degree of variability between subjects that specifying the stimulus conditions is not sufficient for predicting the course of suprathreshold auditory adaptation in any given individual. It is highly likely that the wide variation in the amount of adaptation reported in the literature is a function of the sample composition as well as methodological differences and test variables.
R 10

30,136
Curry, E.T. & Cox, B.P. THE RELATIVE INTELLIGIBILITY OF SPONDEES. J. aud. Res., Oct. 1966, 6(4), 419-424. (Speech Dept., University of Pittsburgh, Pittsburgh, Penn.).

Lists A-D of C.I.D. Auditory Test W-1 were presented monaurally to 50 normal-hearing subjects at increasing 2-db intensity levels. The range of individual spondee intelligibility was 8 db, considered unduly large. The least intelligible spondees tended to have a greater range of response. The homogeneity of the recorded test could be enhanced by using 27 words which fell within a ±2-db range. The exclusive use of these 27 test items would improve the general efficiency of this speech audiometric procedure.
R 4

30,137
Siegenthaler, B.M. & McCollom, H.F., Jr. RELATIONSHIPS AMONG BEKESY TRACING EXCURSION SIZES AT VARIOUS FREQUENCIES. J. aud. Res., Oct. 1966, 6(4), 437-439. (Speech & Hearing Clinic, Pennsylvania State University, University Park, Penn.).

Sixty-one normal-hearing undergraduates took Bekesy fixed-frequency audiometry at 0.25 - 4 kc/s. When care was taken to calibrate pen excursion in db rather than CM, no differences in mean tracing width appeared among frequencies. Each S adopted his own characteristic tracing width at all frequencies. Mean width at all frequencies was 6-7 db. An occasional S yielded a width of 3 db or less, or of 15 db. or more. No S yielded a width of 15 db at more than 2 of the 5 frequencies examined.
R 5

30,138
Zachman, T.A. THE EFFECTS OF BANDPASSED FILTERED SIDETONE UPON VOCAL PRODUCTION OF THE VOWEL /u/. J. aud. Res., Oct. 1966, 6(4), 441-443. (Ohio State University, Columbus, Ohio).

Twenty normal-hearing and -speaking young men phonated /u/ with and without filtered sidetone at 15 db re vocal output. Filters were all-pass and 1200-2400, 2400-4800, and 2500-6000 c/s bandpass. Restrictive filtering had the general effect of raising the frequency peaks of phonation. The frequency of maximum shift was positively related to the frequency of filtering.
R 4

30,139
Reddell, R.C. & Calvert, D.R. SELECTING A HEARING AID BY INTERPRETING AUDIOLOGIC DATA. J. aud. Res., Oct. 1966, 6(4), 445-452. (San Francisco Hearing & Speech Center, San Francisco, Calif.).

Recent developments in the hearing aid industry have rendered obsolete most research evaluating selective frequency amplification in hearing aid selection. This study evaluated hearing aids with frequency response custom-adjusted to each subject (S). Twenty-four Ss with high-tone loss and no previous experience with hearing aids were evaluated with a variety of audiologic tests. Diagnostic information and frequency response specifications for each S were sent to a manufacturer who returned an aid custom-adjusted for the S. Ss response with the experimental aid was compared to his response with two commercially-available hearing aids selected by customary audiologic procedures. Ss rated the 3 aids and completed a questionnaire comparing aided and unaided experiences during a trial period. Mean SRT, discrimination scores, and tolerance for loud speech was slightly better for the experimental aid. Ss preponderantly preferred the experimental aid, rated their everyday listening "better" to "much better" with the aid, and 19 Ss purchased the aid at standard prices. These advantages of the experimental aid seem sufficient to reassert selective frequency amplification as a technique for hearing aid selection. The suggestion is made to use "slope of amplification curve" rather than "selective frequency amplification" as a more correct descriptive term for the present limits of the electronics industry.
R 7

30,140
Swisher, Linda P., Stephens, Myrna M. & Doehring, D.G. THE EFFECTS OF HEARING LEVEL AND NORMAL VARIABILITY ON SENSITIVITY TO INTENSITY CHANGE. J. aud. Res., July 1966, 6(3), 249-259. (McGill University, Montreal, Quebec, Canada).

The two experiments reported were concerned with the relation between the hearing level of the standard tone and sensitivity to intensity change in the interpretation of the SISI (Short Increment Sensitivity Index) test. In the first, SISI scores were plotted as a function of the hearing level represented by the standard tone of 20 db sensation level at which the SISI is presented, in an attempt to resolve conflicting results obtained in previous studies by Yantis and Decker and by Owens. In the second, the intensity difference limen was examined in patients with sensory-neural type loss in relation to their SISI scores and to the variability of differential sensitivity in a group of normal-hearing subjects. The results indicated that the SISI score is influenced by both the hearing level of the standard tone and normal variations in differential sensitivity. It was suggested that the SISI might be interpreted as an indirect test of bone conduction threshold.
R 6

30,141
Hochberg, I. MEDIAN PLANE LOCALIZATION OF SPEECH. J. aud. Res., July 1966, 6(3), 277-281. (New York University, New York, N.Y.).

Front and rear median plane localization for a speech stimulus was determined for a group of 65 normal-hearing adults. Blindfolded Ss localized a sentence presented at a comfortable listening level from one of two loudspeakers as they were seated in a revolving chair in the center of an azimuth field. The front and rear quadrants of the azimuth field were regarded as median quadrants. Localization was more accurate in the front median than in the rear median quadrant. Fifty-eight percent of the Ss confused the front and rear quadrants 10% of the time. Front-rear reversals of localization were almost equally distributed between the 2 median quadrants. Ss tended to confuse either the front or rear quadrant almost exclusively, but not both. Ss who did not demonstrate front-rear confusions were more accurate localizers than were those who demonstrated front-rear reversals of localization.
R 4

30,142
Fricke, J.E. AUDITORY FATIGUE AND MENTAL ACTIVITY. J. aud. Res., July 1966, 6(3), 283-287. (Minot State College, Minot, N.D.).

Twenty Ss were given white noise at 100, 110, and 120 db SPL (sound pressure level) for three min, monaurally, either listening for short interruptions in the noise about every 45 sec, or listening to a story in the other ear. TTS (temporary threshold shift) was checked through 2-10 min of recovery at 2, 4, 6 and 8 kc/s. A slight tendency, which could have arisen by chance, appeared at 110 db SPL only, for the TTS to be greater during the noise-plus-story condition.
R 7

30,143
Muma, J.R. & Siegenthaler, B.M. BEKESY EXCURSION SIZE FOR NORMAL-HEARING YOUNG ADULTS. J. aud. Res., July 1966, 6(3), 289-296. (Speech & Hearing Clinic, Pennsylvania State University, University Park, Penn.).

Extent in db of fixed-frequency Bekesy audiometer tracing excursions for 62 normal-hearing university students was studied as a function of sex, attenuation rate, tone presentation mode (pulsed and continuous), and frequency of tone (250, 1000, and 4000 c/s). Mean excursion-size differences were statistically different for the test variables (not for sex) and for several interaction effects, but only that related to attenuation rate was larger that 2 db and therefore of clinical significance. The excursion size using slow attenuation rate (about 2.5 db/sec) is 2.5-15 db, and 5-20 db using fast attenuation (about 5 db/sec). A patient should be considered to have a 19 in 20 chance of possessing an abnormally large or abnormally small excursion size if his tracings lie outside these ranges.
R 11

30,144
Harbert, F., Young, I.M. & Menduke, H. AUDIOLOGIC FINDINGS IN PRESBYCUSIS. J. aud. Res., July 1966, 6(3), 297-312. (Jefferson Medical College, Philadelphia, Penn.).

Monaural alternate loudness balance tests showed no recruitment in 70% of subjects. Tone decay was within clinically acceptable normal limits. With an attenuation rate of 5 db/sec, pulsed and steady tone Bekesy tracings were superimposed at frequencies below 2000 c/s and were of normal amplitude (13 db). The median aural overload threshold above ASA audiometric zero was 80 db at 1000 and 90 db at 2000 c/s compared with 63 and 65 db respectively in normal ears. Standard discrimination scores were reduced in approximate proportion to the speech reception threshold and age.
R 47

30,145
Wasson, H.W. & Uncapher, Barbara. EFFECTS OF DEXTRO-AMPHETHAMINE ON AUDITORY THRESHOLD IN MAN. J. aud Res., July 1966, 6(3), 351-355. (Otolaryngology Div., West Virginia University School of Medicine, Morgantown, W.Va. & Private Practice Speech & Hearing, Vandergrift, Penn.).

Forty-eight normal-hearing volunteers were given pre- and post-exposure Bekesy sweep-frequency audiometry; 24 were given 5 mg dextro-amphetamine (dexedrine), 12 placebo, and 12 nothing in a double-blind design. Post-exposure audiometry was begun 65 min after drug administration. No even near-significant effects on threshold appeared at any frequency; however, for the experimental group, a significant reduction over the range of 0.25-8 kc/s in number of threshold crossings appeared, and necessarily also in amplitude of excursions.
R 12

30,146
Bond, G.F. EFFECTS OF NEW AND ARTIFICIAL ENVIRONMENTS ON HUMAN PHYSIOLOGY. Arch. Environ. Health, Jan. 1966, 12(1), 85-90. (USN Special Projects Office, Department of the Navy, Washington, D.C.).

From preliminary data no adverse physiologic effects have been noted as a result of the aquanaut exposure to the experimental conditions of SeaLab I Project. As a result of SeaLab I and preceding experiments, it is evident that man has an undetermined but vast capability of adaptation to hostile and exotic environments, without apparent physiological ill-effect. Acclimatization to abnormal temperature differentials has been demonstrated; within limits, ability to survive and function normally in synthetic breathing medium is now a matter of fact.
R 1

30,147
Gaensler, E.A. & Wright, G.W. EVAULATION OF RESPIRATORY IMPAIRMENT. Arch. Environ. Health, Feb. 1966, 12(2), 146-189. (Boston University School of Medicine, Boston, Mass. & Medical Research Dept., St. Luke's Hospital, Cleveland, Ohio).

In this paper we concern ourselves primarily with evaluation of respiratory impairment. Our experiences embrace laboratory and clinical measurements as well as utilization of such data both in day-to-day responsibility for patients and in evaluating impairment for health agencies. We present herein a discussion of the production of such data by methods available in the physician's office and in most urban centers, together with some aspects of the meaning of such data and the manner in which we use them in meeting common medical problems faced in our experience. We hope to indicate the sort of information that is needed, the limitations of this information, and the manner in which such information is interpreted. In essence this is a discussion of personal experience.
R 64

30,148
Ricca, P.M. EXPOSURE CRITERIA FOR FLUORINE ROCKET PROPELLANTS. Arch. Environ. Health, March 1966, 12(3), 399-407. (John F. Kennedy Space Center, NASA, Cape Kennedy, Fla.).

A subject of considerable interest is the use of liquid fluorine for propulsion because it is the most powerful of all the chemical oxidizers. Space vehicles currently in the developmental stage utilize elemental liquid fluorine (LF_2) as well as liquid fluorine and liquid oxygen (FLOX) mixtures. Rocket testing with, and handling of, fluorine oxidizers call for the utmost care and consideration for the health and safety of personnel. Although closed and zero-loss handling systems are used, total and complete containment of all fluorides is generally infeasible. Environmental releases can come from engine exhaust gases, burned purge gases, and accidental discharges from pipe burnouts and spills. This article gives exposure hazards for fluorine rocket propellants. Because releases normally or accidentally, usually involve F_2/HF mixtures, industrial hygiene controls and site planning are based on toxicity criteria for HF and F_2.
R 13

30,149
Fox, E.L., Weiss, H.S., Bartels, R.L. & Hiatt, E.P. THERMAL RESPONSES OF MAN DURING REST AND EXERCISE IN A HELIUM OXYGEN ENVIRONMENT. Arch. Environ. Health, July 1966, 13(1), 23-28. (Exercise Physiology Research Lab., Ohio State University, Columbus, Ohio).

Mean skin temperature (MST), rectal temperature, mean body temperature, sweat loss, and heart rate were measured in man during rest (15 min.), moderate exercise (15 min.), and recovery (45 min.) while exposed either to 79% He-21% O_2 or to air. Test conditions were ground level pressure and either: a) 95°F and 90% relative humidity (RH); b) 95°F and 40%-60% RH; or c) 71°F and 45%-50% RH. At high temperature irrespective of RH, responses in He-O_2 were similar to those in air. At low temperature MST in He-O_2 was lower by 1.0°F during rest, by 2.3°F at end of exercise ($P < 0.05$), and by 2.0°F at end of recovery ($P < 0.05$). Rest, exercise, and recovery rectal and mean body temperatures and heart rates were the same in the 2 media, but sweat loss was 27% less ($P < 0.05$) in He-O_2. These differences are explained by the higher thermal conductivity of He relative to N_2 affecting conductive-convective heat loss in proportion to the skin-to-gas thermal gradient. Calculations indicate that for each °F increase in gradient, MST in He-O_2 will be approximately 0.1°F lower than in air.
R 26

30,150
Schulte, J.H. THE PROBLEM OF RADIOACTIVE CONTAMINATION OF THE SKIN. Arch. Environ. Health, July 1966, 13(1), 96-101. (USN Submarine & Radiation Medicine Div., Department of the Navy, Washington D.C.).

Because of the rapid increase in utilization of radioactive materials, physicians in industry can anticipate seeing workers who have been contaminated with these substances. This report briefly reviews the physical and chemical characteristics of radioisotopes which are pertinent to such an eventuality and also describes the anatomy and defense mechanisms of the skin which are germane to the problem. The report concludes with a sequentially arranged list of procedures recommended by the author for the decontamination of the skin.
R 8

30,151
Sagan, L.A. HUMAN EFFECTS OF CHRONIC, LOW DOSES OF RADIATION. Arch. Environ. Health, Sept. 1966, 13(3), 345-350. (US Medical Research Branch, AEC, Washington, D.C.).

Four areas of information which bear on an understanding of late effects following chronic low-dose exposure have been discussed. Knowledge in all of these areas is incomplete but is in a far more advanced state than is true of many other environmental hazards, e.g. noise, tension, fatigue. Current research gives promise of the possibility of more directly relating past exposure to the injury through an understanding and identification of the mechanisms involved in the induction of radiation effects.
R 19

30,152
Warren, S. & Lombard, Olive M. NEW DATA ON THE EFFECTS OF IONIZING RADIATION ON RADIOLOGISTS. Arch. Environ. Health, Oct. 1966, 13(4), 415-421. (Cancer Research Institue, New England Deaconess Hospital, Boston, Mass.).

The average age at death of U.S. radiologists in the past has been younger than that of other physicians or U.S. adult white males. Since 1935 this evidence of life shortening has lessened, most strikingly since 1945, and disappeared by 1960. Leukemia, though excessive among radiologists, occurs rarely and apparently only after a number of years of occupational exposure. The age pattern of the incidence of leukemia is quite different in radiologists and U.S. white males over age 25. In recent years the excessive incidence of leukemias in radiologists has decreased. From these findings one may conclude that current occupational maximal permissible dose levels provide adequate protection.
R 21

30,153
Forster, W.H. THE SYSTEMS APPROACH. Arch. Environ. Health, Oct. 1966, 13(4), 537-542. (International Telephone & Telegraph Corporation, New York, N.Y.).

This article briefly describes the systems approach and gives examples relating to highway safety.
R 5

30,154
Sataloff, J., Vassallo, L., Valloti, J.M. & Menduke, H. LONG-TERM STUDY RELATING TEMPORARY AND PERMANENT HEARING LOSS. Arch. Environ. Health, Nov. 1966, 13(5), 637-640.

In 1961 hearing tests were done on 21 Ss working in a reasonably steady state overall noise level of about 100 db with approximately 93 db in the 300-2,400 octave band width. The hearing tests measured hearing threshold levels after eight hours of work, after 16 hours rest, after a two week vacation, and again after eight hours of work. There was evidence of small but significant temporary shifts in threshold when hearing was tested during the work week. After a two week rest period, larger threshold shifts were observed on the first day of work. In 1964 hearing studies were obtained on 14 of the original Ss. Hearing thresholds were obtained after a 16 hour rest and after a three week vacation. Whereas in 1961, a two week rest period showed significant improvement in thresholds for 2,000, 3,000, and 4,000 cps (evidence of temporary threshold shift (TTS)), there were no similar improvements in thresholds in 1964 after a three week rest period (no evidence of TTS). A comparison of 1961 and 1964 postvacation, prework thresholds yielded permanent threshold shifts for 2,000, 3,000, and 6,000 cps greater than is to be expected from the aging process.
R 9

30,155
Snyder, M.A. EXPLORING UNDERWATER WITH SCUBA. Arch. Environ. Health, Dec. 1966, 13(6), 690-694.

This paper gives a brief account of the pleasures and good practices of scuba diving.

30,156
Spicer, W.S., Jr., Reinke, W.A. & Kerr, H.D. EFFECTS OF ENVIRONMENT UPON RESPIRATORY FUNCTION. Arch. Environ. Health, Dec. 1966, 13(6), 753-762. (Pulmonary Diseases Div., University of Maryland School of Medicine, Baltimore, Md.).

The effects of selected meteorologic changes and air pollutants upon the mean daily values of 10 respiratory function tests obtained from small groups of patients with chronic bronchitis or bronchial asthma has been assessed for 2 7-week study periods. A logical biostatistical approach, which places chief reliance upon the multiple regression technique, has been used to sort out major effects from a mass of data. The most important environmental-physiologic relationships appeared to be those associated with temperature, wind speed, barometric pressure, and sulfur dioxide levels. 2 distinct patterns of physiologic response were found. In the final analyses, total lung capacity (TLC) and residual volume (RV) were used to exemplify the volume group and airway resistance at functional residual capacity and percentage of the forced vital capacity exhaled in 3 seconds ($FEV_{3.0}$%) the "resistance" group. Airway resistance and TLC increased as temperature decreased. Airway resistance increased and $FEV_{3.0}$% fell in both patient groups and RV increased in patients with asthma either 14 or 38 hours (or both) following a rise in sulfur dioxide in the second study where the range of sulfur dioxide levels was greater than in the first study. Airway resistance increased and $FEV_{3.0}$% decreased 24 hours after a fall in barometric pressure while TLC and RV rose in patients with chronic bronchitis 14 hours after a drop in wind speed. Particular care has been taken to point out that a direct cause and effect relationship cannot be implied from these significant findings.
R 12

30,187
Giolas, T.G. COMPARATIVE INTELLIGIBILITY SCORES OF SENTENCE LISTS AND CONTINUOUS DISCOURSE. J. aud. Res., Jan. 1966, 6(1), 31-38. (University of Alabama, University, Ala.).

This study investigated the relationship between sentences developed at The Central Institute for the Deaf (C.I.D.) designed to measure auditory discrimination ability, and a sample of continuous discourse consisting of a 15-min lecture shown through a phonetic analysis to be a good representation of everyday conversational speech. Speech samples were recorded on magnetic tape under 7 low-pass filtering conditions. Normal-hearing college students were divided into 7 groups of 20 each, each group listening to all speech samples under one particular condition of filtering. Sentence lists were examined for number of key words correct, and the continuous discourse for items correct on a test covering information presented in the lecture. For both sentences and continuous discourse, errors increase in the same way as frequency distortion increases. The error curves for the 2 sentence lists used lie closer to the curve for continuous discourse than do the curves for either the PB-50 or the W-22 Monosyllabic Word Lists as compared in a previous study. Therefore, the possibility is opened of employing the C.I.D. Sentence Lists for estimating a patient's ability to hear and understand colloquial speech.
R 10

30,188
Hickling, S. STUDIES ON THE RELIABILITY OF AUDITORY THRESHOLD VALUES. J. aud. Res., Jan. 1966, 6(1), 39-46. (Otago University Medical School, Dundedin, New Zealand).

Two experiments were designed to investigate certain aspects of audiometric reliability based on the average intra-subject standard deviation from the mean of 3 successive threshold values obtained from 60 subjects at 1, 2, 6 and 8 kcps test tones. Comparison of the results obtained when the earphones were removed and replaced on the ears between each test and when they were left in place between tests suggests that the difference in reliability commonly found between the middle frequencies and the high frequencies is due entirely to the effect of altered earphone placement on standing wave formation. Also demonstrated by the experimental results were the equal reliability of response of the left and right ears, improvement of reliability with immediate listening practice, and improvement in reliability as the interval between successive tests was reduced.
R 10

30,189
Berger, K. BINAURAL PITCH-MATCHING WITH CONTINUOUS TONES. J. aud. Res., Jan. 1966, 6(1), 87-90. (Kent State University, Kent, Ohio).

Ten young adults with normal hearing made 40 diotic pitch matches between a continuous 1-kc tone in one ear and a continuous variable-frequency tone in the other, both at 40 db sensation level. Test ear and initial placement of variable tone were irrelevant. Mean pitch error, disregarding sign, was 18.8 $\pm$ 9.5 c/s, which forms a tentative norm for clinical studies of diplacusis. Individual standard errors of matches ranged from 2.2 - 30.6, median 15.3 c/s, which defines the region within which binaural fusion exists under our stimulus conditions. Some practice but no fatigue effects were found with a preliminary S of whom 100 judgments were required.
R 6

30,190
Suzuki, T. & Kubota, K. NORMAL WIDTH IN TRACING ON BEKESY AUDIOGRAM. J. aud. Res., Jan. 1966, 6(1), 91-96. (Otolaryngology Dept., Shinshu University, Matsumoto, Japan).

Bekesy tracings widths on 50 normal-hearing subjects, ranging from 20-30 years, were obtained with continuous and interrupted tones in an effort to establish normative data. The average widths of both tracings for pure tones of 5 fixed frequencies from 0.5-8 kc/s were measured. The normal limits for the relation between both average widths for each of the frequencies tested was calculated and charted on a graph. When this relation was taken into account, an abnormal width in the Bekesy tracing could be found even in some ears with sensorineural involvements whose average width in the tracings with continuous tones had heretofore been considered within normal limits.
R 13

30,191
Rhodes, R.C. DISCRIMINATION OF FILTERED CNC LISTS BY NORMALS AND HYPACUSICS. J. aud. Res. April 1966, 6(2), 129-133. (Speech Dept., University of Pittsburgh, Pittsburgh, Penn.).

The speech discrimination ability of 20 patients with high-frequency hearing loss and 20 normal-hearing listeners was compared. Ss were presented with speech filtered to match the pure-tone losses of the hearing-impaired listeners. It appears that some individuals with high-frequency hearing loss have learned to compensate for their deficiency. It is further probable that these individuals utilize acoustic cues that are not normally recognized by normal-hearing listeners. The study emphasizes the importance of assessing the perceptual skills of clinical populations because data obtained with normal hearers cannot always be generalized to the hearing-impaired.
R 2

30,192
Hodgson, W.R. & Tillman, T.W. RELIABILITY OF BONE CONDUCTION OCCLUSION EFFECTS IN NORMALS. J. aud. Res., April 1966, 6(2), 141-151. (University of Kansas Medical Center, Kansas City, Kan. & Northwestern University, Evanston, Ill.).

Test-retest bc (bone conduction) thresholds were obtained on 16 normal Ss by conventional and by Bekesy fixed-frequency audiometry. The test ear was either open or occluded by either a TDH-39-MX41/AR phone-cushion combination, or a Sharpe HA-10 circumaural earphone. Bc sensitivity was enhanced when the external ear was occluded, an effect related to stimulus frequency and volume of air enclosed. At 0.25 and 0.5 kc/s positive rank-order correlations of the order of 0.5 were obtained between the force in grams exerted against the head and the magnitude of the occluding effect. At 0.5 kc/s the correlations were generally lower for the circumaural effect. Failure to control the force of an occluding earphone may add an important source of variability to occlude bc measurements.
R 16

30,194
Martin, F.N. SPEECH AUDIOMETRY AND CLINICAL MASKING. J. aud. Res., April 1966, 6(2), 199-203. (Brooklyn College, Brooklyn, New York).

In a two-part experiment it was found that high-level masking produces a 5-db modal threshold shift (central masking) in the opposite ear for spondee words, where cross-conduction masking is ruled out. An appropriate correction should thus be made for this factor in clinical practice. A loud masking noise in one ear had no significant effect on discrimination scores unless the presentation level of the PB (phonetically balanced) words was high enough to be perceived by the contra-lateral ear. In such cases the elimination of the better ear from the test by appropriate masking revealed the true (lower) scores. A formula for the use of effective masking in DS (discrimination score) testing was proposed.
R 6

30,195
Haspiel, G.S. & Havens, R.M. COMPARISON OF SPEECH-BEKESY THRESHOLDS WITH PURE-TONE BEKESY THRESHOLDS. J. aud. Res., April 1966, 6(2), 235-237. (Pennsylvania State University Speech & Hearing Clinic, University Park, Penn.).

Fifty-five normal-hearing adults furnished Bekesy tracings for speech and for fixed-frequency pure tones. Mean threshold for speech was 25.7 db SPL (sound pressure level); for an average of 0.5, 1, and 3 kc/s it was 19.0 db SPL, a difference comparable to that found in conventional audiometry. An $r = .66$ existed between pure-tone vs speech thresholds. Width of excursions for pure tones averaged 6.4 db, for speech 10.2 db. An $r = .53$ was found between pure-tone vs speech excursion widths. These data support the possibility raised by Lezak, Siegenthaler, and Davis of the clinical feasibility of Bekesy-like audiometry for speech.
R 2

30,197
Steel, J. & Sanderson, J.T. TOXIC CONSTITUENTS OF WELDING FUMES. Ann. Occup. Hyg., July 1966, 9(3), 103-111. (Nuffield Dept. of Industrial Health, University of Newcastle upon Tyne, London, England).

Although the main constituents of electrode coatings are known, little information exists on toxic substances present as impurities, and even less on their concentrations in arc-welding fumes. In this investigation, spectrographic and chemical analyses of the coatings of a number of electrodes in common use have been carried out. The same electrodes have also been subjected to standard welding tests and the concentrations of toxic substances in the respirable atmosphere have been measured. The results reveal that current methods for assessing welding fume hazards, based on iron oxide or total fume concentration, are unacceptable.
R 6

30,198
Hickish, D.E. & Challen, P.J.R. A SERIAL STUDY OF NOISE EXPOSURE AND HEARING LOSS IN A GROUP OF SMALL AND MEDIUM SIZE FACTORIES. Ann. Occup. Hyg., July 1966, 9(3), 113-133. (Occupational Hygiene Service, Slough, England).

This paper describes a 3-year study of 277 workers exposed to sound levels ranging from 81.5 dB to 104·5 dB(re 0·0002 dynes/cm^2). Progression of hearing loss during the exposure period was determined by annual pure-tone audiometric tests. Presbycusis data were derived from audiometric tests on a control population, not normally exposed to noise in excess of 70 dB. The existence of a hazard to hearing was assessed by the presence of the characteristic 3 kc/s-6 kc/s "dip" in the audiograms, and by comparison of the progression of hearing loss during exposure, with that anticipated due to aging. In 2 factories employees exposed to mean noise levels not exceeding the modified Burns-Littler Damage Risk Criterion showed evidence of hearing loss extending to, or below 2000 c/s. A preliminary enquiry into the psycho-social effects of noise indicated that employees probably under-estimated their noise exposure in previous employment as assessed by interference with speech communication.
R 7

30,199
Murphy, D.C. NOISE PROBLEMS IN INDUSTRY. Ann. Occup. Hyg., July 1966, 9(3), 149-163. (Medical Dept., Esso Petroleum Co., Ltd., London, England).

This paper gives an account of present knowledge in the measurement, evaluation and control of noise in 3 industrial problems; hearing conservation, interference with speech and annoyance to the community.
R 7

30,200
Mehani, S. LEAD RETENTION BY THE LUNGS OF LEAD-EXPOSED WORKERS. Ann. Occup. Hyg., July 1966, 9(3), 165-171. (University of Newcastle-upon-Tyne Medical School, London, England).

A study has been made of the retention of lead dust and fume by the lungs of 51 lead workers, 22 shipburners, and 25 control subjects. It was found that 39-47 per cent by weight of the inspired lead is retained in the lungs of lead-exposed workers, and in this group, the average ventilation under various working conditions is approximately 10 m^3 per 8 hr shift. It is concluded that at an atmospheric concentration of lead of 2 mg per 10 m^3 of air, the working conditions are within safe limits, as the amount of lead retained per shift is less than one half the amount which can be tolerated by man without producing evidence of ill-health. It was also found that the degree of lead retention was not associated with the depth of breathing. The present findings, and those of previous authors, and the various factors which affect dust retention have been discussed.
R 12

30,237
Colwell, R.N. AERIAL PHOTOGRAPHY OF THE EARTH'S SURFACE; ITS PROCUREMENT AND USE. Applied Optics, June 1966, 5(6), 883-892. (School of Forestry, University of California, Berkeley, Calif.).

Some of the most important applications of the optical sciences are in the taking of aerial photographs of the earth's surface and in the extraction of data from them. This article is intended to serve both as an introduction for the articles following it in this issue and as a summary of the factors that must be considered in the taking and interpretation of aerial photographs. Special emphasis is placed on the means by which photographic images of high quality can be obtained and viewed in order to facilitate the data extraction process. A summary of the more important current applications of aerial photography in the earth sciences and life sciences also is provided.
R 10

30,238
Slaymaker, F.H. THE ELIMINATION OF BUILDING VIBRATION IN AN OPTICAL LABORATORY. Applied Optics, Nov. 1966, 5(11), 1766-1768. (General Dynamics Electronics Division, Rochester, N.Y.).

The elimination of vibration is a straightforward engineering job that is analogous to the design of an electrical filter. The building vibration, which was so intense that no serious interferometry was possible, was measured using a commercial vibration meter. A simple, single-mesh mechanical filter was designed to remove the existing frequencies of vibration. The filter was constructed and its performance measured. As a practical test of the performance of the vibration elimination, a hologram was made on the vibration isolated granite slab.
R 1

30,244
Cohen, J. & Walter, W.G. THE INTERACTION OF RESPONSES IN THE BRAIN TO SEMANTIC STIMULI, Psychophysiology, Jan. 1966, 2(3), 187-196. (Neurology Dept., Northwestern University Medical School, Chicago, Ill. & Burden Neurological Institute, Bristol, England).

Long time-constant EEG (electroencephalogram) recording during paired stimuli has led to the discovery of the contingent negative variation or expectancy wave. This effect is produced when a conditional stimulus signals that an imperative stimulus demanding action, decision, or attention will follow at a short, constant time interval. Symbolic and meaningful stimuli were presented to subjects tachistoscopically, and the evoked responses in the brain were electronically averaged. The cerebral evoked responses to such psychological stimuli are more complex than to flashes. A slow negative DC potential shift (CNV) was seen during the interval between an auditory ready signal and the visual exposure if recognition of the stimulus was required, or if it was interesting. Following the visual exposure, a slow positive DC shift occurred. The method has been developed to study the brain responses to psychological stimuli. The amplitude of the responses relates to the information content and subjective factors rather than to the physical strength of the stimulus.
R 5

30,245
Brown, Barbara B. SPECIFICITY OF EEG PHOTIC FLICKER RESPONSES TO COLOR AS RELATED TO VISUAL IMAGERY ABILITY. Psychophysiology, Jan. 1966, 2(3), 197-207. (Psychiatry Dept., California College of Medicine, Los Angeles, Calif.).

Two groups of subjects were selected from a previously studied population sample: a group of habitual visualizers, most of whom developed eye movements during recall of motion, and a group of non-visualizers, most of whom did not. EEG (electroencephalogram) following responses to red photic flicker differed markedly for the 2 groups, being diminished in visualizers but enhanced in non-visualizers as compared to their EEG following responses to blue or green. Mental and visual imagery tasks induced significantly greater alpha blocking in visualizers than in non-visualizers. The partial or complete desynchronization of ongoing rhythmic EEG activity suggests a lower threshold for EEG desynchronization for visualizers than for non-visualizers. The augmented EEG following of non-visualizers to red flicker appears to represent a different aspect of the same response continuum.
R 42

30,246
Williams, H.L., Morlock, H.C., Jr. & Morlock, Jean V. INSTRUMENTAL BEHAVIOR DURING SLEEP. Psychophysiology, Jan. 1966, 2(3), 208-216. (Psychiatry Dept., University of Oklahoma Medical Center, Oklahoma City, Okla.).

Repetitive auditory stimuli were used to examine the ability of human Ss to sustain instrumental motor responses during sleep. A majority of simple (1 tone) and discriminative (2 tones) responses occurred without distinct electrographic signs of awakening. Punishment for response failure, which changed neutral stimuli to warning signals, increased the probability of correct responding, particularly to stimuli which did not evoke the alpha rhythm. Correct responding was a decreasing function of Stages 1, 2, and 3 plus 4, in that order, in Stage REM (rapid eye movement), however, response probability was markedly affected by the nature of the stimulus, When the stimulus was converted from a neutral to a warning signal, the probability of responding was raised from nearly zero to levels approximating those of other low-voltage EEG stages. These results suggest that while low responsiveness in Stage 4 may be due to physiological depression, Stage REM is a state of activation in which external stimuli are normally blocked. Contingent reinforcement, by changing the significance of the stimulus, modifies this occlusion-like phenomenon, permitting appropriate responding.
R 16

30,249
Tursky, B. & O'Connell, D.N. SURVEY OF PRACTICE IN ELECTRODERMAL MEASUREMENT. Psychophysiology, Jan. 1966, 2(3), 237-240. (Harvard Medical School, Boston, Mass. & Unit for Experimental Psychiatry, Pennsylvania Hospital, The Institute, Philadelphia, Penn.).

This paper is a report on the results of a survey on electrodermal recording procedures. A detailed questionnaire was sent to more than 200 members of the Psychophysiological Society. The results indicate a wide disagreement among investigators in most phases of the recording process. This indicates a lack of standardization in one of the most used of physiological measures.

30,250
Wilcott, R.C. ADAPTIVE VALUE OF AROUSAL SWEATING AND THE EPIDERMAL MECHANISM RELATED TO SKIN POTENTIAL AND SKIN RESISTANCE. Psychophysiology, Jan. 1966, 2(3), 249-262. (Psychology Dept., Western Reserve University, Cleveland, Ohio).

The following 5 experiments are reported: a) After palmar sweating is abolished by atropine, the skin is easier to drill with a dental burr. This suggests that arousal sweating protects the skin against mechanical injury; b) Intracutaneous injection of acetylcholine or mecholyl at the forearm will produce skin potential (SP) effects of both negative and positive polarity and also a reduction in skin resistance (SR). This suggests that a cholinergic substance is involved in the production of SP and SR; c) Intracutaneous injection of mecholyl at the forearm will either lower or raise the pain threshold to a needle prick. A lowering of the pain threshold was associated with the presence of an SP negative effect and a rise was associated with an SP positive effect. It is concluded that the adaptive value of the cholinergic substance related to SP and SR is to modulate cutaneous sensitivity; d) The pain threshold to an electric shock can be lowered or raised by mecholyl injection. This may show that the pain threshold can be varied by mecholyl injection independently of its effect on sweating; e) Lowering of the electric shock pain threshold at the palm is associated with the appearance of both SP negative and positive responses. This further demonstrates a relation between SP activity and pain sensitivity but indicates that the direction of the change in the pain threshold is not dependent on SP response polarity.
R 14

30,251
Agnew, H.W., Jr., Webb, W.B. & Williams, R.L. THE FIRST NIGHT EFFECT: AN EEG STUDY OF SLEEP. Psychophysiology, Jan. 1966, 2(3), 263-266. (Psychology Dept., University of Florida College of Medicine, Gainesville, Fla.).

The electroencephalographic records from 43 subjects who slept for 4 consecutive nights in a laboratory environment were studied in an effort to describe the First Night Effect. These records showed that the first night of laboratory sleep contains more awake periods and less Stage 1-rapid eye movement sleep. There is a delay in the onset of Stages IV and 1-REM (rapid eye movement) and the sleep is more changeable. These effects rapidly adapt out by the second night of sleep.
R 5

30,253
MacNeilage, P.F. EEG AMPLITUDE CHANGES DURING DIFFERENT COGNITIVE PROCESSES INVOLVING SIMILAR STIMULI AND RESPONSES. Psychophysiology, April 1966, 2(4), 280-286. (Allan Memorial Institute, McGill University, Montreal, Quebec, Canada).

In order to investigate the effects on electroencephalographic (EEG) amplitude of cognitive processes, as distinct from direct effects of sensory stimulation and motor response, Ss were given 3 different tasks in which the stimuli were always similar sets of spoken numbers and the responses were always written numbers. In response to 61 regularly occurring, randomly ordered, single-digit numbers, 7 Ss wrote, on successive trials: a) the sum of every 4 consecutive numbers; b) every fourth number; and c) every "7" and "9" heard. Since the physical stimuli were the same and the movements of response were similar for the 3 tasks, intertask pattern differences in EEG alpha and beta amplitude would presumably be due to differences in the cognitive processes required in the tasks. No differences due to cognitive factors were found. All short-term variations in both alpha and beta appeared related to widespread effects of response and preparation for response. Preresponse effects seemed related to motor set which was distinguished from attentional factors. The results suggest the necessity for a greater emphasis on motor effects in EEG studies.
R 9

30,254
Teichner, W.H. INDIVIDUAL THERMAL AND BEHAVIORAL FACTORS IN COLD-INDUCED VASODILATATION Psychophysiology, April 1966, 2(4), 295-304. (Psychology Dept., University of Massachusetts, Amherst, Mass.).

Individuals were classified as fast and non-vasodilators during a first hand-cooling experience. They then were required to carry out a prolonged detection task in 80°F and 55°F air temperature. Comparisons were made of bodily thermal characteristics during hand cooling and during the detection sessions and of the percentage and speed of detection. The results suggest the possibility of characteristic differences between the 2 classified groups as well as of a relationship between behavioral and thermal regulating mechanisms.
R 18

30,255
Campos, J.J. & Johnson, H.J. THE EFFECTS OF VERBALIZATION INSTRUCTIONS AND VISUAL ATTENTION ON HEART RATE AND SKIN CONDUCTANCE. Psychophysiology, April 1966, 2(4), 305-310. (Cornell University, Ithaca, N.Y.).

This study investigated the effects of verbalization instructions and amount of visual attention on direction of change of heart rate (HR) and skin conductance (SC). Little evidence for directional fractionation of SC and HR was found with the conditions used. The variable of verbalization instructions produced a highly significant effect on HR and SC, and conditions of no-verbalization produced a consistent, but non-significant decrement in HR. Other degrees of verbalization produced increments in HR. A visual attention variable produced no significant effect on either HR or SC, although means were arranged in order of increasing activation with increase in visual attention (stimulus complexity). Results were interpreted as being opposed to an intake-rejection hypothesis such as has been proposed by Lacey to account for directional fractionation of response and for HR decrements. Instead, the authors suggest that the requirement to verbalize can produce important changes in degree and direction of autonomic activation.
R 12

30,256
Docter, R.F. & Friedman, L.F. THIRTY-DAY STABILITY OF SPONTANEOUS GALVANIC SKIN RESPONSES IN MAN. Psychophysiology, April 1966, 2(4), 311-315. (Neuropsychiatric Institute, University of California, Los Angeles, Calif.).

Measures of long-range stability of spontaneous GSRs (Galvanic Skin Response) were obtained from 23 male university students. Records were taken throughout a weekly recording period and compared with measures obtained under identical conditions 30 days later. In addition to the investigation of long-term spontaneous GSR stability, this design permitted analysis of the 24-hr stability of measured responses within each of the recording periods. Results yielded significant correlations between measures obtained 24 hr apart, as well as a significant correlation between the median weekly rates of spontaneous GSR emission taken 30 days apart. Comparison of emission rates on comparable recording days 30 days apart failed to manifest a significant relationship. Present data support earlier studies of 24-hr spontaneous GSR stability. In spite of the failure to find significant relationships between emission rates on comparable days of the 2 recording periods, the authors conclude that the significant relationship between median weekly rates of emission, taken 30 days apart, indicates that spontaneous GSR is an intra-individual characteristic which remains relatively stable, even over extended periods of time.
R 5

30,257
Jones, B.E. & Ayres, J.J.B. SIGNIFICANCE AND RELIABILITY OF SHOCK-INDUCED CHANGES IN BASAL SKIN CONDUCTANCE. Psychophysiology, April 1966, 2(4) 322-326. (National Institute of Mental Health Addiction Research Center, Lexington, Ky.).

Once weekly for 5 weeks, 15 adult male postaddicts were given 12 to 15 shocks of 5.0 to 8.0 ma. Basal skin conductance (BSC) was recorded during the 25-min weekly sessions. Increases in BSC during each session and the week-to-week reliabilities of the increases were determined. After the first week, subsequent increases showed reliability coefficients which ranged from 0.69 to 0.95 ($P < 0.01$). The reliabilities of the increases in BSC produced by shock were considered favorable for the use of change in BSC as a dependent variable in designs requiring repeated measurements on the same Ss at weekly intervals
R 13

30,259
MacNeilage, P.F. CHANGES IN ELECTROENCEPHALOGRAM AND OTHER PHYSIOLOGICAL MEASURES DURING SERIAL MENTAL PERFORMANCE. Psychophysiology, April 1966, 2(4), 344-353. (Allan Memorial Institute, McGill University, Montreal, Quebec, Canada).

This study attempted to answer 2 questions: a) Can electroencephalogram (EEG) amplitude changes be related to specific moment-to-moment changes in task performance? b) To what extent are EEG changes related to changes in other indices of activation? Physiological responses were recorded from 20 Ss during 12 alternately fast and slow trials of a paced auditory serial addition task and 3 writing trials involving similar responses. Trial-by-trial results showed that EEG amplitude usually tended to covary with other physiological functions in a manner expected from activation theory. All physiological levels decreased during the session but became increasingly sensitive to differences in task difficulty. Within trials there was some concordance between alpha amplitude levels and other physiological levels, but exceptions of this trend and further analysis of palmar conductance patterns suggested that consideration of differential sensitivities of the individual measures to behavioral events might be more profitable than an activation theory approach. The only relation between EEG changes and specific behavioral events was the tendency for alpha and beta to block during motor responses.
R 24

30,262
Johnson, Laverne C. & Lubin, A. SPONTANEOUS ELECTRODERMAL ACTIVITY DURING WAKING AND SLEEPING. Psychophysiology, July 1966, 3(1), 8-17. (USN Medical Neurophychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. & San Diego State College, San Diego, Calif.).

Spontaneous electrodermal activity (EDA) (galvanic skin response (GSR)) and skin potential response (SPR)) was recorded during daytime sleep and nighttime sleep. During all sleep, spontaneous EDA occurred most frequently during stages 3 and 4 (slow wave sleep) and least frequently during stage 1 (rapid eye movement (REM) and non-REM). This pattern was consistent over 3 nights of sleep. There was no relation between waking and sleeping spontaneous EDA. The spontaneous EDA during slow wave sleep significantly exceeded that during waking. During sleep, spontaneous SPRs often occurred without spontaneous GSRs.
R 19

30,263
Aafjes, Marlene, Hueting, J.E. & Visser, P. INDIVIDUAL AND INTERINDIVIDUAL DIFFERENCES IN BINOCULAR RETINAL RIVALRY IN MAN. Psychophysiology, July 1966, 3(1), 18-22. (Psychophysiology Div., University of Amsterdam, Amsterdam West, The Netherlands).

In a group of 12 male and female subjects of ages between 18 and 45 years the alternation frequency of binocular retinal rivalry (BRR) has been found to change depending upon the durations of the periods for which the target is fixated, and of the intercalated resting time. Analysis of variance indicated significant interindividual differences in level of mean frequency and in rate of increase.
R 14

30,264
Brener, J. & Hothersall, D. HEART RATE CONTROL UNDER CONDITIONS OF AUGMENTED SENSORY FEEDBACK. Psychophysiology, July 1966, 3(1), 23-28. (Birkbeck College, University of London, London, England).

Five human Ss were presented with a high frequency tone on the emission of each short inter-heartbeat interval and a low frequency tone on the emission of each long inter-heartbeat interval. Under these conditions, all Ss learned within a short period of time to produce significantly lower heart rates in the presence of 1 visual stimulus than in the presence of another. On the basis of this finding, it is suggested that an important determinant of where a given response falls on the voluntary/involuntary continuum is the availability of specific feedback from the response in question.
R 10

30,265
Keeler, M.H. & Doehne, E.F. THE EFFECTS OF EPINEPHRINE AND NOREPINEPHRINE ON AN ASPECT OF COLOR VISION. Psychophysiology, July 1966, 3(1), 35-39. (Psychiatry Dept., University of North Carolina School of Medicine, Chapel Hill, N.C.).

With a test involving image and after-image relation, it is demonstrated that epinephrine differentially affects reactivity to green (530 mμ) and red (625 mμ) stimuli and that most of the response is accounted for by altered response to the green stimulus. Norepinephrine effect was in the same direction but not statistically significant and might be accounted for by endogenous epinephrine secretion.
R 4

30,266
Meyers, W.J. HEART RATE FLUCTUATIONS AND FIXED FOREPERIOD REACTION TIME. Psychophysiology, July 1966, 3(1), 40-45. (Institute of Child Behavior & Development, University of Iowa, Iowa City, Iowa).

Visual reaction times were recorded in a fixed foreperiod situation, to study the relation between sensorimotor performance and heart rate measures. With 42 male college students as Ss, both resting and performance levels of heart rate and heart rate fluctuations were obtained. Reaction time data were collected from blocks of trials at given foreperiods which ranged from 1 to 9 sec. Three groups of subjects, formed on the basis of high, medium, and low levels of peak-trough differences in heart rate during the reaction-time trials, showed different foreperiod functions. The hypothesis that fluctuations in heart rate are related to fixed foreperiod reaction time performance was supported.
R 9

30,267
Hord, D.J., Lubin, A. & Johnson, Laverne C. THE EVOKED HEART RATE RESPONSE DURING SLEEP. Psychophysiology, July 1966, 3(1), 46-54. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

Heart rate responses evoked by a 3-sec auditory stimulus were averaged within stages of sleep for 5 subjects. Although there were some individual differences, the evoked HR response is generally diphasic, with the peak of the acceleratory component occurring on the fourth post-stimulus beat and the trough of the deceleratory component occurring on the 10th post-stimulus beat. Unlike other variables, which are depressed during the rapid eye movement (REM) stage, the HR response tends to be larger during the REM stage than during other stages of sleep. The size of the response is not appreciably affected by time of night, since HR is non-habituating during sleep, but is affected by the respiratory cycle phase, being largest when the stimulus occurs during inspiration or the period immediately prior to inspiration, and smallest when the stimulus occurs during the expiratory phase.
R 18

30,268
Lifshitz, K. THE AVERAGED EVOKED CORTICAL RESPONSE TO COMPLEX VISUAL STIMULI. Psychophysiology, July 1966, 3(1), 55-68. (Rockland State Hospital, Orangeburg, N.Y.).

Averaged cortical evoked responses in man to repetitive informationally complex pictorial stimuli, as opposed to other visual stimulation, were obtained from scalp electroencephalographic (EEG) recordings. The method used involved the projection of lantern slides. Included were 3 different categories (indifferent scenic, repulsive medical, and nude female photographs) assumed to evoke, respectively, neutral, negative, and positive reactions in the normal young male subjects. In all subjects, recordings from occipital or occipito-parietal scalp leads consistently resulted in evoked response patterns to pictorial slides measurably differing from responses to these same slides made non-associational through defocusing, or to blank light flashes. Responses to pictorial stimuli were also different than those to motivated observation of projected words, colors, or geometric patterns. The evoked responses to the 3 different categories of pictorial stimuli also showed significant differences. These differences were not as marked and were clearly replicable only for some subjects.
R 15

30,270
Hahn, W.W. & Flax, S.W. AN INSTRUMENT FOR RECORDING AND PRINTING HEART RATE DATA. Psychophysiology, July 1966, 3(1), 93-97. (Children's Asthma Research Institute & Hospital, Denver, Colo.).

An instrument has been designed which will print maximum, minimum, and mean heart rate (HR) data for 10-sec sample periods. The basic components are 3 detector circuits which sample and hold voltage levels proportional to the values measured, a digital voltmeter for "reading" these values, and a solenoid-operated adding machine to print out HR data in beats per minute. This apparatus greatly reduces the time required for transcribing cardiotachometer tracings into digital form for statistical analysis.

30,271
Swinnen, M.E.T., Plumlee, L.A. & Brown, C.C. A NOVEL PEAK DETECTOR. Psychophysiology, July 1966, 3(1), 98-100. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

A photoelectric triggering device has been developed with the aim of providing a minimum or maximum trigger on a blood pressure wave. The output from a strain gauge which measures blood pressure is displayed on an oscilloscope, and triggering is done by means of a miniature photocell mounted on a micrometric advance. A transistor circuit transforms the photocell pulse into a relay contact.

30,272
Hein, P.L., Cohen, S.I. & Shmavonian, B.M. PERCEPTUAL MODE AND CARDIAC CONDITIONING. Psychophysiology, Oct. 1966, 3(2), 101-107. (Psychophysiological Research Div., Duke University Medical Center, Durham, N.C.).

Conditional heart rate responses were measured for field-dependent and field-independent subjects. The conditional stimulus (CS) was a colored light and the unconditional stimulus (US) was an electric shock delivered to the finger. The CS-US interval was 10 sec. The field-independent subjects demonstrated an initial cardiac acceleration followed by a cardiac deceleration, whereas the field-dependent subjects showed only the cardiac deceleration. When these data are compared with the previously reported galvanic skin response (GSR) data, a model of sympathetic-parasympathetic reactivity is evolved wherein the field-independent group shows both conditioned sympathetic and parasympathetic autonomic activity, while the field-dependent group shows only parasympathetic activity.
R 10

30,274
Thompson, L.W. & Botwinick, J. THE ROLE OF THE PREPARATORY INTERVAL IN THE RELATIONSHIP BETWEEN EEG α-BLOCKING AND REACTION TIME. Psychophysiology, Oct. 1966, 3(2), 131-142. (Duke University Medical Center, Durham, N.C.).

The association between alpha-blocking and improved reaction times (RTs) has not been consistently demonstrated in past studies. The possible importance of the preparatory interval (PI) in this relationship has not been totally assessed, and it was felt that further exploration of this variable would help to explain the discrepancies. RTs were measured in 2 experiments, each using different types of stimuli and different PI durations. In the first, 4 PIs, 0.5-, 3.0-, 6.0-, and 15.0-sec, were used in a regular and irregular series. The warning signal was a 400-cps tone; the stimulus, a 1000-cps tone. In the second, PIs were 0.50-, 0.75-, 1.00-, and 1.50-sec; the stimulus was a single flash from a photo stimulator. EEGs were recorded simultaneously from the parieto-occipital region. Both peak-to-peak amplitude measures and subjective ratings of alpha-activity were made prior to the onset of the warning signal and stimulus. The results did not support earlier findings of a relationship between alpha-blocking and RT. However, RT and alpha-blocking were each (independently) a function of the PI.
R 17

30,275
Tursky, B. & O'Connell, D.N. A COMPARISON OF AC AND DC EYE MOVEMENT RECORDING. Psychophysiology, Oct. 1966, 3(2), 157-163. (Massachusetts Mental Health Center, Roxbury, Mass.)

This study demonstrates the distortions introduced into the electro-oculographic record as a function of choice of recorder time constant. Controlled waking eye movements were simultaneously recorded on 5 separate channels from the same pair of nonpolarizable Ag/AgCl electrodes. Time constants for these channels were DC, 3 sec, 1 sec, 0.3 sec, and 0.1 sec. Results indicate that eye movement recorded through short time constants cannot differentiate between rapid eye movement and saccadic components of slow eye movements, cannot follow slow smooth eye movements, and cannot show the position of the eyes when they are not in motion. The use of DC coupling makes it possible to record these 3 classes of events faithfully.
R 12

30,276
Williams, H.L. & Williams, Cindy L. NOCTURNAL EEG PROFILES AND PERFORMANCE. Psychophysiology, Oct. 1966, 3(2), 164-175. (University of Oklahoma School of Medicine, Oklahoma City, Okla.).

Statistical analysis of baseline nocturnal EEG profiles identified 2 groups of Ss (a restless and quiet set) who differed in their performance efficiency under acute sleep deprivation. The restless group with less slow-wave sleep, more body movements, more awakenings, more transitions from stage to stage, and longer sleep latencies showed greatest sleep-loss decrement. On the first night of recovery sleep, the sleep profiles of the 2 groups were virtually identical, but by the 3rd recovery night, the restless group was again showing signs of disturbed sleep. Within each group, all Ss had highly systematic stage-of-sleep cycles, forming Markov chains of at least order one.
R 6

30,277
Engel, B.T. & Hansen, S.P. OPERANT CONDITIONING OF HEART RATE SLOWING. Psychophysiology, Oct. 1966, 3(2), 176-187. (University of California Medical Center, San Francisco, Calif.).

The purpose of this study was to see if heart rate (HR) slowing could be operantly conditioned. Ten experimental Ss and 5 yoked-control Ss were studied. Experimental Ss were positively reinforced for slowing their HR on a beat-by-beat basis, whereas yoked-control Ss were reinforced in a pattern based on the performance of paired experimental Ss. The data showed that: some Ss can be taught to slow their HR by means of an operant conditioning procedure; Ss appear to learn better when they do not infer correctly what the response is that they are controlling; the conditioned HR response is apparently not mediated by changes in breathing; and reinforcement, per se, is not adequate to lower HR.
R 6

30,278
Frazier, T.W. AVOIDANCE CONDITIONING OF HEART RATE IN HUMANS. Psychophysiology, Oct. 1966, 3(2), 188-202. (Manned Spacecraft Center, NASA, Houston, Tex.).

An avoidance conditioning technique was employed to obtain external control over heart rate. A contingency was set up between heart-rate maintenance and punishment avoidance. During periods of time signified by a visual stimulus, punishments were dispensed when the total number of beats per minute decreased from the previous minute's total. Ss performed an instrument-panel-monitoring task without awareness of the biological avoidance contingency, but they were correctly informed that shocks were available only when the visual stimulus was present. After punishments had been dispensed on the basis of the contingency for several periods, punishment was discontinued and the visual stimulus was used alone as a conditioned aversive stimulus, in order to shape predetermined response patterns. Results included: clear evidence of heart-rate control over all Ss after training periods; maintenance of heart-rate control over continuous 40-min periods through continuous presentation of the visual stimulus; and shaping and replication of 3 prespecified response patterns. These findings demonstrate that punishment avoidance contingencies can be used to impose effective control over cardiovascular functioning.
R 13

30,301
Robb, R.M. MODIFICATION OF MAY OPHTHALMOSCOPE. Amer. J. Ophthal., July 1966, 62(1), 164-165. (Howe Laboratory of Ophthalmology, Boston, Mass.).

A simple modification of a May ophthalmoscope can provide an inexpensive and suitable instrument for the determination of the monocular fixation pattern of most eyes. The modification allows the examiner to view a projected pattern on the patient's retina while the patient observes the pattern in the light emanating from the ophthalmoscope.
R 2

30,302
Miller, D. A REVIEW OF SPEED-READING THEORY AND TECHNIQUES FOR THE OPHTHALMOLOGIST. Amer. J. Ophthal., Aug. 1966, 62(2), 334-338.

A review of the results of speed-reading training and an analysis of the qualities of a good reader showed that: a) Reading speed can be improved without loss of comprehension and, in many cases, with an improvement in comprehension; b) Speed of reading is rarely related to refractive errors or muscle imbalance; c) Fine binocularity is not a primary prerequisite for efficient reading. The paper further traces the rationale for calculating the maximal attainable reading speed.
R 35

30,305
Fleishman, E.A. (Ed.). STUDIES IN PERSONNEL AND INDUSTRIAL PSYCHOLOGY. 1967, 821pp. The Dorsey Press, Homewood, Ill. (American Institutes for Research, Washington, D.C.).

This textbook attempts to provide a balanced coverage of the field of personnel and industrial psychology. There are extended treatments of motivation, leadership, communication, and organization as well as the more "traditional" aspects such as selection, performance appraial, training of employees and managers, working conditions, and accidents. The final 2 chapters are on engineering psychology and consumer psychology.
R many

30,360
Burian, H.M. OCCLUSION AMBLYOPIA AND THE DEVELOPMENT OF ECCENTRIC FIXATION IN OCCLUDED EYES. Amer. J. Ophthal., Nov. 1966, 62(5), 853-856. (University of Iowa College of Medicine, Iowa City, Iowa).

Rapid loss of vision of the fixating eye with loss of central fixation, and corresponding improvement in vision and fixation pattern in the originally preferred eye, are observed occasionally in young children. Judicious use of alternate occlusion generally restores well-maintained vision and central fixation in both eyes. This occlusion amblyopia indicates that the concept of an amblyopia "ex anopsia" in young children with immature, plastic sensory visual systems must not be completely rejected. The change in fixation pattern from central to eccentric under occlusion argues against the "anomalous correspondence theory" of eccentric fixation. It favors the view that with the loss of its physiologic superiority the fovea loses that quality which makes it the sensory center of ocular motility.
R 4

30,361
Gunderson, E.K.E. & Nelson, P.D. CRITERION MEASURES FOR EXTREMELY ISOLATED GROUPS. Personnel Psychol., Spring 1966, 19(1), 67-80. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

This paper is concerned with development of individual performance measures in an unusual and extreme environment, that of small scientific stations in Antarctica. Knowledge acquired in the Antarctic setting may have application in other unusual or restricted environments, such as radar and tracking stations, long-range nuclear submarines, lunar colonies, orbiting laboratories, or undersea experimental stations. Efficient personnel selection and utilization in exotic or remote operational settings will depend directly upon the development of appropriate criterion measures. The results generally have indicated that reliable measurement of important behavior characteristics is practicable even in extremely isolated environments and that the concepts measured appear to have sufficient generality to be applicable in other settings.
R 6

30,362
Ross, P.F. REFERENCE GROUPS IN MAN-TO-MAN JOB PERFORMANCE RATING. Personnel Psychol., Summer 1966, 19(2), 115-142. (Arthur D. Little, Inc., Cambridge, Mass.).

A method for getting comparable ratings of job performance from different raters working in several departments was studied. A rating procedure was tried requiring the rater to nominate out-of-department people whose job performance he knew well. A subordinate was ranked on overall job performance within the out-of-department reference group. An index was computed from these man-to-man comparison data. The index was compared with ratings from an anchored rating scale for their validity in guiding salary decisions in a research and development organization. The man-to-man comparison procedure was found to be as valid as the anchored ratings. Nevertheless, the 2 methods diverged in important practical ways in the results they produced. A conceptual framework for the man-to-man comparison method and studies to further define and improve the method are discussed.
R 8

30,363
Gruenfeld, L.W. & Weissenberg, P. SUPERVISORY CHARACTERISTICS AND ATTITUDES TOWARD PERFORMANCE APPRAISALS. Personnel Psychol., Summer 1966, 19(2), 143-151. (New York State School of Industrial & Labor Relations, Cornell University, Ithaca, N.Y.).

It was the purpose of this study to investigate the attitudes of civil service supervisors toward their performance appraisal system. Variables which have in previous investigations been related to supervisory effectiveness correlated consistently with the supervisors' Attitude toward the Appraisal System. The findings of this study suggest strongly that supervisors who are relatively high in Supervisory Quality, Initiative, Self-assurance, Consideration, Structure, and Interpersonal Trust are more favorably inclined toward the development of their subordinates than those supervisors who are relatively low in these characteristics.
R 12

30,364
Fournet, G.P., Distefano, M.K., Jr. & Pryer, Margaret W. JOB SATISFACTION: ISSUES AND PROBLEMS. Personnel Psychol., Summer 1966, 19(2), 165-183. (Central Louisiana State Hospital, Pineville, La.).

This article has attempted to survey the literature on job satisfaction published since the review by Brayfield and Crockett (HEIAS No. 10,701). In doing this, a number of salient features were discussed which have substantial influence on the understanding of this important area of worker behavior. The literature on job satisfaction has been developed by use of various experimental methods, each having some effect on the findings. Characteristics of both the individual and the job appear to be related to job satisfaction, but they are intercorrelated to such an extent that it is extremely difficult to isolate them for scientific investigation; in fact, to attempt this isolation may mean the loss of the interaction effect among variables. Similarly, it is difficult at the present time to understand how these factors are related to such behavior as performance, absenteeism, and turnover. Because of this complexity, theoretical attempts to describe job satisfaction have many shortcomings. Many of the formulations which now appear contradictory may eventually be found to be complementary. In spite of the apparent confusion and complexity in job satisfaction as an area of study, there is a large amount of literature emerging which should help to clarify the issues.
R 59

30,365
Sales, S.M. SUPERVISORY STYLE AND PRODUCTIVITY: REVIEW AND THEORY. Personnel Psychol., Autumn 1966, 19(3), 275-286. (University of Michigan, Ann Arbor, Mich.).

This article sketches a theory to account for the predicted differential in productivity of workers under authoritarian and democratic leaders, and reviews and evaluates the literature relevant to this theory.
R 23

30,366
Biggs, D.A., Huneryager, S.G. & Delaney, J.J. LEADERSHIP BEHAVIOR: INTERPERSONAL NEEDS AND EFFECTIVE SUPERVISORY TRAINING. Personnel Psychol., Autumn 1966, 19(3), 311-320. (Creighton University, Omaha, Nebr.).

The first purpose of this study was to describe significant changes in either the interpersonal needs orientation and/or leader attitudes at the conclusion of a conference designed to increase leader effectiveness. At the conclusion of the conference, there were significant changes in leader attitudes on the Leadership Opinion Questionnaire. These may be described as becoming more considerate and less task-oriented in nature. A second problem in the present study concerned describing the interpersonal needs of participants who endorse significantly different leader behaviors. The difference between high structure and low structure individuals at the conclusion of the conference reflected a difference in their needs to control and influence others, while at the onset the high structure and low structure individuals also seemed to differ in their need to have others respond to them in a warm personal manner.
R 11

30,367
Korman, A.K. "CONSIDERATION," "INITIATING STRUCTURE," AND ORGANIZATIONAL CRITERIA---A REVIEW. Personnel Psychol., Winter 1966, 19(4), 349-361. (New York University, New York, N.Y.).

The purpose of this paper was to review the research literature on the relationship between "Consideration," "Initiating Structure," and organizational criteria. The results show a predominance of low to moderate correlations, but almost all of a concurrent validity nature. There is as yet almost no evidence on the predictive validity of "Consideration" and "Initiating Structure" nor on the kinds of situational moderators which might affect such validity. Despite the fact that "Consideration" and "Initiating Structure" have become almost bywords in American industrial psychology, it seems apparent that very little is now known as to how these variables may predict work group performance and the conditions which affect such predictions. At the current time, we cannot even say whether they have any predictive significance at all. Research is needed of a systematic nature to answer these most basic questions, since it is only in the answers to such questions that the most useful applications can take place.
R 24

30,368
Klores, M.S. RATER BIAS IN FORCED-DISTRIBUTION PERFORMANCE RATINGS. Personnel Psychol., Winter 1966, 19(4), 411-421. (Moravian College, Bethelem, Penn.).

The purpose of this study was to explore, in a research organization, the relationships among several possible sources of rater biases as they express themselves in a forced-distribution performance rating. The rating form consisted of an overall rating preceded by ratings on each of 7 traits: Amount of Work, Quality of Work, Cooperation and Contacts, Judgment, Initiative, Originality and Imagination, and Planning and Organization. It may be concluded from the study that ratings given on a forced-distribution performance rating are strongly affected by a) the relative job levels of the ratees and b) the relative emphases given by the rater to providing structure in the work situation and to showing consideration for subordinates.
R 6

30,410
Binder, A. & Estes, W.K. TRANSFER OF RESPONSE IN VISUAL RECOGNITION SITUATIONS AS A FUNCTION OF FREQUENCY VARIABLES. Psychol. Monogr., 1966, 80(23), 1-26. (University of California, Irvine, Calif. & Stanford University, Stanford, Calif.).

A series of 6 experiments investigated the principles required to account quantitatively for responses of human Ss to new combinations of cues following discrimination learning. In the training phase of each experiment, Ss learned to make identifying responses (numerical labels) to sets of stimuli (pairs of nonsense syllables) under a paired-associate procedure. After a fixed number of acquisition trials Ss were tested on stimulus compounds involving new combinations of the training cues. In all experiments a substantial proportion of variance in the test data was accounted for by a model embodying the additive rule and the probability matching rule of stimulus sampling theory. In cases when training had been conducted under standard discrimination paradigms, responses to test compounds were quite well accounted for by this model without auxiliary principles. Ss exhibited preferences for low ambiguity cues in test compounds only when this preference had been differentially reinforced during training. Under a variety of circumstances, predictions from the stimulus sampling model could be improved by the addition of a "relative novelty" principle, stating that, other things being equal, Ss tend to sample from test compounds the cues that occurred least frequently during previous training.
R 22

30,411
Bass, B.M. EFFECTS ON THE SUBSEQUENT PERFORMANCE OF NEGOTIATORS OF STUDYING ISSUES OR PLANNING STRATEGIES ALONE OR IN GROUPS. Psychol. Monogr., 1966, 80(6), 1-31. (University of Pittsburgh Graduate School of Business, Pittsburgh, Penn.).

In 3 successive experiments, as representatives of management or labor, 256 graduate business students bargained individually with counterparts on 9 issues. Two of the 4 treatments of each experiment required groups of Ss to plan strategies or to study the issues without considering bargaining tactics. Various kinds of prenegotiation study groups were contrasted. Also, some Ss planned strategies or studied alone rather than in groups. In the 1st and 3rd experiments in which deadlines were imposed, those negotiators who had prepared themselves were more likely to deadlock, more so if they had planned in advance in groups rather than alone. Detailed analyses are presented of the effects of the treatments within each experiment on specific contract outcomes, the overall favorability to the company of the settlements, the departure of the agreements reached from community norms and the speed of settlement. The latter 2 outcomes (departure and speed) were highly correlated. A variety of treatment effects appeared, some of which were consistent across experiments. Also, agreement of each 2 negotiators on the relative importance of issues depended on prenegotiation treatment as did the judged importance of most of the 9 issues and the postsettlement evaluation of the adequacy of the settlement reached. Personal orientation of the negotiators also affected outcomes. Thus, task-oriented negotiating pairs reached settlement closer to community norms while self-oriented negotiating pairs tended to agree more closely on the importance of the issues. Company and union representatives favored using different tactics with different concerns in mind.
R 17

30,412
Bradley, J.V. STUDIES IN RESEARCH METHODOLOGY. VII. THE CENTRAL LIMIT EFFECT FOR TWO DOZEN POPULATIONS AND ITS CORRELATION WITH POPULATION MOMENTS. FINAL REPORT. Proj. 7184, Task 718401, AMRL TR 66 242, Dec. 1966, 81pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This report shows the Central Limit Effect upon the sample mean for samples from each of 24 populations. The exact shape of each population is shown graphically and its standardized central moments are given. Along with each population is shown the nonrobustness of its sample mean at both left and right tailed nominal α's of .50, .40, .30, .20, .10, .05, .025, .01, .005, .001, and .0005 for numbers of 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1024, thus depicting the Central Limit Effect in considerable detail. It is shown that the nonrobustness of the sample mean is strongly correlated with the departure of the 3rd and 4th standardized central moments of the sampled populations from their values for a normal distribution. When the population is appreciably asymmetric, the correlation with the 3rd moment tends to be extremely strong, especially when number is moderately large.
R 6

30,419
McWhorter, M.M. & Warner, G.S. A LOW-NOISE TRANSISTOR MICROPHONE AMPLIFIER. IEEE Trans. on Audio & Electroacoustics, March 1966, AU-14(1), 27-31. (Stanford University, Stanford, Calif. & Vidar Corporation, Mountain View, Calif.).

A microphone amplifier is described which possesses good noise characteristics at all gain settings and the capability of handling large input signals without appreciable distortion at low gain settings. A single potentiometer is used as the gain control to: a) vary the negative feedback to provide high overload capability at low gain; and b) attenuate the output to provide a minimum gain of zero. The circuit is developed from a two-transistor building block.

30,420
Holmgren, G.L. SPEAKER RECOGNITION, SPEECH CHARACTERISTICS, SPEECH EVALUATION, AND MODIFICATION OF SPEECH SIGNAL--A SELECTED BIBLIOGRAPHY. IEEE Trans. on Audio & Electroacoustics, March 1966, AU-14(1), 32-39. (Texas Instruments Incorporated, Dallas, Tex.).

This paper represents an effort to update and expand an earlier paper, "Speech Analysis, Synthesis, and Processing--A Selected Bibliography" prepared and published by this author at Texas Instruments, Inc., Dallas, in 1963. Selections included in this paper will provide the research with a fairly extensive and representative presentation of relevant source material in the areas to which the title refers.
R Many

30,421
IEEE Transactions on Audio and Electroacoustics. IEEE STANDARD ON DEFINITIONS OF TERMS FOR AUDIO AND ELECTROACOUSTICS. IEEE Trans. on Audio & Electroacoustics, June 1966, AU-14(2), 59-65.

This Standard is issued to supersede 58 IRE 3. S1, "IRE Standards on Audio Techniques: Definitions of Terms, 1958," to include the definitions of the 1958 Standards and to add definitions of terms for which it was felt a need exists for establishment of precise and concise meanings. Some of the previous standard definitions have been modified to accommodate changes in usage. The definitions included in this Standard all refer specifically to the use of the terms in audio techniques. Many of these terms are used in other fields with different meanings, and it is assumed that definitions for these terms in those fields are or will be included in Standards issued by other committees. Therefore, in general, the modifying phrase "in Audio Techniques" has been omitted except in certain cases where it appears to be particularly necessary to avoid confusion.

30,422
Gerber, S.E. THE INTELLIGIBILITY OF DELTA MODULATED SPEECH. IEEE Trans. on Audio & Electroacoustics, June 1966, AU-14(2), 93-96. (Speech Dept., University of California, Santa Barbara, Calif.).

Delta modulation is a method of simplified coding for digital coding. An experimental delta modulation system for speech processing was built and tested. These tests demonstrated that delta modulation is a useful technique for digital voice communication; in fact, delta modulated speech is of a quality suitable for many applications.
R 9

30,423
IEEE Transactions on Audio and Electroacoustics. RECOMMENDED PRACTICES FOR BURST MEASUREMENTS IN THE TIME DOMAIN. IEEE Trans. on Audio & Electroacoustics, Sept. 1966, AU-14(3), 115-121.

The definitions have been formalized in sufficiently general fashion to include all types of burst-like quantities. The definitions are applicable to regularly shaped, undisturbed pulses of the type encountered in pulse electronics and switching circuits as well as to irregularly shaped contaminated pulses frequently encountered in other areas of engineering practice. By making the formalization as general as possible, this document includes as specific cases many pulse definitions in common usage. The most important feature of the present approach is that it can be applied to all quantities of short time duration regardless of their purity or complexity. Section 2 gives the definitions of parameters which are important to burst measurements in time domain. Section 3 includes basic methods for measuring bursts in this domain. Suggested measurement systems are given in block-diagram form. Three categories of instrumentation are distinguished. These are: a) burst display; b) burst parameter measurement; and c) burst parameter statistical analysis. These categories represent three levels of sophistication of instrumentation and are applicable to different situations in which bursts may be encountered. Techniques for calibration and preliminary analysis of a burst are included as well as more sophisticated methods for examining bursts when they occur as interference.

30,424
Copel, M. HELIUM VOICE UNSCRAMBLING. IEEE Trans. on Audio & Electroacoustics, Sept. 1966, AU-14(3), 122-126. (USN Applied Science Lab., Brooklyn, N.Y.).

Voice communication becomes extremely difficult, if not impossible, when helium-oxygen breathing mixtures are substituted for air in deep-sea diving to overcome physiological problems. The effects of helium and pressure on speech intelligibility are discussed. With the helium voice unscrambler described, effective speech conversation was conducted with various helium-oxygen mixtures at depths to 300 feet. The unscrambler is useful even when high ambient acoustic noise is present, as in "hard-hat" diver applications.

30,425
Webb, H.J. & Webb, Josephine R. AN UNDERWATER AUDIO COMMUNICATOR. IEEE Trans. on Audio & Electroacoustics, Sept. 1966, AU-14(3), 127-135. (Webb Engineering & Hydrotronics Company, Rockford Bay, Idaho).

There is a growing need for voice communications underwater between divers and between divers and surface vessels. This paper discusses the general problem in terms of system analysis. The authors decided to direct their efforts toward the low-cost volume market of the sport and commercial diver. A communicator for this purpose must be simple, reliable, and low in cost. Hydrotalk, the result of their development, radiates an omnidirectional, audio acoustical wave through the water medium. Reception is accomplished by the listening diver's unaided ear. A large part of the development involved the creation of an improved underwater transducer, having a high coefficient of coupling between its signal input current and the sound power produced in the water. While this device represents a real step forward in solving the underwater communications problem, the authors are aware that more work needs to be done in improving intelligibility of the voice signal input to the microphone. This will probably be in the direction of a simple and safe full-face diving mask, which will provide a common chamber for the nose and mouth in which to mount the microphone. The authors are continuing their development work along these lines.
R 17

30,426
Bauer, B.B. & Torick, E.L. RESEARCHES IN LOUDNESS MEASUREMENT. IEEE Trans. on Audio & Electroacoustics, Sept. 1966, AU-14(3), 141-151. (Columbia Broadcasting Systems Laboratories, Stamford, Conn.).

CBS Laboratories has performed a fundamental study of loudness from which several results already have emerged. A new set of equal-loudness contours has been obtained using octave bands of "pink" noise in a simulated living room environment. The CBS Laboratories contours differ radically from the Fletcher-Munson contours. Forward vs. backward inhibition tests were performed, from which a new summation function was deduced. A new duration vs. loudness level function was obtained for octave bands ranging in frequency from 125 Hz to 8 kHz. These data are being incorporated in an instrument for measuring sensory loudness level.
R 10

30,427
IEEE Transactions on Audio and Electroacoustics. IEEE STANDARD ON TEST PROCEDURE FOR CLOSE-TALKING PRESSURE-TYPE MICROPHONES. IEEE Trans. on Audio & Electroacoustics, Dec. 1966, AU-14(4), 156-162.

This document describes a practical and reproducible method of evaluating the performance characteristics of a close-talking microphone by means of quantitative measurements of the microphone characteristics using a standard artificial voice. Terms associated with microphones and their testing are defined. Test procedures, methods of presentation of data, and a standard artificial voice are specified. The tests described in this document involve physical, steady-state measurements only. The data obtained should be sufficient to enable an evaluation of quality and performance of a given microphone in a speech communication system. However, since it is sometimes desirable to obtain a subjective evaluation of a microphone, a procedure for a qualitative performance test is described in Appendix I. Several sections of the document specify experimental limits to account for the effect of the test procedures on the accuracy of the data. These limits have been chosen so that results within the range of normal engineering accuracy will be obtained.
R 2

30,428
Torick, E.L. & Allen, R.G. AN INTERPHONE SYSTEM FOR "HANDS-FREE" OPERATION IN HIGH AMBIENT NOISE. IEEE Trans. on Audio & Electroacoustics, Dec. 1966, AU-14(4), 168-173. (Columbia Broadcasting System Laboratories, Stamford, Conn.).

A new interphone system has been developed providing a high degree of intelligibility and listener comfort in ambient levels up to 125 dB sound-pressure level. This paper discusses some of the novel electronic features employed, including: a) Automatic Gain Control (AGC) with recovery inhibition to prevent noise "pumping" during speech pauses; b) Automatic Level Compensation (ALC) for automatic adjustment of listening level with changing ambient; and c) highly reliable voice-actuated switching (VOX) at widely varying ambient levels.
R 4

30,429
Kenny, J.E. SOME DESIGN PROBLEMS IN WIRELESS DIVER COMMUNICATIONS. IEEE Trans. on Audio & Electroacoustics, Dec. 1966, AU-14(4), 174-177. (Aquasonics Engineering Company, Inc., Solana Beach, Calif.).

Communication equipment for use by divers involves problem areas that are normally not considered as part of the design engineer's interest. Because all equipment carried by the diver must be considered in the context of his life support system, design engineering is critically affected by the diver's psychological attitude, his physiological limitations in stress situations, and the compatibility of peripheral equipment with the basic life support system. This paper deals with some of the major problems indigenous to each of these areas, the effect on system design and the solutions used in each area in the design of a 42 kHz amplitude-modulated, wireless diver communication unit. Having attained an a acceptable design, evidenced by several hundred working units in the field, the author discusses some of the pressing needs for diver communication today.

30,430
Fawe, A.L. INTERPRETATION OF INFINITELY CLIPPED SPEECH PROPERTIES. IEEE Trans. on Audio & Electroacoustics, Dec. 1966, AU-14(4), 178-183. (Electronics Dept., University of Liege, Liege, Belgium).

The paper is based upon the statistical theory of signals. It is shown that the variation of the clipped Gaussian noise spectrum is 5 percent, while the normalized cross-correlation function is 0.80; the results are extended to more general cases. A property of the conditional mean value of speech signals is derived. A typical value of the normalized intelligibility of clipped speech in the presence of noise is 0.70 for S/N = 3 dB; assuming the ear is a clipper, theoretical results are well in agreement. The existence of an intelligibility threshold is shown. The need for information on the envelope (or dynamics) of the speech wave to meet the requirement of naturalness is underlined.
R 14

30,431
Ewing, G.D. & Huddy, N.W., Jr. RF CLIPPING AND FILTERING TO IMPROVE THE INTELLIGIBILITY OF SPEECH IN NOISE. IEEE Trans. on Audio & Electroacoustics, Dec. 1966, AU-14(4), 184-186. (USN Postgraduate School, Monterey, Calif.).

The principle of speech clipping at audio and radio frequencies has been fully investigated to determine its advantages in peak-power-limited systems in which the signal is to be transmitted through a noisy channel at radio frequencies. This paper describes the advantages of radio frequency clipping and filtering in systems in which the noise is encountered when transmitting the speech signal at audio frequencies. Articulation test results showing a 20 percent improvement in intelligibility are presented, as well as repeaking measurements to show the advantage of this method of processing speech in the type of system considered.
R 11

30,432
King, A.J. THE MEASUREMENT AND SUPPRESSION OF NOISE WITH SPECIAL REFERENCE TO ELECTRICAL MACHINES. 1965, 180pp. Chapman & Hall, Ltd., London, England. (University of Manchester, Manchester, England).

This book on noise is divided into 2 parts: basic theory and application. In the first part, the human auditory system is discussed and then methods of noise measurement. This is followed by a treatment of vibration and its measurement. Part 2 deals with radiation of noise from machines and reduction of noise at the source and in transmission. Finally, the author examines the problems of machine installation.
R 100

30,433
Bergeret, P. (Ed.). ESCAPE AND SURVIVAL: CLINICAL AND BIOLOGICAL PROBLEMS IN AERO SPACE MEDICINE. 1961, 116pp. Pergamon Press, New York, N.Y.

Escape at high altitudes, low altitudes at high speed, arctic survival training, gas mixtures for breathing in high performance aircraft, and simulation in bio-astronautics research are some of the aero-space medical problems discussed in this collection of papers.
R scattered

30,437
George, C.E., Hoak, G.R. & Boutwell, J. PILOT STUDIES OF TEAM EFFECTIVENESS. Contract DA 44 188 ARO 2, Feb. 1963, 66pp. Human Resources Research Office, George Washington University, Alexandria, Va. (AD 627214)

Methods if inducing intrateam coordination were tested for their effects on team performance in 5-man groups. Twenty such teams were formed, 10 experimental and 10 control. It was found that intrateam coordination could be induced in teams by differentially reinforcing such behaviors. It was also found that motivation to coordinate one's responses with those of other team members could be increased by appropriate experimental manipulations. Finally, greater increases in cohesion were found in experimental than in control teams. Implications of these results for theory and for application are discussed. Attention is focused, however, on the use of these results as guidelines for future research. These are primarily pilot experiments.
R 5

30,509
Breckenridge, F.C. BACKGROUND AND OBJECTIVES OF THE U.S. STANDARD FOR COLORS OF SIGNAL LIGHTS. Report from: "Night Visibility, 1959, Highway Research Board Bull. 226." 1959, 7-13. National Academy of Sciences - National Research Council, Washington, D.C. (US National Bureau of Standards, Department of Commerce, Washington, D.C.).

The U.S. Standard for Colors of Signal Lights embodies an attempt to eliminate some of the inconsistencies between different specifications for signal-light colors now used in the United States on the basis of the recommendations of the International Commission on Illumination. Differences in service conditions justify some of the differences among these specifications, but not all of them. The report also explains the different purposes served by the several parts of the standards and the relationship of basic definitions, limit standards and procurement specifications.
R 4

30,510
Larimer, E.M. VISIBILITY OF REFLECTORIZED LICENSE PLATES. Report from: "Night Visibility, 1957, Highway Research Board Bull. 163." 1957, 27-32. National Academy of Sciences - National Research Council, Washington, D.C. (Arrow Insurance Company).

Studies by the National Safety Council have established that peril to life and vehicle trebles after sunset, primarily as a result of reduced visibility. Low illumination, contrast extremes, atmospheric conditions, and attendant driver reaction at day's end contribute a host of physical and sensible limitations. Other statistics show that rear-end collisions are the largest single factor in rural motor vehicle accidents. In spite of very considerable and progressive efforts of the automobile industry and enforcement agencies, unlighted, over-aged, damaged, or improperly maintained or equipped vehicles are a continuing hazard to the motorist and a constant challenge to safety leaders. The reflectorized license plate offers a universal opportunity and practical enforcement device for maintenance of minimum protection. This paper presents data to establish typical visibility distances of unlighted vehicles, both with and without reflectorized license plates, relative to safe stopping distances. Visibility and performance limitations imposed by rain, mist, snow and glare have been considered in establishing performance criteria, because 25% of all accidents occur under such conditions. Observations indicate that a completed plate capable of reflecting 5 c.p. per incident ft-c provides the minimum brilliance for requisite warning in typical situations. Practical considerations include ease of cleaning, damage resistance, and effective performance although bent or mutilated. The experience of several states has shown that such reflectorized license plates have aided enforcement agencies. Legibility distance from the rear is markedly improved and the front license plate of lighted vehicles is both visible and legible to the motorist approaching from the opposite direction. This feature assures positive delineation of "one-eyed" vehicles and location of parked cars prevalent in residential areas.
R 9

30,511
Richards, O.W. TINTED CONTACT LENSES--A HANDICAP FOR NIGHT DRIVING. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, p86. National Academy of Sciences - National Research Council, Washington, D.C. (American Optical Company, Southbridge, Mass.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

Tinted contact lenses, absorbing more than 10% of light, can be a source of danger when worn at night, and it is recommended that no tinted or pinhole pupil contact lenses be worn when driving at night.
R 2

30,512
Michaels, R.M. & Solomon, D. EFFECT OF SPEED CHANGE INFORMATION ON SPACING BETWEEN VEHICLES. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 26-39. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Traffic Operations Div., Washington, D.C.).

The purpose of this study was to determine whether advance information on speed changes through a visual signal system markedly changes car-following behavior. A simple signal system placed on a lead vehicle categorized speed changes into 4 classes--2 for acceleration and 2 for deceleration. The driver of the "following" vehicle was instructed to follow as if he were in heavy traffic and wished to prevent anyone from cutting in front of him. He was instructed to watch the signal system for advance information on the speed changes of the lead vehicle. A distance measuring system was placed in the following vehicle with which it was possible to measure headway continuously to within an accuracy of 5%. The headway was converted to digital form and encoded on a digital recorder. Speed of the following vehicle, together with the nominal speed and acceleration of the lead vehicle, was also recorded. Speed changes in the lead vehicle were either 3 or 6 mph per sec and occurred in random order. The occurrence of a speed change was randomized over time so that the following driver did not know when or what change was to take place. The advance speed change information was presented at one of 4 time intervals before the onset of the speed change. A control condition was used in which no information was transmitted. Results indicated a significant reduction in mean headway when advance speed change information was presented and that headway was a minimum when the advance information was presented approximately 1 to 3 sec before the onset of the speed change. At these optimum times the variability in headway was also significantly reduced. In addition, headways were found to be independent of speed; thus, time headways decreased almost linearly with speed over the range from 36 to 54 mph.
R 4

30,513
Ricker, E.R. CANDLE POWER OF REAR LIGHTS ON TRUCKS. Report from: "Night Visibility, 1955, Highway Research Board Bull. 127." 1955, 15-18. National Academy of Sciences - National Research Council, Washington, D.C. (New Jersey Turnpike Authority, State of New Jersey).

The Inter-Turnpike Safety Committee is continuing its study with a view to proposing to its parent bodies definite requirements as to the intensity, placement, and use of tail and stop lamps for vehicles traveling on the various turnpikes. It is recognized that the setting of these standards and the methods of measurement are matters of widened interest in the traffic field. Comments are earnestly solicited as to the significance of the reported measurements and suggestions for the proper standards to be used.

30,514
Hanysz, E.A. UNIFIED COMMUNICATION SYSTEM PROMISES SAFER DRIVING. SAE J., May 1967, 75(5), 36-41. (Research Labs., General Motors Corporation, Detroit, Mich.).

DAIR (Driver Aid, Information, and Routing) is a new system for giving routing instructions, communicating traffic and road signs, and providing radio link for aid and information. It allows the driver to concentrate more on actual driving and results in safer motoring.

30,515
Stonex, K.A. DRIVER EYE HEIGHT AND VEHICLE PERFORMANCE IN RELATION TO CREST SIGHT DISTANCE AND LENGTH OF NO-PASSING ZONES. I. VEHICLE DATA. Report from: "Relation Between Vehicle Characteristics and Highway Design. A Symposium, 1958, Highway Research Board Bull. 195." 1958, 1-4. National Academy of Sciences - National Research Council, Washington, D.C. (General Motors Proving Grounds, Detroit, Mich.).

This paper traces design trends in eye height above the road of passenger car drivers.
R 1

30,516
Roper, V.J. AIMING FOR BETTER HEADLIGHTING. Report from: "Night Visibility, 1958, Highway Research Board Bull. 191." 1958, 49-52. National Academy of Sciences - National Research Council, Washington, D.C. (General Electric Company, Cleveland, Ohio).

The findings of earlier studies in night driving performance along a one-mile controlled stretch of highway are reported in terms of visibility as a function of headlight aiming. The findings are presented graphically. The importance of proper aiming of headlights is stressed.
R 2

30,517
Breckenridge, F.C. U.S. STANDARD FOR THE COLOR OF SIGNAL LIGHTS. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 102-103. National Academy of Sciences - National Research Council, Washington, D.C. (US National Bureau of Standards, Department of Commerce, Washington, D.C.).

The coordination draft of the U.S. Standard for the Colors of Signal Lights has been completed. The Standard has 3 purposes: a) to bring U.S. specifications for signal light colors into agreement with the recommendations of the International Commission on Illumination; b) to eliminate meaningless differences among the specifications issued by different organizations in this country; and c) to set up a technically sound basis on which relatively brief procurement specifications can be based.

30,518
Bartlett, N.R., Bartz, A.E. & Wait, J.V. RECOGNITION TIME FOR SYMBOLS IN PERIPHERAL VISION. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 87-91. National Academy of Sciences - National Research Council, Washington, D.C. (Psychology Dept., University of Arizona, Tucson, Ariz.).

The first part of the project consisted of the design and development of an amplifying and recording system which may be used in moving vehicles to record driver eye movements with a minimum of interference to driver activity. The system may be used in any conventional 6-passenger automobile without modification of the vehicle. The second part of this project involved the investigation and determination of response times to signals in peripheral vision. The original purpose for this phase of the project was to check out the recording equipment described earlier, but as the research progressed it was felt that some of the characteristics of eye movements and the process of seeing should be systematically investigated. The recording equipment proved to be an invaluable tool in this investigation. Exp. I involved the investigation and determination of response times associated with the interpretation of peripheral stimuli. Exp. II was designed to isolate and measure the various components of the total response time. By using the electrical method for recording eye movements, it was possible to isolate the latency, the travel time of the eye, and the response time for interpreting the stimulus. It was concluded that the results of the present research indicated that response times are unusually long in a complex visual situation.
R 4

30,519
Loutzenheiser, D.W. & Haile, E.R., Jr. VERTICAL CURVE DESIGN. II. Report from: "Relation Between Vehicle Characteristics and Highway Design. A Symposium, 1958, Highway Research Board Bull. 195." 1958, 4-8. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Highway Design Div., Washington, D.C.).

While there is a downward trend in the total height and resulting level of driver's eye for passenger cars, its result on the sight distance over crests does not appear to be significant enough to warrant change in presently used design methods and standards. Current passenger car models have driver eye height that reduces crest sight distance by somewhat under 5% and the likely lowest future range may reduce the sight distance upwards of 10%. These percentages are unimportant considering the variables upon which current design formulae are based. Therefore, it is the opinion of the writers that present and prospective lowering of height of driver's eye in passenger cars does not warrant any change in present methods of designing crest vertical curves.

30,520
Goldstein, L.G. & Mosel, J.N. A FACTOR STUDY OF DRIVERS' ATTITUDES, WITH FURTHER STUDY ON DRIVER AGGRESSION. Report from: "Driver Characteristic and Behavior Studies, 1958, Highway Research Board Bull. 172." 1958, 9-29. National Academy of Sciences - National Research Council, Washington, D.C. (USA Department of the Army, Washington, D.C. & George Washington University, Washington, D.C.).

The present study was a first exploratory step in an effort to identify the basic variables, or dimensions, underlying drivers' attitudes. The range of attitude objects is defined to encompass the various aspects of driving. Four factors (or dimensions) were hypothesized: a) Appreciation of hazard; b) Social responsibility or conformity; c) Attitude toward the vehicle itself and its operation; d) Attitude toward speed and speed limits. The broad plan of the study consisted of 3 steps: a) Development of an instrument (or instruments) to measure attitudes toward as many as possible of the various aspects of the driving activity: to cover the domain of interest. b) Collection of data on the attitude measures on a group of drivers whose motivation to manipulate their responses could be minimized. (Attitude measures are almost universally easy to falsify by simply giving the response which is known or believed to be the socially desirable one.) c) Factor analysis of the attitude measures, including rotation to psychological meaningfulness.
R 39

30,521
Rainey, R.V., Conger, J.J., Gaskill, H.S., Glad, D.D., et al. AN INVESTIGATION OF THE ROLE OF PSYCHOLOGICAL FACTORS IN MOTOR VEHICLE ACCIDENTS. Report from: "Characteristics of Vehicle Operators, 1959, Highway Research Board Bull. 212." 1959, 11-15. National Academy of Sciences - National Research Council, Washington, D.C. (University of Colorado School of Medicine, Denver, Colo.).

Concern with driver behavior as a major variable in motor vehicle accidents has drawn the interest and efforts of many investigators for at least 2 decades. These studies of human variables in accidents have ranged the broad spectrum of driver behavior, from a measurement of the most overt physical and psychophysical characteristics to an analysis of the most covert and subtle personality nuances. A review of these studies is beyond the present intent. The purpose of this report is to describe a driver research study at the University of Colorado School of Medicine, which has attempted to extend this research by incorporating in one program the major methods and variables emphasized by other investigators, as well as specific innovations particular to this research study. The 3 major features of this program include: a) A comprehensive research design in which many driver characteristics, physiological, psychophysical, and psychological, were simultaneously studied. b) A heightened concern with defining in operational terms such major variables as "accident", "attitudes", and "personality". c) An emphasis upon repeated cross-validation of early findings to guard against premature and unwarranted conclusions. The objective of this research has been to determine whether there are specific personal characteristics, and/or patterns of such characteristics, which clearly and consistently distinguish accident-repeaters from accident-free drivers.

30,522
Brody, L. PERSONAL CHARACTERISTICS OF CHRONIC VIOLATORS AND ACCIDENT REPEATERS. Report from: "Driver Characteristics, 1957, Highway Research Board Bull. 152." 1957, 1-2. National Academy of Sciences - National Research Council, Washington, D.C. (Safety Education Center, New York University, New York, N.Y.).

In the present report, the concern is with the significance of the findings for basically comparable groups of "good" and "bad" drivers between 26 and 57 years of age. The test of significance in all cases was the statistical device known as chi square, except that critical ratios were employed in evaluating RT data. Wherever the term "significant" is used, it refers to a confidence level of 5% or better. The findings were as follows: Simple RT--No significant difference between control Ss, chronic violators, and accident repeaters in 5 out of 8 comparisons of Ss by age groupings; 2 such comparisons favored the control Ss, one the accident repeaters. Complex RT--No significant difference between control Ss and chronic violators in 7 out of 8 age-group comparisons. Glare recovery time--Mixed results throughout, probably due to test invalidity. The test produced a tri-modal distribution (clusters of good, fair, and poor scores) for all 3 categories of Ss. Depth perception--No significant difference between control Ss, chronic violators, and accident repeaters, probably because of questionable test validity. Field of vision--Control Ss significantly better than chronic violators in one or the other eye; no significant difference between control Ss and accident repeaters. Visual acuity--No significant differences were noted between control Ss and accident repeaters. However, chronic violators as a group had significantly better visual acuity than the control Ss as a group. Personal adjustments and personality trends--There were found in this highly complex and difficult field of testing, 11 signficant differences that tended to favor control Ss over accident repeaters, compared to 3 favoring accident repeaters over control Ss. However, 14 significant differences were found that tended to favor chronic violators over control Ss, compared to 2 that favored control Ss over chronic violators. Outstanding areas of difference in these 2 sets of comparisons were found.

30,523
Harrington, T.L. & Johnson, M.D. AN IMPROVED INSTRUMENT FOR MEASUREMENT OF PAVEMENT MARKING REFLECTIVE PERFORMANCE. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 111-113. National Academy of Sciences - National Research Council, Washington, D.C. (Reflective Products Div., Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Accurate field measurement of reflective pavement marking performance requires portable instrumentation exactly simulating night illumination and visibility conditions. Precise duplication of optical and geometrical relationships between headlamps, driver, and pavement marking is essential for correlation with actual visual appearance. Previous instruments, such as the Hill-Ecker portable photometer and the Hunter night visibility meter, have been handicapped by difficulties in miniaturization resulting in divergence and incidence angles representative of only 40- to 200-ft. distance from the vehicle and lacking desired resolution, color response, and sensitivity. The new instrument combines many of the desirable features of earlier units (such as portability and direct reading) while eliminating the need for sacrificing precise duplication of field conditions. Principal innovations permitting these improvements are the use of transistors and unique design to eliminate stray light and establish exact divergence angles. Geometrical relationships are maintained with a size reduction of 100 to 1 from field conditions. The situation duplicated is a 300-ft. viewing distance, representative of visibility requirements based on 60-mph minimum stopping distance of 306 ft. on dry, level concrete. Proportional consideration of left and right lamp illumination from modern dual headlamps is simulated. Similarly, dual divergence angles for left and right lamps are provided with data integrated into one meter reading. The photocell detector is color-corrected to CIE standard observer response, maintaining instrument resolution at 0.1° with direct meter reading eliminating subjective effects. Ambient daylight effects are minimized by use of source light interrupted at a frequency also required for detection. Power is supplied by rechargeable dry cells, permitting convenient portability.

30,524
Marsh, C.R. EFFORTS TO IMPROVE VISIBILITY IN FOG. Report from: "Night Visibility, 1958, Highway Research Board Bull. 191." 1958, 41-48. National Academy of Sciences - National Research Council, Washington, D.C. (Pennsylvania State University, University Park, Penn.).

To improve visibility in the fog at night for front lamps, it has been found a) that headlamps should illuminate the minimum volume of fog between the driver and the road, and b) that the angle between the headlamp beam axis and the light scattered back along the driver's line of sight should be one to produce low values of scattering. The arrangement which most nearly satisfies both of the above requirements has the headlamps placed as low as possible on the vehicle and projecting light in a thin layer close to and parallel to the road surface. This results in low brightness of pavement but high brightness of objects on or beside it. A polarized spot lamp and cross polarized viewer is the most effective fog light system developed so far, although polarized light penetrates fog to no greater extent than unpolarized light. Polarized light which is scattered back from fog is not depolarized but is blocked when seen through a viewing filter polarized at 90° to the lamp filter, thus removing much of the veiling glare normally present. Light striking opaque objects lacking metallic lustre is partially depolarized and the object therefore, can be seen through the filter. Self luminous objects, such as tail and signal lights and traffic signals, as well as opaque objects, are not obscured by the filter. Restrictions in the application must be observed for satisfactory performance of a polarized fog light system. The following list of attributes of a lighting system suitable for satisfactory performance in fog is offered. a) The volume of illuminated fog between the driver and the road should be small. b) The light which must traverse this volume of fog should do it at angles with the driver's vision which produce the minimum light scattering. c) Direct glare sources should be minimized for fog as well as clearer atmospheres. d) Except for haze having particles much smaller than fog droplets, color seems not to be a factor in scattering.
R 4

30,525
Allen, T.M. NIGHT LEGIBILITY DISTANCES OF HIGHWAY SIGNS. Report from: "Night Visibility, 1958, Highway Research Board Bull. 191." 1958, 33-40. National Academy of Sciences - National Research Council, Washington, D.C. (Virginia Council of Highway Investigation & Research, State of Virginia).

Traffic signs have always played a significant role in the convenience and safety of drivers on the highways. On limited-access facilities, which are now entering a period of great expansion, the motorist is forced to rely to a greater degree on signs. To perform its function effectively, a sign must have good legibility at night as well as in the daytime. The increased need for overhead signs and the need for larger letter sizes make new demands on reflectorized materials. The use of illuminated signs is increasing. There is need for data on the legibility of reflective materials in these applications, and for a comparison of their legibility to that of artificially illuminated signs. It is to this problem that this study addresses itself. It is important that the results of laboratory studies be checked in the field before they are used in practice. Therefore the purpose of the present study was to validate in the field both phases of the laboratory work. This paper presents the practical results which were obtained, and their implications for sign design and usage at the present time.
R 6

30,526
Schoppert, D.W., Moskowitz, K., Hulbert, S.F. & Burg, A. SOME PRINCIPLES OF FREEWAY DIRECTIONAL SIGNING BASED ON MOTORISTS' EXPERIENCES. Report from: "Effects of Traffic Control Devices, 1960, Highway Research Board Bull. 244." 1960, 30-87. National Academy of Sciences - National Research Council, Washington, D.C. (Automotive Safety Foundation, Los Angeles, Calif.).

Freeways offer the highest level of highway service available to the nation's motorists. To be consistent with the high level of engineering design which is represented in these highways, a similarly high degree of planning and design is necessary in presenting information to the motorist. This requires thorough knowledge of the type of information that will best meet his needs. This research project had as its goal the development of such knowledge with the following specific objectives: a) To determine the signing and marking aids sought by motorists in the use of freeways, particularly in urban areas; b) To determine how well existing standards and practices provide these aids and what, if any, changes could reasonably be made in existing practices to provide the aids sought by motorists. Most of the signing deficiencies observed during the course of the study would be corrected if the signs in the field were changed to conform to the present design practice of the California Division of Highways. The locations where signing is deficient, although they probably constitute a relatively small proportion of all the signing locations on the California highways, nevertheless demonstrate the need for a continuous program to bring existing signing into agreement with certain basic principles of directional signing. It is evident that most motorists find their way with little inconvenience most of the time. Nevertheless, the fact that a sizeable proportion of motorists have difficulty at one time or another indicates that a higher level of service could be provided.

30,527
Bauer, L.A. STREET AND HIGHWAY DESIGN. II. Report from: "Relation Between Vehicle Characteristics and Highway Design. A Symposium, 1958, Highway Research Board Bull. 195." 1958, 23-29. National Academy of Sciences - National Research Council, Washington, D.C. (City of Cincinnati, Cincinnati, Ohio).

In planning and working out proper grades for driveways so many different kinds of situations are encountered that the preparation of a set of standards that will cover all cases is almost an impossibility. An attempt has been made to cover the subject as completely as possible and the standards proposed can be applied in most cases. However, every driveway encountered presents a slightly different problem. Widths of sidewalk spaces, differences in elevation between roadway and walks, position and grades of the existing drives and other conditions all vary in different instances. In order to be assured of the proper driveway design in questionable cases, the following procedure is recommended: a) Design the driveway profile as nearly as possible to available standards; b) Plot the profile on a natural (2 ft. to 1 in.) scale; c) Prepare a cut out model car on the same scale as the profile; d) Slide the cut out model along the profile for finding any trouble spots and adjust the profile where necessary. This discourse has been on the matter of driveway profiles where they connect to the roadway and are carried across the walk area of the street. Some difficulties are also encountered in getting in and out of garages, especially where the grades are steep.

30,528
Normann, O.K. DRIVER PASSING PRACTICES. III. Report from: "Relation Between Vehicle Characteristics and Highway Design. A Symposium, 1958, Highway Research Board Bull. 195." 1958, 8-13. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.

Driver passing practices were compared on 3 two-lane highway locations where highway geometry had not changed between a 1938 and 1957 survey. During this period, there had been periodic increases of horsepower on practically all makes of cars. Speeds of passing and passed vehicles were higher in 1957 than in 1938. The time spent by passing vehicles in the left hand lane was shorter in 1957 and the distance travelled greater than in 1938. There is little evidence to indicate that present practices of marking no-passing zones should be changed due to the changes that have taken place during the past years in vehicle design and driver performance.

30,529
McConnell, W.A. PASSENGER CAR OVERHANG AND UNDERCLEARANCE AS RELATED TO DRIVEWAY PROFILE DESIGN. Report from: "Relation Between Vehicle Characteristics and Highway Design. A Symposium, 1958, Highway Research Board Bull. 195." 1958, 14-23. National Academy of Sciences - National Research Council, Washington, D.C. (Ford Motor Company, Dearborn, Mich.).

The current trend in automobile styling appears to be toward lower vehicles. Greater front and rear overhang and reduced road clearances, which make today's cars seem to hug the road, have caused increased concern among highway designers. The trend, of course, is not new. When automobiles were powered buggies, the driver sat high. Then the engines moved out from under the seat. Pneumatic tires could absorb bumps that the buggy wheels needed size to climb. Independent suspensions allowed the engine to drop between the wheels. The frames moved to the outside, or disappeared altogether with integral body structures. Now, load sensing and leveling devices narrow the margin necessary for spring deflections. With each change, the driver has dropped down and the vehicle has become lower. Viewed from the beginning, such a trend is alarming. In reviewing passenger car dimensions related to highway design for the 1948-1958 period, the author presents maximum, minimum, and average dimensions of the various makes of vehicles offered to the public, without regard to their market penetration, because these data reflect trends in automotive design philosophy. It is noted that the critical maxima and minima have remained virtually unchanged in recent years.

30,530
Taragin, A. DRIVER BEHAVIOR AS RELATED TO SHOULDER TYPE AND WIDTH ON TWO-LANE HIGHWAYS. Report from: "Traffic Behavior as Related to Several Highway Design Features, 1958, Highway Research Board Bull. 170." 1958, 54-76. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Highway Transport Research Div., Washington, D.C.).

Approximately 94% of the primary rural roads on a mileage basis are 2 lanes. In the western states the greatest proportion of these roads are surfaced with bituminous material. In the past, the normal practice has been to construct gravel shoulders adjacent to the traveled lanes. In recent years, however, a number of the western states have adopted the practice of also paving the shoulders with bituminous material. In most cases there has been a definite distinction between the appearance of the traveled lanes and the shoulders, either in color or texture or both. On a small but significant mileage of these rural roads, there is no distinction in color or texture between the lanes and the shoulders. In appearance these roads are 2-lane highways with 20-ft lanes without shoulders instead of the normal 12-ft lanes with shoulders. The change in practice of having no distinction between the pavement and shoulder concerned many engineers since in most cases the shoulder area was not as structurally strong as the traffic lane. Furthermore, it was felt that drivers would attempt to operate on these sections in a manner similar to operation on 4-lane undivided highways. This concern resulted in a study to obtain accurate information regarding driver behavior and bearing on safety of operation on 2-lane roads when the shoulders are paved with the same material as the traffic lanes and to compare this information with similar information for 2-lane roads having shoulders that appear distinctly different from the traffic lane.

30,531
Forbes, T.W., Gervais, E. & Allen, T. EFFECTIVENESS OF SYMBOLS FOR LANE CONTROL SIGNALS. Report from: "Effects of Traffic Control Devices, 1960, Highway Research Board Bull. 244." 1960, 16-29. National Academy of Sciences - National Research Council, Washington, D.C. (Highway Traffic Safety Center, Michigan State University, East Lansing, Mich.).

A need was indicated for improved signals for control of individual lanes on freeways and bridges in cases where accidents, maintenance, or unbalanced flow requires closing or reversing of a lane. 5 criteria for more satisfactory signals than are now available for such use included a) positive indication without false direction in malfunctioning; b) distinctive appearance; c) visibility and legibility; d) ready understanding by most motorists; and e) economic feasibility in the field. A series of different symbols was considered by the Michigan Highway Department from which the "red X" and "green-arrow-up" were thought to fulfill qualifications a, b, c, and e, and to be most promising for qualification d. To test the readiness of understandability by the majority of motorists, research was carried out in 2 parts. Part 1 was an engineering psychology approach, which measured the types of meaning most commonly associated with 6 different possible symbols. Part 2 was a check of actual motorist reaction to the most effective signals when installed on the Mackinac bridge.
R 3

30,532
Swanson, C.O. A DEVICE FOR ESTABLISHING A SAFE STOPPING DISTANCE AT NIGHT. Report from: "Night Visibility, 1957, Highway Research Board Bull. 163." 1957, 21-25. National Academy of Sciences - National Research Council, Washington, D.C. (Iowa State College, Ames, Iowa).

It is the primary purpose of this paper to describe a device of slide-rule type which could be used with any data to establish a safe stopping distance at night. Data from the National Safety Council on day and night accidents show at least 3 times as many fatalities at night. There seems no doubt but that a greater margin of safety should be allowed for stopping distance under nighttime conditions. It is the author's impression that the discussers are arguing primarily for higher speeds rather than for a simplification of the paper under discussion. By using the least conservative set of constants it is possible to do this, but the author's purpose was to take a reasonable set of values which are realistic. Many cars on the road are of prewar type and no increase in headlight illumination standards has been accepted in Iowa. It is agreed that the problem is complex and no simple solution can be given which will fit all conditions. Likewise, drivers differ markedly and some states require only 20/70 vision for a driver's license. This fact emphasizes the need for conservative estimates with respect to a safe nighttime stopping distance.

30,533
Michalski, C.S. PROPOSED CHANGES IN TRAFFIC SIGNAL COLOR STANDARDS. Report from: "Night Visibility, 1959, Highway Research Board Bull. 226." 1959, 14-15. National Academy of Sciences - National Research Council, Washington, D.C. (Citizens Traffic Safety Board, Chicago, Ill.).

While specifications for traffic signal glassware have been revised periodically during the past 25 years, there have been virtually no changes in basic chromaticity definitions. In recent years traffic engineers have become increasingly concerned over the variety of shades of reds, yellows, and greens that confront the motorist even on short trips in his own community. The U.S. National Committee on Colors of Signal Lights, a committee of the International Commission on Illumination, has drafted proposals for standardizing definitions of colors of signal lights used by aviation, highway, marine, and railroad services. At the outset of the committee's deliberations, it was apparent that adjustments are desirable in definitions of colors of highway traffic control signals. The most notable deviation is in the description of the green boundary of the yellow signal. Under current specifications sponsored by the Institute of Traffic Engineers, much greener yellows are permitted than by other agencies. In fact, the separation permitted between the yellowest green and the greenest yellow is less than separation between the yellowest red and the reddest yellow. Definitions proposed by the U.S. National Committee on Colors of Signal Lights call for a reversal in separations between colors. The philosophy underlying the USNC spacing between colors is that yellow mistaken for red is safer than yellow mistaken for green. However, there are applications, particularly in flashing signals, where red identified as yellow can lead to disastrous consequences. Hence, it is important that an adequate separation be maintained between yellow and red.

30,534
Finch, D.M. SURFACE-MOUNTED LIGHTS ON ROADWAYS FOR GUIDANCE. Report from: "Night Visibility, 1959, Highway Research Board Bull. 226." 1959, 16-26. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Berkeley, Calif.).

The material presented in this paper is an outgrowth of developments that have been made in lighting for airports. The system may have potential applications to roadways since the basic visual problem of the motor vehicle driver and the pilot is the same. An analysis reveals that the major information required by a driver is contained in the contour lines that outline the basic elements of the scene. Insofar as the roadway itself is concerned, the basic elements are determined by lineal lines that define the edges of the roadway, the intersections and the turnoffs, the lane lines and the center lines. The foregoing has indicated the desirability of a lighting system to develop continuous contours of light along borders and centerlines of roadways. Filament light sources are a logical choice for this design due to their high brightness and simple electric circuitry. If the sources have high brightness, they can be seen against a background which is also relatively high in brightness as in daytime fog. The lighting unit that was developed to meet the above requirements is a small flat circular disc-shaped fixture that uses either a 3-, 4- or 15-watt 12-volt automotive type light bulb. These initial studies suggest that a lineal pattern of lights surface mounted on the pavement may have considerable application possibilities in the highway field. The lights can provide good lineal guidance in almost any weather which is one of the most essential factors in motor vehicle operation.
R 1

30,535
Wolf, E. STUDIES ON THE SHRINKAGE OF THE VISUAL FIELD WITH AGE. Report from: "Night Visibility, 1967, Highway Research Record Number 164." 1967, 1-7. National Academy of Sciences - National Research Council, Washington, D.C. (Retina Foundation, Boston, Mass.).

The loss of visual sensitivity with age is accounted for by physical changes occurring at about age 35-45 years and consists in reduced power of accommodation of the lens and greater sensitivity to scotomatic glare. At age 60 a considerable decrease in the capacity to adapt to darkness and to perceive intermittent stimuli occurs. Also at this age a measureable shrinkage of the visual field is observed. It is thought that these later changes are associated with changes of retinal metabolism. By means of perimetric and tachistoscopic field tests carried out on a large number of individuals ranging in age from 15 to 91 years, it was possible to measure changes in peripheral sensitivity and to recognize the nature of the changes. A shrinkage of several degrees in each decade above age 45 years was observed with a greater shrinkage above age 65. The loss in the extent of peripheral vision appears similar to that produced by reduction of oxygen tension of the breathing air. It was possible to show that by reducing the percentage of oxygen for young observers, their sensitivity could be lowered to the same degree as that attained in the normal process of aging in the 66-75 year old. Such results support the assumption that the changes in peripheral visual sensitivity in the aged are due to reduced retinal metabolism. It is pointed out that for night vision and road safety of the aging population, reduced sensitivity should be taken into consideration by supplying adequate information within their range of visual perception.
R 11

30,536
Schlesinger, L.E. & Safren, Miriam A. PERCEPTUAL ANALYSIS OF THE DRIVING TASK. Report from: "Road-User Characteristics, 1963, Highway Research Record Number 84." 1965, 54-61. National Academy of Sciences - National Research Council, Washington, D.C. (George Washington University, Washinton, D.C.). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

This paper attempts to develop a unified and comprehensive model of the driving task having practical and psychological validity. The model specifies the critical tasks of driving, the critical skills to perform these tasks, and some objective measures of these skills. In the model, the major tasks for the driver are the perceptual organization from moment to moment of a field of safe travel (a region in which the car can move unimpeded), a minimum stopping zone (the smallest region through which the car must move to come to a full stop), and a comparison of these 2 fields. The driver's organization of these 2 fields, or the field-zone ratio, is a control stimulus guiding the control actions to the vehicle. That is, the driver varies the speed and direction of movement of the vehicle to maintain a safe field-zone ratio--one in which the field is greater than the zone. Objective measures of driving skill derived from the model include the "smoothness" of driving, measured by speed and direction changes over time; i.e., the driver who from moment to moment correctly perceives his field of safe travel and minimum stopping zone and maintains the field of safe travel greater than the minimum stopping zone has little occasion for sudden and jerky movements due to contingencies that could have been foreseen. Experiments are designed to test the predictions derived from the model and to further develop the model.
R 12

30,537
Snider, J.N. CAPABILITY OF AUTOMOBILE DRIVERS TO SENSE VEHICLE VELOCITY. Report from: "Road-User and Vehicle Characteristics, 1967, Highway Research Record Number 159." 1967, 25-35. National Academy of Sciences - National Research Council, Washington, D.C. (Industrial Engineering Dept., Ohio State University, Columbus, Ohio).

This paper has presented a study of the ability of automobile drivers to sense one of the many types of information which is available to them. The use of other techniques, such as stimulus change detection, is necessary to fully define this sensory capability. This study is one of a series of investigations aimed at defining the capability of drivers to sense that information which is necessary for longitudinal vehicle control. Investigations are currently being conducted on the ability of drivers to sense velocity (as reported here), acceleration, jerk, headway, and relative velocity. It is felt that by knowing the sensory capability of drivers, it will be possible to better predict the performance of drivers under such conditions as the high density freeway and that it will be possible to evaluate the possible benefits of augmenting the driver's sensory capability.
R 1

30,538
Lauer, A.R. A SAMPLING STUDY OF DRIVERS ON THE HIGHWAYS FOR THE 24-HOUR PERIOD. Report from: "Driver Characteristics and Accidents, 1953, Highway Research Board Bull. 73." 1953, 14-31. National Academy of Sciences - National Research Council, Washington, D.C. (Driving Research Lab., Iowa State College, Cedar Falls, Iowa). (Report from: "Thirty-Second Annual Meeting, January 13-16, 1953.")

This paper is a presentation of the first 6 mo. of a round-the-clock sampling technique designed to throw light on the driving habits of the licensed population considering age, sex, speeds, age of car driven, and related factors. It was found that speed and age are inversely related at times when the traffic flow is light. Heavy traffic seems to cramp the style of speed demons. This classification of drivers is most heavily constituted of men between the ages of 20 to 24. The average percent of women drivers on the highway around the clock was found to be 14.5 of the total. Their heaviest driving hours were between 1400 and 1600. The mean speed for all men observed was 47.6 mph. at an average age of 36.2. The mean speed of drivers between midnight and 0500 was 50.6 mph. at an average age 29.3. If men under 27 were to reduce their accidents to the average for all men driving, the accident toll and consequent fatality lists of the state should be cut by 12%. It would appear that night speed limits would reduce the hazards to the public from this group only by the strictest enforcement between midnight and 0500 daily. Provisional licenses for drivers up to 24 and governors on cars required for persons apprehended exceeding the speed limits might reduce accidents resulting from driving at speeds too fast for conditions or for the driver's experience and training.
R 2

30,539
Roper, V.J. RELATION OF VISUAL ACUITY AND CONTRAST SENSITIVITY UNDER NIGHTTIME DRIVING CONDITIONS. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, p114. National Academy of Sciences - National Research Council, Washington, D.C. (Miniature Lamp Dept., General Electric Company, Nela Park, Cleveland, Ohio).

Though a sufficient number of observers has not been checked to make absolutely certain there is no correlation between visual acuity and the ability to detect low-contrast differences at night, in all the checks so far there has been no correlation; i.e., observers who had 20/20 or better visual acuity oftentimes make a poor showing with the low-contrast chart. Conversely, sometimes those with acuity as low as 20/40 made a good showing with the low-contrast chart. Some had good performance both ways, some had poor performance both ways. Obviously, the best combination from the standpoint of nighttime driving safety is excellent visual acuity plus excellent ability to detect low-contrast differences at night. With the limited number of observers used in conducting seeing-distance tests in moving cars, those with the best performance with the Luckiesh-Moss low-contrast chart also gave the best seeing-distance performance on the tests. Conversely, those with the poorest rating with the Luckiesh-Moss low-contrast chart gave the poorest results in the seeing-distance tests. In the case of these particular tests observers with 20/20 acuity rating or with spectacles giving correction to 20/20 were used. More data are needed.

30,540
King, B.G. & Sutro, P.J. DYNAMIC VISUAL FIELDS. Report from: "Driver Characteristics, 1957, Highway Research Board Bull. 152." 1957, 3-14. National Academy of Sciences - National Research Council, Washington, D.C. (US Office of Aviation Safety, CAA, Washington, D.C.).

It is estimated that an obstruction to vision contributed to one out of every 8 motor vehicle accidents. In these, vision was obscured by objects on the car in 40% of the cases and stationary objects such as trees and buildings in 30% of the cases; the remainder were other cases--some moving, some parking, and a few instances of glare. To these must be added an undetermined number of cases where, through inattention, distraction, or other cause, the visual stimulus which fell upon the eye failed to "register"; i.e., it failed to be perceived and interpreted. Knowledge of man's capability for viewing in terms of extent when operating a moving vehicle, his viewing habits or patterns, and his response behavior, is essential as the basis for specifying and providing for human requirements for vehicle design, highway planning, and driver training.
R 8

30,541
Billion, C.E. COMMUNITY STUDY OF THE CHARACTERISTICS OF DRIVERS AND DRIVER BEHAVIOR RELATED TO ACCIDENT EXPERIENCE. Report from: "Driver Characteristic and Behavior Studies, 1958, Highway Research Board Bull. 172." 1958, 36-94. National Academy of Sciences - National Research Council, Washington, D.C. (Bureau of Highway Planning, New York State Department of Public Works, Albany, N.Y.).

For the collection of data, 526 male and 284 female drivers were interviewed using a schedule of 60 questions relating to personal, social, health and driving characteristics, including miles driven for a 2 1/2-year period from January 1953 through June 1955. Accident records for the respondents covering this 2 1/2-year period were searched from the files of the Motor Vehicle Bureau and evaluated by a panel of judges to determine accident responsibility. The general hypothesis of the whole study is that drivers responsible for motor vehicle accidents have different personal, social, and driving characteristics than drivers who have not had accidents. Each characteristic of the respondent was put into the form of a specific null hypothesis and tested statistically. To determine those attributes that may be causally associated with driver behavior, a factor test was applied to those variables for both male and female drivers that a) were statistically significant on a 95% level, b) were selected on a statistical judgment basis, and c) were selected because of current interest in the variable. To test the hypothesis that there is no difference between accident and no-accident drivers in the way they drive, 428 male and 122 female drivers were followed while driving in Schenectady and their driver behavior was noted and rated on a scale to include speed, headway, lane markings, passing, traffic signals, stop signs, turning movements, yielding, and attentiveness. A scoring system was adopted to group the drivers according to their rated behavior into categories of unsafe, predominately unsafe, neutral, predominately safe, and safe drivers.

30,542
Michaels, R.M. PERCEPTUAL FACTORS IN CAR FOLLOWING. Report from: "Almond, Joyce (Ed.) Proceedings of the Second International Symposium on The Theory of Road Traffic Flow, London, 1963." 1965, 44-59. Organisation for Economic Co-operation & Development, Paris, France. (US Bureau of Public Roads, Washington, D.C.).

In this paper an attempt has been made to examine the information used by the human in the car-following situation, and the nature of the responses that he may make to that information. 3 situations are considered: a) simple overtaking with a constant relative velocity; b) steady-state following; c) responses to acceleration of a lead vehicle. In all 3 cases the driver responds to the angular velocity of the lead vehicle. By operating at the absolute threshold of angular velocity, the driver minimizes his response time and maximizes the distance at which compensatory control action may be taken. This threshold is a function not only of the relative velocity but also the distance between the vehicles. In steady-state following the driver must depend on judging changes of distance, for angular velocity will remain below the threshold. For such conditions long period oscillations in distance will occur. In the third case, damping of a speed change imposed by a lead vehicle should occur whenever the acceleration of the lead vehicle is small enough or of short enough duration to generate a relative velocity that remains within a "just noticeable difference" in angular velocity. Under these conditions, lead vehicle acceleration should affect the time of response but not its magnitude.
R 16

30,543
Wright, S. & Sleight, R.B. INFLUENCE OF MENTAL SET AND DISTANCE JUDGMENT AIDS ON FOLLOWING DISTANCE. Report from: "Driver Characteristics, Highway Research Board Bull. 330." 1962, 52-59. National Academy of Sciences - National Research Council, Washington, D.C. (Applied Psychology Corporation, Arlington, Va.).

Little information is presently available on the relation between various driver characteristics and following distance. Using a photographic technique for measuring distance between vehicles, 2 experiments were designed to measure: a) the effects on following distance of driver set, or general attitude toward the particular driving situation; and b) the ability of drivers to maintain specified following distances, both with unaided vision and with 2 simple judgment aids. When drivers were asked to drive on a newly constructed highway not yet open to traffic under each of 3 sets--emergency, habitual, and maximum safety--at speeds of both 30 & 50 mph, the results indicated that drivers believed they habitually drove with maximum safety, as far as actual following distances were concerned. The distances obtained under the "habitual" set were found to be somewhat greater than those found in regular traffic on similar highways by previous investigators. Both aids to distance judgment substantially reduced errors made with the unaided eye, at both 6- and 8-car lengths and a speed of 40 mph.
R 6

30,544
Kinney, JoAnn S. & Connors, Mary M. RECOVERY OF FOVEAL DARK ADAPTATION. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 35-40. National Academy of Sciences - National Research Council, Washington, D.C. (USN Medical Research Lab., Groton, Conn.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

A continuing problem in night driving is the effect of glare sources, as oncoming headlights, on the visual sensitivity of the driver. The literature contains considerable information on the effect of brief, bright lights on peripheral, scotopic vision, and the amount of time necessary to recover sensitivity after such exposures can be estimated from these data. Although good scotopic vision is undoubtedly of use to the night driver, its importance should not be overemphasized. Peripheral acuity, even at best, is not adequate for most seeing tasks; in the purely scotopic range of illumination levels, where the fovea is blind, acuity is exceedingly poor. At these levels targets must be 10 to 25 times as big as a foveal target at a normal light level to be seen. Furthermore, in the mesopic range of illumination levels, where most night driving situations fall, foveal vision can be used and foveal or central acuity is better than peripheral. These facts, coupled with the normal tendency to direct one's gaze at an object that one wishes to see, make foveal vision of major importance in night driving situations. The literature on the effect of brief glare sources on foveal sensitivity in this range is rather sparse. This study was undertaken to answer the question: What is the effect on dark adapted foveal acuity of brief, bright sources of light? The sources investigated varied between 0.3 & 3,000 ft-L, a range which includes most of the brightnesses of oncoming headlights. Durations between 1 & 45 sec were studied. Since the amount of light required for an acuity threshold varies with the size of the target to be resolved, an acuity target was chosen of a size which gave a final threshold in the low photopic range of illumination and within the range of intensity levels typical of the night driving situation. R 13

30,545
Todosiev, E.P. & Fenton, R.E. VELOCITY THRESHOLDS IN CAR-FOLLOWING AT NIGHT. Report from: "Road User Characteristics, 1966, Highway Research Record Number 122." 1966, 94-104. National Academy of Sciences - National Research Council, Washington, D.C. (Space Technology Labs., Inc., Los Angeles, Calif. & Ohio State University, Columbus, Ohio). (Report from: "44th Annual Meeting, January 11-15, 1965.")

Car-following is defined as that phenomenon in which a vehicle follows a lead vehicle which is traveling at an arbitrary speed. This study is concerned with the determination of velocity thresholds under night driving conditions, and is based on the premise that the information available to the driver of the following car concerning the state of the lead car, is primarily provided by the taillights of the lead car. When a relative velocity exists between the 2 cars, this visual information appears as a change in the visual angle subtended by the 2 taillights of the lead car and apparent changes in the brightness and area of the taillights. It was decided to determine the velocity thresholds using an automobile simulator since experimentation on an actual highway presents many problems as far as experimental control and variable measurement are concerned. This experimental investigation of the driver's night velocity threshold, using a simulator, has yielded the driver's velocity threshold as a function of headway and presentation time of the relative velocity. 2 general velocity threshold equations were derived which interrelate the velocity threshold with the presentation time and headway for the simulated situation. It is simple to calculate the positive and negative night velocity thresholds if the headway and presentation time are known. A comparison was made between day and night velocity thresholds, both obtained from automobile simulator experiments, with the result that the night velocity threshold is generally smaller than the corresponding day velocity threshold.
R 1

30,546
Williston, R.M. EFFECT OF PAVEMENT EDGE MARKINGS ON OPERATOR BEHAVIOR. Report from: "Pavement Edge Markings Shoulders and Medians, 1960, Highway Research Board Bull. 266." 1960, 8-27. National Academy of Sciences - National Research Council, Washington, D.C. (Connecticut State Highway Dept., Wethersfield, Conn.).

The Connecticut State Highway Department applied paint markings along the outer edges of the travel portion of roadway to delineate the separation point between paved roadway and paved shoulder. This application was made on a 2-lane highway which carried substantially heavy traffic volumes and was used by many pedestrians. The pedestrians were mostly residents from a Veterans Home who walked along this highway frequently between the home and a village located some 3 mi distant. (Numerous accidents had occurred during hours of darkness, many of them fatal, involving vehicles and pedestrian.) The placing of a continuous white stripe along the outer edge of pavement provided an area for these pedestrians to walk and at the same time delineated the limits of the traveled roadway for operators of motor vehicles. These lines were termed shoulder lines and their effectiveness was measured by the elimination of pedestrian accidents at night and significant favorable public response to "shoulder striping". On 2-lane and 4-lane divided highways the presence of a painted line along the outer edge of pavement affects the lateral position of vehicles. The most significant change in position occurs during darkness. Some reduction in accidents involving vehicles leaving the roadway on the right is apparent on the 4-lane divided highway after an edge marking is placed. The presence of an edge line along roadways where pedestrians must use shoulders because of the absence of sidewalks offers additional security to both pedestrians and drivers. It appears that an outer edge line provides pavement delineation and a point for a driver to focus his eyes when faced with oncoming headlights. Edge markings appear to have some influence on operating speeds, a factor which might permit a deduction that the added delineation of the pavement edge increases driver confidence with a resulting safer operation.

30,547
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. IX. LITERATURE 1963. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 41-47. National Academy of Sciences - National Research Council, Washington, D.C. (Research Center, American Optical Company, Southbridge, Mass.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

This report is a brief review of the literature published in 1963.
R 86

30,548
Woltman, H.L. A STUDY OF DEW AND FROST FORMATION ON RETRO-REFLECTORS. Report from: "Night Visibility, 1963 & 1964, Highway Research Record Number 70." 1965, 63-66. National Academy of Sciences - National Research Council, Washington, D.C. (Reflective Products Div., Minnesota Mining & Manufacturing Company, Minneapolis, Minn.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

The formation of dew and, at subfreezing temperatures, frost, may occur on a solid body if proper atmospheric conditions prevail. Their formation on retro-reflective materials, which depend on collimated incident light for efficient reflection, refracts and scatters the light beam, rendering them less bright. The purpose of this study was to find means of relief.

30,549
Department of Motor Vehicles. MOTOR VEHICLE ACCIDENTS CAUSED BY FOLLOWING TOO CLOSELY. JANUARY TO OCTOBER 1963. Statistical Bull. 7 (64), 1964, 9pp. Department of Motor Vehicles, State of New York.

Following too closely accounted for 25% of all motor vehicle accidents in New York from January through October 1963. Injuries, rather than deaths, were the real problem encountered. This one circumstance accounted for 30% of all injuries on the State's highways during this period. The number of deaths attributable to this particular circumstance was only 0.6% of all motor vehicle fatalities. Since following another vehicle too closely can, and often does, result in minor bumper-to-bumper collisions, it is surprising that property damage accidents showed up less frequently than personal injury accidents. We can only surmise that many "following too closely" accidents amounted to less than the statutory reportable amount.

30,550
Michaels, R.M. ADAPTING THE HIGHWAY TO THE HUMAN ELEMENT. Report from: "Highway Safety 1963 and 1964, Highway Research Record Number 79." 1965, 56-57. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Office of Research & Development, Washington, D.C.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

One main direction of recent research on the driving task has been the examination of the characteristics of the environment relative to the visual requirements essential to accurate and reliable vehicle control. This work has provided an insight into certain of the basic mechanisms employed by drivers to locate themselves in time and space, and the results indicate that the driver is faced less with the problem of simple detection than with the scaling of speed and projection of position, his own and others. Research has also indicated that immediate control is determined by conditions existing with a driver's visual field whose longitudinal extent is fairly short, varies as a function of speed, and laterally extends beyond the road borders. However, elements outside these limits are important because they provide coherence and structure to the visual world. This orientation is essential for accurate interpretation of what enters the driver's field. Further, they serve as advanced cues by which the driver may sort and order events or changes with which he must deal in the near future. Finally, there are indications that because of his limited information-processing capabilities, the driver must do considerable time sharing among the many sources in the environment. This appears to degrade accuracy and reliability of any one operation. Results of this research indicate that visual velocity information is the most significant perceptual dimension for the safe performance of the functions of driving. This information must be available relative to the roadway itself and other objects, fixed or moving, with which the driver must deal. Thus, the basic conditions for safety are that the roadway environment be structured to provide this visual velocity information without discontinuities or distortion.

30,551
Jorgensen, R.E. PROGRAMMING HAZARD-REDUCING IMPROVEMENTS. Report from: "Highway Safety 1963 and 1964, Highway Research Record Number 79." 1965, 51-52. National Academy of Sciences - National Research Council, Washington, D.C. (Roy E. Jorgensen & Associates). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

Guidelines are developed for programming highway safety improvements. They represent a synthesis of existing practices: accident reporting and hazard identification, accident analyses, spot improvement programs, safety values in regular improvement programs, and management and research. The guidelines are not conceived as a list of requirements that a highway department must meet completely for an effective accident-reduction program.

30,552
Blythe, J.D. HIGHWAY LIGHTING AND ACCIDENTS IN INDIANA. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 1-7. National Academy of Sciences - National Research Council, Washington, D.C. (Indianapolis Power & Light Company, Indianapolis, Ind.). (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

There are many items to consider in the proper design of traffic safety lighting. A few of these are street and highway widths, spacing of lighting units, mounting heights, vehicular traffic conditions and patterns, pedestrian activity, and area problems. What light source should be used, incandescent, sodium vapor, mercury vapor or fluorescent? Incandescent lighting is a general purpose source and is the most widely used. The sodium vapor source should be used only for dangerous and hazardous locations to obtain its most effective results. The mercury vapor source is widely used for streets with heavy traffic. Certain objections to its color distortion have been overcome by color-corrected mercury lamps. Fluorescent lighting, the most recent source for street and highway use, has the least glare, allowing its use in underpasses and tunnels, as well as on streets and highways. By reviewing the history, of highway lighting in Indiana, a determination of its present standing can be made. In summary, here is a 5-point program for traffic safety: a) Strict enforcement of all traffic laws by a full complement of police traffic officers using all available enforcement tools; b) Strict and impartial policy by all courts, with particular emphasis on repeat violators; c) Removal of habitually reckless and dangerous drivers from the streets and highways; d) Increased efforts by all individuals and organizations along every line of safety education and promotion; e) Continuous application and use of all modern engineering, construction, and traffic facility improvements and tools. Certainly, highway lighting is one of these tools.

30,553
Wyatt, F.D. & Lozano, E. EFFECT OF STREET LIGHTING ON NIGHT TRAFFIC ACCIDENT RATE. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 51-55. National Academy of Sciences - National Research Council, Washington, D.C. (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

In many large cities throughout the country, studies have been made to determine what effect the illumination of a roadway has upon the nighttime accident rate. The task is quite difficult under normal circumstances because of the presence of other variable factors which also influence the nighttime accident rate. However, by careful analysis of traffic accident records, it is possible to show that accident rates at night are decreased as a result of improved lighting conditions or, in other words, higher levels of illumination. By examination of traffic accident reports received from the Traffic Section of the Chicago Park District, it is possible to show graphically the value and importance of higher levels of street lighting in reducing the nighttime accident rate. On Michigan Boulevard between the river and 12th Street where the average lighting level was 0.144 ft-C, the night accident rate per million miles of travel for all accidents is 17.9. Between 12th and 16th where the light level was 0.350 ft-C, the accident rate is 11.9, and in the section from 16th Street to 22nd Street which has an average lighting level of 0.88 ft-C, the accident rate is 9.5. Therefore, a definite tendency to reduce the nighttime accident rate by increasing the average lighting level is observed. This is a boulevard on which the various sections fall in the same general classification in relation to vehicle miles traveled; that is, having more than 10 million vehicle miles of travel per year.
R 10

30,554
Baumann, F.H. REVIEW OF TRAFFIC-PAINT RESEARCH. Report from: "Pavement-Marking Materials, 1952, Highway Research Board Bull. 57." 1952, 23-31. National Academy of Sciences - National Research Council, Washington, D.C. (New Jersey State Highway Dept., State of New Jersey). (Report from: "Thirty-First Annual Meeting, January 1952.")

In the early years of the present century it became apparent, with increasing demand for traffic stripes, that paints must be developed which had certain special properties. This paper is an outline of the recorded research for the formulation and testing of traffic-marking paints. Consumers' and manufacturers' opinion on improved properties of traffic paints point the way for additional research.
R 23

30,555
Straub, A.L. & Allen, T.M. SIGN BRIGHTNESS IN RELATION TO POSITION, DISTANCE, AND REFLECTORIZATION. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 13-44. National Academy of Sciences - National Research Council, Washington, D.C. (Virginia Council of Highway Investigation & Research, State of Virginia & University of Virginia, Charlottesville, Va.). (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

There is need for quantitative comparison of the brightnesses of different sign material in various situations on the highway. This paper describes a method for calculating the brightness of a reflective material, for a given distance and placement. The method is applied to investigate the effects of distance and placement. The method is applied to investigate the effects of such factors as sign position with respect to the pavement, type of reflective material, type of headlamp, type of vehicle, and vertical and horizontal curves. Relationships of these factors to sign legibility and their implications for signing practice are discussed.
R 13

30,556
Fries, J.R. & Ross, L.J. HEADLIGHT GLARE VS MEDIAN WIDTH. Report from: "Night Visibility, 1961, Highway Research Board Bull. 298." 1961, 51-55. National Academy of Sciences - National Research Council, Washington, D.C. (Idaho Department of Highways, Boise, Idaho).

The glare of approaching headlights reduces a driver's ability to see. When the lights of an approaching automobile remain on high beam during the passing maneuver, most drivers are blinded by the dazzling light and are unable to observe clearly an obstacle on the highway within the limits of the driver's headlight illumination. Object of study was to determine median width to best avoid the blinding glare from high-beam headlights of oncoming automobiles, and therefore, allow a driver to see an obstacle on the highway at a safe stopping sight distance.

30,557
de Boer, J.B. ROAD SURFACE LUMINANCE AND GLARE LIMITATION IN HIGHWAY LIGHTING. Report from: "Night Visibility, 1961, Highway Research Board Bull. 298." 1961, 56-73. National Academy of Sciences - National Research Council, Washington, D.C. (Lighting Lab., N.V. Philips' Bloeilampenfabrieken, Eindhoven, The Netherlands).

A survey is given of the results of a) stationary (indoor and outdoor) and dynamic (outdoor) visibility tests, b) subjective appraisals of road surface luminance in lighted streets, and c) recordings on the use of headlights under several lighting conditions. From these results it can be concluded that the road surface luminance should be at least 0.6 ft-L (2 cd/m^2) in order to make dense road traffic safe and comfortable. Investigations on glare in lighting for road traffic show that visual comfort of drivers is a graver criterion for glare limitation than the impedance of seeing ability. This means that in installations where glare stays within the borders of visual comfort, disability glare will be negligible. The paper gives a survey of results on this matter providing basic data for the necessary limitation of glare in lighting installations for road traffic. The luminance of the road surface and its distribution determines to a large extent the quality of the installation from a viewpoint of safety and comfort of traffic. The possibility of practical application of the luminance concept in public lighting is, therefore, a matter of high importance. This possibility depends on the availability of convenient methods for computing and measuring road surface luminances. A brief description is given of a simple method of calculation as well as of a photoelectric luminance meter for street lighting purposes both intended for use in everyday practice.
R 14

30,558
Blensly, R.C. & Head, J.A. STATISTICAL DETERMINATION OF EFFECT OF PAVED SHOULDER WIDTH ON TRAFFIC ACCIDENT FREQUENCY. Report from: "Highway Accident Studies, 1960, Highway Research Board Bull. 240." 1960, 1-23. National Academy of Sciences - National Research Council, Washington, D.C. (Oregon State Highway Dept., State of Oregon).

This investigation represents research by the Oregon State Highway Department in the use of statistics to explain how the width of paved shoulders on level and tangent rural 2-lane high-ways affects accident frequency. Two different approaches were taken. Correlation procedures were used to evaluate the relationship between paved shoulder width and accident occurrence, and variance measures were employed to analyze the difference between the average accident frequency on sections with narrow paved shoulders (4 ft or less) and the average accident frequency on sections with wide paved shoulders (8 ft or more). The partial correlation technique established that when the effects of other roadway elements were eliminated and the sections grouped in various ADT ranges, no significant relationship between accident frequency and paved shoulder width was evident except in the 2,000-2,999 ADT range where property damage and total accidents showed a significant tendency to increase in frequency as paved shoulder width increased. The analysis of co-variance procedure established that when the effect of ADT was controlled there was a significantly higher mean number of property damage and total accidents on sections with wide paved shoulders than there was on sections with narrow paved shoulders in the 1,000-5,600 ADT range. The results of this study should be interpreted with extreme caution, inasmuch as the traffic volumes on the bulk of the sections were less than 5,000 vehicles per day.
R 6

30,559
Keese, C.J. & Pinnell, C. EFFECT OF FREEWAY MEDIANS ON TRAFFIC BEHAVIOR. Report from: "Traffic Behavior on Freeways, 1960, Highway Research Board Bull. 235." 1960, 1-18. National Academy of Sciences - National Research Council, Washington, D.C. (Texas Transportation Institute, Texas A & M College, College Station, Tex.).

This paper presents a portion of the material developed during a series of traffic behavior studies conducted on freeways in Texas. The research was conducted by the Texas Transportation Institute for the Texas Highway Department and was designed to obtain data which would be useful in evaluating freeway median design. The field studies utilized the Bureau of Public Roads' electronic traffic behavior equipment which permitted the recording of data on volume, speed, and vehicle placement for each of several freeway lanes. Studies were made on 6 different sections of freeways located in Houston, Dallas, and Fort Worth, Texas. Approximately 50,000 observations were analyzed. Statistical analyses were made to determine the effect of various types of median designs on traffic behavior. Vehicle placements were used as a criterion of traffic behavior and the variations in these placements were compared for various median designs. Studies were also made before and after the erection of a barrier fence on the 4-ft median of the Gulf Freeway in Houston to determine the effect of this fence on traffic behavior. This study utilizes data obtained by use of the Bureau of Public Roads' equipment and from motion picture studies conducted by the Texas Transportation Institute. The analysis of the data indicated that average vehicle placements did not vary greatly, but that different type and width medians had some effect on traffic behavior. The wider medians reduced the effects of opposing flows and high volumes.

30,560
Keese, C.J., Pinnell, C. & McCasland, W.R. A STUDY OF FREEWAY TRAFFIC OPERATION. Report from: "Traffic Behavior on Freeways, 1960, Highway Research Board Bull. 235." 1960, 73-132. National Academy of Sciences - National Research Council, Washington, D.C. (Texas Transportation Institute, Texas A & M College, College Station, Tex.).

In 1956 the Texas Transportation Institute initiated a research project for the Texas Highway Department to correlate freeway operational characteristics with design features. A preliminary report of this study has been published in HRB Bulletin 170. The data presented herewith represent additional studies and analyses of this work. The study was made principally by the motion picture method, which facilitated the simultaneous evaluation of various operational characteristics and provided the distinct advantage of being able to re-create traffic situations for more thorough study. Traffic operations were recorded on approximately 22,000 ft. of 16-mm film during the course of 9 separate studies made on freeways in Houston, Dallas, and Fort Worth. Research was conducted on: operation and capacity, freeway volume control, lane use and placement, entrance ramps, and weaving. A study of freeway median design was also made and the results are being presented in a separate report. The results of these various studies indicate that the factors having the greatest effect on freeway operations are the design and operation of ramps and interchanges. Additional research and development are needed in this area. The volume control, weaving, and entrance ramp studies produced some significant results which are discussed in the report and will contribute to overall knowledge of freeway operation.
R 2

30,561
Taragin, A. & Rudy, B.M. TRAFFIC OPERATIONS AS RELATED TO HIGHWAY ILLUMINATION AND DELINEATION. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 1-29. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C. & Connecticut State Highway Dept., Wethersfield, Conn.).

Increasing construction of freeways has stimulated much discussion of highway illumination and its possible value in providing more comfortable night driving, in the possibility of increasing night usage of the highway, and in reducing traffic accidents. Because of lack of factual knowledge on the subject, the Connecticut State Highway Department in cooperation with the U.S. Bureau of Public Roads undertook a comprehensive study of illumination and delineation on the Connecticut Turnpike. Driver behavior data were recorded under 9 different conditions of highway illumination and delineation at one onramp and one offramp on a mercury-illuminated section of the Connecticut Turnpike. Accident data were obtained on the 53-mi continuous illuminated section and on the 76-mi nonilluminated section. For the various conditions of illumination and delineation, the results showed no significant differences with respect to average vehicle speeds, lateral placements, and clearances between vehicles. The manner of night use of speed change lanes, particularly the acceleration lane, improved with increased illumination. In general, it appears that some beneficial results of illumination in the deceleration area are derived when it is used at the full level and that even greater service is provided when illumination is combined with roadside delineation; and that illumination of the "interchange area only" does not appear to be advantageous insofar as the onramp site is concerned. The importance of delineation, with or without illumination, is demonstrated. Analysis of the accident data for the lighted and unlighted sections of the Connecticut Turnpike did not provide conclusive results because of the extreme variance in traffic volumes and other characteristics.

30,562
Fitzpatrick, J.T. UNIFIED REFLECTIVE SIGN, PAVEMENT AND DELINEATION TREATMENTS FOR NIGHT TRAFFIC GUIDANCE. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 138-145. National Academy of Sciences - National Research Council, Washington, D.C. (Reflective Products Div., Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Consideration of the perception factor in night visibility has led to the joint evaluation of a recognized guidance concept and new reflective materials recently installed at a typical interchange. The retro-reflective treatment was specifically designed to distinguish by color, brightness, and position the location and design of exit and merging ramps. High intensity delineation was used for distant identification. For close approach, paved ramp surfaces were reflectorized for 200-300 ft. Yellow delineation and road surfaces for merging zones formed an integrated system denoting the required caution. For maximum contrast with its complement, and based on airfield practice for off-ramp guidance, a similar system in blue was used for exit areas and pertinent destination signs. Silver through lane delineation was retained with standard green guide signs. To provide adequate differential between green and blue signs, a distinctive blue sheeting was employed. Color and brightness requirements also established criteria for delineation and reflective road treatments. With upper beams, the reflective blue roadway initially provides 6 ft-L luminance at 200 ft., the yellow, 40 ft-L compared to the untreated pavement returning 0.08 ft-L. The substantial increase in road surface luminance offers markedly improved contrast over the surround in both color and brightness. Integrated, color-keyed reflective systems thus afforded, suggest a method for effectively providing the motorist's visual cue and guidance needs night and day.
R 11

30,563
Howard, J. & Finch, D.M. VISUAL CHARACTERISTICS OF FLASHING ROADWAY HAZARD WARNING DEVICES. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 146-157. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation and Traffic Engineering, University of California, Berkeley, Calif.).

Previous investigations of the visual characteristics of flashing light sources, for the most part, have been made at low-energy levels at or near a visual threshold by means of extended sources. Although the results of these investigations have proved useful, they are not directly applicable to the design of portable battery-operated warning lights where conditions are somewhat different. These devices are usually first seen as nearby point sources under suprathreshold conditions. New data have been developed which relate to the important physical characteristics, such as flash duration and wave form, that directly affect the perceptual clues provided by such warning devices. The effect of duration and wave form on the effective intensity of point sources of flash energies of 0.1 candlepower-seconds (red light) has been investigated by performing intensity matches between 2 modulated sources, one of which has a fixed duration and peak intensity. At this flash energy, which was chosen as being significantly above a visual threshold for a dark-adapted eye and as being readily obtainable by currently manufactured devices, flashes that have durations longer than 50 msecs require more energy to have an equal visual effect than flashes of shorter duration. This result is highly important to the conservation of battery energy. Other factors that influence the design of battery-operated units (for example, flash rate, flash energy, and placement of units) are discussed.
R 27

30,564
Mortimer, R.G. THE EFFECT OF GLARE IN SIMULATED NIGHT DRIVING. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 57-62. National Academy of Sciences - National Research Council, Washington, D.C. (Purdue University, Lafayette, Ind.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

Two experiments were carried out in the laboratory in which illumination and glare conditions in night driving were simulated. Steering accuracy was measured as the dependent variable. The interactions between roadway illumination, glare illumination, glare duration and glare frequency were investigated. It was found that there were no differences in performance between the glare illumination levels used in these studies, and that the duration and frequency variables (which reflect traffic speed and density) required further clarification. Road illumination was clearly important as well as the overall effect of glare in tracking performance. The presence of high order interaction effects showed that the investigation of glare phenomenon was complex. It was suggested that the glare hazard and the problems of night visibility could be alleviated by increased reflectance of road surfaces and objects in the road. With respect to the glare source it was felt that the power of current headlamp units should not be decreased since this would lead to undesirable loss in road illumination. Headlamp units would require further redesign to reduce glare.
R 8

30,565
Darrell, J.E.P. & Dunnette, M.D. DRIVER PERFORMANCE RELATED TO INTERCHANGE MARKING AND NIGHTTIME VISIBILITY CONDITIONS. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 128-137. National Academy of Sciences - National Research Council, Washington, D.C. (Minnesota Department of Highways, St. Paul, Minn. & University of Minnesota, Minneapolis, Minn.).

This study was undertaken to study driver performance and opinions under different conditions of night visibility and under the impact of various highway marking systems. Opinions obtained from drivers in this study suggest that they are more confident, have less difficulty, and have a better opportunity to do a good job of night driving when visibility and guidance are improved either by illumination, reflectorization, or both. It appears that the reflectorization treatment is readily related by the motorist to certain night driving needs. For example: a) A significantly smaller number of motorists made suggestions for improvements under Condition V--the combined condition of full illumination and experimental reflectorization--than under any of the other 4 conditions. The proportions of motorists making suggestions increased progressively for conditions of "experimental reflectorization," "full illumination," "standard delineation" and "dark;" b) Conditions of "full illumination" and "experimental reflectorization" appeared equally effective in reducing the incidence of driver difficulty in traversing the intersection; c) More than one-half the drivers under Conditions IV and V identified the pavement reflectorization as indicating areas of merging and/or exiting traffic; d) It was the opinion of the large majority of drivers under Conditions IV and V that the experimental reflectorization was an effective and helpful means of providing night driving guidance.

30,566
Rex, C.H. COMPARISON OF EFFECTIVENESS RATINGS- ROADWAY LIGHTING. Report from: "Night Visibility, 1961, Highway Research Board Bull. 298." 1961, 35-50. National Academy of Sciences - National Research Council, Washington, D.C. (Outdoor Lighting Dept., General Electric Company, Hendersonville, N.C.).

High priority by highway engineers is now being assigned to the evaluation of the broad benefits of roadway lighting. This stimulus of interest is directly attributable to the international engineering emphasis on seeing factor ratings. An even more important fact is that seeing ratings also provide a base which encourages evaluation of the humanitarian, traffic, and economic benefits by the many interested agencies. The night transportation benefits of roadway lighting are also susceptible to numerical evaluation. This progress will be aided by numerical ratings for the lighting provided in such simple terms as visual comfort and visibility. In many countries throughout the world, action with respect to figures-of-merit for both the seeing and traffic benefits of roadway lighting is interrelated and gaining new impetus. Seeing ratings are internationally interchangeable and may be communicated from one portion of the world to another. Interchange of information and ratings aids human progress throughout the world. Improvement of the public welfare is an underlying thought and impelling force for economists, engineers and scientists. Everyone gains by attention to, and more extensive use of, roadway lighting.
R 25

30,567
Lauer, A.R. AGE AND SEX IN RELATION TO ACCIDENTS. Report from: "Road-User Characteristics, 1952, Highway Research Board Bull. 60." 1952, 25-35. National Academy of Sciences - National Research Council, Washington, D.C. (Driving Research Lab., Iowa State College, Cedar Falls, Iowa). (Report from: "Thirty-First Annual Meeting, January 1952.")

A study of 7,692 Iowa drivers sampled from the drivers' license files was made to answer 2 fundamental questions: Are reported accidents equally distributed among the population, age and number of licensees? Are accidents distributed equally among licensed drivers when mileage is held constant? There is a preponderance of evidence that male drivers 30 and under contribute very heavily to the accident total. The differences from 18 to 23 are highly significant. Male drivers spend 5 years before improvement in their reported accident record appears. Women improve their records from the beginning of their driving period. Women differ from men at various age levels with respect to accidents reported against them. They drive much fewer miles a year than men and hold only about 25% of the licenses. They do about 10% of the driving and have about 9% of the accidents reported to the state. The chi-square test of men's and women's reported accidents was not significant, being 1.818, with a slight advantage in favor of women. There is little correspondence for equal population areas, graded from most-dense to least-dense populations, between reported accidents in these areas. There tends to be an excess of accidents reported in larger cities and deficiency of reporting in sparsely settled districts, counties and areas.
R 6

30,568
Gordon, D.A. & Michaels, R.M. STATIC AND DYNAMIC VISUAL FIELDS IN VEHICULAR GUIDANCE. Report from: "Road-User Characteristics, 1963, Highway Research Record Number 84." 1965, 1-15. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Traffic Systems Research Div., Washington, D.C.). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

Perceptual problems in vehicular guidance are considered here in the context of the positional, velocity and acceleration fields around the moving vehicle. These are very general and persistent aspects of the driver's visual environment. The approach is to examine the equations governing these fields, and the fields themselves, for features and regularities which might serve to explain human spatial perception. The following findings emerge from the analysis: a) The interpretive scaling of visual angle, which is the inverse of perspective effects in the positional field, is shown to be a key factor in size, distance and motion perception. b) Simple and obvious features of the visual environment, often ignored in explanations of space perception, are believed to provide the most important aids for vehicular guidance. The roadway ahead of the vehicle, for example, may be used to obtain the scale of the terrain and objects in it. c) The velocity field furnishes a reference for the seen movement of objects. However, the driver may see the field, his own vehicle, or part of the field of reference. If the foreground is taken as reference, a curious illusion of motion is seen. The background seems to rotate forward and around the foreground. This velocity parallax curl is based on the difference in velocity vectors in the foreground and background. d) Some difficulties are pointed out in the motion parallax indication of distance. e) Roadway boundaries and lane markings are used in aligning the moving vehicle with the road. This conclusion challenges the widely quoted view that the focus of expansion is the cue for the direction of sensed locomotion. f) The formulas derived indicate that angular acceleration increases as the square of vehicular speed. g) Evidence is provided that angular acceleration is not directly sensed. R 30

30,569
Rex, C.H. & Franklin, J.S. VISUAL COMFORT EVALUATIONS OF ROADWAY LIGHTING. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 101-116. National Academy of Sciences - National Research Council, Washington, D.C. (Outdoor Lighting Dept., General Electric Company, Hendersonville, N.C.).

Improved comfort for the motorist is one of the principal objectives in the advanced design of vehicles and roadways. This paper presents the use of the Guth evaluator for rating the relative visual comfort of roadway lighting systems. Outdoor, full-scale, field testing is involved as differentiated from ratings based on a previously described computation method.
R 28

30,570
De Rose, F., Jr. AN ANALYSIS OF RANDOM FREEWAY TRAFFIC ACCIDENTS AND VEHICLE DISABILITIES. Report from: "Freeway Operations, 1964, Highway Research Record Number 59." 1964, 53-65. National Academy of Sciences - National Research Council, Washington, D.C. (Michigan State Highway Dept., State of Michigan). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

The purpose of this study is to determine the frequency, duration, and character of random freeway traffic incidents, and also to investigate the factors influencing their occurrence. The study section is 3.2 mi, with television surveillance being accomplished by 14 remotely controlled television cameras. This section has such geometric features as portions of 6- and 8-lane divided, 9 on- and 9 off-ramps, a reverse curve and grades. It has carried as many as 160,000 vehicles per day for both directions. The lane and speed signal controls have been in operation of 1 1/2 yr. and the television system for 3 yr.

30,571
Gantzer, D. & Rockwell, T.H. EFFECTS OF DISCRETE HEADWAY AND RELATIVE VELOCITY INFORMATION ON CAR-FOLLOWING PERFORMANCE. Report from: "Road User and Vehicle Characteristics, 1967, Highway Research Record Number 159." 1967, 36-46. National Academy of Sciences - National Research Council, Washington, D.C. (Center for Naval Analyses, Arlington, Va. & Ohio State University, Columbus, Ohio).

On the basis of this exploratory work any generalizations are tenuous. The research does indicate that a discrete light display presenting headway and relative velocity information can improve car-following system performance. Over 60% reduction of headway variance can be obtained by using a headway bandwidth display alone at both target headways. Overall, the medium headway bandwidth display produced the best reduction in headway variance. The addition of the relative velocity bandwidth display reduced headway and relative velocity variances up to 47% and 58%, respectively, at the far distance. The relative velocity display in combination with large headway bandwidth appeared to have little effect at the close target distance. However, with small headway bandwidth the same general improvement as found earlier is seen. There appears to be no single display combination which is clearly optimal for the experimental conditions, although the SH-SR combination would be a leading candidate. If it is assumed that headway variance is an important performance criterion and that close target distance is more realistic for increased traffic flow, then the best display combination would appear to be the small bandwidth for both displays. However, the absolute performance improvement at the close target headways seems rather small. It appears that at the close target headway conditions, the driver may prefer to use other cues than those provided by the display.
R 5

30,572
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. X. LITERATURE 1964. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 67-73. National Academy of Sciences - National Research Council, Washington, D.C. (American Optical Company, Southbridge, Mass.). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

This is a brief review of the literature published in 1964.
R 102

30,573
Schoppert, D.W. TEAMING UP FOR SAFE DESIGN AND OPERATION. Report from: "Highway Safety, 1963 and 1964, Highway Research Record Number 79." 1965, 53-55. National Academy of Sciences - National Research Council, Washington, D.C. (Alan M. Voorhees & Associates). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

Highway transportation is obviously a team operation. Planning, design, construction, maintenance and operations all figure in the quality of service and, therefore, in the safety on a highway system. Proper planning can make a system of streets inherently safer. Generosity and consistency are necessary in design. Substandard design features are consistently associated with higher than average accident rates. Construction specifications relating to mineral aggregates and pavement mixtures can keep accidents down if they are drawn so that the end result is a pavement with good skid-resisting and light-reflecting qualities. Maintenance can keep accidents down by keeping sight distance unimpaired. When sight distance is less than 1,500 ft on 2-lane roads, the accident rate is twice that where it exceeds 2,500 ft. Even stretches of road with sight distances of 1,500 to 2,500 ft have about 1.5 times the accidents of those with unlimited sight distance. Where the obstructions occur infrequently, the accident rate is doubled. The full and proper use of signs and markings at curves has reduced night and day accident rates as much as 50 & 55%, respectively. Setting up through streets and keeping through traffic off local streets by using stop signs to define through streets has reduced the accident rate on the through and the 2 parallel streets. In 3 such cases in San Francisco, the reductions ranged from 17 to 37%. A signalized intersection with both a left turn lane and a special turning phase will generally have only one-third as many accidents as one with the left turn lane only. Mast arms to get the signal indications out where they can be seen more readily will also bring the accidents down.
R 3

30,574
Hulbert, S. EXPLORATORY WORK ON THE PROBLEM OF REDUCED VISIBILITY. FINAL REPORT. Calif. Standard Agreement 13632, Fed. Work Program HPR 1(3), June 1966, 10pp. Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.).

As part of a large statewide study of the effects of reduced visibility on traffic accidents, the Advisory Committee for the study in January 1965 voted approval for exploratory work to be conducted in the UCLA Driving Simulator Laboratory in an attempt to determine the feasibility of using the simulation laboratory to conduct research into the 4 general areas into which the overall study had been divided. The objective of the overall study is to determine means of giving advance warning to drivers of the need to exercise greater alertness and caution during periods of reduced visibility. Various means of meeting this objective are being considered in 4 general areas: a) Roadway and Signs; b) Law Enforcement; c) Public Information; d) Intervehicle Communication.

30,575
Mount, G.E., Case, H.W., Sanderson, J.W. & Brenner, R. DISTANCE JUDGMENT OF COLORED OBJECTS. J. gen. Psychol., 1956, 55, 207-214. (Psychology Dept., University of California, Los Angeles, Calif.). (Reprint)

Eight comparison stimuli consisting of 4 hues and their matching grays were judged for relative distance with each of 2 gray standards using a modified method of constant stimuli. The standards were placed at a distance of 200 ft from the observer and the comparison targets at distances ranging from 192 to 220 ft in intervals of 4 ft. A total of 128 comparison judgments were made by each of 168 Ss using one of the 2 gray standards. One of the gray standards was used with half of the Ss and the other gray standard with the other half. The results clearly demonstrate a dependence of judgments of distance on the difference in brightness of the 2 standards, on the relative brightness differences of the comparison stimuli and on the differences between the hue and gray comparisons. Thus, each comparison stimulus was seen nearest when compared to the standard which most nearly matched the background brightness. The lightest and darkest comparison stimuli were judged in front of the comparisons of intermediate brightness for each of the 2 standards. Each of the hue comparison stimuli were seen in front of their nearest matching grays. The form of the dependencies in each case was such that stimuli which contrasted most with the background were seen in front of the stimuli which contrasted with the background relatively less. The magnitude of the effects obtained would be expected to depend on the relative importance of other factors determining judgments of distance as well as the relative contrast of objects with the background in a visual field. The magnitude of contrast effects would appear to be greatest in situations for which the primary determiners of distance were equivocal or absent.
R 12

30,576
Finch, D.M. SURFACE-MOUNTED LIGHTS ON ROADWAYS--FOG STUDIES. Report from: "Night Visibility, 1961, Highway Research Board Bull. 298." 1961, 24-34. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Berkeley, Calif.).

The work done to date on airport runways, taxiways and high-speed turn-offs, plus the preliminary work on roadways and on model studies in the fog chamber, demonstrates the versatility and utility of the principle of lineal guidance obtained by light sources inset into pavement surfaces. The principle of guidance as now proposed is generally accepted for airport use. It is hoped that the next step will be to apply the principle to some of the more critical areas on roadways. This is being considered, and some tests have been made by the Connecticut Department of Highways in conjunction with one of the leading lighting equipment manufacturing companies. Another trial installation has been proposed for the Golden Gate Bridge at San Francisco. This installation would be a combination lane-marking system and center-lane reversal system. The operation would be accomplished by shifting the double line from the center to one lane each side of center, using lighted lights on suitable switching circuits. The extra-visual information provided by lighted lane-lines under good visibility conditions is a desirable feature. This means of providing added visual information under poor visibility conditions is highly desirable. Under poor visibility conditions the range of visibility of lighted lane-lines is far greater than with any of the present paint markings or border materials. In general, the visual range can be approximately doubled, using lighted lights, over that which is available using reflective-type marking materials. The low-wattage units placed on close spacings have been found to be preferable to higher-wattage units placed on wider spacings. One reason for this is that the continuity of the lineal pattern is improved and the glare per individual unit is greatly reduced.
R 10

30,577
Rex, C.H. PRINCIPLES AND FIGURES OF MERIT FOR ROADWAY LIGHTING AS AN AID TO NIGHT MOTOR VEHICLE TRANSPORTATION. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 67-82. National Academy of Sciences - National Research Council, Washington, D.C. (Outdoor Lighting Dept., General Electric Company, Hendersonville, N.C.). (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

Action for "open after dark" operation of the nation's motor vehicle transportation system must be accelerated. Really significant progress involves acknowledgement of the economic and social benefits to be gained. Progress also depends upon realization of personal accountability to protect and enhance the over-all welfare of the people. Night usefulness and value of streets and highways depends upon lighting. Although some critical and heavily-traveled sections of roadway have been lighted, more will be properly lighted, the extent depending upon the concentrated attention devoted to night traffic operations. The extra effort is small compared with the importance of the objectives and benefits to be gained. This paper presents the work of only a small group of engineers and technicians in an area in which the active interest of many is essential. Moreover, it is an effort to interest and implement night traffic progress, both now and in the immediate future. Observations, appraisals, estimates, and evaluations of the traffic and seeing effectiveness of roadway lighting may not require number ratings any more than that which is obvious. However, as an additional future aid "figures of merit" will be provided.

30,578
Blackwell, H.R., Pritchard, B.S. & Schwab, R.N. ILLUMINATION REQUIREMENTS FOR ROADWAY VISUAL TASKS. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 117-127. National Academy of Sciences - National Research Council, Washington, D.C. (Institute for Research in Vision, Ohio State University, Columbus, Ohio).

Rather extensive illumination data have been presented for each of 2 roadway visual tasks; that is, seeing a mannequin and a black dog at various distances down the roadway, with a variety of luminaire types and pavement surfaces. All measurements have been made under an illumination geometry which is representative of generally accepted practice in this country. The data suggest that an average value of 1.90 ft-C of horizontal illumination is required for adequate visibility of these targets when they appear in the driving lane 200 ft ahead. Nearly 3 times this much illumination, or nearly 5.7 ft-C will be required for the same targets to be adequately visible at the same distance when they appear in the curb lane. If the targets must be seen 300 ft ahead in the driving lane, more than 9 ft-C of illumination will be required and for 400-ft visibility in the driving lane nearly 48 ft-C will be required. Preliminary measurements indicate that there are more difficult roadway visual tasks than these, which will require even higher levels of illumination. These data reveal that there are visual tasks in night driving of sufficient difficulty so that interior levels of illumination will be required if these tasks are to be adequately performed. These results should not be surprising because the factors of small size, low contrast, and short viewing time will result in difficult visual tasks whether indoors or outdoors, and high illumination levels simply are required for adequate performance of such tasks. The present data do not suggest that impractical levels of roadway lighting are to be recommended for practical use, but they do provide a basis for evaluating what kinds of gains in visibility and hence improvements in the safety of night driving are to be expected with various increases in roadway illumination.
R 4

30,579
Powers, L.D. & Solomon, D. HEADLIGHT GLARE AND MEDIAN WIDTH. THREE EXPLORATORY STUDIES. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 1-28. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.). (Report from 43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

Three study methods were explored for determining the effect of location of an opposing glare vehicle on visibility at night. Both lateral separation and longitudinal distance between glare vehicle and observer were varied. In Study 1, both glare car and target were stationary; the observer drove toward the target and indicated when he could detect it. In Study 2, both target and observer were stationary while the glare car moved toward the observer; locations of the glare car were found for which the target was just visible to the observer. Study 3 involved a self-luminous target, and, as in Study 2, both target and observer were stationary while the glare car moved toward the observer; the observer continuously adjusted the brightness of the target and attempted to keep it barely detectable. Some limited measurements of discomfort due to glare were made, but this line of investigation was abandoned due to high variability in the results and the lack of an adequate definition of discomfort. The results showed that the effects of glare decreased with increasing lateral separation of the glare car, as expected. At any given lateral separation, the effects of the glare were present even when the glare car was at a considerable distance from the observer (3,000 ft or more); the rate of change of the effect with distance was small for a large part of this distance. Recommendations are made for the conduct of target detection studies of this type, remarks are made concerning the visual problems in night driving, and possible areas for future investigation are suggested.
R 24

30,580
McFarland, R.A., Domey, R.G., Warren, A.B. & Ward, D.C. DARK ADAPTATION AS A FUNCTION OF AGE AND TINTED WINDSHIELD GLASS. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 47-56. National Academy of Sciences - National Research Council, Washington, D.C. (Industrial Hygiene Dept., Harvard University School of Public Health, Boston, Mass.).

This study was designed to measure the relative effects of light-absorbing, clear, and tinted windshield glass on the terminal levels of dark adaptation in a large sample of Ss who varied widely in age. a) Both clear and tinted windshield glass reduce the amount of light that reaches the retina of the vehicle driver's eye. b) Tinted windshield glass transmits less light than clear windshield glass, where the transmission factor of clear windshield glass is about 90%, and the transmission factor of tinted windshield glass ranges from 55 to 70%. c) Some areas of tinted windshield transmit less light than is permitted by the American Standard Safety Code. The lower limit allowed by this code is 70% transmission. d) Dark adaptation is a function of age. e) Clear windshield glass interposed between the testlight and the eye of the S at terminal levels of dark adaptation is followed by a greater demand for light to just see the test stimulus, and therefore a rise in the dark adaptation curve. f) Tinted windshield glass interposed between the testlight and the eye of the S at terminal levels of dark adaptation is followed by a demand for light to just see the test stimulus that exceeds in magnitude the demand caused by clear windshield glass. g) Both clear and tinted windshield glass are impediments to vision under low levels of illumination for persons ranging in age from 16 through 89 years.
R 35

30,581
Moore, R.L. REAR LIGHTS OF MOTOR VEHICLES AND PEDAL CYCLES. Road Res. Tech. Paper 25, 1952, 20pp. Road Research Lab., Department of Scientific & Industrial Research, London, England.

The Road Research Laboratory has recently investigated the adequacy of rear lights on motor vehicles and pedal cycles. The research was of 2 kinds, a statistical examination of reported front/rear collisions at night and a study of the visibility of rear lights of various intensities. Both investigations led to the same conclusion, that the majority of vehicle rear lights on the road today are inadequate. Part of the accident analysis consisted of a comparison between the records of accidents at night to pre-war cars and post-war cars; the latter are fitted with greatly improved rear lighting. The results showed that a pre-war car, when stationary on the road at night, is about 6 times as likely as a post-war car to be hit in the rear by a following vehicle. Rear lights of commercial vehicles have not been improved to anything like the same extent as those of private cars and the records showed little difference between risks of front/rear accidents for pre-war and for post-war commercial vehicles. The analysis showed that inadequate rear lights caused about 3,400 casualties per year (about 9% of all night casualties). The effects of condensation on the windscreen and glare from opposing headlamps on the visibility distance of a rear light were studied and it was concluded that glare from opposing headlamps is probably the most important single factor reducing rear-light visibility. The judgement of the distance of a rear light was found to be greatly affected by the intensity and mounting height of the light. Bright lights appear near: high-mounted lights appear further away. It is concluded that the distances of rear lights could be more easily judged if they had a standard intensity and were mounted at a standard height. Further improvement would result if the 2 rear lights were placed a standard distance apart of 2 or more feet. Reliability tests were also made on popular makes of cycle rear lamps. Even a poor rear light was found to be more readily visible than either a reflector or a white mudguard; a white mudguard together with a reflector was better than either separately. R 2

30,582
Peckham, R.H. & Hart, W.M. THE ASSOCIATION BETWEEN RETINAL SENSITIVITY AND THE GLARE PROBLEM. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 57-60. National Academy of Sciences - National Research Council, Washington, D.C. (Eye Research Foundation, Bethesda, Md.).

Retinal sensitivity can be assayed by the measurement of the critical fusion frequency of an alternating light stimulus. The extent of the variation between individuals and the association of reduced sensitivity with increasing age was described to the Highway Research Board in 1959. It has been found that this reduced sensitivity is associated with a delay in shifting visual perception from low to higher levels of ambient illumination. The delay may be for a few seconds, or it may last nearly a minute. The lower retinal sensitivities are associated with greater delay to a degree that far exceeds chance, and retinal sensitivity may therefore contribute to the difficulties in night visibility under conditions of glare from the headlamps of an approaching vehicle. In order to understand the authors' method of assessing retinal sensitivity it is first necessary to consider the phenomenological aspects of flicker. In this set up, the level of a large background is maintained at a steady luminance, just matching the average of the alternating stimulus. But the stimulus does not alternate between darkness and brightness, it alternates between 2 brightnesses, one 5% above and the other 5% below the luminance of the background, at equal intervals. The authors prefer to describe the stimulus as alternating and the perception as scintillating, in order to avoid the semantic error of using the term "flicker" for both stimulus and perception. The experiment described in this report includes the following phases: a) Estimate of scintillation threshold at 50 cd/m^2 (approximately 15 ft-c); b) A period of adaptation to dim light, at 0.3 cd/m^2 (about 0.09 ft-c) for 5 min; c) A reassessment of scintillation threshold at 50 cd/m^2, starting near the upper end of the liminal range.
R 2

30,583
Kilgour, T.R. SOME RESULTS OF COOPERATIVE VEHICLE LIGHTING RESEARCH. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 92-100. National Academy of Sciences - National Research Council, Washington, D.C. (Chrysler Corporation, Detroit, Mich.).

The history of cooperative vehicle lighting research is given and illustrated by examples.

30,584
Roper, V.J. & Meese, G.E. MORE LIGHT ON THE HEADLIGHTING PROBLEM. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 29-34. National Academy of Sciences - National Research Council, Washington, D.C. (General Electric Company, Cleveland, Ohio). (Report from: "43rd Annual Meeting, January 13-17, 1964 & 44th Annual Meeting, January 11-15, 1965.")

Is there any practical way that seeing can be improved with the lower beam? Can the annoyance of headlamp glare be reduced? What is the effect of the headlamp mounting height on today's cars? How about the new quartz iodine headlamps that are being promoted in Europe? How much does alcohol--in the driver--affect seeing distances? Answers to these questions were sought in a recent series of seeing-distance tests using opposing cars with observer-drivers and observer-passengers. Two opposing cars, radio equipped and with the test headlamps, were started some 4,000 ft. apart on a 2-lane highway, accelerated uniformly to 40 mph with this speed maintained throughout the test run. Test obstacles 16 in. square and with 7% reflectance (dark gray) were placed at the right edge of the traveled roadway. There was a total of 10 obstacles, 5 ahead and 5 behind the meeting point. The observer-driver and observer-passenger ignored the obstacles on the left side of the road. They watched for the obstacles on the right side of the road only and indicated the moment of detection by pushing a button. A sufficient number of repeat runs were made to get a fair average of the seeing distance values as the 2 cars approached, passed at the meeting point and proceeded beyond. The data were plotted in curves with the seeing distances as ordinates and the distance between cars as abcissae up to the point of meeting, and the distance behind the meeting point after the point of meeting.
R 2

30,585
Peckham, R.H. & Hart, W.M. A HYPEREFFECTIVE VISUAL SIGNAL FOR NIGHT DRIVING WARNING DEVICE. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highwasy Research Record Number 25." 1963, 83-85. National Academy of Sciences - National Research Council, Washington, D.C. (Eye Research Foundation, Bethesda, Md.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

The enhancement of retinal sensitivity described in this report was first observed in electroretinographic studies of frogs. However, in the interest of brevity, only human perception is discussed here. There are many studies of flicker reported in literature, but they are almost all concerned with the upper frequency terminus of the visual perception; i.e., they are concerned with a rate of iteration so fast that the iterative stimulus seems to be a steady light--i.e., at the cff. The present study is also concerned with iterative stimulation, but at very slow frequencies, near 5 per sec. At very slow rates, the stimulus can be perceived as going on and off. If the stimulus is modified to be brighter and dimmer, instead of on and off, a brightness contrast can be found which is so low that the change in the stimulus cannot be seen. This is a visual threshold, and, of course, must be estimated by the usual psychometric procedure. However, at these slow rates, another and new variable can be introduced, the duty-cycle, or fraction of time within a single brighter-dimmer-brighter cycle in which the brightness occurs. This duty cycle is called "temporal contrast". Just as brightness contrast, $\Delta B/B$, varies from 0 to 100%, so temporal contrast, $\Delta T/T$, also varies from 0 to 100%. In presenting slow iterative stimuli, therefore, there are 2 contrast parameters--luminance and time. These 2 parameters can be independently superimposed on the rate of iteration or repetition. The interaction of these 2 parameters of visual perception were measured, and the preliminary results of these measurements are presented.
R 3

30,586
Schwab, R.N. NIGHT VISIBILITY FOR OPPOSING DRIVERS WITH HIGH AND LOW HEADLIGHT BEAMS. Report from: "Night Visibility, 1963 and 1964, Highway Research Record Number 70." 1965, 87-88. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.).

The relative visibility of 2 tasks which are typical of those encountered in the nighttime driving situation was explored using the Visual Task Evaluator (VTE) measurement technique. The tasks were illuminated with either high or low headlight beams. An opposing vehicle was located at one of several longitudinal separations with the same beam configuration as that of the observer's to simulate a single approaching vehicle at one of 4 different median widths. Disability glare measurements were made and the overall visibility evaluated through an analytical procedure. The 2 tasks studied were a) a red retro-reflector on the rear of an unlighted, black car, parked 500 ft. from the observer on the right shoulder, and b) a section of standard pavement stripe, 200 ft. ahead on the right-hand pavement edge. The results are given in terms of a Supra Threshold Factor (STF). This factor is a measure of how many times above threshold the visibility of an actual target is. Analysis of the data reveals that the shifts in visibility which accompany the switching from low to high or high to low beam are largely determined by changes in the level of adaptation.

30,587
Roeca, W.B., Jr. & Thomas, A.C. AN ANTI-REAR-END COLLISION SYSTEM. Report from: "Electronic Traffic Surveillance and Control, 1963, Highway Research Record Number 10." 1963, 1-9. National Academy of Sciences - National Research Council, Washington, D.C. (Electrical Engineering Dept., Ohio State University, Columbus, Ohio). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

In the study of electronic aids to highway safety, a particularly alluring subject has been the application of electronics to longitudinal control of individual cars. Two desired gains from this application are a reduction in the number of rear-end collisions and an increase in safe traffic density. The shortcomings of straightforward control techniques caused attention to be turned to the human driver. A mathematical relation which describes the motion of his car in response to that of a lead car is termed a driving criterion. A number of these criteria have been proposed as a result of measurements of traffic flow. A number of these relations have been examined, and all of them have been found inadequate to describe what the driver is actually doing. The inadequacy of the continuous criteria functions led to a more detailed examination of existing human driver characteristics obtained from an analog computer simulator in which the driver was following a lead car of constant velocity. This led Barbosa to propose the decision point model of the human driver. This model as developed by Todosiev helps to explain several characteristics of the human driver in the car-following situation. Mainly, though, it suggests that the driver instead of continuously tracking a continuous time variable, actually selects a constant acceleration and holds it until the variable exceeds some arbitrary threshold, at which time he changes to another level of acceleration and holds that, etc. The development of the automatic longitudinal control technique has paralleled this.
R 2

30,588
Meldrum, J.F. SURVEY OF AUTOMOBILE DRIVERS YIELDS STANDARDIZED DATA ON DRIVER EYE LOCATION. SAE J., March 1966, 74(3), 46-49. (Human Factors Research Dept., Ford Motor Company, Dearborn, Mich.).

An SAE-sponsored study--using disinterested driver-Ss and photogrammetric techniques--reveals a new shape to the driver's eye-location-zone, compared with that given in SAE Automotive Safety Glazing Manual.
R 2

30,589
Wolf, E., McFarland, R.A. & Zigler, M. INFLUENCE OF TINTED WINDSHIELD GLASS ON FIVE VISUAL FUNCTIONS. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 30-46. National Academy of Sciences - National Research Council, Washington, D.C. (Harvard University School of Public Health, Boston, Mass.).

Tinted windshields and side windows in automobiles have been introduced for 2 purposes: a) to eliminate a major portion of radiant infra-red energy, and b) to reduce excessive brightness and glare. The commonly used bluish-green tinted glass has a transmission of 65 to 70%, which is similar to that of sunglasses of light shade. At photopic (daylight) luminance levels the absorption of the glass is hardly noticeable. At mesopic (dusk) and scotopic (night) luminance levels a 30% reduction in transmission may interfere seriously with vision. To study the effects of tinted windshield glass on vision at various luminances, tests were performed on a) dark adaptation, b) recovery from the shock of a blinding light flash, c) visual acuity, d) depth perception, and e) the effects of glare. Dark adaptation tests showed that when looking through a tinted windshield the thresholds for recognition of test stimulus were higher than without an absorptive filter in the light path. When the eyes were adapted to low levels of luminance or to complete darkness and were suddenly exposed to a bright flash of light, recovery from the light shock and regaining of the previous sensitivity level was not enhanced by the presence of the tinted windshield glass. Visual acuity was reduced slightly by tinted windshield glass. Depth perception was also influenced by tinted windshield glass. A 25 to 35% loss in depth perception was observed when the test object was seen through tinted windshield glass. When test targets were identified in the vicinity of a glare source and the ratios of glare luminance/target luminance were determined when the targets are viewed through tinted windshield glass and without the filter, it was found that the ratios remained the same whether tinted windshield glass was in the path of view, or vision was not obstructed by filters.
R 27

30,590
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. II. LITERATURE 1952-1956. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 58-66. National Academy of Sciences - National Research Council, Washington, D.C. (Research Center, American Optical Company, Southbridge, Mass.). (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

This is a review of literature pertinent to night driving for the years 1952-1956. Topics covered are: a) dark adaptation, b) glare, c) colored light, d) night myopia, e) visual acuity, and f) night driving vision.

30,591
Michaels, R.M. TENSION RESPONSES OF DRIVERS GENERATED ON URBAN STREETS. Report from: "Increasing Traffic Capacity of Arterial Streets, 1960, Highway Research Board Bull. 271." 1960, 29-44. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.).

The present study was an attempt to relate driver tension responses to those events in traffic which caused an overt change in speed or lateral location of a test vehicle. The results indicated that traffic events occurred, depending upon the street, at a rate of one every 21 to 35 sec. Of these, 85% generated a measurable GSR response. Depending upon the street, the majority of responses were caused by other vehicles in the traffic stream, accounting for 60% or more of all events. The events which generated the greatest mean tension response were those involving a maximum difference in speed between the object and test vehicle. Thus, turning maneuvers and crossing and merging were most tension inducing. The least stress inducing events were related to fixed objects in the environment, such as parked vehicles or islands. This ordering was statistically reliable among the Ss. The results of this study indicate that a road generates tension in drivers inversely with the predictability of the interferences and directly with the complexity of the traffic situation with which they must deal. In addition, the magnitude of tension response is directly related to the rate at which decisions are forced upon the driver by the traffic. Finally, the results indicate that the GSR is a promising tool for the study of the conflicts occurring in driving.
R 9

30,592
Rex, C.H. EFFECTIVE LIGHT DISTRIBUTIONS FOR ROADWAY LIGHTING. Report from: "Special Committee on Night Visibility, Highway Research News Number 9, Nov. 1963." Nov. 1963, 12-14. National Academy of Sciences - National Research Council, Washington, D.C. (Outdoor Lighting Dept., General Electric Company, Hendersonville, N.C.).

Increased visibility and seeing comfort for night motorists is being provided by more effective restrictive control and more appropriate proportioning of the light distribution from roadway system luminaires. The skills of the lighting designer are now being enhanced and implemented by new data which pertain directly to the seeing factor benefit afforded the public from its investment in roadway lighting systems. Such data have not heretofore been widely used. Their availability for appreciation, appraisal, and evaluation of effectiveness is progress which has been significantly aided by the Highway Research Board.

30,593
Allen, T.M. & Straub, A.L. SIGN BRIGHTNESS AND LEGIBILITY. Report from: "Night Visibility, 1955, Highway Research Board Bull. 127." 1956, 1-14. National Academy of Sciences - National Research Council, Washington, D.C. (Virginia Council of Highway Investigation & Research, State of Virginia).

There is need for basic information on relationships between legibility of signs and the brightness of reflectorized materials. 4 factors of primary importance to the night legibility of signs are sign brightness, the level of illumination to which the eye is adapted, characteristics of letters, and contrast direction (black letters on white or vice versa). These factors were investigated in a field experiment and a laboratory experiment to gather information on the effects of these factors and their interrelationships on legibility. Complex relationships among factors were found, and legibility distances for different combinations of factors ranged from 22 to 92 feet per inch of letter height. Relationships are discussed with respect to the use of reflectorized materials. The study is part of a larger study on highway signs, and future work will relate sign legibility to characteristics of reflectorized materials.
R 23

30,594
Mortimer, W.J. MOVING VEHICLE METHOD OF ESTIMATING TRAFFIC VOLUMES AND SPEEDS. Report from: "Traffic Speed and Volume Measurements, 1957, Highway Research Board Bull. 156." 1957, 14-26. National Academy of Sciences - National Research Council, Washington, D.C. (Highway Dept., Cook County, Ill.).

The two most commonly used methods for obtaining traffic volumes are the machine count and the manual count at fixed locations or stations, and for a number of hours duration. These methods are expensive and time-consuming. Many attempts have been made in the past to develop sampling techniques whereby the total volume of traffic could be estimated by sampling only a relatively small portion of the total traffic flow. One such technique was recently developed in England by Wardrop and Charlesworth and reported under "A Method of Estimating Speed and Flow of Traffic from a Moving Vehicle." The Cook County Highway Department investigated this technique to test its usefulness in this country, considering only the estimation of the flow of traffic. If a large number of sections are to be sampled, with the idea of estimating the total combined volume of all sections, the method appears to be very useful, for while in any single section there may be a sizeable error, these errors appear to cancel out when sections are combined. If a fixed degree of precision is required on all sections, the sampling time will vary inversely with the volume in question. It appears, at present, that for estimating total traffic volume flow or total vehicle miles driven, this method is the fastest and may well be the most economical. Studies are underway to compare the cost of this method with other known and accepted methods.
R 3

30,595
Thomas, I.L., Jr. & Taylor, W.T., Jr. EFFECT OF EDGE STRIPING ON TRAFFIC OPERATIONS. Report from: "Effects of Traffic Control Devices, 1960, Highway Research Board Bull. 244." 1960, 11-15. National Academy of Sciences - National Research Council, Washington, D.C. (Louisiana Department of Highways, State of Louisiana).

During 1956, the Louisiana Department of Highways, in conjunction with the Bureau of Public Roads conducted a number of research studies on US 71 near LeBeau to determine the effect of pavement edge striping on the lateral placement of vehicles on 24-ft tangent highways. Results of the study indicated that a continuous edge stripe or line had no effect on vehicle placement during the day, but at night the continuous line tended to move vehicles slightly toward the centerline. During the summer of 1957, the department, again in cooperation with the Bureau of Public Roads, repeated the placement study on 24-ft tangent highways in a different part of the state in an effort to verify findings of the initial study. In addition, the scope of the study was broadened to include a study of a section of tangent 20-ft roadways, a section of 20-ft roadways on a 4-deg curve, and a section of 4-lane divided highway with 12-ft lanes in one direction and 10-ft lanes in the other. In all cases, shoulders were in color contrast to the through roadways.

30,596
Head, J.A. PREDICTING TRAFFIC ACCIDENTS FROM ROADWAY ELEMENTS ON URBAN EXTENSIONS OF STATE HIGHWAYS. Report from: "Traffic Accident Studies, 1958, Highway Research Board Bull. 208." 1959, 45-63. National Academy of Sciences - National Research Council, Washington, D.C. (Oregon State Highway Dept., State of Oregon).

The investigation described in this report represents research by the Oregon State Highway Department to develop equations which can be used to predict accidents on the urban extensions of the State Highway System from roadway elements such as average daily traffic (ADT), commercial and residential units and driveways, intersections, signalized intersections, indicated speed, pavement width, effective lane width, and the number of lanes. The more important conclusions which can be drawn from the study are as follows: a) Motor vehicle accident rates are related to certain physical features of urban extensions of the highway system. This relationship is strong enough in the higher ADT ranges to make it possible to predict accident rates with a reasonable degree of accuracy on the basis of known physical features; b) Accident rates on low volume roads do not have a strong relationship with any roadway feature; c) Motor vehicle accident rates increase when: (1) The number of commercial units adjacent to the section increases; (2) The number of traffic signals increases; (3) The number of intersections increases; (4) The indicated speed decreases; (5) The average daily traffic increases; (6) The pavement width increases.
R 4

30,597
Snider, J.N. & Ernst, R.L. A STUDY OF DRIVER VARIABILITY IN CAR FOLLOWING AND OPEN ROAD DRIVING. Report from: "Road-User Characteristics, 1963, Highway Research Record Number 84." 1965, 34-40. National Academy of Sciences - National Research Council, Washington, D.C. (Sytems Research Group, Ohio State University, Columbus, Ohio). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

This research investigated the variability of driver velocity control when operating a vehicle under 8 different treatment conditions. The following 3 variables were considered: a) an instruction for normal or best control; b) presence or absence of a leading vehicle; and c) presence or absence of a speedometer.

30,598
Greenshields, B.D. TRAFFIC ACCIDENTS AND THE QUALITY OF TRAFFIC FLOW. Report from: "Traffic Accident Studies, 1958, Highway Research Board Bull. 208." 1959, 1-15. National Academy of Sciences - National Research Council, Washington, D.C. (Transportation Institute, University of Michigan, Ann Arbor, Mich.).

This is a report of an attempt to find if there is a correlation between the quality of traffic flow and the frequencey of highway accidents. The term "quality" characterizes the traffic stream and indicates the manner in which vehicles move. Using single vehicle accidents only, the following comparisons were obtained:

Road	Quality Index	Single Vehicle Accidents Per Million Vehicle-Miles
A (two lane)	618	1.28
B (two lane)	1023	0.36
C (three lane)	1930	0.25

The table shows that for single vehicle accidents the higher the quality the lower the accident frequency. The fact that there were more accidents on the curving road than on the straighter one, points to the need for including change of vehicle direction as well as change of speed in the quality index. The results of this limited study show that improving the quality of traffic flow should reduce accidents. Apparently the inherent characteristics of flow in a traffic stream tend to make it safe or hazardous.
R 1

30,599
Perchonok, K. & Seguin, E.L. VEHICLE FOLLOWING BEHAVIOR: A FIELD STUDY. Rep. 5, Sept. 1964, 18pp. Highway Studies Div., Institute for Research, State College, Penn.

Using naturalistic data obtained at a multilane urban expressway, 2 correlational measures, η^2 and r, were employed to quantify the influence exerted upon acceleration behavior by distance headway, relative speed, and the ratio of the two. Major results showed each of the 3 stimulus variables exerted significant influence upon acceleration behavior; however, each of the stimuli accounted for only a minor part of the observed acceleration variance. It was found that distance headway was effective only for short vehicle spacing, and that relative speed exerted maximum influence for vehicle separations in the 50 to 100 foot range. For longer headways, no significant effects were found.
R 5

30,600
Michaels, R.M. EFFECT OF EXPRESSWAY DESIGN ON DRIVER TENSION RESPONSES. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 16-25. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.).

This study was an attempt to use the galvanic skin response (GSR) technique to differentiate among the characteristics of 4 different expressway designs under different volume conditions 6 test Ss drove an 8- to 10-mi section of each highway 4 to 8 times and events causing a speed or placement change were recorded. Only GSR aroused by the observed events was analyzed. The data were broken down by routes, volume, type of conflicts, and Ss. Using the analysis of variance it was found that there were significant differences among the designs on both design and traffic characteristics. Correcting for volume it was found that the interstate design highway generated the lowest GSR rate relative to traffic interferences with the parkway and divided highway with only partial control of access generating the highest. On interferences related to design features, however, the interstate design yielded the highest GSR rate. One reason for this reversal appears to be the higher speeds on the interstate System. The results indicate that the GSR rate is directly related to the frequency of interferences and their relative predictability up to the point where the information load becomes excessive. At this point tension increases very rapidly. Also, the data indicate that modern highway design eliminates a large part of the major traffic conflicts. However, this reduction apparently leads to an increase in speed, which causes increased tension arousal from interaction with the physical characteristics themselves. Thus, GSR rate on highway interferences is higher on the highway of the most modern design.
R 2

30,601
Normann, O.K. COMPARISON OF DRIVER BEHAVIOR ON LIGHTED AND UNLIGHTED HIGHWAYS. Report from: "Night Visibility, 1958, Highway Research Board Bull. 191." 1958, p62. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.).

During the fall of 1957 the Bureau of Public Roads in cooperation with the Illinois and Michigan State Highway Departments, the Cook County and Wayne County Highway Departments, and the city of Detroit, Department of Streets and Traffic, conducted driver behavior studies at a number of locations on freeways in the Chicago and Detroit areas. Some of these were lighted and others unlighted. Driver behavior at night on the lighted and unlighted sections will be compared with the daytime behavior. It will be several months before the results of these studies are available.

30,602
Bauer, H.J. SOME SOLUTIONS OF VISIBILITY AND LEGIBILITY PROBLEMS IN CHANGEABLE SPEED COMMAND SIGNS. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 60-68. National Academy of Sciences - National Research Council, Washington, D.C. (General Motors Research Laboratories, Warren, Mich.).

This report details the unusual, as well as the usual, design criteria specified for a discrete-bulb, matrix, speed command sign. Laboratory tests and various results are discussed. The interaction effects found among criteria meeting design specifications are pointed out. The speed command sign in use with the "Traffic Pacer" system in Warren, Mich., is the end product of the research. Specifications, sketches, and photographs, as well as research data, are included.

30,603
Pritchard, B.S. & Blackwell, H.R. OPTICAL PROPERTIES OF THE ATMOSPHERE AND HIGHWAY LIGHTING IN FOG. Report from: "Night Visibility, 1958, Highway Research Board Bull. 191." 1958, 7-16. National Academy of Sciences - National Research Council, Washington, D.C. (Vision Research Labs., University of Michigan, Ann Arbor, Mich.).

The light transmission and polar scattering properties of natural and artificial fogs have been measured. Since polarization effects in scatter are very large, considerable effort has been devoted to obtaining complete polarization information. These data will be used to design and evaluate improved lighting systems for use on the highway in fog. For each proposed system, the luminances and contrasts of objects as seen through the fog can now be computed. The scattering curves have already suggested some improvements which might be made, and these have been viewed in a 3:1 scale model simulator at the Pennsylvania State University and in a 25:1 simulator at the University of Michigan. These tests have demonstrated that visibility in fog can be improved by changing the candlepower distribution of street lights to avoid forward scatter, by employing vehicle fog lights which are mounted as far as possible away from the driver's line-of-vision, and by increasing the candlepower of taillights. Polarization techniques may also prove to be valuable. Quantitative information about the improvements to be gained by these and other changes will be obtained in an improved simulator now under construction.
R 4

30,604
Huber, M.J. TRAFFIC OPERATIONS AND DRIVER PERFORMANCE AS RELATED TO VARIOUS CONDITIONS OF NIGHTTIME VISIBILITY. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 37-50. National Academy of Sciences - National Research Council, Washington, D.C. (Bureau of Highway Traffic, Yale University, New Haven, Conn.).

During the summer months of 1959 the Traffic and Planning Division of the Minnesota Highway Department and a manufacturer of highway sign materials conducted a joint field study of an experimental reflectorized color guidance system installed in the cloverleaf interchange at the intersection of US 61 and Minn 36. This is a report of the experimental results of traffic surveys and driver interviews made for the study. A description of the reflectorized system is included.
R 2

30,605
Elstad, J.O., Fitzpatrick, J.T. & Woltman, H.L. REQUISITE LUMINANCE CHARACTERISTICS FOR REFLECTIVE SIGNS. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 51-60. National Academy of Sciences - National Research Council, Washington, D.C. (Reflective Products Div., Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Signing on urban and rural roadways exhibits a complex of sign positions and ambient illumination levels suggesting need for determining optimum characteristics for retro-reflective materials under these conditions. Other studies have evaluated available reflective materials for individual effectiveness. This study is designed to establish reflective characteristics required for any installation and suggests a brightness range for typical sign environments. Ideally, consistent luminance would be maintained through approach distances for all sign positions. Iso-illuminance and iso-divergence data indicate varying illuminance and retro-reflective deficiency throughout the approach. However, inverse relationship at generally useful distances indicates little modification of the classic divergence curve is necessary for materials considered. Ambient illumination of sign surfaces commonly ranges from 0.4 ft-c in illuminated areas to less than 0.1 in rural locales. Current reflective materials provide good gigh beam performance and adequate low beam performance where ambient illumination incident on the sign surface does not exceed 0.4 ft-c. In excess of 0.4 ft-c, stream traffic provides additional useful luminance. Sufficiency values for sign luminance are presented for dark and illuminated locales.
R 6

30,606
Finch, D.M. & Palmer, J.D. ASSESSMENT OF NIGHTTIME ROADWAY VISIBILITY. Report from: "Night Visibility, 1957, Highway Research Board Bull. 163." 1957, 1-16. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Berkeley, Calif.).

Approximately 7 visibility meters have been described in the literature during the last 20 yrs. The salient features of each of these instruments along with their limitations and applications are briefly discussed. The U.C. Visibility Meter is discussed in detail. The design equations of the U.C. Visibility Meter are given together with the criteria for a suitable visibility meter. Details of optical parts and calibration are included to show compliance with the design criteria. The U.C. instrument has been used to evaluate the visibility conditions of two extremes of street lighting, that is, a uniform and an extremely non-uniform roadway brightness pattern. Under each condition of a 2-dimensional and a 3 dimensional target was used to gather information. Results of these roadway studies are presented. These results show a great variation in visibility under the non-uniform roadway brightness pattern and less variation in visibility under the uniform roadway brightness pattern. The peak visibility of the non-uniform condition is only slightly greater than the average visibility level of the uniform condition.
R 10

30,607
Hofer, R., Jr. GLARE SCREEN FOR DIVIDED HIGHWAYS. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 95-101. National Academy of Sciences - National Research Council, Washington, D.C. (Sales Development Div., Aluminum Company of America, New Kensington, Penn.).

Several forms of glare screen are in use today. These include plantings of shrubbery, wood or metal fences placed parallel to the centerline of the highway, and intermittent fences of wood or metal placed in a louvered pattern, or placed at 90° to the centerline of the highway. Each type has advantages and disadvantages, but the screen found most satisfactory is a line of expanded metal mesh, erected in the median strip, parallel to the centerline of the highway. Because of the manufacturing process involved in making expanded metal mesh, the manufactured screen has a twist in the strands of the diamonds which will block out light normal to the surface of the strands. Although the view through the fence is impeded at small angles with relation to the centerline of the highway, the fence becomes transparent at angles greater than about 20°. At angles greater than 20°, the glare from opposing headlamps is not considered objectionable during nighttime driving. During the daytime, the fence does not interrupt the general viewing by passengers traveling in the automobiles.
R 1

30,608
Rex, C.H. VISUAL DATA ON ROADWAY LIGHTING. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 61-75. National Academy of Sciences - National Research Council, Washington, D.C. (Outdoor Lighting Dept., General Electric Company, Hendersonville, N.C.).

This paper presents additional data on seeing factor effectiveness ratings for roadway lighting. Such ratings provide an essential basis for highway engineering evaluation of traffic, economic, and human benefits. Field measurements for different roadway lighting systems are continuing, are significant, and should be reported for the guidance of highway engineers interested in improving night motor vehicle transportation. Preliminary tests show that about twice as much pavement brightness is required for equivalent L-M visibility when the target is dynamic (0.1- to 0.2-sec exposure) instead of static. This is based on ratings by 8 observers. Measurements made with the new Blackwell portable visual task evaluator are reported and compared with those obtained with the Finch visibility meter. Experience gained at Hendersonville using the first prototype model of this meter retarded measurements earlier this year. More extensive data are now available and are presented.
R 26

30,609
Jackman, W.T. DRIVER OBEDIENCE TO STOP AND SLOW SIGNS. Report from: "Investigating and Forecasting Traffic Accidents, 1957, Highway Research Board Bull. 161." 1957, 9-17. National Academy of Sciences - National Research Council, Washington, D.C. (Howard, Needles, Tammen & Bergendoff, Cleveland, Ohio).

The purpose of this study was to determine the effectiveness of standard manufactured "stop" and "slow" signs. 4 of the stop signs used were of the new type (red and white, reflectorized); the remaining stop sign and the slow sign were of the old type (yellow and black enamel, non-reflectorized). In addition to the slow sign itself, the slow sign study utilized a radar meter and a pneumatic tube speed meter. The study showed that no combination of stop sign type or position was more effective than any other under the given conditions. However, an attempt was made to weigh the information gathered and assign definite obedience factors to the sign type-position combinations studied. The study also showed that a slow sign placed at a location which obviously does not warrant it, is definitely ineffective. This seems to indicate that the average driver is influenced by the apparent factors involved rather than by the slow sign itself.
R 9

30,610
Forbes, T.W. & Katz, M.S. DRIVER BEHAVIOR AND HIGHWAY CONDITIONS AS CAUSES OF WINTER ACCIDENTS. Report from: "Investigating and Forecasting Traffic Accidents, 1957, Highway Research Board Bull. 161." 1957, 18-29. National Academy of Sciences - National Research Council, Washington, D.C. (American Institute for Research, Pittsburgh, Penn.).

Analysis by 3-month periods of the various physical and driver behavior factors showed "inadequate coping with road conditions" involved in a higher percentage of passenger-car-responsible than in truck-responsible accidents, especially in the fall and winter quarters. Further comparisons indicated that many of these accidents occurred on snowy and icy highway after the weather had cleared. These results indicated the importance of immediate cindering and the elimination of winter road conditions. The Pennsylvania Turnpike Commission instituted improved maintenance and enforcement procedures to accomplish reduction of the hazard. Use of the correction factors for exposure showed the hazards for the ordinary motorist to be much greater under the winter road conditions, even though the total number of accidents was often greatest for dry roadway on an over-all basis. Relationships of different driver behaviors and other factors in accidents under the different road conditions were analyzed. A further study is under way to investigate further underlying causes for the relationships indicated.

30,611
Lundy, R.A. EFFECT OF TRAFFIC VOLUMES AND NUMBER OF LANES ON FREEWAY ACCIDENT RATES. Report from: "Freeway Characteristics, Operations and Accidents, 1965, Highway Research Record Number 99." 1965, 138-156. National Academy of Sciences - National Research Council, Washington, D.C. (California Division of Highways, State of California). (Report from: "44th Annual Meeting, January 11-15, 1965.")

Three years of experience on 659 mi of 4-, 6-, and 8-lane freeways have revealed that the accident rates for each classification will normally increase with an increasing average daily traffic (ADT). The rate of increase per 10,000-veh increase in ADT is 4-lane, 0.240 accidents/million vehicle miles (MVM); 6-lane, 0.094 accidents/MVM; and 8-lane, 0.078 accidents/MVM. For any given ADT, the 4-lane freeways have a higher accident rate than the 6-lane, and 6-lane freeways have a higher rate than the 8-lane. Therefore, as the ADT increases, the difference in rates between the 3 classifications becomes greater. This relationship introduces the possibility of significantly reducing the total number of freeway accidents by increasing the number of traffic lanes, even though the increase is not required by traffic volumes.
R 3

30,612
Society of Automotive Engineers. MINIMUM PERFORMANCE SET FOR BACKLIGHT DEFOGGERS. SAE J., July 1967, 75(7), p73. (Society of Automotive Engineers, New York, N.Y.).

Uniform laboratory test procedures and minimum performance requirements for sedan passenger car backlight defogging systems are established in a new SAE Recommended Practice J953 which has been developed by the SAE Body Engineering Committee. A cold chamber is used in the test and it must be maintained at the test temperature of 0±5 F for not less than 24 hr. before the test vehicle is put into it. Then, before the test starts, the vehicle must soak for 8 hr. unless it can be determined that engine coolant and the backlight have stabilized in a shorter period. The electrically heated vapor generator is started outside the car and the 3 qt. of water it contains brought to a boil. The wattage input to the heater is reduced enough to offset any heat loss by the generator within +5 w. The generator is then installed in the vehicle, and its engine started and stabilized at 1500 rpm. A wind velocity of 1 mph is maintained in the test chamber. Both windshield defroster and backlight defogger are set on high blower and at maximum air temperature. When the vehicle interior temperature reaches 75 F, both the defroster and the defogger are turned off. The vapor generator output is increased to 5000 grains per hr. and the time recorded. Five min. later the windshield defroster and the backlight defogger are turned on high blower speed. The rate of defogging is recorded at 2 min. intervals. The rear vision area as defined in the recommended practice must be 75% defogged in 10 min. The test is continued until the backlight is completely clear or for a maximum of 16 min. The recommended practice includes definitions, test equipment required, cold chamber details, and an appendix giving details on the vapor generator.
R 1

30,613
Bryan, W.E. LENSES FOR NIGHT DRIVING. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, p104. National Academy of Sciences - National Research Council, Washington, D.C. (American Optometric Association, Denver, Colo.).

Various experiments with lenses have been used in night driving. Many of these lenses have been developed in the past and have been categorized as gimmicks. It was the author's desire to try to develop a scientifically sound lens for use in night driving that would not encompass any tint directly over the pupil, but would cause a shadow effect to fall across the pupil to eliminate the oncoming glare of headlights when driving at night on the highway. It is the author's purpose to consider the principle of the lens rather than the exact tint established for research purposes. The "Nite-Site" lens consists of a calobar green slab-off on a white lens. These lenses must be fitted on prescription so that the line of demarcation between the white and the green falls 3 mm to the left side of the night pupil. The pupil area measurements are taken in dim illumination for accuracy. When the driver looks straight ahead while driving on the highway at night a shadow is cast across the pupil, eliminating peripheral retinal shock. As already observed, patient indoctrination is very important when fitting this lens. At no time is the driver to turn his head to any great degree to eliminate the glare of the oncoming light, but rather to look straight ahead and the lens will take care of the oncoming glare on the highway. The lens, however, is not designed for use in driving in the city at night because of the conflicting light coming from the right side.

30,614
Barch, A.M., Nangle, J. & Trumbo, D. SITUATIONAL CHARACTERISTICS AND TURN-SIGNALLING BEHAVIOR. Report from: "Driver Characteristic and Behavior Studies, 1958, Highway Research Board Bull. 172." 1958, 95-103. National Academy of Sciences - National Research Council, Washington, D.C. (Michigan State University, East Lansing, Mich.).

Turn-signalling was chosen as an area of driver behavior worthy of intensive study. In this paper, the turn-signalling behavior of 10,467 drivers who turned at 7 different intersections during daylight hours in the Greater Lansing area was related to various situational characteristics such as type of intersection, direction of turn, presence of following traffic, etc. The major findings were: a) turn-signalling was significantly influenced by type of intersection; b) female drivers generally signalled more frequently than male drivers and both generally signalled left turns more frequently than right turns; c) turn-signalling behavior was not related to time of day, presence of preceding traffic and/or following traffic, or the signalling behavior of the preceding car.

30,615
Allen, M.J. SPECIAL MOTOR VEHICLE AUXILIARY LIGHTS DESIGNED TO REDUCE EFFECTS OF GLARE AND AID HIGHWAY VISIBILITY. Report from: "Special Committee on Night Visibility, Highway Research News Number 5, May 1963." May 1963, p24. National Academy of Sciences - National Research Council, Washington, D.C. (Indiana University, Bloomington, Ind.).

A study (supported by the American Optometric Foundation Motorists Night Vision Research. Grant to Indiana University) was begun to evaluate the feasibility of increasing the light available on the highway adjacent to an automobile and to determine what might be the optimum light pattern. Actual road observations and photographs have shown that side lights are effective when directed downward and backward so that the pattern lies alongside the automobile at an angle of 30°, terminating approximately at the edge of the opposite traffic lane. Such an area of light reveals by silhouette any sizable object on the pavement alongside the oncoming car and permits its momentary full illumination as the side beam passes over it. In fact, the improvement is quite startling, permitting a feeling of increased security as one raises his eyes from the limits of his own headlight beam to the area of light beside the oncoming autobobile. Experimental obstructions of men, cars and posts have shown up well in advance of the normal night driving ranges.

30,616
Powers, L.D. SOME EFFECTS OF THE ELIMINATION OF OPPOSING HEADLIGHT GLARE. Report from: "Special Committee on Night Visibility, Highway Research News Number 5, May 1963." May 1963, p23. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.).

The U.S. Bureau of Public Roads, in cooperation with the Pennsylvania Department of Highways, is studying an installation of 2 miles of expanded metal anti-glare screen in the median of the Schuylkill Expressway at Philadelphia. In the area of the screen installation the expressway has 2 lanes in each direction separated by a 10-ft paved median with beam-type guardrail. Opportunity is provided here for a controlled study of a section of urban freeway under conditions with a) usual exposure to opposing headlights compared to b) conditions with no opposing headlights. The study consists of 3 phases: a study of traffic performance, a study of driver tension, and an accident study. The traffic performance phase will utilize the Bureau of Public Roads' Traffic Analyzer to obtain measures of speed, lateral placement, headway and lane use; in addition, differentiation will be made between passenger cars and commercial vehicles, high and low beam use, and single and dual headlights. The driver tension phase will consist of measurements of galvanic skin responses (GSR) of test Ss driving through the test section and a control section. GSR records will be taken before and after the installation of the screen in both the eastbound and westbound directions, during the day at offpeak hours, and at night under high and low volume conditions. Accidents will be studied for one or more years before and after the installation of the screen, utilizing control sections similar in nature to the control stations for the traffic performance phase: in advance of the screen section and beyond the screen section. Accident data will be categorized by location, time of day, volume, light conditions, manner of collision, and severity.

30,617
Doane, H.C. & Rassweiler, G.M. COOPERATIVE ROAD TESTS OF NIGHT VISIBILITY THROUGH HEAT-ABSORBING GLASS. Report from: "Night Visibility, 1955, Highway Research Board Bull. 127." 1956, 23-44. National Academy of Sciences - National Research Council, Washington, D.C. (General Motors Corporation, Detroit, Mich.).

17,000 individual observations of "seeing distance" have been made in road tests carried out cooperatively by the Automobile Manufacturers Association, General Electric, and General Motors. The purpose of the tests was to determine, under actual night driving conditions, the effect of heat-absorbing glass on nighttime visibility. Observations were made of the distance at which obstacles could first be seen from cars traveling 40 mph against approaching headlights. The tests were similar to those previously described by Roper except that the seeing task of the observer was made much more difficult in some of these more recent tests by using blacker obstacles, by using a black-top road instead of concrete, and by reducing illumination from the headlights. The average difference in nighttime seeing distance through heat-absorbing glass compared to ordinary windshield glass in these experiments was around 3%. This agrees with the earlier observations described by Roper taken under less difficult seeing conditions.

30,618
Moore, R.L., Crawford, A. & Odescalchi, P. TURN SIGNALS FOR MOTOR VEHICLES. Report from: "Driver Characteristic and Behavior Studies, 1958, Highway Research Board Bull. 172." 1958, 104-120. National Academy of Sciences - National Research Council, Washington, D.C. (Road Research Lab., Department of Scientific & Industrial Research, Harmondsworth, Middlesex, England).

An analysis of accidents in Great Britain has shown that it is important that direction signals on motor vehicles should be readily seen from the front and side as well as from the rear, particularly by cyclists and motorcyclists. In the light of this information the relative merits of present-day examples of semaphore-arm and flashing turn signals for use on cars have been compared. It is concluded, over the wide variety of conditions tested, that a side-mounted amber flashing indicator (the "amber ear") is the most effective indicator. A rear indicator was found to become less effective the nearer it was to the stop light. There seem to be advantages in mounting signals at drivers' eye-level, and amber colored signals appear better than red or white ones. The side-mounted indicator is likely to be of help to cyclists and motorcyclists, who are the chief victims of serious and fatal turning-car accidents at road intersections in Great Britain. The importance of standardization in the choice of direction signals is stressed and recommendations are made regarding the choice.
R 7

30,619
Breckenridge, F.C. A CONFIGURATION OF TAILLIGHTS AND BRAKELIGHTS. Report from: "Night Visibility, 1956, Highway Research Board Bull. 146." 1957, 56-57. National Academy of Sciences-National Research Council, Washington, D.C. (US National Bureau of Standards, Department of Commerce, Washington, D.C.). (Report from: "Thirty-Fifth Annual Meeting, January 17-20, 1956.")

Although brakelights have been in use for more than 3 decades, it is still common practice to depend upon a difference in intensity to distinguish them from taillights. This is a situation that certainly warrants consideration. The apparent intensity, or brilliance, of any signal light is determined by at least 5 variables, as follows: a) The luminous intensity of the light; b) The distance of the light from the observer; c) The transmissivity of the atmosphere; d) The brightness, or luminance, of the background; e) The state of dark adaptation of the observer's eyes. Every one of these varies without respect to the significance of the signal. It would be difficult to find a criterion for differentiating 2 signals which would be obscured by as many irrelevant conditions as is an intensity difference. It is a dependable signal only if the observer sees the transition in intensity at the instant the brake is applied. The weakness of the arrangement has evidently been sensed by some designers, because there have been efforts to make a distinction on the basis of color. If a color distinction were well carried out, it would certainly be much more dependable for normal observers than the intensity distinction. Some vehicles, notably busses, have been equipped with red tail lights and yellow brakelights. But this appears to be the reverse of good signal practice, which recognizes yellow as an ordinary warning and red as a signal indicating more than usual danger. This difficulty could have been corrected by sound standardization of the colors but the red-green confusing protanopes and deuteranopes would still have been able to see only signals of different intensities. There remains the possibility of differentiating taillights and brake signals by giving the brake signal a distinctive configuration.

30,620
Ministry of Transport. MEMORANDUM ON THE LIGHTING OF ROAD VEHICLES. Aug. 1951, 11pp. Ministry of Transport, Harmondsworth, England.

The object of the Memorandum which follows is to set out briefly in a single document and in a convenient form the main provisions of the Road Transport Lighting Act, 1927, the Road Traffic Act, 1934 (Section 19), the Road Transport Lighting (Cycles) Act, 1945 and the Road Vehicles Lighting Regulations, 1950 made thereunder. It must not be taken as rendering unnecessary reference to the Acts and Regulations themselves, upon the wording of which any decisions in a Court of Law would necessarily be based.

30,621
Allen, M.J. VISION, VEHICLES AND HIGHWAY SAFETY. Highway Res. News, Autumn 1966, 25, 57-62. (Indiana University, Bloomington, Ind.).

Assuming a sound, reliable, controllable motor vehicle and freedom from catastrophic interferences as might occur from mechanical failure of another vehicle, a motorist depends almost exclusively on vision-derived information to keep him safe from an accident. Although vision isn't everything needed for safe driving, it is an absolute minimum requirement. The visual problems involve the driver and his visual readiness to drive; the vehicle and its "designed-in" features or limitations; the vehicle and its environment; and the signal systems for traffic, for vehicle location and driver communication. Emergency vehicles, school buses, trucks and trains, automobiles, motorcycles, pedestrians and children all have one thing in common, they are often invisible, and the price paid for colliding with them is human lives. This article reviews the visual aspects of highway safety and offers a considerable number of recommendations.

30,622
Highway Research Board. HIGHWAY RESEARCH IN PROGRESS. Report from: "Developmental Issue, Part II, Subject Areas 40-90, April 1967." 1967, 592-626. National Academy of Sciences - National Research Council, Washington, D.C. (Highway Research Information Service, Highway Research Board, Washington, D.C.).

This bibliography provides approximately 200 annotations of articles having to do with driving performance.

30,623
Hanson, D.R. & Palmquist, P.V. EFFECTIVENESS OF REFLECTORIZED HEADLAMPS. Report from: "Night Visibility, 1967, Highway Research Record Number 164." 1967, 8-16. National Academy of Sciences - National Research Council, Washington, D.C. (3M Company, St. Paul, Minn.).

One factor which contributes to the well-established hazards associated with night driving is the problem of encountering vehicles with only one lighted headlamp. Attempts to alleviate problems of this type have included compulsory and voluntary vehicle inspection. However, the 1964 National Vehicle Safety Check of passenger cars found front headlights to be the second most prevalent defect. This paper reports the findings of a research study designed to evaluate the effectiveness of the reflectorized headlamp under realistic night driving conditions. The established parameter was the distance at which the unlit side of an approaching one-eyed car could be detected for vehicles equipped with reflectorized headlamps and for vehicles equipped with conventional headlamps. Variables considered were dry and simulated rain conditions, 3 rates of closure, and both sides of the vehicle. Mean detection distances established were 472 ft. and 288 ft. for the reflectorized and conventional headlamp conditions respectively; the difference in means was highly significant. As expected, all detection distances during conditions of simulated rain were reduced, but relative values were maintained. Comparison of detection distances obtained for reflectorized headlamps to motorist perception-reaction distance established a significant improvement in time available for evasive action.
R 10

30,624
Highway Research Board. HIGHWAY RESEARCH IN PROGRESS. Report from: "Developmental Issue, Part II, Subject Areas 40-90, April 1967." 1967, 627-666. National Academy of Sciences - National Research Council, Washington, D.C. (Highway Research Information Service, Highway Research Board, Washington, D.C.).

This bibliography contains approximately 230 annotations of articles having to do with traffic control and operations.

30,625
Feldhaus, L., Jr. DYNAMIC VISUAL ACUITY--EFFECT ON NIGHT DRIVING AND HIGHWAY ACCIDENTS. Report from: "Night Visibility, 1961, Highway Research Board Bull. 298." 1961, 1-2. National Academy of Sciences - National Research Council, Washington, D.C.

This brief article provides a table giving dynamics visual acuity values for various vehicle velocities. These calculations indicate that when driving at 60 mph and looking at an object located 20 ft. from the car, the driver's visual acuity will be between 20/121 and 20/317, depending on how rapidly his dynamic visual acuity changes. When driving at 30 mph, looking at the same object, his visual acuity would be between 20/70 and 20/150. There is a definite advantage to reducing driving speed.

30,626
Highway Research Board. HIGHWAY RESEARCH IN PROGRESS. Report from: "Developmental Issue, Part II, Subject Areas 40-90, April 1967." 1967, 534-591. National Academy of Sciences - National Research Council, Washington, D.C. (Highway Research Information Service, Highway Research Board, Washington, D.C.).

This bibliography contains approximately 340 annotations of articles having to do with highway safety.

30,627
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. VI. LITERATURE 1960. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 1-11. National Academy of Sciences - National Research Council, Washington, D.C. (American Optical Company, Southbridge, Mass.).

The 1960 literature on vision at levels of night road illumination is reviewed and each citation described very briefly. The subject headings used to group the references are illumination and glare, dark adaptation, acuity and contrast, binocular vision, color, age, and driving and license problems.
R 142

30,628
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. V. LITERATURE 1959. Report from: "Night Visibility, 1960, Highway Research Board Bull. 255." 1960, 190-195. National Academy of Sciences - National Research Council, Washington, D.C. (American Optical Company, Southbridge, Mass.).

This is a review of literature with information applicable to the problems of night driving. It covers articles on vision, illumination and glare.
R 67

30,629
Greenshields, B.D. DRIVING BEHAVIOR AND RELATED PROBLEMS. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, 14-32. National Academy of Sciences - National Research Council, Washington, D.C. (Transportation Institute, University of Michigan, Ann Arbor, Mich.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

This research report is based on the concept that differences in driving patterns may be determined by accurate measurements integrated over a route of sufficient length to reveal differences in driving behavior. The measuring device used in collecting data, records: a) driver actions, b) vehicle motions and c) traffic and/or highway events. All readings are in digits, and the device may be mounted in a car within a short time. It was found that different classes of drivers tend to exhibit different driving patterns. Based on this fact, the paper points out related fields in which the "drivometer" may be used. These include driver training, traffic-stream flow, evaluation of highway design from the standpoint of driving, and the measurement of the "drivability" of vehicles.
R 7

30,630
US Department of Commerce. THE FEDERAL ROLE IN HIGHWAY SAFETY. No date, 45pp. US Department of Commerce, Washington, D.C.

This review of highway transportation systems considers the following matters: a) human factors such as accident proneness, vigilance, alcohol and drugs; b) driver education and control; c) vehicle factors such as safety design, car height, glass area, controls and displays, brakes, lighting, and horsepower; d) air pollution problems.

30,631
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. VII. LITERATURE 1961. Report from: "Night Visibility, 1962, Highway Research Board Bull. 336." 1962, 12-21. National Academy of Sciences - National Research Council, Washington, D.C. (American Optical Company, Southbridge, Mass.).

The 1961 literature on vision at levels of night and road illumination is reviewed and each citation described very briefly. The subject headings used to group the references are illumination, glare and dark adaptation; seeing while in motion; seeing time limitations; acuity, contrast accommodation and fields; color vision; regulation and behavior; driving task analysis.
R 117

30,632
Turner, Laura R. & Philpot, Louise. HIGHWAY SAFETY, AN ANNOTATED BIBLIOGRAPHY, 1960-1965. April 1966, 81pp. Virginia Highway Research Council, Charlottesville, Va.

This annotated bibliography of 266 titles contains information on the driver, the highway, and the vehicle. Accident studies and traffic control studies are included, as well as bibliographies.

30,633
University of Illinois, State of Illinois Division of Highways & US Bureau of Public Roads. MOTOR VEHICLE SPEEDS, ANNOTATED. HRB Biblio. 27, no date, 82pp. National Academy of Sciences - National Research Council, Washington, D.C.

This bibliography contains 609 annotations of papers in the general area of motor vehicle speed. Papers are subsumed under seven topics: driver, highway, vehicle, traffic operation, collision, study techniques, and general articles.

30,634
Gaver, D.P., Jr. TIME-DEPENDENT DELAYS AT TRAFFIC MERGES. FINAL REPORT. Contract Nonr 760 (24), Proj. NR 047 048, MSR Rep. 64, Jan. 1966, 15pp. Graduate School of Industrial Administration, Carnegie Institute of Technology, Pittsburgh, Penn. (AD 629230)

The expected delay of a side-road driver attempting to merge with, or cross, a main-road traffic stream is studied. The model includes the effect of mixture of "slow" and "fast" drivers at the side road, and of different gap acceptance probabilities. Numerical results show the manner in which long-run delays are approached, and an approximation to the transient behavior of delays is studied.
R 13

30,635
Lollis, T.E. AN INVESTIGATION OF MOTOR-VEHICLE ACCIDENTS INVOLVING OFF-DUTY MILITARY PERSONNEL. M.S. Thesis. Contract AF 33(608) 1234, Winter 1966, 52pp. Georgia Institute of Technology, Atlanta, Ga. (AD 480602)

Within the limitations, scope, and methodology of this study, the following conclusions seem warranted: a) Most motor vehicle accidents occurred while military personnel were in the following status categories: (1) On leave or pass--off post; (2) Off duty--off post; (3) Off duty--on post. b) There is a significant difference in the number of accident involvements among grade levels. c) There is significant variation of accident involvements among the hours of the day. d) There is a significant difference in the number of accident involvements among the various days of the week. e) The only day of the month that showed a significant variation was the first day. There are strong indications that this is in some way related to the Army payday, which is once a month. f) Age is a significant factor in accident involvement.
R 45

30,636
Dobbins, D.A., Tiedemann, J.G. & Skordahl, D.M. HUMAN FACTORS RESEARCH REPORTS--AASHO ROAD TEST. I. FIELD STUDY OF VIGILANCE UNDER HIGHWAY DRIVING CONDITIONS. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 1-8. National Academy of Sciences - National Research Council, Washington, D.C. (USA Human Factors Research Branch, Office of the Adjutant General, Washington, D.C.).

In the present study, research opportunity was afforded to study signal detection performance under realistic field conditions rather than by the classical laboratory approach. For the Road Test, Army drivers were required to drive trucks on experimental highways under monotonous and fatiguing conditions. In spite of inhibitory factors present in this study which would lead to a prediction of performance decrement (noise, truck vibration, long hours, boredom, and fatigue), other compensatory factors also present may have combined to cause prolonged high detection levels. The influence of inhibitory factors was apparent in increases in variability of performance, rather than in levels of performance. Possible compensatory factors are a) signal characteristics, b) task characteristics, and c) S characteristics, including motivation. The present study showed that detection performance began at a high level and stayed at a high level in spite of noxious monitoring conditions. The present study suggests that the rapid, severe decrement found in the passive monitoring of laboratory displays may be of limited generality.

30,671
Burg, A. THE RELATIONSHIP BETWEEN VISION TEST SCORES AND DRIVING RECORD: GENERAL FINDINGS. USPHS Grant AC 00015, Rep. 67 24, June 1967, 125pp. Engineering Dept., University of California, Los Angeles, Calif. (Department of Motor Vehicles, State of California).

Early in 1962 the Institute of Transportation and Traffic Engineering, UCLA, in conjunction with the California Department of Motor Vehicles, began a large-scale, long-range study of the relationship between visual ability, as measured on several standard and non-standard screening tests, and driving performance, as reflected in driving record. This report is on the first phase of the study and compares vision test scores and 3-year driving records (accidents and convictions for traffic citations). It has always been assumed, and logically so, that vision plays an important role in the driving task. While this assumption has been traditionally and universally accepted, and has been used by driver licensing agencies as the basis for incorporating one or more vision tests in their procedures for evaluating driver license applicants, there has been, in fact, no definitive experimental evidence relating visual ability to driving ability. Despite a reasonably large amount of published literature on vision in relation to driving, relatively little substantial research has been done and few, if any, basic relationships have been established.. Accordingly, the present study was undertaken with this need in mind, and with the primary aim of discovering relationships between vision test scores and driving record. The study was designed to avoid as many as possible of the pitfalls enumerated above. The second major goal of the study is to generate normative data on the visual, personal and driving characteristics of a large and representative sample of drivers. Heretofore, such data have been generally unavailable.
R 11

30,703
Monty, R.A., Hicks, S.A. & Moler, C.G. ACQUIRING AND RELOCATING TARGETS FROM A HELICOPTER: A PRELIMINARY INVESTIGATION. AMCMS Code 5121.11.035, Tech. Memo 2 66, Jan. 1966, 28pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 631362)

This preliminary investigation was conducted to help resolve the controversy over whether or not a helicopter in combat can increase its safety by performing an evasive maneuver after detecting a target but before firing on it. The result showed that, at least in one situation, the evasive maneuver can give the helicopter some advantage, but not for the reasons hypothesized. It was concluded that the problem is sufficiently complex to warrant additional research.
R 3

30,704
Pask, G., Elstob, M. & Mallen, G.L. INVESTIGATION OF LEARNING AND PERCEPTION. ANNUAL SUMMARY REPORT NO. 3. Contract AF 61(052) 640, Proj. 9769, AFOSR 66 0644, Feb. 1966, 70pp. System Research Ltd., Richmond, Surrey, England. (AD 631634)

Research is summarized on models that describe the learning of a structured skill and on simulations of populations of automata that become more complex as they develop. Applicability and limitations on a simple learning model based on terms of continuous, information-like measures are discussed. The model considers the contribution from learning of the i-th skill to learning of the j-th. Limitations arise for the description of learning of higher-order concepts. The relevance of statistical and homeostatic approaches to the description of learning and adaptation is considered; each is viewed as contributing to the characterization of a real-life population of organisms. The simulation model shows that individual automata do not learn on their own but in cooperating groups. The elaborate population that is postulated shows stability over a larger range of cost parameter values in an unconstrained environment than in a constrained environment. A gregarious automaton is described that has a sensory system (sensitivity to density of population) and a memory system; significance is associated with properties that remain invariant or exhibit regular and correlated transformation. Two appendixes are included that consist of preliminary drafts of two chapters of a manuscript on "The Cybernetics of Living Systems" and are entitled "Cybernetic Models and Control Systems" and "Fabric and Organization of Memory."
R 7

30,707
Jones, W.L. HUMAN FACTORS AS THEY AFFECT METHOD IMPROVEMENT IN CONSTRUCTION. Contract NBy 45818, Tech, Rep. 45, Sept. 1964, 58pp. USN Bureau of Yards and Docks, Washington, D.C. (Civil Engineering Dept., Stanford University, Stanford, Calif.). (AD 628940)

This report discussed the problems of implementing methods improvement studies, i.e., introducing new methods, into an industry that has been characterized for years by individual independence. A comprehensive historical discussion of the development of "scientific management" (an engineering approach to work methods) in the manufacturing industry shows the failures and successes that have characterized the first half of the 20th century. The recent findings of the behavioral scientists (principally from industrial psychology) are reported and discussed as to their application to personnel management for construction. The author contends that a better understanding of the psychological needs of employees can markedly improve the success of methods improvement applications. The report and its extensive bibliography are designed to give managers an insight into the recent, pertinent behavioral science findings.
R 52

30,711
Dickinson, N.F., Jr. & Brown, G.L. A HUMAN FACTORS EVALUATION OF THE MAIN BATTLE TANK. 105MM GUN, M60E1. Tech Memo 14 62, OCMS Code 4020.14.1110.1.10, June 1962, 32pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 627821)

This is a preliminary report on a human factors evaluation of the MAIN BATTLE TANK, 105mm Gun, M60E1. The workspace available to each crew member in relation to his task and the efficiency of maintenance operation including proper utilization of available tools, skills, and supplies were investigated.
R 8

30,713
Torre, J.P., Jr. & Garinther, G.R. DYNAMIC HUMAN ENGINEERING EVALUATION OF THE ARMORED PERSONNEL CARRIERS T113 AND T117. Proj. TB1 1000, Tech. Memo 7 58, Aug. 1958, 28pp. USA Human Engineering Lab., Aberdeen Proving Ground, Md. (AD 627819)

Report of a static evaluation of the T113 and T117 Armored Personnel Carriers. This evaluation was conducted to uncover human engineering design deficiencies and to note areas in which the vehicles proved adequate from a human engineering standpoint. Findings indicated necessity for more intensive investigation. Primary investigation was done in: a) sound measurement and analysis within vehicles with full complement of personnel; b) effects of noise on audition, communication, and performance; c) effects of vehicle configuration and design on crew performance, safety, and comfort; d) crew's opinion on a, b, and c above.

30,716
Charney, E., Rose, A.J. & Lee, L.T. HUMAN ENGINEERING SURVEY OF M-48 TANK. Tech. Memo 16, March 1956, 81pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 627817)

This report is the result of a preliminary field investigation and of 2 surveys among tank crewmen of the 90mm Gun Tank, M-48. 1 Survey was conducted at Fort Hood, Texas and the other at Camp Irwin, California. The purpose of the study was to find out from the user what significant human engineering problems with the M-48 tank were being encountered. In addition, an attempt was made to discover field expedients employed by the crewmen to solve these problems and to elicit any suggestions for pertinent design improvements on the tank. Thus, the liaison team has attempted to serve as a middleman, to inform the human engineering research personnel and designers what difficulties the users are having with equipment that the Ordnance Corps created for them. It was the intention of this survey to determine specific problem areas rather than to obtain an overall opinion of the tank among its crewmen. The report gives no indication of how satisfactory the M-48 is to the using troops. It is the opinion of the liaison team that, on the whole, the troops are well satisfied with the performance and handling of the tank. The detailed list of problem areas reported herein should not be construed as overall dissatisfaction with the vehicle.

30,718
Mahone, R.M. MAN'S RESPONSE TO SHIP SHOCK MOTIONS. Proj. S F015 14 04, Rep. 2135, Jan. 1966, 26pp. USN David Taylor Model Basin, Bureau of Ships, Washington, D.C. (AD 628891)

Men were exposed in the laboratory to motions similar to those experienced on the decks of ships subjected to underwater explosion attack. From measurements of the gross bodily response of men, empirical equations are derived which can be used to compute the velocities at which man will leave the deck under various conditions. Tolerance curves are developed which permit an estimate of the shock level at which injury takes place.
R 13

30,719
Foster, P. AN INVESTIGATION OF THE RELATIONSHIP BETWEEN EXPERIENCE PARAMETERS AND SUBJECT ACCELERATION RESPONSE IN EXPERIMENTAL IMPACT. ARL TR 66 8, March 1966, 18pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (AD 630788)

Studies of human test Ss undergoing sustained acceleration on the centrifuge have shown that tolerance increases with experience. This fact suggested the need for an investigation to determine if a similar relationship existed between certain impact experience parameters and S acceleration response, which was used as an indicator of S tolerance to impact exposure. A number of human test Ss having varying degrees of experience with experimental impact acceleration were exposed to identical impact profiles. Correlations of experience factors to indicated tolerance showed no significant relationship.
R 15

30,734
Ellis, B. BASIC CONCEPTS OF MEASUREMENT. 1966, 220pp. Cambridge University Press, London, England. (University of Melbourne, Melbourne, Australia).

The object of this book is to distinguish and define the basic concepts in measurement, for example: scale, quantity, unit, dimension, number, and probability. The author discusses the problem of classifying scales of measurement and the special logical problems associated with each kind of scale. Associative measurement is illustrated by temperature measurement and time measurement in extreme ranges.
R Many

30,735
Mashhour, M. PSYCHOPHYSICAL RELATIONS IN THE PERCEPTION OF VELOCITY. Contract AF EOAR 64 29, 1964, 176pp. Psychological Lab., University of Stockholm, Stockholm, Sweden. (AD 618289)

The aim of the present monograph was to investigate some observable aspects of man's reaction to visual stimulus moving at different speeds. General methodological problems are discussed in Part I and those concerning motion and velocity perception proper in Part II. In the introductory section the present state of knowledge of real motion and velocity perception is briefly surveyed and the need for further investigation in this field is emphasized. The specific chapter topics are: on the validity of ratio and interval scales constructed by human judgments, a comparison of the method of ratio estimation and the method of magnitude estimation, on fitting some curvilinear functions to psychophysical data, general procedure and apparatus, on the relationship between subjective time, space and velocity, interaction of velocity, time and space in perception, speed of reaction to movement and its relation to stimulus velocity, and the role of eye-movements in the perception of velocity.
R Approx. 100

30,736
Crosley, J. & Allen, M.J. AUTOMOBILE BRAKE LIGHT EFFECTIVENESS: AN EVALUATION OF HIGH PLACEMENT AND ACCELERATOR SWITCHING. Amer. J. Optom. & Arch. Amer. Acad. Optom., May 1966, 43(5), 299-304. (Optometry Div., Indiana University, Bloomington, Ind.).

The 3 phases of this study are: a) the effect of increasing the height of the brake lights above the road; b) the effect of putting the brake light switch on the accelerator pedal; and c) the effect that a red light has on a naive driver on the open highway. Data were taken with the stock brake switches and lights, with accelerator-mounted switches and stock brake lights, and with high-placed auxiliary red lights and accelerator-mounted switches. 10 ml/hr increments of speeds from 20 to 70 were examined during highway day and night driving. Reaction times by day and night were somewhat faster for the accelerator switch system alone and significantly faster when the lights were mounted high--approximately 40% faster by day than stock brake lights and about 50% faster by night. The reactions of a naive driver were significantly longer.

30,737
Richards, O.W. VISION AT LEVELS OF NIGHT ROAD ILLUMINATION. XII. CHANGES OF ACUITY AND CONTRAST SENSITIVITY WITH AGE. Amer. J. Optom. & Arch. Amer. Acad. Optom., May 1966, 43(5), 313-319. (Research Center, American Optical Co., Southbridge, Mass.).

Acuity and contrast vision was measured in the laboratory at 10, 1, 0.1 and 0.01 ft-L from 16 to 90 years of age (141 Ss) and the 1.0 to 0.1 ft-L range is discussed with reference to night driving vision requirements. Based on this selected population having good eye care, vision appears adequate for many people until after 70 years, then driving at night is no longer safe for some.
R 8

30,738
McKnight, A.J. & Hunter, H.G. AN EXPERIMENTAL EVALUATION OF A DRIVER SIMULATOR FOR SAFETY TRAINING. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 9, June 1966, 32pp. USA Office of the Chief of Research & Development, Washington, D.C. (Human Resources Research Office, George Washington University, Alexandria, Va.).

The purpose of this research was to determine the effectiveness of automobile simulators in fostering the safe operation of automobiles. A 20-hr driver improvement course was administered to 238 licensed drivers at Fort Lewis, Washington. Approximately half of the trainees received a program taught entirely by conventional methods, while the other half received a program of similar content but including 8 hrs of simulator instruction. Results of specially constructed tests indicated that simulators were superior to conventional media for developing good driving habits but were no more effective in teaching driving knowledges or influencing driver attitudes. It was concluded that, while simulation represents a potentially valuable means of improving driver habits and skills, substantial modification of current simulator equipment and film is needed to attain this potential.
R 6

30,739
Braunstein, M.L., Laughery, K.R. & Siegfried, J.B. COMPUTER SIMULATION OF DRIVER BEHAVIOR DURING CAR FOLLOWING: A METHODOLOGICAL STUDY. Contract CPR 11 8686, CAL Rep. YM 1797 H 1, Oct. 1963, 58pp. US Bureau of Public Roads, Department of Commerce, Washington, D.C. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

The applicability of complex information-processing computer models to the study of driver behavior was explored in a series of experimental and analytical studies. Verbal reports and objective performance measures were collected during controlled observations of car following on a 4-lane limited-access highway. A model of the observed behavior was formulated in flowchart form. The parameters of the model were examined and one parameter, threshold for a lead-car velocity change, was subjected to experimental study. The effects of rate and direction of velocity change and initial intervehicle separation were determined for 3 response measures. It was concluded that computer modeling is a feasible and useful approach to the study of driver behavior. Programming and testing of the current model, as well as additional experimental studies of the relevant parameters, is recommended.
R 10

30,740
Senders, J.W., Kristofferson, A.B., Levison, W.H., Dietrich, C.W., et al. ATTENTIONAL DEMAND OF AUTOMOBILE DRIVING. Contract CPR 11 5096, BBN Job 11267, Rep. 1482, March 1967, 30pp. US Bureau of Public Roads, Department of Commerce, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

The experiments had 2 general purposes: a) to determine empirically certain relationships between characteristics of the road upon which a car is driven, the amount of time a driver has to look at the road, the interval between such observations, and the speed at which he drives. Exp. I, II, III, & IV have attempted to do so for 2 different classes of roads and for 2 different modes of operation of the experimental apparatus. The results indicate, as would be expected, that the less frequent the observations, or the shorter the period of observation, the slower will be the speed that the driver can maintain; and, conversely, that the greater the level at which the speed is fixed the more often the driver must look at the road. In addition, the differences between the roads appears as a modifier in that the more complicated road results in a lower speed at any constant viewing and occlusion times, and results in shorter occlusion times for any constant speed and viewing time. The data with which to express the functional relationships among all of these variables have been obtained and subjected to partial analysis; b) the other part of the program was aimed at testing the adequacy of a theoretical model which described the behavior of the driver in terms of information processing and uncertainty accumulation.
R 4

30,741
Society of Automotive Engineers. VISUAL CONSIDERATIONS OF MAN, THE VEHICLE, AND THE HIGHWAY. Rep. SP 279, March 1966, 86pp. Society of Automotive Engineers, Inc., New York, N.Y.

This document consists of 2 parts: a) represents a short physiological optics review for designers and users of automobiles. It starts with a description of the macroscopic and microscopic anatomy of the visual organ. The movements of the eyes, the visual field, and fixation field are described in a more detailed way, together with the sensory mechanisms which comprise adaptation, contrast sensitivity, visual acuity, perception of motion, and perception of direction and distances. In view of their importance in driving, special attention was given to the problems of glare, the time factor in vision, and the visual problems in motion. A comparison of visibility of red versus green concludes the paper. An effort has been made to confine the text to the phenomena which are basic and necessary for general understanding and have an obvious bearing on automotive design and driving procedures; b) suggestions for reducing accidents and fatalities on the road are offered from the standpoint that vision is the one common denominator in all the 4 elements involved in highway safety--the vehicle operator, the vehicle itself, the highway, and the highway environment. Detailed aspects of these 4 important factors are examined, and the results given of various studies to obtain more knowledge on human vision as related to vehicle and highway performance.
R 160

30,742
Johansson, G. PERCEPTION OF MOTION AND CHANGING FORM. Scand. J. Psychol., 1964, 5, 181-208. (Psychological Lab., University of Uppsala, Uppsala, Sweden). (Reprint)

It is shown how geometrically changing projections of objects which move and/or change their shape carry no specific information about form and 3-dimensional motion. How, then, does the visual apparatus produce specific percepts from such non-specific changing stimuli? By applying an analogue computer technique, changing projections of artificial objects are generated on a CRT screen. These projections are fed into the eye by means of an optical device where they form a continuously changing solid angle of homogeneous light. The main conclusion is that it is a principle of perceptual 3-dimensionality which gives specificity to the percepts. Preliminary statements of principles for prediction of perceived motion in depth from a given change in proximal stimulus are presented.
R 16

30,743
McFarland, R.A. PUBLICATIONS IN THE FIELD OF HIGHWAY SAFETY, 1950-1965. ca. 1965, 12pp. Environmental Health Sciences & Engineering Div., Harvard School of Public Health, Boston, Mass.

This is a listing of publications from the Harvard School of Public Health 15-yr research program on highway transport safety. These are grouped roughly in terms of major area of emphasis: accident causation based on interrelationships between the driver, vehicle, and environment; human factors in the design of highway transport equipment; and specific aspects of driver behavior in relation to safety.
R Many

30,744
Mashhour, M. A SPEEDOMETER FOR SPEED CONTROL AND EXPERIMENTS ON DRIVING PERFORMANCE. Contract 139/62, Rep. 204, March 1966, 6pp. Psychological Lab., University of Stockholm, Stockholm, Sweden.

The significance of correct speed information for safe driving and the need for investigations concerning the effects of speed information on driving performance are emphasized. Further, it is argued both theoretically and on the basis of experimental findings that human drivers are uncapable of correctly estimating vehicular speeds. A speedometer is described which can reveal the speed of a motor vehicle to other traffic road users. It can be used in experiments on the effects of speed information on driving performance, as a means for maintaining effective speed control, and for various other purposes.
R 11

30,745
Irland, M.J. & Lindberg, V.L. CONTROL OF DOUBLE IMAGES IN AUTOMOBILE GLASS. Report from: "Mid-Year Meeting, Chicago, Ill., May 17-21, 1965." SAE Rep. 650536, 1965, 8pp. Society of Automotive Engineers, Inc., New York, N.Y. (Applied Research Office, Ford Motor Company, Detroit, Mich.).

Double images, as of headlights at night, are sometimes seen through windshields, backlights, and occasionally other windows. The 3 principal factors that determine the visibility of these double images are curvature, inclination (or installation angle), and wedge in the glass. The separation and brightness of the secondary images so formed can be predicted for any glass design from a knowledge of these 3 major factors together with the glass thickness and its index of refraction. Advantage can be taken of the small amount of wedge incidental to manufacturing, to offset in part the double image inherent in some glass designs. With better control of double images possible through application of the foregoing principles, a need was anticipated for better means of measuring curvature and wedge. As a result the local curvature and wedge meter was developed. This instrument has exceeded expectations with regard to accuracy, simplicity of operation, and convenience, both in the laboratory and in the field measurements on installed glass.

30,746
National Safety Council. GUIDE TO TRAFFIC SAFETY LITERATURE. ARTICLES, PAMPHLETS, AND BOOKS. CUMULATIVE EDITION 1955-1965. VOLUME 10, 1966, 293pp. National Safety Council, Chicago, Ill.

This year's Guide to Traffic Safety Literature is a cumulative issue bringing together in one volume, for the first time, pertinent information published in the field of traffic safety from 1955-1965 inclusive. The documents included are those received in the Library of the National Safety Council, which contribute either to the technical aspects or to the development of programming in traffic safety. 3 lists are at the end of this volume: "Addresses of Periodicals Indexed;" "Directory of Publishers and Organizations;" and "Author Index."
R Many

30,747
National Safety Council. GUIDE TO TRAFFIC SAFETY LITERATURE. ARTICLES, PAMPHLETS, AND BOOKS. 1967 EDITION. VOLUME 11. 1967, 68pp. National Safety Council, Chicago, Ill.

The Guide to Traffic Safety Literature is published yearly and brings together pertinent information on published matter in the field of traffic safety according to subject interest. This issue covers publications printed during 1966 received in the Library of the National Safety Council, plus a few printed prior to 1966, but received during that year. Books, pamphlets, and magazine articles included contribute either to the technical aspects of traffic safety or to the development of traffic safety programming. 3 lists, "Addresses of Periodicals Indexed;" "Directory of Publishers and Organizations;" and "Author Index" appear at the end of this Guide.
R Many

30,748
Arthur D. Little, Incorporated. THE STATE OF THE ART OF TRAFFIC SAFETY. A CRITICAL REVIEW AND ANALYSIS OF THE TECHNICAL INFORMATION ON FACTORS AFFECTING TRAFFIC SAFETY. Rep. C 67770, June 1966, 624pp. Arthur D. Little, Inc., Cambridge, Mass.

The purpose of this study was to assess the present understanding of traffic safety, both with regard to the manner and degree to which various factors contribute to traffic accidents and their resulting loss and to methods for reducing this loss. The study entailed a review of the domestic and pertinent foreign literature on the subject together with discussions with persons active in traffic safety research. This report contains 2 parts plus a bibliography and source index. Part I contains an introductory section, a summary of findings, and conclusions and recommendations. Part II contains a detailed presentation of findings and constitutes the basis for the summary, conclusions and recommendations of Part I. The information reviews in Part II provide the main substance of the report. These are presented in 5 chapters: a) human factors; b) environmental factors; c) vehicular factors; d) loss-limiting factors; and e) regulatory and legal factors. Entries in the bibliography are ordered according to Arthur D. Little accession number. As an aid to the reader, the source index lists the corresponding ADL accession numbers for each author and organization.
R 1871

30,752
Hasbrook, A.H. & Dille, J.R. STRUCTURAL AND MEDICAL ANALYSIS OF A CIVIL AIRCRAFT ACCIDENT. Aerospace Med., Oct. 1964, 35(10), 958-961. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

A fatal accident involving a small, fixed-wing aircraft is described. 2 of the 3 occupants died and the third suffered serious injuries despite a reasonably intact cabin and the absence of fire. The continued need is discussed for: a) the design, installation and use of comfortable shoulder harness in small planes; b) improved design of control wheels, their attachments, and instrument panels; and c) seat delethalization. Other casual factors and preventive measures, which can be determined only when all of the relevant crash injury data are obtained and analyzed, are discussed.
R 8

30,783
Randall, C.W. & Ledbetter, J.O. BACTERIAL AIR POLLUTION FROM ACTIVATED SLUDGE UNITS. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 506-519. (Arlington State College, Arlington, Tex. & University of Texas, Austin, Tex.).

Large numbers of potentially pathogenic bacteria were collected from the air surrounding activated sludge units, and many persisted for a considerable time and distance. Significantly, the airborne enteric pathogens were greatly outnumbered by bacteria of proved pathogenicity in the respiratory tract. Klebsiella pneumoniae was the pathogen isolated most frequently, and several studies concerning the spread, longevity, and factors of pathogenicity of this organism were conducted. The potential health hazard of the emitted respiratory pathogens was considerably increased by the fact that a large percentage of the aerosol particles transporting viable bacteria were of a size permitting lung penetration.
R 31

30,784
Fader, B. PRACTICAL DESIGNS FOR NOISE BARRIERS BASED ON LEAD. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 520-525. (Technical Services, Lead Industries Association, Inc., New York, N.Y.).

Acoustical theory predicts that sheet lead and soft plastic materials loaded with finely divided lead should be excellent sound barriers. Seven case histories are given to show how this "limp mass" has been applied in practical problems. Sheet lead and leaded plastic sheet have been shown to possess high mass relative to their thickness and sufficient "limpness" to produce excellent results in practical noise barriers. Although it cannot be demonstrated as a separate effect in the case histories reviewed here, part of the effectiveness stems from the ease with which the materials can be formed to seal or minimize leaks.

30,785
Andrews, R.B. INDICES OF HEART RATE AS SUBSTITUTES FOR RESPIRATORY CALORIMETRY. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 526-532. (Production & Operations Lab., University of California, Los Angeles, Calif.).

The most promising potential substitutes for respiratory calorimetry are regression equations that relate caloric expenditure to heart rate. This study evaluates multiple regression equations, employing seven indices derived from the time pathway of the heart rate, as a means of increasing the precision of the heart rate method. Regression equations are based on the aggregation of different tasks and/or subjects as well as on the single task and single subject. The multiple regression equations are compared with simple regression equations and with respiratory calorimetry in terms of the errors of estimation that each introduces into the measurement of caloric expenditure. The results show that multiple regression equations based on a single subject and single task are as precise as respiratory calorimetry.
R 14

30,786
Snyder, W.S. THE STANDARD MAN IN RELATION TO INTERNAL RADIATION DOSE CONCEPTS. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 539-545. (Health Physics Div., Oak Ridge National Laboratory, Oak Ridge, Tenn.).

The extension of the Standard Man concept, insofar as radiation protection is concerned, is considered to provide a basis for estimation of dose when exposure of a population is in question. Discussion is organized around three main considerations: a) data of a physical and chemical nature concerning the principal organs and tissues; b) data of metabolic nature concerning bodily intake and excretions; and c) ranges of individual variation that are not uncommon and means of allowing for these differences.
R 12

30,787
Edwards, R.G., Jr., Powell, C.H. & Kendrick, Mildred A. DUST COUNTING VARIABILITY. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 546-554. (US Public Health Service, Occupational Health Div., Cincinnati, Ohio).

A dust counting study is described, involving seven people with various amounts of experience, two methods of lighting (light-field and phase contrast), 30 concentrations, and the counting of two types of particles (grains and fibers). The purpose of this study was to determine the effect of these variables on dust count results. An analysis of variance was made by means of a computer on 8400 values comprising the basic data. The biggest single source of variation in results is individual differences of the counters. Methods of keeping this variance to the minimum are discussed. Other methods of improving dust count reliability are also presented.
R 9

30,789
Meadows, F.L. & Stalker, W.W. THE EVALUATION OF EFFICIENCY AND VARIABILITY OF SAMPLING FOR ATMOSPHERIC NITROGEN DIOXIDE. Amer. Industr. Hygiene Assoc. J., Nov.-Dec. 1966, 27(6), 559-566. (US Public Health Service, Air Pollution Div., Cincinnati, Ohio).

A study of the efficiency and variability of the sampling system used to collect nitrogen dioxide in the Alabama Air Pollution and Respiratory Disease Study is described. Experimental sampling was conducted with single and multiple bubblers in series, equipped in each case with either fritted-tip or restricted opening air dispersers. Comparative evaluations of 0.4 to 0.5 lpm and 0.2 to 0.3 lpm air-flow rates indicated that higher collection efficiency, but greater variability, can be expected with lower air-flow rates. Fritted-tip bubblers were found to be more efficient, but restricted-opening bubblers are preferable because their variability is about half that of the fritted-tip bubblers. Sampling variability apparently was not affected by ambient air temperatures, humidity, or the concentration of collecting solution used. Collection efficiency, variability, and the method of empirically determining these factors should be specified when reporting ambient atmospheric nitrogen dioxide.
R 13

30,806
Summers, D.A. & Hammond, K.R. INFERENCE BEHAVIOR IN MULTIPLE-CUE TASKS INVOLVING BOTH LINEAR AND NONLINEAR RELATIONS. J. exp. Psychol., May 1966, 71(5), 751-757. (University of Colorado, Boulder, Colo.).

Ninety Ss made predictions in 2-cue tasks having the following characteristics: a) one cue related in a linear manner, the other in a nonlinear manner to the criterion; b) the criterion partly, but not perfectly, predictable from either cue alone; and c) the criterion perfectly predictable from both cues. Ss were studied under 3 conditions involving different proportions of linear and nonlinear task variance, and 3 levels of task information. Results indicate that task properties and task information determine both inferential accuracy and cue dependence.
R 16

30,807
Greenberg, M.G. & Weiner, B. EFFECTS OF REINFORCEMENT HISTORY UPON RISK-TAKING BEHAVIOR. J. exp. Psychol., April 1966, 71(4), 587-592. (Procter & Gamble Company, Cincinnati, Ohio & University of California, Los Angeles, Calif.).

Risk preferences of 9 groups which differed in their previous reinforcement histories were compared. 2 components of the reinforcement histories were manipulated in a factorial design: a) the amount of money won or lost; and b) the ratio of number of wins to number of losses. The amount of money won or lost was not significantly related to any of the 3 indicators of risk preference: probability, variance, and potential winnings. Groups differing in their ratio of wins to losses differed significantly in their preferences as measured by probability and potential winnings, but did not differ in their variance preferences. The group which had an equal number of wins and losses tended to be more conservative than the groups which had high or low reinforcement ratios. An interpretation suggesting differential biases in subjective probability is offered to explain the results.
R 6

30,808
Wofford, J.C. NEGATIVE IONIZATION: AN INVESTIGATION OF BEHAVIORAL EFFECTS. J. exp. Psychol., April 1966, 71(4), 608-611. (University of Southern Mississippi, Hattiesburg, Miss.).

One hundred experimental Ss from undergraduate psychology classes performed research tasks under an increased density of negative ions, while 100 control Ss performed under normal room conditions. The problem was to determine the effects of increased negative ionization upon discrimination reaction time and manipulative dexterity tasks. Increased negative ionization had a significant effect upon latency of reaction time ($p<.01$) but not upon measures of manipulative dexterity. Simple forms of behavior seem to be influenced more by negative ionization than more complex behaviors.
R 15

30,830
Kasami, T. ERROR ANALYSIS PARSING FOR CONTEXT-FREE LANGUAGES. Contract AF19(628) 4379, Proj. 5628, Task 562801, Rep. AFCRL 66 143, Sci. Rep. 7, Jan. 1966, 14pp. USAF Cambridge Research Labs., L.G. Hanscom Field, Bedford, Mass. (Electrical Engineering Dept., University of Hawaii, Honolulu, Hawaii). (AD 631866)

An aspect of the problem of error analysis parsing for context-free languages is discussed. An error analysis parsing can be considered a parsing problem concerning a grammar whose rules have "weight". Some theoretical framework is presented.
R 8

30,832
Kuchta, J.M., Cato, R.J. & Martindill, G.H. FIRE AND EXPLOSION HAZARD ASSESSMENT AND PREVENTION TECHNIQUES FOR AIRCRAFT. QUARTERLY PROGRESS REPORT, 1 JANUARY-31 MARCH 1966. Task 304801, March 1966, 10pp. US Bureau of Mines, Department of the Interior, Pittsburgh, Penn. (AD 482033)

The problems associated with aircraft fire and explosion hazards frequently increase and become more complex with the use of more advanced aircraft fuel systems. This report summarizes the research performed during the period January 1 to March 31, 1966. For convenience, the work has been divided into 3 parts: a) autoignition temperatures of lubricants at high pressures; b) autoignition temperature and flammability characteristics of aircraft fuels; and c) oxidation rate experiments.
R 4

30,833
Jennings, C.S., Jr. COMPUTERS IN THE RESEARCH ADMINISTRATION PROCESS. SCIENTIFIC REPORT. Proj. 61445014, Rep. AFOSR 66 0633, April 1966, 37pp. USAF Office of Scientific Research, OAR, Washington, D.C. (AD 631974)

The Air Force Office of Scientific Research of the Office of Aerospace Research established an automated Management Control Data System (MCDS) in 1962 which has been integrated into the organization line-management functions and is currently used in the management of basic research programs under AFOSR congizance. A brief history of the origin of the AFOSR MCDS is presented along with administrative consideration and system design criteria which has led to the present configuration of the operational system. The AFOSR MCDS is described from management's point of view as opposed to the computer-system engineer's point of view, with emphasis on management concepts essential to successful automation of management processes. Management experience gained through 4 years of MCDS operation is reflected in the basic rules enumerated in the conclusion as essential to success of any automated management control data system.
R 6

30,834
Johnson, Laverne C. SPONTANEOUS AND ORIENTING RESPONSE DURING SLEEP. NSF Grants GB 922 & GB 3961, BuMed. Proj. MR005 12 2304, Rep. 66 9, Jan. 1966, 16pp. USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. (AD 481521)

Research over the past 2 years concerned with autonomic activity during sleep is reviewed. As reported by others variability in basal heart rate, respiratory rate and in finger plethysmogram response is greatest during I-REM (rapid eye movement). But spontaneous electrodermal fluctuations are greatest during slow wave sleep. Autonomic basal levels are similar from stage to stage. The orienting response (OR) habituated in the awake subject returns with sleep onset and fails to habituate during sleep. Heart rate response is greatest during I-REM and lowest during slow wave sleep. Finger plethysmogram response is smallest during I-REM. Electrodermal response to the tone stimulus is diminished during sleep, compared to waking electrodermal response and to other autonomic variables. There is also no difference in the electrodermal response among the stages of sleep.
R 9

30,835
Hurley, P.B. EXAMINATION OF AIRBORNE NOISE LEVELS FROM PRAIRIE/MASKER INSTALLATION ON USS COBBLER (SS-344). BuMed. Proj. MF022.03.03 9015.09, Memo. Rep. 66 8, March 1966, 5pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 481459)

A noise survey was conducted in order to determine whether a risk to hearing is involved on board the USS COBBLER (SS-344) due to Prairie/Masker equipment noise. It was found that the noises due to this equipment are not intense enough to exceed the BuMed Damage Risk Criterion for hearing or to seriously interfere with speech reception at normally manned positions. However, it is noted that aging of the unit, its shock mounts, etc., may cause a sufficient increase in noise to exceed specified limits. Therefore, a scheduled system of subsequent monitoring is recommended, compatible with the ship's formal sound surveys.
R 1

30,836
Gunderson, E.K.E. ADAPTATION TO EXTREME ENVIRONMENTS: THE ANTARCTIC VOLUNTEER. INTERIM REPORT. BuMed. Projs. MR005.12 2004 & MF022.01.03 9001, Rep. 66 4, March 1966, 28pp. USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. (AD 632571)

This report described the Antarctic Research Program, the Antarctic environment, characteristics of small stations, and the composition of wintering-over parties. Demographic and biographic characteristics of Antarctic volunteers, Navy and civilian, were analyzed, and preenlistment histories and military performance records of Navy Antarctic volunteers were compared with those of Navy men generally. The selection process was portrayed for Navy occupations represented at small stations, and ratios of applicants to assignments for three expeditions were presented. A detailed analysis was conducted of cultural and psychological differences among Antarctic occupational groups. The data reviewed in this survey--the first of 2 parts--were intended to present a rather complete picture of the Antarctic setting and the characteristics of Antarctic volunteers. In the second report, a series of studies concerned with sources and effects of stress, measurement of individual and group performance, patterns of emotional and motivational change in wintering-over groups, and methods for prediction of performance will be summarized. Cf. HEIAS 30,837
R 10

30, 837
Gunderson, E.K.E. SELECTION FOR ANTARCTIC SERVICE. INTERIM REPORT. BuMed. Proj. MF 022.01.03 9001, Rep. 66 15, March 1966, 20pp. USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. (AD 632497)

Environmental conditions, group composition, and work roles at Antarctic scientific stations are described, and possible sources and effects of stress in these environments are indicated. Cultural and psychological characteristics of various Navy and civilian occupational groups represented in wintering-over parties are compared, and the selection problem and procedures are outlined. Personal history, clinical, and self description variables which correlated significantly with 3 performance criteria are presented for Navy enlisted and "Seabee" groups, providing a summary of characteristics that distinguish the successful Navy man at small Antarctic stations. (See also 30,836.)
R 12

30,838
Gillen, H.W. OXYGEN CONVULSIONS IN MAN. Contracts NONR 969(04) & NONR 4343(00), 1966, 11pp. Neurology Dept., Indiana University Medical Center, Indianapolis, Ind. (AD 631925)

Seventy examples of acute cerebral oxygen toxicity were described. Twenty-five had convulsions as the first clinical manifestation of the toxicity, ten had focal twitching, and thirteen more progressed to convulsions in spite of attempted immediate therapy. The convulsions were self-limited if the oxygen partial pressure was reduced to non-toxic pressures. The morbidity was minimal with retrograde amnesia as the only deficit that persisted beyond twenty-four hours. No deaths occurred in this series. Re-examination of the clinical data revealed only one instance where more careful pre-exposure selection may have prevented the convulsion. All exposures were at less than three atmospheres absolute, and all but four were for thirty minutes or less.
R 10

30,839
Glanzer, M. PSYCHOLINGUISTICS AND VERBAL LEARNING. TECHNICAL REPORT. Contract DA 49 193 MD 2496, May 1966, 28pp. USA Research & Development Div., Office of the Surgeon General. Washington, D.C. (New York University, New York, N.Y.). (AD 482118)

The paper surveys recent work in psycholinguistics. This work includes experiments on transformations, phrase structure grammar, semantic structure and categorial grammar. The relation of classic work in verbal learning to the study of language is then analyzed. It is argued that attempts to "purify" the rote learning situation so that linguistic organization is eliminated or minimized (e.g., using nonsense syllables) has actually complicated the performance being studied. The nature of the complications and what they imply for future work is discussed in detail.
R 42

30,840
Dodge, C.H. BIOELECTRICALLY CONTROLLED UPPER EXTREMITY PROSTHESES. Proj. 72202, Rep. ATD 66 46, April 1966, 36pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 632094)

This review article is based on Soviet open sources published in 1964 and 1966. Eight articles are used out of a collection of 35: Popov, B.P. (ed.), Protezirovaniye i protezostroyeniy; sbornik trudov (Prosthetics and prosthesis construction; collection of articles). Moscow, 1964, 174pp. (In: Tsentral'nyy nauchno-issledovatel'skiy institut protezostroyeniya. Sbornik trudov, no. 10(14), 1964). These articles have been summarized in detail to include all pertinent technical data given on the design, operation, and specifications of upper extremity prosthetic devices and components. They deal with problems of the design, testing, and refinement of bioelectrically controlled upper extremity prostheses, especially prosthetic hands. Articles selected are as follows: Electronic circuits for multifunctional prostheses with bioelectric control; Modes of controlling multifunctional bioelectrical prostheses; Design requirements for a feedback scheme for sensing grasping force in bioelectrical prostheses; Distribution of mass in forearm prostheses; Investigation of the electrical activity of muscles when operating a "TsNIIPP" arm prosthesis; Methods of testing miniaturized reducing gear assemblies; A hand for bioelectrically controlled prostheses; Servomotor drive for a prosthetic hand. Applications of bioelectrical control research outside the field of medicine (in space and industry) are indicated by 2 newspaper articles, found when popular literature was scanned for references to the subject. Summaries of these (with comments by Soviet specialists) will be found in a ninth section at the end of the report. According to the author of this report the first goal of prosthetic research is, of course, the clinical rehabilitation of amputees. In addition, the nature of bioelectric control suggests extensive applicability to the problems of manned spaceflight in particular and to the man-machine problem in general. R 10

30,842
Casey, I.J. & Larimore, W.E. PARAPHYSICAL VARIABLES IN WEAPON SYSTEM ANALYSIS. ANSER Rep. AR 66 1, April 1966, 65pp. Analytic Services Incorporated, Falls Church, Va. (AD 632254)

The effectiveness of a weapon system is dependent not only upon its physical characteristics but also upon the social characteristics of the enemy. The reaction of enemy combatants to attack is a function of personality, culture, and social organization. In order to obtain from a weapon system the results theoretically possible, these paraphysical variables must be considered. If the paraphysical effects of weapons are to be exploited, they must be expressed in a form which is usable in weapon system analysis. To accomplish this objective, it is proposed that the concept of modal personality be employed as a construct in the study of overt combat behavior to generate the basic data needed.
R 29

30,843
Clark, R.C. THE EFFECTIVENESS OF PROGRAMMED INSTRUCTION MATERIAL IN SET THEORY COMPARED TO CONVENTIONAL CLASSROOM INSTRUCTION. (M.S. Thesis). Contract AF 33(608) 1268, 1966, 68pp. University of Pittsburgh, Pittsburgh, Penn. (AD 481439)

In the University of Pittsburgh Industrial Engineering 178 course, Finite Mathematical Structures, the teaching of certain concepts and quantitative skills is done with programmed instruction material. It was believed that some areas, such as set theory, now covered by conventional instruction, can be taught as well, if not better, using programmed instruction. Program units in a text by McFadden, Moore and Smith were included in the course repertoire for an experimental group. Results were compared to that of a control group taught by conventional instruction, and statistical methods were applied to test differences in learning between the 2 groups. The promising results obtained from this experiment indicate the potential of programmed instruction in the subject areas covered in I.E. 178. There was no evidence found at any time which suggested that the material could not be covered at least as well with programmed instruction. But because of the question of reliability of small sample statistics, in this experiment n was less than 15, it is not wise to try to draw exact conclusions from the results. It is believed, however, that the favorable results definitely indicate that a more extensive investigation is warranted.
R 14

30,844
Caruso, J. A DISSERTATION FOR THE ORIENTATION OF FBM SUBMARINE MEDICAL OFFICERS. BuMed. Proj. MF022.03.03 9025.26, Rep. 475, March 1966, 29pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 481462)

This presentation of the environmental situation for a typical nuclear powered submarine and its 144 man crew is intended to be of assistance to Naval medical officers assigned to such submarines. It outlines and then treats in detail the responsibilities of the Medical Officer, --as advisor to the Captain, doctor to the crew, and Department Head and Administrator responsible for maintaining the health of the personnel of the ship, making appropriate inspections and making recommendations regarding health, hygiene and sanitation. Required reports are listed and the medical officer's role in a medical training program is specified.

30,846
Fenwick, C. TRENDS IN COMPUTER HARDWARE. Rep. SP 2393, March 1966, 35pp. System Development Corporation, Santa Monica, Calif. (AD 632477)

The capabilities of elements of data processing systems which might be expected to be economically available about 1971 are described. This description is based on an extrapolation by the writer of the present state-of-the-art. Systems are hypothesized containing these capabilities in their parts. It is shown that these systems have capabilities inherent in the hardware which are now expected to be provided only by sophisticated software developments. It is emphasized that software system designers should anticipate hardware capabilities which will be available at the time when their software systems are expected to be available.

30,847
Ginsberg, Rose, McCullers, J.C., Meryman, J.J., Thomson, C.W. (Princ. Investigator), et al. A REVIEW OF EFFORTS TO ORGANIZE INFORMATION ABOUT HUMAN LEARNING. TRANSFER, AND RETENTION. FINAL REPORT Contract AF 33(615) 2951, Proj. 7907, Task 790701, AMRL TR 66 23, March 1966, 40pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (San Jose State College, San Jose, Calif.). (AD 635491)

In this report, 14 efforts pertaining to organizing available information on human learning, transfer, and retention are summarized and evaluated on 6 criteria: behavioral significance of categories, scope, objectivity and reliability of categories, prognosis for the system, logical structure, and heuristic value of the system. Attention is also given to several other sources of guidance for organizing information on human learning. The review indicates at least 6 major approaches to a taxonomy of human learning. The bases for these different approaches are: a) general or limited theoretical factors; b) conditions of learning including the learner; c) individual differences; d) physical characteristics of learning tasks; e) task characteristics in relation to empirical variables; and f) task characteristics in relation to learning principles. In some cases the approaches are combined. The major conclusion is that although some contributions have been made to a general organization of information on human learning, intense and detailed efforts toward a comprehensive taxonomy are only in a preliminary formative phase. An empirically grounded and logically sound taxonomy of a wide range of learning situations will contribute substantially to the use of existing information and to the guidance of future research.
R 27

30,849
Ringel, S. COMMAND INFORMATION PROCESSING SYSTEMS--A HUMAN FACTORS RESEARCH PROGRAM. DA R&D Proj. 2J024701A723, Tech. Res. Rep. 1148, June 1966, 40pp. US Support Systems Research Lab. OCRD, Washington, D.C. (AD 637814)

The Command Systems Task seeks to develop research information by which the effectiveness of current and future command information processing systems may be maximized, pursuing its objective through intensive experimentation in specific Army man-machine complexes. The present publication describes the scope, rationale, and organization of a research program to provide that information to designers, developers, and users. The program represents a comprehensive approach to research concerned with automated command information processing systems, ranging from detailed studies of discrete human functions to integration of sizable highly automated computerized systems. Task effort for the present and in the immediate future will be concentrated on studies dealing with information assimilation and decision making. The report delineates a series of studies in progress or projected on nine major aspects of these functions: a) Amount and density of information; b) Specificity of information; c) Alpha-numeric and symbolic presentation; d) Type, extent, and rate of information updating; e) Coding of updated information and hard copy; f) Sequence of information presentation; g) Individual and group work methods and displays; h) Visual and auditory displays; i) Computer-aided performance. Research to be accomplished in remaining subtasks concerned with problems in the information preparation and system integration areas is more generally discussed.
R 31

30,850
Smithwick, G.A. & Kent, P.R. BIBLIOGRAPHY OF BIOLOGICAL AND/OR BIOMEDICAL EFFECTS OF LASER RADIATION. INTERIM REPORT. BuMed. Proj. MR005.08.5203 1.02, Memo. Rep. 66 3, Jan. 1966, 15pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 481463)

This bibliography represents a survey of the open literature pertaining to the biological and/or biomedical effects of laser radiation. Only English language publications have been included. The literature was searched particularly for sources describing or delineating the hazards associated with the use of lasers, and protective measures found to be effective in reducing or eliminating hazards.
R 163

30,851
Schane, W.P. & Slinde, K.E. SOME CREW SPACE MEASUREMENTS IN ARMY AIRCRAFT. Proj. 3A0 2560 1A 819, Task 054, Rep. USAARU 66 5, May 1966, 43pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (USA Aeromedical Research Unit, Fort Rucker, Ala.). (AD 482084)

Measurements were made in the cockpits of every type of aircraft presently in the U.S. Army inventory, and in most prototype aircraft scheduled for delivery to the U.S. Army through FY 1970. From these measurements it appears that a pilot of standing height greater than 76 inches or sitting height greater than 38 inches would be unable to comfortably and safely pilot many U.S. Army aircraft. This applies particularly to the aircraft used in both fixed and rotary wing pilot training.
R 1

30,852
Saslow, M.G. LATENCY FOR SACCADIC EYE MOVEMENT. Contract NONR 477(34), Rep. PRP 29N, Oct. 1966, 15pp. University of Washington, Seattle, Wash.

Under carefully controlled conditions, in blocks of trials in which the stimulus displacement on any given trial is randomly selected from a group of 2, 4, or 8 possible displacements, latency for lateral saccadic eye movement does not change. Moreover, a S trained on such a disjunctive latency task, then presented with blocks of trials in which there is only one possible stimulus displacement, of probability 1.00, 0.75, 0.50, or 0.25, displays the same latency to that displacement as when it was embedded in one of the disjunctive sets. These results conflict with earlier assertions that knowledge of stimulus location determines saccade latency. When the saccade on each trial is under the control of the stimulus on that trial, the size of the set of possible stimulus displacements does not affect latency to a particular displacement. These results also suggest that previous estimates of saccade latency using single stimulus displacements were underestimates, because Ss were not previously trained to follow stimulus displacement in a disjunctive task. A certain amount of care is required if saccade latencies are to be attributed completely to control by stimulus factors.
R 14

30,853
Jones, W.J. & Simpson, W.C. TECHNOLOGY SURVEY. NASA CONTRIBUTIONS TO: CARDIOVASCULAR MONITORING. NASA SP 5041, 1966, 43pp. National Aeronautics & Space Administration, Washington, D.C. (Research Labs., Westinghouse Electric Corporation, Pittsburgh, Penn.).

In surveying physiological monitoring systems and their applications, we have focused attention on the sensors involved. These elements are of necessity tailored specifically for biomedical use. The primary emphasis of this report is upon the methodology involved in making physiological measurements and the sensing systems used. A further reduction in the scope of this study is in regard to the physiological systems considered. The circulatory and respiratory systems are inherently and directly sensitive to the environmental conditions of space flight, and consequently a preponderance of NASA-supported research and development efforts have been concerned with monitoring of the significant parameters of these systems. The literature surveyed was limited by design to unclassified, unlimited distribution documents.
R 16

30,854
Saslow, M.G. EFFECTS OF COMPONENTS OF DISPLACEMENT STEP STIMULI UPON LATENCY FOR SACCADIC EYE MOVEMENT. Contract NONR 477(34), Rep. PRP 28N, Sept. 1966, 19pp. University of Washington, Seattle, Wash.

The standard displacement step stimulus often used to produce lateral saccadic eye movements is considered in terms of the effects of its components, termination of stimulation at an initial fixation point, and onset of stimulation at a new, laterally displaced fixation point. If the termination and onset are simultaneous, saccade latency is about 200. msec. If there is a gap of 200. msec. or more between these events, latency decreases to about 150. msec. If the termination follows the onset by 100. msec. or more, latency increases to about 250. msec.
R 23

30,855
Saslow, M.G. & Saslow, Carol A. SYSTEMATIC BIASES IN EYE MOVEMENT LATENCY DATA. Contract NONR 477(34), Rep. PRP 27N, April 1966, 5pp. University of Washington, Seattle, Wash.

This investigation was designed to estimate systematic time trends over sets of hundreds of trials, and to suggest methods for their compensation, in the study of human lateral saccadic eye movements. A disjunctive latency paradigm, with four mutually exclusive lateral displacements from a central fixation point, was in use in order to combat time estimation biases often found in simple latency paradigms. The independence of disjunctive saccade latency from number of alternatives had been demonstrated earlier (Saslow, 1963) and the invariance has been extended to the single-alternative case (Saslow, 1966).
R 4

30,861
Jewett, Ann. EVALUATION OF PHYSICAL FITNESS PROGRAM FOR WOMEN MARINES, INTERIM REPORT. BuMed. Projs. MF022.01.04 & MF022.01.04 8003.1, March 1966, 34pp. USN Medical Field Research Lab., Camp Lejeune, N.C. (Springfield College, Springfield, Mass.). (AD 631143)

The purpose of this study was to evaluate the physical fitness program for Women Marines and to make recommendations for possible improvements. Twenty-two recommendations are offered, including the following: a) A battery of 5-7 tests be developed to provide objective pass-fail standards based on the fitness needs of Women Marines; b) The exercise series devised for testing be used on a daily progressive basis during recruit training; c) The recruit physical fitness program be modified to give more emphasis to the use of activities with high potential for developing fitness and to posture and body mechanics activities; d) For Women Marines on permanent duty status, emphasis be placed on maintaining the prescribed level of physical fitness as measured by an appropriate standardized test, with the individual free to select her own means of maintaining fitness; e) Special attention be given to providing Women Marines on permanent duty status sufficient opportunity to exercise, place to exercise, and attractive programs of recreational activities; f) Attention be given to providing qualified leadership for physical fitness activities for Women Marines.
R 41

30,862
Jackson, C.T., Jr. & Snyder, C.T. VALIDATION OF A RESEARCH SIMULATOR FOR INVESTIGATING JET TRANSPORT HANDLING QUALITIES AND AIRWORTHINESS CRITERIA DURING TAKEOFF. NASA TN D 3565, Oct. 1966, 54pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

A fixed-base simulator with an external visual display was used to simulate a current turbojet transport throughout the range of certification takeoff maneuvers. The resulting data and pilot opinions were then compared to the actual flight test data for that aircraft. Correlation was achieved between these data, and participating pilots agreed as to the duplication of the performance and "feel" of the aircraft. The simulator development program indicated the requirements for: a) valid aerodynamic data, in particular, ground effect data; b) lateral motion of the cockpit for tests involving asymmetric thrust where the recognition of engine failure is important; and c) good response of the simulator visual display.
R 30

30,863
Rigney, J.W., Cremer, R.H., Towne, D.M. & Mason, A.K. ARMAN: A COMPUTER PROGRAM FOR GENERATING INHERENT CORRECTIVE MAINTENANCE WORKLOAD TIMES: I. DESCRIPTION, EVALUATION, AND APPLICATION. Contract NONR 228(22), Tech. Rep. 45, March 1966, 66pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Psychology Dept., University of Southern California, Los Angeles, Calif.). (AD 482160)

Maintenance task time, considered as a dependent variable of electronics design concepts, is discussed in the context of an equipment's Inherent Corrective Maintenance Workload (ICMW). A heuristic computer program is described which relates equipment design attributes to perceptual-motor loadings of maintenance tasks, as measured by task times. The program, ARtificial Methods ANalyst (ARMAN), is a generalized work measurement procedure which has the capability of generating inherent maintenance task times from the physical configuration of the equipment and descriptions of maintenance task requirements. A validation study of ARMAN's time- and methods-generating capability is described. It was found that ARMAN times were not significantly different from the means of the human-generated times over a wide range of corrective maintenance tasks. In addition, methods were verified for realism by showing that a technician could accomplish each maintenance-task goal using only ARMAN-specified work elements. An application of ARMAN is described where it is used in the comparative maintenance analysis of two technologically different radars; one based on conventional circuitry and the other on integrated microcircuitry. ARMAN demonstrated its efficiency and generality by very rapidly generating inherent corrective maintenance task times for both systems.
R 8

30,864
Rigney, J.W. & DeBow, C.H. DECISION STRATEGIES IN AAW: I. ANALYSIS OF AIR THREAT JUDGMENTS AND WEAPONS ASSIGNMENTS. Contract NONR 228(22), Proj. Desig. NR 153 093, Tech. Rep. 47, April 1966, 46pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Psychology Dept., University of Southern California, Los Angeles, Calif.). (AD 482051)

This report presents an investigation of strategies used by threat evaluators (trained in CIC procedures) in combining air-raid variables (range, course, bearing, speed, altitude, and composition) to arrive at a composite assessment of threat value. 63 CIC Watch officers judged the similarity of all possible pairs of 20 air-raids in terms of threat. Each raid was also judged individually in terms of a 9 point scale of threat. A final judgment required selection of an action alternative to counter each raid. A multidimensional analysis of the paired data revealed one and possibly 2 variables to be operating in subject judgments. Low levels of reliability in judgments were observed for 1/2 of the sample. Action decisions were found to be influenced by threat value and different weighted combinations of raid variables. Analysis of single raids revealed a priority ordering of raids for weapons assignment.
R 16

30,865
Linhart, E.M., Riley, V.F. & Graham, C.R. INVESTIGATION OF VARIOUS TEXTILE PARACHUTES AND CONTROL SYSTEMS TO ACHIEVE STEERABILITY, PHASES III AND IV. Contract AF 33(657) 10646, Proj. 6065, Task 606501, FDL TDR 64 81, Part III, Rep. NVR 3941, Feb. 1966, 151pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Ventura Div., Northrop Corporation, Newbury Park, Calif.). (AD 482081)

This research program covers the detailed investigation of gliding parachutes and their necessary guidance and control systems to achieve a controlled approach to and touchdown at a preselected spot. Theoretical and analytical investigations and exploratory wind-tunnel and truck-tow tests have been conducted to establish a flexible and self-inflatable canopy configuration capable of meeting the program objectives. Free-flight tests have been conducted to demonstrate the performance of the selected configuration. This report documents the free-flight test phase of the program. Sixteen, twenty-eight, and forty foot steerable parachute canopies were free-flight tested with suspended weights from 198 to 3865 pounds to obtain deployment, inflation, and performance data. The result of this research program is a flexible, self-inflating, steerable parachute which has demonstrated a maximum lift-to-drag ratio of 2.1 in wind-tunnel tests; has been deployed in free-flight tests in sizes up to 40 ft parachute diameter based on upper canopy surface wetted area at velocities up to 150 knots and altitudes up to 15,000 feet, and has demonstrated excellent stability and controllability with turn rates up to 30 degrees per second.
R 5

30,868
Tucker, G.J. & Reinhardt, R.F. PSYCHOMOTOR FUNCTIONS, THE BODY IMAGE, AND AVIATION. BuMed. Proj. MR005.04 0019.1, Rep. NAMI 986, Dec. 1966, 20pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

In the evaluation of aviators, and particularly student aviators, another source of anxiety--unrelated to fears of death and mutilation, etc.--has become evident. This is in the sphere of psychomotor adaption to the process of flying an airplane. In this report, a theoretical formulation of the process of learning to fly is presented in terms of the aviator's psychomotor function, body image, and ability to orient himself in space. Clinical and experimental evidence are presented to validate these theories.
R 13

30,869
Gregory, R.L. VISUAL PERCEPTION OF MOVEMENT. INTERIM REPORT. Grant AF EOAR 65 62, Proj. 9778 01, AFOSR Rep. 66 1532, 1966, 60pp. USAF Office of Scientific Research, OAR, Arlington, Va. (Psychological Lab., University of Cambridge, Cambridge, England). (AD 637510)

This research includes: a) investigation of the use of pitch of a sound as a distance cue; b) investigation of the maintenance of retinal fusion as an object moves in depth; c) description of the apparatus developed for moving observers at constant velocity; d) investigation of apparent depth and perspective set up by a line at different inclinations from the vertical; and e) measurements of the magnitude of the Ponzo illusion for different positions of the horizontal lines within the oblique lines.
R 8

30,871
McKendry, J.M. & Enderwick, T.P. FACTORS AFFECTING THE RELIABILITY AND VALIDITY OF INFORMATION UTILITY SCALES. HRB Rep. 567 R 4, Feb. 1966, 57pp. HRB-Singer, Inc., State College, Penn.

This paper summarizes results of 2 experiments: In the first, 64 Ss were used to appraise effects of a) 2 levels of rater experience, and b) 2 variations in the complexity of information to be evaluated on the reliability and validity of different types of information utility scales. In the second, 80 Ss were used in an incomplete replication study which focused on clarifying and extending findings of the first experiment. The testing situation in each case was an anti-submarine warfare (ASW) game in which Ss rated the value of 4 "intelligence bulletins" both before and after playing the game using some of the information to be evaluated. Half of the Ss rated the value of 4 "simple" bulletins, each of which contained a single item of information. The remaining half evaluated 4 "complex" bulletins, each of which contained a different combination of the 4 single items taken 3 at a time. Results of the first experiment indicated that reliability of judgments varied drastically as a function of the complexity of information to be evaluated. In the second study the rating task was complicated by selecting items whose value interacted with one another by virtue of their containing partially redundant information. Also, 2 of the 4 items of information had equal rational value. In this case, a substantial increase in the number of intransitive judgments was noted which was not related to rater experience or to the complexity of information being evaluated. Both studies showed that rater experience has a significant beneficial effect on the agreement between judged value and rational value. In the second study, increases in stimulus complexity were found to lower significantly the agreement between judged and rational value. In neither case was the interaction between rater experience and stimulus complexity significant.
R 23

30,872
Weis, E.B., Jr., Clarke, N.P. & von Gierke, H.E. MECHANICAL IMPEDANCE AS A TOOL IN BIOMECHANICS. FINAL REPORT. Proj. 7231, Task 723101, AMRL TR 66 84, June 1966, 28pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This report presents new measurements of mechanical impedance in the transient acceleration environment and compares the results with previous measurements made in the steady state sinusoidal acceleration environment. Although there are some discrepancies which await further clarification, the transfer function obtained under these two environments show encouraging general correlation. With further sophistication of the method, the transient impedance measurement shows considerable potential in that a single test furnishes data over a spectrum of frequencies and provides a more general excitation condition. Although it has only been recently employed for this purpose, the practical usefulness of the impedance method as a means of establishing design criteria for protection systems is most encouraging. With further definition of the mechanodynamic properties of the body of protection system components, it appears reasonable that biomechanics can achieve the goal of providing optimized protection against the increasingly severe mechanical environments generated in aerospace vehicles and ground transportation.
R 15

30,873
USN Electronics Laboratory. EQUIPMENT ASSURING HIGH EFFECTIVENESS. May 1966, 24pp. USN Electronics Lab., San Diego, Calif.

This paper defines the programs and facilities at NEL having to do with equipment. Topics are: reliability and maintainability, contractor assistance, shipboard equipment environmental design studies, automatic test systems, assembly tester, radio-frequency-interference correction, human-factors engineering, engineering evaluation, and procurement data control. (HEIAS)

30,874
Weis, E.B., Jr. & Lajeunesse, D.J. SYSTRAN (SYSTEMS ANALYSIS TRANSLATOR): A DIGITAL COMPUTER PROGRAM. SUPPLEMENT ONE. FINAL REPORT. Proj. 7231, Task 723101, AMRL TR 65 133, March 1966, 89pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

SYSTRAN was originally developed around a data acquisition system and was primarily intended for use in analysis of periodic and transient signals. Although the system included some capability for handling random data it was limited. The additions have been made for the purpose of handling unusual data (including random). Extensions of the capability of the original program, corrections to the original program, and listings of all modifications and additions are described. In particular this report describes the addition of computing capability for accomplishing Digital Filtering, Probability Density Function Calculation, and Random Number Generation. The report discusses all aspects of the program essential to competent usage.
R 3

30,876
Passey, G.E. & McLaurin, W.A. PERCEPTUAL-PSYCHOMOTOR TESTS IN AIRCREW SELECTION: HISTORICAL REVIEW AND ADVANCED CONCEPTS. Contract AF 41(609) 2796, Proj. 7719, Task 771904, Rep. PRL TR 66 4, Lockheed-Georgia Co. Rep. ER 8077, June 1966, 236pp. USAF Personnel Research Lab., Lackland AFB, Tex. (Lockheed Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.). (AD 636606)

This report reviews the literature reflecting the employment of perceptual-psychomotor tests for selection of aircrew members since World War II and provides behavioral concepts for consideration as possible future test development areas. The review considers the use of flight experience as well as perceptual-psychomotor screening devices and comments on the results of the programs in which such experience is intentionally used. The fundamental importance of criterion definition to development and validation of selection devices is discussed. Recent research is reviewed leading to the derivation of behavioral concepts recommended for consideration as principles on which new perceptual-psychomotor tests may be based. The merits of simple tests as opposed to complex tests in which numerous facets of performance are concurrently assessed are considered and the latter approach is recommended. References are included in support of the review and critical items are annotated.
R 201

30,877
Ringel, S., Vicino, F.L. & Andrews, R.S. HUMAN FACTORS RESEARCH IN COMMAND INFORMATION PROCESSING SYSTEMS. DA Proj. 27024701A723, Tech. Res. Rep. 1145, March 1966, 29pp. USA Support Systems Research Lab., OCRD, Washington, D.C. (AD 634313)

The report describes the scope, rationale, organization, and progress of a command systems research program to provide human factors information needed for performance within complex automated information processing systems. Following a survey of military information processing equipment and operations and future plans for command information processing systems, basic human factors problems were identified and organized around 5 critical operations--screening incoming data, transforming raw data for input into storage devices, input, assimilation of displayed information, and decision making. A research program was formulated and studies undertaken to yield empirical information about the effects on human performance of: a) characteristics of the information presented (density, amount, etc.); b) dynamic aspects of information (type, extent, coding of updates); c) display modes and sensory modalities (group vs individual displays, multisensory displays); and d) computer aids to the decision process. A Command Systems Laboratory was developed to permit simulation of various Tactical Operations System (TOS) functions. Findings have suggested the possibility of reduction in storage capacity requirements, number of displays called from storage during a given operational time period, and time required for the total information assimilation-decision process and supported the incorporation and use of information conspicuity coding capabilities in command systems.
R 8

30,879
Knoop, Patricia A. PROGRAMMING TECHNIQUES FOR THE AUTOMATIC MONITORING OF HUMAN PERFORMANCE. FINAL REPORT. Proj. 6114, Task 611412, AMRL TR 66 16, April 1966, 60pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 637454)

This report describes the organizational and operational design of a digital computer program for the automatic monitoring of human performance during simulated training missions. The computer program, now in its developmental stage, is designed to serve the dual and interdependent purposes of: a) assisting in the analysis and determination of meaningful performance measures and performance criteria; and b) using these criteria to automatically monitor human performance; including performance evaluation (scoring), adaptive task sequencing, and the automatic initiation of simulated system malfunctions for training in emergency procedures. A description is provided of a Criteria Format that aids the user of the automatic monitoring program in defining criteria with variable tolerances for conceivably any aerospace task or mission. Some projections are made about possible uses of the research-oriented automatic monitoring program to a) vary criteria as the skill level of a particular student increases; b) hold selected flight variables constant to allow the teaching of isolated skills on a progressive basis; c) effect "overlearning" of selected skills by controlling the outputs to the cockpit; and d) aid in debugging simulation programs. A topical flow-chart is provided for the entire automatic monitoring program.
R 23

30,880
Streeter, D.N. & Raviv, J. RESEARCH ON ADVANCED COMPUTER METHODS FOR BIOLOGICAL DATA PROCESSING. Contract AF 33 (615) 2047, Proj. 7233, Task 723305, AMRL TR 66 24, IBM Res. Rep. RC 1513, April 1966, 58pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

The purpose of the research carried out under this contract has been the development of mathematical methods and computer programs for the extraction of meaningful information from biological, primarily neurophysiological, measurements. Emphasis has been placed on statistical methods suitable for separating two or more random signals and which provide insight into the underlying mechanism by which the signals are generated. Loeve-Karhunen expansion and Discriminant Analysis methods are applied to the problem of time signal classification. Experiments are performed both on computer generated time signals and on electroencephalograms. Methods of coping with the singularity problem arising from a small sample size are investigated.
R 27

30,882
McDonald, D.G. CONDITIONAL AND UNCONDITIONAL AUTONOMIC RESPONSES DURING SLEEP. Report from: "Annual Meeting of the Society for Psychophysiological Research, Houston, Texas, Oct. 15-17, 1965." NSF Grant GB 922 & USPHS Grant MH 10236 01, BuMed. Proj. MR005 12 2304, Rep. 65 28, Jan. 1966, 12pp. USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. (University of Missouri School of Medicine, Columbia, Mo.). (AD 481520)

The literature relevant to learning during sleep is reviewed and the conclusion is made that learning during sleep has not yet been demonstrated. Research concerned with autonomic conditioning in awake and drowsy subjects is reported. While conditioning in the awake subjects was demonstrated, there was no evidence of conditioning in the drowsy subjects. Suggestions for research design and research problems related to learning during sleep are presented.
R 15

30,883
Madden, H.L. & Tupes, E.C. ESTIMATING READING ABILITY LEVEL FROM THE AQE GENERAL APTITUDE INDEX. Proj. 7717, Task 771705, PRL TR 66 1, Feb. 1966, 27pp. USAF Personnel Research lab., Lackland AFB, Tex. (AD 632182)

Conversion tables are presented for estimating reading achievement (reading grade level as measured by the California Achievement Test and scaled score as measured by the Davis Reading Test) from the AQE General Aptitude Index. Distributions of estimated reading grade are shown for non-prior-service airmen entering the Air Force in 1964 and 1965 for the total group and for subgroups split on years of education completed. Distributions of estimated reading grade are also presented by career field for airmen assigned to 29 career fields. It was pointed out that a wide range of reading ability was found within each career field and that the career fields differed considerably with respect to average reading ability. Implications for writing of Career Development Courses and technical manuals were discussed.
R 7

30,884
Miga, M.J. SCHEDULING PATIENTS IN AN OUTPATIENT FACILITY - A SIMULATION APPROACH. M.S. Thesis. Contract AF 33(608) 1268, 1966, 87pp. University of Pittsburgh, Pittsburgh, Penn. (AD 481445)

This thesis is concerned with an outpatient facility of a particular hospital; but the results obtained can be applied to the outpatient facility of any hospital. The method used in this thesis can be adapted to other outpatient facilities by changing the various parameters of the consultation time and arrival time distributions. In addition, if it was desired to simulate a clinic operation with more than one doctor giving consultations, it would be necessary to revise the Simscript computer program into one which would incorporate the features of a multi-server queueing process. The simulation technique presented shows that the outpatient facility can cope with the problem of increased demand and congestion through the use of an efficient appointment system. Implementation of an appointment system in itself, however, will not guarantee a solution to the problem. Consulting doctors will have to reappraise their role in dealing with the problem and recognize the importance of a punctual schedule. Education of the patient is another critical area in the successful operation of an appointment system. It was found that many patients simply do not understand what an appointment means. Others, knowingly, completely disregard appointment procedures. Until such time as the patient, himself, can be brought up to a responsible state of awareness, it can only be hoped that outpatient administrators continue to explain to, and impress upon the patient, the importance of following appointment procedures.
R 7

30,885
Morsh, J.E. & Christal, R.E. IMPACT OF THE COMPUTER ON JOB ANALYSIS IN THE UNITED STATES AIR FORCE. Contracts AF 41(609) 2379, AF 41(609) 1982, & AF 41(609) 2387, Proj. 7734, Task 773401, PRL TR 66 19, Oct. 1966, 16pp. USAF Personnel Research Lab., Lackland AFB, Tex.

In keeping with present trends toward the automation of personnel information, the Air Force method of job analysis provides for the exploitation of advances in electronic computer technology. Computer capability is applied not only in the analysis of job inventory data but also in the construction, administration, and publication phases of the procedure. During inventory construction the computer is used to prepare alphabetic lists of tentative task statements according to pertinent key words. This grouping by topic facilitates the detection of redundancy and insures the elimination of duplicate statements. In the administration phase, the computer selects the required sample of job incumbents from current personnel rosters maintained on magnetic tape. In addition, the computer prints names and adresses on appropriate labels to attach to inventories for mailing. It is in the area of occupational data analysis, however, that the computer makes its most impressive impact. By application of a complex program consisting of over 50,000 instructions, those incumbents in a survey sample who perform essentially the same job are grouped together, and a job description composed of duties and tasks is published for each such job type identified. The computer also lists information available for each case and reports means, standard deviations, and distributions of values for specified variables. Composite job descriptions may also be obtained for any group defined in terms of job-related variables such as grade, specialty, years of experience, or specialized training. Other programs compute and generate tables showing group similarities and group differences, thus providing a condensed picture of interrelationships or revealing dissimilarities among job types or other groups. And finally, a program selects and arranges the job descriptions, tabular outputs, and explanatory text materials in any desired order and publishes the complete job analysis survey report. R 6

30,888
Flynn, J.C. & Thompson, W.D. SOVIET CYBERNETICS: A REVIEW OF RECENT PSYCHOLOGICAL, PHYSIOLOGICAL, AND BEHAVIORAL DEVELOPMENTS. Contract AF 29(600) 4923, Proj. 6893, Task 689302, ARL TR 66 11, April 1966, 63pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (Psychology Dept., Baylor University, Waco, Tex.). (AD 486139)

This report is a survey of Soviet bloc publications in psychological, physiological and behavioral applications of cybernetics. The report is based entirely on material made available to the authors in translated form by the 6571st Aeromedical Research Laboratory, Holloman AFB, New Mexico. The relevant material is discussed under 4 major topics. These are Models of Neurons and Neural Processes, Algorithms and Heuristics, Physiological and Medical Applications, and General Social Science Concerns. Within each area representative papers are reviewed and dominant trends are noted.
R Many

30,889
USA Human Enginneering Laboratories. SMALL ARMS USE IN VIET NAM: PRELIMINARY RESULTS. Tech. Note 5 66, Aug. 1966, 18pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

The U.S. Army Human Engineering Laboratories developed a questionnaire to find out how small arms are used in Viet Nam. This report gives preliminary results from a sample of 121 combat troops.

30,890
Peterson, F.E. & Lane, N.E. THE RELATIONSHIP OF COLLEGE MAJOR TO SUCCESS IN NAVAL AVIATION TRAINING. BuMed. Proj. MF022.01.02 5001.47, Rep. NAMI 958, April 1966, 11pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

This study investigated college major of cadets as a possible predictor of success in naval aviation training. Each of 1245 pilot trainees was placed into one of 10 categories according to his college major. 3 dichotomous criteria of success/failure were used. The extent to which the inclusion of college major categories contributed to the multiple prediction of success in flight training was examined by the Wherry-Doolittle technique. Their contribution was determined both as primary selection variables and as predictors after the completion of academic training. The inclusion of college major categories both as primary and as secondary selection variables significantly increased the multiple prediction of success/failure in naval aviation training.
R 4

30,891
Massengill, H.E. & Shuford, E.H., Jr. DIRECT VS INDIRECT ASSESSMENT OF SIMPLE KNOWLEDGE STRUCTURES. Proj. 2806, Task 280609, ESD TR 65 542, March 1966, 51pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

This report compares 2 types of classroom testing in terms of efficacy in guiding instruction. One type of testing is the traditional indirect method based on the observation of choices. The other type is the direct method based on admissible probability measurement. The general finding is that the direct methods always perform as well as and in most cases better than the indirect methods. This deficiency in the indirect method can be alleviated in theory by introducing redundancy into the test and asking the same question over and over again. The performance of indirect methods depends in a very critical manner upon the information available to the instructor from other sources about the current state of knowledge of each student. The performance of the direct methods is unaffected by this. The gain in effectiveness achieved by using direct methods must be balanced off against the cost of using these new methods. A direct method may require more student time per item than does an indirect method. This, however, may be more than compensated for by the requirement for redundancy when using the indirect method. In addition, since a direct method does not require additional information from the instructor as to the current state of knowledge of each student, the possibility exists that much larger classes may be taught with no loss in effectiveness thus implying even further economic benefits from the use of direct methods to guide classroom instruction.
R 6

30,892
Osborn, W.C. & Goodman, Barbara E. A TENTATIVE ORGANIZATIONAL SCHEMA FOR DECISION-MAKING PROBLEMS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 66 14, July 1966, 26pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To take into account the psychological complexity of most real-life decision problems, and to develop a tentative organization of decision behavior that will embrace the many, highly diverse types of problems which are presumed to result in "decision," an attempt was made to delineate the component response processes that lead to these decisions. The procedure followed was a) to identify and descriptively define the relevant stimulus and organismic factors, and b) especially to schematize the response dimensions involved, in such a way as to derive a tentative response matrix. The result is an organizational schema for use in analyzing the response aspects of the decision-making process in terms of the pertinent psychological dimensions of decision behavior.
R 12

30,893
Price, H.E., Monsberger, W.D. & Ereneta, W.J. A STUDY OF POTENTIAL ROLES OF SUPERSONIC TRANSPORT CREWS AND SOME IMPLICATIONS FOR THE FLIGHT DECK. VOLUME I: WORKLOAD, CREW ROLES, FLIGHT DECK CONCEPTS, AND CONCLUSIONS. Contract NAS 2 2209, NASA CR 561, Aug. 1966, 310pp. Ames Research Center, NASA, Moffett Field, Calif. (Serendipity Associates, Chatsworth, Calif.).

The study was conducted to investigate potential roles of supersonic transport crews and the implications of these roles on flight deck design. The results of the study should be useful as an objective data base for decisions concerning crew complement and qualifications, flight deck design, allocation of functions to the crew or automatic equipment, and distribution of duties among crew members. The study results should further be useful for the planning and conduct of empirical simulation research on crew requirements by providing the basis for realistic crew workloads, identification of simulator characteristics, and identification of crew research requirements for simulation investigation.
R 82

30,895
Rabideau, G.F. & Semple, C.A., Jr. HUMAN ENGINEERING SUPPORT TO AIR FORCE FLIGHT CONTROL AND FLIGHT DISPLAY INTEGRATION PROGRAM. FINAL REPORT. Contract AF 33(615) 3757, Proj. 6190, Task 619007, AFFDL TR 66 157, Oct. 1966, 47pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Bunker-Ramo Corporation, Canoga Park, Calif.).

The Bunker-Ramo Corporation conducted a program of human engineering research and applications activities at Wright-Patterson AFB under this contract. The activities provided support to Project 6190, Air Force Flight Control and Flight Display Integration Program over a 15-week period from 14 March to 24 June 1966. Among the research outputs during this period were: a) a head-up display literature search and analysis; and b) experimental design for dynamic (open-loop) study of moving tape scale variables. Among the continuing research tasks were: a) visual requirements in cockpit displays under low ambient illumination; b) switch type and location evaluation for control yoke; c) V/STOL landing display literature search; and d) Control Display Information Center subjective index development. Additionally, the more extensive consulting tasks included: a) V/STOL program development; b) advanced multipurpose spacecraft display study; c) V/STOL panel and cockpit mockup support; and d) electroluminescent altimeter design concept evaluation.

30,896
Spacelabs, Incorporated. X-15 DATA DISPLAY SYSTEM. Contract NAS 4 589, NASA CR 460, May 1966, 181pp. National Aeronautics & Space Administration, Washington, D.C. (Spacelabs, Inc., Van Nuys, Calif.).

Advanced signal processing techniques for the data display system were studied. The general procedure was conversion of flight data (physiological and environmental parameters of interest to the medical monitor) to digital form, the digital process programming, testing and debugging, and interpretation of application run results. Details are given on the electrocardiogram (ECG), autocorrelation, ECG digital filtering, spectral ECG analysis, digital synthetic ECG waveform generation, ECG waveform averaging, respiration signal processing, and Korotkow sound signal processing. Certain trouble areas such as waveform distortion, unreliable performance of bandpass filtering, and waveform averaging difficulties are discussed. It was felt that the techniques have not received sufficient reliability or economy to warrant implementation into an operational system. Areas of work needing further study are indicated.

30,897
Briggs, G.E. & Johnston, W.A. LABORATORY RESEARCH ON TEAM TRAINING. FINAL TECHNICAL REPORT. Contract N61339 1327, Proj. 7587 2, NAVTRADEVCEN 1327 3, May 1966, 56pp. USN Training Device Center, ONR, Port Washington, N.Y. (Human Performance Center, Ohio State University, Columbus, Ohio).

2 experiments were performed in continuation of a laboratory research program on team training. The transfer tasks of both experiments required 2-man teams to coordinate their radar control aerial intercepts. The first experiment varied the criteria used to feed back system performance information to the teams. While in most cases rather rapid adjustment of performance occurred to a change in criteria, when the operational criteria are more complex than the training criteria team performance will suffer. The second experiment varied the channel available for communication of team coordination information. It was found that the visual information channel was superior to the verbal channel. Moreover by increasing redundancy through adding the verbal channel to the visual, no improvement in team performance occurred.
R 3

30,898
Edinger, L.D. & White, G.D. DATA REQUIREMENTS FOR INFLIGHT SYNTHESIS AND MULTIPLE BLENDER STUDIES. Contract NAS 8 11206, NASA CR 548, Aug. 1966, 214pp. George C. Marshall Space Flight Center, NASA, Huntsville, Ala. (Honeywell, Inc., St. Paul, Minn.).

This document reports the analysis performed in the following studies: a) Data Requirements for In-Flight Synthesis; b) Multiple Blender Study. The objective of the 2 studies was to develop improved techniques for the control of large flexible boosters of the Saturn class. The flight control problem was broken into 2 parts: a) identification; and b) synthesis. Work in the Data Requirements for In-Flight Synthesis Study concentrated on solving the synthesis problem. By so doing, it was possible to establish design requirements for an identification process. Work in the multiple blender study was concerned with extending the basic Honeywell rate gyro blender concept to provide control of 2 independent structural bending modes. This was accomplished by blending 3 rate sensors using 3 adaptive blenders. As a result of the work performed in the In-Flight Synthesis study, a control system was defined which met all performance requirements including damping augmentation requirements on the first 2 bending modes. Data to be regulated by an identification process and the accuracy of the regulation was also defined. The concept of multiple blending was found to be feasible, however, several problem areas were encountered in extending the single blender concept to use in a multiple blender system. As a result, an improved blender logic was suggested for application to a multiple blender system.
R 13

30,899
Miller, R.L. A MODEL FOR TRAFFIC FLOWS ON A TWO-LANE TWO-WAY RURAL HIGHWAY. (Ph.D. Thesis). Contracts NONR 1841(87), NR 042 230 & NONR 3963(06), NR 276 004, General Motors Grant DSR 9724, Projs. DSR 9153 & DSR 9493, Tech. Rep. 20, June 1966, 101pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Operations Research Center, Massachusetts Institute of Technology, Cambridge, Mass.). (AD 634597)

A stochastic model is developed to describe the behavior of traffic on a two-lane, two-way road. Unlimited visibility and absence of intersections are assumed. The inputs are free speed distribution and traffic density; the outputs are forced speed distributions, queue lengths, passing times, etc. Computer programs, sample problems, and applications are presented.
R 28

30,900
Jackson, D.H. & Molina, E.A. A COMPUTER METHOD FOR STUDYING THE POSTEXERCISE BALLISTOCARDIOGRAM. BuMed, Proj. MR005.20 0052, NAMI Rep. 978, Rep. 13, Sept. 1966, 13pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The postexercise ballistocardiogram has been shown to be a useful diagnostic tool but has its limitations because of artifacts which result from muscle tremor and respiratory movement, especially if the exercise is vigorous. An electronic system incorporating a small computer previously suggested for clearing electrocardiographic records of artifacts has been applied to the recording of low frequency ballistocardiograms obtained before and after standardized exercise. Evaluation of the postexercise tracings as to accurate reproduction and good quality shows this system to be feasible for use in a large scale postexercise ballistocardiographic study. The system presented also lacks the complexity of the one used with electrocardiograms. Any difficulties in reproduction were found to be those inherent in the ballistocardiographic apparatus rather than in the system itself. Lines for further investigation are pointed out.
R 7

30,903
Bayroff, A.G. METHODS FOR IMPROVING ENLISTED INPUT--CURRENT RESEARCH ACTIVITIES. DA R&D Proj. 2J024701A722, Tech. Res. Rep. 1144, Feb. 1966, 22pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 633410)

In response to continuing requirements of the Deputy Chief of Staff for Personnel (DCSPER), Department of Army, the INPUT QUALITY Task has directed its research efforts to developing new approaches to screening problems and to contributions of screening activities to classification and other manpower management functions. Successive forms of general military trainability measures--Armed Forces Qualification Test (AFQT) and Enlistment Screening Test (EST)--and supplementary measures of specific aptitudes (Army Qualification Battery, AQB)--were developed and produced to aid in more effectively determining enlistment eligibility. The present publication reports on the research accomplishments of the INPUT QUALITY Task for Fiscal Year 1965-1966.
R 34

30,904
Institute of Electrical & Electronics Engineers. EDUCATION: MANAGEMENT; WRITING AND SPEECH. IEEE International Convention Record, 1966, 14(11), 1-90. (Institute of Electrical & Electronics Engineers, Inc., New York, N.Y.). (Report from IEEE International Convention, New York, N.Y., 21-25 March 1966).

This document records the proceedings of a conference on various factors in the engineering profession. One section is on technical writing and speech, another on management problems, and a third on education of the engineer.
R Many

30,905
Institute of Electrical & Electronics Engineers. AUTOMATIC CONTROL; SYSTEMS SCIENCE AND CYBERNETICS; BIOMEDICAL ENGINEERING; HUMAN FACTORS, IEEE International Convention Record, 1966, 14(6), 1-257. (Institute of Electrical & Electronics Engineers, Inc., New York, N.Y). (Report from IEEE International Convention, New York, N Y., 21-25 March 1966)

This part of the proceedings contains papers collected under 8 major headings: engineering and heart disease, cybernetics, what control theory gives and takes from biology, transportation, state of the art of optimal control and stability theory, discrete systems, human factors in electronics and linear systems and applications. The human factors section contains one abstract and two papers.
R Many

30,906
Flynn, P.D. DYNAMIC PHOTOELASTIC STRESS PATTERNS FROM A SIMPLIFIED MODEL OF A HEAD. Report from: Caveness & Walker (Eds.). "Head Injury. Conference Proceedings." Chap. 28, 1966, 344-349. J.B. Lippincott Company, Philadelphia, Penn. (USA Pittman Dunn Research Labs., Frankford Arsenal, Penn.). (Reprint) (AD 639596)

Photoelasticity is a method of experimental stress analysis employing polarized light and transparent models. Dynamic photoelasticity generally deals with the determination of transient stresses and strains in machine parts or structures subjected to impact or shock loading. The potential value of this technic in head injury research is illustrated by stress patterns of a simplified model of a skull and brain under dynamic loads that were photographed at a rate of 240,000 pictures per second. The results are compared with stress patterns obtained from the same model under static loads.
R 11

30,907
Institute of Environmental Sciences. FACILITY SURVEY. SUPPLEMENT. May 1966, 28pp. Institute of Environmental Sciences, Mt. Prospect, Ill.

This supplement provides an alphabetical listing of establishments with special environmental test facilities. In addition the characteristics of some previously unlisted facilities are given. (HEIAS)

30,908
Forbes, F.W., Schofield, J., Hriber, V.F. & Jurich, L. EXPANDABLE STRUCTURE CONCEPT OF CREW TRANSFER TUNNEL FOR SPACE VEHICLES. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 1-18. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio). (AD 631406)

The purpose of this paper is to summarize the results of both Air Force and contractual initial development of the expandable crew transfer tunnel. The general design of the expandable crew transfer tunnel was specifically derived under the major constraints imposed by human factors considerations. In addition, it was required that the tunnel design be consistent with mission requirements. Therefore, the design was oriented to provide crew transfer between currently planned spacecraft and orbital laboratories. The human factors design requirements were established by Air Force in-house programs. By a cooperative effort between the Aero Propulsion Laboratory, the Aero Medical Laboratory, and the Materials Laboratory, a wood mockup of the tunnel geometry was fabricated. This mockup was flown in the KC-135 zero-g aircraft and thoroughly evaluated relative to human factors requirements in zero-g transfer. The tunnel mockup was attached to a mockup of the left half of a 2-man spacecraft. Entry from the tunnel into the spacecraft was through a 17- by 30-inch elliptical hatch located in the main entry hatch of the spacecraft. Entry from the other end of the tunnel into a simulated orbital laboratory was through a 22-inch -diameter circular hatch. Two ropes were placed 21 inches apart to serve as handrails from one hatch to the other. The S wore a full-pressure suit.

30,909
Jourlles, N. A PREDISTRIBUTED FOAM FOR RIGIDIZING MEMBRANE STRUCTURES IN SPACE. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 339-361. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Goodyear Aerospace Corporation, Akron, Ohio). (AD 631406)

On the basis of the work accomplished in this program, the following conclusions were reached: a) A workable predistributed foam material capable of rigidizing solar concentrators and other membrane structures in space has been developed; b) The predistributed foam can be heated to initiate the foaming action in space with selective surfaces to control the absorption of sunlight; c) The foam product has useful structural strength and stiffness in a vacuum up to temperatures approaching 240 F for densities greater than 3 lb per cubic foot. This material is primarily brittle, but a small amount of ductility is present at temperatures in excess of 100 F; d) The limited amount of test data indicates that the tensile, compression, and shear properties increase with increasing density and decrease with increasing temperature, as is typical for urethane foams; e) The thermal-coefficient-of-expansion tests of the foam indicate a small value, and thermal expansion decreases with an increase in density.

30,910
Wykes, R.P. POTENTIAL APPLICATIONS FOR EXPANDABLE AND INFLATABLE STRUCTURES FOR RE-ENTRY VEHICLES. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 497-517. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (North American Aviation, Inc., Los Angeles, Calif.). (AD 631406)

At present, space exploration is essentially still in its initial phases. Most re-entry vehicle designs have been approached with relatively unsophisticated structural concepts that require extensive recovery operations. Parachute deceleration and brute force of the structure are relied upon to reduce potential damage to test data and equipment. Future vehicles will be manned, and expected to fulfill varying missions such as service for ferry vehicles, to supply and maintain unmanned orbiting reconnaissance and military command posts, as well as commercial missions. These vehicles will be required to land more or less conventionally, be reserviced, and re-used without extensive rebuilding of the airframe. They will have the potential which will give the crews adequate capability to correct re-entry errors, select any of several landing sites, and change flight paths from long-range glide to short-range glide after re-entry. These are features that the lifting body re-entry vehicle with stowable variable geometry lifting surfaces and expandable or inflatable structures can provide. The conception of these vehicles that meet future mission requirements will present unforeseen new challenges for research and development in numerous unexplored areas of technology and structural design. The application of inflatable and expandable structures will play a major role in space exploration, and shows much promise in terms of space and re-entry vehicle structures.
R 4

30,911
Van Schaik, P.N. ASTRONAUT MANEUVERING UNIT TECHNOLOGY. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 633-648. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio). (AD 631406)

The future AMU's (Astronaut Maneuvering Units) should contain the bare minimum in capability so that size and weight can be minimized. Added capability can be accomplished by returning to the spacecraft for reservicing and recharging. The MMU (Modular Maneuvering Unit) design is not recommended completely for future systems. New technology is available for improving system and subsystem design. These new items should be investigated immediately so most of them can be incorporated as soon as possible.
R 6

30,912
Ross, R. RECENT APPLICATIONS OF INFLATED STRUCTURES TO AEROSPACE VEHICLES. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 709-739. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Goodyear Space Corporation, Akron, Ohio). (AD 631406)

Although expandable structures are generally considered for space applications primarily, because of their excellent packageability characteristics and the need for small volumes on the launch pad and large structural items once in space, there are quite a number of applications of expandable structures for aerospace vehicles which do function within the earth's atmosphere. In each of these instances the advantages of packageability, high structural integrity and low weight are paramount and result in a concept which is hard to match with a conventional rigid structure. In space, the prime object is often low weight without too great an emphasis on structural load. However, in most of the aerospace applications that operate on the earth's surface, high strength becomes of paramount importance. Developments in fabrics with high strength/weight ratios and good permeability characteristics are constantly opening new avenues for air inflated structures.

30,913
Bair, H.Q. & Fischer, W.H. DUAL WALL INFLATABLE STRUCTURES FOR SPACE ORIENTED APPLICATIONS. Report from: "Second Aerospace Expandable Structures Conference, held at Lake Minnetonka, Minnesota, 25-27 May 1965, AFAPL TR 65 108." Feb. 1966, 785-802. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Air Inflatable Products Corporation, East Haven, Conn.). (AD 631406)

The problem of protecting high frequency radar antennas without degrading transmission or adding weight has led to the development of the wing tab technique. Dual-wall air-supported structures using the wing tab technique were pioneered and developed by Air Inflatable Products Corporation, a subsidiary of the National Union Electric Corporation. In wing tab construction, the attachment flange for the web is an integrally-woven portion of the skin material, thus stress concentrations are virtually eliminated. The ratio of the web width to web spacing has been established for equal loads in all members and may be varied to obtain specific characteristics in special applications. The wing tab is especially applicable in structures, such as radomes, where the unit must be more stable, lighter weight, more versatile, and have less transmission interference than a single-skin unit. Such a unit is virtually self-erecting and may even be employed to erect the equipment being housed. The geometry of wing tab structures may be readily varied and easily contoured in three planes at the same time. Since the materials are light and flexible, the structures are easily packaged and shipped. For example, a radome designed to withstand winds to 110 mph, 38' in diameter by 40' high, with an inside volume of 36,000 cubic feet, weighs less than 1800 pounds and can be packed into less than 120 cubic feet. This radome also provides excellent insulation since it is essentially a rigid dead-air space thirty inches thick.

30,914
Forbes, F.W. (Chm.). SECOND AEROSPACE EXPANDABLE STRUCTURES CONFERENCE. AFAPL TR 65 108, Feb. 1966, 802pp. Archer Daniels Midland Company, Minneapolis, Minn. & USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (AD 631406)

This report presents technical contributions summarizing the status of current, significant research in the field of expandable structures. The subject matter has been arrayed in six sessions for papers scheduled at the conference, followed by six papers not given at the conference. The conference sessions included: a) Expandable structure concept of crew transfer tunnel for space vehicles; b) Lightweight, expandable support shelter systems; c) Structural considerations for an expandable lenticular satellite; d) Sodium silicate and versatile structural material; e) Development of an expandable airlock utilizing the elastic recovery principle; f) Aluminum foil expandable structures.

30,915
Keil, J.H. INTERSECTION DELAY OBTAINED BY SIMULATING TRAFFIC ON A COMPUTER. Report from: "Traffic Flow Theory, 1963, Highway Research Record Number 15." 1963, 73-97. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Berkeley, Calif.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

This paper presents the results of the first phase of an extensive project involving the simulation of vehicular traffic at intersections. The model used in this phase consisted of the time simulation of an orthogonal intersection of two two-lane, two-way streets with the minor street being controlled by stop signs. Approximately 14,000 hr of traffic were simulated on an IBM 701 computer. Approach volumes ranged from 25 to 900 vph with 1,900 vph. During most of the simulation, turning movements were held constant (10% left and 10% right). Additional runs were made at selected volumes where turning movements were varied to determine the effect of the turns on intersection delay. Total intersection delay was the final output of the simulation. This is related to input volumes by multiple regression techniques. These results are compared to the output from the second phase (a signalized intersection) to provide factual data concerning the effect of installing a traffic signal at an intersection.
R 8

30,916
Hulbert, S. & Wojcik, C. RESEARCH ACTIVITIES AT THE UCLA DRIVING SIMULATION LABORATORY. Highway Research News, Feb. 1965, 17, 111-114. (Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.). (Report from: "43rd Annual Meeting, Special Committee on Driving Simulation.")

Progress in the development of driving simulation capability at UCLA-ITTE has taken two major directions since the initial installation became operational in 1962. An automated and unique data recording and processing system has been developed, tested, and used, and two studies of driving behavior have been completed in the fixed-base laboratory where some technical improvements have been achieved.
R 6

30,917
Lewis, R.M. & Michael, H.L. SIMULATION OF TRAFFIC FLOW TO OBTAIN VOLUME WARRANTS FOR INTERSECTION CONTROL. Highway Research Record, 1963, 15, 1-43. (Rensselaer Polytechnic Institute Troy, N.Y. & Purdue University, Lafayette, Ind.).

The paper reports the results of a research project in which a digital simulation model was developed to determine volume warrants at street intersections. The particular type of intersection studied was the four-legged, right-angled intersection of a high-volume major arterial street with a lower-volume minor arterial street. The major arterial had four travel lanes with parking prohibited, whereas the minor arterial had two travel lanes with parking permitted on both sides. Both arterials were operated as two-way streets. Two types of intersection control were studied, the semi-traffic-actuated signal and the two-way stop sign. The delays encountered at the intersection were measured and used as criteria for the establishment of warrants.
R 46

30,918
Hulbert, S. & Wojcik, C. DRIVING SIMULATOR RESEARCH. Report from: "Driving Simulators and Application of Electronics to Highways, 1960, Highway Research Board Bull. 261." 1960, 1-13. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.).

This paper describes two automobile driving simulators at the Institute of Transportation & Traffic Engineering, University of California, Los Angeles. Results are presented for 47 Ss tested on the devices using such responses as speed, steering, brake and accelerator pedal movements and GSR. Problems concerning the achievement of realism in such simulators are discussed.
R 4

30,919
Kobayashi, M. & Matsunaga, T. DEVELOPMENT OF THE KAKEN DRIVING SIMULATOR. Report from: "Driving Simulation, 1963, Highway Research Record Number 55." 1964, 29-35. National Academy of Sciences - National Research Council, Washington, D.C. (Traffic Safety Lab., Scientific Police Research Institute, Tokyo, Japan). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

In 1959, when the Traffic Safety Laboratory was established at the Scientific Police Research Institute, the original plan to construct a driving simulator as a research tool was proposed. In promoting the design project there was concern with performance, cost, and maintainability, and an acceptable balancing point was found with the following items: a) A real car with a simulated environment technique is used for achieving the maximum degree of feeling for driving; b) For the visual display system a motion picture technique was adopted; the projection area will cover approximately 50° horizontally; c) For ease and economy of operation 16-mm films are used; d) A feedback mechanism between car speed and film speed is to be constructed; e) Handling torque and a self-returning function are provided; f) A feedback mechanism between the angular displacement of the steering wheel and the light direction of the projector is actuated by a power servo-motor. The KAKEN (Scientific Police Research Institute) Driving Simulator consists of 3 major parts: vehicle dynamics, visual display system, and recording system. A passenger type car (Toyopet Corona, 1500 cc) was selected for the simulator car for ease of remodeling and because of the limited space of the simulator room. The motion picture technique was introduced to get high simulating fidelity and to reduce maintenance cost. The recording system is divided into 3 major parts: vehicle dynamics, physiological responses, and motion analysis.
R 10

30,920
Michaels, R.M. & Stephens, B.W. PART-TASK SIMULATION IN DRIVING RESEARCH. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, 87-94. National Academy of Sciences - National Research Council, Washington, D.C. (US Bureau of Public Roads, Washington, D.C.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

The part-task facility discussed in this report is actually less a simulator than a laboratory for the analysis of the driving task. It is designed as a means for directly testing conceptual and experimental models of driving processes. Its ultimate objective is to determine the nature and functional characteristics of certain of these driving processes and to delimit classes of interaction phenomena that arise in driving. From one viewpoint of driving simulators, this facility should not be considered a simulator. It is, in reality, a laboratory for the conduct of behavioral research using dynamic stimulus material. It is only in the use of this kind of stimulus material that the facility may be considered in any way as a simulation of driving. Consequently, if the research carried out in this laboratory is to be related directly to driving, it must ultimately be validated by actual, controlled field studies. Thus, the research program of which this facility is a part is conceived as one part of a closed loop in which research progresses from the laboratory to the test track to the field situation and back again. With this research approach, a highly flexible laboratory facility is necessary. It needs to be one that allows freedom for a large range of behavioral studies capable of examining a host of performance dimensions. The present part-task facility is aimed precisely to fill those areas of research needs.
R 6

30,921
Todosiev, E.P. APPLICATIONS OF THE AUTOMOBILE SIMULATOR. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, 102-105. National Academy of Sciences - National Research Council, Washington, D.C. (Electrical Engineering Dept., Ohio State University, Columbus, Ohio). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

An automobile simulator has been used in driver behavior studies. It is shown that these studies would have been difficult or even impossible if attempted on the actual highway. The simulator and the various applications of the simulator to driver behavior studies are described.
R 2

30,922
Hulbert, S. & Wojcik, C. HUMAN THRESHOLDS RELATED TO SIMULATION OF INERTIA FORCES. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, 106-109. National Academy of Sciences - National Research Council, Washington, D.C. (Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

This paper discusses the use of a moving base vehicle simulator which can provide the driver with inertia force cues similar to what he would be experiencing in a real vehicle. An experiment was conducted to test the efficacy of the device by having drivers make a series of position judgements as they sat behind the wheel of the simulator and were moved to various positions. Tests were performed to determine the accuracy with which drivers could determine the extent to which they had been pitched or rolled. It was concluded that the drivers were stimulated in a way similar to what they would be in a real vehicle.

30,923
Fox, B.H. SOME TECHNICAL CONSIDERATIONS IN DRIVING SIMULATION. Report from: "Driving Simulators and Application of Electronics to Highways, 1960, Highway Research Board Bull. 261," 1960, 38-43. National Academy of Sciences - National Research Council, Washington, D.C. (US Public Health Service, Washington, D.C.).

This paper discusses a number of the technical problems associated with the development of driving simulators, especially with modes that attempt to simulate driving long distances. The use of TV and film to present the visual scene is discussed.
R 12

30,924
Fox, B.H. ENGINEERING AND PSYCHOLOGICAL USES OF A DRIVING SIMULATOR. Report from: "Driving Simulators and Application of Electronics to Highways, 1960, Highway Research Board Bull. 261." 1960, 14-37. National Academy of Sciences - National Research Council, Washington, D.C. (US Public Health Service, Washington, D.C.).

This paper presents a general discussion of approaches to highway research and the use and techniques of simulation in such research. There is also a discussion of the paper and the concepts presented by various experts in the field.
R 31

30,925
Fox, B.H. & Fox, Mary W. SOME CRITERIA FOR PRIORITIES OF RESEARCH IN DRIVING SIMULATION. DIFFICULTIES IN THEIR MEASUREMENT AND APPLICATION. Report from: "Driving Simulation, 1963, Highway Research Record Number 55." 1964, 36-53. National Academy of Sciences - National Research Council, Washington, D.C. (US Public Health Service, Washington, D.C. & George Washington University, Washington, D.C.). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

The article discusses the development and measurement of criteria for establishing priorities of research in driving simulation.
R 20

30,926
Domey, R.G. & Paterson, D. DEVELOPMENT OF A VEHICLE SIMULATOR FOR EVALUATING DRIVER PERFORMANCE. Report from: "Driver Characteristics, 1962, Highway Research Board Bull. 330." 1962, 92-100. National Academy of Sciences - National Research Council, Washington, D.C. (Harvard School of Public Health, Boston, Mass.).

The most desirable approach for assessing the performance of special subgroups of the driving population is to measure behavior while operating within a controlled road-vehicle system. However, the expense, time consumption, complexity, and inherent risks involved suggest more conservative procedures before the highway system is utilized. A practical approach to the study of the problem is to obtain fundamental data in the laboratory with such instruments as universal mock-up devices or simulators. This paper is a summary description of the mechanical, electro-mechanical, tracking and data-computation features of such a simulator developed at the Harvard School of Public Health. The fundamental design criteria for the simulator are: a) dimensional duplication of vehicle cab interiors; and b) adequate adjustability range to insure operator comfort. The driver testing procedure must provide experimental task requirements that emphasize biomechanical activity. A study of commercial vehicle cab interiors produced by 5 major manufacturers indicated insignificant dimensional changes between 1956 and 1960 models. Data previously accumulated by Harvard School of Public Health were therefore considered a valid basis for simulator design. A survey of the human engineering man-machine control system literature led to the adoption of a central, continuous tracking task requiring steering wheel manipulation. A series of pilot studies were conducted at Massachusetts Institute of Technology with Sheridan's apparatus in order to gain familiarization with tracking techniques and methodology. In addition, the studies developed the necessary data for the specification of the equipment components of the proposed simulator.
R 4

30,927
Braunstein, M.L., White, W.J. & Sugarman, R.C. USE OF STRESS IN PART-TASK DRIVING SIMULATORS--A PRELIMINARY STUDY. Report from: "Driver Characteristics, Night Visibility, and Driving Simulation, 1963, Highway Research Record Number 25." 1963, 95-101. National Academy of Sciences - National Research Council, Washington, D.C. (Cornell Aeronautical Lab., Cornell University, Ithaca, N.Y.). (Report from: "42nd Annual Meeting, January 7-11, 1963.")

To evaluate the feasibility of using stress in driving simulator research, drivers were subjected to continuous glare while performing a series of tasks in an instrumented vehicle on a specially designed test track. The tasks included keeping within a 7-ft lane at 20 mph, maintaining a constant headway and estimating time to coincidence with an approaching or overtaking vehicle. Methodological problems in driver research were examined.
R 21

30,928
Braunstein, M.L., Laughery, K.R. & Siegfried, J.B. COMPUTER SIMULATION OF THE AUTOMOBILE DRIVER. A MODEL OF THE CAR FOLLOWER. Report from: "Driving Simulation, 1963, Highway Research Record Number 55." 1964, 21-28. National Academy of Sciences - National Research Council, Washington, D.C. (Flight Safety Foundation, Phoenix, Ariz.). (Report from: "43rd Annual Meeting, January 13-17, 1964.")

Driving simulation has generally involved an artificial representation of the environment and an interface for the presentation of the simulated environment to human Ss. For at least the better structured part-tasks, the development of a single system capable of simulating both the driver and the environment could eliminate this severe interface problem. This study is directed toward the development of a digital computer program of the information processing type which simulates the behavior of the individual driver in interstate highway car following. Objective measurements and verbal reports were collected in a series of car-following runs on the New York State Thruway. A preliminary information processing model was prepared in flow-chart form. Quantitative detail was added to the model using data extracted from existing literature and from a psychophysical experiment conducted on the Thruway.
R 6

30,929
Automotive Safety Foundation, US Bureau of Public Roads & US Public Health Service. NATIONAL CONFERENCE ON DRIVING SIMULATION. Report from: "Proceedings held at Santa Monica, California, February 27 thru March 1, 1961." 1961, 45-152.

This report contains papers presented at the conference and covers such topics as: advanced simulation techniques and the application of human behavior data to the development of such devices; the use of simulators in driver education and training; the use and techniques of simulation within the automotive industry; the use of simulation in highway design and operation; and the use of simulation to investigate the effects of alcohol.

30,930
Maio, D.A. THE EFFECT OF GAS DENSITY ON THE WORK OF BREATHING IN MAN. FINAL REPORT. Task 775802, SAM TR 66 22, March 1966, 11pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 632482)

The effect of gas density on the work of breathing was studied in 3 normal male Ss. Gas density was varied by decreasing the barometric pressure in an altitude chamber, as well as by varying the percentage of oxygen with nitrogen and helium. 3 frequencies of breathing were selected at 8, 16, and 24 breaths per minute to cover the resting physiologic range, with tidal volume adjusted to allow an alveolar ventilation of 6 liters per minute. There appeared to be a slight decrease in the total work of breathing at the lower gas densities, owing to a decrease in the nonelastic work of breathing. The elastic work was not influenced by gas density but did decrease with increasing breathing frequency. The nonelastic work likewise was affected by frequency, decreasing at the lower breathing frequencies. The order of magnitude of these changes, however, would probably not be of any practical significance and thus would not be a factor in the preferential selection of a particular gas mixture - cabin pressure combination for a manned space vehicular environment.
R 11

30,931
Funk, J.E., Moegling, J.B., Drake, R.M., Jr., Hall, J.F., Jr., et al. SENSIBLE HEAT TRANSFER IN THE GEMINI AND APOLLO PRESSURE SUITS. FINAL REPORT. Contract AF 33(615) 3370, Projs. 7164 & 7222, Tasks 716409 & 722207, AMRL TR 66 173, Dec. 1966, 78pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (University of Kentucky, Lexington, Ky.).

The results of an experimental program to determine sensible heat transfer effects in the Gemini and Apollo pressure suits are reported. A copper manikin maintained at a constant surface temperature was used and the overall average body surface heat flux and the regional heat flux distribution were measured. The environmental variables studied were ventilating air flowrate, velocity of the air moving over and around the outside surface of the suit, and prevailing pressure. In addition, the following determinations were made: the heat transfer coefficient between the manikin surface and the ventilating air, the overall thermal conductance between the ventilating air and the air moving over the outside surface of the suit, the thermal emissivity of the Gemini suit, and the convection coefficient between the outside surface of the Gemini suit and the air moving over the outside of the suit. These data may be used for heat balances, determination of temperatures, and evaluation of the insulation value of the suit and outside air. The insulation value for the air ambient to the Gemini suit was found to follow a relationship different from the empirical equation for a nude manikin.
R 25

30,932
Hamilton, J.E. A SUMMARY OF EYE-PROTECTION DEVICES AGAINST NUCLEAR EXPLOSIONS. Proj. 6301, Task 630103, SAM TR 66 235, May 1966, 32pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

A bibliography of eye protection from flashblindness and retinal burn is compiled from work that has been done in this area. In addition, each principle of eye protection is explained and the most significant examples of each principle are given. Some fixed filters worn during daylight hours will protect the eyes from flashblindness and retinal burn. Protection for the eyes still remains unsolved for scotopic vision.
R 108

30,933
Stevens, S.S. A METRIC FOR THE SOCIAL CONSENSUS. Science, Feb. 1966, 151(3710), 530-541. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

What are the invariances in these manifold experiments involving human judgment? A convergence of evidence from fields as disparate as psychophysics and criminology has pointed to stable and constant relations. One such relation states that subjective magnitude is a power function of stimulus magnitude. The underlying invariance then becomes the simple principle that equal stimulus ratios produce equal subjective ratios. On many of the continua the stimuli can be measured only on a nominal scale, for the stimuli are verbal statements, occupations, crimes, musical selections, and other nonmetric items. On those continua the power law cannot be confirmed directly, but there emerges another notable invariance. For both kinds of continua, those based on metric stimuli and those based on nonmetric stimuli, there is a constant relation between the scale erected by direct judgment and the scale derived from a unitizing of variability or confusion. Whether the stimuli are measureable on ratio scales or only on nominal scales, the judgmental scale based on units of variability is approximately proportional to the logarithm of the scale constructed by one or another of the direct scaling methods. The extensive invariance of this logarithmic relation attests to a principle known throughout all of science--namely, that error or variability tends to be relative: the size of the error grows with magnitude. The principle finds expression under many phrasings: the standard deviation increases with the mean; the coefficient of variation remains constant; the signal-to-noise ratio stays put; accuracies are statable as one part in so many. The emergence of a similar canon in the subjective domain, a rule that variability tends to increase in proportion to the apparent magnitude, suggests an essential unity among the principles that govern quantitative relations in widely diverse endeavors.
R 42

30,934
Gardner, M. DERMO-OPTICAL PERCEPTION: A PEEK DOWN THE NOSE. Science, Feb. 1966, 151(3711), 654-657. (Scientific American, New York, N.Y.).

This article discusses some of the findings on dermo-optical perception as reported in various media, and points up the widespread lack of sufficiently tight controls to rule out trickery.
R 22

30,935
Eagle, M., Wolitzky, D.L. & Klein, G.S. IMAGERY: EFFECT OF A CONSEALED FIGURE IN A STIMULUS. Science, Feb. 1966, 151(3712), 837-839. (Research Center for Mental Health, New York University, New York, N.Y.).

A concealed figure formed by the contours of a perceptually dominant figure influenced the content of viewers' subsequent imagery, although in describing the stimulus they showed no awareness of the concealed figure even after several exposures.
R 6

30,936
Kenshalo, D.R. & Scott, H.A., Jr. TEMPORAL COURSE OF THERMAL ADAPTATION. Science, March 1966, 151(3714), 1095-1096. (Psychology Dept., Florida State University, Tallahassee, Fla. & Winthrop College, Rock Hill, S.C.).

Previous methods for measuring the range and temporal course of adaptation to the thermal stimuli are difficult to use. A technique requiring subjects to adjust the temperature of the stimulator to maintain a just-detectable sensation is described. Complete adaptation occurs to temperatures within the range between 28° and 37.5° C in about 25 min.
R 12

30,937
Kryter, K.D. PSYCHOLOGICAL REACTIONS TO AIRCRAFT NOISE. Science, March 1966, 151(3716), 1346-1355. (Stanford Research Institute, Menlo Park, Calif.).

This paper discusses the basic psychological attributes of sound; behavioral reactions and auditory fatigue from exposure to noise; and community reaction to the noise from jet aircraft. Possible methods of evaluating the acceptability of the noise from aircraft are presented.
R 32

30,938
Schroeder, M.R. ARCHITECTURAL ACOUSTICS. Science, March 1966, 151(3716), 1355-1359. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

This paper outlines some important research problems in architectural acoustics that may be studied in academic laboratories: reverberation time measurement, reverberation theory analysis, sound diffusion measurement, sound resonance and attenuation measurement, and noise control methods. The need for better cooperation between acoustician and architect is indicated.
R 16

30,939
Donderi, D.C. VISUAL DISAPPEARANCES CAUSED BY FORM SIMILARITY. Science, April 1966, 152 (3718), 99-100. (Psychology Dept., McGill University, Montreal, Quebec, Canada).

3 forms were scaled for similarity by 2 groups of observers, who used different methods. A third group reported the duration of disappearances observed for each pair of forms. Duration of total disappearance increased with an increase in form-pair similarity. Neural overlap can explain the similarity judgments; cell fatigue, the disappearances.
R 6

30,940
Gilbert, E.N. INFORMATION THEORY AFTER 18 YEARS. Science, April 1966, 152(3720), 320-326. (Mathematics & Statistics Center, Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

In this article that aspect of modern information theory which relates to explicit coding systems intended to signal at high rates is considered. More theoretical parts of the subject were omitted. Information theory is a very active area of investigation in the U.S.S.R., but there the emphasis is on mathematical results. As an engineering subject, information theory has flourished for 18 years because of the promise it gave of improved communication systems. The results are still almost exclusively on paper. Nevertheless, the paper work has come closer to practicalities. Experimental systems which use some of the new codes have been tested, and some coders and decoders are now commercially available. They may be in widespread use in a few years. Meanwhile, a page count in the journals devoted to information theory shows that the field is still growing.
R 51

30,941
Rutschmann, Ruth. PERCEPTION OF TEMPORAL ORDER AND RELATIVE VISUAL LATENCY. Science, May 1966, 152(3725), 1099-1101). (Neurology Dept., Mount Sinai Hospital, New York, N.Y.).

Judgments of temporal order to monocular pairs of flashes of equal luminance delivered at various onset asynchronies to the light-adapted fovea and periphery show that uncertainty of temporal order results when the onset of the foveal flash is delayed. Relative latencies vary as a function of peripheral (nasal vs. temporal) locus stimulated.
R 6

30,942
Cavonius, C.R. & Schumacher, Anne W. HUMAN VISUAL ACUITY MEASURED WITH COLORED TEST OBJECTS. Science, May 1966, 152(3726), 1276-1277. (Eye Research Foundation, Bethesda, Md. & Human Sciences Research, Inc., McLean, Va.).

Visual acuity was measured with a grating test object in which alternating bars were matched in brightness but differed in wavelength. If the wavelength difference between adjacent bars was great enough, acuity scores were obtained which were as high as those obtained with test objects in which there was a large brightness difference between adjacent bars.
R 8

30,943
Shearer, W.M. SPEECH: BEHAVIOR OF MIDDLE EAR MUSCLE DURING STUTTERING. Science, May 1966, 152(3726), p1280. (Speech & Hearing Clinic, Northern Illinois University, DeKalb, Ill.).

Behavior of the middle ear muscle during speaking was observed in 5 stutterers by means of the Zwislocki acoustic impedance bridge. Change in impedance did not always parallel precisely the changes in speech sound level. Impedance changed during the initiation and during the course of the stuttering block.
R 6

30,944
Bartz, A.E. EYE AND HEAD MOVEMENTS IN PERIPHERAL VISION: NATURE OF COMPENSATORY EYE MOVEMENTS. Science, June 1966, 152(3729), 1644-1645. (Psychology Dept., Concordia College, Moorhead, Minn.).

Simultaneous recordings of both eye and head movements in response to a peripheral signal indicated that the backward compensatory eye movement was initiated during the constant velocity of the head rotation. This compensatory movement began before the eyes had actually reached the peripheral signal.
R 6

30,945
Berlyne, D.E. CURIOSITY AND EXPLORATION. Science, July 1966, 153(3731), 25-33. (University of Toronto, Toronto, Ontario, Canada).

This article discusses the evidence for and reasons that higher animals put a great deal of effort into securing access to stimuli with no manifest ecological importance. Under the impact of these experimental findings on exploratory behavior and cognate phenomena, motivation theory is undergoing some extensive remodeling. These findings have revealed the pervasive psychological importance of collative variables and arousal. It is now recognized that the disturbances that motivate behavior can come not only from external irritants, visceral upheavals, and deprivation of vital substances, but also from clashes between processes going on in the central nervous system. Related to these additional sources of motivation, there must be a wide range of hitherto overlooked reinforcing conditions that can promote learning of new behavior patterns. In opening up these new prospects, the study of curiosity, exploration, and epistemic behavior merges with developments in several other areas of psychological research, including personality theory, ethology, child development, education, attitude change, social interaction, esthetics, and humor.
R Many

30,946
Bellman, R. DYNAMIC PROGRAMMING. Science, July 1966, 153(3731), 34-37. (University of Southern California, Los Angeles, Calif.).

This article discusses dynamic programming in terms of its use in the study of multistage decision processes. Basic to this procedure is the concept of a policy, a rule for telling what decision to make in terms of the current position of the system. The major advantage of this new control concept over the classical ideas of control lies in its flexibility. Multistage decision making is regarded as the repeated application of a policy. A policy which is most efficient in the sense of minimizing time, or fuel, or cost or of maximizing profit is called an optimal policy. These optimal policies can be quite simply characterized by means of an intuitively derived "principle of optimality"; an optimal policy has the property that, whatever the initial state and initial decision are, the remaining decisions must constitute an optimal policy with regard to the state resulting from the first decision. The translation of this formulation into mathematical terms provides one with equations which enable one todetermine the optimal policies.

30,947
Sternberg, S. HIGH-SPEED SCANNING IN HUMAN MEMORY. Science, Aug. 1966, 153(3736), 652-654. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

When Ss judge whether a test symbol is contained in a short memorized sequence of symbols, their mean reaction-time increases linearly with the length of the sequence. The linearity and slope of the function imply the existence of an internal serial-comparison process whose average rate is between 25 and 30 symbols per second.
R 17

30,948
Julesz, B. BINOCULAR DISAPPEARANCE OF MONOCULAR SYMMETRY. Science, Aug. 1966, 153(3736), 657-658. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

In an earlier demonstration binocular shapes were produced from monocularly shapeless, random-dot stereo images. A reversal of this phenomenon is demonstrated. A stereo image is devised in which the monocularly apparent shapes of bilateral symmetry disappear when stereoscopically viewed. This phenomenon sharpens the implications of the earlier one.
R 2

30,949
Grunwald, A.P. A BRAILLE-READING MACHINE. Science, Oct. 1966, 154(3745), 144-146. (Reactor Engineering Div., Argonne National Laboratory, Argonne, Ill.).

A new system for publishing and presenting Braille text is delineated. The system requires a new device for actual "reading." Experiments to determine reader preference and acceptance of the device are presented, and performance criteria on the device are listed.
R 1

30,950
Robinson, D.N. DISINHIBITION OF VISUALLY MASKED STIMULI. Science, Oct. 1966, 154(3745), 157-158. (Electronics Research Labs., Columbia University, New York, N.Y.).

Backward-masking conditions were established for a pair of circular-patch stimuli. A third stimulus was then selected so as to mask the second when the second and third were presented in the absence of the first. When all 3 stimuli were presented in serial order, the first and third were reliably detected but the second was not. Apparently, by masking the second flash, the third "disinhibited" the first.

30,951
Rushmer, R.F., Buettner, K.J.K., Short, J.M. & Odland, G.F. THE SKIN. Science, Oct. 1966, 154(3747), 343-348. (University of Washington, Seattle, Wash.).

This article is intended to direct the attention of quantitative scientists to the opportunities for effective collaboration on problems related to biological structures and organisms. Thus, the most accessible tissue of the body is described and discussed relative to being a potential focus for multi-disciplinary research. (HEIAS)
R 28

30,952
Doksum, K. DISTRIBUTION-FREE STATISTICS BASED ON NORMAL DEVIATES IN ANALYSIS OF VARIANCE. Rev. Int. Statistical Inst., 1966, 34(3), 376-388. (Statistical Lab., University of California, Berkeley, Calif.). (Reprint) (AD 652211)

Distribution-free test statistics have been considered for problems in analysis of variance. Statistics have been introduced that are more flexible in that they can be used to test and estimate arbitrary contrasts in linear models. When used for testing, these statistics are not distribution-free but are asymptotically distribution-free. It is the purpose of this paper to construct test statistics based on normal deviates (called normal deviates statistics) that are distribution-free and whose exact null hypothesis distributions are normal or chi-square. These statistics are not as flexible as some in that they can only be used for testing the absence of main effects or interactions, not for testing arbitrary contrasts, but when they apply, they are easier to compute. Moreover, they have an advantage over all the statistics mentioned in that exact significance levels can be obtained from tables of the normal or chi-square distributions, and an advantage over discrete rank tests in that one does not need to use randomized tests to obtain exact significance levels.
R 23

30,953
Beck, J. PERCEPTUAL GROUPING PRODUCED BY CHANGES IN ORIENTATION AND SHAPE. Science, Oct. 1966, 154(3748), 538-540. (Psychology Dept., Harvard University, Cambridge, Mass.).

The relative effectiveness of changes in orientation and shape in producing perceptual grouping has been studied using a method based on threshold judgments. Statistical analyses of the threshold values show that rotating some of the figures in a field from a vertical position to a slant of 45° facilitates segregating the field into separate perceptual groups. In contrast, changes in the shape or orientation of these figures, which leave their component lines vertical and horizontal, do not reliably aid grouping. The results also suggest that the similarity of the figures composing the field is not a good predictor of the degree to which the figures will cohere to form distinct perceptual groups.
R 7

30,954
Day, R.H. & Wade, N.J. VISUAL SPATIAL AFTEREFFECT FROM PROLONGED HEAD-TILT. Science, Dec. 1966, 154(3753), 1201-1202. (Monash University, Melbourne, Australia).

Subjects with head upright were required to adjust a lighted bar in a dark room until the bar appeared vertical; the task was performed before and after 2 and 3 minutes of lateral head-tilt with their eyes closed. A visual spatial aftereffect was observed which varied as a function of the angle of head-tilt and which was opposite in direction to head-tilt.
R 14

30,955
Boynton, R.M. & Das, S.R. VISUAL ADAPTATION: INCREASED EFFICIENCY RESULTING FROM SPECTRALLY DISTRIBUTED MIXTURES OF STIMULI. Science, Dec. 1966, 154(3756), 1581-1583. (Visual Science Center, University of Rochester, Rochester, N.Y. & National Physical Laboratory, New Delhi, India).

Visual adapting stimuli having different spectral distributions are used alone and then mixed together. It is found that the mixture is more effective, as an adapting field, than either component when used alone. This experiment, along with others, supports the following: although the most efficient stimulus for eliciting a visual sensation is "compact" in space, time, and wavelength, the most efficient adapting stimulus tends to be dispersed in each of these dimensions.
R 7

30,956
Kahneman, D. & Beatty, J. PUPIL DIAMETER AND LOAD ON MEMORY. Science, Dec. 1966, 154(3756), 1583-1585. (Cognitive Studies Center, Harvard University, Cambridge, Mass. & Human Performance Center, University of Michigan, Ann Arbor, Mich.).

During a short-term memory task, pupil diameter is a measure of the amount of material which is under active processing at any time. The pupil dilates as the material is presented and constricts during report. The rate of change of these functions is related to task difficulty.
R 10

30,957
Fox, R.H., Goldsmith, R., Hampton, I.F.G. & Hunt, T.J. THE INFLUENCE OF ACCLIMATIZING MAN TO HEAT ON HIS TEMPERATURE REGULATION AT REST IN A COMFORTABLE ENVIRONMENT. J. Physiol., March 1966, 183(1), 18P-19P. (Human Physiology Div., National Institute for Medical Research, London, England).

The present study examines the effect of heat acclimatization on the normal level for body temperature. Acclimatization was induced by 10 2-hour periods of hyperthermia at 38.2°C and 3 periods at 39.0°C. Before and after acclimatization, body temperature was recorded hourly for 48 hours from 4 sites: aural, oral, rectal, and skin. The average value for all observations during the 48 hour at each of the 4 internal body temperature sites was lower after acclimatization. The results confirm that heat acclimatization produces a small decrease in the level at which internal body temperature is regulated.
R 1

30,958
Du Croz, J.J. & Rushton, W.A.H. THE SEPARATION OF CONE MECHANISMS IN DARK ADAPTATION. J. Physiol., March 1966, 183(2), 481-496. (Physiological Lab., University of Cambridge, Cambridge, England).

When dark adaptation was plotted using a blue test flash following bleaching by orange light a kinked curve was obtained. The upper branch was shown to have the same dark adapted threshold as Stiles blue (π_5) mechanism and the lower branch as his green (π_4) mechanism. The π_4 dark adaptation curve alone (unkinked) was obtained using a white instead of an orange bleach. Dark adaptation curves were obtained in which the test flash was presented upon various steady backgrounds. In conditions where only π_4 was involved the experimental results fitted the curves calculated on the assumption that the equivalent background of bleaching simply adds to the real background in raising the threshold. In conditions where π_4 and π_5 were both present (blue test, yellow-green background and white bleach) kinked dark adaptation curves were obtained. The blue mechanism recovers in dark adaptation at about the same rate as red and green, or slightly slower. Dark adaptation curves with red (π_5) and green (π_4) limbs were obtained after a deep red bleach using a red test flash and a green background. The red and the green limbs were also plotted alone in their entirety by slightly changing the conditions. The results support the idea of 3 color mechanisms that adapt as independently of one another after bleaching as they do with backgrounds.
R 26

30,959
Brindley, G.S., Du Croz, J.J. & Rushton, W.A.H. THE FLICKER FUSION FREQUENCY OF THE BLUE-SENSITIVE MECHANISM OF COLOUR VISION. J. Physiol., March 1966, 183(2), 497-500. (Physiological Lab., University of Cambridge, Cambridge, England).

With the authors as Ss, flicker fusion frequency for blue stimuli on zero background was found to increase steadily with increasing luminance up to 50 cycles per second. But if a strong yellow background was added flicker fusion frequency increased steadily only to about 18 cycles per second and then remained nearly independent of luminance over a range of a factor of 20. It was argued that the mazimum flicker fusion frequency is about three times lower for the blue-sensitive mechanism of colour vision than for the red- or green-sensitive.
R 5

30,960
Durnin, J.V.G.A., Halsman, M.F., Peters, D.W.A. & Zurich, L. THE EFFECT OF HOT ENVIRONMENTS ON THE ENERGY METABOLISM OF MEN PERFORMING STANDARDIZED PHYSICAL WORK. APRE Res. Memo. N/3, April 1966, 20pp. USA Personnel Research Establishment, OCRD, Washington, D.C. (AD 488358) (J. Physiol., March 1966, 183(2), p75P).

This paper describes an experiment designed to determine whether or not increasing environmental temperature and humidity increases the metabolic requirement for standard physical work. Six soldiers, previously acclimatized to heat, carried each of the loads (13, 21 and 28 kg) in each of three climates (temperate, hot/dry and hot/wet) while marching at a constant speed of 2.8 mph. Energy expenditure and other physiological responses were measured. The results showed that compared to the temperate climate values, energy expenditure was increased by 5% to 9% in the hot climates with no significant difference between the hot/wet and hot/dry climates. The possibility of predicting the calorie cost of an activity from measurements of heart rate is discussed.
R 10

30,961
Clark, T.J.H. & Read, D.J.C. A REBREATHING METHOD FOR STUDYING THE VENTILATORY RESPONSE TO CO_2 . J. Physiol., June 1966, 184(3), 41P-42P. (Medicine Dept., Postgraduate Medical School, London, England).

The ventilatory response to CO_2 is usually studied by the subject inhaling a gas mixture containing CO_2 and recording the ventilation and alveolar or arterial P_{CO_2} when a steady state is reached, commonly after 10-20 min. If a response curve is to be obtained several mixtures must be used making the procedure laborious and almost intolerable for patients with dyspnoea due to lung disease. Furthermore, the procedure cannot be repeated often enough to permit study of acute changes. These difficulties can be overcome by having the subject rebreathe from a small bag. The CO_2 accumulation stimulates the breathing; equilibrium is obtained between the bag, the lungs and blood so that analysis of the P_{CO_2} of the gas passing backwards and forwards obviates the need for blood analysis; registration of the excursions of the bag provides a simultaneous record of ventilation. A complete ventilation-P_{CO_2} curve is obtained in about 4 min.
R 2

30,962
Freedman, S. PROLONGED MAXIMUM VOLUNTARY VENTILATION. J. Physiol., June 1966, 184(3), 42P-44P. (Medicine Dept., Postgraduate Medical School, London, England).

A technique for measuring maximum voluntary ventilation (m.v.v.) over periods greater than the conventional 15 sec is presented. The technique makes use of partial rebreathing to avoid changes in blood gases and paces subject by giving him a target volume flow rate to follow. Preliminary studies find that m.v.v. falls off rapidly with time up to 4 min, but little thereafter.
R 2

30,963
Campbell, E.J.M., Clode, Marie, Higgs, Brenda E., Jones, N.L., et al. MEASUREMENT OF OXYGENATED MIXED VENOUS P_{CO_2} BY REBREATHING DURING EXERCISE. J. Physiol., June 1966, 184(3), 47P-48P. (Medicine Dept., Postgraduate School, London, England).

The method of Ashton & McHardy (1963) has been simplified. By means of a graduated 5 liter piston and cylinder containing 10% CO_2 in O_2, the rebreathing bag is filled with about 1 1/2 times the measured tidal volume of the subject; the bag may then be enriched with measured volumes of 100% CO_2 from a smaller piston and cylinder. A tap at the mouthpiece is turned at the end of expiration and the subject rebreathes for 4-6 breaths (8-12 sec). The record of P_{CO_2} is inspected to see if equilibrium has occurred; if not the bag is further enriched with CO_2. If equilibrium has occurred, the bag may be rebreathed again without enrichment or a fresh bag prepared with less CO_2 enrichment. Each of these steps can be executed in 10-15 sec. The concentration of oxygen in the bag has been found to remain above 20% for 3 rebreathings. Equilibrium must be achieved between the gas in the bag and lungs, and the mixed venous blood, before the P_{CO_2} of the mixed venous blood is elevated by recirculation. The rebreathing method gives results which agree with estimates based on pulmonary arterial blood measurements at work rates up to 1.5 liters O_2/mm.
R 4

30,964
Clode, Marie. CO_2 BALANCE DURING EXERCISE. J. Physiol. June 1966, 184(3), 49P-50P. (Medicine Dept., Postgraduate Medical College, London, England).

CO_2 output (a) is a linear function of (b) aerobic CO_2 production; (c) chemically displaced CO_2, and (d) changes in CO_2 stores. Values can be determined for a, b, and c and d can be calculated. This technique was used on 5 normal Ss doing submaximal exercise for periods of up to 10 min using open-circuit gas collection and infra-red CO_2 and paramagnetic O_2 analyzers. High agreement was obtained between calculated values and previously determined values of d.
R 2

30,965
Campbell, E.J.M., Matthews, C.M.E. & Read, D. ANALOGUE COMPUTER STUDIES OF CO_2 STORES AND CONTROL OF VENTILATION. J. Physiol., June 1966, 184(3), 55P-56P. (Cyclotron Unit, MRC, Hammersmith Hospital, London, England).

An analogic computer was used to simulate the effects on ventilation and P_{CO_2} changes of rebreathing, inhalation of CO_2, hyperventilation and the results of tracer experiments with $^{11}CO_2$. A 7 pool model of CO_2 stores was used. This model combines Farhi & Rahn's (1960) well and poorly perfused pools with Fowle, Matthews & Campbell's (1964) extracellular and intracellular pools. The results are discussed in terms of goodness of the model compared with alternative models and with experimental results.
R 4

30,966
Wright, B.M. A VERSATILE EXPIRED AIR SAMPLER. J. Physiol., June 1966, 184(3), 66P-67P. (National Institute for Medical Research, London, England).

A simple and versatile device for collecting end-expired air samples for breath alcohol analysis is described. The system has been used in a field survey of breath CO concentration and has been found to be simple and reliable and to give reproducible results.

30,967
Johnson, R.H. & Spalding, J.M.K. THE ROLE OF A CENTRAL TEMPERATURE RECEPTOR IN SHIVERING IN MAN. J. Physiol., June 1966, 184(3), 733-740. (Body Temperature Unit, MRC, Radcliffe Infirmary, Oxford, England & Neurology Dept., United Oxford Hospitals, Oxford, England).

5 Ss with spinal cord transections and 1 S unconscious from a head injury have been studied when the deep tissue temperature ('central' temperature) was artificially lowered but normally innervated skin was kept warm, usually 34-36° C. Shivering and/or increased metabolism was evoked when the central temperature was 34.9-37° C. These observations are compatible with the view that there is a central receptor which can cause shivering when stimulated by a fall in central temperature.
R 20

30,968
Booz-Allen Applied Research, Inc. SUPERSONIC TRANSPORT DEVELOPMENT AND PRODUCTION COST ANALYSIS PROGRAM, VOLUME I. FINAL REPORT. Contract FA SS 66 13, Dec. 1966, 290pp. US Office of Supersonic Transport Development, FAA, Washington, D.C. (Booz-Allen Applied Research, Inc., Bethesda, Md.). (AD 652308)

This report documents the results of a cost analysis directed to the determination of independent estimates for development and procurement costs of the proposed supersonic transport (SST). The analysis of these costs was undertaken in support of the SST competition and economic feasibility studies being conducted by the Federal Aviation Agency. Statistical regression techniques coupled with engineering/analog methods were employed to produce cost estimating relationships (CERs) for predicting SST costs. CERs were derived for predicting development and production costs of the airframe, engines, avionics, and aircraft servicing equipment of the proposed SST. The CERs have been exercised herein to compute the anticipated costs of procuring various quantities of SST aircraft. In addition, since the economic study is to examine the impact of competition with other aircraft, cost estimates were computed for the Boeing 707 and 747; the Douglas DC-8, DC-8-63, and DC-10; and the Anglo-French supersonic transport, Concorde. The study concludes with a comparison of SST costs as determined using the BAARINC/RMC (Booz-Allen Applied Research, Incorporated/Resource Management Consultants, Incorporated) relationships herein with those of the competing airframe and engine manufacturers.
R Many

30,969
Debecker, J. & Desmedt, J.E. RATE OF INTERMODALITY SWITCHING DISCLOSED BY SENSORY EVOKED POTENTIALS AVERAGED DURING SIGNAL DETECTION TASKS. J. Physiol., July 1966, 185(2), 52P-53P. (Pathophysiology Lab., Nervous System & Brain Research Unit, University of Brussels, Brussels, Belgium).

Sensory switching mechanisms were studied in normal man by programming mixed series of somatosensory stimuli (electrical pulses on a finger of the hand) and of acoustic clicks. Clicks and finger shocks were made to alternate regularly at various rates, and 2 computers were triggered to average 200 responses picked up respectively over the parietal hand projection and from the vertex. The S was instructed to recognize either clicks or finger shocks of barely noticeable smaller intensity, substituted at random for about 10% of the standard stimuli in a series. When the period of the alternating bimodality series of stimuli is reduced to 1·2 seconds, the late surface-positive component increases for the evoked potentials corresponding to the modality involved by the decision task. The lack of change in the 'primary' early component of the somatosensory evoked potentials confirms that the afferent volley is not influenced on its way to the cortex under the conditions of these experiments.
R 1

30,970
Rushworth, G. & Young, R.R. THE EFFECT OF VIBRATION ON TONIC AND PHASIC REFLEXES IN MAN. J. Physiol., July 1966, 185(2), 63P-64P. (Neurological Research Unit, Churchill Hospital, Oxford, England).

The effects of vibration upon spinal reflexes in man were studied under relatively isometric conditions. An electrically excited vibrator (100 cycles per second and maximum amplitude 2 mm) was applied to the Achilles tendon with the foot, leg and thigh fixed so that torque about the ankle joint was recorded from the foot plate with strain guages. Phasic monosynaptic reflexes in triceps surae muscles were elicited either as ankle jerks (tendon taps via a solenoid or as H reflexes (stimulation of the medial popliteal nerve percutaneously by 0.7 msec pulses at 30--50 volts). Both the electrical activity of sural triceps and its mechanical tension were recorded. In 25 normal relaxed Ss, vibration produced a decrease (often abolition) of the ipsilateral H reflex or ankle jerk. This reduction began within 200 msec of the onset of vibration and the reflexes returned to normal a few seconds after vibration was stopped. Most Ss (16/25) also showed a slowly progressive rise in tension in the vibrated muscles that began a few seconds after the vibration and outlasted it by 0.2--5 sec. The electrical activity accompanying this sustained rise of tension could usually be recorded only from soleus.
R 6

30,971
Pirenne, M.H. ON THE PROBLEM OF BLACK. J. Physiol., July 1966, 185(2), 64P-65P. (University Laboratory of Physiology, Oxford, England).

Doubts concerning the theory that seeing black is simply not seeing are strengthened by the following experiment. First, a dark-adapted S in a dark room looks towards a fixation point, but without keeping accurate fixation. His absolute threshold is measured for a steadily exposed, large, peripherally situated test field (e.g. 16° in diameter, centred 20° from the fixation point). Then, he is instructed to keep his gaze fixed as accurately as possible on the fixation point, while the luminance of the test field is progressively increased from a value well below the threshold luminance as defined above, to a value about 2 or 3 times this luminance. If the S's fixation is accurate enough, he sees nothing but the fixation point while this is going on. But when the light from the test field is suddenly cut off, the S sees a 'black flash', subjectively darker than the surrounding darkness, in the position of the test field. As a control, the test field luminance can in a similar manner be slowly and silently increased and then decreased, in which case the S is never able to distinguish the test field from the surrounding darkness--always provided he keeps sufficiently steady fixation.
R 5

30,972
Cunningham, D.J.C., Lloyd, B.B. & Spurr, D. THE RELATIONSHIP BETWEEN THE INCREASE IN BREATHING DURING THE FIRST RESPIRATORY CYCLE IN EXERCISE AND THE PREVAILING BACKGROUND OF CHEMICAL STIMULATION. J. Physiol., July 1966, 185(2), 73P-75P. (University Laboratory of Physiology, Oxford, England).

Six young men effectively innocent of physiological knowledge sat on a free-wheel Krogh bicycle ergometer with their feet on the pedals and inspired humidified hypercapnic mixtures which were hypoxic, euoxic or hyperoxic. The command to work (630 kpm/min; 60 r.p.m.) was given at the beginning of an expiration, the flywheel having already been accelerated by a motor. Ventilation was measured by open-circuit spirometry, and end-expiratory P_{O_2} and P_{CO_2} which were controlled with a fast-response paramagnetic oxygen meter and an infra-red analyser. The results of 313 commands showed that the increase in ventilation during the first inspiratory-expiratory cycle was independent of the prevailing levels of hypercapnia, hypoxia, and hyperoxia, and of ventilation itself. The increase was largely accounted for by an increase in frequency.
R 9

30,973
LLoyd, B.B. & Moran, P.T. ANALOGUE COMPUTER SIMULATION OF THE EQUATION OF MOTION OF A RUNNER. J. Physiol., Sept. 1966, 186(1), 18P-20P. (University Laboratory of Physiology, Oxford, England).

The distance-time relationship of a runner making maximal use of the energy available is represented by an equation. The distance run in meters is given as a function of a store of energy ("oxygen debt") delivering energy at a specified rate, the energy used in running a horizontal meter, the maximum rate of aerobic metabolism, the resting metabolism, time in seconds, the effective delay in the rise of oxygen consumption, a parameter comprising mechanical efficiency, and a factor for interconversion of units, the body mass, and a parameter including mechanical efficiency and surface area and relating the power needed to overcome air resistance with velocity. A close correspondence is achieved between analogue computer solutions of this relation and experimental values and previous simulations.
R 5

30,974
Weale, R.A. POLARIZED LIGHT AND THE HUMAN FUNDUS OCULI. J. Physiol., Sept. 1966, 186(1), 175-186. (Physiological Optics Dept., Institute of Ophthalmology, London, England).

Measurements were made of the relative fractions of diffuse and specular reflexions in the fovea and periphery of the human fundus oculi. All the light emerging from the eye was found to be scattered or reflected behind the receptors as bleaching the retina affected both fractions equally. Bruch's membrane is the most likely surface at which specular reflexion occurs whereas the choroid and sclera are probably involved in scattering. Both diffuse and specular components exhibited marked directional effects as a function of wavelength.
R 29

30,975
Budd, G.M. SKIN TEMPERATURE, THERMAL COMFORT, SWEATING, CLOTHING AND ACTIVITY OF MEN SLEDGING IN ANTARCTICA. J. Physiol., Sept. 1966, 186(1), 201-215. (University of Sydney School of Public Health & Tropical Medicine, Sydney, Australia).

Three men were studied while dog-sledging 320 km in 12 days in Antarctica. Conventional Antarctic clothing ('sweaters and windproofs') was worn. Four hundred observations were made of medial thigh skin temperature, thermal comfort, sweating, clothing, activity and environmental conditions. Work occupied an average of 11.0 hr/day and sleep 7.5 hr. Estimated daily energy expenditure averaged 5100 kcal (range 2740-6660 kcal). Skin temperature fell on exposure to cold despite the clothing worn, but was not changed by the level of activity. Sweating, and thermal comfort, were directly related to both skin temperature and activity. Inside the tent, the modal value of skin temperature was 33°C (range 27-36°C) and the men were comfortable in 94% of observations. During the 9:2 hr/day spent outdoors the modal value of skin temperature was 27°C (range 18-33°C) and the men felt too cold (but did not shiver) in 11% (range 7-20%) of observations, suggesting that cold stress was not negligible. However, they also felt too hot in 20% of observations and were sweating in 23%.
R 26

30,976
Budd, G.M. & Warhaft, N. BODY TEMPERATURE, SHIVERING, BLOOD PRESSURE AND HEART RATE DURING A STANDARD COLD STRESS IN AUSTRALIA AND ANTARCTICA. J. Physiol., Sept. 1966, 186(1), 216-232. (University of Sydney School of Public Health & Tropical Medicine, Sydney, Australia & Antarctic Div., Department of External Affairs, Melbourne, Australia).

Four men of European descent were exposed naked to an air temperature of 10°C for 2 hr in Australia, and again after 24 weeks' residence at Mawson, Antarctica. Their ability to maintain rectal temperature during the test cold exposure significantly improved at Mawson. Shivering and cold diuresis did not change. The response of skin temperature did not change significantly except for a small increase in toe temperature. Bradycardia caused by the cold exposure was significantly greater at Mawson, but the rise in blood pressure did not change. Spontaneous fluctuations in rectal temperature that occurred during the cold exposure were intensified at Mawson. The results confirm those of a previous study at Mawson, and are attributed to general acclimatization to cold. It is suggested that tissue insulation increased as a result of enhanced vasoconstriction.
R 45

30,977
Budd, G.M. & Warhaft, N. CARDIOVASCULAR AND METABOLIC RESPONSES TO NORADRENALINE IN MAN, BEFORE AND AFTER ACCLIMATIZATION TO COLD IN ANTARCTICA. J. Physiol., Sept. 1966, 186(1), 233-242. (University of Sydney School of Public Health & Tropical Medicine, Sydney, Australia & Antarctic Div., Department of External Affairs, Melbourne, Australia).

Four men of European descent were infused with noradrenaline at rates of 0·038, 0·075, 0.150 & 0·300 µg/kg.min in Australia, and again after 29 weeks' residence at Mawson, Antarctica. A concurrent study of their responses to whole-body cooling showed that they acclimatized to cold in Antarctica. Blood pressure rose and heart rate fell in proportion to the dose of noradrenaline infused. The response was much less after than before acclimatization in three of the four Ss. Subjective effects of the drug decreased in proportion to the decrease in the pressor effect. Finger temperature fell in proportion to the dose infused, in three Ss. The response was unchanged or increased after acclimatization. Oxygen consumption was initially unaffected by noradrenaline, but after acclimatization it apparently increased in proportion to the dose infused. The increase in pulmonary ventilation during infusion was slightly greater after acclimatization.
R 15

30,978
McDermott, M. DIURNAL AND WEEKLY CYCLICAL CHANGES IN LUNG AIRWAYS RESISTANCE. J. Physiol., Oct. 1966, 186(2), 90P-92P. (Pneumoconiosis Research Unit, MRC, Llandough Hospital, Penarth, Scotland).

Lung airways resistance was measured by an interrupter technique at a flow rate of 0.5-2.5l/sec. A 10% increase in inspiratory resistance during the day was observed in control measurements on Ss in an experiment on the effects of inhaling coal dust. These changes were studied in more detail on laboratory staff at 10.00, 14.00, 15.00, 17.00, 18.00, 22.00 and 23.00 hr. It was found that inspiratory resistance measured with a plethysmograph fell slightly during the day, rising in early evening until 23.00 hr, from when no further measurements were made. All Ss showed the same pattern of change. In an investigation, lasting several weeks, of the effect on inspiratory resistance when cigarette smokers changed to cigars a weekly cycle of increasing resistance from Monday to Friday was observed, during both cigarette and cigar smoking periods. Unlike the daily changes this was not apparent in individual results but only on the mean for the group.
R 4

30,979
Carr, R.E., Ripps, H. & Siegel, I.M. RHODOPSIN AND VISUAL THRESHOLDS IN CONGENITAL NIGHT BLINDNESS. J. Physiol., Oct. 1966, 186(2), 103P-104P. (Ophthalmology Dept., New York University Medical Center, New York, N.Y.).

Fundus reflectometry was performed on 2 Ss, each having a different form of congenital night blindness (dominant and recessive, respectively). In both, the concentration of rhodopsin and the rate at which it regenerated after bleaching were within normal limits, a photochemical basis for this anomaly is untenable. The electoretinograms of these Ss showed distinct abnormalities: the dominant form had an overall reduction in electrical activity, while the recessive variety showed normal a-waves but very much reduced b-wave potentials. This, and other evidence, implicates neural transmission pathways proximal to the outer segments as the locus of disturbance in this abnormality. However, measurements of the visual thresholds as a function of stimulus area showed that, in spite of greatly decreased sensitivity, the integrative properties of the fovea and periphery were intact.
R 3

30,980
Lobban, Mary C. & Tredre, Barbara E. DAILY RHYTHMS OF RENAL EXCRETION IN HUMAN SUBJECTS WITH IRREGULAR HOURS OF WORK. J. Physiol., Oct. 1966, 186(2), 139P-140P. (Human Physiology Div., National Institute for Medical Research, London, England).

The daily rhythms of renal excretion in 15 Ss, age 30-60 years, with a previous history of 10-30 years of changing hours of work were studied. Urine samples were collected during 27 40-hour recording periods. The averaged results for all Ss show excretory patterns with normal 24-hour phasing, but reduced amplitude. Inspection of the individual results, however, shows a high proportion of abnormal patterns when values are plotted against the ordinary working day, only 43.5% of the excretory patterns being normal in every respect. Plotting the results: a) against the activity pattern of the Ss at the time of recording; and b) against their activity patterns on the previous shift further reduces the number of normal excretory patterns. Almost as many normal patterns are obtained in relation to the time of the previous shift (21.3%) as in relation to the activity pattern at the actual time of recording (22.2%).
R 2

30,981
Jones, J.G. ON THE MEASUREMENT OF HUMAN OPERATOR DESCRIBING FUNCTIONS IN FLIGHT EXPERIMENTS. Tech. Memo, AERO 967, Dec. 1966, 9pp. Royal Aircraft Establishment, Farnborough, Hants, England. (AD 815082)

The measurement of human operator describing functions is discussed, with particular reference to aircraft bank angle control in turbulence. A method is proposed which uses computed values of power spectra and cross spectra based on time traces of stick force and bank angle recorded in turbulence, and a computed value of the transfer function of aircraft bank angle response to stick force, based on similar time traces recorded in still air. The effect of operator remnant, or noise, upon the estimated describing function is considered. A series of simulator experiments to investigate the practical application of the method is proposed.
R 4

30,982
Chew, V. CONFIDENCE, PREDICTION, AND TOLERANCE REGIONS FOR THE MULTIVARIATE NORMAL DISTRIBUTION. Amer. Statistical Assoc. J., Sept. 1966, 61, 605-617. (RCA Service Company, Patrick AFB, Fla.). (Reprint) (AD 652083)

Formulas for confidence, prediction, and tolerance regions for the multivariate normal distribution for the various cases of known and unknown mean vector and covariance matrix are assembled for easy reference in this expository paper. Tables are provided for the bivariate case.
R 44

30,983
Allwood, M.J. & Nicholson, A.N. TRANSIENT CHANGES IN THE ELECTRORETINOGRAM AND OPTIC TRACT DISCHARGES FOLLOWING LASER IRRADIATION. J. Physiol., Nov. 1966, 187(2), p31P. (RAF Institute of Aviation Medicine, Hampshire, England).

The nasal side of the left eye of the anaesthetized cat (pentobarbitone-sodium 30 mg/kg I.V.) was irradiated. The pupil was fully dilated by the local application of a mydriatic (phenylephrine hydrochloride) and the right eye enucleated. The optic tract discharge of the temporal side of the eye and the electroretinogram or optic tract discharge of the nasal side of the eye were elicited at intervals of 2 seconds by a Grass Model PS2 photostimulator. The control responses and responses following laser irradiation were recorded without interruption. Following irradiation at 6943 Å with an energy of 20 mJ transient changes were observed in the responses and there was evidence of histological damage. However, the responses were unaltered following irradiation with an energy of less than 5 mJ. As these transient changes were observed only in the presence of localized damage it is suggested that they may be related to the production of the choroido-retinal burn.
R 1

30,984
Davies, C.T.M. & Neilson, J.M.M. THE RESPONSE OF THE HEART RATE TO RESPIRATION IN MAN. J. Physiol., Nov. 1966, 187(2), 39P-40P. (Environmental Physiology Research Unit, London School of Hygiene & Tropical Medicine, London, England & Medical Physics Dept., Royal Infirmary, Edinburgh, Scotland).

Heart rate was examined in relation to respiration in 10 healthy Ss in the sitting posture, using a continuous recording system. Ss were studied on 2 separate occasions over a 2 hour period. Each S performed a set routine of respiratory manoeuvres which enabled the separate effects of inspiration and expiration to be investigated. The results indicate that the heart rate responds solely to inspiration. The nature of the response is biphasic, having a mean amplitude of approximately 16 beats/min with a duration of 13 sec and an overshoot of 1.5 beats/min. Expiration has little or no effect on the heart rate. During normal respiration superposition of the inspiratory transient takes place to produce various patterns of arrhythmia depending on the S's respiratory frequency. Only at very low respiratory rates is a clear rise and fall of heart rate seen.
R 4

30,985
Campbell, F.W., Kulikowski, J.J. & Levinson, J. THE EFFECT OF ORIENTATION ON THE VISUAL RESOLUTION OF GRATINGS. J. Physiol., Nov. 1966, 187(2), 427-436. (Physiological Laboratory, Cambridge, England).

Gratings with a sinusoidal light distribution were generated on the face of an oscilloscope. Spatial frequency and contrast could be varied while keeping the mean luminance of the grating constant. Using a homatropinized eye with an artificial pupil and carefully corrected refraction, high resolution in the vertical and horizontal meridians as compared with the oblique meridians was found for gratings ranging in spatial frequency from 1 to 35 c/deg. It is concluded from the similar behavior of low and high frequency gratings that neither focus errors nor optical aniseikonia can account for these findings. Additional proof that optical factors cannot significantly account for these preferred directions of resolution was obtained by forming interference fringes directly on the retina using a neon-helium laser as a coherent light source. Similar orientational changes in resolution were found by by-passing the dioptrics with interference fringes. It is concluded that the effect is due to some orientational inequality in the visual nervous system.
R 15

30,986
Campbell, F.W. & Kulikowski, J.J. ORIENTATIONAL SELECTIVITY OF THE HUMAN VISUAL SYSTEM. J. Physiol., Nov. 1966, 187(2), 437-445. (Physiological Laboratory, Cambridge, England).

Gratings of variable contrast were generated on 2 oscilloscopes; these were superimposed optically. The angle of orientation between them could be changed. The threshold of one grating, the test grating, was determined in the presence of the other, the masking grating. When the gratings were presented with the same orientation (and locked in phase) the increment threshold of the test grating was found to be proportional to the suprathreshold contrast of the masking grating. As the angle between the test and masking gratings was increased the masking effect fell exponentially. At 12° on either side of a vertical test grating the masking effect was reduced by a factor of 2 with respect to its maximum value. This angle was independent of the contrast level of masking, the focus, and also the phase coherence of the masking grating. If the test grating was presented obliquely the effect of masking was slightly less.
R 9

30,987
Tremaine, V.J. AN EVALUATION OF THE TYPE G-4B ANTI-G SUIT: TO DETERMINE ITS CONDITION AFTER PROLONGED STORAGE. Rep. 66 RD 3, July 1966, 7pp. RCAF Institute of Aviation Medicine, Toronto, Ontario, Canada. (AD 816323)

An evaluation was conducted to determine whether the Type G-4B Anti-G Suit is acceptable for Service use after being stored for about ten years in an RCAF supply depot. Forty-five suits were used in this evaluation. Each suit was inspected and tested to RCAF Engineering Order 55-5CA-2. In addition, the inflation time and leakage rates on three garments were tested to specification MIL-S-6455 to which they were manufactured. These three suits were also tested for strength, endurance, low temperature operation, low temperature storage and high temperature conditions. In view of the results of this evaluation, the Type G-4B Anti-G Suit is considered acceptable for Service use after prolonged storage in an RCAF supply depot.

30,988
Horowitz, L.M., Norman, Sandra A. & Day, Ruth S. AVAILABILITY AND ASSOCIATIVE SYMMETRY. Psychol. Rev., Jan. 1966, 73(1), 1-15. (Stanford University, Stanford, Calif.).

This paper examines the concept of availability and its theoretical role in the cognitive processes. An item's availability (AV) is operationally defined by the probability that S could recall it after a 15-sec delay. (AV seems to grow fastest when S produces it from memory. It also grows, though not as fast, when S sees the item without producing it.) This definition is used to examine the principle of associative symmetry, and evidence is presented to support it. Sources of asymmetry in natural language are examined, and the concept's theoretical implications for memory and thought are discussed.
R 37

30,989
Parks, T.E. SIGNAL-DETECTABILITY THEORY OF RECOGNITION-MEMORY PERFORMANCE. Psychol. Rev., Jan. 1966, 73(1), 44-58. (University of Wisconsin, Madison, Wisc.).

Psychophysical signal-detection theory is applied to recognition-memory performance. Old items in the test list are considered to be analogous to "signals" while new items are analogous to "noise only." The resulting fundamental assumptions describe the covert responses which mediate recognition-memory performance as varying continuously in strength. Covert responses to both old and new items are normally distributed with the distance between distributions representing learning and retention. The overt response to an item depends on whether or not S's covert response exceeds an arbitrary criterion. The available evidence suggests that S's criterion will be set such that he will most probably choose a number of items approximately equal to the number of old items in the test.
R 11

30,990
Ganz, L. MECHANISM OF THE FIGURAL AFTEREFFECTS. Psychol. Rev., March 1966, 73(2), 128-150. (University of California, Riverside, Calif.).

A quantitative theory is proposed to account for these perceptual aberrations. The two aspects of the aftereffect--the shifts in contour position and the temporal separation which can be introduced between inducing and test contour--are treated separately. According to the theory, the displacement arises because the neural correlates of visual contour inhibit one another. The inhibition is proportional to the log of the contour intensity. The inhibition is a decreasing linear function of the separation between the contours. These two assumptions, both documented psychologically and physiologically, are sufficient to generate a predicted contour displacement. Eye movements during fixation, also documented, are shown to produce a statistical distribution of repulsions at various intercontour distances. By introducing empirically derived values for the equation parameters, a distribution of figural aftereffects is generated which agrees well with experimental values. Two independent sets of predictions are generated by the model. First, the model predicts a very steep rise in response variability as the test contour is brought closer to the inducing contour. Second, certain changes in the mode of presentation--retinally stabilized, simultaneous presentation, short test-figure presentation--are predicted to yield different distributions of figural aftereffects. The data available to date corroborate the predictions.
R 60

30,991
Munsinger, H. & Kessen, W. STIMULUS VARIABILITY AND COGNITIVE CHANGE. Psychol. Rev., March 1966, 73(2), 164-178. (University of Illinois, Urbana, Ill. & Yale University, New Haven, Conn.).

Four postulates of a tentative theory of cognitive change are presented. Implications of the postulates for response to stimulus variability as a function of age were tested in 4 studies (N = 863). Measures of response used were estimation accuracy, the ability to learn class names, the ability to classify, and changes in expressed preference after differential experience with stimulus variability. In each study children at 2 grade levels and adults responded to random shapes varying from 5-40 independent turns. Results supported the following conclusions: a) Ss are sensitive to variability; b) there is a limit on processing ability; c) there are systematic effects of experience with variability on expressed preference; d) young children tend to select from the presented variability. The postulation that experience with stimulus variability just beyond the limits of processing ability would result in maximal cognitive change received partial support.
R 20

30,992
Wheeler, L. TOWARD A THEORY OF BEHAVIORAL CONTAGION. Psychol. Rev., March 1966, 73(2), 179-192. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

Behavioral contagion is defined operationally and is contrasted with conformity, imitation, social pressures, and social facilitation. Experiments dealing with contagion are reviewed and theoretical statements derived from this review. The basic theoretical argument is that the lowering of the avoidance gradient in an approach-avoidance conflict is essential to the occurrence of contagion.
R 43

30,993
Peterson, L.R. SHORT-TERM VERBAL MEMORY AND LEARNING. Psychol. Rev., May 1966, 73(3), 193-207. (Indiana University, Bloomington, Ind.).

The position taken in this paper acknowledges that short- and long-term retention have much in common. Interference produces forgetting in both cases, and repetition generally improves retention. However, it is considered that in the case of paired associates for a brief period after a presentation a recency mechanism interacts with the learning mechanism. Several variables affect the retention curve differently during the early declining phases as contrasted with the asymptote. Among these are duration of presentations, number of repetitions and duration of the spacing interval between repetitions. The short-term or recency mechanism is conceptualized as a post-perceptual mechanism whose effectiveness decreases through time and the action of other information. Recall for very recent events is characterized by rapid availability, by which is meant search times which can be effective in short recall periods. The long-term or learning mechanism is conceived of as a relatively stable store. There are indications that an increase in the availability of information on the basis of this component occurs for a period of time after presentation. In empirical retention curves the increasing component may be hidden by the rapidly decreasing short-term component. The presence of the former has been inferred from the beneficial effect of increasing the time between repetitions of a pairing and from the reminiscence found after irrelevant intervening activity.
R 40

30,994
Rosenberg, S. & Cohen, B.D. REFERENTIAL PROCESSES OF SPEAKERS AND LISTENERS. Psychol. Rev., May 1966, 73(3), 208-231. (Bell Telephone Laboratories, Inc., Murray Hill, N.J. & Rutgers University, New Brunswick, N.J.).

A stochastic theory is presented to: a) account for a speaker's selection of a linguistic response to distinguish a referent stimulus from nonreferent stimuli; and b) predict the probability that a listener, using the speaker's response, correctly identifies the referent. The speaker's response is postulated to result from the concatenation of 2 hypothetical psychological stages, termed "sampling" and "comparison." The listener's identification of the referent is postulated to result from a 1-stage process similar to that of the speaker's comparison stage. Results from several interrelated experiments are reported which provide support for the basic assumptions of the theory. Psychological processes inherent in classical word association and in recognition and recall are interpreted in terms of the speaker and listener theory.
R 37

30,995
Pinneo, L.R. ON NOISE IN THE NERVOUS SYSTEM. Psychol. Rev., May 1966, 73(3), 242-247. (Delta Regional Primate Research Center, Tulane University, New Orleans, La.).

Treisman and Hebb have suggested that "spontaneous," "random," or "background" activity in the nervous system constitutes "noise" in discrimination and learning; that is, this type of activity has no functional value to the organism. This paper attempts to show that tonic activity, a term including all of the types of activity listed above, is rather the functional substrate of the brain. Examples are cited for the skeletal and autonomic motor systems, the primary sensory systems, and the diffuse ascending and descending reticular activating systems to show that the tonic activity in the entire brain enters into all discrimination and learning, and, in agreement with Lashley, represents the neural basis of behavior.
R 29

30,996
Zeiler, M.D. THE STIMULUS IN THE INTERMEDIATE SIZE PROBLEM. Psychol. Rev., May 1966, 73(3), 257-261. (Wellesley College, Wellesley, Mass.).

Riley, Sherman, and McKee maintained that a 2-process theory based on the learning of the absolute and middle size aspects of the stimulus was a better explanation of the intermediate size problem than the ratio theory. Various aspects of this contention were examined. The ratio theory appeared to be a more precise formulation than the 2-process alternative. In addition, no experiments with Ss below the level of adult humans that have used one training set have revealed that the middle size relationship can control behavior. Although most of the data were readily deduced by the ratio theory, there were results that required the assumption of precise absolute perception rather than the learning of ratios. Some alternative interpretations of the ratio theory were discussed, and a hypothesis based on 2 types of absolute learning was presented.
R 10

30,997
Makous, W.L. CUTANEOUS COLOR SENSITIVITY: EXPLANATION AND DEMONSTRATION. Psychol. Rev., July 1966, 73(4), 280-294. (IBM Research Center, Yorktown Heights, N.Y.).

Past reports that humans can, in complete darkness, sense with their fingers the colors objects would have if illuminated, have understandably been received with skepticism. A previously proposed hypothesis based on differential rate of absorption of infrared radiation by different layers of the skin, is inconsistent with the thermodynamics of the situation. Quantitative analysis of the system consisting of a room-temperature surface juxtaposed to the higher temperature skin, however, leads to the conclusion that large differences in emissivity of different room-temperature surfaces almost certainly could be detected by the associated effects on skin temperature. Easily repeatable demonstration show that this is true, and a few simple temperature measurements confirm the theoretical identification of the mechanism.
R 33

30,998
Haber, R.N. NATURE OF THE EFFECT OF SET ON PERCEPTION. Psychol. Rev., July 1966, 73(4), 335-351. (University of Rochester, Rochester, N.Y.).

Evidence on the effects of set has been reviewed with respect to two basically different hypotheses--set enhances the percept of the stimulus while S is actually viewing it; set facilitates report of the stimulus without affecting its percept. At least 3 varieties of nonperceptual hypotheses were discussed: a) response-limiting or response-probability changes; b) order of report changes coupled with a fading memory; and c) reorganization of the memory process itself. The second alternative does not seem to be a necessary condition for the production of set effects, since even when order of report is controlled the effects of set are still found without loss in magnitude. The supporting evidence for the response-probability interpretation is extensive, in that the magnitude of the set effect varies with the manipulation of the probabilities of responses or limitations on responses. The third alternative, reorganization of the memory process mediated by S's coding strategy, is strongly supported in the results of 3 studies by Harris & Haber (J. exp. Psychol., 1963, 65) and Haber (J. exp. Psychol., 1964, 67 & 1964, 68). Further, Haber's interpretations of those results suggest that the response-probability explanation may be reduced to memory reorganization (encoding), so that only one nonperceptual hypothesis may be needed. While this review then suggests a narrowing of the number of nonperceptual alternatives, it provides less resolution to which of the two basic hypotheses is correct. The problem of analysis is still very complex--many of the experiments discussed provided clear-cut evidence for response or memory explanations, but without simultaneously demonstrating a lack of a perceptual effect. Therefore, this review must conclude inconclusively with respect to a choice between the two hypotheses. Some evidence exists to support each of them, and some exists which favors one over the other. But there is none that supports one while disproving the other.
R 55

30,999
Weitzman, R.A. STATISTICAL LEARNING MODELS AND INDIVIDUAL DIFFERENCES. Psychol. Rev., July 1966, 73(4), 357-364. (University of Minnesota, Minneapolis, Minn.).

In most applications of statistical learning models, it is tacitly assumed, with but little evidence, that individuals do not differ with respect to the models' parameters. This paper examines the evidence, develops a statistical test for the assumption, and applies the test to models and data reported in the literature; the mixed results suggest that individual differences which affect data may not affect the parameters of all models which provide accurate descriptions of the data.
R 7

31,000
Freeman, R.B., Jr. OPTICAL TEXTURE VERSUS RETINAL PERSPECTIVE: A REPLY TO FLOCK. Psychol. Rev., July 1966, 73(4), 365-371. (Pennsylvania State University, University Park, Penn.).

Differences in numerical analysis and experimental predictions resulting from perspective theory and texture-gradient theory are discussed. Flock's criticisms of the mathematical specification of perspective are shown to be in error. Conversely, Flock's use of regression coefficients as a measure of perceived slant is criticized as being inadequate for description of the data. Finally, results of experiments showing the effects of texture gradients on visual slant are analyzed in terms of perspective theory. By means of simple assumptions, the data of Flock and others can be accounted for better, at least in a qualitative sense, in terms of perspective theory than in terms of optical theta.
R 11

31,001
Games, P.A. COMMENTS ON "A POWER COMPARISON OF THE F AND L TESTS--I". Psychol. Rev., July 1966, 73(4), 372-375. (Ohio University, Athens, Ohio).

Boersma, DeJonge, and Stellwagen (Psychol. Rev., 1964, 71) fail to consider any situation except that where the specific ordered alternative of the L test is true. They thus fail to consider the general statistical inference consequences of using ordered-hypothesis tests vs. omnibus tests. The power comparison provides little useful information on the parametric vs. nonparametric choice of tests in either the ordered-hypothesis or omnibus test situations. The conclusion of consistently superior power of the L test is somewhat dubious in that the authors failed to demonstrate equal risks of Type I error in the 2 tests and used computer simulation of data that was inappropriate for either the randomized-blocks analysis of variance or the L test.
R 8

31,002
McGaugh, J.L. & Petrinovich, L.F. NEURAL CONSOLIDATION AND ELECTROCONVULSIVE SHOCK REEXAMINED. Psychol. Rev., July 1966, 73(4), 382-387. (University of California, Irvine, Calif. & State University of New York, Stony Brook, N.Y.).

In a recent paper Lewis and Maher (Psychol. Rev. 1965, 72) concluded that the findings of electroconvulsive shock (ECS) studies provide little support for the consolidation hypothesis, and they proposed the hypothesis that ECS effects on behavior are due to conditioned inhibition. The present paper points out that the evidence cited by Lewis and Maher, contrary to their conclusion, provides strong support for the consolidation hypothesis and that the conditioned-inhibition hypothesis proposed by Lewis and Maher is inadequate on both logical and empirical grounds.
R 30

31,003
Beckwith, Mary & Restle, F. PROCESS OF ENUMERATION. Psychol. Rev., Sept. 1966, 73(5), 437-444. (Indiana University, Bloomington, Ind.).

Mathematically, the process of enumeration is fundamental to arithmetic. Psychologically, it is a sensorimotor chain controlled at every stage by a shifting perceptual organization. Enumeration requires a chant ("1, 2, 3 ..."), a shifting indicator response (pointing), and a perceptual grouping of objects into those already counted and those still ahead. The arrangement of the objects has, theoretically, an important effect on the speed and accuracy of enumeration. Further analysis shows that the serial chain of behavior, required for counting a fairly large set of objects, must be divided into parts, and the objects grouped into corresponding subsets. 3 experiments show the relationship between arrangement of objects and counting.
R 23

31,004
Routtenberg, A. NEURAL MECHANISMS OF SLEEP: CHANGING VIEW OF RETICULAR FORMATION FUNCTION. Psychol. Rev., Nov. 1966, 73(6), 481-499. (Northwestern University, Evanston, Ill.).

Recent data on sleep are reviewed primarily with the goal of understanding the functional organization of midbrain, pontine, and medullary nuclear systems related to the sleep process. A summarizing schema is presented in which it is assumed that there are 2 electroencephalographic desynchronizing systems, 1 described physiologically by Moruzzi and Magoun, and the other, a limbic-midbrain system, described anatomically by Nauta. An attempt is also made to show how these data require modification of previously held views of reticular formation function.
R Many

31,005
Ephron, H.S. & Carrington, Patricia. RAPID EYE MOVEMENT SLEEP AND CORTICAL HOMEOSTASIS. Psychol. Rev., Nov. 1966, 73(6), 500-526. (Psychiatry Dept., New York Medical College, New York, N.Y. & Teachers College, Columbia University, New York, N.Y.).

Findings indicate that under most conditions nonrapid eye movement sleep (NREMS) represents an indispensible conditions for the onset of rapid eye movement sleep (REMS). The implications of this sequential relationship are explored. It is conceptualized that deepening NREM sleep involves a progressive loss of cerebral vigilance which, nevertheless, must somehow be maintained within adaptively appropriate limits. A homeostatic interplay between sleep phases is then postulated. This involves 2 complementary tendencies; 1 tendency toward deepening NREM sleep, and organismic rest, which, when it reaches a preset level, triggers the release of another tendency toward REMS and organismic activation. REMS is seen as acting to increase cortical "tonus" through a process of "endogenous afferentation."
R Many

31,006
Hay, J.C. OPTICAL MOTIONS AND SPACE PERCEPTION: AN EXTENSION OF GIBSON'S ANALYSIS. Psychol. Rev., Nov. 1966, 73(6), 550-565. (Smith College, Northampton, Mass.).

There is a perceptual tendency to see the 2-dimensional transformations of shadows as rigid movements in 3 dimensions. The significance of this illusion for veridical perception is investigated by a mathematical analysis of the correspondence between 3-dimensional object displacements and the optical motions they cause at the eye. The results show that optically equivalent object displacements share significant features, and that therefore the optical motions they produce are potentially informative about those features. Some of the objective features specified by optical motions are initial orientation, rotation, and the ratio between initial distance and translation distance. The analysis is based on coplanar sets of object points, and the fact that their displacements produce 2-dimensional projective transformations of the retinal image.
R 16

31,007
Williams, A.P. THE SELECTION OF MAINTENANCE ENGINEERS FOR DATA PROCESSING EQUIPMENT. Occup. Psychol., Jan. & April 1966, 40(1&2), 53-65. (Hendon College of Technology).

The selection of men to maintain highly complex and expensive technical equipment is a matter of great and increasing importance for many sections of industry. It is a field which has nevertheless been curiously neglected by psychologists although it is one of great intrinsic interest, for at least three reasons: a) it is work of quite a different kind from the classical repetitive tasks normally studied by industrial psychologists, inasmuch as periods of inactivity, when the machines are functioning properly, are unavoidable; b) it involves not only a high degree of skill, training, and technical knowledge, but also the ability to utilize these to solve many problems which have never arisen before, and may not recur; c) it involves manual work carried out by men of above-average intelligence and educational accomplishments, two factors which in present-day society tend to produce aspirations not altogether consonant with the performance of manual work. With regard to manual work a reasonable inference from the interview material is that the balance of accomplishments and aspirations is at the moment struck rather below the level at which disdain for manual work could occur. It is clear from analysis of the test results that intelligence is related to sucess on the job, and is therefore a useful predictor of it; but it is also clear (partly from the limited degree of the relationship, and partly from other observations) that many other factors enter into the reckoning, and that success could be due to various differing combinations of abilities.
R 5

31,008
Corlett, E.N. RECOGNITION OF A CHANGE IN A VIBRATION FREQUENCY, FELT THROUGH THE FINGERS BY NAIVE AND EXPERIENCED SUBJECTS. Occup. Psychol., Jan. & April 1966, 40(1&2), 91-99. (Engineering Production Dept., University of Birmingham, Birmingham, England).

An experiment is reported in which the difference threshold for a vibration, felt through the finger, of 46 cps was determined for unskilled and skilled drilling operators. The frequency represented the order of frequency to be expected from the operation of a sensitive drill. It is shown that the groups are not separated by their performance, but that the skilled group is a certain part of the unskilled. Some comments are made on the treatment of the results of tests with skilled and unskilled subjects.
R 7

31,009
Randell, G.A. A SYSTEMS APPROACH TO INDUSTRIAL BEHAVIOR. Occup. Psychol., July 1966, 40(3), 115-127. (Occupational Psychology Dept., Birkbeck College, London, England).

The approach developed in this report attempts to interrelate known variables of behavior which affect and are affected by work. It is an open system relative to inputs and outputs and has the potential of predictive value, i.e., it enables calculation of causal contribution of predictor variables to criterion variables. It is described in diagrammatic form in terms of constraints, constants, and treatments, all of which interact. Some of the methodological and measurement problems and techniques for carrying out such an analysis are mentioned. (HEIAS)
R 21

31,010
Swinth, R.L. CERTAIN EFFECTS OF TRAINING GOALS ON SUBSEQUENT TASK PERFORMANCE. Occup. Psychol., July 1966, 40(3), 153-165. (Carnegie Institute of Technology, Pittsburgh, Penn).

Although it is usually argued in transfer of training studies that differences in performance between two groups are due to differences in their initial training experiences, it was found in this study that the subsequent performance of individuals was different because their training goals were different even though all had the same initial training experiences (i.e., all had received the same stimuli and had given the same responses). It was reasoned that the strategy required to achieve the single component goal in the experimental task was a subset of the strategy required to achieve the system goal and therefore the latter strategy could be applied to component goal problems but not the reverse, giving the system goal trained subjects an advantage over the component goal trained subjects. The effect was true for individuals moderately high in ability under the stress of having only a short time for performance.
R 15

31,011
Jamieson, G.H. A PILOT SURVEY OF RECRUITMENT AND TRAINING. Occup. Psychol., July 1966, 40(3), 167-172. (Psychology Dept., MRC Unit, University of Liverpool, Liverpool, England).

A survey of firms in the North West was carried out to elicit information regarding methods of recruitment and training with particular reference to the adult worker. The North West Regional Office of the Ministry of Labour provided a list of seventy-seven firms who had consented to take part in the enquiry. The firms were selected on a cross sectional basis from the various sub districts in the region. A questionnaire was devised and distributed to all the firms on the Ministry's list. Fifty-one firms, employing 71,980 persons (50,313 men, 21,667 women) completed and returned the questionnaire. This represented a sixty-six per cent response. The questionnaire was divided into three parts: general information about the firms, recruitment, and training. The following data were obtained: age distribution, recruitment methods, transfer of skill, performance, change as a function of age, and job training techniques.

31,012
Wilson, N.A.B. PSYCHOLOGY AND MILITARY PROFIENCY. Occup. Psychol., Oct. 1966, 40(4), 179-193. (Ministry of Defense, Navy Department, London, England).

This paper is "an account of an established discipline called military psychology... (it consists of) a group of technologies...which can usefully be brought to bear upon problems of military behavior..." Work in the following four areas is described: selection, allocation, and manpower planning; training; human engineering (which deals with effects of task, equipment, and surrounding upon performance); and social studies (dealing with effects of social and institutional variables). (HEIAS)
R 13

31,013
Shimmin, Sylvia. CONCEPTS OF WORK. Occup. Psychol., Oct. 1966, 40(4), 195-201. (Extramural Studies Dept., University of Sheffield, Sheffield, England).

From this review of the concepts of work held by various authorities certain conclusions emerge. First, although work may be equated with 'what one does for a living' in the eyes of many people, it is important for the individual to have a recognised occupation. It may be fashionable to display a cynical attitude to one's job, but employment is valued for the social status it confers. Secondly, work and leisure are connected in that the conditions and demands of the one have a determining effect upon the other, as do the associated attitudes and behaviour. For this reason it seems useful to think of a work-play continuum rather than two separate and contrasting aspects of life. Thirdly, there is considerable evidence of the lingering Puritan tradition of work as a moral, as well as a productive, force which shows itself in overt and hidden fears of the increased leisure expected in the wake of automation. An investigation of the nature of these fears would not be out of place at the present time. It might do much to reveal the reasons for anxiety and would give direction to those who feel that education for leisure will be a necessary provision in the future. Finally, more attention needs to be paid to the social and cultural matrix of the work.
R 20

31,014
Walker, J. FREQUENT ALTERNATION OF SHIFTS ON CONTINUOUS WORK. Occup. Psychol., Oct. 1966, 40(4), 215-225. (Epidemiology Dept., University of Glasgow, Glasgow, Scotland).

This study examines a change in the arrangement of hours in two factories working continuous shifts: from a 7 shift cycle to more frequent alternations (3x2x2 cycle) in a chemical works, and the effects of a similar change (2x2x2 cycle) in a steel works. Fifty and sixty workers from these two respective works were interviewed. The first questions in the interview were open ended, designed to elicit the workers' general attitudes to the new systems and to the change-over. There were then sections of the interview containing specific questions directed towards the effects of shift hours on travelling to work, meal times, sleeping habits, health, fatigue, wages, domestic and social life, and the suitability of the starting and stopping times. The interview procedure was designed to effect a comparison of attitudes between the new systems and the old. The men preferred the new shift systems with the frequent breaks for two main reasons: interrupting the pattern of six or seven consecutive shifts into spells of two or three shifts with a break of 24 hours between the change-overs led to a reduced experience of 'fatigue,' and it reduced the monotony of six or seven shifts in a row. Other physical social and domestic effects starting and stopping times, management experience, and absentiism were examined relative to the shift systems.
R 11

31,015
Elliott, C.K. AGE AND INTERNAL LABOUR MOBILITY OF SEMI-SKILLED WORKERS. Occup. Psychol., Oct. 1966, 40(4), 227-236. (Psychology Dept., University of Liverpool, Liverpool, England).

Content analysis indicates that internal mobility may be usefully categorised in terms of the types of jobs between which movement takes place; the initiating agent of this movement; the type of action taken by this person; and the reasons for this action. Most mobility at all ages takes place between similar grades of work, but older workers are less likely to be promoted and more likely to be found on solitary jobs outside the main lines of production. Approximately seven out of ten moves of workers of all ages are initiated from the employer's side. The reasons for mobility are complex. The most common single reason is the need to balance the available jobs and the available labour force, but with increasing age workers are more likely to be moved because of their individual characteristics.
R 13

31,016
Jamieson, G.H. AGE, SPEED AND ACCURACY: A STUDY IN INDUSTRIAL RETRAINING. Occup. Psychol., Oct. 1966, 40(4), 237-242. (Psychology Dept., University of Liverpool, Liverpool, England).

An investigation is reported of an experimental training scheme designed to overcome the problem of speed and accuracy in the training of adult sewing machinists. The report compares the relative effectiveness of training by the traditional method, based on predetermined standards of speed and accuracy, and an experimental method, based on the linear programmed learning technique of gradual progression from easy to difficult items, without overt pacing and quality standards. The results show that the experimental method was significantly more successful. Theoretical implications are discussed.
R 20

31,017
Otomo, E. & Tsubaki, T. ELECTROENCEPHALOGRAPHY IN SUBJECTS SIXTY YEARS AND OVER. EEG clin. Neurophysiol., Jan. 1966, 20(1), 77-82. (University of Tokoyo School of Medicine, Tokoyo, Japan).

650 EEGs were examined in 466 normal Ss and patients over 60 years old. Abnormal EEGs were observed in 32.7% of normal Ss and in 44.5% of neurologically normal cases. The incidence of EEG abnormalities tended to augment with increasing decades in neurologically normal cases. The existence of high blood pressure did not seem to influence the incidence of EEG abnormalities either in neurological or non-neurological cases. In hemiplegic and hemiparetic patients who had survived more than 1 year after the apoplectic attack, EEGs were normal in 14.5% and 27%, respectively. No difference in the incidence of abnormal EEG was noted between right and left side paralysis; however, the correlation of the side showing more prominent EEG changes with the clinically paralysed side was significantly higher in right sided than in left sided paralysis in right-handed subjects. Alpha blocking was noted in 57.6% of neurologically normal subjects, decreasing significantly with increasing decade after the 6th, and was significantly lower in neurological patients than in subjects with no neurological manifestations. "Flat" EEGs were found in 8.6% of neurologically normal subjects and their incidence tended to decrease with increasing decade after the 6th. No significant difference was noted between neurologically normal and abnormal cases. The build-up after hyperventilation was poor in general, and was absent in 73% of 401 cases.
R 13

31,018
Yules, R.B., Freedman, D.X. & Chandler, K.A. THE EFFECT OF ETHYL ALCOHOL ON MAN'S ELECTRO-ENCEPHALOGRAPHIC SLEEP CYCLE. EEG clin. Neurophysiol., Feb. 1966, 20(2), 109-111. (Yale University School of Medicine, New Haven, Conn.).

This study indicates that 1 gram of ethyl alcohol per kilogram of body weight administered before sleep exerts a systematic effect on Electroencephalograph sleep patterns. In three human subjects over 13 consecutive nights (4 control, 5 alcohol, and 4 recovery nights), the most consistent pattern of change from night to night was seen in stage I Rapid Eye Movement (REM). On the first night of alcohol the mean REM time dropped from the mean control value and over the next four consecutive nights on ethyl alcohol increased steadily to a peak value on the fifth night of alcohol. In four recovery nights REM time dropped back to control levels. This change in REM occurs in the first half of the night, when alcohol levels are at their maximum concentration, and during the second half of the night. Latency or time to the first REM is constant in control and post-alcohol nights but varies unsystematically during nights of alcohol administration. Stages III and IV remain constant while stage II "absorbs" the shifts demonstrated in stage I.
R 7

31,019
Tizard, Barbara. REPETITIVE AUDITORY STIMULI AND THE DEVELOPMENT OF SLEEP. EEG clin. Neurophysiol., Feb. 1966, 20(2), 112-121. (Experimental Neurology Dept., Institute of Psychiatry, London, England).

The aim of the study was to compare the amount of sleep recorded during periods of auditory stimulation and during a control period and to see whether this amount was affected by instructions to ignore or to pay attention to the stimuli. Attention was secured by asking the Ss to press a response bulb when they heard the sounds. Two different intensities of sound were used and there were two experimental sessions, a week apart. Sleep was assessed from the electroencephalogram record by two methods: a) rating stages of sleep; b) measuring the writeout from a frequency analyser for the 4-7 cycle per second range. Skin potential changes were also recorded. There was no significant difference between the amount of sleep, assessed by either method, and the number of spontaneous changes of skin potential recorded during control periods. However, during sleep more spontaneous changes of skin potential occurred during control periods. Significantly less sleep was recorded during "attend to sound" periods and there were significantly more spontaneous changes in skin potential. Intensity of sound was not a significant variable, but there was a large increase in the amount of sleep recorded during the second week. There was a high intra-subject correlation between the two methods of assessing sleep and it would seem that the integrated output of the 4-7 cycles per second band might provide a useful scale of sleep. The findings are discussed in relation to Pavlovian and other theories of going to sleep.
R 11

31,020
Tizard, Barbara. EVOKED CHANGES IN EEG AND ELECTRODERMAL ACTIVITY DURING THE WAKING AND SLEEPING STATES. EEG clin. Neurophysiol., Feb. 1966, 20(2), 122-128. (Experimental Neurology Dept., Maudsley Hospital, London, England).

Electroencephalogram (EEG) and skin potential responses to repeated auditory stimuli of two different intensities were studied. Two sets of instructions, to attend to and to ignore the sounds, were given. Ratings of EEG stages of sleep and also a quantitative measure of 4-7 cycles per second activity were used to measure drowsiness. It was found that significantly more evoked skin potential changes occurred in the "attend to sound" periods than in the "ignore sound" periods, but this variable did not affect the rate of habituation. Transient EEG responses, viz. V waves and K complexes, did not habituate and their number was not affected by instructions to the subject, although significantly more occurred when the stimulus was loud. Changes in ongoing EEG activity during a stimulus also did not habituate, rather there was a tendency for these to increase in number during the experimental period. The nature of the instructions to the subject was a significant variable here, but the intensity of sound was not. In the case of all three types of response there was a significant correlation, positive or negative, between the number of responses recorded and the degree of drowsiness at that time, as assessed by the amount of 4-7 cycles per second activity. There was also a significant association between the frequency with which responses were evoked and the stage of sleep obtaining at the time. The findings are discussed in relation to Sokolov's concept of the orienting reflex.
R 14

31,021
Surwillo, W.W. ON THE RELATION OF LATENCY OF ALPHA ATTENUATION TO ALPHA RHYTHM FREQUENCY AND THE INFLUENCE OF AGE. EEG clin. Neurophysiol., Feb. 1966, 20(2), 129-132. (Gerontology Branch, National Institutes of Health, Bethesda, Md.).

Electroencephalographs (EEGs) were recorded in 90 healthy males aged 17-91 years. The brain wave tracings were attenuated ("blocked") by short, high-intensity flashes of white light (25 trials). Average latency of alpha attenuation and average period of the EEG, in the interval of time between flash and initiation of the involuntary response, were determined along with the number of times the stimulus failed to attenuate the EEG. The data yielded a significant positive regression of attenuation latency on EEG period which remained so when the effects of age were partialled out. A low but statistically significant positive correlation was found between age and latent time of alpha attenuation. EEG reactivity declines in old age, but the correlation in this case was also low.
R 16

31,022
Palmer, C.W., Derbyshire, A.J. & Lee, A.W. A METHOD OF ANALYZING INDIVIDUAL CORTICAL RESPONSES TO AUDITORY STIMULI. EEG clin. Neurophysiol., Feb. 1966, 20(2), 204-206. (Otolaryngology Dept., University of Illinois, College of Medicine, Chicago, Ill.).

A method is proposed which quantifies the degree to which a specified response is present in each single acoustic stimulus. The specified response is described by a second order linear differential equation. This wave form is preset in a function generator. The EEG and this template are multiplied in an analog computer. The second integral of these products is read out on an EEG oscillograph as the degree to which the specified response is present. The variables involved in this analysis are discussed.
R 5

31,023
Donchin, E. & Lindsley, D.B. AVERAGE EVOKED POTENTIALS AND REACTION TIMES TO VISUAL STIMULI. EEG clin. Neurophysiol., March 1966, 20(3), 217-223. (Psychology & Physiology Depts., University of California, Los Angeles, Calif.).

Averaged evoked potentials to brief light flashes were recorded from occipital, vertex, temporal and orbital leads in 10 Ss during a reaction time study. Subjects performed under 2 conditions, with and without knowledge of results. The amplitude of the average evoked potentials was related to reaction time. For any given sequence of reaction times, faster reactions were associated with larger amplitude average evoked potentials. Knowledge of results shortened reaction times and increased the magnitude of average evoked potentials. The diffuse and non-specific character of the main component of the average evoked potential appears to reflect changes in cortical excitability associated with the variability of reaction time. This result has been interpreted in relation to the non-specific arousal and alerting mechanism.
R 22

31,024
Regan, D. SOME CHARACTERISTICS OF AVERAGE STEADY-STATE AND TRANSIENT RESPONSES EVOKED BY MODULATED LIGHT. EEG clin. Neurophysiol., March 1966, 20(3), 238-248. (Physics Dept., Northern Polytechnic, London, England).

An apparatus has been developed to study the phase-locked occipital response at stimulus frequency evoked by modulated light. Intensity and phase have been measured over a range of sinusoidal modulation frequencies for steady-state stimuli. A transient and an average steady-state response have been found and identified mainly with the central retinal region. The average steady-state response is independent of α activity. The α frequency is independent of the stimulus. The steady-state response peaks, and shows a rapid phase shift, in the neighborhood of 10 c/sec. At higher stimulus modulation frequencies the average phase lag of the phase-locked response is proportional to stimulus frequency. An estimate is made of the transport time of the synchronous component. High frequency attenuation is less than that for subjective flicker as measured by De Lange. The nature of the phase-locked response and theoretical models are discussed.
R 12

31,025
Williams, R.L., Agnew, H.W., Jr. & Webb, W.B. SLEEP-PATTERNS IN THE YOUNG ADULT FEMALE: AN EEG STUDY. EEG clin. Neurolphysiol., March 1966, 20(3), 264-266. (Psychiatry Dept., University of Florida School of Medicine, Gainesville, Fla.).

In this study of the sleep of young females additional support was found for the hypothesis that an individual spends a characteristic amount of time in each sleep stage. The length of stages was short, usually 10 min. These stage changes were usually smooth, moving from one stage to the next when sleep was deepening, but less smooth during arousal from deeper levels. Stages IV and III showed their greatest amounts during the first third of the night and I-REM during the last third. Comparisons between this group of young females and a group of males in the same age range revealed no significant differences for these EEG parameters of sleep.
R 2

31,026
Buchthal, F. & Rosenfalck, P. SPONTANEOUS ELECTRICAL ACTIVITY OF HUMAN MUSCLE. EEG clin. Neurophysiol., April 1966, 20(4), 321-336. (Neurophysiology Institute, University of Copenhagen, Copenhagen, Denmark).

The spontaneous electrical activity of human muscle was studied in 197 normals, 67 patients with peripheral nerve involvement and 29 patients with progressive muscular dystrophy. "Noise" was observed in the end-plate zones of normal muscle; after minute displacements of the electrode the noise could be seen to consist of randomly occurring purely negative discharges of 0.5-2 msec in duration and up to 100 μV in amplitude. Outside the end-plate zones of normal muscle a single site was rarely encountered yielding a spontaneous discharge similar to the fibrillation potentials of denervated muscle. The fibrillation potentials in patients with lower motor neurone disease were found to have longer durations than usually stated (1-5 msec as compared with 0.5-2 msec), a significant proportion of triphasic potentials (30%) and voltages half of which were of the same order (100-300 μV) as those of motor unit potentials. The fibrillations found in 29 of 76 patients with progressive muscular dystrophy had the same average duration, amplitude and shape as in denervated muscles. With 50 μ diameter leads of a multi-electrode fibrillation potentials were recorded with peak-to-peak amplitudes as high as 8.5 mV. The decline in amplitude along the multi-lead electrode was the same for fibrillation potentials 1 mV or more in amplitude as for the spike components of motor unit potentials, the voltage falling to less that 1/10 of maximum within 0.45 mm. The amplitudes of 100-600 μV fibrillation potentials declined relatively less with distance.
R 70

31,027
Gartside, I.B., Lippold, O.C.J. & Meldrum, B.S. THE EVOKED CORTICAL SOMATOSENSORY RESPONSE IN NORMAL MAN AND ITS MODIFICATION BY ORAL LITHIUM CARBONATE. EEG clin. Neurophysiol., April 1966, 20(4), 382-390. (Pysiology Dept., University College, London, England).

Various features of the somatosensory cortical response to stimulation with skin electrodes over the ulnar nerve at the wrist, as revealed by an electronic averaging technique, have been studied in a) 17 normal volunteers and b) 9 volunteers receiving oral lithium carbonate. Data are given on the variation in form and amplitude of the averaged response according to stimulus strength and repetition rate and the presentation of a conditioning stimulus in the 5-70 msec period preceding the test stimulus ("cortical recovery function"). With paired stimuli at interstimulus intervals of 10-25 msec. in normal subjects the amplitude of the second response was approximately the same as the first but, after lithium administration (1 g daily for 7 days), the second response at these intervals became relatively much smaller. This change was observed consistently in all 9 Ss. The change in the "cortical recovery function" after oral lithium carbonate resembles that seen in patients suffering from psychotic depression. The possible significance of these findings in relation to electrolyte disturbance in the 2 conditions is discussed.
R 24

31,028
Burns, S.K. & Melzack, R. A METHOD FOR ANALYZING VARIATIONS IN EVOKED RESPONSES. EEG clin. Neurophysiol., April 1966, 20(4), 407-409. (Communications Sciences Center, Massachusetts Institute of Technology, Cambridge, Mass. & Psychology Dept., McGill University, Montreal, Quebec, Canada).

This study illustrates 2 examples in which the usual assumption of an unchanging probability distribution made to justify averaging is not true. In both the behaving animal and the sleeping human subject large changes in the amplitude and wave shape of the evoked response occur in the time needed to obtain an average with a reasonably large signal-to-noise ratio. This result points out the risk in inferring a causal relationship between a behavioral manipulation or observation and a change from one average to another in the amplitude or wave shape of the averaged evoked response.
R 6

31,029
Gilden, L., Vaughan, H.G., Jr. & Costa, L.D. SUMMATED HUMAN EEG POTENTIALS WITH VOLUNTARY MOVEMENT. EEG clin. Neurophysiol., May 1966, 20(5), 433-438. (Neurology Dept., Albert Einstein College of Medicine, New York, N.Y.).

Electroencephalographic recordings obtained prior to and during voluntary muscular contractions of human subjects were analyzed by the summation method. A characteristic wave form called the "motor potential" (MP) was found to be associated with foot dorsiflexion and fist contraction. It consisted of 3 major components. Beginning as much as 1 sec prior to contraction, a slow negative shift developed. Frequently, central rhythm blockade occurred at this time. The slow potential culminated in an abrupt negative wave having an amplitude of 10-15 μV. The onset of the abrupt negative component occurred 50-150 msec before the first signs of contraction and reached a peak with maximal muscle contraction. This was followed by a late positive deflection that tended to persist for the duration of the contraction. MPs developed concurrently in the 2 hemispheres with unimanual contraction but differed significantly. Both the abrupt negative wave and the subsequent positive deflection were larger in the hemisphere contralateral to the activated limb. The possibility that the slow negative shift reflected facilitatory events associated with preparation for movement is suggested. The abrupt negative wave is interpreted as a sign of synaptic potentials associated with corticospinal discharge, and the positive deflection may represent afferent, movement-produced feedback.
R 14

31,030
Nicholson, A.N. & Guignard, J.C. ELECTROCORTICOGRAM DURING WHOLE BODY VIBRATION. EEG clin. Neurophysiol., May 1966, 20(5), 494-505. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Studies in the conscious monkey have shown that during low frequency vibration (4.5-19.5 c/sec) rhythms at the vibration frequency appear intermittently in the ECoG (electrocorticogram). These rhythms are commonly dissociated between recordings from different but adjacent areas of the cortex and augment with changes in the orientation of the head. The rhythms do not arise from mechanical disturbance of the recording leads or instruments or from the vibrator. The appearance of the rhythms is force dependent and independent of the frequency of vibration. The rhythms can be observed during anaesthesia provided that a sufficient intensity of vibration is applied to the animal. The disappearance of the rhythms often induced by anaesthesia during steady state vibration is considered to result from the loss of postural activity and the associated changes in the pattern of vibration reaching the head. On cessation of vibration normal electrocorticographic activity and behavior are observed. During vibration restricted to the trunk the rhythms are not present. Bilateral section of the fifth or seventh and eighth cranial nerves in the dog or cat does not abolish the rhythms.
R 11

31,031
Dement, W. & Greenberg, S. CHANGES IN TOTAL AMOUNT OF STAGE FOUR SLEEP AS A FUNCTION OF PARTIAL SLEEP DEPRIVATION. EEG clin. Neurophysiol., May 1966, 20(5), 523-526. (Psychiatry Dept., Stanford University School of Medicine, Palo Alto, Calif.).

Following a series of baseline nights, 4 adult subjects slept a series of nights in which the time allowed for sleep was reduced by approximately 2.5-3 hr. The amount of time during which a stage 4 EEG was present showed a substantial elevation although the procedure resulted in no prior reduction of the total nightly amount of stage 4. This was most apparent on the final ("recovery") night in the series which could be treated as a "short sleep" night by simply not considering the final hours of recording.
R 19

31,032
Morrell, Lenore K. & Morrell, F. EVOKED POTENTIALS AND REACTION TIMES: A STUDY OF INTRA-INDIVIDUAL VARIABILITY. EEG clin. Neurophysiol., June 1966, 20(6), 567-575. (Neurology Dept., Stanford University School of Medicine, Palo Alto, Calif.).

Experiments with 6 normal adults were undertaken in order to study the relationship between intra-individual variability in simple reaction time and photically evoked potentials. It was found that the amplitudes of prominent components of the evoked response (both early and late) are correlated with the reaction time to the photic signal. The result was found for occipital, central vertex, and right and left Rolandic regions. Latency to peak or trough of various wave components had no consistent relationship to RT. Such factors as selective attention and fluctuations of alertness are discussed as possible determinants of the relationship between RT and amplitude of averaged evoked potentials.
R 18

31,033
Goff, W.R., Allison, T., Shapiro, A. & Rosner, B.S. CEREBRAL SOMATOSENSORY RESPONSES EVOKED DURING SLEEP IN MAN. EEG clin. Neurophysiol., July 1966, 21(1), 1-9. (US Veterans Administration Hospital, West Haven, Conn.).

Human somatic evoked responses (SERs) were recorded from the scalps of 11 Ss to percutaneous shock stimulation of median nerve during waking, slow wave and rapid eye movement (REM) sleep. Both short- and long-latency SERs vary systematically with stage of sleep: a) The cortical primary post-synaptic positivity is markedly reduced in REM sleep compared to waking and slow wave sleep; b) Short-latency (15 msec) "myogenic" evoked responses recorded percutaneously from trapezius muscle at the neck show no change from waking to sleep; c) Long-latency SERs seen during waking are essentially absent in the drowsy subject and during REM.
R 36

31,034
Ciganek, L. EVOKED POTENTIALS IN MAN: INTERACTION OF SOUND AND LIGHT. EEG clin. Neurophysiol., July 1966, 21(1), 28-33. (Slovak Academy of Sciences, Bratislava, Czechoslovakia).

The interaction of sound and light stimuli was studied in man. Clicks followed by flashes at varying intervals were used and the EEG responses evoked by these paired stimuli in the occipital region were recorded. In contradistinction to the previously investigated paired light stimuli no refractory, supernormal (facilitation) or subnormal period was found for the first 6 waves (I-VI) of the second visual response. A simple superposition of the 2 responses was present. The origin of both responses in a common cerebral macro-structure, within the occipital region but with separate "private" projection pathways and cortical elements, is assumed. The last wave (VII) of the visual response presents a significantly smaller amplitude with click preceding the flash by 250 msec. Since the same can be seen with paired light stimuli, the origin of the waves VII evoked by click and by flash in identical cerebral structures is suggested.
R 18

31,035
Satterfield, J.H. A SYSTEM FOR SELECTION OF RESPONSES FOR AVERAGING. EEG clin. Neurophysiol., July 1966, 21(1), 86-88. (Psychiatry Dept., Washington University School of Medicine, St. Louis, Mo.).

A system for enhancing evoked potentials by selecting artifact-free responses for averaging is described. A block diagram of the components for the system is provided.
R 1

31,036
Davis, H., Mast, T., Yoshie, N. & Zerlin, S. THE SLOW RESPONSE OF THE HUMAN CORTEX TO AUDITORY STIMULI: RECOVERY PROCESS. EEG clin. Neurophysiol., Aug. 1966, 21(2), 105-113. (Central Institute for the Deaf, St. Louis, Mo.).

The late, slow, non-specific diffuse cortical response (the "V potential"), recorded from the vertex relative to mastoid or ear, has been studied by the method of averaged responses in waking young adults. Filtered clicks ("tone pips") were our usual stimuli, delivered in repeated cycles of one, two, three or four similar (or different) tone pips at various intervals within the cycle. The corresponding responses were collected and averaged separately. The typical auditory V potential is a sequence of waves with the following latencies to peak: P_1 (vertex-positive) at 50-60 msec; N_1 (vertex-negative) at about 100 msec; P_2 at 170-200 msec; N_2 at about 300 msec, and often P_3 and N_3 also. P_2 may be double-peaked. Tactile responses have slightly longer latencies and show more prominent P_1. Individual differences among subjects make exact descriptions impossible. As a first approximation the above latencies do not vary with the audio frequency, the intensity or the interval between the tone pips, although N_2, P_3 and N_3 become small or disappear with short intervals. The latencies may be longer with very weak stimuli near threshold. For maximal amplitude the intervals between stimuli must be over 6 sec and probably at least 10 sec. If the intervals are regular the average amplitude is about 1/2 maximal at 3 sec, 1/4 at 1 sec and 1/6 at 0.5 sec. If pairs of tone pips are employed the amplitude of the second response depends on the long interval between pairs as well as on the short interval between the members of the pair.
R 17

31,037
Okuma, T., Nakamura, K., Hayashi, A. & Fujimori, M. PSYCHOPHYSIOLOGICAL STUDY ON THE DEPTH OF SLEEP IN NORMAL HUMAN SUBJECTS. EEG clin. Neurophysiol., Aug. 1966, 21(2), 140-147. (Psychiatry Dept., University of Tokyo, Tokyo, Japan).

In order to study the "depth" of different stages of human nocturnal sleep, polygraphic recordings were performed simultaneously with the examination of the responsiveness of the subject to photic stimuli and the measurement of the reaction time. The correct perception and correct motor response were obtained in the trials during stages 1 (awake), 2 (drowsy, suppressed alpha) and in most of the trials in stage 3 (vertex sharp activity). During stage 4 (spindle and K complex) the S could not perceive the photic stimuli in about 30% of the trials, and correct perception with correct motor response was obtained in less than 30%. During stage 5 (spindle and delta), perception of the photic stimuli was almost impossible. During activated sleep, a correct motor response was obtained in 50% of the trials, and the percentage of correct perception with absent motor response was much higher than in any other stages. The reaction time usually increased as the sleep stage advanced from 1 to 5. The mean reaction time during the activated sleep lay around that of stage 4, and the standard deviation was relatively large. The depth of the activated sleep determined by both the stimulus-response experiment and the measurement of the reaction time is assumed to be around that of stage 4.
R 12

31,038
Gupta, S.S. RANKING AND SELECTION PROCEDURES. FINAL REPORT. Contract AF 33(657) 11737, Proj. 7071, Tasks 61445014 & 681304, ARL Rep. 66 0241, Dec. 1966, 8pp. USAF Aerospace Research Labs., Wright-Patterson AFB, Ohio. (Statistics Dept., Purdue University, Lafayette, Inc.). (AD 652847)

Research on ranking and selection procedures for the univariate and multivariate populations has continued space during this period. Several associated problems of distribution theory relevant to selection and ranking problems have also been investigated. In this latter category fall the problems of distribution of the maximum of several correlated random variables and, more generally, the distribution of order statistics or a linear function of them. The application of order statistics to estimate the parameters of the logistic and the multivariate normal distribution has also been made. Almost all other papers in the attached list deal with the selection and ranking problems directly.
R 25

31,039
Liske, E., Hughes, H.M. & Stowe, D.E. AUTO- AND CROSS-CORRELATION OF THE EEG FOLLOWING UNILATERAL CALORIC STIMULATION OF THE LABYRINTH. EEG clin. Neurophysiol., Sept. 1966, 21(3), 295-300. (USAF School of Aerospace Medicine, Neurology & Biometrics Branches, Brooks AFB, Tex.).

28 Ss were monitored by electroencephalograph (EEG) and electrooculograph (EOG) during a standardized unilateral caloric stimulation. 10 of the 28 Ss exhibited recordable nystagmus. Visual inspection of the analog EEGs revealed no unusual changes in electrical activity during or after caloric stimulation. Auto-correlation of right- and left-sided alpha activity demonstrated no significant changes as a result of caloric stimulation whether or not nystagmus was induced by the stimulus. Cross-correlation of the right and left parieto-occipital regions demonstrated no significant phase shift as a result of unilateral caloric stimulation. These results suggest that activation of those neuronal circuits which maintain nystagmus do not significantly affect those neuronal circuits which generate alpha activity.
R 28

31,040
Muzio, J.N., Roffwarg, H.P. & Kaufman, E. ALTERATIONS IN THE NOCTURNAL SLEEP CYCLE RESULTING FROM LSD. EEG clin. Neurophysiol., Oct. 1966, 21(4), 313-324. (Psychiatry Dept., Columbia University College of Physicians & Surgeons, New York, N.Y.).

36 D-Lysergic acid diethylamide (LSD) doses of 0.08-0.73 µg/kg (6-40 µg total dose) were administered orally to humans either just prior to sleep or 1 hr after onset of sleep. All night electroencephalograms (EEGs) and electrooculograms (EOGs) were recorded on control nights, on nights when LSD was administered, and frequently on nights following those in which the drug was given. On 21 nights following administration of LSD a prolongation of either the first or second rapid eye movement sleep (REMS) period was observed. Additional alterations were: a) occurrence of brief REMS bursts interrupting phases of slow wave sleep (SWS); b) general curtailment of REMS periods subsequent to a prolonged REMS period; c) increased body movements and arousals frequently occurring in relation to REMS. Certain neurophysiological similarities during LSD induced awake hallucinatory activity and "dreaming" sleep (REMS) are reviewed. The possible relationship of LSD neuropharmacological action to the hypothetical neurohumoral mechanism underlying REMS is considered.
R 39

31,041
Rapin, Isabelle, Schimmel, H., Tourk, L.M., Krasnegor, N.A., et al. EVOKED RESPONSES TO CLICKS AND TONES OF VARYING INTENSITY IN WAKING ADULTS. EEG. clin. Neurophysiol., Oct. 1966 21(4), 335-344. (Neurology Dept., Albert Einstein College of Medicine, New York, N.Y.).

Evoked responses to clicks and tones in 3 waking adults with normal hearing correspond to the "on-response" of Pauline Davis and consist of a vertex negative peak at 90-150 msec (N_1) and a vertex positive peak (P_2) at about 180-260 msec. Amplitude of the response to tones shows a clearer decrease with decreasing stimulus intensity than that of clicks. The latency of the response to clicks at all intensities is constant, N_1 peaking at 90 msec and P_2 at 180 msec. At high intensities the latency of the response to tone is 10-15 msec longer than the latency of the response to clicks, an interval corresponding apparently to the time needed by the auditory system to detect the tonal quality of the signal. As intensity is decreased the latency of the response to tones increases, a finding interpreted as reflecting the occurrence of temporal integration of the signal. Some effects which appear attributable to the shape of the modulating envelope of the signal were discussed. Suggestions were made for further refining the measurement of evoked responses to make this method practically applicable for audiometric purposes.
R 49

31,042
Vazquez, A.J. & Toman, J.E.P. DEMONSTRATION OF AVERAGED OPERANT POTENTIALS IN THE HUMAN EEG. EEG. clin. Neurophysiol., Oct. 1966, 21(4), 381-384. (Behavioral Sciences Div., Chicago Medical School, Chicago, Ill.).

A retrospective summation method is described for study of electroencephalograph (EEG) event preceding an operant patient hand-signal, together with notes on the intrinsic difficulties of such analysis. A significant cluster of small amplitude waves is found commonly present in bipolar recordings from the contralateral parietal area, in the period from 330 to 140 msec pre-trigger, in particular a 300 msec positive peak.
R 11

31,043
Montagu, J.D. THE APPLICATION OF ELECTRO-LUMINESCENCE TO PHOTIC STIMULATION. EEG clin. Neurophysiol., Oct. 1966, 21(4), 393-395. (Pharmacology Dept., University College, London, England).

A new method of photic stimulation is described which uses 2 electro-luminescent panels mounted in a pair of goggles. When suitably excited by AC, the panels become uniformly illuminated over the whole surface. Flicker is produced by modulating the exciting AC, and a circuit is given for producing square wave modulation of the panel brightness. The goggles standardize the distance between the source and the eye; they also obviate the need to control the ambient illumination. The method has been found to induce photic driving comparable with that obtained with a stroboscope.
R 2

31,044
Otomo, E. ELECTROENCEPHALOGRAPHY IN OLD AGE: DOMINANT ALPHA PATTERN. EEG clin. Neurophysiol., Nov. 1966, 21(5), 489-491. (Yokufukai Geriatric Hospital, Tokyo, Japan).

Electroencephalograms (EEGs) of 1007 subjects and patients 60 years and over were analyzed with special reference to the pattern of the dominant alpha waves. The difference in mean value of the frequencies of the dominant alpha waves in normal subjects (9.47 $\pm$ 1.73 cycles per second) and in neurological patients (8.65 $\pm$ 1.64 cycles per second) was statistically significant. The mean values of frequencies of the dominant alpha waves tend to decrease significantly with increasing decade, after the 7th decade. No significant difference in mean values and in the distribution curves of the frequencies of the dominant alpha waves were noted in the normotensive and in the hypertensive subjects.
R 13

31,045
Giel, R., de Vlieger, M. & van Vliet, A.G.M. HEADACHE AND THE EEG. EEG clin. Neurophysiol., Nov. 1966, 21(5), 492-495. (Neurology Dept., Dijkzigt Hospital, Rotterdam, The Netherlands).

Electroencehpelograms (EEGs) showed unspecific abnormal activity in 22% of 113 migrainous patients and in 24% of 76 patients suffering from psychogenic or tension headache. The small difference in the number of abnormal EEGs between the two samples appears to eliminate the EEG as an important diagnostic aid in the screening of common headache syndromes. The percentages of abnormal EEGs found in a control group of 100 healthy male labourers is about a third of this. The percentages of borderline EEGs are almost equal in the three groups. Comparison with figures from the literature appears to indicate the importance of observer variability, especially if the abnormalities are only slight.
R 14

31,046
Maulsby, R.L., Frost, J.D., Jr. & Graham, M.H. A SIMPLE ELECTRONIC METHOD FOR GRAPHING EEG SLEEP PATTERNS. EEG clin. Neurophysiol., Nov. 1966, 21(5), 501-503. (Physiology Dept., Baylor University College of Medicine, Houston, Tex.).

A simple method for graphing electroencephalographic (EEG) sleep patterns is presented. The technique is essentially an analog write-out of a full-wave rectifier receiving a filtered mixture of delta and theta components of the EEG. This report gives the simple rectifier circuit and illustrates the method by comparing it to conventional visual interpretation.
R 9

31,047
Peacock, S.M., Jr. & Conroy, R.C. A TECHNIQUE FOR PRECISION MULTI-CHANNEL EVOKED RESPONSE AVERAGING. EEG clin. Neurophysiol., Nov. 1966, 21(5), 506-511. (Clinical Research Dept., University of Pennsylvania, Philadelphia, Penn.).

Instrumentation for multi-channel evoked response averaging has been described which permits simultaneous analysis of 4 electroencephalogram (EEG) channels with a bandwidth of 25 kc/sec. Random walk computations are performed at each of 1024 points per response channel and the resulting average values displayed on a multi-trace CRO. Certain advantages of this system have been described and an estimate of current construction costs given.
R 5

31,048
Gaarder, K., Koresko, R., Kropfl, W. THE PHASIC RELATION OF A COMPONENT OF ALPHA RHYTHM TO FIXATION SACCADIC EYE MOVEMENTS. EEG clin. Neurophysiol., Dec. 1966, 21(6), 544-551. (Clinical Neuropharmacology Research Center, National Institute of Mental Health, Bethesda, Md.).

The 2 experimental variables--fixation saccadic (jumping) eye movements and occipital alpha rhythm--have been studied by simultaneous recording. Noting the quadrant of alpha cycle during which a saccade occurs establishes a reliable concrete relationship between the occurrance of a saccade and a particular quadrant in some Ss. Use of saccades to trigger a Mnemotron Computer of Averaged Transients establishes that alpha-like activity in the evoked response is phase-locked to saccades both before and after the saccade. This was found in all 12 Ss studied when alpha activity was present. Since the alpha-like component is phase-locked before as well as after a saccade, this argues against the saccade as stimulus linearly causing the locking and points to the component pacing saccades or to both saccades and the component being paced by something else. The results are interpreted in the light of a model of visual information processing in which saccades generate discontinuous packets of edge information which are cycled as short term templates at a rate reflected by the alpha component frequency.
R 11

31,049
Morrell, Lenore K. SOME CHARACTERISTICS OF STIMULUS-PROVOKED ALPHA ACTIVITY. EEG clin. Neurophysiol., Dec. 1966, 21(6), 552-561. (Neurology Div., Stanford University School of Medicine, Palo Alto, Calif.).

Two groups of Ss, pre-selected for prominent resting alpha, were studied in order to assess the habituation of electroencephalogram (EEG) reactivity to repeated photic stimuli. In one group, the Ss passively received the signals; in the other they were instructed to respond manually as soon as the signal was detected, and the reaction times were measured. It was found that the EEG background of alpha activity tended to alternate with a lower voltage, more random pattern sometimes including slow waves in both groups. The EEG reactivity against the latter background was that of provocation of alpha activity, whereas against the background alpha rhythm, the reactivity was that of blocking or arrest of alpha. From the point in each record in which these patterns began to alternate, it was found that the alpha provocation response had a higher incidence than the desynchronization response, significantly so only for the group not required to respond. The blocking response was relatively habituated for both groups. The requirement of a motor response to the photic signal was associated with an increased incidence of the alpha blocking response. Reaction times tended to be higher when alpha provocation occurred. The hypothesis was advanced that stimulation-provoked alpha activity may be an electrical sign of central inhibitory processes.
R 55

31,050
Deutsch, K.W. ON THEORIES, TAXONOMIES, AND MODELS AS COMMUNICATION CODES FOR ORGANIZING INFORMATION. Behav. Sci., Jan. 1966, 11(1), 1-17. (Yale University, New Haven, Conn.).

Theories, taxonomies, models, and schemes for information classification and retrieval all can be evaluated from the viewpoint of communication theory, by their performance characteristics as languages or codes for organizing information. Specific performance tests for any theory include its organizing power, predictive range, average error margin, economy of categories, operating rules and social cost of adoption, originality, fruitfulness, and probability of transcending itself. Here examples are given from current theories of nationalism, power, and value.
R 49

31,051
Rapoport, A. A STUDY OF HUMAN CONTROL IN A STOCHASTIC MULTISTAGE DECISION TASK. Behav. Sci., Jan. 1966, 11(1), 18-32. (University of North Carolina, Chapel Hill, N.C.).

Models of decision making can be grouped into 2 general classes: static and dynamic decision making. The first consists of those tasks where a single decision is made, the S is told of the results of his decision, and no further application is made. In dynamic decision making, subsequent decisions depend in part on past experience in the task and thus learning is involved in the act. The latter sort of decisions can be further broken down into 2 types: those that do not affect the environment in which the decision maker is behaving, and those involving the future environment. A decision maker who can actively manipulate the environment by his decisions is conceived of as a controller. This article considers a dynamic programming model for this type of decision-making task.
R 11

31,052
Clarkson, G.P.E. & Tuggle, F.D. TOWARD A THEORY OF GROUP-DECISION BEHAVIOR. Behav. Sci., Jan. 1966, 11(1), 33-42. (Massachusetts Institute of Technology, Cambridge, Mass. & Carnegie Institute of Technology, Pittsburgh, Penn.).

Reported here is experimental work on group-decision behavior, exploring the idea that a group's decision behavior with respect to a specific task can be explained or predicted from a knowledge of the decision processes of its individual participants. From these initial experiments, the authors are presently extending their research to a further question: In what manner and by what procedures does the process of arriving at a group decision affect or influence the decision procedures of the individuals concerned?
R 12

31,053
Boguslaw, R., Davis, R.H. & Glick, E.B. A SIMULATION VEHICLE FOR STUDYING NATIONAL POLICY FORMATION IN A LESS ARMED WORLD. Behav. Sci., Jan. 1966, 11(1), 43-61. (American University, Washington, D.C.).

Persons responsible for the formulation and direction of national policy are constantly confronted with problems of predicting the future under unknown or unanticipated social and psychological conditions. Basic issues in the processes of negotiation behavior involve such questions as: if a particular course of action is adopted, how will the environment respond? Given the social pressures and human prejudices that are operative, what is feasible? Would some other course of action be more productive for the nation as a whole or for some particular interest groups? Here the authors present a simulation vehicle and supporting experiments to study problems of national policy planning and negotiation.
R 12

31,054
Tursky, B., Shapiro, D. & Leiderman, P.H. AUTOMATIC DATA PROCESSING IN PSYCHOPHYSIOLOGY: A SYSTEM IN OPERATION. Behav. Sci., Jan. 1966, 11(1), 64-70. (Harvard Medical School, Boston, Mass.).

Psychophysiological research is using increasingly complex instrumentation and the computer analyses are becoming more ambitious. The authors of this paper describe one of the most sophisticated systems. Readers are referred to the third reference at the end of the article for some substantive findings; this paper quite properly limits itself to methodology.
R 5

31,055
Cangelosi, V.E. & March, J.G. AN EXPERIMENT IN MODEL BUILDING. Behav. Sci., Jan. 1966, 11(1), 71-75. (University of Texas, Austin, Tex. & University of California, Irvine, Calif.).

Computer simulation has become a standard tool for the analysis of individual choice behavior. The authors introduced elementary simulation techniques to professors of economics and business administration and explored their ability to develop computer models for binary choice behavior.
R 2

31,056
Pelz, D.C. & Andrews, F.M. AUTONOMY, COORDINATION, AND STIMULATION, IN RELATION TO SCIENTIFIC ACHIEVEMENT. Behav. Sci., March 1966, 11(2), 89-97. (University of Michigan, Ann Arbor, Mich.).

It was found that the amount of autonomy reported by a scientist was positively related to his performance in the middle range of situations which were neither very tightly nor very loosely coordinated. In the latter situation, in which members already enjoyed considerable freedom, the most autonomous scientists were only average, or below, in performance. One explanation for these results may be that in loose or extremely loose settings, the most autonomous scientists tended to withdraw from outer stimulation (or to reduce inner motivation) which might have enhanced their performance. In very tightly coordinated situations, at the other extreme, autonomous individuals were motivated and stimulated; but the rigidities of the setting apparently prevented these factors from enhancing creativity. Thus, only in the middle-range situations were 2 essential conditions present; a) high autonomy was accompanied by a number of strong motivations and stimulations, and b) the setting was flexible enough to allow these factors to improve performance. The loosely coordinated settings represented by levels IV and V consisted mostly of Ph.D.'s, with some nondoctorals, in research-oriented laboratories. In these situations, the wholly self-determining individual, who excludes even colleagues from a voice in his goal-setting, may isolate himself from stimulation. Complete autonomy may encourage complacency rather than zest, narrow specialization rather than breadth.
R 6

31,057
Swets, J.A., Harris, Judith R., McElroy, Linda S. & Rudloe, H.S. COMPUTER-AIDED INSTRUCTION IN PERCEPTUAL IDENTIFICATION. Behav. Sci., March 1966, 11(2), 98-104. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

With the increased use of computerized programmed instruction, it is important to determine which methods will enable the student to benefit most from the computer experience. It has previously been found true in verbal-learning experiments, and is shown here in regard to perceptual-learning experiments, that complex procedures such as continual interrogation, overt response, immediate knowledge of results, and presentation of successive items conditional upon past performance have turned out to be less successful than a simpler, more direct, approach--the presentation and observation of paired associates.
R 6

31,058
Vitz, P.C. PREFERENCE FOR DIFFERENT AMOUNTS OF VISUAL COMPLEXITY. Behav. Sci., March 1966, 11(2), 105-114. (New York University, New York, N.Y.).

In this article are reported 2 studies carried out to test the hypothesis that subjects prefer a specific degree of visual complexity. Angular patterns of increasing complexity were presented to subjects. Results of these tests showed that the average curve of preference increased up to a moderate degree of complexity and then decreased.
R 16

31,059
Morrissette, J.O., Jahnke, J.C. & Baker, K. STRUCTURAL BALANCE: A TEST OF THE COMPLETENESS HYPOTHESIS. Behav. Sci., March 1966, 11(2), 121-125. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

The "completeness hypothesis," advanced by Harary in 1959, constitutes the background for the investigations presented in this paper. Both a theoretical and an empirical examination of Harary's assumptions were made, the former showing them to be inconsistent with Heider's theory of balance, but the latter producing data consistent with Heider's theory. These findings suggest either that Harary's completeness hypothesis is false, or that it requires revision.
R 7

31,060
Greenberger, M. SIMULATION AND A HOUSE-HEATING PROBLEM. Behav. Sci., March 1966, 11(2), 143-147. (Massachusetts Institute of Technology, Cambridge, Mass.).

The development of a simulation model must be by persons intimately familiar with the subject matter. This principle has been violated in the past because of excessive delegation of responsibility to mathematicians and programmers whose primary interest lay in questions of structure and style. To use the house-heating problem as an example, only someone with a firsthand knowledge of the meaning of the heating data could have resolved them and spotted the probable sources of error in data collection. These simple lessons may be summed up as desiderata for simulation research on a computer. The simulation process should be characterized byta) easy access to data during model building; b) incremental construction of the model with frequent testing and verification of partial results; c) avoidance of unnecessary arbitrariness and overcomplexity; d) retention of proxy by the research worker at the computer.
R 2

31,061
Miller, M.C., III. COMPUTATIONAL PROCEDURE FOR FACTORIAL EXPERIMENTS. Behav. Sci., March 1966, 11(2), 148-152. (University of Oklahoma School of Medicine, Oklahoma City, Okla.).

Computer calculations for one type of analysis of variance are examined step-by-step. The proposed computational procedure is especially suitable for the division of the sum of squares for treatments in the factorial experiment, that is, the "breakdown" of main effects and interactions. Some of the advantages of the proposed computational procedure are: a)Ease of computation. This procedure does not require matrix inversion and uses only routine computer programs. b) Clarity. It is easily understood and facilitates the introduction to students of the concept of division of the sums of squares of main effects and interactions into their component parts. c) Flexibility. It is applicable to situations in which the factors (sources of variations) are qualitative, quantitative, or combinations of the 2 and have equal or unequal spacing between levels.
R 4

31,062
Skinner, B.F. CONTINGENCIES OF REINFORCEMENT IN THE DESIGN OF A CULTURE. Behav. Sci., May 1966, 11(3), 159-166. (Harvard University, Cambridge, Mass.).

Excessive eating, excessive procreation, and excessive pugnacity, according to Professor Skinner, are the results of reinforcement patterns which once had survival value and so were selected for in the process of evolution. In our day of abundance, overpopulation, and war, these reinforcement patterns are a threat. The dangers of overindulgence in food, sex, aggression, and related behaviors have been dealt with by three traditional methods. The author proposes a fourth method based on contingent reinforcement.
R 4

31,063
Baker, R.A., Ware, J.R., Spires, G.H. & Osborn, W.C. THE EFFECTS OF SUPERVISORY THREAT ON DECISION MAKING AND RISK TAKING IN A SIMULATED COMBAT GAME. Behav. Sci., May 1966, 11(3), 167-176. (USA Armor Human Research Unit, Fort Knox, Ky.).

William Tell's tour de force with the crossbow is probably the most celebrated example of performance unimpaired (possibly improved) by psychological stress. Stage fright has been known to ruin a performance and also to make it great. At any rate, the question of how psychological stress affects performance is an open one, probably because many kinds of performances, conditions, and types of threat are subsumed under the question. In this paper, the effect of threat (in the form of a severely displeased military superior) is examined with respect to a task involving vigilance, data processing, and decision making in simulated (automated) combat.
R 26

31,064
Vinacke, W.E., Crowell, Doris, E., Dien, Dora, & Young, Vera. THE EFFECT OF INFORMATION ABOUT STRATEGY ON A THREE-PERSON GAME. Behav. Sci., May 1966, 11(3), 180-189. (New York State University, Buffalo, N.Y.).

When a game of strategy is played by 3 or more players and coalitions are allowed, the outcome of the game depends on how the players will form coalitions. In the simplest case, the coalition which includes the majority of the players wins the same prize regardless of who is in the winning coalition. In a somewhat more general situation, different "weights" are assigned to different players and a coalition with the preponderant total weight wins. One hypothesis on the formation of coalitions states that if 2 weaker players can combine their weights to defeat the third stronger player, they will do so. To what extent is this so and under what conditions?
R 8

31,065
Arbib, M.A. A PARTIAL SURVEY OF CYBERNETICS IN EASTERN EUROPE AND THE SOVIET UNION. Behav. Sci., May 1966, 11(3) 193-216. (Stanford University, Stanford, Calif.).

In Eastern Europe and the Soviet Union, the term "cybernetics" covers many diverse fields from biophysics to computer technology, from pattern recognition to mechanical translation, in fact all the aspects of technology and the supporting mathematical sciences which deal with information processing. This article presents one man's impression of the state of the art in the U.S.S.R. and Eastern Europe, and thumbnail sketches of some of the leading practitioners.
R 80

31,066
Balzer, R.M. A MATHEMATICAL MODEL FOR PERFORMING A COMPLEX TASK IN A CARD GAME. Behav. Sci., May 1966, 11(3), 219-226. (Carnegie Institute of Technology, Pittsburgh, Penn.).

Programs which simulate card playing are written less frequently than programs for board games such as chess, checkers, or tick tack toe. The main reason for this lies in the fact that the initial stages of card games are not identical--the dealing of cards produces one of a large number of conditions. The author discusses this problem in regard to the game of Hearts.
R 2

31,067
Weil, R.L., Jr. THE N-PERSON PRISONER'S DILEMMA: SOME THEORY AND A COMPUTER-ORIENTED APPROACH. Behav. Sci., May 1966, 11(3), 227-234. (University of Chicago, Chicago, Ill.).

The two-person, two-strategy prisoner's dilemma is, by now, well known. The purpose of the research reported here is to start an investigation of the more interesting multiple-person, multiple-strategy analogue of the prisoner's dilemma. The multiple-person, two-strategy game is the subject of this study. Four interpretations of the game are possible. Each of these is presented and one is selected for further study. The rationale for a combined laboratory-computer approach is given, some decision-making models for the game are constructed, and the results of the simulations of the models are reported.
R 8

31,068
Deutsch, K.W. SOME QUANTITATIVE CONSTRAINTS ON VALUE ALLOCATION IN SOCIETY AND POLITICS. Behav. Sci., July 1966, 11(4), 245-252. (Yale University, New Haven, Conn.).

In a classic study, Harold Lasswell and Abraham Kaplan have endeavored to summarize under eight headings all the major substantive values to the allocation of which political processes are relevant. The author discusses these--power, wealth, deference or respect, well-being, affection, skill, enlightenment, and righteousness--interms of interpersonal values, partially autonomous values, and a paradoxical combination of the two, and relates his discussion to game theory and to the ecomonic theory of inflation and deflations.
R 14

31,069
Steiner, I.D. MODELS FOR INFERRING RELATIONSHIPS BETWEEN GROUP SIZE AND POTENTIAL GROUP PRODUCTIVITY. Behav. Sci., July 1966, 11(4), 273-283. (University of Illinois, Urbana, Ill.).

What a group actually accomplishes depends on the nature of its task, the relevant resources of the members, the motivations of members, and the coordination patterns developed as the group proceeds with its work. Research workers have often failed to distinguish between what groups actually accomplish and what they have the ability to accomplish. The following study reflects an attempt to organize some of the literature on group productivity into a coherent pattern, and to treat the ability of groups as a problem separate from actual productivity.
R 15

31,070
Anderson, C.C. A COGNITIVE THEORY OF THE NONINTELLECTIVE CORRELATES OR ORIGINALITY. Behav. Sci., July 1966, 11(4), 284-294. (University of Alberta, Edmondton, Alberta, Canada).

The author comments that the main idea of this paper was suggested by a very talkative, impulsive, and enquiring female student who pointed out the connection, of which he was unaware, between a lecture on originality which he gave one day and one on Luria on the following day. He adds that it is perhaps fitting that a theory of originality should come from an original aperçu by a student whose academic success was moderate.
R 79

31,071
Payne, B. A DESCRIPTIVE THEORY OF INFORMATION. Behav. Sci., July 1966, 11(4), 295-305. (Goddard College, Plainfield, Vt.).

Originally the mathematical theory of information was developed in the context of "selective information;" that is, information was assumed to have been transmitted when the uncertainty (as to which of a number of possible messages was sent) was reduced by the receipt of a message. This theory, eminently suitable as the basis of telecommunication technology, runs into conceptual difficulties when applied to the content of the message received. A descriptive theory of information deals with the problem of specifying quantitatively the amount of information about something.
R 11

31,072
Cooperband, A.S. THE USE OF A COMPUTER IN CONDUCTING PSYCHOLOGICAL EXPERIMENTS. Behav. Sci., July 1966, 11(4), 307-311. (System Development Corporation, SantaMonica, Calif.).

Great economies in experimenter time can result from using a computer to design and conduct an experiment as well as to analyze the results. A psychological study is described in which the experiment was constructed, controlled, and analyzed entirely by a computer. The general characteristics and expense of such a computer program system are discussed.
R 3

31,073
Spilerman, S. STRUCTURAL ANALYSIS AND THE GENERATION OF SOCIOGRAMS. Behav. Sci., July 1966, 11(4), 312-323. (Johns Hopkins University, Baltimore, Md.).

A method for analyzing sociometric information using a modified mutual choice sociomatrix is presented. Replication of individuals is permitted in this connection matrix, enabling a person to be placed in proximity to all subgroups to which he belongs. As a result, the octopus-like configurations which often appear in a sociomatrix and confound clique detection do not occur. The connection matrix developed by this routine can be easily transformed into a sociogram, and rules governing this conversion are presented. Finally, a computer program which constructs the matrix directly from sociometric data is described.
R 6

31,074
Klausner, S.Z. RATIONALISM AND EMPIRICISM IN STUDIES OF BEHAVIOR IN STRESSFUL SITUATIONS. Behav. Sci., Sept 1966, 11(5), 329-341. (US Bureau of Social Science Research, Washington, D.C.).

The present paper grows out of the author's interest in research methodology, especially the problems of inference from indicators to concepts. The proportion of concepts directly reducible to observation terms differs from one research report to another even when workers are studying the same phenomenon and ostensibly working within the same theoretical framework. "Empiricists" try to anchor as many concepts as possible in observation terms. "Rationalists" are more concerned with reasoning from and to observations. Here the author explores orientation and attitudes behind each approach.
R 30

31,075
Harsanyi, J.C. A BARGAINING MODEL FOR SOCIAL STATUS IN INFORMAL GROUPS AND FORMAL ORGANIZATIONS. Behav. Sci., Sept. 1966, 11(5), 357-369. (University of California, Berkeley, Calif.).

The author says of his paper: "It seems to me that among all noneconomic motivational variables social status may be the most important one. But social status itself is too complex a social phenomenon to be used as a further-not-analyzed primitive concept of our theory. This paper is an attempt to analyze it in terms of some more basic human motivations, by asking the questions why people seek high social status and why some people are granted high social status by others. I am trying to answer these questions in terms of a game-theoretical bargaining model for social status."
R 8

31,076
Walton, R.E. & McKersie, R.B. BEHAVIORAL DILEMMAS IN MIXED-MOTIVE DECISION MAKING. Behav. Sci., Sept. 1966, 11(5), 370-384. (Purdue University, Lafayette, Ind. & University of Chicago, Chicago, Ill.).

The dilemmas in mixed-motive decision situations are discussed and analyzed at the level of implementing tactics. A basic distinction is drawn between 2 types of decision making--problem solving, which exploits the cooperative potential, and bargaining, which seeks advantage within the competitive aspects of the decision situation. For the decision maker, these 2 functions are complementary.
R 11

31,077
Levonian, E. & Comrey, A.L. FACTORIAL STABILITY AS A FUNCTION OF THE NUMBER OR ORTHOGONALLY-ROTATED FACTORS. Behav. Sci., Sept. 1966, 11(5), 400-404. (University of California, Los Angeles, Calif.).

The results of a factor analysis may be unclear if a false idea of parsimony has led the investigator to rotate too few factors.
R 10

31,078
Goldberg, D.H. THE PHYSIOLOGICAL EFFECTS OF MULTIPLE STRESSORS. Behav. Sci., Nov. 1966, 11(6), 438-443. (US Office of Education, Washington, D.C.).

In psychophysiological experimentation a number of studies have investigated the physiological response to a single stimulus or to a series of stimuli differing only in intensity. They have, in general, reported sympathetic-like changes in a wide range of physiological variables to such diverse stimuli as electric shock, loud noise, dynamometer tension, acceleration, and thermal stimulation. The purpose of this experiment was to compare the physiological effects obtained in a multiple stressor condition to the effects obtained in two single stressor conditions.
R 18

31,079
Rapoport, A. & Mowshowitz, A. EXPERIMENTAL STUDIES OF STOCHASTIC MODELS FOR THE PRISONER'S DILEMMA. Behav. Sci., Nov. 1966, 11(6), 444-458. (University of North Carolina, Chapel Hill, N.C. & University of Michigan, Ann Arbor, Mich.).

A game of strategy represents a situation in which two or more players make choices between available alternatives. When the interests of the players are partly coincident and partly opposed, it is a nonzero-sum game. The psychologically interesting aspects of this game or of any realistic situation which can be adequately described by it stem from mixed motives, in which the confrontation is not only between the conflicting players but also between the conflicting motives within each player.
R 20

31,080
Stedry, A.C. & Kay, E. THE EFFECTS OF GOAL DIFFICULTY ON PERFORMANCE: A FIELD EXPERIMENT. Behav. Sci., Nov. 1966, 11(6), 459-470. (Carnegie Institute of Technology, Pittsburgh, Penn. & General Electric Company, Philadelphia, Penn.).

Within organizations, individuals are surrounded by performance goals--quotas, standards, "bogeys," deadlines--which, whether set by themselves or others, are expected to influence their performance. Should these goals be set at, or close to, previously attained levels or far above them?
R 13

31,081
Janda, K. & Tetzlaff, W.H. TRIAL: A COMPUTER TECHNIQUE FOR RETRIEVING INFORMATION FROM ABSTRACTS OF LITERATURE. Behav. Sci., Nov. 1966, 11(6), 480-486. (Northwestern University, Evanston, Ill.).

TRIAL is an acronym formed from "Technique for Retrieving Information from Abstracts of Literature." The TRIAL system consists of two basic computer programs. The EDIT program in TRIAL loads and edits abstracts on magnetic tape; the SEARCH program searches magnetic tape and retrieves information according to specified combinations of keywords. Although TRIAL was originally designed to retrieve research findings and propositions abstracted from books and articles in political science, the system is sufficiently flexible for other applications in information retrieval. The important unanswered questions about the TRIAL system lie not in programming procedures but in preparing the abstracts for the computer. Abstracting research literature is a time-consuming enterprise that requires a well-defined conceptual framework geared to a specific research problem. The abstracts that were prepared to test out the computer programs are not suitable for a broader test of the system's utility.
R 5

31,082
Woodard, W.H., Jr. THE ANATOMY OF AN INDUSTRIAL VISION PROGRAM. Safety Maint., Jan. 1966, 131(1), 12-16, 24-26. (Bausch & Lomb, Inc., Rochester, N.Y.).

As different persons have widely varied skills and aptitudes for using their hands, so too, individuals have varied visual skills. A man might have entirely adequate vision for one job and be visually deficient for another job requiring different visual skills. In short, vision cannot simply be categorized as good or bad. The planner of a comprehensive program will in some way touch all of these bases: visual skills of the workers; interpretation of findings; visual requirements of various jobs; optical aids to specific operations; eye protective measures and equipment; safety regulations; a system for transferring employees based on the job and employee vision; consideration of attitudes toward such a program; cooperation of labor groups; method of referral for professional help; cooperation of the ophthalmic profession; indoctrination and cooperation of both workers and supervisory personnel; accident studies; rehabilitation possibilities; methods of enforcement of policies; employee relations and public relations. In addition, each company will have certain problems peculiar to the nature of its business. To accomplish all these things, the planner must set certain clear objectives and specific ways to carry them out.

31,083
Heluska, F.P. HEARING PROTECTION PITFALLS AND HOW TO AVOID THEM. Safety Maint., Jan. 1966, 131(1), 32-34, p39. (Aluminum Company of America, Cleveland, Ohio).

This article describes the development of industrial hearing protection programs over about 2 decades.

31,084
Safety Maintenance. THRESHOLD LIMIT VALUES. Safety Maint., Jan. 1966, 131(1), 40-45.

These threshold limit values refer to air-borne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. Because of wide variation in individual susceptibility, exposure of an occasional individual at or even below the threshold limit may not prevent discomfort, aggravation of a pre-existing condition, or occupational illness. Threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations.

31,085
Hughes, T.A. DON'T LOSE SIGHT OF EYE PROTECTION. Safety Maint., Feb. 1966, 131(2), 20-21. (Bechtel Corporation, San Francisco, Calif.).

This article presents a brief set of rules for the eye protection of industrial workers.

31,086
Safety Maintenance. TRENDS IN PROTECTIVE RUBBER FOOTWEAR. Safety Maint., Feb. 1966, 131(2), 22-24.

This article gives a brief review of trends in protective rubber footwear design.

31,087
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: NOISE CONTROL. Safety Maint., Feb. 1966, 131(2), 43-45.

This article presents brief descriptions and photographs of hearing protectors.

31,088
Safety Maintenance. A CONSTRUCTION HEADACHE: FOOT PROTECTION. Safety Maint., March 1966, 131(3), 18-20.

The complexities of providing protective footwear for construction workers lies in the variety of jobs, the variety of hazards, and the method of contracting and subcontracting. In addition, the consideration of the shoe as an employee furnished item of clothing adds to the difficulties of protection.

31,089
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: EYE PROTECTION. Safety Maint., March 1966, 131(3), 29-33.

This is a brief photographic and descriptive presentation of protective goggles and face shields.

31,090
Bowers, R.W. HOW TO FIT HARD HATS CORRECTLY. Safety Maint., April 1966, 131(4), 22-25. (Fibre-Metal Products Co., Chester, Penn.).

An improperly fitted or incorrectly worn hard hat or cap negates all the safety provisions designed into it. Adjustments should be made to give the wearer maximum protection.

31,091
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: FOOT PROTECTION. Safety Maint., April 1966, 131(4), 32-34.

Photographs and brief desciptions are given on protective footwear for men and women.

31,092
Safety Maintenance. DO YOU NEED RESPIRATORY PROTECTION? Safety Maint., June 1966, 131(6), 18-19, p24.

If any industrial operation involves or produces a gas, vapor, mist, fume or dust, or if it reduces the amount of oxygen in the immediate area, then there may be a respiratory protection problem. In many cases, the hazard can be engineered away through changes in processes or the materials used, through enclosure of the operation, through remote control techniques, and through good ventilation equipment. Frequently, however, these methods are impractical, impossible, or inadequate; and respiratory protection for personnel becomes vital. Such protection may take the form of self-contained breathing apparatus, air-line masks, hose masks, gas masks, filter type respirators, or chemical-cartridge respirators.

31,093
Safety Maintenance. KEEPING UP WITH RECENT DEVELOPMENTS: HEAD PROTECTION. Safety Maint., June 1966, 131(6), 25-27.

This article provides photographs and brief descriptions of several types of head protection. HEIAS

31,094
Gorg, W.E., Jr. MAKE VISUAL AIDS YOUR SAFETY SALESMEN. Safety Maint., July 1966, 132(1), 13-14. (E.D. English & Co., St. Louis, Mo.).

Visual aids should be pertinent communicators appealing to the intelligence of the reader. They are accident prevention advertising.

31,095
Safety Maintenance. WHAT GOES INTO A HEARING PROTECTION PROGRAM? Safety Maint., July 1966, 132(1), 37-40.

This article describes the hearing protection program instituted in a paper plant mill.

31,096
Safety Maintenance. HOW TO SELECT MODERN SIGNAL SYSTEMS SO YOUR EMPLOYEES "GET THE MESSAGE". Safety Maint., Aug. 1966, 132(2), 16-18.

Signals can be used to warn, or to inform. Warning signals can cover general alarms, or indicate a specific, localized danger. General alarm signals cover fire, burglary, air raid, evacuation, or other general warnings. For such applications sirens are usually preferred, for two reasons: The distinctive tone is commonly identified with a warning or emergency, and secondly, the up and down scale tone will contrast with and penetrate through, constant pitch noises. Horns and bells are usually less satisfactory for three reasons: They may already be in service for other purposes for which they are better suited; tone quality or pitch may blend with existing noise levels; large electric horns and bells do not offer the high intensity output of large sirens, and an adequate air supply may not be available for air horns. Danger signals are used to warn of a temporary or localized hazard, such as a moving crane, truck, or elevator; suspended load overhead; or open hatchway, shaft drawbridge, etc. Information systems include start-dismissal signals and coding-paging signals. Audible signals indicate the start or end of work periods, lunch, rest breaks, the start of a special production process or procedure, or any other timed or programed activity. Coding-paging systems reproduce a sequency of timed impulses with a prearranged code. Signals require sharp, instant reaction to the electrical impulses, so the primary devices are usually electric horns, air horns, or bells.

31,097
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS. ARM AND HAND PROTECTION. Safety Maint., Aug. 1966, 132(2), 25-28.

This article presents photographs and brief descriptions of various arm and hand protective devices. HEIAS

31,098
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: WARNING EQUIPMENT. Safety Maint., Sept. 1966, 132(3), 21-27.

This article presents photographs and brief descriptions of warning signs and signals.

31,099
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: FIRE PROTECTION. Safety Maint., Oct. 1966, 132(4), 46-52.

This article gives photographs and brief descriptions of fire-fighting equipment.

31,100
Allison, W.W. ELECTRICITY MUST BE SAFER. Safety Maint., Nov. 1966, 132(5), 13-16. (Safety Engineering Dept., Sandia Corp., Alburquerque, N.M.).

Minimum electrical standards will not provide adequately safe conditions. Betting one's life on constant caution and personal judgment is a long shot...one miss, you lose. Designers should aim at making electrical maintenance and testing accidents impossible--not just infrequent!

31,101
Welck, A.C. THE GROWING NEED FOR FLAME-RETARDANT CLOTHING. Safety Maint., Nov. 1966, 132(5), 20-21, p31. (Safetex Div., Wamsutta/Pacific Industrial Fabrics, New York, N.Y.).

A survey was made of 52 industrial companies which had expressed some curiosity or interest regarding flame-retardant clothing. Of these, 28, or 54%, had shown only an inquisitive interest in this subject. They wanted to learn more about it, but did not wish to advocate the use of flame-retardant clothing as protection for some of their own employees, feeling that the need was either non-existant in their operations, or of a minor nature, and that flame-resistant apparel consituted an unnecessary expense at this time. Improved durability and launder-proof treatment make flame-resistant clothing a practical consideration for many semi-hazardous occupations, especially where companies provide uniforms.

31,102
Safety Maintenance. KEEPING UP WITH DEVELOPMENTS: PROTECTIVE CLOTHING. Safety Maint., Dec. 1966, 132(6), 29-33.

This article gives photographs and brief descriptions of industrial protective clothing.

31,103
Worden, F.X. WHO IS GOING TO DO WHAT ABOUT YOUR NOISE PROBLEM? Safety Maint., Dec. 1966, 132(6), 42-44. (Western Electric Company, New York, N.Y.).

The subject of noise and its control has been of concern to safety specialists for many years. Experience has shown that the more involved one becomes in the field of noise control and hearing conservation, the more one realizes that a successful program requires the cooperative efforts of several organizations. The hearing conservation program described in this paper sets forth goals, not minimum standards, and it must be recognized that many factors may quite reasonably prevent achievement of these goals. At the same time it will undoubtedly serve the interest of noise control and hearing conservation to give the full details of a desirable hearing conservation program. The following disciplines are required for an effective hearing conservation team, not necessarily in this order of importance: engineering, medical, industrial hygiene, safety, operating.
R 6

31,104
Summers, T., Jr. & Waldbauer, W.M. A PROPOSED METHOD FOR DETERMINING THE CONTROL CLASSIFICATION OF ROADWAY LIGHTING LUMINAIRES. Illum. Engng., Feb. 1966, LXI(2), 84-90. (Lighting Div., Westinghouse Electric Corp., Cleveland, Ohio).

Forty luminaire light distributions were selected for the purpose of this study . The luminaires were of the present horizontal (or near horizontal) oval mercury lamp type. Assumed roadway conditions for computation purposes are shown. Luminaire mounting heights were selected on the basis of customary installation procedures, 25 ft for the 175-watt luminaires and 30 ft for the remaining luminaires. Overhang was assumed as 5 ft. For Disability Veiling Brightness (DVB) calculations, the observer was placed a distance from the first luminaire equal to the system spacing (150 ft), and 7 ft from the right edge of lane 1. An eye-level height of 4 ft above the pavement was selected. Data shown for system DVB include the contribution of the first 8 luminaires. Average initial and maintained footcandle (ft-c) levels, uniformity ratios based on average to minimum ft-c, and system DVB were calculated for each luminaire light distribution. The recommended practices of other countries as well as that of CIE were studied. The proposed control classification distribution requirements are characterized by intensity limitations at 90 degrees vertical, 85 degrees vertical and 8 TRL in the neighborhood of the usual directions of view of drivers. The 3 categories of cutoff, semi-cutoff and noncutoff are retained. The concept of a checkpoint at 90 degrees vertical agrees with most other practices. The 8 TRL plane was chosen in preference to the 80-degree cone on the basis that it agrees with our present standard and recognizes the usage of long vertical classifications. This is in contrast to the 65-degree vertical beam limitation for cutoff distributions found in many foreign practices. The 85-degree cone adds a third point to define further the candlepower gradient. The use of the highest candlepower occurring within the limits of the lateral classification results in the control classification being based on the intensity "in the usual direction of view of the drivers." R 7

31,105
Van Dusen, H.A., Jr. OPTICAL PLASTICS APPLICATION IN STREET-LIGHTING LUMINAIRES. Illum. Engng., Feb. 1966, LXI(2), 91-100. (Line Material Industries, South Milwaukee, Wisc.).

This paper compares the advantages and limitations of various plastics and glass that are or may be used in outdoor lighting applications. The functions of the refractor or globe are generally to provide a weatherproof closure to the luminaire optical chamber, provide a transparent window, give optical control by refraction or diffusion, protect the lamp from vandalism and serve as a structural member in some cases. The ideal street-lighting plastic would combine, at reasonable cost, the advantages of safety and handling ease provided by light weight and the ability of plastics in general to mold fine detail. It would provide the high-temperature capability and impact strength of polycarbonate, the optical efficiency of acrylics, and the weathering and ultraviolet resistance of ultraviolet-inhibited acrylic. There is no such material today, but with the spectacular developments occurring in the plastics industry, perhaps some day soon that material will be developed.
R 7

31,106
Lurkis, A. & Stonehill, E.A. SHIELDED-ZONE LOW-ELEVATION OUTDOOR LIGHTING UTILIZING SPECULAR PARABOLIC WEDGE LOUVERED LUMINAIRES. Illum. Engng., Feb. 1966, LXI(2), 107-119. (Zonal Lighting Company, Inc., Brooklyn, N.Y.).

A new trend of low-elevated (parapet) lighting has become apparent in designs by architects and lighting engineers in many parts of the world. Parapet lighting has many advantages over high-mounted lighting, especially for bridges, interchanges, access roads and from the viewpoint of good lighting. Esthetics is an important reason for the expanding demand for parapet lighting. For parapet lighting, low-brightness luminaries are a definite requirement. The specular parabolic wedge louver principle applied to parapet luminaries, either flourescent or mercury, provides the low brightness required regardless of the lighting level and also better visibility than high lighting. The projection can be controlled by varying the angle of the louver, thus using the cutoff qualities of the parabolic wedge in the shielded zone with good efficiency. This cutoff quality also provides a low luminaire brightness for tunnels and underpasses. The 1963 "American Standard Practice for Roadway Lighting" should be revised to define clearly the required lighting at low elevations and to establish classification standards for luminaire brightness, glare, distribution and control.
R 13

31,107
Fisher, W.S. (Chm.). LIGHTING AND AIR CONDITIONING. Illum. Engng., March 1966, LXI(3), 123-147. (Illuminating Engineering Society, New York, N.Y.).

A study has been undertaken by the Illuminating Engineering Society (IES) Committee on Lighting and Air Conditioning to provide a better understanding of the nature of lamps and luminaires as heat sources and the possibilities for coordinating lighting with thermal and structural design. This report documents the results of the study to date. It is composed of 5 sections: Part I considers electric lamps as heat sources; Part II considers the total energy distribution of any luminaire destined to become a component of a building; Part III discusses general lighting systems as heat sources; Part IV deals with methods of controlling lighting heat; and Part V considers systems for controlling lighting heat.
R 46

31,108
Ronge, H., Frisk, P. & Hökfelt, S.R. HEAT RADIATION FROM INCANDESCENT DOWNLIGHTING. Illum. Engng., March 1966, LXI(3), 171-174. (University of Lund, Lund, Sweden).

This article presents the results of a test series aimed at obtaining heat radiation information on available incandescent lamps. Six different kinds of incandescent lamps, all mounted in reflectors, were used; for comparison, 2 different kinds of fluorescents also were tested. The measuring device was a globe thermometer and mercury thermometer protected from radiation. Measurements were made about 4 feet above the floor. The over-temperature of the globe in relation to the air temperature close to the globe was the decisive factor. The resultant relative values of heat radiation generally show that ordinary incandescent lighting gives about 5 times as great a heat effect as fluorescent at the same light intensity. Using these data plus heat sensation threshold information, some recommended practices are considered. (HEIAS)
R 9

31,109
Logan, H.L. & Siegal, J.R. DIRECT GLARE EVALUATION BY THE VISUAL COMFORT PROBABILITY METHOD. Illum. Engng., April 1966, LXI(4) Sect 1, 177-188, (Holophane Co., Inc., New York, N.Y.).

The application of the VCP (visual comfort probability) procedure to large-area lighting sources gives valid results. The VCP estimates for 9 interior visual scenes lighted by large-area, uniformly bright, artificial light sources for situations to which the horizontal-line criterion of the scissors curve is intended to apply, substantially agree with the latter. They do, however, indicate that this line should be set at 200 footlamberts, rather than 250, with a limiting footcandle level of 170. The VCP estimates for 8 exterior visual scenes lighted by uniformly bright skies, with or without direct sunlight but with the sun not in the field of view, are directly consistent with the 9 artificial fields evaluated. They dovetail with the artificially lighted fields of view in a regular sequence without anomalies, and the 2 sets of evaluations reinforce each other. The VCP estimates for the remaining 6 exterior visual scenes, which do not fit into the preceding pattern, are found upon examination to be consistent with the pattern of nonuniformity they exhibit and are the types of lighting situations that the sloping line of the present scissors curve was designed to cover up to 100 footcandles. The data show that large-area, nonuniformly bright, exterior natural sources can be accompanied by lighting levels in excess of 6000 footcandles, and meet a VCP criterion of 75 per cent. The VCP procedure develops data that can be used to determine the additional footcandles needed to compensate for differences in direct glare for alternative solutions of a lighting problem.
R 5

31,110
O'Brien, P.F. EFFECTIVE REFLECTANCE OF ROOM CAVITIES WITH SPECULAR AND DIFFUSE SURFACES. Illum. Engng., April 1966, LXI(4) Sec 1, 189-195. (University of California, Los Angeles, Calif.).

Using parallel analytical methods, expressions for the effective reflectance of rectangular cavities with diffuse and mixed diffuse-specular surfaces are developed in this paper. Current technical papers suggest significant applications of the concept of effective reflectance in lighting design. A parametric representation of effective reflectance in an appropriate range of surface reflectance and cavity geometry is presented here for potential design use. When diffuse cavities are compared with the mixed diffuse-specular cases the largest per cent difference occurs at low surface reflectance in the range of 0.2 to zero. Only when a cavity is quite deep (i.e., depth equal to or greater than the width) is the difference between the diffuse and mixed diffuse-specular cases significant. At an opening-area-to-wall-area ratio of 0.5 the difference is about 6 per cent. In general, rectangular cavities with mirror base areas exhibit a higher effective reflectance than a cavity with an equal diffuse base reflectance. Finally, a Computation Sheet is presented here as a numerical analysis aid to rapid paper-and-pencil computation of effective reflectance.
R 9

31,111
Spencer, Donina E. & Levin, R.E. ON THE SIGNIFICANCE OF PHOTOMETRIC MEASUREMENTS. Illum. Engng., April 1966, LXI(4) Sec. 1, 196-204. (University of Connecticut, Storrs, Conn. & Sylvania Electric Products, Inc., Danvers, Mass.).

The paper investigates the errors in photometry caused by out-of-focus operation. A previous paper has analyzed calibration factor and field of view. The present paper defines a weighting function $w(r_1)$, which specifies the effect on the photometer reading of any element of source. Equations are developed for the calculation of the weighting function and are applied to the aperture photometer. Experimental data on a commercially available instrument show that the shape of weighting function is similar to that obtained for the aperture photometer. Over a major part of the field of view, the weighting function may differ by more than 100 per cent from the value that would be associated with an average over the field of view.
R 13

31,112
Balogh, E. INFINITE PLANE--LUMINANCE DIFFERENCE TECHNIQUE FOR COMPUTING ILLUMINATION. Illum. Engng., April 1966, LXI(4) Sec 1, 205-214. (Columbia Lighting, Los Angeles, Calif.).

For many years there has been a need for computing illumination at a specific point in a room. This has been especially true since the Illuminating Engineering Society recommends levels of illumination as being those on the seeing task rather than the average in the room. The Infinite Plane-Luminance Difference method described gives the necessary information to arrive at an easy solution for obtaining illumination at any point on a horizontal plane in interiors. The method may also be used for determining the uniformity of illumination within a room. The illumination incident on a specific point in interiors consists of 2 components. One component is produced by light reflected to the point by the room surfaces. This is the interreflected component. The other component is the direct radiation component and is produced by flux radiating to the specific point directly from the luminaires without room surface interreflections. These 2 components may be computed separately. The illumination in footcandles produced at a point by a source that is an infinite horizontal plane is equal to the luminance of that plane in footlamberts. A room may be considered an infinite plane. Therefore, the illumination produced at a specific point by light reflected from room surfaces is equal to the luminance of the walls plus the product of a room position multiplier and the difference between the luminance of the ceiling cavity and that of the walls. For the direct radiation component all luminaires are considered a point source. This is made possible by breaking the luminaires into smaller segments to permit the use of point-source calculations. A table is provided showing footcandles produced per 1000 candlepower of each luminaire in the direction of the point where the illumination is being determined. By adding the interreflected component to the direct radiation component, final illumination is determined.
R 7

31,113
Jones, B.F. & Balough, E. EFFECTIVE CAVITY REFLECTANCE CHARTS. Illum. Engng., April 1966, LXI(4) Sec. 1, 215-220. (Smoot-Holman Co., Inglewood, Calif. & Columbia Lighting, Los Angeles, Calif.).

The zonal-cavity method is basically concerned with the calculations of average illumination and brightness within interiors, but its use goes far beyond this application. For example, the information on which the system is built can be used to calculate horizontal illumination at any point within an enclosure. It may also be used to calculate the illumination or brightness (luminance) on vertical surfaces placed anywhere within an enclosure. Many calculations that can be made depend on the use of the cavity reflectance concept. In such applications the cavity is not always the ceiling or floor cavity. Sometimes it may be desirable to consider a part of the room as a cavity and then to determine its "effective wall cavity reflectance." It is as though there were an imaginary wall at the location being considered, and its reflectance is the effective cavity reflectance of this portion of the room. It therefore becomes important to be able to determine the effective reflectances of cavities of any size, or combination of actual reflectances. The accompanying graphs and charts make this possible. They cover the entire range of surface reflectance from 0 to 90 per cent, and for cavity ratios from 0 to 10. Since effective cavity reflectance does not change appreciably for cavity ratios greater than 10, these graphs and tables cover any possible situation. The information is shown in 2 forms since for different purposes one or the other may be more convenient.
R 18

31,114
Jones, J.R. & Sampson, F.K. LIGHTING DESIGN AND LUMINANCE COEFFICIENTS. Illum. Engng., April 1966, LXI(4) Sect 1, 221-229. (Lamp Div., Westinghouse Electric Corp., Los Angeles, Calif. & Sampson, Randall & Press, Los Angeles, Calif.).

Luminance coefficients offer the industry a tool for determining the brightnesses of room surfaces. These coefficients may be substituted into the common lumen-method footcandle formula in place of the coefficient of utilization to determine the luminance of the walls or that of the ceiling cavity.
R 16

31,115
Brown, R.L. DIRECT-RECORDING SPECTRORADIOMETER FOR LIGHT SOURCES. Illum. Engng., April 1966, LXI(4) Sec. 1, 230-235. (General Electric Company, Cleveland, Ohio).

The article describes the design and operation of a spectroradiometer constructed for measuring near-ultraviolet, visible, and very near-infrared sources. The components include 2 types of collecting optics, a grating monochromator with nearly constant dispersion, a quartz-windowed S-20 response photomultiplier, a conventional electrometer amplifier, and a compensator and recorder.
R 4

31,116
Ropp, R.C. HIGH-BRIGHTNESS RED FLUORESCENT LAMPS. Illum. Engng., April 1966, LXI(4)Sec. 1, 236-242. (Lamp Div., Westinghouse Electric Corp., Bloomfield, N.J.).

Study of rare-earth activated phosphors has been neglected in the past because of availability and purity of rare-earth materials. The advent of lasers has spurred investigation of the fluorescence of rare earths in various hosts, including the oxides. The earliest work stressed the cathodoluminescent properties of Gd_2O_3 and Y_2O_3, activated by small amounts of Eu, Er, Sm or Tb. Since that time a large number of studies of the luminescent properties of various Y_2O_3 phosphors have been presented but no data have ever been given in which the performance of such phosphors in fluorescent lamps has been detailed. The present report outlines such performance, both in terms of preparation and composition of the phosphors. It is shown that, properly prepared, these phosphors possess quantum efficiencies considerably higher than any other lamp phosphor known heretofore, approaching or exceeding 100 per cent, when 2357 Å (Angstrom unit) excitation is employed. Lamps prepared with these phosphors are redder than any phosphor-lamp combination known heretofore and provide a significant increase in the level of red illumination.
R 20

31,117
Ashley, A. & Douglas, C.A. CAN INFRARED IMPROVE VISIBILITY THROUGH FOG? Illum. Engng., April 1966, LXI(4)Sec. 1, 243-250. (Airborne Instruments Lab., Cutler-Hammer, Inc., Deer Park, L.I., N.Y. & US National Bureau of Standards, Washington, D.C.).

The results of this study indicate that, in fog, improvement in optical densities is obtained at longer wavelengths. However, power radiated at the longer wavelengths is insufficient to realize any of these atmospheric gains. Furthermore, special receivers and dome materials are needed at these longer wavelengths, thereby further complicating the problem. The approach of this paper has been to examine basic system parameters without consideration of the handicaps of actual system design. For example, the sensors require suitable domes if the equipment is mounted in the fuselage. Alternatively, the dome can possibly be eliminated if the sensor is mounted on the main-wheel strut. In any event, the mechanical problem is horrendous because of such problems as vibration, temperature, alignment and field of view. No mention has been made of the display and processing system. This is a difficult problem with all types of sensors. It certainly is evident that the processing and display system of the pilot is far superior to that developed by human ingenuity for this application. It is concluded that, when incandescent sources are used, the net benefit to be derived from the application of infrared signaling techniques in low-visibility conditions is less than, or at best equal to, that gained from the use of visible light and a human observer. Further consideration of the application of these infrared techniques to ground guidance of aircraft is not warranted.
R 26

31,118
Spencer, Domina E. & Levin, R.E. GUIDANCE IN FOG ON TURNPIKES. Illum. Engng., April 1966, LXI(4)Sec. 1, 251-265. (University of Connecticut, Storrs, Conn. & Sylvania Electric Products, Inc., Danvers, Mass.).

This paper has shown that a system of button lights embedded in the roadway, coupled with a series of fog detectors placed along the edge of the road, makes a promising system for guidance in fog. The paper has laid the theoretical foundation necessary for the guidance system. An implicit assumption underlies the method of calculation of the helios in fog used in this paper; namely, secondary scattering within the volume of the fog is negligible.
R 12

31,119
Shurgan, J. A SIMPLE EMPIRICAL METHOD FOR MEASURING COLOR RENDERING INDEX. Illum. Engng., April 1966, LXI(4)Sec. 1, 266-270. (Duro-Test Corp., North Bergen, N.J.).

A simple empirical method, using easily obtainable components, for approximating the color rendering ability of light sources is suggested. The method is suitable for "white" fluorescent sources only and is not intended to replace accurate spectroradiometric methods.
R 3

31,120
Blackwell, H.R. CALCULATIONAL PROCEDURE FOR DESIGN OF LUMINAIRE LAYOUTS PROVIDING EQUAL VISUAL PERFORMANCE. Illum. Engng., April 1966, LXI(4)Sec. 1, 271-277. (Institute for Research in Vision, Ohio State University, Columbus, Ohio).

The present paper describes a calculational procedure to eliminate the need for a trial-and-error approach to the problem of designing lighting installations. The number of luminaires required to satisfy a given visual performance criterion is calculated directly from illumination requirement data for different lighting materials together with the usual ratings of luminaire output. Four lighting materials have been studied with this procedure at each of 5 viewing angles. The procedure results in a value of the percentage ceiling coverage required in each of the 20 cases to provide a criterion level of visual performance. The total lamp lumens and the approximate number of lamps required for each installation may be readily computed. The new procedure provides a necessary tool for lighting designs to keep pace with the advancing technology of evaluating the visual effectiveness of different lighting installations.
R 4

31,121
Bodi, L.J. ELECTROLUMINESCENT LAMP BRIGHTNESS AS A FUNCTION OF CONSTRUCTION AND EXCITATION PARAMETERS. Illum. Engng., April 1966, LXI(4)Sec. 1, 278-284. (General Telephone & Electronics Laboratories, Inc., Bayside, N.Y.).

The observed responses of an electroluminescent phosphor to the parameters specifying the structure of the electroluminescent lamp into which it is to be incorporated are synthesized into an empirical brightness-parameter equation. By application of this equation to the design of an electroluminescent lamp, such complex operational variables as the thicknesses of electroluminescent layer, d_ϕ, and insulating layer, d_β, may be predicted with reasonable accuracy. For greatest precision, the parameters should correspond roughly to those measured for the phosphor in a test cell for which the field and frequency conditions approximate those of the application.
R 16

31,122
Engle, C.R., III. AN EVALUATION OF THE CHARACTERISTIC CURVES OF DIMMERS FOR INCANDESCENT LIGHTING CONTROL. Illum. Engng., April 1966, LXI(4)Sec. 1, 320-323. (General Engineering Associates, Washington, D.C.).

Since a dimmer is primarily a device which varies the voltage, current or power fed to a lamp, the characteristic curve is often thought of as the response of these electrical qualities to changes in the dimmer settings. These quantities, however, are of only academic interest to the lighting designer whose responsibility is solely that of controlling the quantity and quality of light. The important characteristic curve indicates the change in light output from the controlled light source when a specific change in dimmer setting is made. For each type of dimmer considered, two characteristic curves have been plotted. The first shows the variation in actual light output in per cent of rated lumen output of the source. This curve also indicates the change in footcandle levels supplied by a controlled lighting system. The second curve indicates the apparent change in light output or brilliance as perceived by the human eye. For this curve the Munsell value scale has been used as a reference for the response of the eye to light changes. The Munsell scale is a widely recognized scale which was experimentally derived to represent the nonlinear response of the eye to variations in light levels. The units used for the apparent light curve are the apparent per cent of maximum brilliance at full dimmer setting. For both curves the dimmer settings are represented by the common 0 to 10 scale on which zero is the minimum setting, ten the maximum.

31,123
Bodmann, H.W., Söllner, G. & Senger, E. A SIMPLE GLARE EVALUATION SYSTEM. Illum. Engng., May 1966, LXI(5), 347-352. (Phillips Lighting Laboratory, Aachen, Germany).

The criticism that has been made of present glare evaluation systems may be converted into three requirements in view of the lighting practice: a) Satisfactory agreement with direct observations in relation to the statistical reliability of discomfort glare appraisals; b) Sufficient range of applicability in lighting design; and c) Practicable and definite handling procedure for the lighting engineer. It was desired to incorporate these features in a system based upon observations in typical lighting installations. For this purpose, experimental installations in models of office rooms on a 1-to-3 scale were used, simulating practical conditions as real as possible. From extensive experiments a new system was developed resulting in a luminance limitation of luminaires in relation to room dimensions, illumination level and quality requirements. The underlying work has been described elsewhere. This paper presents the system in view of proposed applications in lighting practice. Comparisons with other methods are drawn and finally a proof of the system in real indoor installations is reported.
R 19

31,124
Walick, J.A. & Wotowiec, J.P. FLUX CONTRAST--FIELD INVESTIGATION WITH PROPOSED STANDARD TASK. Illum. Engng., May 1966, LXI(5), 353-358. (Lighting Div., Westinghouse Electric Corp., Cleveland, Ohio).

The field investigation reported in this paper used a proposed standard pencil task supplied by H.R. Blackwell and contrast values determined by him under hemisphere lighting. These values, in conjunction with the contrast values used in his earlier work to establish the standard visual performance curve, were applied in an evaluation of various lighting installations. The task was studied at several viewing angles under seven separate lighting systems in a small office. Results of the study are compiled in tabular form to show the contrast values, Contrast Rendition Factors and required illumination levels for equivalent ease of visual performance. Singular required illumination levels were established for each lighting system and were used for comparative purposes. The paper reveals the importance of luminaire layout and indicates that light-control shielding is an important feature in the establishment of light quality.
R 10

31,125
Eastman, A.A. & DeLaney, W.B. VISIBILITY OF OFFICE-TYPE TASKS UNDER VARIOUS LIGHTING MATERIALS. PART I. Illum. Engng., May 1966, LXI(5), 366-378. (Lamp Div., General Electric Co., Cleveland, Ohio).

Relative footcandles for equal visibility were determined for four pencil tasks, three printed tasks and one typewriter task. Contrast measurements were made for the same tasks with the exception of one pencil task, 6. All measurements were made in an experimental model room that has provisions for changing the ceiling material and pattern. Five ceiling materials, arranged as an over-all luminous ceiling were used, and all measurements were made with 100 footcandles on the work plane. The relative footcandle measurements showed consistent increases with increases in viewing angle, which was to be expected. These increases can be attributed principally to foreshortening of the task. A statistical analysis (at the 5 per cent level of significance) of the relative footcandle measurements showed little or no advantage of one ceiling material over another. The central and flux contrast measurements revealed that no one type of task can be used to study the effects of veiling reflections on changing contrast. It seems likely that at least pencil and printed tasks should both be used. From the data obtained so far it appears that an over-all pattern of dots such as the hexagonal pattern of task 8 can be a satisfactory target representative of actual office and school tasks. It has the advantage of complexity, which is inherent in most visual tasks. Also, it has the advantage of uniformity in the ratio of target and background areas. This is important in making flux contrast measurements.
R 8

31,127
Allphin, W. & Gibson, C.D. (Chm.). GUIDE FOR LIGHTING AUDIOVISUAL AREAS IN SCHOOLS. Illum. Engng., July 1966, LXI(7), 477-491.

The American Standard Guide for School Lighting and "School Lighting Application Data" deal with quality and quantity considerations for the lighting of classrooms, laboratories, shops, study carrels and other areas in schools and colleges. It is the purpose of this Guide to provide supplementary suggestions for lighting when screens are viewed or learning machines are used. For educational television viewing, the factors important to lighting include: picture contrast relative to room illumination, reflections in the implosion screen and picture tube, surround luminances, and room lighting systems. For projected materials, projector type and location, screen type and dimensions, and room characteristics and lighting are delineated. For teaching machines, techniques to reduce reflections and glare are indicated. For viewing chalkboards and roll-down maps and charts, supplementary lighting is recommended.
R 8

31,128
Neenan, C.J. TELEVISION LIGHTING AND THE CONVERSION FROM MONOCHROME TO COLOR. Illum. Engng., Aug. 1966, LXI(8), 514-525. (Columbia Broadcasting System, New York, N.Y.).

It is intended that this paper should serve as a guide for those involved in the conversion of television studio lighting from monochrome to color operation. Although the basic production lighting techniques are essentially the same for both, lighting levels required for color are substantially greater. These higher lighting levels lead to increases in both power and air-conditioning needs. Further, in order to achieve the higher levels, higher wattage luminaires are required, which, in turn, results in higher necessary dimmer and outlet capacity. In addition to these obvious requirements, light sources and control systems, together with studio grid and hanging systems, are discussed. It is imperative that all of these interrelated factors are evaluated both individually and collectively in order to ensure adequate operating facilities at a reasonable cost.
R 21

31,129
Bishop, V. & Tuck, W.M. HOW TO LIGHT A SHOPPING CENTER. Illum. Engng., Oct. 1966, LXI(10), 621-627. (Crouse-Hinds Company, Syracuse, N.Y.).

This article discusses lighting principles and practices relative to the requirements of a shopping center. The 6 primary types of light sources are described: incandescent, fluorescent, quartz, mercury, metallic vapor, and ceramic discharge. The use of beam utilization is indicated for evaluating light on the ground. Lighting level recommendations are made and a formula for quickly determining the number of units required is given. (HEIAS)

31,130
Allphin, W. INFLUENCE OF SIGHT LINE ON BCD JUDGMENTS OF DIRECT DISCOMFORT GLARE. Illum. Engng., Oct. 1966, LXI(10), 629-633. (Sylvania Electric Products, Inc., Danvers, Mass.).

This paper reports research in which observers were required to make judgments of BCD (borderline between comfort and discomfort) in situations having simulated overhead luminaires, the observer sometimes having a horizontal line of sight and sometimes looking at a luminaire. The purpose was to see which line of sight produced the more discomfort glare. Twelve Ss, 28-63 years, participated. While the mean BCD's, translated into VCP's (visual comfort probability), differed from those of the more than 100 observers in previous work by the authors, the new observers were spread over just as wide a range of sensitivity to direct discomfort glare. Furthermore, their patterns of response were similar to each other in relative terms, and similar to those of the previous observers. Therefore, while it cannot be proved statistically, it seems a reasonable assumption that the observers were representative of a large population in regard to relative BCD's. If this assumption is made, it can be concluded that in an interior lighting situation with overhead luminaires located 22 degrees above a horizontal sight line, and with a facing wall having a color similar to that of the light source, there is less direct discomfort glare when looking at a luminaire than when looking at the facing wall.
R 4

31,131
Guth, S.K. COMPUTING VISUAL COMFORT RATINGS FOR A SPECIFIC INTERIOR LIGHTING INSTALLATION. Illum. Engng., Oct. 1966, LXI(10), 634-642. (Lamp Div., General Electric Co., Cleveland, Ohio).

The procedure for determining specific ratings as described in this paper parallels the one used for preparing general VCP (visual comfort probability) tables. The primary differences are that the standard uniform arrangement of luminaires is replaced by a specific layout, and the level of illumination will be that actually obtained. These will require the determination of certain values needed for obtaining solid angles, position indices and luminances for which predetermined factors are provided when preparing the tables. Nevertheless, the entire procedure is simple and straightforward, and can be performed with a slide rule or desk calculator, standard tables of squares and cubes of numbers and trigonometric functions, and graph paper. Charts and tables have been prepared in order to facilitate the determination of certain values.
R 6

31,132
Allphin, W. & Fry, G.A. (Chm.). VISUAL COMFORT RATINGS FOR INTERIOR LIGHTING. REPORT 2. Illum. Engng., Oct. 1966, LXI(10), 643-666.

This new system permits, for the first time, the calculation of discomfort glare ratings which take into account the following: room size and shape, room surface reflectances, illumination level, luminaire type, size and light distribution, number and location of luminaires, luminance of entire field of view, observer location and line of sight, differences in individual glare sensitivity, and if desired equipment and furniture. Furthermore, the system and calculational procedure are applicable to the preparation of: a) general glare tables for typical types of luminaires; b) tables for specific luminaires; and c) ratings of specific lighting layouts. It is expected that (a) and (b) will provide the desired information in such a way that designers can make quick assessment of the suitability of luminaires and lighting installations. Appropriate additional tables will permit obtaining ratings for the range of footcandle levels encountered in typical lighting practice. Thus, individual calculations are not expected to be necessary except when the arrangement of luminaires or luminous areas differs markedly from typical practice. An added feature is that computer programs can be prepared that will eliminate the need for repetitive calculations, especially in the preparation of tables. On the other hand, the procedure is sufficiently simple so that few will have difficulty in making calculations for specific lighting systems if desired. The purposes of this report are to present a brief summary of the background and basis of the procedure, an outline of the computations involved in determining discomfort glare ratings (DGR) and visual comfort probabilities (VCP), and to show how such information can be presented in order to be of greater value to the user. Full details are given in order to illustrate and explain how the various factors are determined and that the procedure is explicit.
R 13

31,133
Beck, C.E., Noble, R.A. & Sorgen, R.P. INFRARED ON THE AEROSPACE TEAM. Illum. Engng., Nov. 1966, LXI(11), 703-706. (USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio).

Future high-performance flight vehicles will have thermal environments much more difficult to simulate than those of present aircraft. If the quartz infrared lamp is to retain its position on the first team in these newer and more demanding applications, more efficient use techniques must be developed. The logical first step in such a development is a thorough analysis of the basic characteristics and performance factors of the lamp. This paper describes a program conducted by the Air Force Flight Dynamics Laboratory to obtain these basic data. Experimentally measured values of the power density agree closely with values calculated from the equation. A comparison of calculated and experimental values for a group of 11 lamps and a gold-surfaced reflector for lamp power levels of 200 and 300 watts per inch of filament is shown. These curves are for a measurement plane one inch from the lamps. Similar agreement exists at the 2- and 4-inch distances.

31,134
Miller, S.E. COMMUNICATION BY LASER. Scient. American, Jan. 1966, 214(1), 19-27.

Today there are probably more physicists and engineers working on the problem of adapting the laser for use in communication than on any other single project in the field of laser applications. At the Bell Telephone Laboratories many workers are engaged in exploring the potential of the laser for communication. In this article an attempt is made to explain some of the advantages of a laser communication system and also some of the problems that remain to be solved before such a system can become an actuality.
R 4

31,135
Irving, L. ADAPTATIONS TO COLD. Scient. American, Jan. 1966, 214(1), 94-101.

To keep their internal temperature at a viable level mammals must be capable of adjusting to a wide range of environmental temperatures. In tropical air at 30 degrees C. (86 degrees F.), for example, the environment is only eight degrees cooler than the body temperature; in arctic air at -50 degrees C. it is 88 degrees colder. A man or other mammal in the Arctic must adjust to both extremes as seasons change. The mechanisms available for making the adjustments are: a) the generation of body heat by the metabolic burning of food as fuel and b) the use of insulation and other devices to retain body heat. The requirements can be expressed quantitatively in a Newtonian formula concerning the cooling of warm bodies. A calculation based on the formula shows that to maintain the necessary warmth of its body a mammal must generate 10 times more heat in the Arctic than in the Tropics or clothe itself in 10 times more effective insulation or employ some intermediate combination of the two mechanisms. One need not dwell on the metabolic requirement; it is rarely a major factor. An animal can increase its food intake and generation of heat to only a very modest degree. The decisive difference in resisting cold lies in the mechanisms for conserving body heat. In the Institute of Arctic Biology at the University of Alaska studies have been in progress for 18 years to compare the mechanisms for conservation of heat in arctic and tropical animals. The investigations have covered a wide variety of mammals and birds and have yielded conclusions of general physiological interest. This article reviews some of the findings.
R 6

31,136
MacInnis, J.B. LIVING UNDER THE SEA. Scient. American, March 1966, 214(3), 24-33.

The submerged domain potentially available to man for firsthand investigation and eventual exploitation can be regarded as a new continent with an area of about 11,500,000 square miles--the size of Africa. It comprises the gently sloping shoulders of the continents, the continental shelves that rim the ocean basins. The shelves range up to several hundred miles in width and are generally covered by 600 feet of water or less. Mineral deposits similar to those under dry land lie under the shelf. Oil and natural gas are the foremost examples. In 1964 alone the petroleum industry spent $5 billion to find and recover offshore oil; only recently the continental shelf in the North Sea has become the site of extensive exploration for oil and gas. Drilling and capping a well from the surface is not easy. The prospect of more efficient oil and gas operations in deeper water by men working on the floor of the shelf is one of the primary reasons for the surge of activity directed toward living under the sea. Faced with a variety of difficulties commercial divers and undersea investigators found it impossible to spend time and do useful work on the continental shelf. Those who went down in pressurized suits and thick-hulled submersible vehicles were held prisoner by their protective armor. Free divers, on the other hand, could not go very deep or stay very long. In 1956 Edwin A. Link recognized that a diver could work more effectively at substantial depths if he could live there for prolonged periods instead of having to be decompressed to the surface after each day's work. Link set out to build a vehicle that could operate as an underwater elevator, a diving bell and a decompression chamber. This article describes Link's and other undersea researches.
R 5

31,137
Peterson, L.R. SHORT-TERM MEMORY. Scient. American, July 1966, 215(1), 90-95. (Indiana University, Bloomington, Ind.).

This article considers experimental findings on short-term forgetting and the factors which have been identified as significant to this memory process. The interpretation by various investigators of the memory process for both short and long-term storage is discussed. Some studies are cited which suggest these activities are closely related but involve some separate mechanisms.
(HEIAS)

31,138
Berlyne, D.E. CONFLICT AND AROUSAL. Scient. American, Aug. 1966, 215(2), 82-87.

This article considers the role of conflict and arousal in the motivation of behavior. "The inner conflicts that ambiguous, surprising or complex stimuli produce help to arouse the individual. Arousal involves a heightening of attentiveness which, in turn, helps the individual to act and to learn." Highlights of laboratory studies designed to verify that conflict and collative stimulus properties (e.g., novelty, surprise) can heighten arousal are presented as evidence for a broadening of the motivation spectrum. The relationship of such a view to learning and reinforcement points up the need for further studies in this area.
(HEIAS)

31,139
Bonné, Batsheva. GENES AND PHENOTYPES IN THE SAMARITAN ISOLATE. Amer. J. Phys. Anthrop., Jan. 1966, 24(1), 1-20. (Boston University School of Medicine, Boston, Mass.).

A genetic and anthropological survey of the Samaritan community in Israel carried out in the autumn of 1963 included tests for about 30 blood group antigens, several serum proteins, hemoglobin variants Glucose-6-Phosphate Dehydrogenase activity, secretor status, color-blindness and some 18 anthropometric measurements and 18 morphological observations. About 90% of the total group were studied. The results obtained show that in blood groups, the Samaritans have the highest O frequency in the Middle East, A_2 is more common than A_1, and there are more N genes then M. Not a single case of G6PD deficiency was found. The incidence of color-blindness is very high (27%). There is heterogeneity in physical type and large variations between individuals are also manifested in hair and eye-color distribution.

31,140
Jacobs, I. DETECTION OF A SIGNAL WITH AN UNKNOWN PARAMETER. Contract N00014 66 C0005, Proj. RF 001 03 01, Tasks 17x1319.1451 & 17501 14, Tech. Rep. 12, Aug. 1966, 8pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Bell Telephone Laboratories, Inc., Whippany, N.J.). (AD 652808)

Preliminary consideration is given to the general problem of the detection of a signal that depends on an unknown parameter. Two detection procedures are contrasted: a) a likelihood ratio detector plus maximum likelihood estimator; and b) a combined maximum likelihood detector and estimator. The latter has the apparent advantage of not requiring a priori knowledge of the distribution of the parameter, but this oft-stated advantage is shown to be misleading. Special cases considered indicate that the former procedure, which has a firmer theoretical basis, becomes relatively insensitive to a priori knowledge when sufficient data are present.

31,141
Heath, Barbara H. & Carter, J.E.L. A COMPARISON OF SOMATOTYPE METHODS. Amer. J. Phys. Anthrop., Jan. 1966, 24(1), 87-100. (San Diego State College, San Diego, Calif.).

In order to compare Parnell's and Heath's somatotype methods, the authors independently somatotyped a series of 59 adult male and 61 adult female Ss: a) using the criteria of Heath's method; b) using the criteria of Parnell's method; and c) taking into consideration tentatively adapted Parnell criteria in addition to Heath's criteria. The authors conclude that when using similar rating criteria their mean differences are smaller, their overall correlations are similar, and their percentage agreements to a half-unit are higher (96%) than for comparisons reported by other investigators. The study considers the potentially important relationships of measurements of subcutaneous fat to ratings of the first component. The similarity of distributions of subcutaneous fat measurements and of first component ratings in selected samples suggest important interrelationships among ratings of the first component, height/weight ratios and subcutaneous fat measurements. The authors feel: a) that Parnell's method fails to modify the basic weaknesses in Sheldon's somatotype method; and b) that analyses of the anthropometric data basic to Parnell's method, if guided by the criteria of Heath's method, will further objectify and simplify Heath's method, will improve agreement among independent raters, and will increase the usefulness of somatotyping as a research instrument.
R 31

31,142
Bonné, Batsheva. ARE THERE HEBREWS LEFT? Amer. J. Phys. Anthrop., March 1966, 24(2), 135-146. (Boston University School of Medicine, Boston, Mass.).

The Samaritan sect in the Middle East traces its ancestry over a period of more than 2,000 years from the Biblical Samaritans. The Samaritans are the guardians of a unique and very ancient religious literature which together with other historical accounts makes their claim of such a length of existence probable. Comparison of blood group frequencies as well as other genetic markers (such as PTC sensitivity, color blindness and G6PD deficiency) indicate that the Samaritans are unlike any of the existing surrounding groups whom they might be expected to resemble. From comparison of anthropometric data the Samaritans appear to exhibit their own "typical" features which do not resemble those of any other Jewish or non-Jewish community in the Middle East. These differences support the contention that the Samaritans' separation and isolation from the communities is not a recent event. The possibility that the Samaritans today can be regarded as modern representatives of the ancient Hebrews and the living offspring of a particular branch of the Israelite kingdom is discussed.
R 45

31,143
Brozek, J. BODY COMPOSITION: MODELS AND ESTIMATION EQUATIONS. Amer. J. Phys. Anthrop., March 1966, 24(2), 239-246. (Lehigh University, Bethlehem, Penn.).

Several approaches have been developed to a quantitative description of the "inner man." The present attempt at a synthesis of the basic methodological aspects begins with the anatomist's handiwork and goes on to somatometric models and to procedures based on determinations of body density and body water. The estimation equations used in the densitometric and the hydrometric analysis of body composition are derived afresh from information on an empirically defined "reference body." The Minnesota model is based on considerations of the composition of the reference body and of the "obesity tissue," initially defined as body mass gained during a prolonged intake of excess calories. Subsequently, information has been obtained on the composition of weight losses and of the mass differentiating "lean" and "fat" young men of the same height. Due consideration is given to the approaches based on the measurement of whole-body radioactivity generated by the naturally occurring isotope of potassium (K^{40}), and to the multicomponental system developed by F.D. Moore and his co-workers in the context of surgical treatment and research. While the very nature of the field is interdisciplinary, the presentation endeavors to be intelligible to students, teachers, and investigators approaching the problem from the point of view of any scientific specialty.
R 26

31,144
Thayer, S.B., Self, C.R., Burco, R.A. & Tiffany, W.D. CIVIL DEFENSE COMMUNICATIONS REQUIREMENTS AT THE LOCAL, STATE, AND REGIONAL LEVELS. FINAL REPORT. Contract OCD PS 64 201, SRI Proj. MU 4949 120, July 1966, 174pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (Stanford Research Institute, Menlo Park, Calif.). (AD 652686)

This report analyzes the information flows that would be required at various levels of government to coordinate a civil defense response to nuclear emergency. Communications circuit requirements to convey these information flows are estimated for varying sizes of political subdivisions. The research technique employed is principally that of abstracting communications attributes from scenarios of general civil defense activities in an emergency, and classifying these attributes by descriptors such as urgency, frequency, quantity, and time of occurrence. Estimates of quantifiable attributes have then been applied to the information flows, allowing their combination into physical circuit requirements for voice and TTY (record). The level of approximation inherent in the quantitative results is significant due largely to the lack of established policies, organization, and procedures for many facets of civil defense operations.
R 35

31,145
Roach, S.A. A MORE RATIONAL BASIS FOR AIR SAMPLING PROGRAMS. Amer. Industr. Hygiene Assoc. J., Jan.-Feb. 1966, 27(1), 1-12. (London School of Hygiene & Tropical Medicine, London, England).

There are real difficulties in designing sampling procedures that assure compliance with the present hygienic standards for air contaminants. A reasoned and consistent system of sampling is developed, based on the assurance that a critical body burden is not exceeded. It is shown that the duration of the sampling should be proportional to the biological half-time of the substance. A large safety margin is obtained by making the duration one-tenth of the half-time. The sampling results are then summarized in the formula, Average + Range/$(n-1)^{1/2}$. When the resulting figure is less than the ACGIH (American Conference of Governmental Industrial Hygienists) threshold limit value, a favorable report can be given.
R 21

31,146
Henschel, A., Dukes-Dobos, F., Humphreys, C.M., Carlson, W., et al. ASSESSMENT OF INDUSTRIAL HEAT STRESS. Amer. Industr. Assoc. J., Jan.-Feb. 1966, 27(1), 13-16. (Occupational Health Div., US Public Health Service, Cincinnati, Ohio).

The problem of assessing the thermal impact of an industrial situation is complex because of the multiplicity of other stresses which may be present in the environment. To define the problem requires, as a minimum, data on the climatic environment of the work, the demands of the job, the daily work-rest regimen, the heat exposure history, the health and nutritional status, the state of body hydration, and the non-working physical environment and activities of the individuals. A study of industrial heat stress conducted by this Division, incorporated a simple standard laboratory type heat-work test along with an exhaustive study of the men at the work site. The physiological responses of the men to the standard tests were significantly correlated with the responses on the job and reflected the magnitude of the on-the-job environmental stress.
R 2

31,147
Moody, J.A. & Duggar, B.C. ALERTNESS MANAGEMENT IN INDUSTRY. Amer. Industr. Hygiene Assoc. J., Jan.-Feb. 1966, 27(1), 17-24. (Bio-Dynamics, Inc., Cambridge, Mass.).

Alertness management is of interest in industry because of its criticality to production rate, quality control, and operator safety. Alertness management includes: a) elimination of factors conducive to alertness decrement; b) addition of conditions or procedures which enhance alertness; c) reduction of the consequences of alertness decrements; and d) personnel monitoring when necessary. The criteria for evaluating the controlling elements in the task, physical environment, social environment, and procedures which may lead to decrements in alertness are discussed. Monitoring procedures are described and recommendations suggested which should lead to improved alertness management in the industrial situation. An alertness checklist is presented for use in analyzing particular job situations.
R 35

31,148
Plumb, E.E., Mendenhall, E.L. & Robbins, M.C. EVALUATION OF PROTECTIVE CLOTHING AND EQUIPMENT FOR OPERATIONS IN OXYGEN-RICH OR -DEFICIENT ATMOSPHERES APPROACHING -100°F. Amer. Industr. Hygiene Assoc. J., Jan. & Feb. 1966, 27(1), 29-38. (Aerospace Group, Boeing Company, Seattle, Wash.).

The paper summarizes an investigation conducted to evaluate protective clothing and equipment for personnel who might be required to work up to 90 minutes in the Saturn S-IC booster interstage prior to launch at temperatures approaching -100°F. Because the environment might be either oxygen-rich or -deficient, the selected material must be compatible with liquid oxygen. Tests of clothing and equipment have been conducted in environments to -100°F temperature. Ss wore various types of arctic clothing and respiratory equipment. In the cold environment they performed tasks simulating those which would be required in the booster interstage. The exposure times were varied from 15 to 57 minutes. The limiting parameters appear to be communications, visibility, and satisfactory respiratory protection at this temperature.
R 2

31,149
Hangebrauck, R.P., Lauch, R.P. & Meeker, J.E. EMISSIONS OF POLYNUCLEAR HYDROCARBONS FROM AUTOMOBILES AND TRUCKS. Amer. Industr. Hygiene Assoc. J., Jan.-Feb. 1966, 27(1), 47-56. (US Public Health Service, Taft Sanitary Engineering Center, Cincinnati, Ohio).

Polynuclear hydrocarbon and particulate emission rates were determined for eight gasoline-powered automobiles and four trucks of various age and mileage categories. The total exhaust flow was sampled while the vehicle was driven over a typical driving route. Simultaneously, gaseous emissions of CO_2, CO, total gaseous hydrocarbons, and NO_x were determined by continuously collecting a quantity of the exhaust proportionate to the total exhaust flow. Average emissions of BaP and other pollutants for the eight automobiles and four trucks tested are, respectively, as follows: BaP, 11 and >40 µg/mile; CO, 45 and 84 gm/mile; total gaseous hydrocarbons, 3.2 and 7.0 gm/mile; NO_x, 6.2 and 6.7 gm/mile; and particulates, 0.31 and 0.63 gm/mile. Emissions of BaP and other polynuclear hydrocarbons were much higher for the 1957 model or older vehicles with 50,000 miles or more accumulated. Automobiles in this category averaged 28 µg of BaP per mile as compared to an average of 5.5 µg/mile for the newer, lower-mileage automobiles. Emissions of total gaseous hydrocarbons, carbon monoxide, and particulates did not follow this pattern but were frequently higher where BaP emissions were high.
R 28

31,150
Grim, K.E. & Knox, R.E. FACTORS INFLUENCING HAZARDS IN ISOCYANATE FOAM-SPRAYING. Amer. Industr. Hygiene Assoc. J., Jan.-Feb. 1966, 27(1), 62-67. (Elastomer Chemicals Dept., E.I. duPont deNemours & Company, Inc., Wilmington, Del.).

Controlled foam-spraying experiments conducted in a sealed, unventilated room were designed to evaluate the influence of formulations and application techniques on atmospheric contamination with isocyanates. The conditions for sampling the atmosphere during application of formulations involving TDI (toluenediisocyanate) and MDI (methylenebis (4-phenylisocyanate)) are described in detail. The Elastomers Laboratory spray gun, which mixes the chemicals internally, is compared to a conventional external-mix spray gun. Equipment for quantitative measurement of TDI and MDI retained by activated charcoal canisters is described, and results are given. Recommendations of the safest method of foam spraying, based on information acquired and safety precautions, including the use of operator protection equipment, are discussed.
R 9

31,151
Snook, S.H., Hinds, W.C. & Burgess, W.A. RESPIRATOR COMFORT: SUBJECTIVE RESPONSE TO FORCE APPLIED TO THE FACE. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 93-97. (Liberty Mutual Insurance Company, Hopkinton, Mass.).

The force that a respirator facepiece exerts against the face was investigated as a factor in respirator discomfort. An experiment was designed to test the hypothesis that some locations on the face are more sensitive to force than other locations. Twelve facial locations were selected and subjected to 5 different forces. On the basis of psychophysical measurements obtained from 12 Ss, it was concluded that facial locations do differ in sensitivity to force, but that these differences are not significant enough to warrant any major changes in respirator facepiece design.
R 4

31,152
Sherwood, R.J. ON THE INTERPRETATION OF AIR SAMPLING FOR RADIOACTIVE PARTICLES. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 98-109. (Health Physics & Medical Div., Atomic Energy Research Establishment, Harwell, England).

This paper outlines a 5-year program of studies of air samples taken in operational areas where radioactive substances are handled. The special instruments and techniques developed for this purpose are briefly described. For the areas studied, the results indicate that routine air sampling for radioactive particles may not give a reliable indication of human exposure and that more attention should be given to the interpretation of air sampling results.
R 9

31,153
Ferber, B.I. BUREAU OF MINES RESPIRATOR APPROVAL SCHEDULES: NEW AND REVISED. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 110-114. (US Bureau of Mines, Department of Interior, Pittsburgh, Penn.).

The Bureau of Mines tests and approves respiratory protective devices according to performance requirements set forth in pertinent approval schedules. Changes in industrial technology and respirator application require review and revision of these performance requirements. Revisions are accomplished through cooperative efforts of the Bureau of Mines, the manufacturers, and the users of respiratory protective devices. The requirements of recently revised Schedule 21B for dust, fume, and mist respirators are discussed, as well as requirements proposed for inclusion in revisions of approval schedules for other types of respiratory protective devices.

31,154
Konzen, R.B., Craft, B.F., Scheel, L.D. & Gorski, C.H. HUMAN RESPONSE TO LOW CONCENTRATION OF p,p-DIPHENYLMETHANE DIISOCYANATE (MDI). Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 121-127. (US Public Health Service, Occupational Health Div., Cincinnati, Ohio).

A study was conducted during the spray application of a pre-expanded polyurethane foam in an underground mine to determine the air concentrations of diisocyanate and the human response to it. The sampling procedure showed that the majority of unreacted MDI was contained in the particulate material generated by the spray mechanism. The concentrations observed at a given distance downstream were directly related to the ventilation air velocity. Analysis of the particle size distribution showed that nearly all generated particles were within the respirable range. The immunochemical response of human Ss to low concentrations of diisocyanate was investigated. Results show that an exposure of about 1.3 ppm-min resulted in an antibody response, whereas an exposure of about 0.9 ppm-min did not. As a result of these studies, the demonstration of antibodies in the serum of individuals would be diagnostic proof of a recent exposure to diisocyanates. However, the number of individuals in this study is too small to indicate that the titer of antibodies found is proportional to the exposure.
R 11

31,155
Croley, J.J., Jr. PROTECTIVE CLOTHING-RESPONSIBILITIES OF THE INDUSTRIAL HYGIENIST. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 140-143. (Savannah River Plant, E.I. duPont de Nemours & Company, Aiken, S.C.).

The industrial hygienist must recommend protective clothing that affords maximum protection and comfort at minimum cost. He is responsible for designing, selecting, and evaluating protective garments and where radioactive contamination is encountered, must develop methods to monitor, decontaminate, and recover the garments. In many industries, protective clothing requirements are often complex, and the cost of this protection, although small compared to other operating costs, nevertheless requires substantial expenditures.
R 11

31,156
Apol, A.G., Cook, W.A. & Lawrence, E.F. PLASTIC BAGS FOR CALIBRATION OF AIR SAMPLING DEVICES--DETERMINATION OF PRECISION OF METHOD. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 149-153. (Industrial Health Dept., University of Michigan, Ann Arbor, Mich.).

The precision of a described technique for preparation of known concentrations of volatile liquid vapor in air in plastic bags was determined by gas chromatography. The average of 5 samples taken from each of 50 Mylar bags into which concentrations of 50 to 150 ppm of trichloroethylene had been introduced was shown to be within a maximum of 3 ppm from the calculated values. Results are reported on use of this method for calibration of a continuous indicating device and also of a number of so-called grab sampling devices.
R 9

31,157
Andersen, A.A. A SAMPLER FOR RESPIRATORY HEALTH HAZARD ASSESSMENT. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 160-165. (Andersen Samplers & Consulting Service, Provo, Utah).

A multistage-multijet air sampler is described which automatically classifies air-borne particles according to their aerodynamic dimension, which is the only true measure of lung penetrability. The standard instrument, with six 400-jet stages, has been calibrated with unit density spheres with respect to the particle sizes collected on each stage. Since "the selective action of the respiratory system in dealing with dust particles of different aerodynamic sizes is well known," assessments of the health hazard of any sample can be made with the instrument. The small jets make possible the collection of particles at lower jet velocities, on uncoated plates, with sharper particle size discrimination.
R 13

31,158
Chiantella, A.J., Smith, W.D., Umstead, M.E. & Johnson, J.E. AROMATIC HYDROCARBONS IN NUCLEAR SUBMARINE ATMOSPHERES. Amer. Industr. Hygiene Assoc. J., March-April 1966, 27(2), 186-192. (USN Research Lab., ONR, Washington, D.C.).

An analytical study has been directed to the identification and determination of individual aromatic hydrocarbons present in nuclear submarine atmospheres in concentrations of parts per million or less. Hydrocarbon oil samples were desorbed from activated carbon which had been exposed in submarine atmospheres. The aromatic hydrocarbon content of these oils was approximately 25 to 30% of the total. The quantitative distributions of individual aromatic hydrocarbons found in submarines were strikingly similar to those of typical petroleum distillates in the same boiling range. Several commercial petroleum products were studied as possible sources of hydrocarbons in submarine atmospheres.
R 11

31,159
Snook, S.H. & Irvine, C.H. THE EVALUATION OF PHYSICAL TASKS IN INDUSTRY. Amer. Industr. Hygiene Assoc. J., May-June 1966, 27(3), 228-233. (Liberty Mutual Insurance Company, Hopkinton, Mass.).

The evaluation of physical tasks in terms of fatigue has often been based on their effect on the "average man," thus serving to protect only half of the population from excessive fatigue. The concept of group work capacity is proposed as a technique for task evaluation which includes the entire population. It is defined as the percentage of workers that can perform a task without showing physiological signs of fatigue. An experiment that investigates 30 different lifting tasks is described. Thirty Ss were used, and group work capacity was estimated for each task by 3 different methods. The application of the results to industrial situations is discussed.
R 11

31,160
White, J.M. & Beal, R.J. THE MEASUREMENT OF LEAKAGE OF RESPIRATORS. Amer. Industr. Hygiene Assoc. J., May-June 1966, 27(3), 239-242. (Atomic Energy of Canada Limited, Chalk River, Ontario, Canada).

Four types of respirators used at Chalk River Nuclear Laboratories were tested for leakage on personnel who frequently wear them during their work. The method involves wearing the respirator in an atmosphere containing submicron particles of sodium chloride then measuring, by means of a flame photometer, the sodium content of the exhaled breath. About 60 full-face and 100 oronasal filter respirators were tested. Smaller numbers of supplied-air masks and the facepieces of self-contained breathing apparatus were also checked. Results indicated that some Ss wearing full-face respirators which they fitted themselves experienced leakage around the facepieces amounting to as much as 5% of the inspired air. Facepiece leakage with oronasal respirators exceeded 20% of the inspired air in some instances. Neither type of air-supplied device leaked significantly as long as the air supply was adequate.
R 3

31,161
Blum, H.F. ON HAZARDS OF CANCER FROM ULTRAVIOLET LIGHT. Amer. Industr. Hygiene Assoc. J., May-June 1966, 27(3), 299-302. (US National Cancer Institute, Department of Health, Education & Welfare, Bethesda, Md.).

Direct quantitative comparison cannot be drawn between experimental induction of cancer in laboratory animals with ultraviolet light and the hazard of skin cancer in man resulting from this agent. Reasons for this are: a) the very different optics in the two cases, ultraviolet light penetrating to deeper tissues in mice than in man and hence producing different types of cancer; b) quantitatively indeterminable biologic differences between man and experimental animals; c) the fact that reliable statistics permitting comparison of incidence of skin cancer with incidence of exposure to ultraviolet B of sunlight are sparse and difficult to obtain. The cumulative carcinogenic effect of repeated doses, clearly shown in animal experiments, makes it important to consider this hazard in terms of repeated exposure, whether to sunlight or to artificial sources of ultraviolet light or to a combination of both, rather than in terms of the magnitude of single doses.
R 10

31,162
Hurtado, A. MAN AND ALTITUDE. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 313-320. (High Altitudes Research Institute, Peruvian University "Cayetano Heredia," Lima, Peru).

Medical research at high altitudes still offers many valuable and interesting possibilities. From a physiological point of view much has been advanced in the understanding of the adaptative mechanisms responsible for an adequate tolerance to a condition of hypoxia, and also in the appreciation of the differences existing between acquired acclimatization, which concerns newcomers and temporary residents at high altitudes, and the so-called natural acclimatization related to the characteristics and processes found in subjects born and raised in this environment. However, important gaps remain to be filled in our knowledge of these problems. One aspect is the need for further data about the nature of tissular chemical processes which participate in the respiratory functions at cell level and in the production of energy. The importance of genetic factors in acclimatization to high altitudes has also not been studied. It is not known to what extent a man born at high altitudes brings to this environment inherited characteristics, to be added to those developed when contact with hypoxia is established at birth. The fact cannot be ignored that a native man in these regions has, retrospectively, thousands of years of continuous exposure. The influence of a high-altitude environment, and of the consequent hypoxia condition, on the incidence, evolution, and prognosis of certain diseases constitutes a problem which still awaits research interest. It is not known if immunological processes are subject to certain modifications, and in this regard there are some challenging observations. In summary, high-altitude research is not an isolated activity in scientific medicine. It also has general implications, closely related to many broad aspects in basic sciences and clinical practice.
R 21

31,163
Zenz, C. & Berg, B.A. PHYSIOLOGICAL FATIGUE AND ENERGY EXPENDITURE OF PRODUCTION MACHINE OPERATORS. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 321-322. (Allis-Chalmers Manufacturing Company, Milwaukee, Wisc.).

Typical small drill press and milling machine operations were studied with standard ergonomic techniques. Continuous recordings of heart rate, respiratory minute volume, and oxygen consumption were made, with healthy workers as subjects. No technical drawbacks were noted, and these studies will be extended to include other machine operations.
R 6

31,164
Campbell, E.E. & Ide, H.M. AIR SAMPLING AND ANALYSIS WITH MICROCOLUMNS OF SILICA GEL. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 323-331. (Health Div., Los Alamos Scientific Laboratory, Los Alamos, N.M.).

This paper describes a simple microcolumn of silica gel, its behavior under experimental conditions and its applicability to air sampling. Data are presented for the ultraviolet spectral absorbance analysis of selected aromatic hydrocarbons, using a base line correction for background interference. The problems of direct silica gel elution and ultraviolet spectrophotometry are discussed, and resolution of the particulate background problem by base line calculations is shown. The silica gel microcolumn is proved simple, practical, and highly efficient for sampling air contaminants. Although only spectrophotometric analysis of eluates is reported here, other methods of analyzing the sorbed contaminant are suggested.
R 5

31,165
Fitzpatrick, G.R., Bracken, J., O'Brien, Mary J., Wentling, L.G., et al. PROGRAMMING THE PROCUREMENT OF AIRLIFT AND SEALIFT FORCES: A LINEAR PROGRAMMING MODEL FOR ANALYSIS OF THE LEAST-COST MIX OF STRATEGIC DEPLOYMENT SYSTEMS. Report from: "American Meeting of the Institute of Management Science, Dallas, Texas, 17 Feb. 1966." RAC Paper RAC P 17, Sept. 1966, 16pp. Research Analysis Corporation, McLean, Va. (AD 652341)

A linear programming model for analyzing the strategic deployment mix of airlift and sealift forces and prepositioning to accomplish the composite requirements of a complex of possible contingencies is described in this paper. It solves for the least-cost mix of deployment means capable of meeting any one of a spectrum of contingencies, or meeting simultaneous contingencies. The model was developed by RAC as part of the US Army's study program and has been used in analyses of deployment systems conducted in support of the Joint Chiefs of Staff and the Office of the Secretary of Defense. Results of analyses have influenced the preparation of long-range plans as well as the formulation of the FY67 Department of Defense budget. The paper gives the background and assumptions of the model, describes the model by means of a simple hypothetical example followed by a selected subset of a complete version, and discusses how the model is used.

31,166
Riley, E.C., Fassett, D.W. & Sutton, W.L. METHYLENE CHLORIDE VAPOR IN EXPIRED AIR OF HUMAN SUBJECTS. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 341-348. (Industrial Medicine Lab., Eastman Kodak Company, Rochester, N.Y.).

The results of experimental studies of methylene chloride vapor in expired air of human Ss exposed to low, well-controlled concentrations of solvent vapor are presented. Analysis of the expired air data reveals that methylene chloride is excreted principally in the expired air. The rates of "buildup" and "die-away" of the vapor in the expired air are suggested as indicators of the distribution of the solvent in body tissues.
R 8

31,167
Booth, R.A., Gould, A.V., LaMar, S.A., Regan, L.G., et al. COST ANALYSIS OF SUPERSONIC TRANSPORT IN AIRLINE OPERATION, VOLUME I. Contract FA SS 66 12, RAC Rep. 20, Dec. 1966, 156pp. US Office of Supersonic Transport Development, FAA, Washington, D.C. (Research Analysis Corporation, McLean, Va.). (AD 652311)

During the second phase of the supersonic transport (SST) development the Research Analysis Corporation (RAC) assisted the Federal Aviation Agency (FAA) in an investigation and analysis of the economic feasibility of the aircraft. This effort was completed 31 December 1966. Supersonic aircraft operation was simulated by RAC through use of a cost model structured to reflect the environmental (physical and social) elements to be encountered by the airlines in 1980. These operating costs served as input to the FAA economic model designed for use in determining the investment return to be realized as a result of SST development and usage. RAC study results indicate that the SST will exceed the seat-mile costs of advanced subsonic aircraft by 5 percent on international routes of 3500 statute miles and by 20 percent on the 1500-mile domestic distance. Ground stop time, curfew restrictions, and scheduling constitute major restraints on hour-per-day utilization of aircraft. A utilization level of 8.5 hours per day was projected for airline operation of the SST. In relation to SST operating costs the most critical element concerns the amount of supersonic flight allowable. The necessity for subsonic cruise, because of the sonic boom restriction, adds measurably to supersonic aircraft operational expense.
R Many

31,168
Trasko, Victoria M. (Chm.). RESURVEY OF INDUSTRIAL HYGIENE SERVICES IN INDUSTRY. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 369-378.

The analysis just presented is a summary of replies to the questionnaire received from 105 respondents. A comparison with the 1956 survey shows relatively little change in administrative practices for providing industrial hygiene services, general activities of industrial hygienists and availability of equipment and laboratory facilities. A major difference between the two surveys is the considerably larger number of space and nuclear industries employing industrial hygiene personnel and responding in the 1965 survey. The questionnaire replies suggested a certain fuzziness as to who comprised the industrial hygiene unit. This is probably due to the organizational pattern of the companies for providing such services, involvement in research and development activities, sharing of functions with other plant personnel, and performing activities not directly related to worker health. The resurvey disclosed a higher proportion of industrial hygienists associated with a plant safety organization than was found in the 1956 survey. Conversely, it also disclosed a relatively extensive degree of reliance on safety and other plant personnel for performing functions that traditionally fall to industrial hygienists. This may be accounted for by shortage of industrial hygienists, the relatively high degree of control of hazardous situations in large industry, and the realization that certain routine functions can be performed adequately by personnel trained for special activities, thus freeing the industrial hygienist for other responsibilities. An increased interest by industries in consolidating industrial hygiene with safety may also be reflected. On the other hand, comments indicated that some companies still need to be sold on the need for routine supervision of potentially hazardous situations and that their solution requires the competency of trained industrial hygienists. It is believed that owing to limitations inherent in a mail questionnaire survey, the full implication of changing industrial technology and economy and its effect on the profession of industrial hygiene was not adequately brought out in the resurvey. R 1

31,169
Barrett, J.C., Bennett, R. & Buckmaster, J. AUTOMATIC CARBON MONOXIDE MONITOR. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 402-406. (Occupational Health Div., Michigan Department of Public Health, Lansing, Mich.).

Michigan's Division of Occupational Health has a unique instrument for continuously monitoring and recording carbon monoxide concentrations. Maximum concentration recorded is 200 ppm, with a sensitivity of ± 2 ppm. Built in are automatic circuits allowing the instrument to purge, check zero reading, and check upscale (185 ppm) calibration once every 12 hours. All components are housed in an aluminum case 13 3/4 by 31 3/4 by 17 3/4 inches, weighing 105 pounds. It is possible for one engineer to transport it and set it up. One year's field experience has shown that the instrument is reliable and will operate in the field up to 36 hours, with minimum supervision.
R 5

31,170
Stoddard, D.L. ENVIRONMENTAL HEAT STUDIES. Amer. Industr. Hygiene Assoc. J., July-Aug. 1966, 27(4), 407-413. (Agricultural Research Lab., University of Tennessee-Atomic Energy Commission, Oak Ridge, Tenn.).

Several methods of evaluating industrial heat stress were investigated in relation to actual industrial heat problems. The method adopted was that proposed by Belding and Hatch. Their method was useful in: a) offering a formula whereby the heat stress could be predicted prior to workers being exposed; b) indicating clearly the factors contributing most to the heat stress and thus enabling an engineer to determine quickly those factors that could be varied with the best results in reducing the stress; and c) making it possible, under conditions where the stress could not be appreciably reduced, to estimate prior to job exposure safe working time for employees exposed to the stress. When applied to the manikin, the formula made it possible to determine, in advance, the margin of protection that the air-cooled suit would afford under a given set of conditions. The use of an air-conditioned recovery room at hot jobs not only will make recovery from each individual heat exposure more complete but will make it possible to work day after day in hot environments with a minimum loss of manpower.
R 5

31,171
Key, M.M., Ritter, E.J. & Arndt, K.A. CUTTING AND GRINDING FLUIDS AND THEIR EFFECTS ON THE SKIN. Amer. Industr. Hygiene Assoc. J., Sept.-Oct. 1966, 27(5), 423-427. (US Public Health Service, Occupational Health Div., Cincinnati, Ohio).

Although improvements in formulations of cutting and grinding fluids have been made, occupational dermatitis can still be a problem. Oil acne and folliculitis are the most common cutaneous problems of those who work with insoluble oils. Bacteria in lubricating coolants may contribute to breakdown of the coolant but are unrelated to outbreaks of folliculitis. The chief problem which results from exposure to soluble oils and synthetic coolants is eczematous contact dermatitis, a disease of multiple causation. These two important skin diseases as well as several minor ones associated with exposure to lubricating coolants can be prevented by measures designed to minimize contact and to improve personal hygiene.
R 41

31,172
Lynch, J.R. & Ayer, H.E. MEASUREMENT OF DUST EXPOSURES IN THE ASBESTOS TEXTILE INDUSTRY. Amer. Industr. Hygiene Assoc. J., Sept.-Oct. 1966, 27(5), 431-437. (US Public Health Service, Occupational Health Div., Cincinnati, Ohio).

Data obtained from environmental surveys of nine asbestos textile mills, which represent the baseline for the textile segment of the Public Health Service epidemiological study of asbestos processing industries, are presented. From these data concentration ranges are derived which yield significant differences between typical sample groups. Variance ratio tests of different methods of counting and analysis were made and count weight ratios based on magnesium analyses for asbestos were calculated.
R 13

31,173
Green, F.L. USES AND SAFETY ASPECTS OF THE LOW-ENERGY SOURCE YTTERBIUM-169. Amer. Indust. Hygiene Assoc. J., Sept.-Oct. 1966, 27(5), 444-448. (Viso Corporation, Burlington, Mass.).

The radioactive source ytterbium-169 emits a 52-kev characteristic x-ray and various gamma rays with energies from 65 kev to 310 kev. Ytterbium sources in small exposure units weighing about 20 pounds are useful for radiography of castings, weldments, assemblies, and other forms of various materials, such as sluminum, magnesium, iron, plastics, and wood. Radiography with Yb^{169} produces no hazard from electrical shock or explosion. Radiation scattered from air, the object, and surrounding materials is less with Yb^{169} than with conventional x-ray sources, Ir^{192}, or Co^{60}. Therefore, portable radiographic applications can be made with less difficulty in protection of personnel.
R 6

31,174
Breslin, A.J. SOLVING AIR CONTAMINATION PROBLEMS THROUGH DIAGNOSTIC AIR SAMPLING. Amer. Industr. Hygiene Assoc. J., Sept.-Oct. 1966, 27(5), 460-468. (US Health & Safety Lab., AEC, New York, N.Y.).

Air sampling can be used as an effective diagnostic tool for the identification of predominant sources of contamination, the proper selection of contaminant control methods, and the regulation of occupational exposures. The diagnostic approach in air sampling entails the discernment and interpretation of either location-dependent or time-dependent patterns of contamination or a combination of both. The effort required to distinguish the patterns varies widely, depending on the dominance of the patterns over normal fluctuations in background concentrations of the air contaminant. Examples are cited, covering a range of applications, from the collection of a few samples for the detection of dominant time or location exposure patterns to the use of multisampler arrays at varying time collection intervals.
R 3

31,175
Garner, W.R. TO PERCEIVE IS TO KNOW. Amer. Psychol., Jan. 1966, 21(1), 11-19. (Johns Hopkins University, Baltimore, Md.).

This paper is a progress report of research on perception in the broad sense. The experiments reported are chosen with the expectation that they will illustrate 3 aspects of perception. These 3 aspects are: First, and most general, to perceive is to know. Perceiving is a cognitive process involving knowing, understanding, comprehending, organizing, even cognizing. Most of our current research on the topic would suggest that perceiving is responding, naming, discriminating, and analyzing. Second, the factors known in perception are properties of sets of stimuli, not properties of individual stimuli. Third, to perceive is an active process, one in which the perceiver participates fully. The perceiver does not passively receive information about his environment; rather, he actively perceives his environment. Nor does he simply impose his organization on an otherwise unstructured world--the world is structured. But he does select the structure to which he will attend and react, and he even provides the missing structure on occasion. In particular, as we shall see, the perceiver provides his own total set and subset when these do not physically exist.
R 7

31,176
Dill, D.B. ASSESSMENT OF WORK PERFORMANCE. J. sports Med. phys. Fitness, March 1966, 6(1), 3-8. (Anatomy & Physiology Dept., Indiana University, Bloomington, Ind.).

Methods used for assessing work performance on the bicycle ergometer are described. Sources and costs of essential items of equipment are given. Particular emphasis is placed on economy, mobility, reliability and ruggedness making the assembly suitable for environmental field studies. Examples are given of a steady state experiment and of a "Balke" test with a work increment of 150 kpm/min. each minute to the limit of the subject's capacity.

31,177
Rougier, G. & Babin, J-P. GLYCEMIA AND MUSCULAR EXERTION. J. sports Med. phys. Fitness, March 1966, 6(1), 9-22. (Institute of Physical Education, Bordeaux, France).

The results are given of 140 experiments carried out on 45 healthy subjects. Each experiment consisted of a certain number of blood sugar measurements, before, during and after muscular efforts of differing intensity and duration. The efforts consisted of running on a treadmill, pedalling an ergostat, and of sporting activities (training or competitive). They can be classed as short efforts, medium efforts, long efforts and exhausting efforts. From a study of the results the following conclusions were reached: a) Muscular activity of an intensity and duration corresponding to those habitually achieved by a man practising a sport has only a moderate effect on the blood sugar level; b) Only prolonged exercises exceeding the extent of those habitually performed are accompanied by a clear and regular hypoglycemia; c) On the other hand, a tendency towards hyperglycemia appears whenever the effort includes a marked emotional content; d) In any case, the very great variability of the glycemic response from one subject to another, as well as from one occasion to another in the same subject, means that any attempt to explain these reactions must be extremely cautious.
R 35

31,178
Shephard, R.J. ON THE TIMING OF POST-EXERCISE PULSE READINGS. J. sports Med. phys. Fitness, March 1966, 6(1), 23-27. (Physiological Hygiene Dept., University of Toronto School of Hygiene, Toronto, Ontario, Canada).

The optimum timing of pulse measurements for the prediction of cardiovascular "fitness" varies with the intensity of exercise performed. If the subjects are exercised maximally, the largest correlations between pulse rate and directly measured oxygen consumption occur 2-3 min. after exercise, but the optimum time is progressively advanced as the intensity of exercise is decreased. At the more moderate effort recommended for the Åstrand nomogram, approximately equal correlations are obtained during and immediately following exercise. The possibility of a revised nomogram, based on palpable post-exercise pulse readings, is suggested.
R 16

31,179
Häntzschel, K. & Dohrn, K. THE ELECTROCARDIOGRAM BEFORE AND AFTER A MARATHON-RACE. J. sports Med. phys. Fitness, March 1966, 6(1), 28-32. (Center of Sports Medicine, Karl-Marx-Stadt, Germany).

In more than half of the electrocardiograms (ECGs) of Marathon-runners, taken in the pre-start phase, no alterations nor effects of an increased vagotonus like bradycardia, prolongation of PQ-interval, ST-alterations, were found. The most frequent and normal alterations in the pre-start phase seemed to be enlargement of the P- and T-waves with shift of the transition-zone to the left and slight respiratory arrhythmia. Within 20 minutes after the race all these alterations increase, except respiratory arrhythmia. One hour later only alterations of the P- and T-waves were visible in some cases. There did not exist typical alterations in the ECG after exhausting muscular work. There were no significant differences in the ECGs between the best and the last competitors.
R 6

31,180
Homola, D., Rous, J., Srnova, V. & Vank, L. A CHANGING PICTURE OF VENTRICULAR PRE-EXCITATION IN A FIRST-CLASS SWIMMER. J. sports Med. phys. Fitness, March 1966, 6(1), 33-37.

In an excellent swimmer without organic heart disease a pre-excitation of the type of C-L-C syndrome was found, which in the sympatol test changed to a ventricular form of the W-P-W syndrome or to idioventricular rhythm. No similar case has ever been described. The mechanism of mutual transitions of both these pictures of pre-excitation was discussed; up to this time these two conditions were supposed to be two different and completely independent electrocardiograph and clinical entities.
R 18

31,181
Raab, W. TRAINING, PHYSICAL INACTIVITY AND THE CARDIAC DYNAMIC CYCLE. J. sports Med. phys. Fitness, March 1966, 6(1), 38-47. (Cardiovascular Research Unit, University of Vermont College of Medicine, Burlington, Vt.).

Methods of measurement, nomenclature and data concerning the left ventricle's systolic dynamic cycle and its subdivisions are briefly reviewed from the international literature. Under standard conditions the length of the total isometric tension period (TP) and of the isometric contraction period (ICP) reflects the degree of sympathetic adrenergic (catecholamine-mediated) inotropic and metabolic activity in the left ventricle. Physical training results in an antiadrenergic prolongation of TP (and ICP) whereas lack of physical activity causes an adrenergic shortening of these parameters at rest, and its exaggeration under certain stresses. The value of muscular training in the prevention of hypoxic ("coronary" or "ischemic") degenerative heart disease rests primarily in the abolition of oxygen-"wasting" adrenergic preponderance in myocardial metabolism.
R 75

31,182
Odell, F.A. THE APPLICATION OF FLASH X-RAYS SYSTEMS TO SPORTS MEDICINE AND EXERCISE PHYSIOLOGY. J. sports Med. phys. Fitness, March 1966, 6(1), 48-54. (Field Emission Corporation, McMinnville, Ore.).

The recent development of high-speed flash x-ray devices now makes it possible to do stop-motion studies which will open up new vistas in sports medicine and exercise physiology. Like the high-speed flash camera in its stop-motion capability, the flash x-ray can "see through" objects in motion and can expose an x-ray film in times as short as 30 nanoseconds. The detailed mechanics of body injuries can be studied dynamically including the effectiveness of protective devices such as helmets.
R 3

31,183
Carlile, F. & Carlile, Ursula. PROBLEMS OF COMPETING AT MEXICO CITY. J. sports Med. phys. Fitness, March 1966, 6(1), 55-61. (University of Sydney, Sydney, Australia).

A consideration is made of various physiological factors which may affect performances at the 1968 Olympic Games in Mexico City. Reference is made to known relevant research and questions of geographical acclimatization, general stress of rarified atmosphere, training tempo, food and water, and mental attitude. It is concluded that the evidence points to the need of from 3 to 4 weeks training at about 7500 feet (the altitude of Mexico City) before athletes should be expected to give their best performances.
R 5

31,184
Behnke, A.R. & Royce, J. BODY SIZE, SHAPE, AND COMPOSITION OF SEVERAL TYPES OF ATHLETES. J. sports Med. phys. Fitness, June 1966, 6(2), 75-88. (University of California Medical Center, San Francisco, Calif. & University of California, Berkeley, Calif.).

Procedures are available to provide a quantitative description of body size, shape, and composition ranging from the simplicity of tape measures to the complexity of the K^{40} counter. In this paper the emphasis is on estimating body weight, lean body weight and fractionation of body weight (somatogram) by the use of anthropological measurements. The (quantitative) data obtained will serve as an introductory description of several types of athletes, chiefly distance runners, basketball players and weight lifters. The techniques outlined have potential value for the selection of men for various sport disciplines. The knowledge of body composition can be useful in definitive evaluation of physical potential.
R 18

31,185
Medved, R. BODY HEIGHT AND PREDISPOSITION FOR CERTAIN SPORTS. J. sports Med. phys. Fitness, June 1966, 6(2), 89-91. (Association Jougoslave de Medecine Sportive, Zabreb, Yugoslavia).

Relationships between body height and predisposition for certain sports are discussed on the basis of personal experience of numerous cases in different sports.
R 1

31,186
Banister, E.W., Cureton, T.K., Abbott, B.C. & Pollard, J.W. A COMPARATIVE STUDY OF THE BRACHIAL PULSE WAVE AND ITS TIME DERIVATIVES AMONG ATHLETIC, NORMAL AND PATHOLOGICAL SUBJECTS. J. sports Med. phys. Fitness, June 1966, 6(2), 92-99. (University of Illinois, Urbana, Ill.).

An apparatus has been devised to record simultaneously the brachial pulse wave contour and its two time derivatives together with the ballistocardiogram, electrocardiogram, and arterial blood pressures, heartometer records. The latter (heartometer recordings) were obtained by separate tracings. Records of athletes, of sedentary and trained middleaged men, and of subjects with cardiac disease were compared and showed distinct qualitative and quantitative differences. The nature of differentiating the brachial pulse wave and its value in analysing more critically simple physiological data may provide a useful method for further investigation, of problems in hemodynamics.
R 14

31,187
Ikai, M. WORK CAPACITY OF THE JAPANESE RELATED TO AGE AND SEX. J. sports Med. phys. Fitness, June 1966, 6(2), 100-105. (Physiologic Research Lab., University of Tokyo School of Education, Tokyo, Japan).

The work capacity was evaluated by measuring the energy output qualitatively and quantitatively in Japanese boys and girls from 6 to 20 years of age. The muscular power was measured by the "inertia ergometer" originally devised by A.V. Hill, and the relation between the power and the isometric muscular strength was discussed. The muscular endurance was measured by hand, arm and leg ergometer with the load of 1/3 of the maximum strength. The general endurance was measured by the "maximum running time on the treadmill" on one hand, and by the "respiro-circulatory response" to the 5 minutes running on the treadmill with submaximal load on the other hand. The aerobic maximum work capacity was estimated by measuring the maximum oxygen intake as well as the cardiac output in exhaustive running on the treadmill. The work capacity was discussed as the integral function of the body.
R 7

31,188
Journal of Sports Medicine and Physical Fitness. STANDARDIZATION OF PHYSICAL FITNESS TESTS. J. sports Med. phys. Fitness, June 1966, 6(2), p106.

At the Games of the 18th Olympiad in Tokyo, Japan, the Fédération Internationale de Médecine Sportive (FIMS) conducted the International Congress of Sport Sciences (ICSS). During the congress a committee on the Standardization of Physical Fitness Tests (ICSPFT) was appointed and requested to set standards and to construct instruments for the measurement of physical fitness.

31,189
Ikai, M., Kagaya, H., Yoshizawa, S. & Nakagawa, K. PHYSIOLOGICAL SIGNIFICANCE OF ENDURANCE IN DISTANCE AND MARATHON RUNNERS. J. sports Med. phys. Fitness, Sept. 1966, 6(3), 158-162. (University of Tokyo School of Education, Tokyo, Japan).

In order to study the physiological function in exercise, some observations on respiration and circulation were carried out during treadmill running. Elite and untrained athletes served as subjects. Percentage of increase of heart rate and recovery of heart rate were found to be a useful index of endurance. Decrease in respiratory efficiency was a limiting factor of endurance. It was concluded that decrease in respiratory efficiency was caused by a decreased alveolar ventilation due to respiratory movement rather than decrease in cardiac output.
R 3

31,190
Morehouse, L.E. & Beckman, E.L. EXERCISE TOLERANCE OF SEALAB II AQUANAUTS. J. sports Med. phys. Fitness, Sept. 1966, 6(3), 163-165. (Human Performance Lab., University of California, Los Angeles, Calif. & USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.).

Aquanaut teams of 10 men aged 25-38 lived and worked for 2 week periods in a depth of 205 feet on the edge of the Scripps Canyon off La Jolla, California during September and October 1965. In SEALAB II, the cabin environment consisted of the following atmosphere: Temperature: 82-88°F; Humidity: 60-80%; Pressure: 92.8 p.s.i.; Gas composition: 79% helium, 17% nitrogen, 4% oxygen. Exercise tolerance was monitored by a test in which the cardiac pulse frequency and pulmonary respriatory frequency was measured before and immediately after a barbell lifting exercise. The pre-exercise pulse frequency and respiratory frequency remained fairly constant or declined slightly during the SEALAB exposure. The pulse and respiratory response to the test exercise was unchanged in all Ss except two who showed some reduction in post-exercise pulse frequency and two others who showed some reduction in post-exercise respiratory frequency when the first two and last two test scores are compared. From these data it may be concluded that exercise tolerance did not deteriorate during 9 days in the SEALAB II environment. If fatigue was present it was either not of the type, or not of sufficient magnitude to affect physical work performance capacity.

31,191
Arstila, M. & Koivikko, A. ELECTROCARDIOGRAPHIC AND VECTORCARDIOGRAPHIC SIGNS OF LEFT AND RIGHT VENTRICULAR HYPERTROPHY IN ENDURANCE ATHLETES. J. sports Med. phys. Fitness, Sept. 1966, 6(3), 166-175. (University of Turku, Turku, Finland).

The electrocardiograms of endurance athletes have many features which are rarely seen on study of normal populations. In the present study the vector loops and xyz lead ECGs were registered, according to Frank's system of vectorcardiography. These and standard 12 lead ECGs were analyzed with the aid of the most recent criteria. The material consisted of 46 endurance athletes, all of which were selected for special training for the Tokyo and Innsbruck Olympic Games. As a group, endurance athletes exhibit more quantitative than qualitative ECG abnormalities. However, individual sportsmen, often show peculiarities in the ECG which may be difficult to interpret if the background of hard training is not known. In addition to signs of hypertrophy, intraventricular conduction defects of minor degree were frequently observed and in at least three instances the ECG signs were similar to those of myocardial infarction. These findings have little medical interest when occurring in young, symptom-free athletes, but already at late middle age, these abnormalities might be erroneously diagnosed. It is therefore important to study the ECG of endurance athletes at regular intervals.
R 23

31,192
Van Uytvanck, P. & Vrijens, J. INVESTIGATIONS ABOUT SOME BODY-CIRCUMFERENCE-MEASUREMENTS FOR THE APPRECIATION OF PHYSICAL FITNESS IN ADOLESCENCE. J. sports Med. phys. Fitness, Sept. 1966, 6(3), 176-182. (University of Ghent, Ghent, Belgium).

The purpose of this study on robustness is to specify some morphological and physiological characteristics of breadth-development and to explain them. With that aspect in mind, the relation of the circumference-measurements of the left thigh, of the left upper arm, and of the chest to some functional aspects of robustness have been examined. In the morphological observations, 20 adolescents of the same age and the same height were divided into a more robust and a more weak group by means of the index of Kaup. Between the two groups not only a significant difference in weight was noticed, but also a corresponding difference in the circumference measurements on the chest and on the legs. The difference in weight results only for a small part in the thickness of the superficial fat-layers, but chiefly in the greater development of muscles and internal organs. The comparative study demonstrates that the robust adolescent has not only the greatest chest girth but also the greatest heart volume. Besides he obtained the least working-pulse-sum for a determined work load. It is known that with sound adolescents a great heart-volume signifies a good working capacity; the same can be said for a slow heart frequency by moderate work. Since a linear relation exists between heart-volume and maximal stroke-volume, it can be presumed that the robust boy reacts to work with a greater stroke volume and a slower frequency: this cardio-vascular reaction is the most efficient working-adaptation.
R 28

31,193
Field, W.H. & Lachman R. INFORMATION TRANSMISSION (I) IN RECOGNITION AND RECALL AS A FUNCTION OF ALTERNATIVES (k). J. exp. Psychol., Dec. 1966, 72(6), 785-791. (New York State University, Buffalo, N.Y.).

Information transmission (I) in free recall has been reported as equal or superior to I in recognition where it is assumed that the number of response alternatives scanned (k) in recall is established by describing the stimulus population to S. The present study was designed to yield values of k by estimating the actual number of stimuli scanned during recall and to compare resulting values of I. The results suggest : a) The number of symbols scanned can be manipulated by instructions and different values of k may be appropriate for different recall instructions; b) As S becomes more familiar with characteristics of the stimulus population, more response alternatives become available for scanning during recall and the appropriate value of k increases; c) Manipulation of k through instructions has subtle effects on recall raw scores; d) Depending on the value of k used to calculate I for recall, I can be larger or smaller for recall vs. recognition; e) The value of k used to compute I in free recall, was grossly overestimated in previous research; f) When I is calculated from a value of k that appears to the best estimate of scanning in conventional free recall, more information is transmitted in recognition than in free recall.
R 6

31,194
Gottsdanker, R. & Way, T.C. VARIED AND CONSTANT INTERSIGNAL INTERVALS IN PSYCHOLOGICAL REFRACTORINESS. J. exp. Psychol., Dec. 1966, 72(6), 792-804. (University of California, Santa Barbara, Calif.).

Choice responses to 2 successive signals were made by 8 young men with both randomly varied and constant intersignal intervals, ranging from 50 to 800 msec. "Delay" interpretations of psychological refractoriness were disconfirmed by quantitave tests, and evidence was against grouping explanations of this failure. The extent to which refractoriness is related to time uncertainty was not established definitively. Although reaction time (RT_2) was lengthened with short constant intervals, and less degree than with varied intervals, the values of RT_2 for the constant condition are suspect because of the marked variation of RT_1 with interval. The "organization-persistence" prediction of higher RT_2 when opposite responses were required to the 2 signals was not realized, possible because of expectation of reversals.
R 19

31,195
Lappin, J.S. & Eriksen, C.W. USE OF A DELAYED SIGNAL TO STOP A VISUAL REACTION-TIME RESPONSE. J. exp. Psychol., Dec. 1966, 72(6), 805-811. (University of Illinois, Urbana, Ill.).

In a visual RT (Reaction Time) experiment, 5 male Ss were each confronted with 2 lights and instructed to respond to 1 light but not respond when both lights occurred. The onset of the 2 lights was made asynchronous by 0, 12, 33, or 63 msec. Probability of inhibiting the response declined markedly for each delay and increased with RT. It was concluded that choice RT is correlated with the extent of the stimulus information processing and the duration of effective stimulation which has preceded initiation of the motor event.
R 21

31,196
Bahrick, H.P. & Reynolds, Nancy. RETROACTIVE INHIBITION AND THE SENSITIVITY OF DICHOTOMOUS INDICANTS. J. exp. Psychol., Dec. 1966, 72(6), 812-819. (Ohio Wesleyan University, Delaware, Ohio).

Absolute and relative retroactive inhibition (RI) are compared for an easy and a difficult recognition task and a recall task, after 2 degrees of original learning (OL). Contrary to previous conclusions, it is shown that RI can increase or decrease with increased OL, and that recognition tasks may show larger or smaller amounts of RI than recall tasks. RI is accounted for as a combined function of task difficulty and the degree of training. These variables determine sensitivity of measurement by their effect upon the control group's distribution of associative strength in relation to the threshold of recall or recognition at the end of the retention interval. Measuring RI in ebbs is shown to be useful in minimizing these artifacts, but may introduce other artifacts.
R 13

31,197
Van Twyver, H.B. & Kimmel, H.D. OPERANT CONDITIONING OF THE GSR WITH CONCOMITANT MEASUREMENT OF TWO SOMATIC VARIABLES. J. exp. Psychol., Dec. 1966, 72(6), 841-846. (University of Florida, Gainsville, Fla. & Ohio University, Athens, Ohio).

An attempt was made to determine whether operant galvanic skin response (GSR) conditioning depends upon changes in somatic responses. The Ss were 21 pairs of college students who received either contingent or noncontingent reinforcement during a reinforcement period. A 10-minute rest period was followed by 16 minutes of reinforcement and then 10 minutes of extinction. In addition to the GSR, respiration rates and electromyograms (EMGs) were recorded. Ss receiving contingent reinforcement increased significantly in GSR rates during acquisition while a noncontingent group declined slightly. A significant Contingency X Minutes interaction was also found for GSR rates during this period. During reinforcement, there were no statistically significant differences between groups in respiration rate, forearm movements, or frequency of breathing irregularities. Subtraction of all somatic associated GSRs resulted in no attenuation of the conditioning effect. During extinction the contingency effect reached significance only after subtraction of all movement associated GSRs. The results were interpreted as evidence that the GSR may be operantly conditioned in the absence of somatic mediation.
R 6

31,198
Wickelgren, W.A. ASSOCIATIVE INTRUSIONS IN SHORT-TERM RECALL. J. exp. Psychol., Dec. 1966, 72(6), 853-858. (Massachusetts Institute of Technology, Cambridge, Mass.).

Thirty Massachusetts Institute of Technology undergraduates listened to a list of 9 letters presented at the rate of 4 letters per second and then attempted to recall the letters in order. Some lists contained repeated letters, and some did not. The letters following repeated letters tended to be substituted for each other in recall, by comparison to the frequency of confusing letters in the same positions of lists without repeated letters. Such substitutions were called "associative intrusions," and the associative-intrusion phenomenon was observed whether the repeated letters occurred at the beginning or the middle of the list, whether 1 or 2 items separated the repeated letters, and whether the items following the repeated items did or did not have a vowel phoneme in common. The results were interpreted as supporting an associative theory of short-term memory.
R 5

31,199
Bevan, W., Bell, R.A. & Taylor, C. CHANGES IN RESPONSE LATENCY FOLLOWING SHIFTS IN THE PITCH OF A SIGNAL.. J. exp. Psychol., Dec.1966, 72(6), 864-868. (Kansas State University, Manhattan, Kan.).

A set of 3 experiments, involving a total of 516 Ss, examined response latencies to a tone following an adaptation series of 20 tones. The results indicate response time to increase to a maximum as the pitch of the test tone differed from the pitch, or average pitch, of the preceding series. Larger differences resulted in a return of the response latency to the level of the series. Increases in latency were greater following a variable-pitch than following a constant-pitch series. In addition, changes in latency were found to be minimal when the pitch of the test signal coincided with the mean, as compared to the mode or midrange, of the adaptation series.
R 3

31,200
McBurney, D.H. MAGNITUDE ESTIMATION OF THE TASTE OF SODIUM CHLORIDE AFTER ADAPTATION TO SODIUM CHLORIDE. J. exp. Psychol., Dec. 1966, 72(6), 869-873. (Brown University, Providence, R.I.).

Following adaptation to 1 of 4 different concentrations of NaCl, Ss rated the subjective intensity, without regard to quality, of NaCl solutions ranging in concentration from HOH to 1.0 M. The minimum subjective intensity occurred at the adapting concentration (AC). The slope of the psychophysical function was steeper close to the AC, and this effect was greater with stronger ACs. Below the AC the test solutions had a sour-bitter taste which increased as concentration decreased, reaching a maximum at 0 concentration, i.e., it was greatest for distilled HOH. With correction for adaptation, the results fit a power function.
R 13

31,201
Carlson, Julia A. EFFECT OF INSTRUCTIONS AND PERSPECTIVE-DRAWING ABILITY ON PERCEPTUAL CONSTANCIES AND GEOMETRICAL ILLUSIONS. J. exp. Psychol., Dec. 1966, 72(6), 874-879. (University of Iowa, Iowa City, Iowa).

To test the hypothesis that geometrical illusions are examples of misplaced constancy scaling, 2 groups of 64 Ss, high and low in drawing skill, were administered size constancy, shape constancy, Müller-Lyer illusion, and Sander Parallelogram illusion tasks under 2 sets of instructions. No differences were found on the basis of skill. A difference as a result of instructions and an Instruction X Skill interaction were obtained for size and shape constancy. There was no correlation of an illusion with a constancy. The above findings weaken the proposition that illusions reflect misplaced constancy scaling.
R 15

31,202
Fagot, R.F., Eskildsen, P.R. & Stewart, M.R. EFFECT OF RATE OF CHANGE IN PHYSICAL INTENSITY ON BISECTION AND FRACTIONATION JUDGMENTS OF BRIGHTNESSS. J. exp. Psychol., Dec. 1966, 72(6), 880-886. (University of Oregon, Eugene, Ore.).

Eight Ss made bisection and fractionation judgments of brightness under 4 rates of change in luminance, 4 of the Ss bisecting 1st and the other 4 fractionating 1st. The effect of rate of change was significant for both bisection and fractionation. The data indicated certain advantages of bisection compared to fractionation: 1st, fractionation judgments were influenced by prior experience with bisection (significant order effect), but bisection judgments were relatively independent of prior exposure to fractionation. Second, the variability of judgments was smaller for bisection than for fractionation.
R 15

31,203
Held, R., Efstathiou, Aglaia & Greene, Martha. ADAPTATION TO DISPLACED AND DELAYED VISUAL FEEDBACK FROM THE HAND. J. exp. Psychol., Dec. 1966, 72(6), 887-89;. (Massachusetts Institute of Technology, Cambridge, Mass.).

S viewed an oscilloscope trace of a short bar which appeared at the position of his nonvisible right hand. The motion of the trace was equivalent to the movements of the hand, which were restricted to a frontal plane. The bar could be optically displaced by 20 diopter prisms, either to the left or right, and its motion could be made to lag behind that of the hand by 1 of 6 delay intervals ranging from 0.0 to 3.0 sec. Results show that the adaptation to displacement found with no delay is completely eliminated under all delay intervals, including the minimum of 0.3 sec.
R 10

31,204
Landauer, A.A., Singer, G. & Day, R.H. CORRELATION BETWEEN VISUAL AND KINESTHETIC SPATIAL AFTEREFFECTS. J. exp. Psychol., Dec. 1966, 72(6), 892-894. (University of Sydney, Sydney, Australia).

A kinesthetic and visual aftereffect in judgment of horizontality was found for 202 Ss in paired balanced trials using the method of adjustment. Adjustment times were also measured. The correlation between the 2 aftereffects was reduced but nevertheless significant after allowance had been made by partial correlation for adjustment times in the 2 tasks. This finding is contrary to that of earlier experiments in which allowance was not made for adjustment times.
R 14

31,205
Costa, L.D., Horwitz, M. & Vaughn, H.G., Jr. EFFECTS OF STIMULUS UNCERTAINTY AND S-R COMPATABILITY ON SPEED OF DIGIT CODING. J. exp. Psychol., Dec. 1966, 72(6), 895-900. (Albert Einstein College of Medicine, Yeshiva University, New York, N.Y.).

One of 8 digit-digit coding tasks varying in 2 levels of stimulus uncertainty (U_S) and 4 levels of S-R compatibility were administered to 8 different groups of 10 Ss each. Response speed was found to vary as a function of S-R compatibility and this effect increased as U_S was raised from 1 to 3 bits. S-R compatibility effects in these tasks, in which sets of stimuli were identical and mode of motor response was held constant, were ascribed to the availability of logical S-R translation rules as a function of preexperimental experience.
R 12

31,206
Crawford, F.T. & Klingaman, R.L. FIGURAL AFTEREFFECTS AS A FUNCTION OF HUE. J. exp. Psychol., Dec. 1966, 72(6), 916-918. (Florida State University, Tallahassee, Fla.).

A previous experiment showed that chromatic stimuli generated figural aftereffects but failed to demonstrate differential effects due to differential hues. In this study 20 Ss observed gray, orange, and blue inspection figures equated for Munsell value and chroma. Observations were made with a viewing box housing an illuminant Color source. The results indicated that the samples produced aftereffects which were significantly different from each other, with the order of magnitude increasing from gray to orange to blue.
R 9

31,207
Alpern, M. & Dudley, Donica. THE BLUE ARCS OF THE RETINA. J. Gen. Physiol., Jan. 1966, 49(3), 405-421. (University of Michigan, Ann Arbor, Mich.).

Around a dim light viewed in a dark room can be seen faint blue-gray arcs which occupy that part of the visual field corresponding to the retina where the arcuate nerve fiber bundle passes from macular ganglion cell bodies to the optic nerve. These blue arcs of the retina are an entoptic phenomenon in which action potentials of the arcuate nerve fiber bundle presumably excite adjacent neurons. The experiments here described show that the light stimulus initially evoking the blue arcs excites cones and not rods as has been generally believed until now. Another commonly held idea is that the blue arcs are produced by bioluminescence or fluorescence associated with the action potentials in the arcuate nerve fiber bundle. The experiments described here disprove this hypothesis.
R 28

31,208
Haise, F.W., Jr. & Barber, M.R. HANDLING QUALITIES EVALUATION OF SEVEN GENERAL AVIATION AIRCRAFT. Soc. exp. Test Pilots Tech. Rev., 1966, 8(2), 70-85. (Manned Spacecraft Center, NASA, Houston, Tex. & Flight Research Center, NASA, Edwards AFB, Calif.).

A quantitative and qualitative evaluation of the handling qualities of seven late-model, personal-owner aircraft indicates that these aircraft have generally satisfactory stability and control characteristics that deteriorate with decreasing airspeed, increasing aft c.g. loading, increasing power, and extension of gear and flaps. During visual flight, and during instrument flight in smooth air, the flying qualities are satisfactory. Atmospheric turbulence critically degrades these flying qualities; this is particularly noticeable during ILS (instrument landing system) approaches because of the marked increase in pilot workload. Excessive control-system friction, low levels of static longitudinal and lateral stability, high adverse yaw, objectionable Dutch Roll characteristics, and control surface float--all combine to make precise instrument tracking tasks, in the presence of turbulence, difficult even for experienced instrument pilots.
R 7

31,209
Van de Geer, J.P. & Jaspars, J.M.F. COGNITIVE FUNCTIONS. Annu. Rev. Psychol., 1966, 17, 145-176. (University of Leiden, Leiden, The Netherlands).

The area of cognitive functions is surveyed from 1959-1961 through the end of 1964. Usages of the term "cognition" and distinctive features of cognitive theories are discussed. The review covers: concepts, emphasizing mathematical models; problem solving under the headings of transfer personal variables, and group problem solving; computer simulation of thought; and reasoning. (HEIAS)
R 273

31,210
Poulton, E.C. ENGINEERING PSYCHOLOGY. Annu. Rev. Psychol., 1966, 17, 177-200. (Applied Psychology Research Unit, MRC, Cambridge, England).

Selected topics in engineering psychology are reviewed for the time span 1962-April 1963 Environmental stresses are discussed from the standpoint of the sensitivity of experimental designs and interactions among stresses. Perceptual isolation and vigilance are reviewed under the rubric of input studies. Central processes are covered under three subheadings: a) How much discriminability is required? b) The additional-task method; c) Decision taking. A final section on output studies reviews tracking and keyboards. (HEIAS)
R 123

31,211
Wohlwill, J.F. PERCEPTUAL LEARNING. Annu. Rev. Psychol., 1966, 17, 201-232. (Clark University, Worcester, Mass.).

This is the third and final review of perceptual learning to appear in the Annual Review. In this review the area of perceptual learning is delimited in a manner closely following previous reviews. Following brief reference to publications of a general and theoretical nature, research on two major topics--sensorimotor adaptation and attentional processes--is examined in detail. This is followed by a discussion of the role of reinforcement associative processes, and response factors. (HEIAS)
R 162

31,212
Tanaka, Y. STATUS OF JAPANESE EXPERIMENTAL PSYCHOLOGY. Annu. Rev. Psychol., 1966, 17, 233-272. (Psychology Dept., University of Tokyo, Tokyo, Japan).

The status of Japanese experimental psychology--emphasizing perceptual studies--is surveyed. The survey concentrates on the period March 1955 through March 1965. As general background, the history, training, societies and publications, financing, and research emphases are briefly covered. The research areas surveyed are: a) optical illusions; b) visual induction; c) time order error, d) figure-ground reversals and figural aftereffects; e) perception of size, shape, and transparency; f) constancy phenomenon; g) perception of motion and speed; h) weight and pressure; i) psychophysical methods and scaling; and j) sensory deprivation. (HEIAS)
R 190

31,213
Ward, W.D. AUDITION. Annu. Rev. Psychol., 1966, 17, 273-308. (University of Minnesota, Minneapolis, Minn.).

A critical review of selected (as being of interest to the author) topics in audition is presented. Topics reviewed are: a) auditory signal detection; b) attributes of auditory perception; c) temporal effects; d) binaural phenomena; e) middle ear muscles; f) electrical potentials; g) tone decay; h) temporary aftereffects of auditory stimulation; i) permanent threshold shifts; and j) miscellaneous. (HEIAS)
R 216

31,214
Sherrick, C.E. SOMESTHETIC SENSES. Annu. Rev. Psychol., 1966, 17, 309-336. (Princeton University, Princeton, N.J.).

The present review attempts to summarize the results of representative research in the following fields; cutaneous sensitivity, comprising touch, temperature, and pain, including deep pain; kinesthesis, both static position sense and movement; and vestibular sensitivity, both static and dynamic mechanisms.
R 175

31,215
De Valois, R.L. & Abramov, I. COLOR VISION. Annu. Rev. Psychol., 1966, 17, 337-362. (Psychology Dept., Indiana University, Bloomington, Ind.).

A critical and interpretive appraisal of the status of color vision is presented. The anatomy and physiology of the visual system and visual psychophysics are reviewed. It is concluded that the research of the last few years leads us to the following conception of the visual system in its analysis of color information. The receptors (rods and three types of cones) contain one of four photopigments whose spectral sensitivities overlap considerably. Photopigment breakdown, initiated by light, results in an early receptor potential whose amplitude is linearly proportional to the number of molecules broken down. However, by the time the bipolars are activated, this linearity is lost because of response attenuation by a feedback gain control; this operates as long as the receptors respond or their photopigment is unregenerated, and involves also neighboring receptors of the same type (red cones inhibit red cones, etc.).
R 145

31,216
Hernández-Peón, R. & Sterman, M.B. BRAIN FUNCTIONS. Annu. Rev. Psychol., 1966, 17, 363-394. (Instituto de Investigaciones Cerebrales, Moras, Mexico & US Veterans Administration Hospital, Sepulveda, Calif.).

Two areas of brain function are reviewed--wakefulness and attention--and neurobehavioral studies of instrumental learning. The major emphasis of the chapter is on sleep. Three pages are devoted to attention and inattention, three pages to learning, and 19 pages to sleep. Topics discussed under the heading of sleep include: a) sleep pattern distribution studies; b) phylogenetic and ontogenetic studies; c) physiological activities--somatomotor, visceral, sensory transmission, cortical excitability, learning and sensory discrimination; d) sleep and dreams; e) experimental sleep induction by sensory stimuli, central electrical stimulation, and central chemical stimulation; f) theories of sleep. (HEIAS)
R 227

31,217
Porter, L.W. PERSONNEL MANAGEMENT. Annu. Rev. Psychol., 1966, 17, 395-422. (Psychology Dept., University of California, Berkeley, Calif.).

The area of personnel management is reviewed from the dual standpoint of a differential--social psychology. The lack of integration of these two viewpoints and the possibility of an integrated approach are pointed out. Recent significant books are reviewed under the headings of special merit, general interest and specialized. Job description, analysis, and evaluation are briefly covered (1.5 p.). Topics emphasized are: a) evaluation of potential job behavior (4 pp.); b) evaluation of actual job behavior (3 pp.); and c) modification and facilitation of job behavior (8 pp.). A short survey of neglected areas (frontiers) concludes the review.
R 181

31,218
Sitgreaves, Rosedith. STATISTICAL THEORY. Annu. Rev. Psychol., 1966, 17, 423-434. (Teachers College, Columbia University, New York, N.Y.).

The present review examined references appearing principally in the 2 years from May 1, 1963 to April 30, 1965. Five articles selected as representative of current activity and thinking in statistics are reviewed. The topics reviewed are: a) model building with the aid of stochastic processes; b) decision making under uncertainty; c) use of non-numerical information in a 1-way analysis of variance problem; d) simple methods for analyzing 3-factor interactions in contingency tables; and e) selecting the population with the largest mean. HEIAS
R 5

31,219
Ervin-Tripp, Susan M. & Slobin, D.I. PSYCHOLINGUISTICS. Annu. Rev. Psychol., 1966, 17, 435-474. (University of California, Berkeley, Calif.).

The present review covers the period from 1958 to June 1965. Topics reviewed are: a) language acquisition, (3 pp.); b) grammar and verbal behavior (transformational grammar and sentence use (4 pp.); sequential linguistic events (2 pp.), and units and classes (2 pp.)); c) linguistic perception (2 pp.); d) meaning (process approaches (2 pp.), and analytic approaches (4 pp.)); e) internal language functions (1.5 pp.), f) biological bases of languages (1.5 pp.); g) extralinguistic phenomena (1 p.); and h) sociolinguistics (2 pp.). HEIAS
R 328

31,220
McGuire, W.J. ATTITUDES AND OPINIONS. Annu. Rev. Psychol., 1966, 17, 475-514. (Columbia University, New York, N.Y.).

This review covers the time span 1963 to June 1965. General works on attitude research and recent methodological advances are first reviewed. Twelve controversial attitude change topics are covered under the 5-topic sequence of communciation research: source, message, channel, receiver, destination. Source factors covered are intent to persuade and race vs. belief similarity. Message factors include fear appeals, size of discrepancy, and order effects. Resolution of opinion controversy in natural groups is the only channel factor covered. Receiver factors include forced compliance, active vs. passive participation, effects of disconfirmation, and personality correlates of persuasibility. Destination factors are immunization against persuasion and interrelation among measures. HEIAS
R 252

31,221
Boorer, N.W., Davey, B.J. & Sallee, G.P. VARIABLE-SWEEP WING THE THING FOR OPTIMUM V/STOL PERFORMANCE. SAE J., Jan. 1966, 74(1), 82-83. (British Aircraft Corporation, Ltd., London, England).

Variable-sweep wing gives both good subsonic and supersonic performance, with only a minor weight penalty. Deflected thrust cruise engine and pure lift turbojets or turbofans give lightest engine combination.
R 2

31,222
Helvey, W.M. INSIDE STORY OF THE ASTRONAUTS. SAE J., May 1966, 74(5), p83. (Missiles & Space Company, Lockheed Aircraft Corp., Palo Alto, Calif.).

Both Americans and Russians report unpleasant sensations during prolonged flight. Eleven space flights show reaction to weightlessness needs further probing.
R 1

31,223
Pennoni, R.J. FAILURE ANALYSES POINT WAYS TO CUT USAF ACCIDENTS. SAE J., Dec. 1966, 74(12), 44-51. (USAF Directorate of Aerospace Safety, Norton AFB, Calif.).

Actions taken following specific failures point up design principles and policies needed to improve reliability and safety of U.S. Air Force aircraft. Analyses of these cases show that safety features must be designed, manufactured, and tested into every airplane part. This conclusion applies to mechanical linkages, hydraulic systems, and electrical circuits. It also applies to major components, such as wings, control surfaces, and landing gear. Built-in reliability and safety are urged.
R 1

31,224
Severy, D.M. & Brink, H. PEDESTRIAN IMPACTS MEASURED IN 10-40-MPH FULL-SCALE COLLISIONS. SAE J., Dec. 1966, 74(12), 76-78. (Transportation & Traffic Engineering Institute, University of California, Los Angeles, Calif.).

The shape and height of the front end of a vehicle as well as its resistance to deformation during impact with a pedestrian positively influence the forced movements of a pedestrian following impact and until he reaches his position of reset. Front ends having the shape of a horizontal wedge increase the upward projection of the pedestrian and, therefore, the subsequent injury potential on striking the pavement. Blunt frontends decrease upward projection but result in higher initial impact forces.
R 1

31,225
Shiras, F. (Assoc. Ed.). RADIANT ENERGY EYE PROTECTION DEVICES. Nat. Safety News, March 1966, 93(3), 63-70. (National Safety News, Chicago, Ill.).

Welding presents one of the greatest hazards to the human eye. So intense is the radiant energy emitted during welding operations that eye protection must always be worn. Although eye injuries from welding usually heal without permanent damage, repeated or prolonged exposure can cause irreversible injury. There are three dangerous kinds of light involved in welding: intense visible light (glare), invisible ultraviolet, and invisible infrared. The severity of these three kinds of eye hazards varies with the type of welding. This article describes protective devices and practices for welders.
R 5

31,226
National Safety News. CHLORINE. Nat. Safety News, March 1966, 93(3), 74-92.

Handling pure chlorine safely requires close attention to safety precautions and the use of adequate personal protective equipment. This "data sheet" on chlorine was revised by the Industrial Department of the National Safety Council with the help of the Western Pennsylvania Chapter of the American Society of Safety Engineers and the Chlorine Institute.
R 17

31,227
Wolnez, G.J. ACCIDENT PREVENTION IN THE PLANT KITCHEN. Nat. Safety News, April 1966, 93 (4), 26-31. (Aerojet-General Corporation, Sacramento, Calif.).

This article provides photographs of safety devices, a check list and safety rules for employees of an industrial plant kitchen feeding approximately 4000 people daily.

31,228
Recht, J.L. SYSTEMS SAFETY ANALYSIS: THE FAULT TREE. Nat. Safety News, April 1966, 93 (4), 37-40. (Statistics Div., National Safety Council, Chicago, Ill.).

Of all the methods for conducting systems safety analysis, perhaps the most promising is the fault tree. Like other methods, it can be a useful tool even without mathematics. Although the fault tree method of analysis is only four years old, it has already been successfully applied to some very knotty safety problems in the aerospace field. Its success has gained it acceptance not only within the aerospace industry, but also by the Department of Defense, which has made fault tree analysis a requirement in its contracts for design of new missiles and aircraft. At the present time fault tree analysis is being used exclusively for product safety--safety of missiles, aircraft, and automobiles. The technique is used by the design engineers in the design stages of these products. Although it is a new technique, it seems to have great potential for application in a much wider area. The safety engineer (possibly with an assist from his own product engineers) can certainly find uses for this analytical method not only with respect to existing systems in his plant but also for setting specifications on new or replacement equipment.

31,229
Hopkins, S.K. (Ed.). BIOMECHANICS - FOE OF INDUSTRIAL WORK STRESS. Nat. Safety News, May 1966, 93(5), 29-33. (National Safety News, Chicago, Ill.).

The biomechanics program of the Western Electric program is described briefly and illustrated by photographs.

31,230
Recht, J.L. SYSTEMS SAFETY ANALYSIS: ERROR RATES AND COSTS. Nat. Safety News, June 1966, 93(6), 26-28. (Statistics Div., National Safety Council, Chicago, Ill.).

This article gives a brief description of the technique for human error rate prediction (THERP) and the use of cost effectiveness and indicates their usefulness in systems and safety.
R 10

31,231
National Safety News. FIRE CAUSES CHECKLISTS. Nat. Safety News, July 1966, 94(1), 41-46.

According to information from the National Fire Protection Association and Factory Mutual, approximately 90% of all industrial fires are caused by 11 sources of ignition. These 11 causes and the percentage of industrial fires attributed to each are: electrical fires, 19%; friction, 14%; mechanical sparks, 12%; smoking and matches, 8%; spontaneous ignition, 8%; hot surfaces, 7%; combustion sparks, 6%; open flames, 5%; cutting and welding, 4%; overheated materials, 3%; static electricity, 2%. Other sources of ignition include exposure fires and fires caused by lightning, chemical action, and arson, which account for about 5% of all industrial fires. The cause of approximately 7% of the fires is not determinable. Checklists covering the 11 major sources of ignition of industrial fires are given.

31,232
Bruce, J.C. THE INFLATABLE RAFT: SURE SURVIVAL AT SEA. Nat. Safety News, Aug. 1966, 94(2), 33-35.

This article describes features of inflatable life rafts and gives accounts of proving trials and actual emergency service.

31,233
Belknap, R.G. RECORDING AND MEASURING EMPLOYEE OFF-THE-JOB INJURY EXPERIENCE. Nat. Safety News, Aug. 1966, 94(2), 36-39. (National Safety Council, Chicago, Ill.).

The purpose of this guide is to provide a practical and uniform method for recording and measuring employee injuries occurring off the job. Injury rates compiled in accordance with this guide may be used to evaluate: a) The seriousness of the off-the-job injury problem, b) The relative need for accident prevention activities, c) The effectiveness of these activities, d) The particular types of accidents that require the most attention, e) The progress being made in improving the injury experience. The methods outlined in this guide for classifying off-the-job injuries are independent of methods used by insurance companies or other agencies.

31,234
Bird, F.E., Jr. PROPERTY DAMAGE - SAFETY'S MISSING LINK. Nat. Safety News, Sept. 1966, 94 (3), 24-29. (Lukens Steel Co., Coatesville, Penn.).

One long-revered occupational safety practice is to report and investigate all accidents resulting in injury. This almost exclusive emphasis on the injury-producing accident has continued to the present time in even the most modern industrial safety programs. Regardless of the injury potential and costs involved in no-injury accidents, safetymen generally do not include requirements for investigation unless an accident results in personal injury. Frank Bird, of the Lukens Steel Company, has pointed out that this is a limited view of accidents, and that property damage should be included. Bird's persistent refinement of the "near miss" approach to accident reporting and investigation will culminate in the publication of the hard-cover book, Damage Control, co-authored by Bird and industrial psychologist George L. Germain. On the following pages, Bird summarizes what he has learned about damage control after years of innovation, testing, and refinement.

31,235
Smith, S.D. 1965 OVER-ALL ACCIDENT DEATH RATE UP 2 PER CENT. Nat. Safety News, Sept. 1966, 94(3), 34-37. (Statistics Div., National Safety Council, Chicago, Ill.).

The 1965 accident death total was approximately 107,000, about 2% more than the 1964 death toll of 105,000. Disabling injuries numbered about 10,400,000, including 400,000 which resulted in some degree of permanent impairment--ranging from partial loss of use of a finger to blindness or complete crippling. Disabling injury totals for the principal classes of accidents were: Motor-vehicle, 1,800,000; public non-motor-vehicle, 2,400,000; home, 4,200,000; work, 2,100,000. Duplications of motor-vehicle with other classes numbered 100,000. These and other statistics are given in this summary.

31,236
Payne, C.L. APEX - A SYSTEM FOR RATING ACCIDENT PREVENTION EFFORT. Nat. Safety News, Sept. 1966, 94(3), 38-40. (Kalium Chemicals, Ltd., Regina, Saskatchewan, Canada).

This article describes a rating index for indicating the amount of effort expended by a plant in accident prevention measures. A numerical value, calculated for a plant and its subdivisions, that indicates the amount of effort spent on positive accident prevention measures for a specified period of time; i.e., for a month or year. The rating is expressed in percentage points and is the ratio of efforts expended to a preset goal of efforts deemed necessary to achieve a high standard of performance in preventing disabling and crippling injuries.

31,237
National Safety News. Rx FOR O_2 STARVATION. Nat. Safety News, Sept. 1966, 94(3), p45.

Oxygen starvation is often the catalyst of death following carbon monoxide poisoning, shock, poor circulation, gas gangrene, and other conditions resulting in circulatory difficulties. It can be combated by a new hyperbaric (high pressure) oxygen chamber. The success of the new therapy is underscored by the American Industrial Hygiene Association which advocates its use especially in the treatment of carbon monoxide poisoning.

31,238
National Safety Council. TRACTOR OPERATION AND ANTI-ROLL BARS. Nat. Safety News, Sept. 1966, 94(3), 50d-55. (Public Employee Section, National Safety Council, Chicago, Ill.).

The purpose of this data sheet is to discuss the installation of a protective device, known as anti-roll bars, when tractors are used in earth moving and mowing operations on roadsides, on railroad rights-of-way, or in farming.
R 6

31,239
Worden, F.X., Roberts, W.C. & Dunn, J.P. SAFETY WITH THE LASER. Nat. Safety News, Oct. 1966, 94(4), 20-27, 306. (Western Electric, New York, N.Y.).

A few years ago lasers were space age toys, used primarily by laboratory researchers. Last year an estimated 1,000 were sold for commercial use. Today industry is finding dozens of new uses for lasers. Tomorrow they may be commonplace production tools. The obvious hazard posed by lasers--thermal burns--have been recognized for years. Associated effects such as pressure and shock wave generation, photosensitization, photoactivation, particulate motion and impact, and frequency multiplication and scattering are still being defined. Long-term biological, especially genetic, effects of laser radiation, even from low-power systems, is unknown. The need to establish safety engineering and safe practice standards and controls for the mushrooming laser technology has not gone unrecognized. Pending the development of machinery to set standards, several large laser-using companies have published their own guidelines for laser safety. The authors suggest, development, in addition to specific bioengineering controls for laser operations, organizational procedures and responsible programs appropriate for an over-all laser safety plan.
R 7

31,240
National Safety News. ROCKETS JOIN FIRE-FIGHTING WEAPONRY. Nat. Safety News, Oct. 1966, 94 (4), 36-38.

Firms in the United States and a Japanese research institute are presently developing ballistic and rocketry fire-fighting techniques which, when perfected, would enable fire fighters to knock down flames from safe distances with little risk to their personal safety. Intense heat from industrial, commercial, or residential fires often forces fighters to operate from a distance that decreases effectiveness of hose streams. That same heat can also hinder access to hydrants or water sources and make it difficult, if not impossible, to place fire-fighting equipment in the best position. The need for a more practical method of fire fighting has been prompted by the idea that if it were possible to knock down fire, even for a short period of time, a reduction in heat would occur, thus permitting fire fighters to move in closer and have a better chance to extinguish the fire with hose streams or other agents.

31,241
Hopkins, S.K. (Ed.). ELUSIVE FACTOR IN FALLS: THE SHOE SOLE. Nat. Safety News, Nov. 1966, 94(5), 34-37. (National Safety News, Chicago, Ill.).

This article describes some of the fundamental concepts involved in the study of soling materials. It is an attempt to illustrate the possibilities for more precise knowledge about slip-resistant footwear. It is based on study of current safety shoe catalogs and advertising literature, information from major suppliers of work shoe soles, conversations with safetymen and safety shoe company representatives, and a review of some pioneering European research.

31,242
National Safety News. LIBERTY MUTUAL STUDIES INDUSTRIAL FATIGUE CRITERIA. Nat. Safety News, Dec. 1966, 94(6), 32-35.

The Liberty Mutual Research Laboratories programs in fatigue and other studies are described and illustrated by photographs.

31,243
Nesteruk, V.F. & Porfiryeva, N.N. THE CONCEPT AND DETERMINATION OF THE CONTRAST OF THE OBJECT AND IMAGE ELEMENTS. Optics & Spectroscopy, Oct. 1966, XXI(4), 272-274.

The definition of a quantitative measure of contrast of 2 elements of an object or of an image when the brightness is of a fluctuating nature is discussed in the article. A definition of contrast satisfying the condition of equivalence is given. The principle of employment of the definition introduced here under the conditions of experimental tests for the presence of contrast is examined.
R 2

31,244
Ostrovskii, Yu. I. TIME-SPATIAL SEPARATION OF LIGHT PULSES BY MEANS OF SEMITRANSPARENT MIRRORS. Optics & Spectroscopy, Nov. 1966, XXI(5), 342-343.

A system of semitransparent mirrors which are either parallel or at a small angle to one another is proposed for time-spatial separation of light pulses. Such an arrangement can be used for high-speed motion pictures and for taumeters.
R 2

31,245
Medvedev, V.E. & Paritskaya, G.G. CALCULATION OF ILLUMINATION IN AN IMAGE. Optics & Spectroscopy, Nov. 1966, XXI(5), 351-353.

A procedure, based on the theoretical photometry concept of the light field, is developed for calculating the illumination in an image produced by an optical system.
R 1

31,246
Paisley, W.J. THE EFFECTS OF AUTHORSHIP, TOPIC, STRUCTURE, AND TIME OF COMPOSITION ON LETTER REDUNDANCY IN ENGLISH TEXTS. J. verbal Learn. verbal Behav., Feb. 1966, 5(1), 28-34. (Communications Research Institute, Stanford University, Palo Alto, Calif.).

Previous studies of letter redundancy in English texts showed differences which, because of nonsystematic sampling, could be regarded only as error variance. In this study thirty-nine 2528-character samples from English translations of 9 Greek texts were selected to permit controlled analyses of authorship, topic, structure, and time-of-composition factors. Letter redundancy was found to covary with all 4 factors. Authorship and topic differences are of ideographic interest; they may also represent control problems in information-theory-based studies of verbal behavior. The structural analysis showed that prose texts are more redundant than verse texts; this finding has implications for the study of special structural constraints (e.g., telegraph English, aircraft-control English). Translations of the same text from the 14th, 16th, and 20th centuries showed that English letter redundancy is decreasing, as Zipf's "principle of least effort" (1949) would predict.
R 7

31,247
Rosenberg, S., Coyle, P.J. & Porter, W.L. RECALL OF ADVERBS AS A FUNCTION OF THE FREQUENCY OF THEIR ADJECTIVE ROOTS. J. verbal Learn. verbal Behav., Feb. 1966, 5(1), 75-76. (George Peabody College, Nashville, Tenn.).

2 lists of low-frequency adverbs ending in ly, one in which the adverbs contained high-frequency adjective roots and one in which they contained low-frequency adjective roots, were presented to 2 groups of 24 Ss for 3 free-learning, free-recall trials. 2 other groups of 24 Ss learned the high- and low-frequency adjective roots in the same manner. The high-frequency adjectives and their adverb counterparts were easier to recall than the low-frequency adjectives and their adverb counterparts, and there was no evidence of interaction. A difference in favor of adjectives as compared with adverbs approached but did not reach significance. Thus, it appears that the ease of recall of derived low-frequency adverbs is influenced by the frequency of their adjective roots.
R 4

31,248
Glanzer, M. ENCODING IN THE PERCEPTUAL (VISUAL) SERIAL POSITION EFFECT. J. verbal Learn. verbal Behav., Feb. 1966, 5(1), 92-97. (New York University, New York, N.Y.).

On the basis of the verbal loop hypothesis, specific changes in the shape of the perceptual serial position curve were predicted as a function of encoding, or verbalization length of the stimulus, and stimulus exposure time. The effects of post-stimulus delay, both with and without an interpolated task, were also explored. With 8-place binary numbers as stimuli, a group of 12 Ss was tested to evaluate the effect of these 4 variables--verbalization length, exposure time, delay time, and interpolated task during the delay. It was demonstrated that, as predicted, increasing the verbalization length and shortening the exposure time have similar effects. They tilt the serial position curve up on the right. The presence of an interpolated task produces an overall increase without, however, any effect on the shape of the serial position curve. Poststimulus delay, within the range used in this study, produces no clear or systematic effect.
R 11

31,249
Clark, H.H. THE PREDICTION OF RECALL PATTERNS IN SIMPLE ACTIVE SENTENCES. J. verbal Learn. verbal Behav., April 1966, 5(2), 99-106. (Johns Hopkins University, Baltimore, Md.).

The present experiment proposed to show that information about the recall properties of a stimulus sentence is contained in the sentence-assocations it elicits. 87 Ss were presented 20 stimulus sentences, all grammatically equivalent to The small boy hit the ball, and were asked to give a grammatically identical sentence-association--the first sentence that comes to mind--for each. Another 40 Ss were asked to recall the same 20 stimulus sentences. The recall probability of the modifier, actor, verb, or object in each stimulus sentence was inversely related to the variability, measured by informational uncertainty U, of the words used as the corresponding sentence part in the sentence-assocations to each stimulus sentence. In general, the actor was best recalled and had the least variability in the sentence-associations; the modifier and object were intermediate in these respects; the verb was least recalled and had the most variability. In addition, individual differences of the stimulus sentences in recall were predicted from the Us. Evidence of immediate constituents in the stimulus sentences was found in contingency measures among the modifier, actor, verb, and object both in recall and in the sentence-associations.
R 10

31,250
Biederman, G.B. SUPPLEMENTARY REPORT: THE RECOGNITION OF TACHISTOSCOPICALLY PRESENTED FIVE-LETTER WORDS AS A FUNCTION OF DIGRAM FREQUENCY. J. verbal Learn. verbal Behav., April 1966, 5(2), 208-209. (New York University, New York, N.Y.).

In an attempt to replicate an earlier study which found that tachistoscopically presented high digram-frequency words had a higher recognition threshold than low digram-frequency words, an experiment was performed which used the stimuli employed in the earlier study. /The opposite relationship was obtained for low-frequency words ($p < .05$), while the effect of word frequency was reproduced in the usually expected direction of frequent words having lower thresholds than infrequent words, but only for words with low digram frequency ($p < .05$). In a second experiment, novel stimuli were used with the word frequency variable held constant. High digram-frequency words were recognized in significantly fewer trials than low digram-frequency words, with infrequent words ($p < .01$). No difference was found between words of homogeneous and non-homogeneous position digram-contribution to total digram frequency.
R 6

31,251
Martin, E. & Roberts, K.H. GRAMMATICAL FACTORS IN SENTENCE RETENTION. J. verbal Learn. verbal Behav., June 1966, 5(3), 211-218. (University of Michigan, Ann Arbor, Mich.).

A rationale for indexing the structural complexity of sentences was introduced and an experiment reported that demonstrated the relationship between this index and sentence retention. The proposed measure entails a phrase-structure analysis of the sentence and a counting of the grammatical commitments incurred by each word of the sentence. A word is said to be structurally embedded in a sentence to the extent that it determines the structure of those parts of the sentence that follow. In a 6-trial free-learning experiment where sentence complexity and sentence kind were manipulated independently and sentence length held constant, sentences of lesser indexed complexity were recalled significantly more frequently than sentences of greater complexity. The role of sentence kind was found to affect recall, but not in the systematic way predicted by the transformation-grammar model.
R 9

31,252
Hodge, M.H. & Fox, W.F. SEQUENTIAL SHORT-TERM RETENTION AS A FUNCTION OF PROBABILITY OF RECALL OF CATEGORY ITEMS. J. verbal Learn. verbal Behav., June 1966, 5(3), 228-233. (University of Georgia, Athens, Ga.).

60 college students were asked to perform a sequential retention task in which the probability of recall (PR) of the stimulus words from 0, 2, or 4 categories was either .00, .25, .50, .75, or 1.00. All Ss, equally divided among the 3 category conditions, were presented 16 sequences of 24 items (4 sequences for each PR) on each of 4 successive days. Increases in PR and increases in the number of categories in which $PR < 1.00$ led respectively to significant decreases and increases in the mean proportion of correct responses at recall. It was suggested that variations in PR and in the number of categories affect performance by producing differential information-processing demands on S.
R 9

31,253
Buschke, H. TYPES OF IMMEDIATE MEMORY. J. verbal Learn. verbal Behav., June 1966, 5(3), 275-278. (Stanford University School of Medicine, Palo Alto, Calif.).

This study compares retrieval from immediate memory by same-order and true serial-order recall. The present findings are consistent with predictions based on the assumption of an order-dependent address storage for same-order recall and a marker storage which is not order dependent for true serial-order recall. Until certain alternative assumptions are evaluated, it is not clear whether these results imply 2 types of retrieval from a common storage, or 2 types of storage.
R 9

31,254
Pick, Anne D., Thomas, Margaret L. & Pick, H.L., Jr. THE ROLE OF GRAPHEME-PHONEME CORRESPONDENCES IN THE PERCEPTION OF BRAILLE. J. verbal Learn. verbal Behav., June 1966, 5(3), 298-300. (Macalester College, St. Paul, Minn.).

The function of grapheme-phoneme correspondences in the perception of Braille was investigated by presenting 26 Braille readers with pseudo-words which follow the rules of spelling-sound correspondence (pronounceable) and pseudo-words which do not (unpronounceable) and measuring the speed with which the 2 types of pseudo-words were read. Nearly all of the Ss spent more time reading the unpronounceable pseudo-words than the pronounceable pseudo-words. The results suggest that grapheme-phoneme correspondences function as grouping principles in the perception of Braille in the same manner as has been demonstrated for the perception of print by sighted Ss.
R 5

31,255
Kolers, P.A. INTERLINGUAL FACILITATION OF SHORT-TERM MEMORY. J. verbal Learn verbal Behav., June 1966, 5(3), 314-319. (Electronics Research Lab., Massachusetts Institute of Technology, Cambridge, Mass.).

The probability of recalling a word from a long list of unconnected words increases monotonically with its frequency of occurrence. This facilitating effect of repetition upon recall is found to occur interlingually. The probability of recalling a word when it and its translation are presented n/2 times in each of a bilingual's 2 languages is approximately equal to its unilingual presentation n times. Since the words in the 2 languages are usually phonetically and visually distinct, it appears to be their conceptual identity that permits the facilitation.
R 9

31,256
Payne, B. THE RELATIONSHIP BETWEEN A MEASURE OF ORGANIZATION FOR VISUAL PATTERNS AND THEIR JUDGED COMPLEXITY. J. verbal Learn. verbal Behav., Aug. 1966, 5(4), 338-343. (University of Washington, Seattle, Wash.).

A descriptive coding system was developed for visual patterns generated from binary and ternary sequences. This coding system took into consideration the repetition of higher-order units, composed of 2 or more line segments, as well as the actual number of line segments in a pattern. The number of items in the descriptive code of a pattern was called its logon content and was used as an indication of its organization. The hypothesis investigated was that the logon content of a pattern is directly proportional to its judged complexity. 3 groups of 15 patterns each were constructed. Group I consisted of patterns generated from 10-digit binary sequences. Group II consisted of patterns generated from binary sequences between 5 and 20 digits long, and Group III consisted of patterns generated from ternary sequences each 16 elements in length. These patterns were ranked in order of complexity by Ss (225 per group), and the mean experimental ranks for each pattern were correlated with predicted ranks derived from the organization measures. The correlations were between .85 and .99, provided that the Ss were first divided into subgroups on the basis of their ranking of a criterion pattern. One subgroup consisted of Ss who consistently considered symmetry, regularity, or repetition of higher order units in their judgments, whereas a second subgroup was composed of Ss who considered only the total number of line segments in their judgments. A third group of Ss appeared to average these 2 factors.
R 19

31,257
Broerse, A.C. & Zwaan, E.J. THE INFORMATION VALUE OF INITIAL LETTERS IN THE IDENTIFICATION OF WORDS. J. verbal Learn. verbal Behav., Oct. 1966, 5(5), 441-446. (Psychological Lab., University of Utrecht, Utrecht, The Netherlands).

In most experiments dealing with the relative effectiveness of different word parts in word identification, the greater importance of the word beginning has been ascribed to the sequential order of speech. However, differences in the amount of information must also be taken into account: initial letters contain more information than final letters. In order to determine whether both factors have an effect, an experiment was carried out in which 48 Ss had to guess Dutch 7-letter nouns from a varying number of letters which constituted either the initial or the final word part. For these nouns as a group, beginnings and endings carried equal amounts of information. The results indicated that both information and serial order in speech were effective. The time required for identification was dependent on the amount of information of the n-gram presented. The Ss also enumerated more 7-letter nouns if the initial letters were available, and as a result identification took less time. In addition, the enumerated nouns were found to be relatively frequent words, and speed of solution was directly related to frequency of occurrence in the language.
R 21

31,258
Puff, C.R. CLUSTERING AS A FUNCTION OF THE SEQUENTIAL ORGANIZATION OF STIMULUS WORD LISTS. J. verbal Learn. verbal Behav., Dec. 1966, 5(6), 503-506. (University of Connecticut, Storrs, Conn.).

This experiment was designed to investigate the amount of clustering and the amount of recall as a function of the sequential organization of the stimulus list. The stimulus list contained 10 words from each of 3 taxonomic categories and was arranged so that there were either 0, 9, 18, or 27 category repetitions in the serial order of presentation. Lists at each level of organization were presented once to a total of 15 Ss for free recall. The results showed that the number of words recalled increased as a linear function of the organization of the stimulus list, while the amount of clustering increased as a more positively accelerated function. These results were interpreted as being generally consistent with a rationale based on the priming of common mediating responses.
R 13

31,259
Howes, D. A WORD COUNT OF SPOKEN ENGLISH. J. verbal Learn. verbal Behav., Dec. 1966, 5(6), 572-604. (Boston University School of Medicine, Boston, Mass.).

A table of word frequencies derived from 250,000 words of recorded interviews with university students and hospital patients is presented. Data for subsamples of 100,000 words each from the student patient populations are also given to permit evaluation of their differences. A total of 9699 different words, of which 4097 occurred only once in the complete sample, are listed.
R 4

31,260

Anderson, Lynn R. LEADER BEHAVIOR, MEMBER ATTITUDES, AND TASK PERFORMANCE OF INTERCULTURAL DISCUSSION GROUPS. J. soc. Psychol., Aug. 1966, 69(Second Half), 305-319. (Psychology Dept, Wayne State University, Detroit, Mich.).

Ratings of the leaders' initiation of Structure and Consideration were obtained from members of 36 intercultural discussion groups consisting of one American and one Indian graduate student plus an American leader. Ratings of Group Atmosphere, Esteem for Leader, and Effectiveness of Leader were also obtained after each group had completed an intercultural-negotiation task and also after completing a group-creativity task. Results showed that on both tasks the American and the Indian members' Esteem for Leader ratings and Group Atmosphere ratings were positively correlated with their leaders' considerate behaviors, but were not related to their leaders' structuring behaviors. The leaders' effectiveness, as rated by Americans, was positively correlated with both Consideration and Initiation of Structure scores. When rated by the Indian Ss, the leaders' effectiveness was correlated only with their Consideration scores. The leaders' self-ratings of Consideration and Initiation of Structure were positively correlated with their own ratings of the Group Atmosphere and with their ratings of their own Effectiveness. The group-performance scores were unrelated to Consideration ratings; however, group performance was positively related to the Initiation of Structure ratings (but this finding was specific to the culture and the task). The results were discussed in terms of differences in "role expectations" between the 2 cultural groups.
R 36

31,261

Bauer, R.W., Matuzxa, J.L., Blackmer, R.F. & Glucksberg, S. NOISE LOCALIZATION AFTER UNILATERAL ATTENUATION. AMCMS Code 5014.11.84100, Tech. Memo 4-66, April 1966, 14pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.). (J. Acoust. Soc. Amer., Aug. 1966, 40(2), 441-444).

Partial hearing loss was simulated by insertion of V51-R plastic ear plugs. Ss wore plugs continuously for periods ranging from 6 hours to 3 days. Predictable shifts in localization errors were observed when the stimulus was a broad-band noise made up of frequencies above 3000 cycles per second. Reorientation in azimuth localization with ear plugs inserted required 3 days or more unless accelerated by specific training.
R 6

31,262

Weltzman, D.O., Kinney, Jo Ann S. & Ryan, Alma P. A LONGITUDINAL STUDY OF ACUITY AND PHORIA AMONG SUBMARINERS. BuMed. Proj. MF022.03 9019.11, SMRL Rep. 481, Sept. 1966, 14pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn.

In 1951, a group of 1,064 submariners were given a battery of visual tests in order to assess the visual characteristics of the population at that time. A sample (51 individuals) of the original group was recently retested on the same battery, in order to assess the effects of long-term submarine duty (15 yrs.) on vision. It was found that certain changes had taken place over the 15-year period, most notably, a loss of visual acuity, at both near and far, and a tendency toward esophoria. While some decrement in vision is expected as a function of age, these changes are larger than that predicted for men of their age level. The suggestion has been made previously that the confining nature of the submarine with the constant requirement for accommodation and convergence, might cause a visual impairment. This possibility, and other conceivable influences, will be evaluated in further longitudinal studies of submariners and non-submariners. Preventitive measures will also be assessed.
R 18

31,263

National Aeronautics & Space Council. REPORT TO THE CONGRESS FROM THE PRESIDENT OF THE UNITED STATES. 1966, 171pp. Executive Office of the President, National Aeronautics & Space Council, Washington, D.C.

This report summarizes the 1966 activities of the United States in aeronautics and space. Chapter headings are: U.S. Aeronautics and Space Activities--1965 Summary; National Aeronautics and Space Council; National Aeronautics and Space Administration; Department of Defense; Atomic Energy Commission; Department of State; National Science Foundation; Department of Commerce; National Academy of Sciences--Federal Research Council; Smithsonian Astrophysical Observatory; Federal Aviation Agency; Federal Communications Commission; United States Information Agency; Arms Control and Disarmament Agency.

31,264

Seeman, J.S. & Williams, R.B. DECK MOTION SIMULATOR PROGRAM. HORIZONTAL SINUSOIDAL OSCILLATION EFFECTS UPON PERFORMANCE OF STANDING WORKERS. NASA TN D 3594, Oct. 1966, 44pp. National Aeronautics & Space Administration, Washington, D.C. (George C. Marshall Space Flight Center, NASA, Huntsville, Ala.).

This work was a preliminary attempt to determine on-tower-limitations of the capabilities of standing workers servicing the Saturn V Vehicle at a firing site on Launch-Complex 39. It was determined that horizontal, linear, sinusoidal oscillation-frequencies of 0.33 cps and 0.80 cps were satisfactory samples of the wind conditions that could be expected; likewise the corresponding amplitudes of ± 6.3 inches and ± 7 inches. For such reasons, this work was done in the form of an experiment using a deck-simulator that reproduced some of the motions known to occur on the servicing platforms of the Saturn V Vehicle at a firing site on Launch-Complex 39. The deck-simulator does not reproduce the ellipsoidal pattern of motion known; yet its capability was considered adequate for this study. The experiment was done in 3 tasks at each of the frequencies and amplitudes: a) Hand-Assembly-Accuracy Test; b) Hand-Probe Steadiness Test; c) Visual Acuity Test. Significant decrements of performance appeared at 0.80 cps.
R 14

31,265
Dorian, M.F. A NEW TECHNIQUE FOR THE SCHEDULING AND SIMULATION OF MANNED ORBITAL OPERATIONS. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 907, 1966, 7pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Convair, General Dynamics Corporation, San Diego, Calif.).

A technique utilizing a modular system of computer programs is described, wherein the schedule for a manned orbital operation is generated by simulating the mission. Major components of the system include the scheduling model, a preprocessor program, ephemeris generator, the simulation program, and abstraction, extraction and display routines. A priority concept utilizing both static and dynamic priority functions is employed. A typical manned mission, postulated as a test of the validity of the approach, is discussed, along with results of simulation runs. Also discussed are potential applications of the technique throughout the various phases of a program, from early mission planning to post-flight evaluation.
R 4

31,266
Olling, E.H. BIO-MEDICAL FACTORS AND EXTERNAL HAZARDS IN SPACE STATION DESIGN. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 934, 1966, 21pp. American Institute Aeronautics & Astronautics, New York, N.Y. (Manned Spacecraft Center, NASA, Houston, Tex.).

The design of space-station configurations is influenced by many factors. The major biomedical factors, such as physiology, psychology, nutrition, personal hygiene, waste management, and recreation, all impose their own peculiar requirements. The relationship of biomedical factors for the internal space-station environment is explored with respect to internal atmospheric constituency, atmospheric pressure levels, oxygen positive pressure, temperature, humidity, carbon dioxide concentration, and atmospheric contamination. Requirements and criteria for specific problem areas such as zero and artificial gravity and crew private quarters are reviewed and the impact on the design of representative solutions is presented. The impact of factors such as meteoroids, radiation, temperature extremes, and cycling on station design are evaluated. Factors of spacecraft design to achieve acceptable launch and reentry g levels, crew rotation intervals, etc., are reviewed. The effects of solutions to certain biomedical factors on configuration weight, operational convenience, and program costs are compared.

31,267
Stephens, R.R. & Rauch, R.P. THE INFLUENCE OF MANNED MISSION REQUIREMENTS ON SPACECRAFT DESIGN AND SELECTION. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 958, 1966, 14pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (McDonnell Aircraft Company, St. Louis, Mo.).

Results of a point design study comparing four spacecraft having lift-drag ratio's (L/D's) of .25 to 2.7 for the logistic support of a space station are presented. Comparisons in terms of payload capability, number of launches required to perform the mission, and overall cost were made. The spacecraft were of modular design consisting of either a ballistic, a lifting body, a variable geometry, or a winged body crew module and a separate cargo modual/launch vehicle adapter. The launch vehicles used were the Saturn IB and the Saturn V. Specific critical engineering problems analyzed were the structural and heat protection design, refurbishment, compatibility of the spacecraft and launch vehicle, emergency escape, docking, and earth landing systems. The results showed that the ballistic spacecraft had maximum cargo capability, lowest development risk, and minimum cost for the resupply missions, and its operational flexibility was adequate. If additional operation flexibility were required, the variable geometry spacecraft would provide the best combination of hypersonic maneuvering and landing performance.
R 2

31,268
Miesse, C.C., Martin, M.A. & Risa, T. FREEWAY TRAFFIC SIMULATION. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 834, 1966, 8pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (General Electric Company, Valley Forge, Penn.).

The effects of sources (entrances) and sinks (exits) on single lane vehicular traffic on a limited access highway are simulated by assuming the "car-following" equation which implies direct variation of a car's acceleration ($\ddot{x}_n$) with its velocity ($\dot{x}_n$) relative to that of the preceding car ($\dot{x}_{n-1}$): $\ddot{x}_n = k(\dot{x}_{n-1} - \dot{x}_n)$ where k is the sensitivity factor. Digital simulation is achieved by applying the first integral of Equation (above) $\dot{x}_n = k(x_{n-1} - x_n - a)$ (where a is the average car-length) to a typical freeway configuration, resulting in expanding low-speed regions upstream of each entrance. A nonlinear continuum flow representation is derived, utilizing Cep's continuity equation for flow with sources. Validity of the latter solution is confirmed by comparison of the respective velocity profiles. The effect of a constant time lag on flow stability is determined by a linearized analysis of the continuum flow equation, resulting in a stability diagram which predicts instability for large values of velocity and/or acceleration.
R 6

31,269
Berg, K.J. & Schmitt, A.J. GRAPHIC DISPLAYS GENERATED FROM DIGITAL COMPUTERS. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 854, 1966, 5pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (United Aircraft Corporate Systems Center, Farmington, Conn.).

Under the USAF 433L Weather Observing and Forecasting System, the United Aircraft Corporate Systems Center, a Division of United Aircraft Corporation, has developed advanced techniques in computer generated graphics. The data processing activities and ancillary equipment developed and utilized to accomplish the task, are described. A major area of this activity supported the development of computer programs to convert input data to binary images for the graphic presentation of contours, alphanumerics, background maps, and isoshades (a variable shading technique). These programs, originally intended to prepare automated weather charts, have been expanded to include a number of other areas, such as line plots, bar charts, engineering drawings, halftone pictures, geological contours, seismic traces, and war game maps that have application within industry and the military. Technical advancement of prototype equipment produced a versatile device called Compix®, which is a high speed magnetic tape-driven plotting, printing, and pictorial system that will produce 50 "B" size drawings per hour regardless of picture complexity at 100 spots per inch resolution in both axes.

31,270
Smith, B.D. SIMULATION OF RAPID MASS TRANSPORTATION SYSTEMS. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 870, 1966, 8pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Melpar, Inc., Falls Church, Va.).

A mathematical model and digital-computer program has been written in FORTRAN which is generally applicable to simulating the dynamic motion, ride quality, and performance of existing or proposed railroad vehicles subject to excitation at various speeds and acceleration by a railroadbed of specified statistics. The car body, trucks, and wheel sets are treated as general mechanical members with 6° of freedom, coupled to each other by an arbitrary set of linear elements or a programmed set of non-linear functions having given spring rates, damping constants, etc. The model includes simulation of truck "hunting" phenomena with cylindrical or tapered wheel treads, and simulation of the horizontal alignment, gauge, vertical profile, crosslevel, and compliance properties of the railroadbed. Specific results, as applied to high-speed test cars with self-leveling air suspension, are compared with experimental results obtained as part of a simulation and instrumentation program being conducted for the Department of Commerce. The applicability of digital simulation of other engineering problems, such as pantograph and catenary motion and electrical performance, automatic speed control, etc., is also discussed.
R 26

31,271
Berry, C.A. PHYSIOLOGICAL MONITORING. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 928, 1966, 43pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Manned Spacecraft Center, NASA, Houston, Tex.).

It has been possible to monitor space crew physiological parameter in orbital flight without undue interference with crew performance and comfort. In most instances the crew has not been aware of the presence of sensors as they perform their duties. Collection of data on crew status each A.M. and P.M. has included blood pressure and sleep, water and food reporting. The physiological information available has been adequate and timely enough to allow decision making on crew physiologic capability during various mission phases. It has also provided data for evaluating the effects of flight on various body systems and planning future missions. Extra vehicular activity (EVA) has been effectively monitored from a safety standpoint, but information concerning temperature and carbon dioxide levels would be valuable in assessing the cause of heart and respiratory rate increases. Efforts should be continually directed at eliminating the need for a biomedical umbilical and for easily donned and doffed sensors as well as a blood pressure method which does not require the wearing of a cuff. Long duration flights in the orbital workshop and other Apollo applications missions will require such developments if we are to obtain the wealth of medical information possible on such missions.
R 10

31,272
Usry, D.B., Jr. TRAINING AND SELECTION CRITERIA FOR PILOTS OF SMALL SUBMERSIBLES. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 901, 1966, 5pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Westinghouse Electric Corporation, Baltimore, Md.).

Safety and efficiency dictate that standards for selection and training of small submersible operators be developed within the underseas industry. Private industry is taking the initiative in evolving logical yet flexible groundrules in cooperation with appropriate governmental agencies. The unique construction and operational requirements of these new craft indicate a departure from personnel standards solely based on past, conventional submarine experience. However, basic selection criteria evolved from military and space programs provide valuable data and a logical starting point. Individuals well-versed in the undersea environment, technically-oriented and with work experience stressing individual responsibility promise to be good candidates and eliminate much elaborate training for a relatively small group of personnel. Qualification should be limited to one vehicle, based on a 3-phase program: vehicle analysis, maintenance apprenticeship and thorough in-water operational training. Private industry is seeking flexibility within a broad set of standards since it is advantageous not only to the customer but to the industry to avoid accidents in this rapidly expanding field.

31,273
Osofsky, J.A. TRAINING FOR SUBMARINE CASUALTIES AT GREAT DEPTHS. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 902, 1966, 7pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Hydrosystems, Inc., Farmingdale, N.Y.).

The loss of the Thresher several years ago has focussed considerable attention on the problem of the modern submarine which encounters a severe casualty while operating at great depths. Examples of such casualties are given along with a brief description of each of the shipboard systems involved in the casualty; specifically the stern plane system, Main Ballast Tank blow system (high pressure air), propulsion system and sea water piping. Some examples of recovery procedures and resulting trajectories as determined from computer studies are presented. The need for and methods of training submarine crews in casualty recovery procedures are discussed with particular emphasis on submarine diving trainers and simulation fidelity.

31,274
Trout, O.F., Jr. INVESTIGATION OF MAN'S EXTRAVEHICULAR CAPABILITY IN SPACE BY WATER IMMERSION SIMULATION TECHNIQUES. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 903, 1966, 7pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Langley Research Center, NASA, Hampton, Va.).

In order to accelerate the development of man's extravehicular capabilities on future space missions new economical terrestrial based simulation techniques are required. One such development, which is proving to be a useful research tool, is the use of water immersion techniques to simulate zero and partial gravity operations of the astronauts, study man's capabilities in space, determine man-machine interfaces, obtain design data and to provide pre-mission training. The technique is being applied to the study of ingress-egress operation through airlock systems, manual locomotion, maintenance and assembly processes, crew and cargo transfer functions, rescue operation and repair tasks. Despite the limitations imposed by hydrodynamic drag and planing forces, hydrostatic simulation of zero gravity permits the pressure suited subjects to operate in 6° of freedom while providing total support for the body appendages. The simulation is not limited by supporting cables or attachments to the subject's body and is relatively insensitive to changes in center of gravity. Time is not a limitation since operations can be extended to several hours with sufficient breathing gas.

31,275
Konecci, E.B. SPACE RESCUE. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 905, 1966, 10pp. American Institute of Astronautics, New York, N.Y. (National Aeronautics & Space Council, Washington, D.C.).

Some study is being given space rescue, but many feel greater and higher priority is needed. Interim measures like emergency bail-out devices are in the near future, but not a true manned space rescue vehicle system. The cost of a space rescue system could be high unless the requirements for space rescue could be met or incorporated into the basic design of a new system such as the logistic-ferry vehicle. The key to extensive future manned operations in space requiring or demanding a rescue system, is reduced operating cost, dollars per pound, of launching and delivering men and materials to and from space. Manned recoverable and reusable systems appear to be the eventual answer. They promise reduced total cost per pound in space flight of launch vehicles, spacecraft, and recovery operations, and provide the backup or rescue systems, as well. An interim step is needed of driving launch costs down by making cheaper expendable boosters, chemical and solids and developing a second generation highly maneuverable spacecraft probably of the lifting body type for land recovery and many reuses. The beginning of such a logistics-ferry system in a few years could yield a rescue system capability shortly after the first few manned flight tests, probably in the early 1970's.

31,276
Tiedemann, J.B. AN INEXPENSIVE VEHICLE SIMULATOR. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 875, 1966, 3pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (University of Kansas, Lawrence, Kan.).

Experiments suggest that a realistic automobile simulator can be constructed without electronic components. A crude hovercraft simulator using a point source projection system and mechanical simulation of vehicle inertia demonstrated that inexpensive optical components provide an acceptable illusion of reality, and that rudimentary audible cues are more effective than refinements of the visual display. Applying the technique to an automobile simulator suggests a device for training drivers in maneuvering, parking, and skid recovery, with full 360° vision. Adjustments permit simulation of various road surfaces, drive systems, and vehicle dynamics. Use of the device to train drivers in potentially dangerous maneuvers could minimize panic reactions in real emergencies.
R 3

31,277
Birnbaum, A.H. EXPLORATORY STUDY IN INTERPRETATION OF VERTICAL AND HIGH OBLIQUE PHOTOGRAPHS. DA Proj. R&D PJ 2J620901A721, Tech. Res. Note 174, June 1966, 46pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 643242)

Recent technical developments have made available a variety of different sensors and displays, intended to enable the image interpreter to extract a greater amount of information more accurately and more quickly than ever before. A research study was undertaken by the INTERPRETER TECHNIQUES Task to explore some of the advantages and disadvantages associated with the use of vertical and high oblique views that cover substantially the same area of surveillance. Specific objectives of the study were to compare aspects of interpreter performance for vertical and oblique photography concerned with accuracy in mensuration, accuracy and completeness in interpreting the total area and in interpreting foreground and background of the oblique photograph. 2 sets of non-stereo photographs, one of an airfield, the other of a bridge, were viewed by 64 experienced interpreters. The photo interpreters were randomly divided into 2 groups, each (N = 32) being about equally representative of the Army, Air Force, and Marines. Interpreter performance was compared on the airfield photo for common areas constituting foreground, background, and total area. Only the total overlapping area was used for the bridge photo. Comparisons were made separately for PI tasks of detection and identification, counting of objects, and mensuration. Principal findings are: a) vertical photos were better for identification of objects with major dimensions in the horizontal plane, oblique photos for objects with major dimensions in the vertical plane; b) mensuration was much easier on vertical photos than on oblique photos; c) in oblique viewing, completeness of interpretation, but not accuracy, was affected by the portion of the photo being viewed. For the foreground, completeness was 28.5%; for the background 8.8% General implications are for the greater utility of vertical over oblique views for mensuration and plotting.
R 1

31,278
Laymon, R.S. AN EXPERIMENTAL STUDY OF TWO METHODS OF INDEXING TACTICAL IMAGERY. Contract DA 49 092 ARO65, DA Proj. R&D 2J620901A721, Tech. Res. Note 176, July 1966, 47pp. USA Personnel Research Office, OCRD, Washington, D.C. (System Development Corporation, Falls Church, Va.). (AD 643243)

Among the specific objectives of the MAN-COMPUTER FUNCTIONS Task, U.S. Army Personnel Research Office, is the development of an integrated system for the organization and presentation of reference information. An experiment conducted jointly with personnel of the System Development Corporation to compare 2 methods--graphic and textual--of indexing reference materials for use of image interpreters in a tactical image interpretation facility is reported in this study. The objective was to evaluate the 2 methods for speed and accuracy in locating rolls of reference imagery in a Tactical Image Interpretation Facility (TIIF). Image interpreters trained in the use of area-oriented graphic and textual indexes to tactical imagery on roll film were required in 2 experiments to obtain from indexes the accession number of rolls of imagery containing coverage for a given area. Interpreter performance with both types of indexes was compared for accuracy and speed. Sixteen problems were designed to require use of the indexes in a number of experimental conditions including variation of area size and inclusion of an area in a single map or in 2 maps. Major findings were: a) interpreters took less time on the average with the textual index when areas were small; b) with the graphic index, less time was taken when areas were large. The longer time taken with the textual index to locate desired imagery for large areas appeared due to recording and analyses tasks required under these conditions. Conclusions point to the greater utility of the graphic index in a manual image processing system where coverage of large geographical areas is required or if image coverage has to be precisely defined. The textual index appears more useful in a computerized system where coverage of small area targets with less definition is the major requirement. R 1

31,279
Brown, Emma E. ABSTRACTS OF U.S. APRO RESEARCH PUBLICATIONS--FY 1966, DA Projs. 2J620901A721, 2J024701A722, 2J024701A723, 2J023201A711, Tech. Res. Note 177, Sept. 1966, 50pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 641909)

Abstracts have been prepared for the majority of fiscal year 1966 publications of the U.S. Army Personnel Research Office. Where a publication has been abstracted, the principal research findings have been described as much as possible in non-technical language. Technical language has generally been used as the most expeditious method of communicating details of research and analysis.
R 42

31,280
Doten, G.W., Cockrell, J.T. & Sadacca, R. THE USE OF TEAMS IN IMAGE INTERPRETATION: INFORMATION EXHCANGE, CONFIDENCE, AND RESOLVING DISAGREEMENTS. Contract DA 49 092 ARO 65, DA Proj. R&D 2J620901A721, Tech. Res. Rep. 1151, Oct. 1966, 57pp. USA Personnel Research Office, OCRD, Washington, D.C. (System Development Corporation, Santa Monica, Calif.). (AD 643312)

Among the specific objectives of the COMPONENT INTEGRATION Task, U.S. Army Personnel Research Office is the identification of effective team procedures under various system conditions and requirements. In prior studies, research has focused on the basic question of whether teams can perform image interpretation more effectively than can individuals acting alone, and on related questions concerning best team methods and procedures and best size of teams for maximal performance. Here, 3 experiments were conducted, using the common procedure of having each team member in 2-man teams check the interpretation of his teammate. Three specific primary objectives were established: a) To determine the amount and type of knowledge which the checker should have of the initial interpreter's work; b) To determine whether the initial interpreter can accurately judge when his work needs to be checked by his teammate; and c) To determine how best to utilize a third man to resolve disagreements among teammates on interpreted items. Variations in procedures were achieved for analysis by setting up 4 phases or modules of interpreter team activity. Team results produced under each method were assessed in terms of completeness, amount of error, accuracy, and efficiency. Findings suggest that: a) more complete results are produced with higher efficiency in teams where the checker has full knowledge of the initial interpreter's work; b) only limited judgment as to the adequacy of their interpretations can be made by initial interpreters; c) team performance increases in completeness but decreases in efficiency with the introduction of a third man; d) results with different team methods pose a tradeoff situation, since no one method appears to hold best for team performance under all requirements.
R 3

31,281
Plath, D.W. HUMAN ENGINEERING CHECKLIST. T6 146/3111, Jan. 1966, 68pp. Autonetics Div., North American Aviation, Inc., Downey, Calif. (AD 477288)

This human engineering checklist has been prepared to assist engineering personnel in designing equipment in accordance with human capabilities and limitations. Applied early in a design program, it can help to assure that human engineering principles and criteria will be reflected in the ultimate design, at a time when their incorporation can be achieved at little or no cost. The checklist can also provide a basis for design standardization within and among systems. Utilized later in the development cycle, i.e., just prior to release of drawings, it can serve as a final check that specific human engineering design requirements have been incorporated in formal design documentation. The checklist is based upon criteria from MIL-STD-803, "Human Engineering Criteria for Aircraft, Missile, and Space Systems, Ground Support Equipment." This standard, published by the U.S. Air Force, is the most widely used human engineering reference in the defense industry.

31,282
Biberman, L.M., Dunkelman, L., Fickett, M.L. & Finke, R.G. LEVELS OF NOCTURNAL ILLUMINATION. Contract SD 50, Task T 36, Jan. 1966, 193pp. Institute for Defense Analyses, Washington, D.C. (AD 632918)

Summary tables show, for 4 lunar months (mid-summer, mid-fall, mid-winter, and mid-spring), the number of hours in which the illumination exceeds levels in 8 decades from 1.5×10^{-6} lumens per square foot to $1.5 \times 10^{+1}$ lumens per square foot; the full tables list the hours, day by day, in which the illumination exceeds the same 8 levels. Note that the sum of the hours not exceeding and the hours exceeding a given level equals a constant which is the total number of hours in a lunar month. So that these tables may be more easily understood, they also have been plotted at levels of 1.5×10^{-5}, 1.5×10^{-3}, 1.5×10^{-1}, and $1.5 \times 10^{+1}$. These curves show the number of hours per day as a function of date, the time that terrestrial illumination equals or exceeds these values. There are separate sets of tables for latitudes of 0°, 30°, and 60° latitude.

31,284
Aiken, E.G. & Lau, A.W. PITCH MEMORY FOR NEAR THRESHOLD STIMULUS DIFFERENCES. FINAL REPORT. Proj. PF017030501, Tech. Bull. STB 66 28, April 1966, 15pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 482390)

The increasing range of active sonar contacts raises questions concerning the ability of the operator to detect very small amounts of Doppler, when the reverberation and echo are separated in time. To get some data relevant to this problem, an investigation of memory for the pitch of a short duration pure tone pulse was conducted. Utilizing an 800 cps standard stimulus with comparison stimulus separations of 0, ±3, ±4, ±5 cps, discriminability and constant error measures were taken with .95, 4.5, and 8.9 sec interstimulus separations. The data justify the following conclusions: a) pitch discrimination shows no reliable change over the interval from .95 to 8.9 sec; b) the nature of the incorrect responses indicates an increasing willingness to report a pitch difference as the interstimulus interval increases; c) a bias in reporting more lower than higher pitch differences at the .95 sec interval reverses at 4.5 sec, and is absent at 8.9 sec; d) the data are consistent with much previous research involving pure tone discrimination, and with most of the data on Doppler discrimination employing sonar stimulus materials. It is inferred that no decline in near threshold Doppler judgments is likely up to about a 9 sec separation between reverberation and echo. However, specific training against high and low Doppler response biases at certain time separations is indicated.
R 20

31,285
Semple, C.A., Jr. & Schwartz, R.W. TIME BASED ANALYSIS OF CONTROL ACTIVITIES AND INFORMATION REQUIREMENTS FOR V/STOL. Contract AF/33(657) 8600, Proj. AF 6190, Task 619007 & 619011, AFFDL TR 65 193, Jan. 1966, 74pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Bunker-Ramo Corporation, Canoga Park, Calif.).

An analytic study was conducted for the purpose of delineating operator control activities and information requirements associated with the piloting of a hypothetical, 2-place V/STOL jet fighter aircraft. A vectored lift plus vectored lift-cruise propulsion configuration was assumed. The emphasis within the study falls within the first category of cockpit development; derivation of information requirements. A total V/STOL tactical mission was divided into 9 mission segments. Commonalities among control activities during various mission segments are discussed. Short-field and vertical takeoff and landing segments received primary emphasis. This report contains definitions of the vehicle and the mission profile segments which were hypothesized for the study. Time histories of anticipated control activities during the take off and landing segments were analyzed in detail in order to determine information requirements for flight data displays and operational features of thrust vector and thrust magnitude controls. Based upon operator task loading estimates, a suggested gross division of crew duties is presented. Cockpit panel and console mockups were developed as graphic aids in conjunction with the analytic investigation. Based upon experience gained in using the mockups throughout the study, suggestions for functional groupings of panel and console areas are included for a 2-place, side-by-side seating arrangement.
R 7

31,286
Rigney, J.W., Cremer, R.H., Towne, D.M., Bond, N.A., Jr., et al. MEASUREMENT AND PREDICTION OF COGNITIVE LOADINGS IN CORRECTIVE MAINTENANCE TASKS: I. A BAYESIAN APPROACH. Contract Nonr 228(22), Proj. NR 153 093, Tech. Rep. 46, Dec. 1965, 65pp. USN Personnel & Training Branch, ONR, Washington, D.C. (University of Southern California, Los Angeles, Calif.). (AD 481122)

This report describes methods for analyzing the cognitive loadings involved in electronics troubleshooting tasks. The symptom-malfunction (S-M) matrix is introduced as the basis for matching electronics technicians' troubleshooting capabilities to hardware requirements. S-M matrices show interrelationships between possible malfunctions and the set of symptoms which each malfunction can cause. Based on these matrices, the Bayesian Electronics Trouble Shooter (BETS) model was developed as a criterion measure of troubleshooting ability. Basic circuit S-M matrix-completion tests and troubleshooting performance tests were given to 39 technicians. Analysis of the test data revealed that these technicians were about one-third as efficient as the BETS model in troubleshooting the same circuit. There was a moderate positive correlation between the quality of the subjective S-M matrices, as determined by the completion test, and the quality of their troubleshooting performance. Their subjective S-M matrices were used in conjunction with a Bayesian algorithm to identify those technicians who acted like Bayesian processors while troubleshooting. About half of the technicians resembled Bayesian processors.
R 15

31,287
Archer, W.B. COMPUTATION OF GROUP JOB DESCRIPTIONS FROM OCCUPATIONAL SURVEY DATA. Proj. 7734, Task 773401, PRL TR 66 12, Dec. 1966, 31pp. USAF Personnel Research Lab., Lackland AFB, Tex.

The analysis of occupational survey data is demonstrated in detail, using miniature examples. Beginning with the responses of 10 incumbents to a job inventory consisting of 10 task statements, composite job descriptions are derived for a) special groups of incumbents, selected on the basis of background information data; and b) job type members, identified by an automated job clustering program. Computer outputs from both types of analyses are illustrated and explained.
R 10

31,288
Rekosh, J.H. & Feigenbaum, K.D. THE NECESSITY OF MUTUAL TRUST FOR COOPERATIVE BEHAVIOR IN A TWO-PERSON GAME. J. soc. Psychol., June 1966, 69(First Half), 149-154. (Psychology Dept., Brandeis University, Waltham, Mass.).

This experiment is aimed at demonstrating that trust of the other person is one of the most crucial factors that produces cooperative behavior in a two-person game. The payoff matrix employed was such that payoff to each player was completely dependent upon the choice of the other player. In one condition the game was explained to the two subjects, and they were told they would play with each other (peer relationship); in the second the game was explained to one subject, and he was told he would play experimenter (outsider relationship). This two-choice game situation was run with 20 subjects for the first condition (10 were confederates) and another 10 for the second. Results were interpreted in terms of cooperative vs. competitive responses--the competitive response being significantly different at the .01 level for the two conditions. The behavior of the subject is based on the maximization-of-difference principle only when the subject is playing the experimenter; when playing another student the pattern of choices is cooperative. (HEIAS)
R 8

31,289
Knight, K.E. ORGANIZATIONAL FACTORS THAT INFLUENCE TECHNOLOGICAL INNOVATION. Report from: "AIAA Third Annual Meeting, Boston, Massachusetts, November 29-December 2, 1966." AIAA Paper 66 985, 1966, 14pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Stanford University, Stanford, Calif.).

The paper summarizes the result of work to analyze exhaustively the digital computer industry and to develop quantitative measures of the performance capability of and innovation associated with each machine. The data indicates that: a) the computing technology consists of a large number of discreet improvements; b) most of the improvements are small; c) many of the most commercially valuable improvements occur as the sum of numerous engineering and production innovations; d) the average economic value of an innovation increases with more radical designs; e) for a firm to innovate it needs beforehand knowledge of (1) the need for the improvement, and (2) the technology necessary for creating the improvement; f) users are likely to introduce innovations where the performance requirements are ambiguous and manufacturers are likely to innovate where the performance requirements are clearly specified; g) the more successful a firm, the more likely it is to innovate, and the innovation will be of a more radical nature; h) a firm's first computer has a greater probability of being innovative than its subsequent systems; i) with an econometric analysis the data supports (1) a "learning by doing" model of technological improvement and (2) a model that hypothesizes that technological knowledge is freely transferable between firms.
R Many

31,290
Fiedler, F.E. & Meuwese, W.A.T. THE EFFECT OF STRESS ON THE CONTRIBUTION OF MEMBER INTELLIGENCE TO GROUP CREATIVITY. Contracts NR 177 474 & Nonr 1834(36), ARPA Order 454, Tech. Rep. 29, Jan. 1966, 16pp. USN Group Psychology Branch, ONR, Washington, D.C. (University of Illinois, Urbana, Ill, & Technische Hogeschool, Eindhoven, The Netherlands). (AD 627359)

The study investigates the relation between leader and member intelligence under 3 conditions of experimentally created stress, and under varying degrees of leader anxiety. The results indicate that the leader's intelligence correlates with (that is, contributes to) group performance primarily in situations which are relatively free of stress or when the leader's anxiety is low, while his members contribute to group performance primarily under anxious leaders or in situations which are stressful or anxiety arousing for the leader.
R 6

31,291
Mcelhannon, V.B. AN ANALYSIS OF THE CENTER OF GRAVITY OF THE ARM DURING CERTAIN SIMULATED INDUSTRIAL MOVEMENTS. (M.S. Thesis). Contract AF33(608) 1119, May 1966, 115pp. Texas Technological College, Lubbock, Tex. (AD 620343)

The primary purpose of this investigation is to determine the distance and path traveled by the center of gravity of the total arm complex during certain work movements typical of those used in industrial tasks and to analyze the behavior of the velocity of the center of gravity during each of the movements. The experiment was designed so that all moves considered were within the normal work area of a seated worker. All moves were straight line motion and remained in the horizontal plane. Distance moved, path of motion, average increment velocity, average velocity, maximum velocity, and hand velocity measurements were made and are analyzed.
R 18

31,292
Kennedy, K.W. & Filler, B.E. APERTURE SIZES AND DEPTHS OF REACH FOR ONE- AND TWO-HANDED TASKS. FINAL REPORT. Contracts AF 33(657) 9201 & AF 33(616) 7863, Proj. 7184, Task 718408, AMRL TR 66 27, Sept. 1966, 33pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This report presents data on: a) the optimal sizes and locations of maintenance apertures; and b) man's working-reach distances through such apertures, for both the shirt-sleeved and the pressure-suited conditions. In all cases, the vertical dimension of the aperture permits the technician to maintain simultaneous visual and manual contact with the task area. Data include Depth of Reach, Breadth of Aperture, Vertical Dimension of Aperture, and distances to the floor from both the lower and the upper edges of these apertures. Different apertures provide for forward or lateral reaches, in the standing or seated position, with one or both arms. Data are reported in the 5th, 25th, 50th, 75th, and 95th percentiles. Ranges, Means and Standard Deviations are given. Recommendations are made regarding the appropriate application of the data to the sizing and location of maintenance accesses.
R 7

31,293
Breul, H.T. A SIMULATOR STUDY OF LOW SPEED VTOL HANDLING QUALITIES IN TURBULENCE. FINAL REPORT. Contract NOw 63 0518 c, Res. Rep. RE 238, Feb. 1966, 62pp. USN Bureau of Naval Weapons, Department of the Navy, Washington, D.C. (Grumman Aircraft Engineering Corp., Bethpage, N.Y.). (AD 477949)

An experimental study was performed to determine, from the pilot's point of view, the effects of certain stability derivatives, atmospheric turbulence, and control power on the handling qualities of VTOL craft. Using a flight simulator, qualified pilots evaluated over 450 configurations in the task of moving the craft from one hover spot to another. The simulator consisted of a cockpit providing motion in roll and pitch and an optical display system providing an illusion of motion in the remaining four degrees of freedom. The primary conclusion drawn from the study is that speed stability, either lateral or longitudinal, strongly influences a hovering vehicle's control power and angular rate damping requirements. Furthermore, lateral and longitudinal requirements are found to be similar, when the effects of speed stability are taken into account.
R 19

31,294
Schmauch, G.E. & Bailey, B. OXYGEN SUPPLY SYSTEM FOR MANNED SPACE ENCLOSURES. FINAL REPORT. Contract AF 33(615) 3335, Proh. 6373, Task 637302, AMRL TR 66 169, Dec. 1966, 51pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Air Products & Chemicals, Inc., Allentown, Penn.).

This study was conducted to design, construct, and test an Oxygen Supply System for Manned Space Enclosures. The system was designed to provide oxygen at a rate of 0-91 grams/hr. (0-0.2 lbs/hr.) for a period of 24 hours, under weightless conditions. The design utilized the catalytic decomposition of hydrogen peroxide to breathing oxygen and potable water on demand. It consists of a positive expulsion peroxide storage tank, a catalytic reactor, a heat exchanger, a gravity independent phase spearator, and a product storage tank. A laboratory model was constructed and tested to demonstrate the feasibility of the design. This unit produces breathing oxygen and potable water at the design capacity in any gravitational orientation.
R 14

31,295
Trombley, D.J. EXPERIMENTAL DETERMINATION OF AN OPTIMAL FOOT PEDAL DESIGN. (M.S. Thesis). May 1966, 66pp. Industrial Engineering Dept., Texas Technological College, Lubbock, Tex. (AD 478371).

This investigation was designed to experimentally determine an optimal foot pedal for use in situations where the hands are overburdened with control tasks. Reaction time to a visual stimulus and the time of travel to a fixed stop were selected as the criteria of optimality. The design of the experimental investigation considered the following factors: a) The ratio of the distance from the ankle to the ball of the foot and the distance from the ankle to the back of the heel; b) The location of the fulcrum of the pedal considering the muscle groups in the leg required to move the pedal and the physiological limitations of the foot and ankle; c) The size of the load to be moved by the foot; d) The angular relationship between the foot and the tibia as well as the angular relationship between the femur and the tibia. A detailed description of the equipment used is given in Chapter II; the experimental design and procedure are described in Chapter III; the experimental results and a discussion of the findings are covered in Chapter IV, and Chapter V contains the conclusions reached from the investigation and recommendations for further research.
R 9

31,296
Drebelbis, R.C. A DOCUMENTARY ON WEIGHT, DIET AND EXERCISE. Jan. 1966, 80pp. Rand Corporation, Santa Monica, Calif. (AD 626658)

This paper was compiled to bring together authentic scientific data on weight, diet, and exercise. It answers such basic questions as: a) How much should you weigh? b) What should your daily caloric intake be: To reduce? To maintain your weight? c) What is a calorie? d) How are calories used in the body? e) What are the effects of overweight on mortality and life expectancy? f) What are the effects of reducing drugs? g) What should you expect from a diet? It also contains a chart to determine metabolism or the calories per day that will be required to lose weight and then to maintain a desired level. A complete nutritive calorie chart of foods arranged in alphabetical order is included. The caloric value of the foods listed is shown in convenient measurements of average portions or servings. Also a conversion table is included which relates weights and measurements to standard food portions in daily use. This document has been organized into two parts; Part I deals with weight and diet and Part II discusses exercise and physical fitness. Part II also includes a series of Back Flexion Exercises recommended for those individuals who suffer recurring back problems.

31,297
Murphy, T.W. A MATHEMATICAL MODEL OF THE RESPIRATORY CONTROLLER. Jan. 1966, 58pp. Rand Corporation, Santa Monica, Calif. (AD 627312)

This Memorandum presents a model of the respiratory control mechanism. The primary stress in this model is on information transport in blood and on an attempt to test the widely held hypothesis that the respiratory controller is a proportional controller, whose error signal is the difference between the tissue carbon dioxide concentration in the respiratory center and some reference level. This model refers only to conditions in which the S is resting and not to any states of exercise, since it would appear that during conditions of exercise many proprioceptive (i.e., positional) impulses, arising from those muscles participating in the exercise function, heighten the tone of the respiratory center and cause increases in ventilation not dependent on the carbon dioxide control mechanism.
R 11

31,298
Wilde, J.F. PULSE RATE COMPARISONS BETWEEN FLICKER AND INTERMITTENT TONE. (M.A. Thesis). Contract Nonr 2252 (01), June 1966, 34pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Hofstra University, Hempstead, N.Y.).

In order to determine how Ss initially perceived simultaneously presented pulsed auditory and visual stimuli, the method of constant stimuli was used. Thirty paired stimuli consisting of a pulsed auditory tone (between 1.41 and 50.00 pulses per second) and a pulsed visual stimulus (3, 5, or 10 pulses per second) were presented for four seconds with a six second inter-trial interval. Percent of "same" responses for the 20 presentations of each stimulus pair was used as the dependent variable for four Ss. The data indicated that: a) Ss are more accurate at pulse rates below four pulses per second, and become less accurate as pulse rate increases; b) Ss are better able to discriminate between the two stimuli when the auditory pulse rate is lower, than when the visual pulse rate is lower, and c) the method of constant stimuli yields much different data on intersensory rate comparisons between flicker and pulsed tone than does the method of adjustment.
R 20

31,299
Klausner, S.Z. THE TRANSFORMATION OF FEAR. Contract AF 49(638)1510, Proj. 9779 01, AFOSR 66 0123, Jan. 1966, 35pp. Bureau of Social Science Research, Inc., Washington, D.C. (AD 631020)

Hypothesis: a) Fear and enthusiasm are negatively correlated components of affectual excitement; b) In acting despite fear, fear is transformed into enthusiasm (the affectual valence shift from negative to positive); i.e., fear at one point is positively correlated with enthusiasm at a later point in the act. Method: A sample of 825 American sport parachutists indicated the degrees of fear and enthusiasm experienced during their first jump. The data were examined by regression analysis of the fear and enthusiasm scores. Findings: During the jump preparation both fear and enthusiasm increase. At the start of the jump run, fear decreases and enthusiasm increases. A nadir and zenith, respectively, are reached when the parachute is opened. Fear again increases and enthusiasm decreases near landing. Upon touching the ground, fear drops to a new nadir and enthusiasm rises to a zenith above the first. The mean scores for fear and for enthusiasm at successive points during the jump are negatively correlated. At single points, individual fear and enthusiasm scores are also negatively correlated. These findings support the first hypothesis. The individual fear scores at the first zenith of fear are less negatively and then more positively correlated with individual enthusiasm at successive subsequent points; this finding supports the second hypothesis. A deviant case analysis showed that those who transform their fear into a relatively great amount of enthusiasm tend to be independent, energetic personalities, while those who fail, relatively, to transform the fear into enthusiasm tend to be passive, dependent personalities.
R 22

31,300
Gafarian, A.V., Hayes, E. & Mosher, W.W., Jr. THE DEVELOPMENT AND VALIDATION OF A DIGITAL SIMULATION MODEL FOR DESIGN OF FREEWAY DIAMOND INTERCHANGES. Report from: "Twenty-Ninth National Meeting of the Operations Research Society of America, Santa Monica, California, May 18-20, 1966." Rep. SP 2159/000/00, April 1966, 95pp. System Development Corporation, Santa Monica, Calif. (AD 633905)

The principal goal of the project is to develop a valid general-purpose simulation model of a diamond interchange for traffic between a freeway and an arterial street. The existence of such a model will enable the traffic engineer to study the effects of alternative geometric and control configurations on diamond interchange operations. The principal emphasis of this study is on the validation problem. To validate the model efficiently, the complete interchange is separated into components, one of which, for example, is the merging of an on-ramp with the freeway. A computer model is then designed for that component, and its performance (when the parameters are properly set) is compared with that of existing real operations. If realistic performance is obtained, the next component of the interchange is then added; otherwise, indicated modifications of the model are made and again compared with field data. This iterative process is continued until validation is achieved for the entire interchange model. An account is given of the work accomplished to date. This includes a complete description of the first version of Model 1, the merging of an on-ramp with the freeway. This model, as well as its data reduction program, has been programmed, debugged, and is running. Some of the results obtained with it are described, as are the results of the preliminary validation study.
R 4

31,301
Gould, E.E. AN ADAPTIVE PATTERN RECOGNIZING MODEL OF THE HUMAN OPERATOR ENGAGED IN A TIME VARYING CONTROL TASK. (Ph.D. Thesis). June 1966, 119pp. Purdue University, Lafayette, Ind. (AD 633200)

A model is presented in this study which describes the input-output response of a human operator engaged in the task of manually controlling a certain class of plants. The problem is approached from an engineering point of view in which the human operator is viewed as an adaptive controller performing the functions of identification, decision, and modification while manually controlling the plant. The control task treated is a one-dimensional compensatory visual-manual tracking task which visually displays the error to the subject and a control mechanism is provided to allow error compensation. From experimental tests it was found that the human operator uses pattern recognition to classify a limited variety of plants into one of three categories. The nature of the recognition problem is investigated and the decision surfaces associated with the pattern recognition process measured. An adapted model is developed for each of the three plant categories. These models consist of control strategies formulated from an analysis of input-output data of test Ss. An adaptive algorithm is developed which changes the model response characteristics so that they correspond to the human response characteristics when gain changes are introduced in the plant being controlled. The adaptation is based on both the measurement of plant parameters and a sequential modification of the measured values. The measurement portion of the algorithm uses only the values of variables that are available to the human operator to estimate the plant parameter values. These estimates are modified during subsequent control actions. The modification is based on the values of the displayed error at the beginning and at the end of a control action.
R 25

31,302
Human Factors Research, Incorporated. FACTORS INFLUENCING THE JUDGMENT OF HUMAN PERFORMANCE. Contract NONR 4140(00), Proj. NR 153 625, Feb. 1966, 33pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Human Factors Research, Inc., Santa Barbara, Calif.). (AD 628690)

The independent stimulus variables are, first, those determining the complexity of the task; second, those associated with the performer--relevant ones associated with his true proficiency and irrelevant ones such as his physical appearance; and third, those associated with the rater--his knowledge of the task, experience on it, and his evaluation of his own proficiency on it, as well as stimuli from his previous judgments of the performer, his knowledge of others' evaluations of the performer, his response to the range and variability of the performances of more than one performer, and irrelevant factors. In addition to these stimulus variables, there are the number of observations of ratee performance, the duration of time between observation and making the judgment, and the duration of time the rater has "known" the ratee. There also are several dependent variables, all derived from the basic dependent variable, a rater's judgment of a given performance. 5 studies were conducted in the context of this model.
R 4

31,303
Williams, L.G. A STUDY OF VISUAL SEARCH USING EYE MOVEMENT RECORDINGS. Contract NONR 4774(00), Rep. 12009 IR1, Feb. 1966, 40pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Honeywell, Inc., St. Paul, Minn.). (AD 629624)

Study I was concerned with how observers' search behavior was affected by specification of one or more target characteristics. Observers do look at objects having the target specifications. Color has much greater force than does size. For fields containing objects of 5 different colors, approximately 60% of the objects looked at were of the specified color. Size has somewhat more force than shape. When 2 or 3 target characteristics were specified, observers tended to ignore the less potent characteristics. The time scores were highly related to the fixation data. When subjects were able to use the target information more efficiently, they found the targets faster. Study II was concerned with the utilization of shape information. The problem was to determine in what types of backgrounds shape information could be used most effectively. This is an important question since, in many situations, the shape of the target is the only information available to the observer. When all objects in the field are of the same size and lightness, observers were best able to fixate objects having the target shape. However, performance was only moderately superior to that for mixed fields, where objects were of different sizes or different lightnesses. Search times were also found to be shorter for the homogeneous fields. Behavior was found to be virtually identical for fields of 2 widely different densities. For the 2 densities, observers were able to look at objects having the specified shape with equal facility. A major conclusion from the 2 studies, therefore, is that by studying how observers utilize a single dimension of information about the target we can go very far towards a precise prediction of search times for arbitrary search tasks.
R 18

31,304
Evans, W.O. & Hansen, J.E. TROOP PERFORMANCE IN HIGH ALTITUDES. Army, Feb. 1966, 1-4. (USA Department of the Army, Washington, D.C.). (Reprint) (AD 629330)

If troops are taken very rapidly from a low altitude to one exceeding 10,000 ft, the commander must be prepared for the appearance of a number of severe symptoms and deficiencies in performance. His notice will first be drawn to the classic symptoms of mountain sickness: headache, insomnia, fatigue, shortness of breath, dizziness and nausea, loss of appetite. These symptoms, though severe, will fade in most people within 4 days to 1 week. During the first week, the commander must expect his unit to be able to function only at low efficiency. The most serious sickness caused by high altitudes is lung congestion. A soldier stricken with this disorder must be evacuated to lower altitudes or he may die. After the passage of these initial symptoms, the effects of high altitude may be more insidious because men are not necessarily subjectively aware of them. The commander must realize that on tasks requiring highly concentrated or prolonged attention, or sudden bursts of maximum energy, his men will be performing with up to 50% less efficiency for 2 to 3 weeks. Night vision is also affected adversely. Finally, on those tasks which call for prolonged, physically heavy work, it may take more than 6 months for most men to return to previous standards of performance. A set of simple rules which will aid the commander in minimizing the inefficiency of his men at high altitude is given.

31,305
Crane, H.D. A THEORETICAL ANALYSIS OF THE VISUAL ACCOMMODATION SYSTEM IN HUMANS. Contract NAS 2 2760, NASA CR 606, Sept. 1966, 77pp. Ames Research Center, NASA, Moffett Field, Calif. (Stanford Research Institute, Menlo Park, Calif.).

This study models the human visual-accommodation system, starting directly with the retinal image. The models that are developed are reasonably consistent with existing data and offer a certain degree of understanding of certain features of the data. The modeling is in 3 stages: a) what portion of the retinal picture is involved in accommodation control; b) how that portion of the picture is processed to derive a measure of defocus; and c) how that signal in turn is used to control the ciliary muscles. It is tentatively concluded that the relevant portion of the retina is a central region of the fovea, having a diameter of some 30 min. of arc, or 6 mils--the diameter of a coarse human hair. As for processing of the retinal image, neural circuits based on lateral inhibition can yield a measure of defocus that is consistent with experimental data over several orders of magnitude of object size and illumination. Interaction between 3 such overlapping receptor regions could account for certain chromatic effects in accommodation control. For the control system, an intermittent contol model is tenatively proposed in which accommodation correction cycles may be initiated by relatively abrupt changes in the retinal pattern, caused for example by involuntary eye-movement saccads or certain target movements. The models predict significant interaction between accommodation control and eye-movements.
R 74

31,306
Duncan, C.P. & Wood, G. NORMS FOR SUCCESSIVE WORD ASSOCIATIONS. Psychon. Monogr. Suppl., 1966, 1(7), 203-206. (Northwestern University, Evanston, Ill.). (Reprint)

Five successive word associations were elicited from 500 Ss to each of 20 Kent-Rosanoff stimulus words. For each stimulus, the frequency of occurrence of each of the 10 most frequent associates in each of the 5 successive positions is tabled.
R 8

31,307
Pignatelli, A.B. A RAPID RESPONSE FLAME DETECTION SYSTEM. FPRC/Memo 228, Jan. 1966, 9pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Fires in oxygen rich environments are of a fundamentally different character to those in air and they can cause fatal damage to man within a few seconds. This report describes a rapid response flame detection system specifically developed to combat the consequences of such fires.
R 1

31,308
Benson, A.J. & Bodin, M.A. EFFECT OF ORIENTATION TO THE GRAVITATIONAL VERTICAL ON NYSTAGMUS FOLLOWING ROTATION ABOUT A HORIZONTAL AXIS. FPRC/1247, Jan. 1966, 10pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Following clockwise rotation at 60°/sec about a horizontal cephalo-caudal axis the rate of decay of nystagmic eye movements, produced by an impulsive deceleration, was significantly greater than when the axis of rotation was vertical. The direction of the gravitational acceleration when normal to the axis of rotation had no consistent effect on the time constant of decay, though the angular velocity of nystagmus was greater in the 0° and 90° positions than at 180° and 270° and accounted for the larger 'nystagmus output' in the former positions. Hypothetical mechanisms by which a linear acceleration may modify post-rotational responses are discussed.
R 12

31,309
Glaister, D.H. & Howard, P. THE EFFECT OF POSITIVE ACCELERATION UPON PULMONARY ARTERY PRESSURE IN MAN. FPRC/1251, April 1966, 16pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Pulmonary artery pressures have been measured in man, seated at rest and during exposure to positive acceleration. Values obtained from 4 Ss averaged 17.2 cm water systolic and 4.3 cm water diastolic (12.6/3.2 mm Hg), with a mean of 9.5 cm water (7.0 mm Hg), referred to the level of the pulmonary trunk. Discrepancies between these and other published data are explicable on the basis of the posture adopted, most measurements having been made with the subjects supine. Positive acceleration led to a fall in pulmonary artery pressures and a 'hydrostatic indifference point' was demonstrated on a plane 8 cm below the pulmonary trunk. In addition there were alterations in pulse pressure and pulse wave form suggestive of active vaso-motor changes. Good agreement was found between the present results and predictions of pulmonary artery pressure based upon previous measurements of the distribution of pulmonary blood flow during acceleration. No evidence was found for the existence of a significant critical closing pressure in the pulmonary capillaries of the lung apex.
R 9

31,310
Kerslake, D. McK. A SENSITIVE RECORDING BALANCE FOR WEIGHING HUMAN SUBJECTS. FPRC/Memo 232, July 1966, 18pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

The weight of the subject and his support is counterbalanced by the buoyancy of floats immersed in oil. Changes in weight cause changes in the level at which the system floats. Errors due to changes in temperature of the oil are avoided by appropriate design of float system and the tank which contains it. Slow changes of an inert weight of 100 Kg can be measured with an accuracy of about ± 50 mgm, but in the case of a living subject the useful sensitivity is of the order of ± 0.1 gm. The balance is made from low precision parts, mostly from the building trade. Apart from one knife edge, which need not be of high quality, no accurate machining is required.

31,311
Mercier, A. & Whiteside, T.C.D. THE EFFECT OF RED VERSUS WHITE INSTRUMENT LIGHTING ON THE DARK ADAPTATION INDEX. FPRC/1255, May 1966, 12pp. Flying Personnel Research Committee, London, England. (French Air Force, Centre de Union Nocturne, Tours, France & RAF Institute of Aviation Medicine, Farnborough, Hampshire, England).

The concept of a Dark Adaptation Index is introduced so that one can refer to intermediate levels of night vision (mesopic vision) in terms which are meaningful to operational users. Thus DAI 5 refers to the level of retinal sensitivity achieved after 5 min in the dark, whilst DAI 30 refers to the level of sensitivity achieved after 30 min in the dark. Using this technique it has been found that after 5 min reading a simulated instrument panel the DAI was reduced to 14.1 when the panel was lit with white light and to 17.25 when the panel was lit with red light to a level giving equal legibility. The loss in adaptation is, therefore, greater with white light as one would expect. A standard dark adaptation curve has been calculated mathematically from the results obtained in the investigation of 68 Ss.

31,313
Smith, P.F. SOUND SURVEY ABOARD YFNB-34. BuMed. Proj. MF022.03.03 9015.08, Memo Rep. 66 6, Feb. 1966, 3pp. USN Medical Research Lab., New London Submarine Base, Groton, Conn. (AD 481460)

A survey was conducted to determine the sound pressure levels in certain compartments of a Navy barge, designated as YFNB-34, which is being used in connection with a sonar research study. It was found that airborne pure tone signals at sound pressure levels exceeding the damage risk criteria specified in BuMed Instruction 6260.6A were prevalent in some compartments. It is pointed out that Naval personnel boarding the YFNB-34 must be supplied with suitable ear defenders.
R 1

31,314
Smith, R.L., Garfinkle, D.R., Groth, Hilde & Lyman, J. PERFORMANCE STUDIES ON THE NOTS-UCLA TRACKING SIMULATOR: EFFECTS OF SELECTED CONTROLLER CONFIGURATIONS AND TRANSFER OF TRAINING. Contract N123(60530)23558A, Tech. Rep. 33, Rep. 66 22, March 1966, 46pp. Engineering Dept., University of California, Los Angeles, Calif. (AD 481915)

An experiment was performed on the NOTS-UCLA Tracking Simulator to assess effects of selected tracking controllers and transfer of training. The controllers varied in extent of movement and strength of centering. Trajectory characteristics, trajectory direction and tracking dimension were also included as variables. The results showed that: a) subjects who had gained experience with a strong-centering, movable controller rapidly transferred to pressure-type controllers; b) naive subjects learned faster and performed better the greater the strength of controller centering; c) trajectory direction had some importance only with naive subjects; d) differences between azimuth and elevation scores were not significant; e) no differences were observed between all strong-centering controllers when trajectory difficulty was moderate. Given a high inertia tracking system with strong controller centering and sufficient practice, there appears to be little evidence favoring either pressure or movable controllers.
R 24

31,315
Wade, W.R., MacDonald, H.D., Jr., DeStefano, L.A. & DeLeo, J.M. A STUDY OF OPEN SEAT AIRCRAFT EMERGENCY ESCAPE SYSTEMS. Contract AF MIPR AS 4 63, Proj. AMCMS Code 5910.22.20035.09, SEG TR 65 72, FA Rep. R 1802, Feb. 1966, 72pp. USAF Systems Engineering Group, Wright-Patterson AFB, Ohio. (USA Frankford Arsenal, Philadelphia, Penn.). (AD 481728)

A study of open seat aircraft emergency escape systems is presented. Special attention is directed toward thrust requirements necessary to achieve improved seat trajectories. A 2-dimensional, 3 degrees-of-freedom mathematical model of a rocket-powered ejection seat trajectory, including means for attitude stabilization, has been formulated. This resulting mathematical model has been programmed on both the IBM 7094 Digital Computer and the REAC Systems Dynamic Simulator Analog Computer at Wright-Patterson Air Force Base. On the basis of available aerodynamic and trajectory data, a representative ejection seat configuration was selected for study. Typical trajectories were computed using the mathematical model. Parametric studies directed toward providing a guide for achieving improved escape trajectories were conducted and summarizing graphs are presented. These parameters include aircraft velocity, aircraft pitch angle, main rocket size, vernier rocket thrust, and thrust misalignment.
R 2

31,316
Van Horn, W.H. OPERATIONAL AND MANAGEMENT ASPECTS OF PERIPHERAL RADIOLOGICAL COUNTERMEASURES. FINAL REPORT. Contract N228(62479)65718, Subtask 3221 B, URS Rep. 646 4, March 1966, 154pp. USA Office of Civil Defense, Department of the Army, Washington, D.C. (URS Corporation, Burlingame, Calif.). (AD 632211)

The 4 peripheral countermeasures studied, postattack evacuation, applied shielding, dose equalization (including group shielding), and exposure scheduling, can be used by the local civil defense organization to provide a significant degree of control over radiation exposure during the early postattack period, resulting in the reduction of dose to personnel and/or the time of emergence from shelter. Operational constraints on the implementation of peripheral countermeasures can be lessened by a limited preattack planning effort on the part of the local civil defense organization. Such planning includes recognition of postattack demands for peripheral countermeasures and the probable response capability. Postattack implementation of peripheral countermeasures, although optimized by preattack planning, can be accomplished using planning aids and procedures, developed in the report, which permit the rapid evaluation of available inputs. These aids emphasize predicting dose (both accumulated dose and equivalent residual dose) for complex radiological environments. Response time, which is a major management constraint, can best be minimized by delegating authority for local action to the lowest echelon, normally the shelter itself. It is concluded that the planning necessary for the use of peripheral countermeasures can be integrated into the present civil defense organizations with relatively minor difficulty, resulting in an appreciable payoff in postattack capabilities.
R 34

31,317
Wallace, E.M. SURF: SUPPORT OF USER RECORDS AND FILES, DESCRIPTION AND OPERATION. Tech. Memo. 2912 000 00, April 1966, 33pp. System Development Corporation, Santa Monica, Calif. (AD 632480)

SURF is an EDP-based service for Support of User Records and Files. SURF is designed to meet, or be adapted to, a variety of unique requirements fulfilling the needs of individuals in organizing, maintaining and finding what is in their personal files, without extensive reprogramming for unusual or special demands. It is programmed in SDC's MADAM language which is implemented for an 8K IBM 1401, or IBM 360/30 with 1401 emulator. This document describes SURF routines and associated operational requirements in detail sufficient for using the programs. Included are a summary of the history and purpose of SURF development, usage, and a functional description of inputs, outputs and processes. Three appendices present complete listings of instructions for each routine, examples of the variety of inputs and outputs required by different SDC users, and operational instructions to keypunch and machine operators.
R 4

31,318
USAF Instrument Pilot Instructor School. FLIGHT DIRECTOR/FLIGHT PATH ANGLE APPLICATION OF NON-ILS APPROACH ENVIRONMENT. March 1966, 8pp. USAF Instrument Pilot Instructor School, Randolph AFB, Tex. (AD 632029)

4 pilots from the IPIS Instrument Evaluation Branch flew 72 hooded approaches to determine the application of flight director techniques, flight path angle and absolute altitude information to a non-ILS approach environment. It was determined that: a) Flight director techniques can be used in a non-ILS approach environment to increase precision and decrease pilot workload; b) path angle information is more meaningful to the pilot than vertical velocity for glide slope following; c) pitch augmented rate, the vertical component of flight path angle, is a significant improvement over barometric vertical velocity; d) due to variations in terrain contour, the utility of absolute altitude with current landing weather minima is limited. However, it is essential to an IFR touchdown capability. Properly presented it provides the pilot with accurate and easily interpreted rate of closure information.

31,319
Thorne, C.J. THE PERT CRITICAL-PATH COST SYSTEM. PMR TM 66 3, April 1966, 423pp. USN Pacific Missile Range, Bureau of Naval Weapons, Point Mugu, Calif. (AD 632247)

A description is given of the PERT critical-path cost system and experimental testing and evaluation of the IBM 7094 PERT Cost II program for potential Navy, Point Mugu use. Networks for 2 hardware projects, one management project, and a laboratory building project were successful. The PERT system and capability developed are available for cooperative implementation. The experience gained through the use of PERT at PMR indicates the following: a) The PERT critical-path cost system for managing and allocating time and resources and evaluating performance should be established at PMR, by phasing it in, project by project. The initial effort should be to establish individual project time, manpower, and performing organization PERT network and manual update reporting. b) Major and immediate improvement in planning and performance can be expected since this is the common experience. Dollar savings follow as a natural consequence of improved performance and automation. c) Many present managers are generally familiar with the PERT system. This, together with the available checked-out IBM PERT Cost II computer program, will save training, programming time and cost. d) The effort will fail without the dedicated contributions of PERT analysts and experts; routine computer report processing, review, and expediting by a computer services group; estimates and progress reviews by the performing groups; management review and action at all levels based on these networks and reports.
R 4

31,320
Shurtleff, D.A. DESIGN PROBLEMS IN VISUAL DISPLAYS. PART I. CLASSICAL FACTORS IN THE LEGIBILITY OF NUMERALS AND CAPITAL LETTERS. Contract AF 19(628) 5165, Proj. 7030, ESD TR 66 62, MITRE Rep. MTR 20, May 1966, 114pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.) (AD 636414)

The effects of classical factors, such as symbol geometry, symbol brightness, and brightness contrast, upon the legibility of numerals and capital letters are discussed. The literature of the last few decades is evaluated, and selected studies are reviewed in detail and referenced. Conclusions are drawn, and recommendations are made for display design and application. (c.f. HEIAS 31,321)
R 31

31,321
Shurtleff, D.A. DESIGN PROBLEMS IN VISUAL DISPLAYS. PART II. FACTORS IN THE LEGIBILITY OF TELEVISED DISPLAYS. Contract AF 19(628) 5156, Proj. 7030, ESD TR 66 299, MITRE Rep. MTR 203, Sept. 1966, 68pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The literature on the legibility of numerals, capital letters, and records on television displays, dating from the late 1940s to the present is evaluated. Selected studies of such factors as vertical resolution, video bandwidth, and direction of scanning are reviewed in detail. Conclusions are drawn, and recommendations are made for display design and application. (c.f. HEIAS 31,320)
R 21

31,322
Botha, B., Shurtleff, D. & Young, M. STUDIES OF DISPLAY SUMBOL LEGIBILITY. PART III. LINE SCAN ORIENTATION EFFECTS. Contract AF19(628) 5165, Proj. 7030, ESD TR 65 138, MITRE Rep. W06774, May 1966, 13pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

This report delineates effects upon letter legibility produced by horizontal, oblique, and vertical simulated linear TV scan lines. Horizontal lines were parallel to letter bases; the angle between letter bases and oblique lines was 45 degrees; and vertical lines were perpendicular to the letter bases. The results indicate that letter legibility, as measured by response accuracy and letter identification reaction time, is not affected to any significant degree by the scan line angle. In general, the oblique lines yielded the best legibility scores particularly for brief letter exposure times. The main finding of the study was that certain letters remain highly legible regardless of the scan line orientation used for their presentation, and, therefore, are uniquely suitable for TV display.
R 4

31,323
Shurtleff, D., Botha, B. & Young, M. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART IV. THE EFFECTS OF BRIGHTNESS, LETTER SPACING, SYMBOL BACKGROUND RELATION AND SURROUND BRIGHTNESS ON THE LEGIBILITY OF CAPITAL LETTERS. Contract AF 19(628) 5165, Proj. 7030, ESD TR 65 134, MITRE Rep. W 06899, May 1966, 21pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

Two exploratory studies are reported in which the effects of brightness, letter spacing, symbol background relation, and surround brightness on legibility were determined. As a measure of legibility, both studies used the reciprocal of the visual angle subtended at the eye by capital letters when the S identified correctly 50 percent of the letters in a matrix. A matrix consisted of 20 letters arranged in 4 rows and 5 columns. The first study showed that legibility was significantly altered by brightness, spacing, and symbol background relations. The complexity of the effects of each of these factors was shown by the significant interactions among them. The second study showed surround brightness for the light letters on a dark background to be significant factor in legibility.
R 4

31,324
Shurtleff, D. & Owen, D. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART VI. LEROY AND COURTNEY SYMBOLS. Contract AF19(628) 5165, Proj. 7030, ESD TR 65 136, MITRE Rep. TM 4212, May 1966, 29pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

At vertical resolutions of 12-, 10-, 8-, and 6-scan lines per symbol height, the legibility of Courtney alphanumeric symbols, designed especially for television, was compared with that of standard Leroy symbols. These symbols were presented singly on a 525-line TV monitor, and the speed and accuracy with which they were identified by groups of Ss having normal vision were recorded. A group of Ss viewed only the Courtney symbols, while another viewed only the Leroy. The results showed that, at any resolution value, identification of Courtney symbols was no better than for Leroy. Some practice was required with the Courtney symbols before it was possible to obtain a performance equal to that of the Leroy. This study supports the findings of other experiments: that a resolution of 10 lines per symbol height remains the lowest value recommended for TV displays.
R 14

31,325
Shurtleff, D. & Owen, D. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART VII: COMPARISON OF DISPLAYS AT 945- AND 525-LINE RESOLUTIONS. Contract AF19(628) 5165, Proj. 7030, ESD TR 65 137, MITRE Rep. TM 4213, May 1966, 19pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The legibility of Leroy alphanumerics was determined for 6, 8, 10, and 12 active scan lines per symbol height on a good quality 945-line television system. These results were compared with those of a similar study in which an inexpensive commercial 525-line television system was used. One group of Ss identified symbols displayed by the 945-line system while a second group identified symbols displayed by the 525-line system. The symbols were presented singly, and the speed and accuracy with which the Ss were able to identify them were recorded. The results showed that, even with good quality television, identification performance deteriorated for resolutions lower than 10 lines per symbol height. Performance for the two television systems was similar for 8, 10, and 12 lines per symbol height; but at 6 lines per symbol height, performance was better for the 945-line television than it was for the 525-line television system. As with previous experiments in this series, 10 lines per symbol height was the lowest resolution recommended for television displays.
R 11

31,326
Shurtleff, D., Marsetta, M. & Showman, D. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART IX. THE EFFECTS OF RESOLUTION, SIZE, AND VIEWING ANGLE OF LEGIBILITY. Contract AF19(628) 5165, Proj. 7030, ESD TR 65 411, MITRE Rep. MTR 5, May 1966, 37pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

An investigation was made to determine the visual sizes required for the identification of standard and revised Leroy alphanumerics, which were televised at resolutions of 10, 8, and 6 lines per symbol height. The visual size needed for 99 percent identification accuracy was similar for resolutions of 10 and 8 lines, but a significantly larger visual size was required for symbols resolved by 6 lines. There were no significant differences in visual sizes required for identification of standard versus revised Leroy symbols at any value of resolution. The findings were used to calculate the effective area for viewing televised symbols.
R 16

31,327
Showman, D.J. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART X. THE RELATIVE LEGIBILITY OF LEROY AND LINCOLN/MITRE ALPHANUMERIC SYMBOLS. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 115, MITRE Rep. MTR 204, Aug. 1966, 29pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The legibility of standard Leroy alphanumeric symbols was compared with a new font, the Lincoln/MITRE (L/M) font. Legibility was tested by having human Ss attempt to identify the symbols when seen one at a time for a brief exposure period. The results showed the L/M font to be more legible than the standard Leroy. It is recommended that the 2 fonts be compared in a similar test on a TV monitor; this study is presently being conducted.
R 6

31,328
Kinney, G.C. & Showman, D.J. STUDIES IN DISPLAY SYMBOL LEGIBILITY: PART XI. THE RELATIVE LEGIBILITY OF SELECTED ALPHANUMERICS IN TWO FONTS. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 116, MITRE Rep. MTR 205, Aug. 1966, 25pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

Twelve of the most frequently confused alphanumeric symbols were selected from Leroy and Lincoln/MITRE (L/M) fonts and studied for their relative legibilities. Human Ss saw the symbols with 5 different brightness contrast ratios, and errors were recorded. The L/M font gave significantly fewer errors at all contrast ratios. It was concluded that the L/M font will yield better legibility than the Leroy font and that a greater reduction in errors can be obtained by using the L/M font than by increasing the contrast of a display using Leroy symbols.
R 6

31,329
Kinney, G.C., Marsetta, M. & Showman, D.J. STUDIES IN DISPLAY SYMBOL LEGIBILITY. PART XII. THE LEGIBILITY OF ALPHANUMERIC SYMBOLS FOR DIGITALIZED TELEVISION. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 117, MITRE Rep. MTR 206, Nov. 1966, 44pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The relative legibility of numerals and capital letters in 4 fonts, standard Leroy, an idealized Hazeltine, a Simulated Hazeltine and a Modified Idealized Hazeltine, was studied in 3 experiments using a controlled exposure time, single-symbol, recognition test. The Hazeltine fonts were constructed of TV lines digitally controlled to generate symbols of elements in a 5-column by 7-row rectangular matrix. The Hazeltine font was found to be as legible as the Leroy, but losses in legibility were found for photographic simulations of the symbols as they appear on a TV tube. The modified font was found to be superior in legibility, and is recommended for display use. Further study should be done on a TV tube and would best employ other kinds of legibility tests.
R 16

31,330
Kinney, G. & Showman, D. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART XIII. STUDIES OF THE LEGIBILITY OF ALPHANUMERIC SYMBOLS IN THE BUIC SYMBOL. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 302, MITRE Rep. MTR 234, Aug. 1966, 36pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The legibility of alphanumerics for BUIC (Back-up Interceptor Control) system displays was studied in 3 experiments. Four fonts, standard Leroy, Idealized Early BUIC, Idealized Late BUIC, and Simulated Late BUIC, were tested in single-symbol, controlled exposure-time, recognition tests. The Early BUIC font was less legible than standard Leroy; but after some symbol changes were made, the new font (Idealized Late BUIC) was more legible than the earlier font. When the improved alphanumerics were simulated to appear as they do on the display console, they were less legible than the Idealized alphanumerics. Symbol changes are recommended, and BUIC operators are urged to exercise caution in reading the displays.
R 6

31,331
Marsetta, M. & Shurtleff, D. STUDIES IN DISPLAY SYMBOL LEGIBILITY. PART XIV. THE LEGIBILITY OF MILITARY MAP SYMBOLS ON TELEVISION. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 315, MITRE Rep. MTR 264, Sept. 1966, 79pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The speed and accuracy with which 5 Ss identified military map symbols were determined with 5 different resolutions in lines per symbol height on a television monitor in 3 experiments. The first 2 experiments indicated that the minimum acceptable resolution is approximately 17 lines even after considerable practice. The third experiment indicated that a slightly lower resolution is permissible only with an optimum contrast of detail and a carefully selected and maintained television system. Recommendations are made for field installations.
R 5

31,332
Bell, G.L. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART XV. RELATIVE LEGIBILITY OF LEROY AND TELETYPEWRITER SYMBOLS. Contract AF19(628) 5165, Proj. 7030, ESD TR 66 316, MITRE Rep. MTR 265, Sept. 1966, 79pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The first two studies are reported from a planned series of studies to obtain legibility data on teletyped hourly sequence weather reports. In the first study, Ss were asked to identify symbols, shown singly in a random order with the symbols occurring with equal frequencies. The two teletype fonts, Murray and Long Gothic, were compared with a standard Leroy font. The second study used the teletype fonts only, and the Ss identified symbols shown with symbol frequencies similar to those in typical hourly sequence reports. For these experimental conditions, the teletype fonts were not as legible as the standard Leroy font although the symbol frequencies found in typical hourly sequence reports improved the Ss' reading performances.
R 9

31,333
Ziff, P. MORE ON UNDERSTANDING UNDERSTANDING UTTERANCES. Rep. SP 2504, June 1966, 15pp. System Development Corporation, Santa Monica, Calif. (University of Wisconsin, Madison, Wisc.). (AD 635203)

The question as to how hearers are able to understand correctly utterances containing polysemous words can be clarified by considering what would be involved in providing an automaton with a comparable ability to resolve polysemy. It is clear that such an automaton would have to be able to analyze utterances syntactically and to ascertain whether any of certain standard discourse operators had been applied in the generation of an utterance, e.g. operators corresponding to tropes, nonce usage, etc. But there are a number of other factors that impinge upon the resolution of polysemy. One of these pertains to coherence in discourse, another to matters of general belief. As an approach to dealing with these additional factors, a vectorial analysis of word senses and a new relation of logical implication are proposed.

31,334
Zemme, C.J. & Silvia, J. SHIPBOARD EVALUATION OF EXPERIMENTAL MODEL I BUOYANT INSULATED COLD WEATHER JACKETS. Proj. T F015, Rep. RENS 14 02 001 00 1, May 1966, 20pp. USN Supply Research & Development Facility, Bureau of Supplies & Accounts, Bayonne, N.J. (AD 636973)

A service evaluation of experimental buoyant permeable and impermeable cold weather jackets was conducted during 2 consecutive winters aboard aircraft carriers and destroyers. The extended evaluation was conducted to assess the protective properties, fit, and durability (especially of the buoyant insulation) of the garments. The jackets were insulated with unicellular polyvinyl chloride foam (PVC) which provided sustained emergency buoyancy as an integral component of the jackets. This feature is not provided by the standard Navy A-2 Intermediate Cold Weather Jacket and A-1 Extreme Cold Weather Jacket when the liner is removed. Test results indicated that the new jackets furnished satisfactory, functional utility and environmental protection and that the PVC foam was suitable for use as an insulating material. The tests also revealed certain design short-comings of the impermeable jacket which will require correction.
R 4

31,335
Thompson, R.E. SEALAB I: A PERSONAL DOCUMENTARY ACCOUNT. BuMed Proj. MF011.99 9003.05, Memo. Rep. 66 9, March 1966, 36pp. USN Medical Research Lab., New London Submarine Base, Groton, Conn. (AD 635656)

The author was the medical officer participant in the group of 4 men who spent 10 days in the underwater habitation designated SEALAB I in July-August 1964. This is a day by day account of the experiences and problems encountered by the author during the preparation for the experiment, beginning on 28 April, and during the actual time underwater and during the ascent to the surface and the period of decompression, terminating on the first of August. This particular submarine-qualified medical officer was chosen for this assignment in the SEALAB I project because of his previous training in the fields of marine biology and diving medicine. This personal account is published at this time as a part of the record of the SEALAB series of projects, which are part of the larger Man-in-the-Sea Program. He describes what they ate, how they slept, details of their sorties into the ocean around them; problems due to contamination of their atmosphere; the fish and marine life observed through their portholes or encountered in their excursions outside the SEALAB; as well as their psychological states, their relationships with each other, and their communications with both the support personnel topside and their families at home.

31,336
Silverman, J. A COMPUTER TECHNIQUE FOR CLUSTERING TASKS. PROGRESS REPORT. Proj. PF016011001, Tech. Bull. STB 66 23, April 1966, 77pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 635901)

This report describes an advanced computerized technique for clustering work tasks. The ultimate objective of this research is to devise a method for determining the basic technical skills needed to man current and future weapons and support systems in order to provide a basis for the Navy enlisted personnel classification structure required in the next decade. This technique produces homogeneous clusters of task patterns using an input of tasks performed in a sample of jobs. These clusters represent the occupational specialties that exist in a field of work. The most important features of this technique are: a) its capacity for computer analysis of task patterns of large numbers of subjects; b) its capability for computer assistance in making research decisions at various levels of task analysis; and c) its flexibility as a tool of pattern recognition and structuring. With only minor modifications, the computer programs and concepts described in this report should be of interest to those concerned with other clustering, classifying, and taxonomic techniques.
R 117

31,337
Siegel, A.I., Lanterman, R.S., Lazo, J., Gifford, E.C., et al. CONSPICUITY OF FLUORESCENT AND NON-FLUORESCENT STIMULI. FINAL REPORT. Contract N156 44911, BuWeps. Task RRMA 05 010/2001/R007 08 01, Prob. Assign. 12 86, NAEC Rep. ACEL 537, June 1966, 33pp. USN Aerospace Crew Equipment Lab., NAEC, Philadelphia, Penn. (Applied Psychological Services, Wayne, Penn.). (AD 635393)

2 investigations were performed into the conspicuity of stimuli equated for luminance, but of different purity and of different dominant wave length. In these experiments, subjects performed a simulated flight and responded to the stimuli as the stimuli appeared at various azimuth locations against a simulated sky background. The results supported the contention that purity will affect detection time in the simulated flight situation and that wave length also exerts an important effect.
R 12

31,338
Peterson, F.E. & Pomarolli, R.S. ACADEMIC GRADES IN PRIMARY FLIGHT TRAINING AS PREDICTORS OF FLIGHT SUCCESS. Spec. Rep. 66 3, March 1966, 5pp. USN Naval Aerospace Medical Institute, NAMC, Pensacola, Fla. (AD 635304)

Academic grades received during primary training were evaluated as predictors of success in naval aviation training. It was found that the addition of primary academic grades to the present prediction system resulted in a significant increase in predictive effectiveness.
R 1

31,339
Nakonechny, B.V. SURVEY OF PRESENT STATE OF TECHNOLOGY AND PRACTICAL EXPERIENCES WITH AIR-CUSHION VEHICLES. Rep. 2203, July 1966, 54pp. USN David Taylor Model Basin, Bureau of Ships, Washington, D.C. (AD 637135)

This report presents a survey of the present state of technology as well as practical experiences relating to design and operation of air-cushion vehicles (ACV's). Topics include a brief desciption of vehicle types and basic-engineering principles, characteristics of existing vehicles and those of the near future, existing and potential main machinery and propulsion systems, and possible technological trends in critical areas. No attempt is made to discuss the potential of ACVs for naval application; rather, the technologic base is identified so as to make available to naval architects information supplemental to their conceptual design studies. On the basis of available information one can conclude that air-cushion vehicles of 1,000 tons and larger will not be available for open ocean operations within the next 2 to 3 years.
R 40

31,340
McRae, A.V. INTERACTION CONTENT AND TEAM EFFECTIVENESS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task UNIFECT, Subtask 1, Tech. Rep. 66 10, June 1966, 33pp. USA Office of the Chief of Research & Development, Washington, D.C. (Human Resources Research Office, George Washington University, Alexandria, Va.). (AD 637311)

An experiment was performed to study intrateam interaction under controlled conditions. Coordination was a prerequisite for completing a team task and verbal interaction was the sole means of coordination. All such communications were tape-recorded. Communication content was categorized into 2 major areas related to task demands and to organizational efforts. With time to solve held constant, number of errors correlated negatively with number of communications specifically concerned with effective response to task demands, but did not yield consistent correlations with interaction related to organizational aspects.
R 11

31,341
Goodyear Aerospace Corporation. STUDY OF SUBMARINE CASUALITY CONTROL TRAINING. FINAL REPORT. Contract N61339 1813, Proj. 7878 2, Tech. Rep. NAVTRADEVCEN 1813 1, March 1966, 286pp. USN Training Device Center, ONR, Orlando, Fla. (Goodyear Aerospace Corporation, Akron, Ohio). (AD 486430)

The study confirmed previous research and opinions that plane failures and flooding are the most critical of the casualties to be trained. Critical factors for recovery and skill behaviors to be trained were identified. These factors a) emphasize immediate detection and automatized (immediate) emergency response; b) add as critical requirements for team training, judgments by the Officer of the Deck (OOD) and the upgrading of enlisted men to stand Diving Officer (DO) and Ballast Control Panel (BCP) Watches; c) emphasize the need for programs of standardized alternate recovery actions and guidelines related to depth and speed bands; and d) emphasize the need for adjustment of recovery action to operational requirements, such as the tactical situation and concealment by noiseless submerged running for as long as possible. The recommendations include characteristics of high-fidelity dynamic ship control trainers for SSN's and SSBN's, respectively; a flooding demonstration trainer; a communications trainer; and a BCP emergency procedures trainer. The recommendations also include the use of basic generalized dynamic ship control trainers (for example, Device 21B56A), a training course for upgrading nonline officers and enlisted men to stand the DO watch, the establishment of standardized casualty recovery procedures and guidelines (including standardized flooding classification and reaction), the development of recoverability data for less than "worst case" casualties, and an additional study effort on damage control training approaches.
R 73

31,342
Kinder, F.A. UNDERWATER LIGHT ATTENUATION MEASUREMENTS. Report from: "10th SPIE Technical Symposium, San Francisco, California, 17 Aug. 1965." WEP Task RU 22 2E 000/216 1/R004 03 01, NOTS Rep. TP 4148, July 1966, 5pp. USN Naval Ordnance Test Station, China Lake, Calif. (SPIE Journal, 4, Dec. 1965-Jan. 1966) (AD 636043)

This report is a reprint of a paper presented at the 10th SPIE Technical Symposium held in San Francisco 17 August 1965. Underwater light attenuation measurement techniques are discussed, and typical data are presented. Also presented are specific data obtained from measurements taken near San Clemente Island and those taken at greater depths in the north Pacific. The San Clemente Island data include the volume attenuation coefficient, the diffuse attenuation coefficient, and the spectrographic characteristics found in those waters; the north Pacific data center around typical volume attenuation measurements taken to depths of 6,000 feet.

31,343
Fregly, A.R. & Graybiel, A. AN ATAXIA TEST BATTERY NOT REQUIRING THE USE OF RAILS. Contract NASA R 93, BuMed. Proj. MR005.04 0021, NAMI Rep. 985, Rep. 140, Dec. 1966, 15pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Normative standards on a new quantitative ataxia (postural equilibrium) test battery using rails of various widths as platforms were presented in a previous report. The present study reports normative standards of performance on a related battery of ataxia tests with the floor as a platform and employed routinely in the vestibular research program at this laboratory. Significant decreases in performance with age and an apparent superior performance by males were found. The scores of bilateral and unilateral vestibular-defective individuals and of patients referred for testing because of symptoms of vertigo departed significantly from the normative standards. The usefulness of individual tests as well as of the test battery in clinical and research situations was made apparent.
R 9

31,344
Eckles, A.J., III & Garry, T.A. TARGET OBSCURATION FROM INTERVENING LIGHT SOURCES: A PRELIMINARY INVESTIGATION. Tech. Note 2 66, May 1966, 18pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 637720)

This preliminary experiment examined how an intervening light source affects target obscuration. More specifically, this experiment estimated how target obscuration depends on variables such as target brightness, intensity of intervening light source, target range, and range of the intervening light source. These results, while limited to data from 2 Ss, point the way to more detailed and sophisticated experimentation.

31,345
Egerman, K. EFFECTS OF TEAM ARRANGEMENT ON TEAM PERFORMANCE: A LEARNING-THEORETIC ANALYSIS. J. Pers. & soc. Psychol., 1966, 3(5), 541-550. (American Institutes for Research, Pittsburgh, Penn.). (Reprint) (AD 635700)

Three groups of six 2-man teams, differing only in arrangement, underwent 2 major phases of training: preteam, where each individual developed a proficiency in making a timing response; and team training, where each S used his timing skill as a team member. Individual preteam proficiencies and the team arrangement were the only 2 variables used to predict: a) initial team performance; b) the schedule of reinforcement for each S; and c) the manner in which team performance would change from the initial to the final periods of training. This investigation points out the feasibility of applying learning-theoretic principles to a study of group behavior.
R 21

31,346
Cusack, B.L., Flint, R., Gibbons, R.D., Haney, T.P., et al. EMERGENCY OPERATIONS SIMULATION RESEARCH. FINAL REPORT. Contract OCD PS 65 71, Tech. Memo.(L) 2938/001/00, May 1966, 130pp. System Development Corporation, Santa Monica, Calif. (AD 637766)

This document contains findings, conclusions and recommendations resulting from the study of emergency operations such as: a) The establishment of a research facility, including the operations room of an Emergency Operating Center (EOC) and the supporting simulation and observation areas; b) The development of a simulation research model of a prototypical urban area including an organizational and operational plan, a supporting resource data base, and a disaster effects compendium for the model; c) The conduct of experimental studies utilizing operations simulation methods; d) The investigation of various types of input, display and simulation equipments, including their uses within an Emergency Operating Center; e) The investigation of the potential application of electronic data processing within Emergency Operating Centers; f) The evaluation of simulation as a research tool in the design, development, evaluation and improvement of the EOC program; g) The examination of fire data collected during the civil disturbances in South Los Angeles in August 1965.

31,347
Aviation Safety Engineering & Research. UNITED STATES ARMY AVIATION CRASH SURVIVAL RESEARCH. SUMMARY REPORT. Contract DA 44 177 AMC 254(T), Task 1P125901A14230, USAAVLABS Tech. Rep. 66 43, AvSER Rep. 65 12, June 1966, 31pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research, Phoenix, Ariz.). (AD 637132)

Analysis of U.S. Army aircraft accidents has revealed that accelerative loads on impact have been well within the limits of human tolerance in the majority of cases. Personnel involved in these accidents, however, have frequently suffered serious or fatal injuries as a result of the failure of some portion of the aircraft structure (e.g., crushing of fuselage), failure of some major component (e.g., crew seat), or postcrash fire. Accordingly, the major emphasis in the projects conducted during the contract year was on improved structural crashworthiness, improved crash survival capability in seats and retention systems, and improved fuel containment in dynamic crash environments. The objective of the work effort in general was to develop more realistic crash survival design criteria for existing and future U.S. Army aircraft. In addition to the areas cited above, effort continued in the areas of crash survival investigators' training, field investigation of pertinent aircraft accidents, and scientific liaison. All major work areas are reported in summary form.
R 17

31,348
Barmack, J.E. & Sinaiko, H.W. HUMAN FACTORS PROBLEMS IN COMPUTER-GENERATED GRAPHIC DISPLAYS. Contract SD 50, Proj. ARPA Assignment 15, Study S 234, April 1966, 116pp. Institute for Defense Analyses, Washington, D.C. (AD 636170)

This study is a review of current practices in computer-generated graphic displays from the point of view of engineering psychology. Input devices, which are integral to man-computer systems, are also considered. Theories of cognition are examined with respect to their applicability to computer-graphics.
R 98

31,349
Siegel, A.I., Lanterman, R.S. & Macpherson, D.H. STUDIES INTO INFORMATION PRESENTATION THROUGH NOVEL METHODS: INFORMATION TRANSFER THROUGH ELECTROCUTANEOUS STIMULATION. Contract DA 28 043 AMC 00186(E), Proj. ICO 24701 A 121, Task 03, Subtask 03, Rep. ECOM 00186 7, Phase 7 Report, April 1966, 84pp. USA Electronics Command, Fort Monmouth, N.J. (Applied Psychological Services, Wayne, Penn.). (AD 632735)

International Morse code reception, one dimensional tracking, and probabilistic decision making with electrocutaneous signals were investigated. It was found that trained Morse operators can receive electrocutaneously presented Morse code after only brief training. However, after as much as 19 to 22 hours of electrocutaneous Morse reception training, the operator's performance with electrocutaneous signals had not reached their performance levels with auditory signals. No difference was found between electrocutaneous and visual, one-dimensional tracking or between probabilistic decision making with the 2 modes of reception.
R many

31,350
Siegel, A.I. & Pfeiffer, M.G. POSTTRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. PERSONNEL PSYCHOPHYSICS: OPERATIONAL CORRELATES OF ELECTRONIC CIRCUIT COMPLEXITY. TECHNICAL REPORT. Contract NONR 2279(00), May 1966, 41pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.). (AD 485865)

A series of magnitude estimation judgments was made for each of 16 different circuit types in order to investigate "subjective" and "objective" job correlates of perceived circuit complexity. These estimations involved: a) the difficulty of meeting five different Fleet maintenance objectives (correlates); b) the number of on-the-job training hours required in repair on each circuit type before a typical striker can achieve proficiency with the circuit, and c) the number of on-the-job checks required before a typical striker can perform circuit analysis on his own and without direct supervision. The Ss involved in the scaling also rated each other on an objective criterion (i.e., number of effective and ineffective performances) and on a subjective criterion (i.e., peer ranking of perceived proficiency). Perceived circuit complexity data, based on an independent sample of journeyman avionics maintenance personnel, had been previously obtained. The resulting linear relationships between perceived circuit complexity and the operational correlates suggest possibilities for prediction of performance data on the basis of judgments of circuit complexity.
R 10

31,351
Smith, Janice L. THE EFFECT OF ACCELERATIONS ON THE VESTIBULAR ANALYZER. BIBLIOGRAPHY. REPORT 1. ATD Work Assign. 79, Task 48, ATD Rep. 66 62, June 1966, 21pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 636474)

This bibliography was compiled from Soviet open sources published 1955-1966 together with 5 Western sources. It is the first report in a series and deals with the effect of angular, impact, and Coriolis accelerations on the vestibular mechanism. The bibliography is divided into 2 sections. The first section consists of 112 items which were considered of primary interest. The second part contains 27 items considered of secondary interest because they contained elementary or background information or had only a few relevant paragraphs. Pertinent information included: diagnostic value of labyrinthine reactions, changes in the frequency spectrum of an encephalogram during vestibular and optokinetic stimulation, cortical regulation of vestibular reactions, stimulation of the vestibular appartus of a dog, development of conditioned vestibular reflexes, biological and physiological studies in rocket and satellite flights, physiological effects of gravitation, spatial orientation, equipment for study of the vestibular analyzer, effect of prolonged acceleration, motion sickness, vestibular training.
R 139

31,352
Smith, K.J., George, Marilyn E., Speckman, E.W., Homer, G.M., et al. EVALUATION OF THE BIOCHEMICAL AND PHYSIOLOGICAL EFFECTS OF CONFINEMENT ON HUMAN SUBJECTS. FINAL REPORT. Contract AF 33(657) 11716, Proj. 7164, Task 716405, AMRL TR 66 2, April 1966, 45pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The reported 42-day experiment was designed to evaluate the effects of confinement on the nutritional, biochemical, and physiological status of human subjects in the Life Support Systems Evaluator. A freshly prepared diet that closely matched a proposed aerospace diet was fed to human volunteers, and coefficients of apparent digestibility and balance of the component nutrients were determined. The 4-day cycle menu composed of fresh, canned and heat processed foods was high in organoleptic acceptability. None of the foods became less acceptable with repeated servings. Confining the subjects for 28 days in the Life Support Systems Evaluator did not affect subject body weight, nutrient balance, digestion, or water balance. The values obtained for the nutrient balances indicated that the diet was efficiently digested and metabolized. Confinement to 2.4 square meters per man, in the Evaluator, had no effect on the hematological or physiological measurements.
R 34

31,353
Smith, K.J., Speckmann, E.W. & Hein, R.L. SELECTED BIBLIOGRAPHY ON THE SUSTENANCE OF MAN IN AEROSPACE SYSTEMS. FINAL REPORT. Contract AF 33(615) 2182, Proj. 7164, AMRL TR 65 234, May 1966, 78pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This bibliography, selected after a thorough review of the existent literature, covers various aspects of the nutritional support of man in aerospace systems. The 311 references are concerned with the development of aerospace feeding concepts, nutritional studies having direct or potential aerospace application, closed ecological systems for the production of food, and general reviews of related problems of extra-terrestrial travel and habitation. As an aid to domestic research workers, emphasis has been placed upon foreign literature concerning nutritional support of man in aerospace systems.
R 311

31,354
Smith, R.L., Garfinkle, D.R., Groth, Hilde & Lyman, J. PERFORMANCE STUDIES ON THE NOTS-UCLA TRACKING SIMULATOR: INDEPENDENT EFFECTS OF ERROR MAGNIFICATION, FIELD OF VIEW AND TRAJECTORY DYNAMICS. Contract N123(60530) 23558A, Tech. Rep. 34, Rep. 66 23, April 1966, 40pp. USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif. (Engineering Dept., University of California, Los Angeles, Calif.). (AD 483327)

An experiment was conducted on the NOTS-UCLA Tracking Simulator to determine the independent effects of error magnification and field of view on tracking performance. Magnification was achieved by either increasing the display gain or decreasing the S-to-display distance (optical gain). In general, the results showed that: a) the facilitative effects on performance of increasing display magnification were aparently due to the concomitant reduction in field of view rather than to magnification per se; b) differences in performance resulted from the same retinal magnification, contingent on the method used to obtain it; c) display magnification had little affect on performance when used in conjunction with optical magnification.
R 18

31,355
Spencer, G.J., Kolkowitz, H. & Dibelka, G.S. THE COGAG SIMULATION MODEL (COSIMO) PILOT STUDY. VOLUME I. DATA ACQUISITION AND MODEL EXERCISES. DISCUSSIONS. Contract NONR 4563(00), Rep. PTB 67 3, Oct. 1966, 157pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Serendipity Associates, Chatsworth, Calif.).

The report presents the results of the second phase of the COSIMO model development effort which was devoted to model checkout, data acquisition and preliminary data adjustment runs. A complete model description is provided together with a discussion of input data acquisition. Model run results are provided for both the single-shaft and twin-shaft configurations. System-effectiveness measures resulting from model runs are lower than desired for the system, even though a high level of maintainability was assumed. This effectiveness deficiency is attributed to the failure rate data which resulted in a higher frequency of maintenance than had been predicted by other studies. The cause for this disagreement is attributable to the difference in the definition of gas turbine reliability and the meaningfulness of data based on airline experience. Data are presented which show that the mean time between maintenance actually performed on gas turbines in a military environment agrees quite closely with the data used for the study. The significance of these results in terms of personnel performance requirements and trade-offs is discussed.
R 11

31,356
Steinemann, J.H. COMPARISON OF PERFORMANCE ON ANALOGOUS SIMULATED AND ACTUAL TROUBLE-SHOOTING TASKS. Proj. PF017030601, Res. Memo. SRM 67 1, July 1966, 11pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 636994)

This investigation compared the performance of a group of subjects assessed on a simulated troubleshooting task and on the identical actual troubleshooting task using real equipment. Subjects were 14 students in the experimental training program for Electronics Technicians, conducted by the Navy Training Research Laboratory, San Diego. Analysis of results revealed that the simulated performance measure did not provide a valid estimate of performance proficiency on the actual task. Obtained negative inter-test correlations indicate that simulated test results would actually be misleading in terms of estimating actual performance scores. In addition to performance score discrepancies, there were observable differences in specific performance procedures and overall troubleshooting strategy attributable to the differences in test mode. The evidence strongly suggests caution in assuming that a simulated performance measure, even with considerable face validity, will provide a valid estimate of actual performance on a common task.

31,357
Stern, R.M. & Gaupp, L. PHYSIOLOGICAL AND SUBJECTIVE ADAPTATION TO SHOCK: A DISCREPANCY. Contract NONR 908 15, Tech. Rep. 12, May 1966, 11pp. Indiana University, Bloomington, Ind.

The purpose of this experiment was to compare subjective and physiological adaptation to 15 repeated electric shocks of the same intensity. Twenty-four Ss received shocks at the highest level they would tolerate, 24 others received shocks at their predetermined "annoying" level. All Ss were told that shock intensity would vary from trial to trial and that their task was to rate the intensity of each shock. The data for both groups show that there was no physiological adaptation, as determined by size of GSRs, but there was significant subjective adaptation. The results are accounted for in terms of special qualities of the stimulus--electric shock.
R 4

31,358
Stichman, E.P. TRANSCRIBER CONFIDENCE IN RELATION TO ACCURACY OF TRANSCRIPTION. DA Proj. R&D 2J024701A723, Tech. Res. Note 175, July 1966, 25pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 642544)

In continuing research conducted under controlled laboratory conditions, the Combat Communications Task is investigating voice radio-telephone communications techniques and improvement of performance of personnel in communciations operations. The present study was designed to determine the relationship of transcriber confidence to transcription accuracy. Measures of two aspects of performance--message intelligibility and expressed confidence in the correctness of transcription--were obtained from 8 Army enlisted men (untrained in communications) transcribing word lists received at 3 signal-to-noise rations. Confidence was expressed through the use of a five-point rating scale ranging from "fully confident" to "not at all confident", and a separate rating was assigned to each word in a list as it was transcribed. A significant relationship was obtained between transcriber confidence and accuracy of transcription. As expected, both mean intelligibility and mean confidence ratings increased as a direct function of signal-to-noise ration. Signal-to-noise ratio did not similarly affect the relationship between confidence and accuracy. Because of generally unpredictable and unstable listening conditions in the field, the relationship between confidence and accuracy--averaged across signal-to-noise ratios--appears to provide a stable measure which is the best practical basis for estimating transcript accuracy. Conclusion was that a positive relationship exists between transcriber confidence of correct reception and message intelligibility, even when personnel untrained in communications serve as transcribers. While far from perfect, the relationship is sufficient to warrant further research using trained communications transcribers.
R 8

31,359
Stoner, L.D., Horton, J.A. & Carson, E.R. SIMULATION IMAGE GENERATION. VOLUME I. STUDY OF TELEVISION CAMERA AND OPTICAL PICKUP FROM SCALE RELIEF MODELS. FINAL REPORT. Contract AF 33(615) 2394, Proj. 6114, Task 611405, AMRL TR 66 18, GAC Rep. GER 12313, Feb. 1966, 234pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Goodyear Aerospace Corporation, Akron, Ohio).

Simulation devices for high-speed low-level flight, approach, and landing are considered deficient in one or more of the areas of: a) depth of field, b) resolution, c) perspective, and d) shading. Phase I of this study program is an investigation of these problems as they relate to an optical-Pickup/three-dimensional-model/television-system type of visual-image generator. The problems are examined in detail, and solutions or optimization techniques are offered for advancing the state of the art. Ten approaches-six with a single television channel in black-and-white and four in multiple-tube configuration, variously arranged for electronic depth-of-field improvement, color, and wide angle--are considered. A single-tube system with Scheimpflug-plane adaptive optics and a multiple-tube system with electronic data compilation of the equivalent high-resolution pickup plane are developed more fully; these are the recommended designs, representing state-of-the-art advances for improving depth of field. For available high-resolution television systems, it is possible to design a practical optical-pickup image generator whose apparent resulting display resolution is essentially limited by the television characteristics for all typical conditions of probe-model relationships and simulated vehicle attitudes.
R 34

31,360
Sturm, R.D., Snyder, H.L., Wyman, M.J. & Rawlings, S.C. THE EFFECT OF PREDESIGNATION INFORMATION UPON TARGET AND CHECKPOINT RECOGNITION PERFORMANCE. Contract NONR 4405(00), Projs. NR 142 184 & 196 00X/12 4 64, Rep. C6 274/3111, Feb. 1966, 75pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Autonetics, North American Aviation, Inc., Anaheim, Calif.).

A simulation study was performed to investigate a new display technique for improving air-to-ground target recognition performance. This technique, called target predesignation, indicates to the pilot the anticipated location of a target on any cockpit sensor display. In this manner the pilot, by searching the predesignated area on his cockpit sensor display, has a reduced area in which to search for the target. In the present study several parameters of the predesignation technique were investigated in a fixed-base simulation in which Marine Corps pilots and radar operators served as Ss. Comparisons were made among the following parameters: a) display type (direct visual search versus radar display); b) type of predesignation information (range, cross-range, or range plus cross-range); c) size of predesignated area (single point, 4,000 or 8,000 feet between parallel reticle lines); and d) navigation system error (1/4, 1/2, or 1 mile per hour). Study results clearly indicate that visual target recognition performance can be markedly improved by the presentation of dynamic target predesignation information. Results for radar target recognition, although not statistically significant, suggest that radar target acquisition can be improved by the addition of predesignation information. Total results are not as definitive in providing information on the optimal configuration of the predesignation display.
R 12

31,361
Rowan, T.C. SYSTEMS ANALYSIS: PROBLEMS, PROGRESS, AND POTENTIAL. Rep. SP 2615, Oct. 1966, 9pp. System Development Corporation, Santa Monica, Calif. (Industr. Res., Aug. 1966). (AD 642233)

This paper discusses the application of system analysis techniques to the mounting socio-economic problem of urban areas. Several specific projects are described including: the applications in management information, crime and delinquency, waste management, transportation, education, document handling, urban and regional affairs and long-range planning. Several operational problems encountered in the course of the studies are reviewed.

31,362
Rothstein, J.D. & Brown, W.K. FEASIBILITY STUDY: LATERAL IMPACT WITH STANDARD AIRCRAFT HARNESS CONFIGURATION. Contract T 13335(G), ARL TR 66 3, Feb. 1966, 22pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (AD 629007)

A series of 11 impact tests using the Daisy Decelerator was accomplished to evaluate the adequacy of restraint from lateral impact forces of up to 14 sled G using as minimal restraint, standard aircraft harness and a non-contoured seat. Standard harness would offer greater range of movement to the restrained S than would be offered by a more complex harness previously proposed and tested for Project Apollo. Results of the 11 tests demonstrated adequacy of restraint with the standard harness at tested impact profiles. It was also observed that when the torso was not laterally supported a shallow, 5.08 cm (2-inch) deep head support was adequate at sled G less than 10 G, above 10 sled G this shallow head support was preferred to a deeper, 17.8 cm (7-inch) head support so that at impact the S's head can rise out and over the shallow support thereby minimizing the shearing force between the head and laterally moving torso. It was also observed that amplification of G from seat to S was about the same for both harnesses even though input force was greater in the series using standard harness. This observation suggested greater absorption of impact force by torso movement and strap stretch with standard harness than almost entire force absorption by the rigidly restrained body with more complex harness.
R 3

31,363
Tapscott, R.J. & Sommer, R.W. A FLIGHT STUDY WITH A LARGE HELICOPTER SHOWING TRENDS OF LATERAL AND LONGITUDINAL CONTROL RESPONSE WITH SIZE. NASA TN D 3600, Sept. 1966, 10pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A flight study was undertaken with a large single-rotor helicopter in an effort to establish possible effects of vehicle size on minimum acceptable control response. Test results for the pitching and rolling axes indicate that control sensitivity and angular velocity damping characteristics which provided acceptable maneuvering capability, in general, tend to confirm the validity of the reduction of these parameters with increase in vehicle size indicated by the established flying-qualities criteria. The test results show the need for considering the damping in combination with the control sensitivity when control-response criteria are applied for design purposes or when pilot's opinions are used to determine minimum acceptable response characteristics for VTOL vehicles.
R 4

31,365
Turnbow, J.W. HELMET DESIGN CRITERIA FOR IMPROVED CRASH SURVIVAL--SUPPLEMENT I TO HELMET DESIGN CRITERIA FOR IMPROVED CRASH SURVIVAL. Contract DA 44 177 AMC 254(T), Task 1P125901A14230, USAAVLABS Tech. Rep. 65 44A, Jan. 1966, 18pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research, Flight Safety Foundation, Phoenix, Ariz.). (AD 628679)

This supplement on impact test methods is separated from the basic report in order to permit study by readers who are interested primarily in this subject. The analysis is presented to allow the reader to evaluate the primary methods of testing helmets and to illustrate specifically certain problems associated with each test method in interpreting the test results. The evaluation and/or comparison of helmet performance against the impact threat must be based upon the measurement of 3 parameters: a) head acceleration; b) energy-absorption capacity; and c) resilience, since the ideal helmet absorbs maximum energy with no resilience (no rebound after impact) while maintaining a tolerable acceleration level (no injury). The test method selected should permit these measurements to be made simply and preferably without bias due to helmet weight and other possible variables unless the measured quantities can be readily and accurately corrected for such bias. The analyses presented illustrate the effect of 2 variables, the mass of the test components, and the coefficient of restitution upon the energy-absorption and acceleration levels.

31,366
Urry, V.W. & Nicewander, W.A. FACTOR ANALYSIS OF THE COMMANDER'S EVALUATION REPORT. USAEEC Proj. 693, Tech. Res. Study 40, May 1966, 28pp. USA Enlisted Evaluation Center, Fort Benjamin Harrison, Indianapolis, Ind. (AD 636328)

A factor-analytic study was conducted to determine what the current Commander's Evaluation Report (CER) measures and what a revised CER should measure. For these purposes, samples from the 2 and 4 skill levels were used. Five interpretable factors were extracted at the 2 skill level. These were: Rater Bias or Halo Effect; Contribution to Group Effort; Dependability; Drive for Self-Improvement; and Military Propriety. Of the above factors, Contribution to Group Effort, Dependability, and Drive for Self-Improvement were most valid. At the 4 skill level, 6 interpretable factors were extracted. These were: Rater Bias or Halo Effect; Dependability; Direction of Group Effort; Drive for Self-Improvement; Motivation for Military Life; and Personal Bearing. The factors, Direction of Group Effort, Drive for Self-Improvement, and Motivation for Military Life, were most valid. The rating characteristics to be used in a revised CER should elicit responses which are related to the more valid factors. For this purpose 14 rating characteristics were recommended. These were: Cooperativeness, Reliability, Job Performance, Drive, Development, Conduct, Initiative, Job Knowledge, Acceptability, Adaptability, Application, Leadership, Participation, and Responsibility. A random ordering of descriptive statements for each rating characteristic was proposed to counteract the tendency of raters to react to general impressions of ratees. The action was necessary since approximately 60 percent of the variance measured by the current CER was of this nature.
R 2

31,367
USAF Instrument Pilot Instructor School. OPERATIONAL TEST AND EVALUATION OF UNFILTERED WHITE LIGHTED INSTRUMENTS. TE Proj. 64 2, Jan. 1966, 7pp. USAF Instrument Pilot Instructor School, Randolph AFB, Tex. (AD 631633)

The SAE Committee A-20 on aircraft lighting requested that the Air Force review the need for blue filtered white lighting because many manufacturers have had a difficult time meeting the present specifications. Nineteen pilots flew filtered and unfiltered panels in the T-38, and their preference was strongly in favor of the blue filtered white lighting. Accordingly, it is recommended that the blue filter be retained.

31,368
Wessel, A.E. THE IMPACT OF THE NEW TECHNOLOGY ON COMMAND SYSTEM DESIGN. Report from: "Third Congress on Information System Science and Technology, Buck Hill Falls, Pennsylvania, November 1966." Rand Rep. P 3409, July 1966, 10pp. Rand Corporation, Santa Monica, Calif. (AD 636961)

It appears that current technology offers a potential software development which would permit on-site, on-line functional programming. Such a development would permit direct user construction and adaptation of man-machine routines as a normal on-site activity. Success in this area, at least in the sense indicated by the pilot program and in conjunction with other continuing laboratory developments, would ultimately permit the return of system design to the laboratory, even though the path back to the laboratory leads through an on-site development program.

31,369
Whitehouse, A.C., Brown, W.K., Foster, P. & Scherer, H.F. QUANTITATIVE EFFECTS OF ABRUPT DECELERATION ON PULMONARY DIFFUSION IN MAN. Contract NASA T 13335G, ARL TR 66 12, May 1966, 16pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (AD 633170)

Pulmonary diffusion capacity was measured in 9 Ss using the steady state method to determine if this physiological measurement was altered by impact. Each S rode the Daisy Decelerator twice backward ($+G_x$) at 25 G, twice laterally ($-G_y$) at 15 G, and experienced one sham ride. Carbon monoxide diffusion capacities were measured immediately before and after each ride, and 3 and 24 hours afterward. No significant change in pulmonary diffusion capacity was associated with impact. There was no correlation between observed pulmonary diffusion capacity and predicted pulmonary diffusion capacity based on oxygen consumption, however, observed pulmonary diffusion capacity and oxygen consumption were highly correlated. The validity of the prediction formula as described by Donevan et al., is questioned, but this may be related to the increased altitude (4400 ft) at which the studies were done.
R 7

31,370
Wilde, J., Siegel, J. & Williams, J. RECOGNITION OF LUNAR CRATERS. Report from: "10th Annual Meeting, Human Factors Society, Anaheim, California, November 1-4, 1966." 1966, 26pp. Kollsman Instrument Corporation, Syosset, N.Y.

Recognition thresholds for lunar crater size were determined, analytically, for various look angles and magnifications, at an orbital altitude of 80 nautical miles. Elliptical image measurements for various sized craters were combined with some previous threshold recognition data for the ellipse (Casperson, 1950). Elliptical image measurements consisted of the visual angle of the major axis, and elliptical form (the ratio of minor axis to the major axis). A computer program was generated from which the visual angle and form measurements of anticipated elliptical crater images were computed for various combinations of crater size, look angle, and magnification. Casperson's data was then reworked to obtain the visual angle and form measurements associated with his recognition threshold data for the ellipse. By graphically combining the visual angle and form data from both computations, 50% and 75% threshold recognition curves were generated, relating crater size, magnification and look angle. Implications of these data are discussed.
R 7

31,371
Williams, W.E. & Young, D.D. AN EVALUATION OF FOUR METHODS OF MONITORING SIMULTANEOUS PRIMARY AND SECONDARY VOICE MESSAGES. Report from: "10th Annual Meeting, Human Factors Society, Anaheim, California, November 1-4, 1966." Contract AF04(695) 880, 1966, 27pp. Human Engineering Sec., Philco Corporation, Palo Alto, Calif.

Four methods of monitoring simultaneous primary and secondary voice messages were investigated in high and low ambient noise environments. Two of the methods used a single earpiece headset and wall speaker, and 2 methods used a dual earpiece headset with either the primary message in one ear and the secondary message in the other ear, or the primary message in both ears and the secondary message in a single ear. A realistic script and operational setting were used to test the conditions using 54 trained Ss. The dual-headset methods were found to be significantly superior to the headset/speaker method in most scoring categories. No significant differences were found between noise levels. The findings are compared with previous research on multimessage monitoring.
R 15

31,372
Wortz, E.C., Diaz, R.A., Green, F.H., Sanborn, W.G., et al. REDUCED BAROMETRIC PRESSURE AND RESPIRATORY WATER LOSS. Contract AF 41(609) 2389, Task 793002, SAM TR 66 4, Feb. 1966, 73pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Life Sciences Dept., AiResearch Manufacturing Company, Los Angeles, Calif.). (AD 631151)

Respiratory water loss was investigated with a group of normal Ss breathing oxygen orally. Data were collected from all Ss under 3 absolute pressures (3.5, 7.0, and 14.7 p.s.i.), 3 work rates on a treadmill (0, 2, and 4 m.p.h.), 3 humidities of the inspired oxygen (40° F., 60° F, and 80° F. dewpoint), and 3 drybulb temperatures of the inspired oxygen (95° F., 75° F., and 55° F.). The data were analyzed statistically. All of these variables affected respiratory water loss in varying degrees. Reduced pressure diminished respiratory water loss, apparently because of a corresponding decrease in minute volume observed at lower pressures. Increased work rates elevated pulmonary ventilation and thus increased respiratory water loss. Increasing humidity decreased water loss, while increasing drybulb temperature produced greater water loss. Expired gas temperatures approached body temperature only at elevated inspired temperature; the expired gas volume was never saturated.
R 28

31,373
Yemel'yanov, L.A., Abchuk, V.A., et al. THEORY OF SCANNING IN MILITARY SCIENCE. FTD TT 65 1259/1+2, March 1966, 242pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Voyennoye Izdatel'stvo Ministerstva Oborony SSSR, 1964, 1-208). (AD 637072)

Methods of scientific analysis pertaining to problems of encounter and discovery of moving targets (ships, aircraft, tanks, etc.) are elucidated in the theory of scanning. The book shows how, on the basis of the theory of scanning, it is possible to obtain practical recommendations for the best means of action in scanning for targets and in evading scanning under various conditions. The book is intended for a wide circle of army and navy officers, as well as students and cadets at institutions of military learning. It will be useful to specialists in civil aviation, in the navy, and in the merchant marine, whose work is connected with scanning for certain movable and stationary targets. The book is based on domestic and foreign open-source materials.
R 4

31,374
Young, L.R., Zuber, B.L. & Stark, L. VISUAL AND CONTROL ASPECTS OF SACCADIC EYE MOVEMENTS. Contract NAS 2 1328, NASA CR 564, Sept. 1966, 138pp. Ames Research Center, NASA, Moffett Field, Calif. (Biosystems, Inc., Cambridge, Mass.).

The mechanism by which humans move their eyes in rapid saccadic jumps is examined from the physiological, behavioral and control points of view. The anatomy of the extraocular system is reviewed to present the special control problem involved in saccadic eye movements. Behavioral data describing the nonlinear and nonsymmetric characteristics of individual saccadic eye movements are assessed and new experimental data are provided to evaluate the timing of information received by the eye. Experiments were conducted on the effective dead zone of the eye and a simple probabilistic model proposed to describe this dead zone. The question of proprioceptive feedback in the extraocular muscles is considered in some detail. A number of control models for the mechanism of the saccadic eye movements are presented and evaluated.
R 53

31,375
Sidorsky, R.C. PREDICTING THE DECISION BEHAVIOR OF A KNOWLEDGEABLE OPPONENT. Report from: "10th Annual Meeting Human Factors Society, Anaheim, California, November 1-4, 1966." Contract N61339 1329, 1966, 22pp. USN Training Device Center, ONR, Orlando, Fla. (Electric Boat Div., General Dynamics, Groton, Conn.).

Twenty-four Ss competed against one another in pairs during 5 daily sessions of a simulated tactical air strike. One S of each pair was permanently assigned as defender, the other as attacker. Four kinds of targets-- aircraft carriers, FBM submarines, destroyers, and single bombers--of different point value were used. The targets were provided with protective screens of varying degrees of penetrability and were given the capability of providing a totally effective defense to one of the targets. Each trial required a choice between 2 targets which could be of the same or different value. The results were analyzed in a 2 x 2 non-zero sum game framework. The results were discussed in terms of: a) distribution of choices between targets; b) accuracy of prediction of opponent's behavior; c) consistency between predictions and actions; d) decision time; e) adequacy of performance. While neither attackers nor defenders responded in an optimum game-theoretic manner, the attackers and defenders counterbalanced each other's strength and weaknesses and attained the theoretic maximum effectiveness of performance.

31,376
Sheldon, R.W. & Bjorklund, J.F. PURSUIT ROTOR PERFORMANCE: I. EFFECTS OF REINFORCING THE LONGER INTERVALS OF CONTINUOUS TRACKING WITHIN EACH TRIAL. Contract DA 44 188 ARO 2, DA Proj. 2J0145018748 02, Tech. Rep. 66 11, June 1966, 24pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To determine whether selective reinforcement of pursuit rotor performance facilitates acquisition of skill and promotes its retention, five groups of Ss were individually trained for ten sessions of 15 trials each. Selective reinforcement of longer than average target contacts was introduced for one group of Ss during Sessions 6 and 7 and for another during Sessions 4 to 7. Continuous reinforcement of target contacts was introduced for two other groups. A control group received no reinforcement. Dependable improvements in time-on-target scores were obtained for all four sessions, but the superior performances were not maintained when reinforcement was withdrawn. The results suggest that this improvement as a function of feedback was attributable to motivational rather than learning or informational effects.
R 7

31,377
Sergeant, R.L. VOICE COMMUNICATION PROBLEMS IN SPACECRAFT AND UNDERWATER OPERATIONS. INTERIM REPORT. BuMed. Proj. MF011.99.9001, SMRL Rep. 485, Nov. 1966, 25pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 642825)

Various problems in voice communication systems found in operations underwater and in outer space are considered. Since the production of speech is basic to these problems, the major part of the article is devoted to factors affecting vocal production. Examples are given of special problems which arise when the voice communication situation involves highly restrictive environmental factors such as those encountered by deep sea divers, swimmers, and personnel within under-the-sea habitats or space capsules. In addition to the effects of speech of varying ambient pressures, changes to the voice caused by different gas mixtures are described. Several ways of making helium-speech more intelligible and natural-sounding are presented with their advantages and disadvantages. Problems associated with the electronic link between the talker and listener are discussed. In addition to revised calibration techniques, there are problems of waterproofing, size and weight restrictions, and pressure proofing of components which must be solved. The effectiveness of communication systems can be increased by proper circuit discipline, training to speak clearly, and the utilization of vocabularies specific to the immediate operation. The need for improved coordination among behavioral and engineering efforts to solve problems of communication in space and underwater environments is emphasized.
R 26

31,378
Haverland, E.M. DEVELOPMENT OF TECHNICAL TRAINING MATERIALS FOR NIKE HERCULES JUNIOR OFFICERS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task SAMOFF, Subtask IV, Tech. Rep. 66 6, June 1966, 44pp. USA Office of the Chief of Research & Development, Washington, D.C. (Human Resources Research Office, George Washington University, Alexandria, Va.).

The checks and procedures necessary to determine whether the major functions of the Nike Hercules fire control system could be satisfactorily accomplished were chosen, and programed instructional materials were written to teach junior officers the relevant technical information. Evaluation of these materials indicated: a) that they taught a substantial amount of technical information additional to that taught in the Officer Basic Course (44-A-C20) at the U.S. Army Air Defense School; and b) that more technical information was learned from the SAMOFF IV programed instruction than was learned from directed study of existing Army reference material.
R 7

31,379
Harshbarger, J.H. COLOR SIGNAL SOURCE FOR VISUAL SIMULATION. FINAL REPORT. Contract AF 33 (615) 2970, Proj. 6114, Task 614405, AMRL TR 66 116, SRL Rep. 827, Sept. 1966, 43pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Labs., Inc., Dayton, Ohio).

A specialized color closed-circuit television camera system was developed as a source of high-quality signals to be used in simulation display device research programs. The system employs three vidicon camera tubes in conjunction with a unique optical and beam-splitting system. Camera configuration permits the system to be used as a three-color pickup, a multichannel monochrome signal source, or a high performance monochrome television signal source. The camera system contains 4 major units: camera, camera control, video inverter, and power supply unit. The camera is mounted on a special framework which also serves as a model or test chart support. The camera control, power supply, and color television monitor are placed in a rack cabinet. Wherever possible, standard circuit modules of high quality are employed in the system; this design approach provides a high degree of reliability even though the system represents a new approach to color television camera design.

31,380
Harris, D.H. THE IMPACT OF MICROELECTRONICS ON THE UTILIZATION AND TRAINING OF MAINTENANCE PERSONNEL. Report from: "Human Factors Society 10th Annual Meeting, Anaheim, California, 1-4 November 1966." Rep. X6 1845/501, 1966, 20pp. Autonetics, North American Aviation, Anaheim, Calif.

Microelectronic functional equivalents were defined for two operational systems--a ship's inertial navigation system and a torpedo guidance system--and, by means of maintenance burden analyses, the maintenance personnel, training and organizational requirements of the microelectronic and existing configurations were compared. Microelectronics reduced the amount of maintenance required by the ship's inertial navigation system by 84 percent, and the amount required by the torpedo guidance system by 18 percent, under existing maintenance philosophies. Specific conclusions were provided with respect to the impact of microelectronics on maintenance personnel and training requirements, and on the organization of maintenance activities.
R 9

31,381
Hanson, P.G. & Foster, P. URINARY EXCRETION OF VANILMANDELIC ACID AFTER $+G_x$ IMPACT IN HUMANS. ARL TR 66 6, March 1966, 9pp. USAF 6571st Aeromedical Research Lab., Holloman AFB, N.M. (AD 629198)

Seven volunteer Ss were exposed once each to 25 $+G_x$ impact and sham impact on the Daisy Decelerator. Urinary excretion of vanilmandelic acid (VMA) was measured during 2 time periods prior to and after impact or sham impact. The results indicate that the average urinary excretion of VMA increases with exposure to both impact or sham impact. The greatest average increase was observed after true impact. It is suggested that S anxiety attendant to both experimental conditions causes an increased liberation of catecholamines. True impact may further stimulate this adrenergic activity.
R 10

31,382
Hanes, R.M. & Gebhard, J.W. THE COMPUTER'S ROLE IN COMMAND DECISION. US Naval Institute Proceedings, Sept. 1966, 92(9), No. 763, 61-68. (Applied Physics Lab., Johns Hopkins University, Silver Spring, Md.). (Reprint Series 934)

The results of a 4-year study by the Applied Physics Laboratory of The Johns Hopkins University clearly indicate that naval officers will accept advice--provided it is proffered in the right way--from a machine. Moreover, officers can make effective use of battle actions recommended by a decision-making computer. With the computer as staff aide, the anti-air warfare (AAW) commander, for example, can use his interceptors more efficiently, lose fewer of them, make more effective use of surface-to-air-missiles, and reduce the enemy's penetration into his vital area. But it is equally clear that commanders are not about to let combat automation take over their command and control responsibilities. They will reject the robot's advice when its solution to a tactical problem disagrees with their own.

31,383
Haley, J.L., Jr. & Turnbow, J.W. TEST RESULTS - HEMISPHERICAL SPECIMENS. SUPPLEMENT II TO HELMET DESIGN CRITERIA FOR IMPROVED CRASH SURVIVAL. Contract DA 44 177 AMC 254(T), Task 1P125901A14230, USAAVLABS Tech. Rep. 65 44B, Jan. 1966, 17pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research Div., Flight Safety Foundation, Inc., Phoenix, Ariz.). (AD 628680)

This supplement on the results of impact tests on 27 different types of helmet construction is separated from the basic report (HEIAS No. 31,384) in order that readers interested only in this subject can review the detailed data independently of the basic report.
R 1

31,384
Haley, J.L., Jr., Turnbow, J.W., Macri, S. & Walhout, G.J. HELMET DESIGN CRITERIA FOR IMPROVED CRASH SURVIVAL. FINAL REPORT. Contracts DA 44 177 AMC 116(T) & DA 44 177 AMC 254(T), Task 1P1215901A14230, USAAVLABS Tech. Rep. 65 44, Jan. 1966, 121pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research Div., Flight Safety Foundation, Phoenix, Ariz.). (AD 628678)

The major crash survival variables affecting the design and testing of U.S. Army aircrewmen helmets are presented and discussed in this report. Such factors as head acceleration limits, impact velocity, impact surfaces, impact sites, suspension and retention harnesses, helmet ventilation, impact test methods, and structural concepts are considered. An examination of all available data on the tolerance of the human head to deceleration was conducted. Consideration was given to an analysis of acceptable design limits. A parallel study of head injuries occurring in aircraft accidents was conducted to determine the significant injury areas of the head and correlate this to protection area and techniques. A cockpit survey was conducted to develop criteria for testing the helmet and liner materials. Consideration was given during the program to a preliminary investigation of helmet retention systems and head cooling techniques. A series of instrumented drop tests was conducted to investigate various helmet design concepts and materials. Double-shell and single-shell helmets of nearly equal weight were analyzed. The advantages and disadvantages of three different methods of helmet impact testing are discussed.
R 24

31,385
Haley, J.L., Jr. & Turnbow, J.W. IMPACT TEST METHODS AND RETENTION HARNESS CRITERIA FOR U.S. ARMY AIRCREWMAN PROTECTIVE HEADGEAR. FINAL REPORT. Contracts DA 44 177 AMC 116(T) & DA 44 177 AMC 254(T), Task 1P125901A14230, USAAVLABS Tech. Rep. 66 29, AvSER Tech. Rep. 65 15, March 1966, 45pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research Div., Flight Safety Foundation, Inc., Phoenix, Ariz.). (AD 631493)

This report discusses impact test methods and helmet retention harnesses for U.S. Army aircrew protective helmets. On the basis of simple analyses and some experimental testing, recommendations are made for the design and testing of helmet retention harnesses. A "collar-type" retention harness is recommended, and two tests are suggested as a method of insuring a good design. Impact tests were conducted by an impactor-drop method and a head-form drop method. These test methods employ one movable piece and one fixed piece rather than two movable pieces as are currently used by most test agencies. On the basis of the impact test results, it is recommended that the impactor-drop method be used for the qualification of U.S. Army aircrew helmets. Probable head impact velocities and impact surfaces are discussed, and impact test conditions are specified.
R 8

31,386
Hackman, J.R. EFFECTS OF TASK CHARACTERISTICS ON GROUP PRODUCTS. SCIENTIFIC REPORT. Contract AF 49(638) 1291, Proj. 9778 02, Rep. AFOSR 66 0893, Tech. Rep. 5, June 1966, 155pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Psychology Dept., University of Illinois, Urbana, Ill.). (AD 636997)

This is a study of the effects of group task characteristics on the characteristics of written group products. The 2 task variables are: a) task "type" (production, discussion, problem solving); b) task difficulty. Measures of product characteristics are 8 descriptive dimensions derived by the author. Results show that the task characteristics strongly affect the characteristics of group products. Predictions of the "creativity" of group products are found to be moderated by the types of tasks which gave rise to the products. Extrapolations from the data about the nature of the "group task space" are made, and methodological implications are discussed.
R 77

31,387
Klausner, S.Z. VOLUNTEERS FOR A HIGH RISK SPORT. Contract AF 49(638)1510, Proj. 9779 01, Tech. Rep. AFOSR 66 0121, Jan 1966, 33pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Bureau of Social Science Research, Inc., Washington, D.C.). (AD 631049)

Sport parachutists tend to be over-represented in the Western region of the United States. They are, by and large, relatively young males who look upon the sport as a masculine expression. The sport is objectively dangerous, as measured by the accident rate, and is subjectively perceived as such. Sport parachutists tend to be single-minded in their attitude to the sport, sometimes giving it priority over their commitment to family roles. Press reportage emphasizes the spectacular and exhibitionistic aspects of parachuting rather than its competitive sport aspects. Newspapers see the activity as exhibiting fun and "guts" and as dangerous.
R 19

31,388
Kramer, H.P. CLASSIFICATION BY STRINGS OF PINGS. J. Underwater Acoustics, 1966, 489-494. (Tempo, General Electric Company, Santa Barbara, Calif.). (Reprint) (AD 488122)

The probability of correct identification of sonar targets can be improved by basing judgment on a sequence of pings. A calculation has been performed that gives the probability of correct identification as a function of the number of pings included and for different one-ping identification probabilities. The calculation is applicable to those cases in which successive ping classifications can be considered to be independent events. It has been found that the one-ping probability of correct identification must be greater than 0.7 if a correct identification is to be carried out in less than 15 pings with probability greater than 0.95.

31,389
Kristofferson, A.B. A TIME CONSTANT INVOLVED IN ATTENTION AND NEURAL INFORMATION PROCESSING. Contract NAS 2 2486, NASA CR 427, April 1966, 40pp. Ames Research Center, NASA, Moffett Field, Calif. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

It is reasonable to entertain the hypothesis that the human brain functions like a time-shared information processing system having a cycle time of 50 msec. A central periodic process is postulated which generates a series of equally-spaced points in time. These points, in turn, are the instants when the central processor can switch from one input channel to another and they also determine when information can be transferred from one stage within the processor to another. Three behavioral time parameters are defined and experiments have been done which allow them to be estimated independently for single individuals. The 3 parameters are equal in magnitude, about 50 msec., for the group of Ss. They are highly correlated over individuals. They are independent of sensory modality. And they vary over individuals in the same way and to the same extent in relation to another variable. It is concluded that they are identical. Further, a simple theory provides an integrated interpretation of the three.
R 5

31,390
Kunnapas, T. ACOUSTIC PERCEPTION AND ACOUSTIC MEMORY OF LETTERS. MULTIDIMENSIONAL RATIO SCALING AND MULTIDIMENSIONAL SIMILARITY. Rep. 218, Nov. 1966, 12pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The similarities of the acoustic perception and the acoustic memory of 9 letters of the alphabet were studied by direct multidimensional ratio scaling and by the method of multidimensional similarity analysis. Three factors were found which were exactly the same in respect of both perception and memory of these letters, and with nearly identical loadings.
R 6

31,391
Kvelm, K.B. MUSCULAR AND CIRCULATORY RESPONSES: THEIR SENSITIVITY ASSESSED IN A SIGNAL DETECTION SITUATION. Contract NONR 908 15, Tech. Rep. 11, April 1966, 280pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Psychology Dept., Indiana University, Bloomington, Ind.). (AD 634784)

Two male and 2 female Ss were used in a signal detection task with signal to noise ratios of 31.6 and 15.8 during 800 trials. To assess the sensitivity of the somatic response systems, EMG (electromyogram) potentials from the forearms, neck and jaw, amplitude of the R-wave of the EKG (electrocardiogram), heart cycle time, digital volume pulse and finger volume were recorded. The data was analyzed by comparing the S and N trials to find signal effects and by comparing S and N trials under the 2 signal energies to find energy effects. Reliable signal effects were found in all variables with the high signal energy producing more consistent reactions. Energy effects were also established for all but 2 EMG variables. Exploratory calculations with the discriminatory function technique, however, indicated that somatic variables harbor more sensitive differential reactions than revealed by the simple single-point measures used. The study shows that it is quite feasible to investigate meaningfully the absolute sensitivity of somatic responses with signal detection methods.
R 40

31,392
Laba, L. APPLICATION OF STANDARD DECOMPRESSION TABLES IN THE PREVENTION OF DECOMPRESSION SICKNESS IN DIVERS. NSTIC Transl. 1754, Rep. NSTIC/05456/66, Jan. 1966, 30pp. USN Research & Development Services Dept., Washington, D.C. (Transl: (Polish) Bull. Inst. Marine Medicine, Golansk, 1964, 15, 157-183). (AD 482229)

The use of the hygienic norms given in the Polish diving tables safeguards divers from the possibility of suffering decompression sickness. The notable feature is the marked margin of safety obtained by shortening the permitted working times underwater and lengthening the decompression periods. The extension of decompression time applies especially to short exposures at high pressure which renders the use of the Polish diving tables unusable for skin divers. The need for revising the hygiene norms of the Polish diving tables on the basis of the experimental investigations has become obvious.
R 120

31,393
Lamb, L.E. THE INFLUENCE OF MANNED SPACE FLIGHT ON CARDIOVASCULAR FUNCTION. Cardiologia, 1966, 48, 118-133. (USAF School of Aerospace Medicine, Brooks AFB, Tex.). (Reprint) (AD 636797)

Manned space flight alters cardiovascular function. Confinement and weightlessness cause function changes similar to inactivity, designated as cardiovascular deconditioning. This includes decreased exercise and orthostatic tolerance. The influence of weightlessness as a separate environmental factor cannot yet be determined since manned space flights involve multiple changes in environmental factors that also effect cardiovascular function. Preliminary data and laboratory studies suggest that with a good life support system man can tolerate the weightlessness of space flight for at least one month.
R 18

31,394
Layton, G.P., Jr. & Dana, W.H. FLIGHT TESTS OF A WIDE-ANGLE, INDIRECT OPTICAL VIEWING SYSTEM IN A HIGH-PERFORMANCE JET AIRCRAFT. NASA TN D 3690, Oct. 1966, 33pp. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

A wide-angle, indirect optical viewing system was qualitatively evaluated in an F-104B aircraft as a means of providing visual reference to the pilot. Safe and acceptable performance using the indirect viewing system was demonstrated for all phases of daytime visual flight. Landings were performed in both the conventional and low lift-drag-ratio configurations. When the horizon was in the field of view, aircraft attitude sensing with the optics was satisfactory about all axes except pitch attitude in climbing flight. This degraded pitch-attitude sensing was due to the poor resolution at the bottom of the field and the lack of view to the sides. A night flight was also performed. The system, in its present form, was considered unacceptable for this use because of large light losses and degraded resolution. It was evident in the study that additional view directly to the side is required for performing circling approaches.
R 2

31,395
Lebedinskiy, A., Levinskiy, S. & Nefedov, Y. MAN IN A SPACESHIP. FTD TT 65 1591/1+4, April 1966, 11pp. USAF Translation Div., Wright-Patterson AFB, Ohio (Transl: Meditsinskaya Gazeta, Sept. 1964, p3). (AD 640255)

This is a brief, non-technical account of prolonged stays (10 to 120 days) in hermetically sealed chambers.

31,396
LeBlanc, J. & Potvin, P. STUDIES ON HABITUATION TO COLD PAIN. Canad. J. Physiol. Pharmac., 1966, 44, 287-293. (Physiol. Dept., Laval University School of Medicine, Quebec City, Quebec, Canada). (Reprint) (AD 630979)

It was possible to produce habituation to cold in a group of human subjects by immersing the left hand in cold water for 2 1/2 min twice a day for 19 days. The right hand did not adapt. Another group of subjects was exposed similarly with the difference that an anxiety test (mental arithmetic test) was always given simultaneously with the cold-water test. In this second group the original blood pressure response, i.e. for the first day, was greater than in the first group because of the cumulative effects of the 2 tests. After 19 days definite evidence was obtained for adaptation to these 2 tests administered together. However, when these tests were given separately to the second group, no adaptation was evident; adaptation occurred only to both tests given simultaneously. These results indicate that no adaptation develops to cold per se if the subjects are distracted from cold discomfort. It was also found that adaptation of one hand to cold water not only failed to induce adaptation in the opposite hand but even reinforced responses of the unadapted hand. These findings suggest a participation of the central nervous system in adaptation to cold pain, and tend to minimize the importance of local peripheral changes.
R 6

31,397
Leslie, J.M. & Thompson, D.A. HUMAN FREQUENCY RESPONSE AS A FUNCTION OF VISUAL FEEDBACK DELAY. Report from: "Tenth Annual Meeting, Human Factors Society, Anaheim, California, Nov. 1-4, 1966." 1966, 27pp. Mechanical Engineering & Industrial Engineering Depts., Stanford University, Stanford, Calif.

This paper uses a light-matching tracking study to determine the human frequency band pass characteristics in the presence of significantly large external transmission delays which are introduced into the stimulus-response information loop. Such delays occur in real time operation of vehicles and other equipment which is at some distance from the operator (near earth or deep orbit, surface of the moon, etc.). When information in the visual sensory channel is delayed because of transmission times between man's controlling action and the displayed results, this interacts with the relatively short normal delay of the other sensory feedback loops such as tactual and kinesthetic information loops, causing substantial phase interference problems between otherwise inphase parallel sensory information channels. A representative model was used for the human transfer function for the system studied, which matched the experimental data reasonably well. The maximum frequency at which a person could meaningfully accept and act on random inputs (where the cut-off point was defined as the 3 db down point) is $f_{co}=0.16/(T+0.15)^{0.85}$ for a T second transmission delay.
R 20

31,398
Levison, W.H. & Elkind, J.I. STUDIES OF MULTI-VARIABLE MANUAL CONTROL SYSTEMS: TWO AXIS COMPENSATORY SYSTEMS WITH COMPATIBLE INTEGRATED DISPLAY AND CONTROL. Contract NASw 668, NASA CR 554, Aug. 1966, 147pp. National Aeronautics & Space Administration, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

Experiments were conducted to determine what modifications to the current models of the human controller of single-variable systems are necessary for them to be good representations of the controller in two-variable situations. These experiments were performed with a single compensatory display and a single two-axis control. Two-axis performance degradation was small when the tracking conditions were homogeneous and when the inputs (but not the dynamics) were heterogeneous. Large and significant performance differences were seen when the dynamics were heterogeneous. Three factors that affect human controller characteristics in two-axis control situations are identified. These are: a) visual-motor interaction, b) differential allocation of attention, and c) non-homgeneity of required equalization when the controlled-element dynamics are non-homogeneous. A simple model has been developed for predicting visual-motor interference effects. Models for the prediction of attention and equalization effects have not yet been developed. Single-axis describing function models for the human controller should be modified to include the effects of these factors in order to obtain accurate predictions of human controller characteristics in two-axis situations and probably also in higher-dimensional control situations.
R 17

31,399
Perry, B.L. & Griffin, Patricia A. AIRCRAFT LANDING APPROACH PATHS WITH THE RAINBOW OPTICAL LANDING SYSTEM. INTERIM REPORT. NRL Problems Y02 01 & Y02 21, Projs. RR 006 09 41 5351 & RS 11 50 016/652 1/F012 06 02, NRL Rep. 6380, June 1966, 60pp. USN Engineering Psychology Branch, NRL, Washington, D.C.

The Rainbow Optical Landing System is designed to present color-sequence-encoded sink-rate-error information to a pilot landing aboard a carrier. As the name implies, the Rainbow system utilizes a tricolor, dynamic light beam projected into the sky from a point near the landing spot. The approach path and associated sink rate of an aircraft whose pilot is flying the Rainbow system have been determined and plotted for several values of different system parameters. On the basis of these plots, optimal values of beam-pattern parameters can be selected. In addition, the effects on overall system performance of aircraft approach parameters such as initial error, initial range, and rate of approach to the carrier, can be displayed in the form of graphs and numerical tables. This analytical methodology can be readily applied to other systems which display higher-derivative-command signals.
R 2

31,400
Perry, D.K. & Cannon, W.H. RELATIONSHIPS AMONG PROGRAMMERS' BACKGROUND AND INTEREST CHARACTERISTICS: VOCATIONAL INTERESTS OF COMPUTER PROGRAMMERS. Tech. Memo. 2655/004/00, July 1966, 35pp. System Development Corporation, Santa Monica, Calif. (AD 636840)

Relationships of background information on educational level, college major, programming experience, type of programming application, job responsibility, occupational satisfaction, and relative salary to scores on the Strong Vocational Interest Blank and additional background variables were analyzed for a national sample of computer programmers. Statistically significant relationships are reported showing consistent differences among business, scientific, software systems, and military systems programmers, with other relationships generally consistent with these differences.

31,401
Pfeiffer, M.G. & Siegel, A.I. POST TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. PERSONNEL PSYCHOPHYSICS: A MODEL OF THE JOB OF THE NAVAL AVIONICS PERSONNEL AND FURTHER STUDIES IN PERSONNEL PSYCHOPHYSICS. TECHNICAL REPORT. Contract NONR 2279(00), Jan. 1966, 49pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Science Center, Applied Psychological Services, Wayne, Penn.).

The results of several previous studies of Applied Psychological Services are first incorporated into a model of the job of the avionics technician. Evidence is presented which is purported to support the content, concurrent, and predictive validity of the model. Then a study into the psychophysical relationship between perceived circuit complexity and an objective, physical measure of circuit complexity is presented. The implications of the results of the psychophysical study for the model and for the personnel subsystem are discussed.
R 43

31,402
Platt, F.N., Manikas, J.G. & Feddersen, G.J. A BASIC PLAN FOR A HIGHWAY TRANSPORTATION SYSTEMS STUDY. Report from: "Fifth World Meeting, International Road Federation, London, England, Sept. 1966." 1966, 16pp. Ford Motor Company, Detroit, Mich.

This paper presents a brief review of systems approaches to highway transportation, and gives an example of a proposal to accomplish a systems study.
R 5

31,403
Pomaroli, R.S. PSYCHOLOGICAL FACTORS IN VOLUNTARY WITHDRAWAL FROM FLIGHT TRAINING. Spec. Rep. 66 2, March 1966, 23pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla. (AD 634000)

Each year a substantial number of students, who appear to be progressing normally, voluntarily withdraw (DOR) from naval aviation training. This study was undertaken in an attempt to better understand the psychological factors prompting such decisions. A questionnaire covering fifty-seven factors that might contribute to DOR decisions was administered to 86 DOR's from Basic Flight Training. They were asked to check all factors that influenced their decision, and then to weigh these as to their relative importance in that decision. They were then asked to check the point at which each became important in the program. Results of the analysis indicate that the causative factors most commonly checked tend to cluster around the idea of "losing interest in," "not deriving satisfaction from," or just plain "disliking" flying. Approximately 17 per cent of the students indicated a "fear of flying." Results show that widely varying time periods elapse between the mental decision to withdraw and the formal expression of that decision. The implications of these findings for basic flight training are discussed.
R 10

31,404
Pritchard, F.E. THE TURBULENCE AND TERRAIN ENVIRONMENTS AFFECTING LOW-ALTITUDE, HIGH-SPEED FLIGHT. Report from: "IEEE/AIAA National Aerospace Electronics Conference, Dayton, Ohio, May 16-18, 1966." Rep. CAL FDM 393, July 1966, 46pp. Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y. (AD 486689)

The performance of most military systems depends heavily on the pertinent physical environment. Low-altitude high-speed (LAHS) penetration aircraft represent one of these systems, a system for which the physical environment consists of atmospheric turbulence and the terrain height profile. This paper is a review of the appropriate statistical theory and the data for representing these two most important environmental aspects of LAHS flight. The paper presents representative data and, where possible, models of the turbulence and terrain.
R 22

31,405
Propst, A.S., Jr. PERSONNEL AND TRAINING REQUIREMENTS FOR DEEP SUBMERGENCE RESCUE VEHICLES (DSRV). PRELIMINARY STUDY. Proj. SQ 46 15, Subtask 3, Rep. WRM 66 63, June 1966, 101pp. USN Personnel Research Lab., Bureau of Naval Personnel, Washington, D.C. (AD 636521)

This report presents personnel and training implications incident to the development of a new and improved submarine rescue capability in the Navy. Included is a description of system design and support requirements. Estimates of personnel and training requirements for manning this system are based on current information and planning data and encompass the manned Deep Submergence Rescue Vehicles (DSRV), specialized support equipment, and support ships (one modified ASR; two new ASR's; and forty "mother" submarines--SS(N)'s).
R 12

31,406
Murphy, W.W., Krusemark, K.A. & Moyer, R.W. INCREASED CREW ACTIVITIES SCHEDULING EFFECTIVENESS THROUGH THE USE OF COMPUTER TECHNIQUES. Report from: "10th Human Factors Society Meeting; Anaheim, California, Nov. 1-4, 1966." 1966, 15pp. Apollo Support Dept., General Electric Company, Daytona Beach, Fla.

The cost of space and oceanic missions per man hour of effective crew activity is extremely high. Vehicle operations and basic crew requirements frequently leave only a small percentage of the crew time available for experiments and data collection. To make optimum use of this time and simultaneously eliminate the laborious manual task of crew scheduling, an automated Crew Activities Scheduling Program (CASP) has been developed, and is described in this report. This program gives consideration to vehicle operations, work/rest cycles, geophysical events, experiments, and other crew functions, as well as the associated constraints. Rapid and convenient means are provided for trade-offs, rescheduling and parametric analysis of crew involvement. Typical computer printouts of detailed crew scheduling data are presented.

31,407
Meyer, D.E. A COMPARISON OF RESPONSE CONFIRMATION TECHNIQUES FOR AN ADJUNCTIVE SELF-STUDY PROGRAM. FINAL REPORT. Proj. 1710, 171003, AMRL TR 66 98, June 1966, 30pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

An experimental evaluation was made of various methods to confirm responses to an adjunctive self-study program. The adjunctive program was designed to teach aircraft engineering features of the F-101B as part of a continuing program of refresher training for operational fighter interceptor aircrews. The adjunctive program consisted of a comprehensive series of carefully sequenced multiple choice questions. Each question referred to the page and paragraph number of a publication containing detailed information on which the question was based. Responses to the questions were confirmed as being either correct or incorrect by one of the experimental treatments. When a student responded correctly he continued on to the next question, when he responded incorrectly he studied the appropriate information in the manual before continuing on with the program. The response confirmation treatments were: a) chemically impregnated inks which change color when moistened with a wetting agent, b) punchboards, c) opaque erasable overlays, and d) machine presentation and response confirmation. The response confirmation treatments differed widely in cost and difficulties in preparation. Production procedures and a discussion of problems encountered are included in the appendices of the report. No significant differences in learning were found as a result of the experimental treatments, nor were there any notable differences between group opinions concerning the efficacy of the particular response confirmation method used. Upon this basis, the selection of a response confirmation mode for an adjunct program may be based upon cost and availability of equipment and materials.
R 6

31,408
Melching, W.H. & Nelson, F.B. THE INFLUENCE OF PRACTICE FRAMES AND VERBAL ABILITY ON PROGRAMMED INSTRUCTION PERFORMANCE. Contract DA 44 188 ARO 2, DA Proj. 2J024701 A712 01, Tech. Rep. 66 1, Jan. 1966, 27pp. USA Office of the Chief of Research & Development, Washington, D.C. (Human Resources Research Office, George Washington University, Alexandria, Va.). (AD 628444)

The effect of special practice frames upon programed instruction performance was examined using a program in Counterinsurgency. The individuals who served as Ss represented two levels of verbal ability. Practice frames enabled Ss to proceed through the program at a faster rate per frame, make fewer program errors, and score higher on a recall type of achievement test. Ss of higher verbal ability were able to proceed through the program at a faster rate, make fewer program errors, and exhibit higher scores on all measures of achievement.
R 4

31,409
Meister, D. & Farr, D.E. DESIGNER'S GUIDE FOR EFFECTIVE DEVELOPMENT OF AEROSPACE GROUND EQUIPMENT CONTROL PANELS. FINAL REPORT. Contract AF 33(615) 1350, Proj. 7184, Task 718404, AMRL TR 66 29, Sept. 1966, 121pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Effectiveness Dept., Bunker-Ramo Corporation, Canoga Park, Calif.).

This guide was developed for use by the practicing designer. It contains a discussion of the system factors to be considered in designing Aerospace Ground Equipment control panels (Part I), a form (the Design Information Worksheet) to gather and present design information (Part II), steps to be followed in control panel design (Part III), and a listing of control/display technology presently available to designers (Part IV). Particular attention has been paid to the information necessary to analyze panel requirements and to the design implications of human engineering requirements.
R 7

31,410
McLean, F.E., Carlson, H.W. & Hunton, L.W. SONIC-BOOM CHARACTERISTICS OF PROPOSED SUPERSONIC AND HYPERSONIC AIRPLANES. Report from: "Conference on Aircraft Aerodynamics, Langley Research Center, Virginia, May 23-25, 1966." NASA TN D 3587, Sept. 1966, 15pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

Existing theoretical methods of sonic-boom estimation have been used to determine the sonic-boom profiles of representative supersonic and hypersonic airplanes of the future. The sonic-boom characteristics of these future airplanes have been related to the sonic-boom characteristics of current supersonic airplanes. In the supersonic climb and cruise phases of flight, where the sonic-boom overpressure and impulse levels are relatively high, the use of near-field effects to modify the sonic-boom disturbance of these large future airplanes has been considered. The near-field investigation indicates that some reduction in overpressure and impulse might be possible.
R 7

31,411
McRuer, D.T. & Magdaleno, R.E. HUMAN PILOT DYNAMICS WITH VARIOUS MANIPULATORS. FINAL REPORT. Contract AF 33(657) 10835, Proj. 8219, Task 821905, AFFDL TR 66 138, STI TR 134 3, Dec. 1966, 42pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Systems Technology, Inc., Hawthorne, Calif.).

The purpose of the experimental efforts in this report is to explore on a preliminary basis the limiting characteristics of the human operator's "actuator" or neuromuscular system dynamics as affected by the manipulator. The effects of three manipulators (pressure, free-moving, and spring-restrained) on system performance and the human operator's describing function are presented for three controlled elements and two high bandwidth forcing functions.
R 41

31,412
McLane, J.T., Weingartner, W.J. & Townsend, J.C. EVALUATION OF FUNCTIONAL PERFORMANCE OF AN INTEGRATED SHIP CONTROL CONNING CONSOLE BY OPERATOR PERSONNEL. Proj. SS 22 07x, Task 10595, MEL R&D Rep. 333/65, MEL Rep. 62 110, May 1966, 39pp. USN Marine Engineering Lab., Annapolis, Md.

The adequacy of the human engineering for a ship control conning console static mock-up was evaluated by 6 naval officers and 3 enlisted personnel. The console was designed for 2 operators--conning officer and conning assistant. Each officer was instructed to simulate 3 maneuvers: man-overboard, replenishment at sea, and maneuvering in restricted waters. He criticized the adequacy of the mock-up in light of the criteria established by the human engineering team by pointing out omissions, overinclusions, faulty layout, and desired substitutions. Two members of the team observed and took notes. The enlisted personnel were also questioned as to their evaluative comments at the conning assistant's position. Comments of both officers and enlisted men were analyzed and a list of recommendations was made. The Ss approved the ship control console concept and were in favor of its automatic features as long as a human override was available. Seating the conning officer and assigning both helm and throttle to the conning assistant alone were disapproved. The results of this experiment, combined with continuing system development efforts, will be used as a basis for refining the conning console design. A prototype operational configuration will be constructed and tested in a simulated environment.
R 9

31,413
McKechnie, D.F. AN INVESTIGATION OF SECTIONAL AERONAUTICAL CHARTS AND SERIES 200 CHARTS AS BRIEFING AIDS FOR A SIDE-LOOKING RADAR RECONNAISSANCE TASK. FINAL REPORT. Proj. 7184, Task 718404, AMRL TR 66 153, Nov. 1966, 12pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

After appropriate training, 42 Air Force navigators were tested on a strip of side-looking radar imagery to study the effects on performance that circling targets on two types of aeronautical charts might produce. The imagery, at a scale of 1:130,000, moved down a back-lighted 14 by 14-inch screen at 16.8 inches per minute, corresponding to 1800 knots. The subject's task was to identify all airfields, dams, railroad yards, tank farms, and ammunition storage areas. The speed and accuracy of locating and identifying these targets under three conditions of briefing were assessed. The three conditions were a) target list only (control group), b) Series 200 Chart (1:200,000), target circled, and c) Sectional Aeronautical Chart (1:500,000), targets circled. Fifty-five percent of the 24 targets were found when only the target list was given. Ninety-three percent of the 24 targets were found with the Series 200 Charts. Ninety-four percent of the targets were found with the group and one each for the chart groups. The mean travel distance before detecting a target increased when the charts were used. The mean false positive travel before responding was in every comparison greater than for the real targets. This suggests that readily available charts, when annotated by circling the target, improve target detection performance tremendously. Methods of displaying charts should be investigated.
R 5

31,414
McGrath, J.J., Christensen, P.R. & Osterhoff, W.E. GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: SPEED CONTROL INVERSION. Contract NONR 4218(00), Proj. NR 213 028, Tech. Rep. 751 7, July 1966, 37pp. US Joint Army Navy Aircraft Instrumentation Research Committee, Washington, D.C. (Human Factors Research, Incorporated, Santa Barbara, Calif.).

An experiment was conducted to investigate the incidence of inversion errors in the control of airspeed. Sixteen pilots were tested in a laboratory task that required them to make speed control decisions similar to those made during flight for the purpose of achieving a preplanned time of arrival. The results showed that pilots had little difficulty in deciding whether or not a change in speed was necessary, but frequently made errors in deciding which direction to change it. That is, pilots often decided to decrease speed when the correct response was to increase speed, and vice versa. The question of whether or not inversion errors in speed control occur during actual flight is discussed, and some of the factors that may influence the occurrence of such errors are examined.
R 10

31,415
McGoff, M.J. & King, J.C. SUPEROXIDE CONFIGURATIONS FOR ATMOSPHERE CONTROL SYSTEMS. FINAL REPORT. Contract AF 33(615) 2792, Proj. 6373, Task 637302, MSAR Rep. 66 144, AMRL TR 66 167, Nov. 1966, 78pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Mine Safety Appliances Company, Evans City, Penn.).

Solid superoxide forms were studied to evolve optimized configuration designs for life support of one man on 2-, 4-, 8-, 24-, and 48-hour space missions. Suitable designs were developed to generate O_2 for these missions, but CO_2 control becomes progressively more difficult as mission time decreases. Optimization for short mission configurations were gained by dynamic flow designs, preheating inlet flow streams, and use of a catalyzing agent. The evolution of available O_2 was as high as 85% for 4-hour mission configurations and as high as 98% for 24-hour missions. The superoxide configurations that have been developed are in plate form as opposed to discs since the former have more efficient O_2 generation and CO_2 absorption characteristics. This was the effect of flow orientation rather than specific shape, per se. The configurations feature rippled superoxide plates, which, when packaged, achieve a 20% increase in bulk density over granules, and a lower pressure drop, thereby minimizing fan power. Heat generated by the superoxide reaction was utilized in the following manner: the inlet flow stream was preheated by refluxing a part of the inlet portion of the superoxide bed. Mass transfer correlations were developed to describe the mechanics of the reactions. Effects of humidity, reduced pressure, O_2/N_2 balance and densification of solid forms on the mass transfer behavior of the superoxide configurations are described.
R 1

31,416
Pishkin, V. & Foster, J.A. AUDITORY CONCEPT IDENTIFICATION SYSTEM AND METHOD OF OPERATION. Psychon. Monogr. Suppl., 1966, 1(10), 239-241. (US Veterans Administration Hospital, Oklahoma City, Okla. & Oklahoma School of Medicine, Oklahoma City, Okla.). (Reprint)

Auditory concept identification system was designed and built to provide for automatic programming and presentation of stimuli which may vary in intensity, laterality, number, frequency and duration. Automatic recording of stimuli, feedback and S's responses is provided. Adjustment of specific levels within each dimension of auditory signal may be accomplished with automatic storage of data and dimensions of each signal.
R 5

31,417
Mashhour, M. INFORMATION TRANSMISSION IN SPEED PERCEPTION AND IN LOCOMOTION. Report from: "XVIIIth International Congress of Psychology, Moscow, Russia, Aug. 1966." Rep. 216, Oct. 1966, 19pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The visual perception of velocity and visual perception in locomotion are treated within the general outlines of Cybernetics and Information Theory: a) The experimental results on the input-output metric relations in the perception of velocity, time and length are summarized and include among others the conclusions: (1) Transmission of speed information is subject to negative feedback which corresponds to Sokolov's 'adaptation reflexes;' (2) The preference function in the judgment of velocity follows an asymmetric unimodal curve, the modal value of which varies somewhat with the motion-track length; b) It is argued that speed is perceived directly; electrophysiological and psychophysical evidence is given in support of this view; c) Transmission of information in pursuit is discussed; theoretical and experimental supports are given to the effect that the eye muscles do not provide information required in speed perception but that the motion of the retinal image does; d) The problems of velocity as a dimension of intensity, the feedback mechanisms, and the visual channel capacity are discussed. It is concluded that: a) In pursuing a moving object, the retinal feedback control deteriorates with increasing velocity; b) The informational capacity of the human eye decreases with increasing speed of locomotion; its bearings on air and land traffic as well as on some theories of perception are pointed out.
R 39

31,418
Mashhour, M. THE EFFECT OF CHANGE IN STIMULATION ON THE TRANSMISSION OF INFORMATION IN VISUAL PERCEPTION. Report from: "XVIIIth International Congress of Psychology, Moscow, Russia, Aug. 1966." Rep. 217, Oct. 1966, 5pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The following points are discussed: a) The relation between change in the pattern of stimulation and the 'orientation reactions;' b) The problem of coding in the transmission of speed information; c) The eye as a control system; and d) The relation between the homogeneity of the visual field and the informational capacity of the eye on the one hand, and speed of locomotion on the other.
R 5

31,419
Magdaleno, R.E. & McRuer, D.T. EFFECTS OF MANIPULATOR RESTRAINTS ON HUMAN OPERATOR PERFORMANCE. FINAL REPORT. Contract AF 33(657) 10835, Proj. 8219, Task 821905, AFFDL TR 66 72, STI TR 134 2, Dec. 1966, 47pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Systems Technology, Inc., Hawthorne, Calif.).

This report is concerned with a series of experiments in which the effects of manipulator restraints, i.e., load dynamics imposed on the operator, are central. The purposes of this investigation are to: a) Determine the load effects on the human operator's describing functions and performance measures for a representative variety of manipulator restraints and controlled elements; b) Provide inferential insight into the relative importance of limb position and output force senses in manual control.
R 7

31,420
Madnick, H. POLYESTER BATTING FOR CLOTHING AND MITTEN INSULATING LAYERS. Tech. Rep. 66 23 CM, C&ED Rep. 40, Feb. 1966, 8pp. USA Clothing & Organic Materials Div., Natick Laboratories, Natick, Mass. (AD 636728)

This report describes the feasibility of using a flame-bonded polyester insulating layer to replace a stitch-bonded insulating material for clothing and mitten environmental layers. Substitution of this material would reduce the weight of the end product and lower the ultimate cost to the government because it would require fewer fabrication processes.

31,421
Macdonald, J.S. EXPERIMENTAL STUDIES OF HANDWRITING SIGNALS. Contract DA 36 039 AMC 03200(E), NSF Grant GP 2495, NIH Grant MH 04737 05, NASA Grant NsG 496, DA Proj. 200 14501 B31F, Tech. Rep. 443, March 1966, 76pp. Electronics Research Lab., Massachusetts Institute of Technology, Cambridge, Mass. (AD 634047)

A system for measuring the displacement, velocity, and acceleration of handwriting movements has been developed. Samples of handwriting processed by this system indicate that the acceleration waveforms of uninterrupted handwriting approximate multilevel trapezoidal time functions. Electronic simulation of the measured displacement, velocity, and acceleration waveforms of handwriting has been accomplished. The "handwriting" produced by the electronic simulator can duplicate uninterrupted handwriting with a high degree of accuracy. The simulator has been used both to generate samples of "handwriting" and to duplicate the handwriting of a number of Ss. The simulator, in effect, represents a point mass driven by a trapezoidal "force" function. Although the biological system producing handwriting is highly complex, the motions involved can be duplicated with a high degree of accuracy in terms of an extremely simple mechanical model. Some preliminary results have been obtained which are directed toward the establishment of relations between the model and the biological system responsible for handwriting. Possible applications of the techniques and apparatus developed in this report to problems of handwriting recognition and neurological studies are discussed.
R 21

31,422
Randle, R.J., Lampkin, B.A. & Lampkin, E.C. SEXTANT SIGHTING PERFORMANCE IN MEASURING THE ANGLE BETWEEN A STATIONARY SIMULATED STAR AND A STATIONARY BLINKING LIGHT. NASA TN D 3506, July 1966, 25pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, Moffett Field, Calif.).

In space flight, the target vehicle in a rendezvous maneuver might carry a high intensity blinking light as a marker and navigation aid for the chase vehicle. The present study was made to determine the ability of subjects to measure the angle between a simulated star and a blinking point of light of the same magnitude as the star. The subjects were eight male junior college students with normal visual acuity (Snellen 20/20). Four were pretrained on the task and four were trained using as targets a simulated star and a steady light. The blinking light was given three levels of frequency (1/2, 1, and 3/2 cps) and three levels of on-time (5,10, and 20 percent), making possible nine experimental conditions. Two steady stars were used as a control. A Plath micrometer marine sextant was used to measure the angle by star superpositon. There was no relative motion between the two targets. The sextant was mounted and did not need to be supported by the subject. The angle was measured with a digital encoder attached to the sextant vernier shaft. Performance decreased at the shorter on-times, in terms of larger variability in measured angle, and at the lower frequencies, in terms of longer sighting time.
R 14

31,423
Reeves, Elizabeth, Weaver, J.W., Benjamin, J.J. & Mann, C.H. COMPARISON OF PHYSIOLOGICAL CHANGES DURING LONG TERM IMMERSION TO NECK LEVEL IN WATER AT 95°, 85°, AND 75°F. RESEARCH REPORT. BuMed. Rep. MF 011.99 1001, Rep. 9, Aug. 1966, 24pp. USN Bureau of Medicine & Surgery, Department of the Navy, Washington, D.C. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.). (AD 636989)

This experiment was designed to evaluate the physiological changes which result from immersion of Ss in water to neck level for 24 hours at water temperatures of 95°, 85°, and 75°F. It had previously been determined that immersion of Ss in water below 95°F resulted in a heat loss from the body which was compensated by an increase in metabolic rate. Other changes in blood morphology and blood electrolytes had been shown to occur concomitantly with increased urinary excretion of water and electrolytes. Since the previous studies had been carried out over a relatively short period of time, the present experiments were designed to evaluate such changes over a 24-hour period, not only at 95°F water temperature but at lower water temperatures as well. It was found that the 3 Ss increased their metabolic rate when immersed in 85°F water and were able to maintain a "normal" deep body temperature over a 24-hour period. When immersed in the 75°F water, the increased oxygen consumption due to shivering was insufficient to maintain deep body temperature. In addition, the physiological discomfort of immersion at 75°F and "the spiritual failure" of those Ss caused the experiments to be terminated within 12 hours. The changes in the morphology and electrolyte content of the blood together with the hemoconcentration were associated with increased urinary water and electrolyte excretion and were progressive with time.
R 11

31,424
Richey, E.O. PREDICTION OF EYE SAFE SEPARATION DISTANCES. Report from: "AGARD Symposuim on Loss of Vision from High Intensity Light, Paris, France, 16-17 March 1966." Program Element 6.16.46.01.D, Projs. 6301 & 5710, Task 630103, Subtask 03.003, June 1966, 22pp. US Defense Atomic Support Agency, Washington, D.C. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A method is given for predicting the distances at which the thermal radiation from nuclear detonations will be hazardous to the unprotected human eye. This method relates calculated retinal exposure to experimentally determined eye effects data. Eye hazards as a function of distance are determined for the unprotected human eye exposed to sea-level, airburst detonations from 0.01 to 10 kt yield. The pupil diameter of the human eye is taken to be 2.5 mm. and 6.0 mm. respectively, for day and night conditions and the effective focal length of the eye is taken to be 17 mm. Nuclear detonation characteristics and scaling factors are taken from Glasstone's "The Effects of Nuclear Weapons". The results indicate that the eye hazard is the limiting factor in determining the distance of nearest approach to a nuclear detonation unless eye protection is provided. Eye hazards as a function of distance are also determined for the human eye protected from daytime detonations by a 2% transmission fixed filter. The results indicate that use of such a filter will provide eye protection at distances where other hazards become limiting factors.
R 8

31,425
Riley, D.R., Jaquet, B.M., Pennington, J.E. & Brissenden, R.F. COMPARISON OF RESULTS OF TWO SIMULATIONS EMPLOYING FULL-SIZE VISUAL CUES FOR PILOT-CONTROLLED GEMINI-AGENA DOCKING. NASA TN D 3687, Nov. 1966, 35pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

An investigation involving seven astronauts as test Ss has been made to assess the overall compatibility of the results of two independent full-size simulations of pilot-controlled Gemini-Agena docking. One simulator (fixed base) employed a closed-circuit television system to display an image of the Agena target vehicle on a spherical screen. The other simulator (moving-base) used a dynamic full-size model of the Gemini spacecraft and a stationary three-dimensional target. A comparison of the results of the investigation in which only visual cues of the target vehicle were used for guidance information indicated that, after sufficient training, essentially the same results could be obtained from either simulator. Learning effects were found for both simulations; however, these effects were considerably more pronounced for the fixed-base simulator. Differences in the target markings and docking cones employed on the Agena models, a lack of three dimensions in the TV image, degradation of the visual cues due to the TV presentation, and the presence of the gravity-force angular cue in the moving-base simulator are partially responsible for this difference in learning effects. In addition to the simulator comparison, the docking results presented herein provide additional information on Gemini-Agena docking using the direct mode of control (on-off acceleration command system).
R 10

31,426
Rizy, E.F. DICHROIC FILTER SPECIFICATION FOR COLOR ADDITIVE DISPLAYS: I: PRELIMINARY TOLERANCE DETERMINATION AND THE C.I.E. DESIGNATIONS FOR CODING COLORS. FINAL REPORT. Proj. 5597, Task 559705, RADC TR 66 193, July 1966, 38pp. USAF Rome Air Development Center, Griffiss AFB, N.Y.

Twelve pairs of dichroic filters were used in a xenon-source additive color projector to determine their effects upon observer use of the seven color codes customarily employed in Command-and-Control visual displays. The particular filters used were selected on the basis of previously published research. The resultant primary color codes and white were described in CIE (Commission Internationale de l'Eclairage) terms for more ready comparison with color discrimination literature. Results indicated that the blue filter should reflect energies well into the green region of the spectrum for adequate seven-color production. No overall differences were found among the red dichroics, although red filters interacted significantly with coding colors. It was concluded that the relative efficiencies of the seven color codes may be tailored to anticipated or present operational need by the utilization of narrow filter tolerance. Broader tolerances around 516 nanometers for the blue filter cutoff and 585-590 nanometers for the red cutoff should result in an adequate set of seven coding colors. A comparison of several studies completed over the past two years seemed to suggest that overall display brightness may have almost as significant effect on observer performance as the selection of filters.
R 7

31,427
Robinson, G.H. THE HUMAN CONTROLLER AS AN ADAPTIVE, LOW-PASS FILTER. Report from: "10th Annual Meeting, Human Factors Society, Anaheim, California, November 1-4, 1966." Public Health Research Grant HM 00224, 1966, 13pp. Industrial Engineering Div., University of Wisconsin, Madison, Wisc.

A number of human control tasks have elements analogous to low-pass filtering. A signal, S, on which control is to be based, is contaminated by a noise, N, with frequency components higher than S, 3 models of a first-order linear filter are compared with the results of a study in which 4 Ss performed a pursuit tracking task with each of 2 signals and 1 noise value - S/N (amplitude) ratios of 0.5, 1, 2, 4, and ∞(N = 0). Ss mean square error (MSE) data suggest that Ss perform low-pass filtering poorly. The 3 filter models--a) optimal at each value of S/N; b) optimal for S and N and S/N = 1; c)optimal for S and N and S/N = 2--performed substantially better than Ss. At S/N = 2 or 4, Ss MSE is higher than would have resulted from no filtering at all. Examination of the response records indicates that a large proportion of S's MSE is accounted for by S's response lag. A model incorporating this response lag is presented and found to be in close agreement with the S's response records.
R 10

31,428
Roebuck, J.A., Jr. A SYSTEM OF NOTATION AND MEASUREMENT FOR SPACE SUIT MOBILITY EVALUATION. Report from: "Tenth Annual Meeting, Human Factors Society, Anaheim, California, Nov. 1-4, 1966." 1966, 27pp. Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.

An integrated system of mobility notation and standard techniques for measurement of space suit mobility is described. New terminology is proposed to describe human body movements for engineering workspace analysis and suit mobility specifications. Vector and link concepts are combined in a simplified model of man to describe body positions in terms of orientation of limbs with respect to a tri-planar, angular, coordinate system conceived as attached to the pelvic region. Numerical coding of the body links and joints is described. The notation system may be used as a basis for mathematical modeling for computer analysis of vehicle workspace geometry and control locations. The system is independent of gravitational reference semantic implications and is sufficiently general for a wide range of complexity in kinesiological, medical, and human engineering applications.
R 9

31,429
Severy, D. & Brink, H. AUTO-PEDESTRIAN COLLISION EXPERIMENTS. Report from: "Automotive Engineering Congress, Detroit, Michigan, Jan. 10-14, 1966." SAE Rep. 660080, 1966, 129pp. Society of Automotive Engineers, Inc., New York, N.Y. (Institute of Transportation & Traffic Engineering, University of California, Los Angeles, Calif.).

Auto-pedestrian accidents--one of the most important factors in motor vehicle deaths and injuries--were studied with the precise techniques of full-scale accident simulation. Thirty-eight anthropometric dummies, instrumented with tri-axial accelerometers, were impacted under representative auto-pedestrian exposure conditions. Under study were: The pedestrian blow by the striking vehicle and the pedestrian's corresponding body gyrations, displacements and subsequent pavement contacts varying with the size and speed of the impacting vehicle; the portion of the front-end contacting the pedestrian; the direction the pedestrian was facing when impacted; the pedestrian height, and his walking or standing postures. Other factors under study concerned the relationship that vehicle braking and special vehicle structures bear to auto-pedestrian injuries. Thirty special photographic devices provided coverage for data reduction and documentary film production. Post-impact observations provided data of considerable value in accident reconstruction.

31,430
Tresselt, M.E. ANCHORING AND MENTAL SET. Psychon. Monogr. Suppl., 1966, 1(14), 287-291. (New York University, New York, N.Y.). (Reprint)

The concept of anchoring is distinct from mental set. The chief phases of both concepts are identified and analyzed comparatively in the light of sample experiments. It is suggested here that there is only one major criterion that separates these concepts, namely, whether a specific response or an area of responses is required. It is further argued that anchoring might be a more everyday phenomena and that it lends itself to varied directions of study, including the role of ego-involvement and the interaction of natural and supplied anchors with emphasis on the organism in the stimulus-response situation.
R 22

31,431
Nixon, C.W., Harris, C.S. & von Gierke, H.E. RAIL TEST TO EVALUATE EQUILIBRIUM IN LOW-LEVEL WIDEBAND NOISE. Proj. 7231, Task 723103, AMRL TR 66 85, July 1966, 16pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Psychomotor performance on a rail test was measured during free-field exposure to wideband noise at an overall level of 120 dB re 0.0002 dyne per square centimeter. Subjects wore various combinations of ear protectors to obtain experimental conditions of: a) sound pressure levels equal in both ear canals (balanced condition) and; b) sound pressure level greater in one ear canal than in the other (unbalanced condition). Man's ability to maintain his equilibrium was adversely affected by the unbalanced noise condition. The rail test may be a useful measure of psychomotor performance in intense noise. Future research will be directed to rail test performance in exposure conditions higher than those employed in this study.
R 21

31,432
Osterhoff, W.E., Earl, W.K. & McGrath, J.J. GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: ACHROMATIC DISPLAY OF COLOR-CODED CHARTS. Contract NONR 4218(00), Proj. NR 213 028, Tech. Rep. 751 8, Nov. 1966, 43pp. US Joint Army Navy Aircraft Instrumentation Research Committee, Washington, D.C. (Human Factors Research, Incorporated, Goleta, Calif.).

Geographic orientation performances of 4 groups of pilots were measured under conditions of simulated, VFR flight. The first group used a full-color standard Sectional chart. The second group used a graytone version. The third group used a black-and-white line version. The fourth group used a blank version. Pilots who used the achromatic graytone and line charts, performed significantly poorer than pilots who used color charts, but better than pilots using blank charts. The main reasons for the inferiority of the achromatic charts were: a) categories of topographic information were difficult to differentiate; b) reliance on natural landmarks had to be abandoned in favor of reliance on cultural landmarks; c) pilots had to spend too much time studying the charts during flight; and d) the vertical development of terrain was poorly portrayed. It was concluded that navigation display systems which lack color capability cannot effectively employ existing color-coded aeronautical charts. Specially designed achromatic graphics will be required for such systems.
R 7

31,433
Osterhoff, W.E. & McGrath, J.J. GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: CONTEMPORARY CHARTS AND PILOT PERFORMANCE. Contract NONR 4218(00), Proj. NR 213 028, Tech. Rep. 751 6, May 1966, 41pp. US Joint Army Navy Aircraft Instrument Research Committee, Washington, D.C. (Human Factors Research, Incorporated, Santa Barbara, Calif.). (AD 635384)

Three different aeronautical charts were evaluated in terms of their relative effectiveness as visual navigation aids. Geographic orientation performances of 3 groups of pilots were measured under conditions of simulated, VFR, flight. One group used the Sectional Aeronautical Chart, another used the Operational Navigation Chart (ONC), and a third used the Pilotage Chart (PC). After a practice sortie, each pilot flew two test sorties over different routes of simulated flight. The poorest performances were achieved with the PC on one route and with the ONC on the other route. Pilots using the Sectional performed as well as or better than those using either the PC or the ONC on both routes. An explanation of the complex results was offered, based on a theoretical model suggested in an earlier report. The model accounted for the experimental results in terms of the orientation strategies adopted by the pilots under different conditions of flight. It was concluded that the relative effectiveness of aeronautical charts is specific to the terrain over which the pilots must navigate. The PC was an effective navigation aid when used over terrain having a substantial number of visual landmarks, but was less effective than the other charts when used over terrain having few available landmarks.
R 6

31,434
Guy B. Panero, Incorporated. VENTILATION TESTS OF FALLOUT SHELTER SPACES IN NEW YORK CITY AND VICINITY. SRI Subcontract B 64212(4949A 3) US, Work Unit 1214B, Feb. 1966, 3pp. Guy B.Panero, Inc., New York, N.Y. (AD 631475)

A summary is given of fallout shelters in New York City under the following sub-headings: core areas within above-ground buildings, buried and semi-buried shelters, and manual ventilation devices.
R 1

31,435
Parsons, H.M. STAVE: STRESS AVOIDANCE/ESCAPE. Report from: "1966 Meeting of the Human Factors Society in the Symposium on Motivational Variables in Human Performance." Rep. SP 2459, Aug. 1966, 28pp. System Development Corporation, Santa Monica, Calif.

This paper reviews three operant conditioning studies, relates them to the concept of stress and suggests that the conditionability of avoidance and escape behaviors helps to define stress in an operational manner.
R 21

31,436
Patten, C.W., Ramme, F.B. & Roman, J. DRY ELECTRODES FOR PHYSIOLOGICAL MONITORING. NASA TN D 3414, May 1966, 31pp. National Aeronautics & Space Administration, Washington, D.C. (Spacelabs, Inc., Van Nuys, Calif.).

A method for very rapid application of electrocardiogram electrodes by spraying a conductive mixture is described. The electrodes are also suitable for electroencephalograms. All required equipment and the application procedure are described in detail. The finished electrode is dry and is less than 0.01-inch thick. Electrical and operational factors are not considered.
R 1

31,437
Pennington, J.E., Hatch, H.G., Jr. & Driscoll, N.R. A FULL-SIZE PILOT-CONTROLLED DOCKING SIMULATION OF THE APOLLO COMMAND AND SERVICE MODULE WITH THE LUNAR MODULE. NASA TN D 3688, Dec. 1966, 35pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A full-size pilot-controlled simulation of the docking of the Apollo command and service module with the lunar module has been completed by using a 6-degree-of-freedom dynamic simulator. The study was designed to investigate the pilot's ability to complete a successful docking by using only visual information. Several thruster failures and 3 vehicle control modes were simulated. Results indicated that, with adequate visual aids and with no thruster failures, docking by using the primary control mode is not a difficult maneuver. Control-system failures increased the terminal docking errors and tended to reduce the pilot's confidence in his ability to control the vehicle precisely.
R 11

31,438
Perry, B.L. & Birmingham, H.P. THE ALTITUDE RATE COMMAND SYSTEM. INTERIM REPORT. Contract NRL Prob. Y02 21 & Y02 01, Projs. RS 11 50 016/652 1/F012 06 02 & RR 006 09 41 5351, NRL Rep. 6459, Oct. 1966, 9pp. USN Research Lab., ONR, Washington, D.C. (USN Engineering Psychology Branch, ONR, Washington, D.C.).

A visual landing aid designed to increase landing accuracy and thus reduce accident rates, has been developed. Called the Altitude Rate Command (ARC) system, it provides highly sensitive rate-of-descent error information to approaching aircraft. The information is encoded as a cyclic sequencing of the intensity of a single light. The pilot interprets a repetitive increasing of intensity as a command to increase power so as to decrease his sink rate. Conversely, a decreasing sequence indicates the need to reduce power in order to increase rate of descent. In addition, binary hi-lo information is provided by color coding of the sequencing light: amber signifies "on glide path," green signifies high, and red warns of the potentially dangerous low condition. The introduction of intensity sequencing, rather than the color sequencing of the similar Rainbow Optical Landing System, to encode error rate permits increased information rate and minimum interpretation time, which thus increase the effectiveness of the rate display.
R 3

31,439
Foley, W.L. A STUDY OF LIGHT MODULATION AND SCANNING TECHNIQUES FOR APPLICATION TO SIMULATION DISPLAY GENERATION. FINAL REPORT. Proj. 6114, Task 611410, AMRL TR 66 9, March 1966, 56pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Various techniques for modulation and scanning of coherent light are analyzed for application to the generation of high resolution high contrast displays for simulation. A number of possible techniques are discussed in the main body of the report. The individual discussions include a brief description of the principles of operation together with capabilities relative to bandwidth, contrast ratio, deflection angle, alignment, sensitivity, ease of fabrication, and handling. This is based somewhat upon voltage and power requirements over range of operation.
R 16

31,440
Fregly, A.R. & Graybiel, A. ACUTE ALCOHOL ATAXIA IN RELATION TO VESTIBULAR FUNCTION. Contract NASA Order R 93, BuMed. Proj. MR005.13 6001.1, Rep. NAMI 973, Rep. 133, June 1966, 15pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Determination of alcohol effects on postural equilibrium of bilateral labyrinthine defective individuals was made to aid in the elucidation of the functional role of the vestibular organ in man. Generally, severity and duration of the intoxicating effects were found to be less than that observed in a previous study on vestibular-intact individuals. The superimposition of an "acute alcohol ataxia" on vestibular-impaired individuals appears to depend upon the degree to which nonvestibular functions can be made to compensate for the initial characteristic vestibular ataxia.
R 18

31,441
Favour, C.B. LACTIC ACID, FITNESS AND ALTITUDE. PROGRESS REPORT. Contract DA 79 193 MD 2446, Feb. 1966, 38pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (National Jewish Hospital, Denver, Colo.). (AD 628713)

Healthy young men acclimatized to 5,300 feet and in a sedentary state were assembled in the spring of 1963, 1964 and 1965 for a 2-variable 4-part study of the effect of physical fitness on acute exposure to one week's residence at 14,150 feet. In part one, the Ss underwent a battery of tests at ambient altitude. In part 2, immediately thereafter, these tests were repeated at 14,150 feet. The Ss then returned to ambient altitude where they spent 4-5 weeks in a physical conditioning program. In part 3, the test battery was repeated at the end of the fitness program and in part 4, another week of tests at 14,150 feet was completed. These studies indicate that a month of physical training significantly lowers both the resting and exercise arterial blood lactic acid level using a bicycle ergometer work load at 600 Kg m/min. Exposure to altitude raised resting and exercise HLA levels in the sedentary state but did not alter the lowered values of the fit state. Fitness also prevented at altitude the hyperventilation and increased oxygen consumption seen in the second 5 minutes of the 10 minute work period in the sedentary state. A number of hematological, blood gas and electrolyte responses to exercise and to altitude were not altered by becoming fit. Ss in the fit state were less symptomatic and more effective in technical duties at altitude than when in a sedentary state. It is concluded that there is a useful but by no means complete cross-adaptation between physical fitness and tolerance to acute exposure to high altitude.

31,442
Eberhard, J.W. SLEEP REQUIREMENTS AND WORK-REST CYCLES FOR LONG TERM SPACE MISSIONS. Report from: "Human Factors Society National Convention, Anaheim, California, Nov. 1-4, 1966." Aug. 1966, 12pp. Matrix Corporation, Arlington, Va.

This analysis tried to piece together data found in various industrial studies of the influence of sleep-wakefulness cycles on productivity, basic research studies applying physiological and psychological indices, results from space flight simulation studies, and finally, the data released from the long term American space flights that have occurred to date. The review of the literature indicated: a) There seems to be inadequate data relating the application of earth-oriented sleep/wakefulness cycles in long-term space missions; b) The Gemini flights shift from a four-four schedule to one of eight hours tended to verify this for long-term missions; c) The 14 day Gemini 7 flight seems to indicate that an extended flight gradually requires less sleep; d) If mission oriented tasks require astronauts to perform on other than 8 hours consecutive sleep consideration should be given to the effectiveness of different sleep periods from 2 angles: (1) selecting astronauts who require sufficiently less sleep, and (2) preconditioning the astronauts to use the different sleep/wakefulness cycle; e) More definitive work should be done on the area of split sleep schedules if such schedules should be required for future long-term space missions; f) More data is required on the influence of zero "g" on sleep requirements; and g) Consideration should be given to testing the period of wakefulness as related to the critical mission oriented tasks and astronaut performance of those mission oriented tasks to be performed upon sudden awakening.
R 14

31,443
Deatherage, B.H. STUDIES OF BINAURAL INTERACTION. SUMMARY REPORT. 1 APRIL 1965-31 MARCH 1966. Contract NONR 4193(00), TRACOR 66 311U, 1966, 124pp. USN Physiological Psychology Branch, ONR, Washington, D.C. & TRACOR, Inc., Austin, Tex.

The series of basic studies in binaural interaction, begun at these laboratories in 1961, has continued through the last 12 months with emphasis on 3 areas of investigation. These areas were auditory sensitization, binaural masking, and the critical bands of some special click stimuli. Work in a fourth area, detectability of tonal signals under conditions of azimuth certainty has proceeded during the final quarter of the reporting period, but the data are not yet complete. This report contains the discussions of the 3 major studies of the current year: demonstration of the phenomenon of auditory sensitization, investigation of the effects of varying the interaural correlation and interaural intensive ratio of a binaural masker on the detection of a monaural signal, and an examination of the difference in processing tone bursts and clicks by the auditory system as of function of frequency coding in the ear.
R 72

31,444
VanWinkle, G.L. & DeBono, M.A. SOLID STATE DISPLAY DEVICES. FINAL REPORT. Contract AF 33(657) 11554, Proj. 6190, Task 619009, AFFDL TR 66 81, Rep. GRR 65 1063, Aug. 1966, 75pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Lear Siegler, Inc., Grand Rapids, Mich.).

The result of this program was the development of a solid state display device utilizing binary input information. An extension of previous contract work, the program produced the application of thin photoconductive elements, with as many as 128 individual switching elements in a single substrate. The photoconductor switches are driven with electroluminescent lamps. The readout is made up of five columns of segmented electroluminescent lamps with a resolution of 32 lines per inch. Four of the columns are of the thermometer type while the fifth is a single line which moves as a time reference.

31,445
Smode, A.F. (Princ. Investigator), Hall, E.R. & Meyer, D.E. AN ASSESSMENT OF RESEARCH RELEVANT TO PILOT TRAINING. FINAL REPORT. Contract AF 33(615) 2968, Proj. 1710, Task 171003, AMRL TR 66 196, Nov. 1966, 241pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (BioTechnology, Inc., Arlington, Va.). (AD 804600)

This report presents a critical review and interpretation of the considerable amount of research data that have either direct or indirect implications for the training of pilots. The purpose is to organize systematically the research findings from the human performance and the training research literature that are pertinent to pilot training, and, based on the status of research in defined areas, to identify researchable issues. Successive portions of the report deal with studies on the definition of the pilot's job, the acquisition of flying skills, performance measurement, simulation and transfer of training, operational components of the pilot's job, and the maintenance of flying proficiency. In addition, attention is given to studies concerned with improving training systems and recent innovations in training methods are reviewed. As it provides a considerable background of information directly concerned with pilot training, this report will be of interest to individuals involved in any aspect of flight training.
R Many

31,446
Coleman, B., Hertzman, A.B., D'Agrosa, L.S. & Flath, F. IMPEDANCE MEASUREMENTS OF CARDIAC OUTPUT DURING MODERATE HEAT EXPOSURE. FINAL REPORT. Contract AF 33(657) 11551, Public Health Research Grants H 4939 & HE 07070, Proj. 7164, Task 716409, AMRL TR 66 5, Feb. 1966, 21pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Physiology Dept., Saint Louis University School of Medicine, St. Louis, Mo.).

Cardiac outputs of nude resting subjects were estimated from measurement of the intrathoracic impedance pulses as recorded with the 4 electrode system. Ambient temperature was increased from 28° C to 43°C. Increases in cardiac output were small, (about 1.0L/M^2/min) variable, and due to small increases in heart rate and stroke volume. The greater cardiac output during heat was probably due to the cutaneous vasodilatation as demonstrated in the cutaneous opacity pulses, but this relation has not been demonstrated decisively. The ratio of increase in cardiac output to sweating was about the same as that shown previously for cutaneous blood flow and sweating. A decrease occured in intrathoracic impedance indicating a greater volume of electrolyte fluid in this area. Validation of the thoracic impedance pulses as a measure of right ventricular stroke volume was accomplished in human and canine subjects.
R 14

31,447
Williams, D.W. (Princ. Investigator), Duggar, B.C., Burger, E.J. & Chamberlain, H.S. REVIEW OF COMBINED TRAUMA: RESEARCH, CLINICAL MANAGEMENT, AND PLANNING. FINAL REPORT. Contract OCD OS 63 141 & PH 86 64 134, Proj. OCD Work Unit 2421F, Jan. 1966, 155pp. US Office of Civil Defense, Department of the Army, Washington, D.C. & US Department of Health, Education & Welfare, Washington, D.C. (Bio-Dynamics, Inc., Cambridge, Mass.). (AD 632595)

This review covers the topic of combined trauma--radiation injury plus burns, physical injury, and/or infection. This class of casualty is almost exclusively the product of nuclear weapons effects, so the emphasis of the review is principles of clinical management. Major sections of the review are: a) A casualty model, generated to assess the significance of combined trauma relative to other forms of injury; b) A review of clinical management principles for care of combined trauma patients; c) Clinical guides to the care of radiation, burn, and infection casualties; d) A review of the recent combined trauma research; and e) A summary of planning measures designed to assist in preparedness for disaster medical care. An extensive bibliography is also included.
R 292

31,448
Cogswell, J.F. (Princ. Investigator), Bratten, J.E., Egbert, R.E., Estavan, D.P., et al. ANALYSIS OF INSTRUCTIONAL SYSTEMS. REPORT OF A PROJECT: NEW SOLUTIONS TO IMPLEMENTING INSTRUCTIONAL MEDIA THROUGH ANALYSIS AND SIMULATION OF SCHOOL ORGANIZATION. FINAL REPORT. DOHEW Grant 7 14 9120 217, Tech. Memo 1493 201 00, April 1966, 276pp. System Development Corporation, Santa Monica, Calif. (AD 632462)

This is the final report of a project designed to explore uses of system analysis and computer simulation in studying innovation in public secondary schools. The project, entitled New Solutions to Implementing Instructional Media Through Analysis and Simulation of School Organization, was jointly sponsored by the U.S. Office of Education and System Development Corporation. The major findings reported include the identification of 2 ways for using system analysis in education, the specification of procedures for conducting analyses of instructional systems, and implications for school organization. Although there is a definite trend in secondary education to search out and introduce ways to alter school organizations so that the individual differences among students can be accommodated, no school has yet evolved an organization to successfully meet this objective. Schools striving in this direction are presently blocked because they lack 2 major resources: a) adequate self-study instructional materials; and b) adequate systems to provide information to instructors, counselors, and administrators about the status of students as individuals. Recommendations for attacking these problems growing out of the study include: a) continued development of the computer-based system to assist students and counselors in academic planning that was started in the project; b) continued study of the use of information processing in the classroom to design systems that will collect, store, and display student information so that it can be used in the immediate instructional process; c) in-service training of influential school personnel in the skills of designing individualized course materials; and d) development and dissemination of procedures for the management of changes in schools. R 25

31,449
Mileson, D.F. & Cameron, K.A. A METHOD OF QUANTIFYING SYSTEM CAPABILITY. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 39-44. American Institute of Aeronautics & Astronautics, New York, N.Y. (ARINC Research Corporation, Annapolis, Md.).

It has been recognized for some time that a system's reliability, maintainability, and capability constitute system effectiveness. There are many techniques for establishing quantitative measures of system reliability and maintainability. However, quantitative assessment of capability is difficult, particularly in complex systems. While a parameter such as CEP (Circular Error Probable) might serve as a measure of capability for a bombing system, so convenient a measure is not often available for a system that performs multiple functions. Because of practical problems associated with the application of this relationship, the direct measurement (or synthesis) of capability and, hence, effectiveness is suggested. Quantification of the relative contributions of the various functions to the performance of the mission, combined with the availability and dependability of these functions, makes it possible to establish the effectiveness value for a system. This value can be useful in the comparison of 2 similar systems or of alternate configurations of the same system.

31,450
Novosad, R.S. SYSTEM EFFECTIVENESS AND LEVELS OF ACHIEVEMENT. Report from: "Fifth Reliability and Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 51-56. American Institute of Aeronautics & Astronautics, New York, N.Y. (Martin Company, Denver, Colo.).

A commonly used definition of system effectiveness is "the probability that the system will accomplish a mission successfully under specified conditions". When the mission has many, or perhaps even infinitely many, possible outcomes, each with a different degree of success, a more general definition is required. We require that the defined measure will: a) demonstrate the effectiveness of a program; b) develop criteria to be used in trade-off evaluations. One can calculate a system effectiveness measure for each of the possible outcomes. If the number of possibilities is large, the utility of such a procedure is small unless the set of possibilities can be structured in a logical manner. Good structure will have 2 features: a) it will make the job of calculating the probabilities easier; b) it will assist in the interpretation of results. This paper outlines how this can be accomplished for some examples of problems involving launches of payloads to orbit.
R 5

31,451
Glenn, R., Martin, J.D. & McDonough, J.R. THE MAINTENANCE DEPENDENCY CHART, A NEW TROUBLE-SHOOTING TECHNIQUE. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 92-99. American Institute of Aeronautics & Astronautics, New York, N.Y. (Martin Company, Orlando, Fla.).

The Maintenance Dependency Chart provides a relatively new technique for presenting troubleshooting information on all types of equipment, including complex missile systems. This type of chart symbolically presents all functions which occur during operation of the equipment, in such a manner that a technician can determine, from the chart, all possible causes of any malfunction that occurs. Other applications of the chart are its uses as a training aid for theory and as a design-checking tool.

31,452
Sohn, H.M. C-5A QUANTITATIVE MAINTAINABILITY PROGRAM. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 104-111. American Institute of Aeronautics & Astronautics, New York, N.Y. (Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.).

Until quite recently, maintainability was a characteristic of design which the Department of Defense and its contractors approached in abstract terms only. With the growth of vastly intricate defense systems, and huge industrial organizations, however, well-defined quantitative maintainability requirements have become increasingly essential to balanced design. And as a distinct engineering discipline, quantitative maintainability is today commanding the interest of engineers and management alike. For the new C-5A, Lockheed is committed to meet quantitative maintainability guarantees which are contractually binding. This paper explains the development and implementation of Lockheed's C-5 Quantitative Maintainability Program, and discusses what it will mean to the Air Force in terms of increased air vehicle utilization and cost effectiveness.

31,453
Crumley, L.M. & Wilson, M.A. ARMNET: A QUANTITATIVE APPROACH TO THE EVALUATION OF MAN-MACHINE SYSTEM AVAILABILITY. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 112-115. American Institute of Aeronautics & Astronautics, New York, N.Y. (General Electric Company, Philadelphia, Penn.).

A brief description is given of evaluation of system availability for ground equipment and for missiles, sustable to the specific needs of the reentry systems department.

31,454
Barone, M.A. A METHODOLOGY TO ANALYZE AND EVALUATE CRITICAL HUMAN PERFORMANCE. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 116-122. American Institute of Aeronautics & Astronautics, New York, N.Y. (Brown Engineering Company, Inc., Huntsville, Ala.).

Presented in this paper is a methodology to evaluate, analyze, and predict critical human performance. The methodology is a novel approach towards evaluating potential human error. The aim of the Critical Human Performance and Evaluation Program (CHPAE) is to develop a methodology to control and minimize the natural subjectivity associated with evaluation programs. The typical approach of the CHPAE is: a) analyze the system or task; b) select evaluation factors; c) establish and prevalidate a rating manual or check list; d) perform an analysis and evaluation; e) estimate potential error probabilities; and f) perform critical comparison studies. Much work still remains to be done towards a complete and final validation of the program--partly because there is a variety of methods both computerized and manual that can be applied to quantify the evaluations and partly because of the need of large population statistics, other than experimental or selected source data to validate the error potential prediction of the plan. Regardless of the early limitations of the metric, the plan will perform a valuable human factors evaluation of a group of tasks, subsystems or systems.
R 3

31,455
Topmiller, D.A. HUMAN FACTORS AND SYSTEMS EFFECTIVENESS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 123-132. American Institute of Aeronautics & Astronautics, New York, N.Y. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

This paper treats Human Factors in Systems effectiveness as a basic problem relating human performance to the major Systems effectiveness parameters of Operability, Reliability and Maintainability. The latter 2 parameters are topologically related to the primary dependent human performance variables used in laboratory research of errors and time respectively. The need is outlined to not only topologically relate these variables but to also develop a framework within which human engineering design can be quantitatively assessed. Two studies were reviewed in which human performance (time) was predicted from design evaluations and analysis of equipment.
R 6

31,456
de Callies, R.N. HUMAN RELIABILITY IN THE OPERATION OF V/STOL AIRCRAFT. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 133-145. American Institute of Aeronautics & Astronautics, New York, N.Y. (Life Sciences Group, North American Aviation, Inc., Los Angeles, Calif.).

There is a need for human reliability in a man-machine environment. Human reliability is achieved by optimizing input-output conditions which occur at the man-machine interface. The operator of a vehicle needs displays and controls which contribute to his reliability by reducing perceptual judgment time and maintaining response constancy. Vertical/Short Takeoff and Landing Aircraft (V/STOL) requirements for displays and controls are examined for several modes of operation such as hover and transition, Low-Altitude, High Speed (LAHS), and all-weather. Display concepts such as "head-up" and the "contact analog" are examined for their capability in maintaining response constancy. Current work by North American Aviation, Los Angeles Division is reviewed. Conclusions and recommendations are made for a continuing effort.
R 24

31,457
Hunt, G.C. & Ridley, H. THE OPTIMIZATION OF EARTH-ORBITING SPACE STATION MISSIONS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 193-201. American Institute of Aeronautics & Astronautics, New York, N.Y. (Boeing Company, Seattle, Wash.).

The general model described in this paper optimizes long-term, continuous-operation missions performed by an earth-orbiting space station. The model is based on the use of an arbitrary cost-effectiveness criterion. In this example, space station operating time availability is shown as a function of cost for arbitrary mission lengths and payloads. In this model, resupply vehicles are used to support a separately-launched, "permanent" space station. The formulation focuses attention on the following critical reliability and maintainability questions: a) Should a new space station be launched instead of repairing or replacing failed items of equipment? b) What is the best initial provisioning of spares and redundancy elements? c) What are the best in-flight spares provisioning strategies? d) When should crewmen be retained for in-flight maintenance pruposes? These questions are answered in an optimization which takes into account unscheduled resupply flights, necessitated by random failures; time lost due to unsuccessful orbit injection of resupply vehicles; and time constraints on the use of man in space. The mission functions may be such as to require both manned and unmanned periods, in addition to manning requirements for repair and for set-up operations needed for the unmanned tasks. Complete freedom is allowed in the model for specification of different boosters, power systems, and expendables usage rates. Cost is calculated independently from operational effectiveness and, thus, may be handled at any desired degree of detail.
R 2

31,458
Austin, R.N. OPTIMIZED OPERATIONAL PAYLOADS FOR MANNED MARS MISSIONS. Report from: "Fifth Reliability & Maintainability Conference, New York, 18-20 July 1966." 1966, 202-214. American Institute of Aeronautics & Astronautics, New York, N.Y. (General Dynamics Corporation, Fort Worth, Tex.).

A technical approach which has been used to assess the trade-offs between system mass, reliability, and development cost for the purpose of optimizing an operational payload for manned missions to Mars in the 1973-1990 time period is described herein. The overall mission operational payload is considered to be composed of: a) the various systems and subsystems which are essential to the success of the missions considered, b) the scientific and engineering reconnaissance instrumentation (including unmanned probes), and c) the crew living quarters (mission module) and structure. Mass/reliability and cost relationships are derived for each individual system concept and the module structure; these quantities serve as inputs to a computerized Systems Optimization Procedure which, by means of dynamic programming, is used to select an optimum system complement based on specified mass, reliability, or cost constraints. Cost/mass relationships for operational payloads are combined with the costs of the propulsion system, launch, and operations, including those associated with orbital assembly, in order to derive relationships between total mission costs and operational payload mass. An optimum operational payload is then selected.
R 2

31,459
Kenyon, H.A. & McJilton, T.F., Jr. MICROELECTRONICS COST OF OWNERSHIP. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 215-221. American Institute of Aeronautics & Astronautics, New York, N.Y. (Research & Engineering Div., Autonetics, Anaheim, Calif.).

Since the introduction of microelectronics to avionics systems, a significant change has taken place in the economics of system ownership during the operational phase. Today greater demands than ever are being placed on systems in terms of capability, reliability, availability, and other "-abilities," all at a minimal cost. In addition, with the ever changing applications of our Strike Avionics, the avionics systems are becoming more and more independent of flight line ground equipment. These new requirements lead to built-in test equipment, fault isolation circuitry, alternative mode or abort displays, maintenance data recording, on-board spares; which all can be realities through microelectronics. Microelectronics has led to modularized concepts which have been defined as Line Replaceable Units, (LRU's), Weapons Replaceable Assemblies (WRA), Shop Replaceable Units (SRU), and Shop Replaceable Assemblies (SRA).
R 8

31,460
Tayler, N.M. ECONOMICS OF SYSTEM CHANGE. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 222-227. American Institute of Aeronautics & Astronautics, New York, N.Y. (Research & Study Dept., Vitro Laboratories, Silver Spring, Md.).

Economic factors affecting the operations of businesses and weapon systems are analogous. A weapon system, like a business enterprise, must be dynamic and ever changing in order to remain competitive and secure its share of the market. The relevance of commercial business practices to the decision processes affecting weapon system changes is explored. Management should continually search for more definitive analytical procedures that describe the system functions, values, risks, and alternatives.
R 1

31,461
Dunlap, R.A. & O'Keefe, J.K. SYSTEMS ANALYSIS FOR SPACE PROGRAMS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 286-294. American Institute of Aeronautics & Astronautics, New York, N.Y. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

The basic concepts and scope of systems analysis in the design of space systems are discussed in terms of the elements and activities of the analysis effort. Reliability and maintainability are examined in terms of their relationship to systems analysis and their importance in selection of design concepts and requirements which achieve the best system.
R 5

31,462
Lanier, R.E. THE IMPACT OF THE A-7A MAINTAINABILITY REQUIREMENT ON MANAGEMENT AND DESIGN. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 410-415. American Institute of Aeronautics & Astronautics, New York, N.Y. (LTV Aeronautics Div., Ling-Temco-Vought Aerospace Corp., Dallas, Tex.).

The impact of the A-7A maintainability requirement has been reflected in the program management organization and in the design approach. An analysis of early flight test maintenance data is presented.

31,463
Wilson, M.A. THE LEARNING CURVE IN MAINTAINANCE ANALYSIS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 434-443. American Institute of Aeronautics & Astronautics, New York, N.Y. (General Electric Company, Philadelphia, Penn.).

The paper applies the theory of learning curves to explain the tendency toward decreasing down-time observed in the maintenance of many systems. Maintainability demonstrations performed under current military specifications assume stationary distributions of maintenance times; that is, the demonstrated times are considered as samples drawn from populations having time-invariant parameters. Statistical evidence, based on observed maintenance actions on military electronic equipments, is presented to contest the validity of these assumptions. The author shows that maintenance times decrease for iterative tasks in accordance with the negative logarithmic relationship, which is the accepted form of the human learning curve, historically applied in manufacturing operations. As the number of performances of a task increases, the time required for each iteration is progressively reduced in accordance with a constant experience factor. Although the experience factor is, in a strict sense, a unique characteristic of a specific worker at a specific task, it is shown that a satisfactory composite factor may be computed for a maintenance crew or department, and may be employed for prediction of maintainability improvement.
R 5

31,464
Viehmeyer, G.F., Jr. AN APPROACH TO IMPLEMENTATION OF AFSCM 375-5 IN THE AIRCRAFT INDUSTRY. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 472-480. American Institute of Aeronautics & Astronautics, New York, N.Y. (Lockheed-Georgia Co., Lockheed Aircraft Corp., Marietta, Ga.).

Air Force Systems Command Manual (AFSCM) 375-5 is a systematic approach to the "Uniform Design Process". Its successful implementation requires a systematic organizational arrangement, a complex network of information flow, and a critical examination of the roles of the system engineer vis-a-vis the various specialty engineers. This paper discusses implementation philosophy and typical operating personnel interrelationships to accomplish the purposes of the -5, with examples for reliability, safety, and maintainability engineers. The paper is addressed to engineering managers who have read the -5 but have not had practical experience in its implementation.
R 2

31,465
Canale, S. SYSTEM, SAFETY MEASUREMENT AND CONTROL. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 482-489. American Institute of Aeronautics & Astronautics, New York, N.Y. (Radio Corporation of America, Camden, N.J.).

This paper presents a new technical definition of safety and a method of measuring (predicting) the safety level of a system. The application of the definition provides a method which is applied to a relatively simple hypothetical system having several types of potential hazards. The measurement procedure used to obtain the safety level of the system involves several steps leading to the calculation of: a) probability of control of these hazards, b) magnitude of the hazards, and c) cost of controls. For comparison purposes, calculations are made for the hypothetical system with and without significant application of safety effort. These calculations provide data needed for Cost Effectiveness and System Effectiveness analyses. System Effectiveness is shown as a function of the safety level of the system. The overall procedure for safety measurement appears to be feasible and sound since it is based primarily on technical characteristics of physical systems. However, limitations, similar to limitations on any measurement process of related disciplines, exist at the present time. A recommendation to use this procedure to promote future military and industrial progress is given.
R 15

31,466
Stieglitz, W.I. NUMERICAL SAFETY GOALS - ARE THEY PRACTICABLE? Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 490-493. American Institute of Aeronautics & Astronautics, New York, N.Y. (William I. Stieglitz Associates, Huntington, N.Y.).

It has been argued that if Systems Safety Engineering is to be considered as a scientific discipline, it must, like reliability, be based on numerical goals. For such goals to be meaningful, it must be possible both to predict and to demonstrate their achievement. The problems of successfully doing either in the case of safety are discussed, and it is concluded that neither is practicable. It is emphasized, however, that qualitative prediction is necessary to identify potential causes of catastrophic accidents, and that every effort must be made to eliminate such factors. In addition, it is argued that any goal other than that of a zero fatality rate would be unacceptable, both morally and legally.
R 7

31,467
Hammer, W. NUMERICAL EVALUATION OF ACCIDENT POTENTIALS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 494-500. American Institute of Aeronautics & Astronautics, New York, N.Y.

This paper discusses methods for quantitative evaluation of accident potentials, principally as related to missile and space systems. It indicates methods which have been used to rate safety numerically, and provides additional procedures. It indicates that a complete system should involve both probability of a mishap and the degree of loss which might result.
R 2

31,468
Barton, J.A. RELATIONSHIP AND CONTRIBUTIONS OF THE SYSTEM SAFETY CONCEPT TO COST AND SYSTEM EFFECTIVENESS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 501-514. American Institute of Aeronautics & Astronautics, New York, N.Y. (LTV Aeronautics Div., Ling-Temco-Vought Aerospace Corp., Dallas, Tex.).

The concepts of System Safety and System Effectiveness are discussed. The relationship of System Safety to the other System Effectiveness disciplines are developed to reveal the contributions made by System Safety. The cost of implementing the System Safety plan and the resultant potential savings to total program cost are evaluated.
R 15

31,469
Johnston, W.D., Bittle, R.E. & Simpson, S.A. A CONCEPT FOR TRAINING RELIABILITY PROGRAM SURVEYORS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 729-733. American Institute of Aeronautics & Astronautics, New York, N.Y. (General Electric Company, Daytona Beach, Fla.).

This paper comments on the overriding ecomonic and moral demand for reliability in the United States space effort, particularly on the Apollo Program. The reliability requirement is particularly stringent because of the cost in time and money and, above all, because of the potential loss of human life. The paper also traces the manner in which this demand has established the need for reliability surveys and, in consequence, the need for properly trained personnel to perform this function. It then outlines the NASA Apollo Program Office response to this challenge--the Training Seminar for Reliability Surveyors, conducted for NASA by the Apollo Support Department, General Electric Company, Daytona Beach, Florida. The body of this paper is concerned with the seminar as it is presently constituted and conducted. The importance of and the means for selection of seminar participants is developed in some detail. The seminar content is fully delineated, covering surveying techniques, methodology, and procedures. Instructional techniques employed to meet the special requirements of this training situation are fully discussed. The final portion is devoted to a discussion of the techniques used to evaluate the effects of seminar participation on the participants. The authors conclude that on large, complex contracts, reliability surveys are effective only when conducted by capable, knowledgeable surveyors, and that, on any large scale program, an effective training program for reliability surveyors is an indispensible requirement.
R 4

31,470
Johnson, R.A. & Smalley, W.G. PERSONNEL TRAINING - A MAJOR COMPONENT OF SYSTEM EFFECTIVENESS; Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 734-739. American Institute of Aeronautics & Astronautics, New York, N.Y. (Martin Company, Martin Marietta Corporation, Orlando, Fla.).

Time was, when man and machine had a second, third, and even a fourth chance of success before the destruction of one or both. This is no longer true in today's technology. Man and his "machine" must be perfectly matched. To achieve this harmony the first time, many new scientific disciplines or developments of old ones have come into play. This paper highlights the requirements of "first-time success," the inherent requirements of design goals and constraints, and the marriage of these to the science that will apply them. The emphasis here is upon training and its relationship to reliability and maintainability. It is shown that consideration of the proper balance is the main element that ultimately assures success or failure. Since the focal point is the development of balance between man and machine, it is then conclusively shown that personnel training is a major component of system effectiveness.

31,471
Burkhart, J.W. FACTORS FOR DETERMINING THE EFFICIENCY OF PROGRAM TECHNICAL TRAINING. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 740-743. American Institute of Aeronautics & Astronautics, New York, N.Y. (Martin Company, Martin Marietta Corporation, Orlando, Fla.).

Personnel and training contribute heavily to the maintainability and reliability of a weapon system. As such, they are prime targets for cost effectiveness and system optimization considerations. Contractor technical training functions will be discussed in this paper, with emphasis placed on those factors that contribute most heavily to cost effectiveness and system optimization.
R 1

31,472
Medford, J.F. RELIABILITY TRAINING - INDUSTRY'S DILEMMA. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966," 1966, 744-753. American Institute of Aeronautics & Astronautics, New York, N.Y. (Bell Aerosystems Company, Buffalo, N.Y.).

This paper describes the problems confronting the Aerospace Industry in the training of new reliability engineers in view of the critical shortage of this type of engineer. It explores the questions raised by this dilemma and indicates generally where Industry and University contributions will do the most good to alleviate the problem in the short and long run. It is suggested that Industry take a hard look at the present shortage of reliability engineers and decide on a course of action along with the Universities as described in this paper. The action for the short run will involve training design engineers to become reliability engineers and setting up comprehensive training classes in-house for continuous reliability training of all personnel whose work affects product reliability. The only hope for the long run is that Industry must support Universities and Colleges in setting up and teaching reliability courses, institutes and seminars to a greater extent in the future than they have in the past. Further, Industry must establish a better working relationship and exchange of ideas with the academic community so that we can fill the gap in reliability education of new engineers currently graduating and coming into Industry. Time is of the essence in which Industry and Universities can do something about the problem. Generally, there is a lag of 2 or 3 years between the need for a new discipline in Industry, and when the University or College can start presenting formal training and education to its engineers. Herein lies one of the major problems.
R 13

31,473
Ralph, J.A. & Cicchetti, C. SYSTEM EFFECTIVENESS CAN BE ACHIEVED IN A MANNED SPACE PROGRAM THROUGH CORRECT MANAGEMENT DECISIONS. Report from: "Fifth Reliability & Maintainability Conference, New York, New York, 18-20 July 1966." 1966, 951-964. American Institute of Aeronautics & Astronautics, New York, N.Y. (IBM Corporation, Cape Kennedy, Fla.).

The essential difference between the management of space vehicle launch operations and the management of any other engineering or scientific enterprise is the criticality of the time element. The rigidity of the launch date, once set, as well as the intermediate milestone events, determine the environment in which launch operations management must operate effectively. Timely management response demands rapid and accurate reporting techniques and an effective corrective action system. The early approach to space vehicle launch operations, where problems were solved and dates met by force of numbers, is no longer valid. Cost of manpower is a paramount consideration. A businesslike cost effective approach to space flight launch operations is now mandatory. A computerized technique developed for a current manned space program is discussed. Further, as manned space vehicle launch centers (i.e., turn-around times) are compressed, management effectiveness is proportionally stressed. An improved methodology utilized for a one-week turn-around mission is shown. This technique, which permits management to operate as an intelligence-governed conditioned reflex, involves much preplanning and analysis. With the required response for conceivable problems developed in advance, management is free to respond to the improbable. Extrapolation of these computer-assisted techniques to future programs and missions are discussed.
R 1

31,474
Rosenthal, S.A. (Chm.). ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5. ACHIEVING SYSTEM EFFECTIVENESS. FIFTH RELIABILITY & MAINTAINABILITY CONFERENCE, NEW YORK, NEW YORK, 18-20 JULY 1966. 1966, 984pp. American Institute of Aeronautics & Astronautics, New York, N.Y. (Kollsman Instrument Corporation, Syosset, N.Y.).

This volume, nearly 1000 pages, presents the papers of the Fifth Reliability and Maintainability Conference, July 1966, under the sponsorship and with the participation of several professional societies. Major subject headings are: management of parts programs; system effectiveness; operations, maintenance, and support; human factors; materials properties, cost-effectiveness; designing for reliability; systems analysis; program management panel; reliability in system design; research in maintainability; specifications and standards; systems safety; testing; reliability in system evaluation; mechanical and structural reliability; data acquisition and analysis; manufacturing; reliability prediction; reliability training; current research trends in reliability and maintainability; designing and maintainability; mathematical techniques; reliability education.
R Many

31,475
French, B.O., McBrayer, R.O., Feddersen, W.E., Pesman, G.J., et al. EFFECTS OF LOW FREQUENCY PRESSURE FLUCTUATIONS ON HUMAN SUBJECTS. NASA TN D 3323, March 1966, 24pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Spacecraft Center, NASA, Houston, Tex.).

Twenty human subjects were exposed to sinusoidal pressure fluctuations which corresponded to sound pressure levels from 119 to 144 decibels at frequencies from 2 to 12 cycles per second, and their psychophysiological responses were measured. A description of the test apparatus, a piston-cylinder arrangement which produced the pressure fluctuations and a test chamber which isolated the subjects from the laboratory, is included as an appendix. Psychophysiological monitoring techniques and instrumentation consisted of audiometry, electronystagmography, electrocardiography, impedance pneumography, and performance and subjective responses. The test results show that repeated exposure to 137 to 141 decibels produced temporary threshold shifts of 10 to 22 decibels in the 3000 to 8000 cycles per second frequencies.
R 3

31,476
Hicks, S.A. & Moler, C.G. A FIELD SURVEY OF AIR-TO-GROUND TARGET-DETECTION PROBLEMS. Code AMCMS 5121.11.035.04, Tech. Memo. 1 66, Jan. 1966, 25pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

Twenty enlisted men were tested on a target-detection task at Fort Ord, California. Each S was required to detect 10 targets appearing at ranges of 1000 meters to 2100 meters. Forty trials were run. The results indicate that detection and identification depend on more than mere distance between target and observer. Not only did a target's size and form affect its detectability, but it appeared that the main cause of misidentifications was differing targets with similar sizes and forms. These results are related to current literature, and their implications for the course of the program are examined.
R 5

31,477
La Porte, H.R., Jr. & Calhoun, R.L. LABORATORY STUDIES IN AIR-TO-GROUND TARGET RECOGNITION: X. CLUE UTILIZATION IN TARGET RECOGNITION. Rep. T6 1504/3111, July 1966, 34pp. Autonetics Div., North American Aviation, Inc., Anaheim, Calif.

A study was conducted to determine: a) whether the clues used by observers in a target recognition task can be meaningfully classified; b) whether the clue categories are related to target recognition performance; and c) whether performance is related to target codability. Codability was defined as the readiness with which elements of the environment can be stored in memory and verbally described by the observer. While viewing motion pictures of flights over target areas, Ss attempted to identify preselected targets. In general, clues varied widely, both from S to S and from target to target. Clues ranged from non-specific ones, such as "terrain," to specific items, such as "the road intersection." Where available, roads were the most frequently reported clue objects. The most significant finding of the study was that, for most targets, non-target clues were more important to successful target recognition than were target clues. The results also confirmed earlier observations that observers usually recognize targets correctly before their confidence in their judgments reaches a maximum. Target recognition was found to be a positive function of the effectiveness with which the observer can encode the visual world--i.e., target codability is a factor in target recognition performance.
R 7

31,478
Wyman, M.J. (Princ. Investigator), Rawlings, S.C. & Sturm, R.D. LABORATORY STUDIES OF TARGET RECOGNITION USING TERRAIN SIMULATION: II. EFFECTS OF SPEED AND FIELD OF VIEW. Rep. T6 1762/3111, Aug. 1966, 31pp. Autonetics Div., North American Aviation, Inc., Anaheim, Calif.

A laboratory experiment was performed on a simplified terrain simulator to investigate the effects of aircraft speed and field of view on target recognition performance under simulated low-altitude, high-speed conditions. Lateral target offset, target type, and background type were investigated as variables of secondary interest. The results indicated that: a) As speed increased from M 0.25 to M 0.6 to M 0.9, probability and range of recognition decreased; b) As horizontal field of view decreased from 50 deg to 20 deg, the probability of correct recognition decreased and the range of correct recognition increased; c) The results for the variables of lateral target offset, target type, and background were similar to those obtained previously(a). As offset increased from 500 feet to 1500 feet, recognition probability decreased, while recognition range increased. Probability and range of recognition were greater for the rural background than for that of the forest. Generally, as vertical extent of the target decreased, performance in both measures of recognition decreased.
R 12

31,479
Dolby, J.L. SOME STATISTICAL ASPECTS OF CHARACTER RECOGNITION. Contract NONR 225(52), NR Proj. 342 022, Tech. Rep. 115, May 1966, 67pp. USN Logistics & Mathematical Sciences Branch, ONR, Washington, D.C. (Statistics Dept., Stanford University, Stanford, Calif.). (AD 636400)

The character recognition problem is considered as a generalization of the discrimination problem. Two issues that are of trivial importance in the two category problem become central to the n-category problem. Not all of the available information is relevant to each of the discriminations that have to be made. A few of the discriminations are much more difficult than all of the others. The analysis consists mainly of studying which character pairs are difficult to separate. After dealing with these it is relatively easy and expedient to separate the others by a few functions of the observations which are less than optimal for a particular pairwise discrimination but which serve to make many pairwise discriminatons adequately. Assuming a particular physical mechanism and a specific character set of 36 characters, decisions are made on the choice of blocksize in the scanning area, the procedure for positioning characters within the scanning area, the choice of twelve linear functions of the blackness in a block for each of the blocks in terms of which the discriminations are to be made, and the robustness of the system to variations in character position.
R 7

31,480
Dean, R.D. THE USE OF ENVIRONMENTAL STRESS IN CONJUNCTION WITH SIMULATION TESTING. Report from: "IEEE Aerospace System Conference, Seattle, Washington, July 1966." 1966, 9pp. Space Div., Boeing Company, Seattle, Wash.

Large-scale vehicle simulations in which human Ss are exposed to realistic environmental profiles are well within the engineering state of the art. The Boeing Multiple Stress Laboratory is capable of exposing Ss to heat, noise, vibration, and altitude while measuring their performance and physiology. Data have been obtained on simulations relative to fixed-wing aircraft, helicopters, and 3-stage boosters. Exposure periods have ranged from a minimum of 9 minutes to a maximum of 6 hours. Boeing experience, in the past 4 years, has evidenced that a facility of this type can provide an effective bridge between analytical studies and the operational situation. Inherently flexible, such a facility can support a wide variety of development programs.
R 6

31,481
De Botton, I. HUMAN FACTORS EVALUATION OF A HEAD UP DISPLAY AND FLIGHT PERFORMANCE BY USE OF PHOTOGRAPHY AND DATA REDUCTION METHODS. Report from: "Tenth Annual Human Factors Meeting, Anaheim, California, Nov. 1-4, 1966." 1966, 25pp. Eclipse-Pioneer Div., Bendix Corporation, Teterboro, N.J.

A photographic method is presented which can determine flight parameters, and many of the measures of the quality of an electronic Head-Up Display which uses a Microvision All Weather Landing System and an electronic horizon as real world information. In conjunction with pilot input factors and pilot acceptance and evaluative factors which can be obtained through other means, there are enough parameters to relate the quality of the display to good flight performance. One method proposed involves the taking of motion pictures through the head-up display while the pilot is using it to fly the airplane. With the use of a film reader, the x and y coordinates of 12 points are obtained as the raw data. This, in turn, through simplified approximate formulas, can be converted to flight parameters and quality of the display which, in turn, can be related to flight performance.
R 5

31,482
Corballis, M.C. IMMEDIATE RECALL OF SPOKEN DIGITS PRESENTED THREE AT A TIME. Contract NONR 4896(00), DRB Grant 9425 10, Tech. Rep. 2, March 1966, 16pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Psychology Dept., McGill University, Montreal, Quebec, Canada). (AD 479163)

A well-known strategy in recalling spoken digits presented two at a time, one to each ear, is to report the digits "channel by channel" where each ear constitutes a separate "channel." A technique is described for presenting digits three at a time, one to each ear and a third to both ears at once. In this "three-channel" situation subjects could generally report at least some information from all three channels; however, channel by channel report was not in general an efficient recall strategy.
R 8

31,483
Brockmann, H.E. DEVELOPMENT OF REVISED SIMPLEX FABRIC FOR SUMMER FLYING GLOVES. Contract NADC 5243/65, BuWeps. Task RAE 20J 101 2021 F012 01 02, NADC MR 6607, Final Rep. PNAS 84, July 1966, 5pp. USN Air Development Center, Johnsville, Penn. (Prodesco, Inc., Perkasie, Penn.). (AD 636423)

Prodesco, Inc. was awarded a contract to develop an improved Simplex knitted fabric for use in summer flying gloves which would effect better protection in the event of exposure to flames and reduce or eliminate the difficulties encountered with the filament Simplex fabric which was adopted under Specification MIL-G-81188(WP). The fabric was to conform to all the requirements needed for comfort, serviceability and protection. All manufacturing techniques utilized in this effort were to conform to and be compatible with standard commercial methods for reproducing the finished product. The primary difficulties encountered in the fleet evaluation of the filament glove developed under Contract No. N62269-2120 (report dated October, 1964) were limited to seam slippage and glove fit. Since the seam slippage presents a problem in serviceability, it was proposed that the yarn structure be modified from a continuous filament yarn to a yarn spun from short length staple fibers. This in itself would effect a greater degree of surface cohesiveness within the fabric structure and thus help to hold the seams in place. As far as the glove fit in the thumb area was concerned, a simple modification of the pattern accomplished the change. The services of the Blue Ridge Textile Company of Bangor, Pa., as the knitter, and the J.M. Rubin & Sons Co. of Gloversville, N.Y., as the glove manufacturer, were utilized in assuring the practical value of the fabric and gloves. The comments and recommendations of these two firms were invaluable in evaluating the success of this program.

31,484
Brictson, C.A. MEASURES OF PILOT PERFORMANCE: COMPARATIVE ANALYSIS OF DAY AND NIGHT CARRIER RECOVERIES. FINAL REPORT. Contract NONR 4984(00), June 1966, 137pp. Physiological Psychology Branch, ONR, Washington, D.C. (Dunlap & Associates, Inc., Santa Monica, Calif.). (AD 636433)

The research purpose was to explore the psychophysical differences implied by a day/night carrier landing accident ratio of 1:4. The approach required a valid and reliable in-flight measure of pilot landing performance to a) determine quantitative differences between day and night landings, and b) differentiate the influence of day and night visual information performance. An attempt to quantify and define day/night pilot landing performance was the subject of a field experiment in which landing performance was recorded for 21 Navy F4 pilots during day and night carrier landing operations. Altitude and lateral error were the principal measures of pilot performance. Results: Generally, pilots tended to approach slower and higher, and land harder and shorter by day than by night. Significant differences were found between day and night pilot altitude performance at 1/4 mile (<.01) and 1/8 mile (<.05) from touchdown with night altitude error variability at least twice that recorded during the day. By day, pilot approaches were consistently above glide slope while approximately 1/4 of all night landings were below glide slope. Pilot perceptual ability and experience factors resulted in significant multiple correlations for predicting day lateral error performance. It was concluded that an empirical criterion of pilot landing performance was necessary to gain insight into the radically different visual and perceptual environments encountered in day and night carrier landings. Furthermore, experimental and applied research should be conducted to develop improved visual sources of height guidance information to assist the pilot in judging altitude at night, thereby reducing pilot landing performance variability and the dangerous tendency to fly low approaches.
R 47

31,485
Barrett, G.V., Kobayashi, M. & Fox, B.H. FEASIBILITY OF STUDYING DRIVER REACTION TO SUDDEN PEDESTRIAN EMERGENCIES IN AN AUTOMOBILE SIMULATOR. Report from: "10th Annual Human Factors Meeting, Anaheim, California, Nov. 1-4, 1966." 1966, 21pp. Goodyear Aerospace Corporation, Akron, Ohio.

An experiment was conducted to determine the feasibility of studying driver reaction to sudden pedestrian emergencies in an unprogrammed automobile simulator. A random sample of 11 male Ss followed an identical procedure. Each S completed a speed estimation study which was designed so that the S would drive past a shed containing a pedestrian (dummy) 11 times. This was done so that the emergence of the pedestrian would be completely unsuspected. The S drove in the right lane of the road at approximately 25 mph. When the front bumper was 76.5 ft. from the shed containing the pedestrian, a microswitch was tripped which released the dummy into the center of the road at a controlled rate. During the study a continuous record of speed, time, brake position, steering wheel position, lateral position of vehicle, longitudinal position of vehicle, and position of pedestrian was recorded. All of the Ss attempted to avoid the pedestrian either by brake application or by a steering change. Since this was a feasibility study with a small sample, no conclusions were drawn beyond the data, but the possibility of productive research in this area using simulation techniques seems to have been opened up.
R 4

31,486
Armstrong, R.C. LIFE SUPPORT SYSTEM FOR SPACE FLIGHTS OF EXTENDED TIME PERIODS. Contract NAS 1 2934, NASA CR 614, Nov. 1966, 515pp. Langley Research Center, NASA, Langley Field, Va. (Life Sciences Dept., General Dynamics Corporation, San Diego, Calif.).

This report summarizes a comprehensive two-year program to develop a prototype physical-chemical life-support system for space flights of extended time periods, providing reclamation and reuse of water and oxygen for a four-man crew and maintaining a safe, comfortable atmosphere in a test chamber which simulates a spacecraft. The program included engineering and optimization studies to select the most promising fundamental processes, establish configurations of minimum weight and power consistent with reliability, and test the operation and performance of the integrated system.

31,487
Deane, F.R., Wood, C.D., Graybiel, A. & Cawrse, A.C. THE EFFECT OF DRUGS IN ALTERING SUSCEPTIBILITY TO MOTION SICKNESS IN AEROBATICS AND THE SLOW ROTATION ROOM. Order NASA R 93, BuMed Proj. MR 005.13 6001.1, NAMI Rep. 971, Rep. 132, June 1966, 11pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla. & Office of Advanced Research & Technology, NASA, Washington, D.C.

Seven exemplary antimotion sickness drugs and three "individually treated" placebos were investigated in ten men during twenty-four aerobatic maneuvers in an AIE "Skyraider" aircraft and in performance of the Pensacola Slow Rotation Room Dial Test. The rank order of drug effectiveness and of S susceptibility under each condition was determined and compared. Individual difference in drug effectiveness was significant at the .01 level or better and was similar under the two conditions. Susceptibility to motion sickness in the slow rotation room was generally a good predictor of susceptibility in aerobatics in eight Ss, but in the remaining two it was grossly in error. A combination of scopolamine and d-amphetamine was by far the most effective of the drugs tested under both conditions.
R 12

31,488
Copeland, W.L., Hilton, D.A., Huckel, Vera, Dibble, A.C., Jr., et al. NOISE MEASUREMENT EVALUATIONS OF VARIOUS TAKE-OFF--CLIMBOUT PROFILES OF A FOUR-ENGINE TURBOJET TRANSPORT AIRPLANE. NASA TN D 3715, Dec. 1966, 51pp. National Aeronautics and Space Administration, Washington, D.C. (Langley Research Center, NASA, Hampton, Va.).

Noise measurement evaluations have been conducted on a four-engine turbojet transport airplane for several climbout profiles involving various climb speeds, flap settings, and engine pressure ratios; these data were correlated with airplane operations and position data. The main result of these studies is that power reductions during second segment climb generally result in reduced noise levels on the ground compared with those associated with a full-power take-off climbout. The amount of noise reduction attained depends upon the amount of power reduction, and the noise level profile on the ground is related directly to the engine power schedule. Tables and figures are presented to show detailed comparisons.
R 4

31,489
Colin, J. & Houdas, Y. PROTECTION FOR AIRMEN AGAINST HIGH THERMAL ENVIRONMENTS. FSTC Proj. 6305, DIA Task T64 305, Rep. FSTC HT 23 4 66, Feb. 1966, 30pp. USA Foreign Science & Technology Center, Washington, D.C. (Transl: Revue Des Corps De Dante Des Armees V VI, (5), France, Oct. 1965). (AD 480936)

The authors discuss the results of studies conducted at the Aerospace Medicine Laboratory of the French Air Force with ventilated undergarments for issue to airmen. After discussing the various ways in which heat can be transmitted along the surface of the skin, such as convection, radiation, evaporation, and conduction, they present a number of formulas and various factors involved in the computation of the heat loss or heat gain, make reference to British and American developments in the area of ventilated undergarments and flying suits and they compare these to the French model which they describe in detail. The French ventilated underwear model weighs 1.9 kg and is provided with air intake and outlet tubes. They briefly describe the pressurized and ventilated helmet used by the French Air Force, and discuss the criterion of efficiency of ventilated clothing, covering the notion of the average temperature, the average skin temperature, the central temperature, including rectal, buccal, sublingual, and axillary temperatures, as well as the use of tympanic and hypothalamic temperatures, proposed by other authors.
R 39

31,491
Ackerman, R.E. ADVANCED ARMY AIRCRAFT INSTRUMENTATION SYSTEM. FINAL REPORT. Contract DA 36 039 SC 87354, DA Proj. 1E1 34101 D 235 01 01, ECOM Rep. 87354 F, Rep. 5, July 1966, 120pp. USA Electronics Command, Fort Monmouth, N.J. (Douglas Aircraft Company, Inc., Long Beach, Calif.). (AD 486431)

An advanced Army aircraft instrumentation system on the contact analog concept has been installed in a Beech J-50 test bed aircraft in accordance with Specification SCL-5804B and delivered to the Electronics Command. The design of the display system is universally applicable to a wide variety of high and low performance aerodynamic vehicles. It will meet the display requirements of future aircraft and will demonstrate a significant improvement over present instrumentation. This final report summarizes the aircraft modification requirements, component procurement and installation, and system aspects of the program as covered by the four previous progress reports, plus more detail coverage of the system tests, demonstration and flight testing accomplished, since the last progress report.

31,492
Baldwin, R.D. & Anderson, H.E. SOURCES OF VARIABILITY IN MISSILE UNIT EVALUATIONS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task VIGIL, Tech Rep. 66 13, June 1966, 24pp. USA Office of the Chief of Research & Development, Washington, D.C. (Human Resources Research Office, George Washington University, Alexandria, Va.). (AD 636776)

The unit proficiency scores obtained during Missile Annual Service Practice firings during 1958 were analyzed. The objectives of the analyses were to identify the major factors affecting unit proficiency scores and to identify systematic sources of variance in the scores obtained. The analyses indicated a) essentially no correlation existed between the Crew Performance and Firing Result Scores obtained, b) differences in the total ASP (Annual Service Practice) Scores were primarily dependent upon differences in Firing Result Scores, and c) differences in Firing Result Scores obtained were distributed in accordance with a random model.
R 2

31,493
Carpentier, W.R. MEASUREMENT OF COMPLIANCE AND RESISTANCE OF THE LUNGS AND THORAX BY THE USE OF EXPIRATORY FLOW-VOLUME CURVES. FINAL REPORT. Contract AF 33(657) 11698, Proj. 7222, AMRL TR 66 12, April 1966, 29pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Ohio State University, Columbus, Ohio).

Compliance and resistance of the lungs and thorax system were measured in five healthy Ss by a method using relaxed expiratory flow-volume curves. Determinations were made during normal "shirt-sleeve" conditions and with the Ss suited in ventilated full pressure suits and in anti-G suits inflated to 3 psi. Vital capacity, inspiratory capacity and expiratory reserve volume were also measured under the three conditions. A significant correlation was found between the volume of air inspired above Functional Residual Capacity (FRC) expressed as percentage of normal vital capacity and peak flow reached under normal conditions. No significant correlation was found between the volume of air inspired above FRC and the slope of the ventilation minus volume (V - V) curve. Vital capacity and expiratory reserve volume were reduced when the Ss were in pressure suits and anti-G suits, but there was no significant change in inspiratory capacity. A reduction in FRC is implied.
R 38

31,494
Crossman, E.R.F.W., Szostak, H. & Cesa, T.L. STEERING PERFORMANCE OF AUTOMOBILE DRIVERS IN REAL AND CONTACT-ANALOG SIMULATED TASKS. Report from: "10th Annual Meeting, Human Factors Society, Anaheim, California, Nov. 1-4, 1966." Public Health Research Grant AC 00260 01, Oct. 1966, 39pp. Industrial Engineering & Operations Research Dept., University of California, Berkeley, Calif.

At the present a satisfactory man-machine theory of motor-vehicle operation is lacking on which to develop statements of a car's safe operating limits considering load carried, road situation, driver skill and experience, maintenance status, etc. The research described in this paper represents initial stages of an attempt to develop such a theory for steering and directional control using the established techniques of automatic-control theory along with experimental approaches derived from the psychological laboratory. While at the present time it seems somewhat unlikely that the human driver can be fully represented as a system element with a quasi-linear transfer characteristic, a description in these terms is nevertheless the first objective, since it would provide immediate if approximate answers to practical questions of steering gain, stability, and safe operating limits.
R 12

31,495
Collins, V.P. PHYSIOLOGIC OBSERVATIONS ON RACE CAR DRIVERS. Grant NsG 730, NASA CR 570, Sept. 1966, 114pp. National Aeronautics & Space Administration, Washington, D.C. (College of Medicine, Baylor University, Houston, Tex.).

The field of sports presents a broad opportunity for physiologic observations under conditions of physical and mental stress that vary greatly with the particular type of activity. Competitive auto racing has certain distinctive characteristics that lead to initiating this investigation: a) There is an environment of stress involving only moderate physical exertion but a relatively high element of danger; b) In this environment the individual must exercise mechanical control of a vehicle and judgment as to factors of motion, speed, and distance that are acquired skills far removed from instinctive or reflex responses that are utilized in other stressful sports; c) There is an element of motivation to aggressive action, which cannot be simulated under laboratory conditions, that may influence responses and performance; d) It is considered that these factors simulate in some degree the stress environment of space flight, particularly on launching or reentry. The present investigation explores a variety of physiologic responses to this particular type of environmental stress as the first of two parts of the total study. The importance of the study lies in how alterations in physiologic status may alter performance. The evaluation of performance is the second part of the study presently in the planning stage.

31,496
Clauer, C.K. & Erdmann, R.L. EFFECTS OF MTF SHAPES ON PREFERENCES AMONG TYPEWRITTEN REPRODUCTIONS. IBM Lab. Rep. 16.133, April 1966, 22pp. IBM Advanced System Development Div., Los Gatos, Calif.

Comparative preferences of typewritten reproductions were determined for original and third carbon documents with the reproducing modulation transfer function (MTF) shape and spatial frequency scale factor as independent variables by using four different ranking tasks. Rank discrimination was excellent with each of the MTF shapes for scale factor steps of about 10%. Considerable variability resulted when all five MTF shapes were compared at equal scale factors. Comparisons between the two extreme MTF shapes reversed as scale factors were increased. The original document scale factor equivalents of the carbon document scale factors were also determined for each MTF shape.
R 7

31,497
Annett, J. & Paterson, Laura. THE USE OF CUING IN TRAINING TASK: PHASE II. FINAL REPORT. Contract N62558 4119, Proj. 7570 3, Tech. Rep. NAVTRADEVCEN 4119 1, Feb. 1966, 74pp. USN Training Device Center, ONR, Port Washington, N.Y. (University of Aberdeen, Aberdeen, Scotland). (AD 630260)

This report falls into three sections: a review of the literature on training for auditory tasks, an account of three experiments comparing cuing and knowledge of results as training techniques for a detection task, and the comparison of cuing and knowledge of results in an intensity discrimination task.
R 53

31,498
Boettner, E.A. & Wolter, J.R. TRANSMISSION OF THE HUMAN EYE. FINAL REPORT. Contract AF 33(657) 8880, Proj. 6301, Task 630103, Rep. 05096 1 F, Jan. 1966, 19pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (College of Engineering, University of Michigan, Ann Arbor, Mich.). (AD 628333)

The total transmittance of light through the whole human eye has been measured at 466, 566, 666, and 800mμ. The forward scattering of light in passing through the eye was also measured. The results obtained on four of five specimens shortly after enucleation showed that the average maximum transmittance was 81.6% at 666mμ. The forward scattered light outside of 1° was 35% ± 5% for the five specimens at 566 and 666mμ.
R 8

31,499
Bate, A.J. & Porterfield, J.L. EFFECTS OF DISPLAY WIDTH ON SIDE-LOOKING RADAR TARGET RECOGNITION. Proj. 7184, Task 718404, AMRL TR 66 160, Dec. 1966, 26pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

An investigation was made of the effect of display screen width on the recognition of targets of opportunity on a moving strip of rear-projected side-looking radar imagery. The imagery moved across the screen from left to right at a simulated aircraft speed of 1316 knots. The screen height was a constant 18 inches and the screen widths were 4.5, 9, 18, or 36 inches. The image scale was 1:70,700 (one inch equals approximately one nautical mile). Increasing screen width, hence increasing the length of time objects appeared on the display, has no beneficial effect upon the number of targets correctly recognized or upon the number of nontargets mistaken for targets. Response latency increased as a linear function of display width.
R 12

31,500
Brown, A.C. FURTHER DEVELOPMENT OF THE BIOTHERMAL ANALOG COMPUTER. FINAL REPORT. Contract AF 33(657) 10838, Proj. 7222, Task 722207, AMRL TR 66 197, Dec. 1966, 65pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Physiology & Biophysics Dept., University of Washington, Seattle, Wash.).

An electronic analog computer, designed to enable calculation of the response of man to thermal stress, was developed. In accordance with equations previously developed (c.f. HEIAS No. 22,203), the computer circuits were used to simulate the physical distribution of heat within the body, the thermal stress imposed by the environment, and the physiological mechanisms of homeostatic feedback. Computer predictions were compared with experimental results from cyclic thermal stresses furnished by Lieutenant Colonel W.C. Kaufman, AMRL, and agreement was found to be good. The computer was used to calculate human response to wearing of an unventilated anti-exposure suit. The technical aspects of the computer circuits are presented in detail.
R 1

31,501
Brainard, R.W., Sadacca, R., Lopez, L.J. & Ornstein, G.N. DEVELOPMENT AND EVALUATION OF A CATALOGUE TECHNIQUE FOR MEASURING IMAGE QUALITY. Contract DA 49 092 ARO 19, DA Proj. R&D 2J620901A721, Tech. Res. Rep. 1150, Aug. 1966, 125pp. USA Personnel Research Office, OCRD, Washington, D.C. (North American Aviation, Inc., Columbus, Ohio). (AD 645644)

An experimental technique for assessing the interpretability of images was developed in the form of an image catalog. The catalog developed in the study contained a standard set of 231 images having diverse scene content and quality. The image variants in the catalog were assigned indexes of image interpretability based on the measured performance of 154 interpreters who were required to compare any new image with images in the catalog and to select the catalog image most similar in quality to the new image. The catalog technique was highly effective with both trained and untrained interpreters (an average correlation coefficient of .77 vs .70 for target area discrimination; .54 vs .51 for target identification). Results obtained with two other techniques also compared favorably. One technique using physical image characteristics including scale and resolution combined on the basis of statistical weights was best for target area discrimination with coefficients of .86 vs .52; the other technique using weighted physical characteristics plus catalog judgments was best for target identification ($\bar{r}$ = .60 vs .43). Each of the techniques employed in the study appeared efficient as a means of measuring image quality. The image catalog required a minimum of supportive equipment and facilitated rapid and effective judgments by both trained and untrained interpreters. The other two techniques, however, required elaborate mensuration and computational facilities and were more time consuming. Based on the prototype developed in the study, the U.S. Army Personnel Research Office is directing developmental effort toward production of a more comprehensive image catalog including a greater variety and range of image variants which could fulfill the operational requirement for a simple measurement technique.
R 3

31,502
Berger, P.K., Newmiller, C.E. & Matheny, W.G. STUDY OF ATTITUDE CHANGE TOWARD EQUIPMENT DESIGN: ALTIMETER DISPLAY PREFERENCE CHANGE AS A FUNCTION OF PERFORMANCE FEEDBACK. Contract NONR 4097(00), Proj. RR 006 09 01, Tech. Rep. 3, Jan. 1966, 49pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Life Sciences, Inc., Fort Worth, Tex.).

The objective of this research is the determination of techniques for changing preferences toward new equipment to ameliorate the problem of equipment rejection and to predict susceptibility to preference change. Two types of performance were tested; success, in which Ss were given differential feedback concerning their performance, and same, in which Ss were given equal feedback concerning their performance. On 2 measures, stated preference and a semantic differential attitude measure, a trend for the success performance technique to influence change in the desired direction was observed. This trend was not observed for the same performance technique. Prediction of preference change from background data has not been successful. Proposed research is to be directed toward determining parameters which optimize the performance technique as a preference change method; its utility when administered on a group basis; conditions for bringing about a spread of preferences to a group from key members; and the study of preference trends over time.
R 10

31,503
Klausner, S.Z. THE IMPACT OF THE MEANS OF RECRUITMENT ON PERFORMANCE IN A DANGEROUS SPORT: SOCIAL, ENTHUSIASTIC AND EXHIBITIONIST SKYDIVERS. TECHNICAL REPORT. Contract AF 49(638) 1510, Proj. 9779 01, AFOSR 66 0122, Jan. 1966, 26pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Bureau of Social Science Research, Inc., Washington, D.C.). (AD 631019)

Many skydivers are recruited by friends; relatively few are recruited through the mass media. Written materials are likely to attract older and more educated individuals to the sport. Individuals recruited by their friends tend to place the social group ahead of the sport and may shift to another sport rather than change their group when faced with a choice. Those who are recruited through written materials tend to be more active and enthusiastic skydivers. Those recruited through television are more interested in the exhibitionistic aspects of skydiving and, in their personalities, tend to be more passive. Those recruited by friends are more likely to be "locals," concerned with the activity of their immediate skydiving group, while those recruited through the mass media are more likely to be "cosmopolitans," concerned with national aspects of skydiving.
R 5

31,504
Kira, A. THE BATHROOM. Res. Rep. 7, 1966, 116pp. Center for Housing & Environmental Studies, Cornell University, Ithaca, N.Y.

This report marks the culmination of a research program initiated at the Cornell University Center for Housing and Environmental Studies in the fall of 1958. This program, sponsored by the Cornell University Agricultural Experiment Station and the Plumbing and Heating Division of the American Radiator and Standard Sanitary Corporation, had as its aims a thorough investigation of the hitherto largely unexplored problems of personal hygiene and the establishment of basic criteria and parameters for the design of facilities to accommodate these activities. Because the problems of human accommodation comfort, and safety have received so little attention, the decision was made at the outset of this program to focus, insofar as possible, on the human requirements, both functional and psychological, for personal hygiene. Thus, this study is concerned with the development of equipment that will best accommodate the performance of the major personal hygiene activities, without respect to existing bathroom equipment and practices. It is based on the premise that equipment should be adapted to people and to the physical actions involved in the performance of activities. The criteria for design, therefore, include the heights, reaches, breadths, ranges of movement, and other characteristics of the people who will be using the equipment.
R Many

31,505
Arkad'yev, A.G. & Braverman, E.M. TRAINING PATTERN-RECOGNITION MACHINES. FTD TT 65 1699/1+2, March 1966, 111pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Izdatel'stvo "Nauka", 1964, 1-110). (AD 637111)

The concept of "hypothesis of pattern compactness" enables one to construct the learning machines described in this book, and to note ways of improving them and to explain the action of certain learning machines constructed in other countries. This book also gives the results of experiments with learning machines, carried out by E.M. Braverman in conjunction with O.A. Bashkirov and I.B. Muchnik. The authors have taken into account the need to give a general idea of learning machines to specialists in related fields--biologists, psychologists, medical specialists, who are interested in these machines from different points of view, but who are not always in a position to cope with the specialized literature on cybernetics.
R 28

31,506
Beckman, E.L. THERMAL PROTECTIVE SUITS FOR UNDERWATER SWIMMERS. RESEARCH REPORT. BuMed. Proj. MF 011.99 1001, Rep. 8, July 1966, 34pp. USN Bureau of Medicine & Surgery, Department of the Navy, Washington, D.C. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.). (AD 485871)

An analysis of the problems of maintaining the thermal balance of underwater swimmers is presented. Current and planned developments to provide the necessary thermal protective equipment are described. A satisfactory garment for maintaining the thermal balance of underwater swimmers during 4-hour work periods in water at temperatures down to 29°F must include both an insulative layer and a source of supplemental heating. The insulative layer must be as effective at depth as the popular 1/4" unicellular, foam neoprene skin divers "wetsuit" is in shallow water. A fabric in which the insulative value is independent of pressure change must be developed. In addition, a system of supplemental heating must be developed to supply the swimmer with approximately 350 to 500 thermal watts per hour. An electrical, resistance-wire heating system with a silver zinc battery for power was integrated with a "constant volume," pressure-compensated, insulative garment for use by SEALAB II aquanauts. This development will be described in addition to the planned thermal protective garments for use by SEALAB III aquanauts which include a liquid heating system powered by an isotopic thermal generator.
R 22

31,507
Blanchard, R.E., Mitchell, M.B. & Smith, R.L. LIKELIHOOD-OF-ACCOMPLISHMENT SCALE FOR A SAMPLE OF MAN-MACHINE ACTIVITIES. FINAL REPORT. Contract NONR 4314(00), June 1966, 70pp. USN Psychological Research Branch, Bureau of Naval Personnel, Washington, D.C. (Dunlap & Associates, Santa Monica, Calif.). (AD 487174)

Techniques for use in man-machine effectiveness analysis are limited by the current lack of empirical data on human performance capabilities in complex systems. To explore an interim solution to that problem, a paired comparison scaling approach was employed to obtain relative estimates of human capability to perform 100 man-machine activities. An analysis of variance procedure revealed that a satisfactory fit of the linear paired comparison model to the data was obtained. Within-judge consistency and between-judge agreement was determined to be satisfactory. The resultant scale values were transformed to a probability dimension using a log transform function and two data points. A technique for expanding the basic store of data using a "key" stimulus approach was suggested. Follow-up study with empirically-derived performance data is required to test the validity of the scale values obtained and the transformation equation.
R 49

31,508
Bowen, H.M., Bishop, E.W., Promisel, D. & Robins, J.E. STUDY, ASSESSMENT OF PILOT PROFICIENCY. FINAL REPORT. Contract N61339 1614, Tech. Rep. NAVTRADEVCEN 1614 1, Aug. 1966, 128pp. USN Training Device Center, ONR, Orlando, Fla. (Dunlap & Associates, Inc., Darlen, Conn.). (AD 637659)

Study examined utility of various objective scoring devices used in an OFT (Operational Flight Trainer) for purposes of augmented feedback to student pilot and for assessment of pilot proficiency. Results indicate that augmented feedback based on objective scores heighten performance in OFT; that scores of proper sequencing of procedures, control of aircraft to prescribed settings, and response time to unexpected situations are independent measures of pilot skill; and that these scores are predictive of proficiency at landing the aircraft. However, the association between OFT measures and flight measures is complex and seems to depend upon an adequate correspondence between OFT and real flight conditions. It is inferred that for adequate training and assessment, the student in the OFT should experience the plurality of events that can occur in real flight missions.
R 25

31,509
Brown, J.L. (Princ. Investigator). STUDY OF VISUAL PERCEPTION IN HUMANS AND ANIMALS. Contract NONR 3634(04), Tech. Rep. 1, Aug. 1966, 30pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Psychology Dept., Kansas State University, Manhattan, Kan.). (AD 637553)

This paper describes a series of experiments related to visual perception. Topics are: effects of motion on visual function, effects of variations in the atmospheric environment on vision, effect of drugs, and such matters as flash blindness, flicker effects, and visual fatigue.
R 57

31,510
Caligiuri, H. A STUDY OF 3-D EFFECTS IN VISUAL SIMULATION. PHASE I. AN ANALYSIS OF THE FACTORED TRANSPARENCY METHOD. Task 7883 6, Tech. Rep. NAVTRADEVCEN IH 53, June 1966, 24pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 635869)

This report contains the analysis of the factored transparency film storage method of generating images of 3-dimensional objects or terrain on a TV screen. The special set of factored transparencies containing the elevation and ground terrain information is read out by using a standard TV type of flying spot scanner and photomultiplier tubes. The description includes the system's deficiencies and drawbacks. Another method of 3-dimensional image generation using a laser beam coherent light source will be described in detail in the report on Phase II of this task. However, a brief description of its basic principles and the possible application using a hologram type of film storage media is included in this report.
R 11

31,511
Carr, M.J. & Silverman, J. SAMOA--A METHOD FOR DETERMINING WORK REQUIREMENTS. PROGRESS REPORT. Proj. PF016011001, Res. Rep. SRR 66 23, June 1966, 19pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 637617)

This report describes the progress to date on research to develop a systematic, computerized approach for determining basic work requirements for current and future weapons and support systems. This approach has been termed "SAMOA" (Systematic Approach to Multidimensional Occupational Analysis). The rationale upon which this research is based is that: a) the enlisted personnel classification structure required for the next decade must be based upon valid work requirements; b) current methods for determing work requirements on a large scale are too slow, too subjective, and are limited primarily to the technical dimensions of work, and, therefore; c) the development of improved procedures for determing work requirements is a necessity. The SAMOA method consists essentially of 3 major steps. First is the development and administration of comprehensive task lists and related data gathering forms. The second step is the computerized analysis of the data on tasks and task patterns. This is accomplished by a clustering program which identified homogeneous work groups on the basis of similarity of patterns of tasks performed. The third major step is a set of computerized procedures for stratifying and grouping clusters on the basis of significant variables within 3 fundamental dimensions of the work situation; namely, Technical, Organizational, and Communicational. The indices of these TOC variables form the basis for the cluster profiles which would constitute the primary input into a personnel classification structure. The next phase in this research is the application of the method to a larger sample of fleet units to test its reliability and to refine techniques and procedures.
R 15

31,512
Condon, G.C., Jr. ESTIMATION OF MINUTE-VOLUME DISTRIBUTIONS FOR TROOPS PERFORMING TACTICAL TASKS. Task 1C522301A08402, Tech. Rep. 4017, Aug. 1966, 36pp. USA Systems Analysis Div., Edgewood Arsenal, Md. (AD 487587)

Minute-volume distributions and averages were derived for troops performing tactical tasks in a simulated combat environment. The data for this study were obtained by systematically sampling the action of a troop experiment on moving-picture film. Activity distributions were derived from a frame-by-frame analysis of the film. The results were obtained by assignment of minute-volume values to each of five arbitrarily defined activities. The results of this study indicate that the values of minute volume currently in use for casualty estimation are somewhat low and in certain tactical situations will give unrealistically low casualty estimates. The techniques used in this study are considered to be a satisfactory method for obtaining data on activity distributions for troops performing tactical tasks. The results derived in this study provide a more comprehensive picture of minute volume than those found in previous studies. The photographic coverage for any future studies in this area should be increased by reducing the length of the sampling interval, that is, time between film sequences.
R 5

31,513
Cripwell, F.J. THE CONCEPT OF COMPUTER-ASSISTED GAMES. ORD Informal Paper 66/P8, April 1966, 14pp. Operational Research Div., Department of National Defence, Ottawa, Ontario, Canada. (AD 486922)

This publication is a reproduction of a talk given to the East Coast War Gaming Conference in May 1966. It illustrates the concept of a computer-assisted game. This concept envisages the retention of the advantages of both human decision making and the high speeds of computer calculations.

31,514
Decker, H.M. THE NEED FOR BIOLOGICAL DECONTAMINATION OF FIELD SHELTERS, OCCUPANTS, AND METHODS OF CONTROL: A REVIEW OF CONTRACTUAL LITERATURE. Proj. 1C622401A072, Tech. Memo. 93, June 1966, 46pp. USA Biological Center, Fort Detrick, Frederick, Md. (AD 486316)

The extent of the problems of contamination and decontamination of clothing and man has been summarized. Consideration should be given to practical studies on the decontamination of the soldier entering collective protective shelters in the field. Laboratory data developed by Litton Industries indicate that peracetic acid is the decontaminant of choice because a 1% solution was highly efficient in reducing Serratia marcescens and Bacillus subtilis var. niger microorganisms in the air and on surfaces when exposed for 120 to 240 seconds. The procedure requires further study which would include medical safety, stability, cost, and logistics. Consideration has been given to utilization of increased filtered air flow through airlocks of field shelters (pods) to remove airborne microorganisms in the airlock and possibly some of the microorganisms previously deposited on the clothing of contaminated personnel. Data obtained in these tests were preliminary but were promising enough to require further investigation.
R 16

31,515
Mirabella, A. SENSORY INTERACTION: THE EFFECTS OF AMBIENT NOISE AND COMBINED VISUAL-AUDITORY SONAR DISPLAYS ON SIGNAL DETECTION. FINAL REPORT. Contract NONR 2512(00), Rep. U417 66 013, May 1966, 37pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Electric Boat Div., General Dynamics, Groton, Conn.). (AD 488126)

A review of the literature was undertaken to determine the effects of ambient noise and combined audio-visual sonar displays on signal detection. Literature relevant to the problem of ambient noise showed: a) that an increase in ambient noise should have no effect on the ability of the alerted operator to detect signals; b) that for vigils requiring responses to infrequent signals in single displays, noise has little or no effect on monitoring performance; c) that for tasks requiring time sharing among several displays, noise produces decrements in monitoring performance; and d) that for tasks requiring the operator to process displayed data in order to extract signals, i.e., computation or counting, noise produces decrements in monitoring performance. The literature relevant to the problem of dual sensory display presentation showed that such displays increase detection probability when they present completely redundant information, but decrease detection probability when they present completely nonredundant information. The studies cited in this report represent the only studies found that employed tasks comparable to sonar detection tasks. Some real differences exist, however, between the parameters of these two sets of tasks. It was concluded that these differences limit the applicability of the findings of existing studies for evaluating the effects of ambient noise and dual sensory display presentation at the sonar station.
R 39

31,516
Harris, D.H. THE IMPACT OF MICROELECTRONICS ON THE UTILIZATION AND TRAINING OF MAINTENANCE PERSONNEL. VOLUME I. RESEARCH REPORT. FINAL REPORT. Contract NONR 4975(00), Rep. PTB 66 5, June 1966, 40pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Autonetics, North American Aviation, Inc., Anaheim, Calif.). (AD 485901)

Microelectronic concepts and techniques have eliminated many of the requirements for discrete components, have reduced the size of functional units, and have increased the efficiency of circuit interconnections in electronic systems. As a result, microelectronics may have a significant impact on the reliability and maintainability of electronic systems and, in turn, on system maintenance requirements. The objective of the study was to investigate the impact of microelectronics on the utilization and training of maintenance personnel. Microelectronic configurations of the existing Navy systems were found to reduce significantly the imposed maintenance burden and, consequently, to reduce maintenance personnel and training requirements, under existing maintenance philosophies. The maintenance burden for Ships Inertial Navigation System (SINS) was reduced by 84 percent; the maintenance burden for the MK 46 Torpedo Guidance and Control (G and C) was reduced by 18 percent. In addition, the microelectronic configurations suggested new ways of organizing maintenance activities to further reduce Navy personnel and training requirements. (Cf. HEIAS No. 31,517)
R 9

31,517
Harris, D.H. THR IMPACT OF MICROELECTRONICS ON THE UTILIZATION AND TRAINING OF MAINTENANCE PERSONNEL. VOLUME II. MAINTENANCE BURDEN ANALYSES. FINAL REPORT. Contract NONR 4975(00), Rep. PTB 66 5, June 1966, 147pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Autonetics, North American Aviation, Inc., Anaheim, Calif.). (AD 485902)

This is the second volume of a two-volume final report describing a study of the impact of microelectronics on the utilization and training of maintenance personnel. The research method and study results are contained in Volume I. The general approach consisted of selecting two operational Navy systems, defining their microelectronic functional equivalents and, by means of maintenance burden analyses, comparing the maintenance personnel, training, and organizational requirements of the existing systems with their microelectronic equivalents. The two operational Navy systems included in the study were the MK 2 MOD 2 Ships Inertial Navigation System (SINS) and the Torpedo MK 46 MOD 0 Guidance and Control System (G&C). Volume II provides the detailed procedures used in performing the maintenance burden analyses and the resulting maintenance burden data. In addition, the sources of failure rate and task time data are provided together with a discussion of the assumptions under which these data were applied to the analyses. See also 31,516.
R 6

31,518
Hartman, J.J. ANNOTATED BIBLIOGRAPHY ON SIMULATION IN THE SOCIAL SCIENCES. Contract OCD PS 65 9, Proj. 401 44 96 09 1529, Res. Subtask 4811 D, Rural Sociology Rep. 53, 1966, 31pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (Iowa Agricultural & Home Economics Experiment Station, Iowa State University, Ames, Iowa) (AD 634997)

The articles included in this bibliography have been abstracted and judgments made about the utility of each for behavioral scientists who are contemplating simulation as a method of analysis. This method is being explored as a method of synthesizing the various concepts which have been used in community studies, particularly as they relate to adoption-diffusion studies in community frameworks. The articles were abstracted using the following frame of reference: a) that the reader is interested in simulation as a methodology; b) that his frame of reference includes behavioral science variables, with emphasis on sociology and social psychology; c) that the readers are not accomplished computer analysts; d) that their interest lies principally in "pure machine" simulations and not in the area of "man-machine" programs which introduce the human decision-making element; e) that their main focus is not on "gaming" or purely stochastic models applied to generated populations; and finally f) that their interests are in the dynamics of social interaction, and not merely in the ability to "mirror reality" with a static model (mock-up).
R 74

31,519
Johnson, R.L. THE USE OF PROGRAMMED LEARNING AND COMPUTER-BASED INSTRUCTION TECHNIQUES TO TEACH ELECTRICAL ENGINEERING NETWORK ANALYSIS. (M.S. Thesis). Contracts DA 28 043 AMC 00073(E) & NONR 3985 (08), Proj. 20014501B31F, Rep. R 297, July 1966, 76pp. USA Electronics Command, Fort Monmouth, N.J. (Coordinated Science Lab., University of Illinois, Urbana, Ill.). (AD 636406)

2 types of programmed instruction sequences (inquiry and tutorial) were used on the PLATO system to teach electrical network analysis (EE 322, University of Illinois). 2 groups of students were selected to use each of the 2 types of instruction. Both of the instruction sequences were to provide the same performance objectives. The report describes the design and use of the instruction on the PLATO teaching system and summarizes the performance of the students with respect to the 2 methods of teaching. The study indicated that the desired performance objectives were obtained satisfactorily in both cases. Although in certain aspects the inquiry teaching program exhibited some advantages, a teaching program which could make available all of the facilities contained in the present programs would be more desirable.
R 10

31,520
Koonce, J.F. PROBABILISTIC MANPOWER FORECASTING. (M.S. Thesis). May 1966, 72pp. Texas A & M University, College Station, Tex. (AD 635248)

The use of the methods presented in this report are limited only by the availability of accurate data. Any organization that does not presently employ a system of preparing and using planning data will undoubtedly find it difficult to initiate such a data gathering network. However, use of the statistical techniques embodied in this report will provide a manpower planning system that is more up-to-date than most now in use. These methods give realistic planning figures that take into account the likelihood that some projects will not materialize. In addition, many other planning costs, such as hiring and layoff, purchase and salvage, and several types of operating costs, can be derived from such a manpower plan. Additional study in these areas is presently under way by the research group. The major result of using these techniques will be to provide top management with "look-ahead" capability that will pin-point real and potential problem areas in budgeting and in large fluctuations in manning. By identifying these problems before they arise, economical and efficient improvements to long range plans can be made early enough to avoid expensive mistakes. By thus preventing or greatly reducing large wastes, the organizations will be able to fulfill its mission more economically.
R 17

31,521
Larrimore, H. VISIBILITY OF NAVIGATIONAL LIGHTS IN A SUBMARINE ARRAY. INTERIM REPORT. Subproj. SF 013 12 08, Task 4601, R&D Rep. 1 95, April 1966, 24pp. USN Mine Defense Lab., Bureau of Ships, Panama City, Fla. (AD 481774)

The U.S. Navy Mine Defense Laboratory conducted a series of tests on a simulated nuclear submarine running light array at sea under normal nighttime operating conditions. The tests were made to determine the maximum range at which the light array could be recognized. Observers were selected from military personnel who normally stand duty watch as lookouts. Tests indicated that with an atmospheric transmission rate of 70 percent per nautical mile the maximum range of visibility for the lights in the array was: white masthead light, 9.3 miles; green starboard sidelight, 2.1 miles; and red port sidelight, 2.3 miles.
R 7

31,522
Mayzner, M.S. FACTORS AFFECTING INFORMATION STORAGE AND RETRIEVAL IN MAN. FINAL REPORT. Contracts NONR 285(56) & NR 196 027, June 1966, 19pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Industrial Engineering & Operations Research Dept., New York University, Bronx, N.Y.). (AD 486382)

The present report represents the Final Report on a contract (NONR 285(56)) between the Engineering Psychology Branch of the Office of Naval Research and New York University concerning "Factors Affecting Information Storage and Retrieval in Man." This Final Report discusses in some detail the major results of some 14 studies that examined the effects of four parameters, namely: a) Coding of information; b) Organization of information; c) Amount of information; and d) Display time, on information storage and retrieval capacity in man. Five studies dealt specifically with coding, three studies dealt specifically with organization, two studies dealt specifically with amount, and four studies dealt specifically with display time. The results of all 14 studies were related to a variety of display design problems in military "Command and Control" systems and a number of specific display design recommendations are offered based on the research findings.
R 14

31,523
Melaragno, R.J. A STUDY OF TWO METHODS FOR ADAPTING SELF-INSTRUCTIONAL MATERIALS TO INDIVIDUAL DIFFERENCES. FINAL REPORT. Contract N00014 66 C0081, Tech. Memo. 2932/000/01, June 1966, 50pp. System Development Corporation, Santa Monica, Calif. (AD 635213)

This two-phase study compared two methods of adapting self-instructional materials to individual differences among learners; these were compared with each other and with a control condition involving only minimal adaptation. Results of the experiment support three conclusions: a) training times can be reduced by varying instruction on the basis of learners' abilities; b) a branching strategy can reduce training time further than either prediction or linear strategies; and c) when both amount learned and training time are of interest, branching is superior to a linear presentation.
R 44

31,524
Mitchell, M.B., Smith, R.L. & Verdi, A.P. DEVELOPMENT OF A TECHNIQUE FOR ESTABLISHING PERSONNEL PERFORMANCE STANDARDS (TEPPS): PHASE III. FINAL REPORT. Contract NONR 4314(00), July 1966, 75pp. USN Psychological Research Branch, Bureau of Naval Personnel, Washington, D.C. (Dunlap & Associates, Inc., Santa Monica, Calif.). (AD 487908)

Work performed during Phase III of a study to develop a method for establishing personnel performance standards is reported. Emphasis was placed on: a) developing a technique for allocating system effectiveness requirements to establish performance standards based on estimates of performance data obtained by subjective scaling techniques; b) extending TEPPS (Technique for Establishing Personnel Performance Standards) methodology to identify essential personnel-equipment functional units and to account for the influence of feedback and redundancy on derived performance standards and estimated system success probabilities; c) consideration of the implications to current TEPPS methodology of system effectiveness requirements stated on dimensions which are more complex than probability of success and interactions among system personnel-equipment functional units based on degree of success; and d) development of a preliminary concept and tentative program plan for a personnel performance data store for Navy systems.
R 18

31,525
Mosher, R.S., Fleszar, J.S. & Croshaw, P.F. TEST AND EVALUATION OF THE LIMITED-MOTION PEDIPULATOR. FINAL REPORT. Contract DA 36 034 AMC 0268T, Proj. EH 5 6R025 01 EH AC, Task AMCMS 5022.11.82200, Feb. 1966, 58pp. USA Tank-Automotive Center, Warren, Mich. (Research & Development Center, General Electric Company, Schenectady, N.Y.). (AD 637681)

This report is a description of the test and evaluation of a full-scale, limited-motion pedipulator. The investigation determined the impact of important variables that affect operator performance and directly influence the design of functional walking levered vehicles. Results indicated: a) operators were able to quickly and accurately position and balance the machine; b) operators' retentions of learning were nearly perfect; and c) machine-control response and other characteristics may be optimized in the design of walking levered vehicles.

31,526
Hall, A.T. THE MILITARY USE OF BICYCLES IN THAILAND AND MALAYA: AN MRDC INFORMATION REPORT. Rep. 66 020, May 1966, 70pp. US Advanced Research Projects Agency, Office of the Secretary of Defense, Washington, D.C. (Joint Thai-US Military Research & Development Center, Bangkok, Thailand). (AD 485581)

In this information report, several reports and extracts describing the use of bicycles for past and present military operations are brought together. The first selection summarizes the history of such operations, worldwide, from 1870 to 1946. The other 5 selections each consider a different aspect of the military use of bicycles in Thailand and adjacent areas. Subjects treated are: The use of bicycles by the Japanese in their conquest of Malaya in 1942 (extract from a Japanese officer's account); The civilian uses of 2-wheel bicycles in Thailand (a photographic report); A preliminary evaluation of different load carrying techniques for the military use of bicycles in Thailand (a photographic report); The use of bicycles by personnel of a Thai Special Operations Center; and the employment of bicycles in Vietnam. Although an information report cannot by itself support any deep conclusions or findings, it does appear that under certain conditions, the military use of bicycles in Southeast Asia is both feasible and advantageous.

31,527
Fleischman, H.L., Ambler, Rosalie K., Peterson, F.E. & Lane, N.E. THE RELATIONSHIP OF FIVE PERSONALITY SCALES TO SUCCESS IN NAVAL AVIATION TRAINING. BuMed. Proj. MF022.01.02 5001, NAMI Rep. 968, Rep. 48, May 1966, 8pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Cattell's Sixteen Personality Factor Questionnaire, the Taylor Manifest Anxiety Scale, the Pensacola Z Scale, and the Adjective Check-List were evaluated as predictors of success/failure in Naval aviation training. Results showed that certain personality variables contributed significantly to multiple prediction.
R 8

31,528
Eney, J.A. COMPARATIVE FLIGHT EVALUATION OF LONGITUDINAL HANDLING QUALITIES IN CARRIER APPROACH. Contract NONR 1858(50), Rep. 777, May 1966, 52pp. USN Air Systems Command, Department of the Navy, Washington, D.C. (Aerospace & Mechanical Sciences Dept., Princeton University, Princeton, N.J.). (AD 487660)

Simulated carrier approaches were flown by 5 pilots in a variable-stability Navion airplane. Frequency (ω_{sp}) and damping (ζ_{sp}) of the short period mode were varied through augmentation of the M_α and $M_{\dot{\alpha}}$ derivatives. Control sensitivity (stick-to-elevator gearing) was a third variable. All flights were visual, in daylight, and in light to moderate natural turbulence. The approach speed of 105 knots was well up on the front side of the power curve. Configurations with $\omega_{sp} > 1.4$ and $\zeta_{sp} > 0.2$ were found to be satisfactory. Short period dynamics typical of current carrier aircraft in landing approach were found acceptable, despite relatively high frequency phugoid dynamics inherent in the simulation. Comparison is made with data taken from a similar study which used a variable-stability jet trainer. Pilot ratings and preferred control sensitivities are shown to be in good agreement. The data are plotted on several proposed handling qualities design criteria including one which takes the derivative $L_{\dot{\alpha}}$ into consideration. Comparison is also made with two proposed criteria of the time history type. Agreement in all cases was poor to none. Control sensitivity was found to be a critical parameter for some configurations, and of little consequence for others. Stick force per g, which varied to extremes in the simulation, is concluded to be a noncritical parameter in landing approach under the tested flight conditions.
R 18

31,529
Eachus, H.T. & King, P.H. ACQUISITION AND RETENTION OF CROSS-CULTURAL INTERACTION SKILLS THROUGH SELF-CONFRONTATION. FINAL REPORT. Proj. 1710, Task 171008, AMRL TR 66 8, May 1966, 69pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

An experiment was conducted to assess relative effectiveness of 2 techniques for training United States Air Force military advisors in cross-cultural communicative skills. Retention of skills over time and effects of attitude on learning were also studied. A scenario required Ss to play the role of an Air Force Captain who had to interact in specified ways with a "foreign counterpart," a role played by a confederate of the experimenters. Ss were to perform 57 distinct behaviors appropriate to the situation and to the fictitious cultural description, which gave either a positive, negative, or neutral impression of the culture. Sixty-six male Ss were divided into 2 groups and taught the desired behaviors either by extensive reading of training manuals followed by 3 role-playing sessions or by less reading but with self-confrontation by a videotape replay between successive role-play trials. Ss returned and performed the same role again either 1 day, 1 week, or 2 weeks following initial training. Self-confrontation proved superior to manual reading in training the desired behaviors. Ss with positive attitudes toward the culture learned fastest. Retention of skills learned through self-confrontation was high. A discussion of planned future research on cross-cultural training techniques and programs is given.
R 20

31,530
Eachus, H.T. COMPARISON OF VARIOUS APPROACHES TO TRAINING FOR CULTURE-CONTACT. FINAL REPORT. Proj. 1710, Task 171008, AMRL TR 66 7, March 1966, 16pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A comparative analysis of several approaches to training interaction skills for culture-contact was conducted. In addition, the range of American overseas work by the Air Force and other Government agencies was delineated with discussions of the type of training most required in different areas of involvement. Two major opposing scientific conceptualizations of training for culture-contact are discussed. The objectives of cross-cultural interaction skill training are presented with consideration of self-confrontation as a training technique.
R 31

31,531
Fregly, A.R., Oberman, A., Graybiel, A. & Mitchell, R.E. THOUSAND AVIATOR STUDY: NONVESTIBULAR CONTRIBUTIONS TO POSTURAL EQUILIBRIUM FUNCTIONS. Contract NASA R 136, BuMed. Proj. MF022.03.02 5007, NAMI Rep. 956, Rep. 10, March 1966, 13pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

In a preliminary study of nonvestibular sources of variance in the postural equilibrium functioning of a group of middle-aged males, 28 of 38 selected measures have been shown to be related to one or another of 3 postural criteria. Outstanding among these, in descending order of magnitude, are: abdominal circumference, age, endomorphy, heart rate immediately after exercise, and duration of cigarette smoking. These and other findings are discussed in terms of their implications for vestibular and gerontological research.
R 48

31,532
Girling, F. & Topliff, E.D.L. THE EFFECT OF BREATHING 15%, 21%, AND 100% OXYGEN ON THE SHIVERING RESPONSE OF NUDE HUMAN SUBJECTS AT 10°C. Canad. J. Physiol. Pharmac., 1966, 44 495-499. (Defence Research Medical Labs., Toronto, Ontario, Canada). (Reprint) (AD 634072)

Six volunteer Ss from the armed service, wearing swim trunks only, were exposed to an ambient temperature of 10°C for 90 minutes or less, depending on the time until development of continuous generalized shivering. Each S was exposed 3 times, once each while breathing 15%, 21%, and 100% oxygen. It is obvious from these experiments that there is a very large subject-to-subject variation in the time until onset of shivering and the time until development of severe continuous shivering. These times are increased by increasing the percentage of oxygen in the inspired gas mixture. The mechanism of the effect of oxygen on the shivering response requires further clarification.
R 7

31,533
Trout, O.F., Jr., Loats, H.L., Jr. & Mattingly, G.S. A WATER-IMMERSION TECHNIQUE FOR THE STUDY OF MOBILITY OF A PRESSURE-SUITED SUBJECT UNDER BALANCED-GRAVITY CONDITIONS. NASA TN D 3054, Jan. 1966, 32pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A technique for simulating zero-gravity performance of an astronaut in a pressurized spacesuit by complete water immersion has been developed and investigated. The technique allows the pressure-suited subject to move in 6 degrees of freedom without the encumbrance of connecting lines or hoses or other supports and further permits performance simulation of long-duration tasks. Experiments were made to demonstrate the relationships between the maneuvers performed by a pressure-suited subject under weightless conditions produced by water-immersion and zero-gravity aircraft flights and those performed under full-gravity conditions. An overall description of the test procedures, pressure suit and modifications, self-contained gas-supply breathing system, and methods for obtaining neutral buoyancy is provided. The tests demonstrated that the simulation technique is useful for pre-mission determination of critical operational characteristics relating to spacecraft and spacesuit design under conditions of zero gravity. In addition, the physical capabilities of man and his ability to perform useful work and maneuvers in a pressurized suit under simulated zero-gravity conditions can be demonstrated by this technique. Test variables included time, suit pressure, and simulation mode. Comparison of the S's motion behavior between the aircraft and water-immersion tests showed that the water-immersion technique is valid where the velocities are low.
R 7

31,534
Birkhead, N.C., Blizzard, J.J., Issekutz, B., Jr. & Rodahl, K. EFFECT OF EXERCISE, STANDING, NEGATIVE TRUNK AND POSITIVE SKELETAL PRESSURE ON BED REST-INDUCED ORTHOSTASIS AND HYPERCALCIURIA. FINAL REPORT. Contract AF 33(615) 1538, Proj. 7164, Task 716405, AMRL TR 66 6, Jan. 1966, 29pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Research Div., Lankenau Hospital, Philadelphia, Penn.).

Tilt intolerance and hypercalciuria were induced in healthy Ss fed weighed diets by 18-32 days continuous bed rest in a Metabolic Ward. The effect of supplementing bed rest with daily supine bicycle exercise (2 or 4 hours), quiet standing (3 hours), or longitudinal supine skeletal pressure on orthostasis and urinary calcium was determined. Tilt tolerance was evaluated by blood pressure and heart rate response to 10 minutes of 70° head-up body tilt and urinary calcium excretion by analysis of 3- or 6-day urine collections. Supine bicycle exercise was ineffective in significantly reducing tilt intolerance or hypercalciuria. Standing decreased orthostasis in 3 of 5 Ss and decreased urinary calcium in 4 of 5 Ss. Longitudinal skeletal pressure decreased hypercalciuria in 1 of 2 Ss but did not improve tilt tolerance. Intermittent lower body negative pressure during bed rest in one S impeded development of orthostasis but increased urine calcium. Three hours daily standing is the minimum effective duration for reversing bed rest-induced tilt intolerance and hypercalciuria while supine bicycle exercise is not a practical method for obtaining similar effects.
R 11

31,535
Cochrane, J., Kooney, N., et al. TRANSTAGE PROPULSION SYSTEM PILOT MONITORING AND CONTROL SIMULATION. FINAL REPORT. Contract AF 04(611) 10792, Proj. 6753, AFRPL TR 66 41, April 1966, 250pp. USAF Rocket Propulsion Lab., Edwards AFB, Calif. (Martin Company, Martin Marietta Corporation, Baltimore, Md.). (AD 481179)

Studies of inflight failures of rocket booster vehicles have shown that the propulsion system offers many opportunities for improvements which will result in increases in system reliability. One manner in which improved reliability may be achieved is through the use of the pilot to monitor the system, correct malfunctions, and provide a backup control function. The Transtage Propulsion System Pilot Monitoring and Control Simulation study was established in order to examine pilot monitoring and control concepts. The program was conducted in 3 phases. Phase I consisted of determining pilot monitoring and control concepts and evolving a modified design of the Transtage Main Propulsion System. Phase II involved: a) the development of an analog computer program which simulated the operation of the modified system; b) the design, fabrication and installation of a set of control and display panels in a simulator; and c) the training and testing of Air Force pilots in a simulation program in the Aerospace Research Pilots School T-27 Simulator. Seven pilots were each conducted through 36 training runs and 65 test trials. Phase III consisted of an evaluation of the test data and the development of a final system based on reliability gains and pilot control capabilities.
R 31

31,536
Clegg, B.R. & Schaefer, K.E. STUDIES OF CIRCADIAN CYCLES IN HUMAN SUBJECTS DURING PROLONGED ISOLATION IN A CONSTANT ENVIRONMENT USING 8-CHANNEL TELEMETRY SYSTEMS. NASA Contract R 24, BuMed. Proj. MR005.14 3300 1.01, Memo. Rep. 66 4, Feb. 1966, 11pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 632696)

This report presents experiences obtained with the use of 8-channel telemetry systems in continuous simultaneous monitoring of 6 physiological functions (electroencephalograph (EEG), electrocardiograph (ECG), respiratory rate, body temperature, skin temperature, basal skin resistance (BSR)) in one or 2 Ss during isolation experiments of 2 to 3 weeks duration. The studies were performed to determine the extent of internal desynchronization in free running circadian cycles of physiological functions, under conditions of confinement in a constant environment such as those encountered in spaceflights and underwater exploration.
R 6

31,537
Chajet, G. EFFECTIVENESS AND STUDENT ACCEPTANCE OF INDIRECT PAIRED ASSOCIATES LEARNING. FINAL REPORT. Contract N61339 1337, Proj. 7635 2 Pt.2 LO 8, Tech. Rep. NAVTRADEVCEN IH 42, Feb. 1966, 62pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 628449)

Direct learning, a conventional paired-associates memorizing task was compared with indirect learning, a game-like memorizing task. The two learning tasks were studied under two conditions: no task overloading and task overloading. Two hundred college students with Verbal SAT scores of 500 or below participated. It was found that: a) Direct learning is superior when learning is measured by recall; b) The two learning tasks are about equally effective when learning is measured by recognition; c) Direct learning elicits less favorable attitudes; d) Direct learning appears less resistant to task overloading.
R 48

31,538
Caro, P.W., Jr. & Isley, R.N. CHANGES IN FLIGHT TRAINEE PERFORMANCE FOLLOWING SYNTHETIC HELICOPTER FLIGHT TRAINING. Report from: "Twelfth Annual Meeting, Southeastern Psychological Association, New Orleans, La., 2 April 1966." Contract DA 44 188 ARO 20, Task ECHO, Subtask II, Professional Paper 1 66, April 1966, 11pp. Human Resources Research Office, George Washington University, Alexandria, Va. (AD 630484)

This paper deals with a determination of the training value of certain training device concepts and techniques in Army helicopter contact flight training.
R 5

31,539
Campanella, S.J., Coulter, D.C. & Irons, R. A 1000 BIT PER SECOND SPEECH COMPRESSION SYSTEM. Contract AF 33(600) 39962, 1966, 5pp. Melpar, Inc., Falls Church, Va. (AD 627589)

The system that is the subject of this paper exploits the speech bandwidth compression capabilities of the method known as formant tracking to provide digitized communication of speech at a rate of 1000 bits per second. The system derives a set of 7 parameters from the original speech signal which contain the essential word content information of speech. The 7 parameters consist of 3 formant frequencies, 3 formant intensities and the frequency of pitch. In their analog form they occupy 140 cps of bandwidth. The parameters are digitized into a 23 bit code word that is sampled at a 43.5 cps rate to provide a 1000 bit per second serial digital stream. At the receiving end of the system the serial binary stream is decoded and converted to synthetic speech. A discussion of the information theory of speech compression systems is included. From this discussion it is concluded that the system will possess a 13 db signal to noise advantage over conventional uncompressed speech transmission systems, an advantage that will result in significant size, weight and power requirements reduction for speech communications systems.
R 4

31,540
Agadzhanyan, N.A., et al. OXYGEN UTILIZATION OF THE ORGANISM AND ITS REGULATION. Abstracts of Papers Presented at a Symposium Held in Kiev-Kanev, May 24-29, 1965. NASA TT F 420, June 1966, 186pp. National Aeronautics & Space Administration, Washington, D.C.

This is a collection of 76 excerpts from papers on the oxygen metabolism in mammals, under conditions of hypoxia, and includes topics on: effect of induced hypoxia in trained and untrained human Ss; oxygen utilization control by regulatory mechanisms; psychological and biochemical aspects of altitude hypoxia; biological oxidation.

31,541
Neuberger, T.P., Myles, W.E. & Ludwig, U.W. VIRTUAL IMAGE DISPLAY FOR SPACE FLIGHT SIMULATOR. FINAL REPORT. Contract AF 33(615) 1826, Proj. 7184, Task 718401, AMRL TR 66 58, April 1966, 35pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Link Group Div., General Precision, Inc., Riverdale, Md.). (AD 636270)

This report describes the addition of virtual display imagery to a spacecraft rendezvous and docking simulator. The virtual image display is an optical system which accepts inputs from two image generators and produces a superimposed, virtual image. The major components of the system are a window display, two wide angle rear projection screens, a beamsplitter, a screen drive servo mechanism, and a television projection system. Installation and alignment were accomplished by positioning and leveling the basic structure, attaching the projection enclosures, and installing the window display and projection equipment. Basic operation and performance characteristics, including the relationships of the field of view to the screen size, and the signal voltage to the range, are provided in the report. Recommendations for future improvements in the system, including expansion of the angular field of view and improvement of resolution and brightness, are also given.
R 10

31,542
Kelley, C.R. (Princ. Investigator) & Wargo, M.J. ADAPTIVE SIMULATION. DESIGN APPLICATIONS OF SELF-ADJUSTING SIMULATORS. FINAL REPORT. Contract NONR 4986(00), NR Proj. 196 050, Aug. 1966, 83pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Dunlap & Associates, Inc., Santa Monica, Calif.). (AD 637658)

"Adaptive Simulation." Adaptive or "self-adjusting" simulators vary their own difficulty level automatically as a consequence of operator performance. This study reviews their usefulness for design in 2 technical papers, and reprints the basic earlier technical paper in the field, which had become unavailable. The first paper, "Design Applications Of Adaptive Simulators," reviews the history of adaptive simulation, analyzes and develops recommended equations and procedures for adaptive applications, and presents example data with respect to: a) display gain; b) continuous vs. on-off control; and c) one vs. two vs. three-axis tasks. The data were gathered by an adaptive tracking simulator which varied the amplitude of the forcing function of an acceleration tracking task as a function of operator performance. The second paper, "Cross-Adaptive Operator Loading Tasks," describes and illustrates adaptive techniques by means of which performance on one (primary) task modifies a second (operator loading) task in such a way that primary task performance is standardized, and all of the variance transferred to the loading task score. Experimental data are given comparing performance with a primary task alone, a primary plus independent loading task, and a primary plus cross-adaptive loading task. Rules for applying cross-adaptive loading tasks are given.
R 49

31,543
Jex, H.R., McDonnell, J.D. & Phatak, A.V. A "CRITICAL" TRACKING TASK FOR MAN-MACHINE RESEARCH RELATED TO THE OPERATOR'S EFFECTIVE DELAY TIME. PART I: THEORY AND EXPERIMENTS WITH A FIRST-ORDER DIVERGENT CONTROLLED ELEMENT. Contract NAS 2 2288, NASA CR 616, Nov. 1966, 105pp. Ames Research Center, NASA, Moffett Field, Calif. (Systems Technology, Inc., Hawthorne, Calif.).

A closed-loop compensatory tracking task has been developed which yields a measure of the human operator's time delay characteristics while tracking, constrains his behavior to within very narrow limits, and provides a low-variability indicator of the operator's tracking ability. The task is called the "Critical Task" because the operator is required to stabilize an increasingly unstable controlled element up to the critical point of loss of control. In the present report, a first-order divergence is used as the controlled element to obtain certain theoretical advantages. Based on recent human response research, a theoretical analysis of this man-machine system is performed, and an experimental program is described which enables describing function and critical task measures to be compared. A specific critical task mechanization and operating procedure is developed which yields consistent and reliable measurements of the critical levels of instability.

31,544
Hurst, P.M. & Weldner, Marianna F. DRUG EFFECTS UPON COGNITIVE PERFORMANCE UNDER STRESS. Contract NONR 4423(00), Proj. NR 144 189/12 7 64, ONR Rep. H 66 3, Aug. 1966, 152pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Psychobiology Div., Institute for Research, State College, Penn.).

Three experiments were conducted to test the hypothesis concerning drug enhancement of performance under task-induced stress. Cognitive abilities subjected to examination were highly paced short-term memory and simple arithmetic skill. Changes in mood state, judgment of performance and perception of time passage completed the behavioral characteristics assessed. The study was guided by the viewpoint that drug enhancement of cognitive performance is achieved through mitigation of disturbing influences, rather than through direct facilitation of cognitive processes. Two mitigating components were postulated: an anti-stress factor and an anti-boredom factor.
R 54

31,545
Huether, G.F. TELEVISION TWO-DIMENSIONAL LIGHT VALVE AND 142-DEGREE WIDE ANGLE LENS. FINAL REPORT. Proj. 7883 9, Tech. Rep. NAVTRADEVCEN IH 57, July 1966, 19pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 636969)

This investigation provides conclusions based on a subjective evaluation and observations of a television display of real world, real time images projected on a ten-foot radius hemispherical screen. In the experiment described, an existing 143 degree lens designed for the 35 millimeter film frame format was coupled to an Eidophor projector and the results evaluated, using a segment of the screen. Test results were generally favorable and indicated that this concept is feasible in applications where clarity of image can be traded off for angle of view.
R 9

31,546
Hormann, A. A NEW TASK ENVIRONMENT FOR GAKU TEAMED WITH A MAN. Contract NONR 4745(00), Task NR 348 009, Tech. Memo. 2311/003/00, May 1966, 26pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (System Development Corporation, Santa Monica, Calif.). (AD 636480)

An experimental environment designed for man/machine problem-solving is described. Criteria for an adequate experimental task environment are that it contain problematic features like those of the real world, that it be formalizable and controllable, and that it contain elements that are both familiar and unfamiliar to most adult humans. The experimental environment devised to meet these criteria is a 4-dimensional 4-in-a-row game called "Shimoku." The game contains scoring elements similar to poker, and moves are made by sliding or exchanging counters on the playing spaces of the 16 planes of the hypercube. It is anticipated that this environment will provide sufficient complexity and variability to serve as a vehicle for testing the Gaku program system and studying the behavior of man and machine when they function as an interacting problem-solving team.
R 39

31,547
Holmgren, G.L. & Harker, G.S. CHARACTERISTIC PACE AS DETERMINED BY THE USE OF A TRACKING TREADMILL. DA Proj. 3A014501A74D, Task 00, USAMRL Rep. 685, Nov. 1966, 13pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (USA Experimental Psychology Div., MRL, Fort Knox, Ky.).

It was found that when Ss walked on a tracking treadmill under a "comfortable-but-determined" (C-D) walking instructional set for a minimum of 30 min on each of 3 testing days: a) Ss demonstrated a characteristic C-D pace that was stable on any given day; b) Ss' C-D pace differed statistically from each other ($P < 0.001$); and c) Ss' C-D pace measures were most reliable between testing days 2 and 3 ($P < 0.01$).
F 12

31,548
Hixson, W.C. & Anderson, J.J. THE CORIOLIS ACCELERATION PLATFORM: A UNIQUE VESTIBULAR RESEARCH DEVICE. Order NASA R 93, BuMed Proj. MR005.04.0021, NAMI Rep. 980, Rep. 138, Oct. 1966, 28pp. Office of Advanced Research & Technology, NASA, Washington, D.C. (USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

This report presents a brief description of the Coriolis Acceleration Platform, a new combined linear and angular motion-producing vestibular research device developed to study the biological effects of aerospace acceleration environments. The primary element of the device is a 20-ft diameter capsule equipped with various life-support equipments to study the long-term effects of continuous rotation. A low rpm, direct-coupled, DC torque motor operated in a closed-loop, velocity mode, power servomechanism configuration rotates the device in either direction at angular velocities extending to 200 deg/sec at accelerations ranging to 15 deg/sec^2. A second drive system can be programmed to produce time-varying rectilinear translations of a single subject along a track structure fixed to the capsule where this form of motion can occur singly, or in combination with rotation of the entire device. Peak ratings of the linear drive system include a radial displacement of $\pm$20 ft, a linear velocity of $\pm$ 16 ft/sec, and a linear acceleration of 96 ft/sec^2 (3 g).
R 2

31,549
Hershman, R.L. & Freitag, M. A BAYESIAN MODEL FOR TROUBLESHOOTING ELECTRONIC EQUIPMENT. RESEARCH REPORT. Proj. SR 006 09 02, Task 11281 (NEL N51461), NEL Rep. 1412, Nov. 1966, 19pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

Bayes' Theorem is applied to the problem of formulating an optimum strategy for the troubleshooting of equipment failures. The probabilities attaching to hypotheses about the various possible causes of system failure are modified according to the theorem, and the process of testing and replacing components is structured so as to minimize the expected total cost of system restoration.
R 16

31,550
Helmreich, R.L. PROLONGED STRESS IN SEALAB II: A FIELD STUDY OF INDIVIDUAL AND GROUP REACTIONS. FINAL REPORT. (Ph.D. Thesis). Grants NONR (G) 00012 66 & NONR (G) 00030 66, Tech. Rep. 1, May 1966, 85pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. & Yale University, New Haven, Conn. (Psychology Dept., Yale University, New Haven, Conn.).

This study was an investigation of individual and group reactions to extreme, prolonged stress in a field situation conducted as part of Project SEALAB II. The 28 divers completed personality and demographic questionnaires prior to submersion. While underwater, they filled out checklists and were continuously monitored by closed-circuit audio and television. Divers underwater were significantly more fearful and aroused than on the surface prior to submersion. The three 10 men teams which lived together underwater became significantly more cohesive after submersion. Evaluation of sociometric choices of leaders indicated that age and maturity were the only characteristics associated with being chosen as a leader. Performance, fear, arousal, gregariousness and choice as a peer were not related to leader choice. Self-reported fear and arousal were significantly correlated wtih performance criteria. The more frightened and aroused divers demonstrated inferior performance. First-born and only children were significantly more frightened and showed significantly poorer performance than later-borns. Failure of an individual to share in group activities and social behavior was associated with higher levels of reported stress and inferior performance. Using six predictors in a multiple regression, it was possible to account for 50% of the variance of each of three objective performance criteria.
R 62

31,551
Kagerer, R.L. A SYSTEM FOR INTEGRATION OF FLIGHT CREW STATUS DATA IN FUTURE MANNED SPACE FLIGHTS. Report from: "Tenth Annual Human Factors Society National Convention, Anaheim, California, Nov. 1-4, 1966." July 1966, 13pp. Matrix Corporation, Arlington, Va.

The primary goal of this paper is to define the requirements for a system to provide a quick and accurate evaluation of various crew status and environmental parameters that will be monitored during projected manned space missions. There will be three outputs of this system. The first is a quick, concise indication to the crew status monitors that one or more of the monitored parameters is deviant, and a quantitative estimate of the amount of deviation. A second output is a tentative identification of possible causes of that deviation, including correlation with both scheduled and unscheduled mission operations. A third, and somewhat more tenuous output, is the prediction of future crew status and implied performance capability as a function of current data. An approach is outlined in this paper that provides the guidelines for integrating data for use by the flight surgeon in determination of flight crew physiological status as a function of the crews' physiological manifestations, the operational schedule, control actions performed, and environmental control system status. On receipt and evaluation of this data the flight surgeon and his associates in crew status monitoring will determine the crew status and, calling upon experience, both with other case studies and with the particular men involved, will prescribe whatever is necessary to maintain the flight crew in operating condition or to insure the flight crews' survival.
R 23

31,552
Kelley, C.R., Mitchell, M.B., Wargo, M.J. & Prosin, D.J. THE ROLE OF PREDICTION IN TRAINING WITH A SIMULATED ORBITAL DOCKING TASK. FINAL REPORT. Contract N61339 1767, Proj. 7903, NAVTRADEVCEN Tech. Rep. 1767, June 1966, 125pp. USN Training Device Center, ONR, Orlando, Fla. (Western Div., Dunlap & Associates, Inc., Santa Monica, Calif.).

A review of the literature relating to the role of prediction in manual control resulted in substantial evidence indicating that learning to control vehicles in complex maneuvers such as orbital docking is primarily a matter of learning to predict the future states of the vehicle. The purpose of this project was to: a) investigate the relation between the ability to predict and manual control skill; and b) determine the effect of prediction training on learning vehicular control. Two simulated docking experiments were performed. The results supported the hypothesis that ability to control is highly correlated with ability to predict. It was also demonstrated that while prediction training alone is no more effective than standard training, a combination of the two training methods appears to be much more effective than training in either control or prediction alone. It is therefore recommended that manual control training programs incorporate training in prediction. It is also recommended that associated training devices be revised or developed so as to incorporate means of training prediction skills and of measuring prediction capability.
R 47

31,553
Geoghegan, H.R. SPACE CABIN FIRE SAFETY. Contract EWA 63701, Code 81205, Rep. D2 84190 1, Feb. 1966, 60pp. Boeing Company, Seattle, Wash. (AD 478268)

Current data on space cabin fire safety are summarized and a literature survey is presented. Fire prevention and detection techniques for aircraft are well understood and can be applied to spacecraft. In contrast, fire extinguishing data applicable to zero gravity and high oxygen concentrations are very limited. A test program currently being conducted by NASA may provide some of the design data. Based on the literature and this study, extinguishing space cabin fires will be primarily by reduction of cabin pressure, use of small portable fire extinguishers, or both. Selection of the extinguishing agent and sizing the extinguishers must be based on results of zero gravity fire tests.
R 6

31,554
Orrick, W.P., Jr. EVALUATION OF THE AMBIENT NOISE DIFFERENTIAL OF THE S2E AND T-39 SERIES AIRCRAFT. PHASE REPORT. BuWep Task RAE 20J 043/2021/F012 01 11, NADC MR 6610, Aug. 1966, 28pp. USN Aerospace Medical Research Dept., NADC, Johnsville, Penn. (AD 637527)

Pertinent data on the noise and vibration environments in the S2E and T-39 aircraft, supplied by the Advanced System Development and Structural Dynamics groups of North American Aviation, Inc. are presented and examined regarding the effects of the noise and vibration environments of these two aircraft on crew performance. The nature and scope of the effects of the acoustic noise and vibration environments on human performance are discussed. Both auditory and non-auditory effects are included, and particular emphasis is placed on the speech-interfering characteristics of the noise environment, and also its ability to cause permanent hearing loss. It was found that under some operating conditions the noise levels in the S2E were above specification limits, and that even with a protective helmet, the noise levels in the S2E were sufficiently high to cause some permanent hearing loss.
R 27

31,555
Denison, D.M., Ernsting, J. & Cresswell, A.W. THE FIRE HAZARDS TO MAN IN COMPRESSED-AIR ENVIRONMENTS. Rep. FPRC/1249, Jan. 1966, 5pp. RAF Institute of Aviation Medicine, Farnborough, Hants., England. (AD 800318)

The effects of burning as a function of compressed air and pure oxygen environments were compared using denim covering and portions of a pig's carcass as the materials. In air at 1 atmosphere the material slowly smouldered but did not burn, and the pig's skin showed no detectable singeing. In air at 2 to 5 atmospheres, the material ignited with increasing ease and burnt more vigorously. The areas of burning of clothing and the pig's skin increased with the total pressure. No flash-burning of the material or the pig's skin was seen. In oxygen at 1 atmosphere, the material ignited almost instantaneously and a flash fire was propagated over the surfaces of the clothing and the pig's skin, leading to a very vigorous fire.
R 1

31,556
Post, T.J., Parker, J.F., Jr. & Bonner, L.T. PROTOTYPE SPECIFICATION FOR THE PREPARATION OF FLIGHT MANUALS. FINAL REPORT. Contract N61339 1638A 1, Proj. 7614 1, NAVTRADEVCEN Tech. Rep. 1638 1, June 1966, 176pp. USN Training Device Center, ONR, Orlando, Fla. (BioTechnology, Inc., Arlington, Va.). (AD 637200)

The purpose of the study was to develop a new specification for military pilots' flight manuals. A conceptual framework for the development was rationally derived and included the results of a previous and related study, NAVTRADEVCEN 748-1, Improvement of Flight Handbooks. A central feature of the framework and the resulting specification is a set of criteria for flight manual preparation. A supporting technical report, NAVTRADEVCEN 1638-2, describes the development effort in detail.

31,557
Rasch, P.J. & Bird, J.S. PHYSICAL TRAINING IN CONFINED SPACES: I. EVALUATION OF THE UNIVERSAL GYM. FINAL REPORT. BuMed Rep. MF 022.01.04 8001.2, Aug. 1966, 22pp. USN Medical Field Research Laboratory, Physiology Div., Camp Lejeune, N.C. (AD 637187)

A group of Marine infantrymen were trained for six weeks on a Universal Gym and a Marcy Isometric Power Rack in order to determine the value of these pieces of apparatus for use in maintaining the physical fitness of Marines confined to shipboard for an extended period. The Ss displayed improved performance in certain test of muscular strength, but did not demonstrate improved performance in events requiring cardiorespiratory fitness and/or speed of movement of large muscle masses.
R 24

31,558
Reeves, Elizabeth, Stephens, M.P. & Beckman, E.L. AN EVALUATION OF THE FOAMED NEOPRENE "DIVER'S WET SUIT" AS A SURVIVAL GARMENT FOR HELICOPTER AIRCREWS. INTERIM REPORT. BuMed Proj. MF 011.99 1001, Rep. 7, July 1966, 31pp. USN Bureau of Medicine & Surgery, Department of the Navy, Washington, D.C. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md.). (AD 637153)

The type of flights performed by helicopters require particular garments for their aircrews as follows: a) Water entry by aircrew is by way of water collision so that there is a high probability of damage to the survival garment; b) The short flight radius of the helicopter ensures that the time-distance from a potential rescuer should be relatively short, so that rescue should be expected in less than 4 hours; c) The suit must be wearable without an air ventilated suit for cooling and still be usable in high cockpit temperatures up to 90° F; and, d) The low altitude of flight allows no time to don or zipper up a survival garment so that there should be no significant penalty for entering the water with the garment partially unzipped. Laboratory experiments using a variety of anti-exposure assemblies demonstrated that the 3/16" foamed neoprene wet suite, mittens, hood, and insulated rubber "thermal" boots provided the most comfortable and efficient configuration. Tolerance times were established for such clothing in 40°, 50°, and 60°F. water.
R 10

31,559
Schmidt, S. RECORDS OF AUTOMATION AND TELEMECHANICS (SELECTED ARTICLES): MATHEMATICAL CLASSIFICATION MODELS IN OBJECT-RECOGNITION PROBLEMS. FTD TT 65 883/1+2+3+4, March 1966, 25pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl. from: Archiwum Automatyki I Telemechaniki, 1964, 9(4), 427-442). (AD 487734)

Models are formulated for problems of statistical object recognition and a classification process. Four classification processes are considered, including a process with learning and an adaptive process. An inquiry is made into certain asymptotic properties of a classification process with learning.
R 9

31,560
Schultz, D.P. (Princ. Investigator). AN EXPERIMENTAL APPROACH TO PANIC BEHAVIOR. FINAL REPORT. Contract NONR 4808(00), Aug. 1966, 63pp. USN Group Psychology Branch, ONR, Washington, D.C. (Mary Washington College, University of Virginia, Fredericksburg, Va.). (AD 637604)

A series of experimental studies were undertaken in which a person's efforts to escape a danger situation were thwarted due to the actions of fellow group members who were jamming the escape exit in their own attempts to escape. The specific purpose of the research was to determine how many subjects would demonstrate a willingness to sacrifice their fellow group members in order to save themselves. A number of situational, personality, and background variables were investigated to determine their possible influence in either facilitating or inhibiting the panic response. Over all the experimental situations, 1/4 to 1/2 of the subjects sacrificed their fellow group members in order to save themselves. None of the variations in the situation produced any significant differences in the incidence of the panic response. However, several of the variables did produce non-significant trends in the direction of increasing the panic response. Specifically these were: a) increasing the level of threatened penalty for failure to escape, b) increasing the anonymity of the subject, and c) introducing intense visual and auditory stimulation. One scale of an objective test of personality did significantly discriminate between those who displayed the panic response and those who did not. This suggested that those who panicked were significantly more sensitive, effeminate, dependent, hypochondriacal, and anxious than those who did not panic. Results from a biographical inventory tentatively suggested that only-borns may be more likely to panic, and to do so more quickly, than subjects who are later-borns. Implications of the present research and plans for future research are discussed.
R 14

31,561
Shoup, June E. RESEARCH ON GRAMMATICAL ANALYSIS OF SPOKEN LANGUAGE. FINAL REPORT. Grant AF AFOSR 22 64, Proj. 9769, AFOSR Rep. 66 1566, July 1966, 11pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.). (AD 637566)

This report summarizes research directed toward an increased understanding of the grammar of spoken language. A technique for prosodic analysis was developed that flattens the power spectrum without changing the instantaneous power and optionally reintroduces harmonics of the fundamental frequency. When the channel for average fundamental voice frequency was eliminated, correct listener responses tp stress on English words decreased only slightly, but listener responses to intonation approached the chance level. A generative format was developed for expressing the structure of the syntax of a spoken language (French). An ordered set of rewrite rules used with a set of tables generated all existing verb forms and no nonexisting ones. An attempt to describe the syntax of English determiner phrases led to a reconsideration of the place of semantics in syntactic descriptions and the properties required of a syntactic description. Problems of grammatic description were examined with reference to two examples of chess notations. Abstracts of three papers written during the period are included.
R 3

31,562
Siegel, A.I. & Pfeiffer, M.G. POST TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. PERSONNEL PSYCHOPHYSICS: ESTIMATING PERSONNEL SUBSYSTEM RELIABILITY THROUGH MAGNITUDE ESTIMATION METHODS. TECHNICAL REPORT. Contract NONR 2279(00), Oct. 1966, 51pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.). (AD 485865)

A logic and technique for measuring achieved avionics maintenance personnel subsystem reliability are described. Then, the employment of the logic is demonstrated. The "software" reliability determination technique is based on magnitude estimates of uncommonly effective and uncommonly ineffective performances. These are combined to yield an index, which ranges from zero to one, for each software component. To determine software system reliability, hardware equipment reliability combinational techniques are then employed.
R 9

31,563
Stanat, D.F. NONSUPERVISED PATTERN RECOGNITION THROUGH THE DECOMPOSITION OF PROBABILITY FUNCTIONS. TECHNICAL REPORT. Contract AF AFOSR 367 65, Proj. 9769, AFOSR Rep. 66 1454, April 1966, 55pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Psychology Dept., University of Michigan, Ann Arbor, Mich.). (AD 637486)

Two problems of parametric statistics are investigated with a view to their application to nonsupervised pattern recognition, i.e., without a learning period in which information is given a device about its performance. Each problem involved the problem of determining population parameters from a random sample drawn from a finite mixture of probability functions, where each element of the mixture is of known form. The first problem investigated is that in which all summand functions are distinct multivariate normal functions with arbitrary means and covariance matrices. A method of decomposing f(X) uniquely is given for the case where f(X) is known exactly. The second problem investigated is concerned with finite mixtures of probability functions over the set of binary n-tuples. A squared error function and the method of steepest descent provide solutions for problems where f(X) is known to be a weighted sum of multivariate bernoulli functions which are: a) arbitrary; b) spherical; and c) identical except for translation. The problem of estimating f(X) and its discrete fourier transform is investigated; unbiased and consistent estimates are found for the function values.
R 21

31,564
Stevens, G.W.H. PARACHUTES FOR ESCAPE SYSTEMS. RAE Tech. Rep. 66705, March 1966, 21pp. Royal Aircraft Establishment, Farnborough, Hampshire, England. (AD 485098)

This is a review of the types and designs of parachutes used in escape systems and of some of the properties of parachutes which are pertinent to the escape problem. The research and development work on escape parachutes which has been recently undertaken at the Establishment is discussed. With regard to outstanding problems some comment is made on where effort is worthwhile or, on the contrary, relatively unrewarding.
R 17

31,565
Stolurow, L.M. (Princ. Investigator). SOCRATES, A COMPUTER-BASED INSTRUCTIONAL SYSTEM IN THEORY AND RESEARCH. Contract NONR 3985 (04), Proj. NR 154 239, Tech. Rep. 12, June 1966, 51pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Training Research Lab., University of Illinois, Urbana, Ill.). (AD 637656)

This paper summarizes a general model used to design a computer-based instructional system. This idiographic contingency model defines classes of variables that are presumed to be important in adaptive instruction. It also specifies relationships between those variables that characterize the learner before and after learning which can be used selectively to individualize instruction. Included among the "before" measures are knowledge, aptitude, and personality. The data indicate that the "before" measures have different relationships with the "after" measures (e.g., amount learned and attitude) under different conditions of learning. These data support the model. The kinds of decisions that need to be made to individualize instruction were discussed and a set of research studies relating to them was described briefly. Relevance of the data to the model was indicated and it was pointed out that learning environments can be made more adaptive by using appropriate matching of: a) aptitude and sequence contingencies; b) aptitude and encoding contingencies; and c) personality and evaluative feedback contingencies.
R 30

31,566
Thielges, J.R. & Matheny, W.G. A REVIEW OF THE ANALYSIS OF VISUAL DISCRIMINATIONS IN HELICOPTER CONTROL. Report from: "Southwestern Psychological Association, Arlington, Texas, 21-23 April 1966." Subcontract DA 44 188 ARO 2, HumRRO Task ROTOR, Prof. Paper 4 66, June 1966, 10pp. Human Resources Research Office, George Washington University, Alexandria, Va. (Life Sciences, Inc., Fort Worth, Tex.). (AD 636579)

An analysis was conducted of the necessary and sufficient cues for maintaining vehicle stability in pitch, roll, yaw, altitude, range, and latitude, and a model was developed which expresses the relationship between the cue sources and the information they provide about the vehicle stability in flight. This paper discusses the portion of the analysis which deals with the cue structure of the pilot's visual environment and the development of the model.

31,567
Lachman, R. & Field, W.H. A COMPUTER ALGORITHM FOR ESTIMATING NONSEQUENTIAL INFORMATION TRANSMISSION IN RECOGNITION AND RECALL. Psychon. Monogr. Suppl., 1966, 1(16), 299-304. (State University of New York, Buffalo, N.Y.). (Reprint)

Significant theoretical developments in the information sciences and major advances in computer technology have profoundly influenced the experimental study of complex psychological processes. One such development is the mathematical technique created by Judd and Sutherland (1959) for measuring the information content of nonsequential messages, conditions where the ordering of symbols is devoid of information or is ignored. Complexity of the computations involved has precluded widespread use of the technique. Presented below, in code, is a computer program that should make the technique generally available. The program can be punched and running within an hour after careful examination of the documentation.
R 7

31,568
Gelselhart, R. THE EFFECT OF PRIOR EXPERIENCE ON ACQUIRING SKILL ON A SIMULATED INERTIAL CONTROL TASK. Proj. 1710, Task 171003, AMRL TR 66 25, July 1966, 26pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

The performance of test pilots and college student Ss in acquiring the skill to control the attitude of a simulated space vehicle was compared. The purpose of the comparison was to investigate transfer of training to this type of task as a function of prior pilot experience and determine the degree to which one may generalize from students to pilots. There was also a further breakdown of the student group into experimental subgroups to assess the effects of type of control/display relationship and the order of part training on the acquisition of the vehicular control task. The secondary comparisons within the student group were to determine optimal training conditions to make the comparison with the pilots as equitable as possible. The conclusions based on the results of the study were: a) there appear to be more positive transfer effects than negative in transitioning from flying aircraft to a simulated inertial control task; b) the degree to which generalizations can be made from students to pilots depends on the amount of training given the students provided an optimal control/display relationship is used; c) previously untrained Ss can achieve skill levels comparable to pilots on this type of task, but it takes more trials for the nonpilot to do so; d) order of part training does not appear to be an important variable in training on this type of task.
R 15

31,569
Gracey, W., Sommer, R.W. & Tibbs, D.F. EVALUATION OF CROSS-POINTER-TYPE INSTRUMENT DISPLAY IN LANDING APPROACHES WITH A HELICOPTER. NASA TN D 3677, Nov. 1966, 45pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Field, Va.).

An evaluation of a landing-approach instrument display incorporating a cross-pointer presentation has been conducted in landing-approach tests with a helicopter. The display consisted of a vertical-situation--flight-director indicator, a horizontal-situation indicator, and small vertical-scale instruments for the presentation of airspeed, ground speed, vertical speed, range, and height. The tests of the display were conducted under simulated IFR (Instrument Flight Rules) conditions along a 6° glide slope at approach speeds of 30 and 60 knots. The results of tests of four configurations of the attitude-guidance elements of the display showed that course guidance information in the form of control-command (flight-director) signals provided more precise control of course than that provided by course-deviation and ground-track angle information. With the best of the four configurations of slope guidance information, satisfactory guidance along a 6° glide slope could be maintained at airspeeds below that for minimum power. Using the best display of course and slope guidance, one pilot flew twenty (out of twenty-two) 30-knot approaches (in head, cross, and tail winds) to a successful 50-foot (15.24 meters) breakout and visual slowdown to hover. The success of these approach tests, however, can be considered as only a partial indication of the operational suitability of the test display.
R 4

31,570
Graybiel, A. ORIENTATION IN AEROSPACE FLIGHT. Report from: "XVth International Congress on Aviation & Space Medicine, Prague, Czechoslovakia, Sept. 30, 1966." NASA Order R 93, Proj. MR005.04 0021, Spec. Rep. 66 6, Oct. 1966, 40pp. Office of Advanced Research & Technology, National Aeronautics & Space Administration, Washington, D.C. (USN Aerospace Medical Institute, NAMC, Pensacola, Fla.).

In delimiting the subject matter for purposes of this report, attention is focused on some of the problems involved in spatial orientation which have been studied during many investigations of the Naval Aerospace Medical Institute. The first part is a review of these long-time studies and this is followed by a discussion of some experiments carried out in weightlessness.
R 37

31,571
Lodge, G.T. BODY-BUILD AND SURVIVAL IN EJECTIONS FROM NAVY AIRCRAFT. Report from: "Seventy-Third Annual Convention, American Psychological Association, Chicago, Illinois, 7 Sept. 1965." March 1966, 7pp. USN Aviation Safety Center, Behavioral Sciences Div., Norfolk, Va. (AD 630466)

Eleven hundred forty-eight ejectees had height/$\sqrt[3]{\text{weight}}$ ratios ranging from 11.72 to 14.06, with a median at 12.78. This distribution was divided into deciles and the proportions determined for each, of survivors to nonsurvivors. Fatalities ranged from a minimum of 6.1% in Decile IV to a maximum of 23.7% in Decile X. Pilots comprising Decile IV are of athletic build and have the most compatible dimensions for cockpits designed according to prevailing height-weight standards. Decile X consists of ectomorphs relatively maladapted to these cockpits, and more disadvantaged by g-stresses, etc., for emergency movements like pulling the face curtain.
R 6

31,572
Gabron, F. & McCullough, J. THERMAL MANIKIN. Contract NAS 9 3554, NASA CR 644, Nov. 1966, 37pp. Manned Spacecraft Center, NASA, Houston, Tex. (Arthur D. Little, Inc., Cambridge, Mass.).

In order to test the value of various space suit designs and their attendant clothing assemblies and conditioning systems, simulated environmental and operational conditions are imposed. It is not desirable to expose the astronaut to tedium and/or hazards of the full developmental test sequence and, therefore, a thermal manikin which simulates the individual's homeothermy represents a useful tool. This report deals with the fabrication and qualification tests of an anthropomorphic Thermal Manikin and Temperature Logging-Power Control System designed to simulate regional heat losses at relatively low skin temperatures where sweating is not present.
R 2

31,573
Vailbona, C., Vogt, F.B., Cardus, D. & Spencer, W.A. THE EFFECT OF BEDREST ON VARIOUS PARAMETERS OF PHYSIOLOGICAL FUNCTION. PART X - THE EFFECT OF BEDREST ON THE CIRCULATORY RESPONSE TO A VALSALVA MANEUVER. Contract NAS 9 1461, NASA CR 180, Dec. 1966, 13pp. Manned Spacecraft Center, NASA, Houston, Tex. (Texas Institute for Rehabilitation & Research, Houston, Tex.).

Experimental design of studies of the effect of bedrest carried out at the Texas Institute for Rehabilitation and Research in 1963 included an evaluation of the performance of a controlled Valsalva maneuver before and after bedrest. This report presents the quantitative results of the changes in arterial blood pressure during the performance of a controlled Valsalva maneuver before and after bedrest by a group of thirteen individuals who participated in this study. An analysis of the data indicates that after 14 days of bedrest the Valsalva maneuver may trigger a greater adrenergic reaction to compensate for the decreased venous return in the phase of forced expiration. This adrenergic reaction was evident also in subjects who developed poor tolerance to passive tilt following bedrest. The findings suggest that a mechanism of orthostatic hypotension after bedrest must be explained on basis other than deficit in the autonomic nervous system of these individuals.
R 23

31,574
Society of Automotive Engineers. PASSENGER CAR DRIVER'S EYE. SAE Rep. J941, Jan. 1966, 2pp. Society of Automotive Engineers, Inc., New York, N.Y. (Technical Report Preprint)

This SAE Recommended Practice establishes 2 dimensional eye ranges, representative of several percentile increments of the driving population, for use in defining the driver's visual requirements to interior and exterior environments in passenger cars and station wagons. It is to be used in conjunction with the 2-dimensional manikin specified in report SAE J826. Complete definitions for the interior dimensions used in this SAE Recommended Practice are specified in the SAE Aerospace-Automotive Drawing Standards, Section E1. Reproductions of the passenger car driver's eye range contours may be obtained from SAE by ordering drawings supplementary to SAE J941. This recommended practice is intended as a guide toward standard engineering practice. Its use is not recommended as a basis for legal regulation.

31,575
Watling, W.H. ACOUSTICAL AND VISUAL ATTENUATION THROUGH DYNAMIC REGULATION OF MUZZLE GAS FLOW. Report from: "Army Science Conference, West Point, New York, 14-17 June 1966." June 1966, 449-463. USA Springfield Armory, Springfield, Mass. (AD 634649)

This paper has presented the fundamental concepts of fluid flow on which to base theoretical and empirical studies in the use of weapon muzzle attachments used for flash and sound suppression. It presents the development of an improved flash suppressor for a given weapon and provides a chapter of experimental data to be added to the theoretical data published in the references. When research was initiated on this project, the paucity of published test data left the researcher with something to be desired, that is, the link between theory and reality. The paper further serves to illustrate the fact that here is a fertile field for future research in the field of fluid dynamics. As in most problem solutions, the most difficult portion is the definition of the problem itself. As discoveries continue along the theory of submerged jet flow, heat transfer, thermodynamic properties of propellants, and equations of state of gun gases, the many assumptions now being made during theoretical analysis will be replaced with fact and the area of transitional ballistics will become thoroughly defined. This will reduce the art of muzzle device development to a practical engineering science.
R 9

31,576
Riely, Phyllis E. & Gall, Lorraine S. EFFECT OF DIET AND ATMOSPHERE ON INTESTINAL AND SKIN FLORA, VOLUME II - LITERATURE SURVEY. Contract NAS 9 4172, NASA CR 662, Dec. 1966, 132pp. Manned Spacecraft Center, NASA, Houston, Tex. (Fairchild Hiller Corporation, Farmingdale, N.Y.).

The microflora of the integument of the human body is composed of a varied population of differing microorganisms which may be influenced by the environmental factors to which the host is exposed as well as the particular personal hygienic procedures used by the host and which has never been completely defined on subjects living under the differing environmental conditions encountered in space flight, such as 100% oxygen atmosphere at reduced pressures, minimal personal hygiene care, and the wearing of a tight-fitting space suit. As a basis for detecting the influence of such conditions of space flight on the skin flora and of understanding the possible effect of any changes induced, it is necessary to define as completely as possible the microflora present on the human integument under ordinary environmental conditions. The cornerstone of any such study is a comprehensive survey of the literature pertaining to this subject, to summarize and evaluate the existing knowledge so that areas in which information is deficient may be recognized and remedial action suggested. These are the goals of this report. This report considers the microflora of the integument to be those microorganisms which exist in or on the skin, but excluding those growing on mucous surfaces, and includes the following generalized and specialized skin areas; i.e., anal fold, axilla, external ear, eye, fingernails, scalp, toenails, and umbilicus. The microflora considered included both aerobic and anaerobic bacteria, yeasts, molds, fungi, actinomyces and viruses.
R Many

31,577
Kosmider, G., Young, Marion & Kinney, G. STUDIES IN DISPLAY SYMBOL LEGIBILITY. PART VIII: LEGIBILITY OF COMMON FIVE-LETTER WORDS. Contract AF 19(628) 5165, Proj. 7030, ESD TR 65 385, Rep. TM 4239, May 1966, 13pp. USAF Decision Sciences Lab., Hanscom AFB, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

This report describes the findings of a study in symbol legibility which investigated the reading time and errors for common five-letter words when they are projected by a solid stroke and when they are shown by a broken stroke. The latter was produced on a 945-line TV monitor at 10, 7, & 5 active lines per symbol height. This study is similar to an earlier report on the readibility of 5-letter common words in which a 525-line TV system was employed. With visual size, brightness, contrast, and other viewing conditions controlled, the best reading performance resulted from solid-stroke letters. Broken-stroke letters constructed by resolution of 10, 7, & 5 lines resulted in progressively poorer performances.
R 7

31,578
Kosmider, G. STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART V. THE EFFECTS OF TELEVISION TRANSMISSION ON THE LEGIBILITY OF COMMON FIVE-LETTER WORDS. Contract AF 19(628) 5165, Proj. 7030, ESD TR 65 135, Rep. W 07450, May 1966, 17pp. USAF Decision Sciences Lab., Hanscom AFB, Bedford, Mass. (MITRE Corporation, Bedford, Mass.).

The legibility of common 5-letter words was studied under 4 conditions: with solid-stroke letters, and with 10, 7, and 5 horizontal scan lines per character height on a television monitor. Twelve Ss were shown 100 words, one at a time, under controlled conditions. The S's task was to recite each word as quickly and as accurately as possible. Analysis of the errors and reaction times showed that the legibility of the words significantly decreased as the number of lines decreased. Using the mean reaction time of the solid condition as a base, there is a 32-percent increase in mean reaction time for the 10-line television presentation, 40 percent using 7 lines and 89 percent using 5 lines.
R 4

31,579
Slonim, A.R. EFFECTS OF MINIMAL PERSONAL HYGIENE AND RELATED PROCEDURES DURING PROLONGED CONFINEMENT. FINAL REPORT. Contracts AF 33(657) 11716 & AF 33(615) 1814, NASA Defense Purchase Request R 85, Proj. 7164, Tasks 716410 & 716405, AMRL TR 66 146, Oct. 1966, 30pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Thirty-six healthy male Ss were studied under closely confined conditions in 9 6-week experiments over a 2-year period. The effects of minimal personal hygiene and related procedures were evaluated. No major problems resulted from the lack of bathing, sponging the body, changing clothes and bedding. Body odor, strongest in axilla, groin, and feet, heightened in 7-10 days inside the AMRL Evaluator, but subsided in the second week. The absence of shaving and hair and nail grooming resulted in 25% of the Ss having to trim their mustache, 50% having to trim their fingernails at or after the fourth week, and dandruff and scalp itchiness in almost all cases. Of all restricted hygenic procedures, the use of substandard oral hygiene produced the greatest clinical effect, with all 20 Ss tested developing varying degrees of gingivitis. Limited hygiene during exposure to two 32 C periods produced no major but a number of minor problems associated with much dryness of skin and scalp. The types of microorganisms recovered from S and environment as well as their characteristic buildup and spread over certain body areas under these minimal hygiene conditions are reviewed. Prolonged wearing of full pressure suits was well tolerated in most cases. Constant wearing of bioinstrumentation electrodes attached to the skin irritated all Ss tested. Seven different oral hygiene procedures and the efficacy of various waste management items, including different chemically-saturated wipes and fecal collectors, were evaluated.
R 9

31,580
Holcomb, W.G., Rasch, P.J., Buckels, L.J. & Jackson, R. IMPROVEMENTS IN RECORDING HEART RATE DURING EXERCISE IN THE PERSPIRING SUBJECT. INTERIM REPORT. BuMed. Proj. MF022.03.04 8002, Rep. 4, Feb. 1966, 8pp. USMC Headquarters, Washington, D.C. (USN Medical Field Research Lab., Camp Lejeune, N.C.). (AD 631142)

Electrodes manufactured by Naval Medical Field Research Laboratory were compared with those manufactured by Beckman Instruments Co. for the purpose of obtaining heart rates during vigorous activity (treadmill walking) under conditions of high temperature and humidity. Use of the Ace (R) bandage to secure the electrodes in place was compared with use of the Beckman adhesive fastener. The electrodes manufactured by NMFRL performed as well as did those manufactured by Beckman Instruments. The adhesive fastener presented advantages over the Ace (R) bandage, but a longitudinal study is required to determine whether its use over a period of time will result in dermatologic problems. The analog presentation of heart rate data used in this study presented several advantages over previous techniques.
R 6

31,581
Goldbeck, R.A., Kaeding, Judith H. & Feroglia, W.E. ODOR CODING FOR MALFUNCTION DETECTION AND DIAGNOSIS. FINAL REPORT. Contract AF 33(615) 2948, Proj. 7184, Task 718406, AMRL TR 66 122, Aug. 1966, 56pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Western Development Labs., Philco Corporation, Palo Alto, Calif.).

The use of the olfactory sense for detecting and diagnosing malfunctions in equipment systems has been investigated. The literature on olfaction is reviewed and the data and data gaps relevant to equipment maintenance applications are summarized. With the literature findings as a point of reference, performance requirements for an odor-coding system are established and a taxonomic structure is synthesized for the purpose of developing specific odor-coding systems. A survey of equipment system applications leads to the conclusion that odor-augmented maintenance displays are both feasible and practical. Recommendations are made for a program of research and development leading to broad scope implementation of odor coding for malfunction detection and diagnosis.
R 99

31,582
Stong, R.A. & Neely, K.K. A NOISE EXPOSURE DURATION INDICATOR. J. Sound Vib., 1966, 3(1), 1-3. (Defense Research Medical Labs., Toronto, Ontario, Canada). (Reprint) (AD 629101)

The amount and type of hearing loss suffered by an individual exposed to noise depends, in part, upon the intensity of the noise and the duration of exposure to it. The development of adequate criteria and procedures for hearing protection requires the correlation of observed hearing losses, temporary or permanent, with a quantitative knowledge of the conditions of exposure responsible for them. This note describes an instrument which has been developed to record the accumulated time during which the ambient noise level exceeds a predetermined value.
R 10

31,583
Peterson, C.J. & Smith, H.A. DEVELOPMENT OF HIGH CONTRAST ELECTROLUMINESCENT TECHNIQUES FOR AIRCRAFT DISPLAYS. IN-HOUSE REPORT. Contract AF 33(657) 8600, Proj. 6190, Tasks 619007 & 619009, AFFDL TR 66 6, April 1966, 52pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio & Bunker-Ramo Corporation, Canoga Park, Calif.).

This report outlines the steps taken by the Air Force Flight Dynamics Laboratory to develop a new display technology capable of meeting display requirements of future manned weapon systems. A description is made in the first part of this report identifying the basic concept and resulting development of high contrast electroluminescent (EL) displays both from an engineering and psychophysical standpoint. The problem of display legibility, quite often confused with display brightness, is also discussed with respect to its effect on the limitations of EL displays. Finally, information is presented explaining how this limitation was overcome and why such progress is considered to be an important contribution to the development of solid state displays. The second part of this paper describes the human factors aspects of the high contrast EL program. The inherent weakness of transilluminated displays, the variables related to readability, the effects of the anticipated upper limits of environmental lighting, and the study of one of the first high contrast EL displays are discussed.
R 16

31,584
Howell, W.C., Johnston, W.A. & Goldstein, I.L. INFLUENCE OF STRESS VARIABLES ON DISPLAY DESIGN. FINAL REPORT. Contract AF 30(602) 3622, Proj. 5577, Task 557704, RADC TR 66 42, April 1966, 56pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Human Performance Center, Ohio State University, Columbus, Ohio). (AD 481509)

Nine exploratory studies and 5 formal experiments were conducted to determine: a) whether stress decrements occur in a complex display monitoring situation; b) if so, what variables contribute most to these decrements; and c) what conditions--particularly display conditions --may be introduced to reduce such decrements. Variables studied included stimulus density; signal frequency, kind, and predictability; irrelevant signal characteristics; display format; duration of monitoring; and response requirements. The major findings suggested that: a) serious stress decrements do occur, but these are not simple monotonic functions over time; b) decrements are most severe under conditions of high display density and low signal frequency, particularly when predictability of signal occurrence is low and irrelevant information is present; c) performance does not seem to deteriorate over weeks or months of daily monitoring sessions; d) display formats in which classes of information are separated spatially or in which some spatial compression is introduced seem to reduce decrements and enhance overall performance. Implications of these and other more tentative findings are discussed relative to the problem of display design and future research.
R 9

31,585
Björkvall, C. A NOTE ON INDUCING STRESS BY AN AUDIO-VISUAL-CONFLICT TEST. Proj. 40X 997 01, Rep. 210, June 1966, 4pp. Swedish Council for Social Science Research, Stockholm, Sweden & Swedish Medical Research Council, Stockholm, Sweden. (Psychological Labs., University of Stockholm, Stockholm, Sweden).

An audio-visual-conflict test, used to induce a state of stress or arousal, is described. The test is modelled on Stroop's color-word test, which was made more complex by presenting color words simultaneously through the visual and auditory modalities. Experimental data show that the test has strong arousing properties when used either individually or in group situations.
R 10

31,586
Bergström, S.S. A PARADOX IN THE PERCEPTION OF LUMINANCE GRADIENTS III. Rep. 35, Nov. 1966, 6pp. Psychology Dept., University of Uppsala, Uppsala, Uppsala, Sweden.

In two earlier reports the investigator reported studies on a brightness paradox in the perception of luminance gradients. One striking result was the absence of the paradox in a certain gradient called E. It differed from a gradient, called A, in two respects, it lacked inducing areas adjacent to the areas constituting the paradox and it was narrower in visual angle (2° compared to 4°). The effect was concluded to depend on the lack of inducing areas. In this study gradient A was presented to 9 Ss on 3 different distances, i.e., 3 different widths in visual angle (1°33, 2° and 4°). A "constant sum" method was used to estimate the brightness of the areas of interest. The result is that the paradox appeared in gradient A under all 3 conditions. Actually, there is a tendency toward stronger paradox when the gradient is narrower.
R 5

31,587
Beagles, J.A. & Coll, E.F. DIVERS' BODY HEAT LOSS. RESEARCH REPORT. Proj. SR 011 01 01, Task 0401 (NEL Z1 22), NEL Rep. 1408, Oct. 1966, 34pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

A study was made primarily to obtain data applicable to the design of an optimum protective suit for divers in arctic environments. The experimental method employed swimmers who performed shallow dives in the NEL Arctic Pool at 30-32°F. Skin temperature was recorded by the use of suitably located thermistors, and other data were obtained from blood samples drawn immediately before and after each dive. Results suggest that a 4-piece foam neoprene wet suit consisting of a 1/8-inch tight-fitting inner suit and a 1/4-inch snug-fitting outer suit along with 2 pairs of neoprene socks and mittens would provide the optimum combination of protection and mobility for divers in arctic waters.
R 27

31,588
Avner, R.A. EXPECTED INJURY RATES FOR EXPERIMENTAL AIRBORNE OPERATIONS. Proj. 3A 0 2560 1A 819, Task 036, USAARU Rep. 66 7, June 1966, 6pp. USA Medical Research & Development Command, Office of the Surgeon General, Wahhington, D.C. (USA Aeromedical Research Unit, Fort Rucker, Ala.). (AD 633630)

Probability of injury for Army paratroopers under conditions of full combat load and unprepared drop zone was estimated to be .006 (standard error = .002, N = 5,253). Tables were computed to allow tests of departure from this rate under experimental conditions involving up to 50 jumpers.
R 3

31,589
Semb, G. & Saslow, M.G. CONFORMITY TO EXPERIMENTER-DETERMINED, PAY-OFF ENFORCED, CRITERION LEVELS IN THE METHOD OF RANDOM STAIRCASES. Contract DA 49 193 MD 2713, Psychophysics Lab. Rep. PRP 21A, March 1966, 8pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (University of Washington, Seattle, Wash.). (AD 639355)

Outcome structures are incorporated into the method of random, yes-no staircases. Results obtained from Ss paid to meet arbitrary criteria are compared with ordinary determinations of limens for intensive increments of white noise above a constant background of white noise. It is demonstrated that a S can reliably exhibit a variety of arbitrarily determined "thresholds" when appropriate pay-off contingencies are introduced.
R 1

31,590
Gourevitch, Vivian & Galanter, E. A SIGNIFICANCE TEST FOR ONE PARAMETER ISOSENSITIVITY FUNCTIONS. Contract DA 49 193 MD 2713, Psychophysics Lab. Rep. PRL 19A, Jan. 1966, 18pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (University of Washington, Seattle, Wash.). (AD 639354)

A large-sample test for the significance of the difference between two detection data points is developed based upon the assumptions of a one-parameter signal detectability model. In essence, the null hypothesis tested is that two observed data points belong to the same d' function.
R 8

31,591
Ross, J.J., Johnson, Laverne C. & Walter, R.D. SPIKE AND WAVE DISCHARGES DURING STAGES OF SLEEP. Arch. Neurol., April 1966, 14, 399-407. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.). (Reprint) (AD 634208)

To study the effect of stage of sleep on EEG (electroencephalogram) seizure discharge rate and morphology, spontaneous all-night sleep EEGs were recorded from 13 ambulatory patients with petit mal attacks or grand mal seizures or both whose waking interictal EEG showed bilateral synchronous paroxysmal spike and wave patterns. Most records demonstrated an increase in spike and wave discharge rate at sleep onset with a continued increase through slow wave sleep, and a marked diminution in the discharge rate with onset 1-REM (rapid eye movement). The presence of rapid eye movements further suppressed the discharge rate. The centrecenphalic discharges demonstrated a progressive change in rhythm, regularity frequency, form, and amplitude as sleep progressed. By the time stage 4 was reached, the tracing showed a preponderance of high voltage waves interspersed with numerous spikes and multiple spikes. The morphology of the discharges during 1-REM was similar to that during awake periods. Comparison of the overall pattern of sleep of these patients with nonepileptic Ss revealed no differences, indicating that the discharges had little effect on the normal sleep patterns. There was no augmentation of the behavioral or autonomic correlates of the discharges during sleep.
R 20

31,592
Jewett, W.M. PITCH VARIATIONS IN VOCODED VOICE. BuShips Subproj. SF 006 11 01, Task 7260, NRL Memo. Rep. 1699, May 1966, 30pp. USN Research Lab., ONR, Washington, D.C. (AD 634162)

In the analysis of the KY-537/U channel vocoder for the Bureau of Ships, a study was performed of the pitch variations in the vocoded digital data signal using three untrained male speakers. The results obtained have been compared to published data for the pitch perturbations in natural speech for trained speakers. The comparison indicates that statistically the variations in pitch between successive voiced vocoder frames were zero a much larger percent of the time than found in natural speech, and also that large changes in pitch occurred more often than in the reference data. This is partly the result of using a quantization interval in the vocoder that is too large to permit encoding the small pitch variations which account for most of the pitch perturbations that occur in natural speech. The extension of this work using a larger number of speakers under different stress and background noise conditions would yield data of value on the adequacy of the pitch extractor in presently designed channel vocoders, the need for speaker training, and possible constraints on vocoder use.
R 7

31,593
Williams, W.J. & Scheindlinger, S. STATISTICAL PRESENTATION OF LANDING PARAMETERS FOR MODELS F-4B, A-4C, AND RA-5C AIRCRAFT ABOARD THE USS INDEPENDENCE (CVA-62) OPERATING IN THE NORTH ATLANTIC. BuWep Task 1 22 74, Rep. NAEC ASL 1101, July 1966, 174pp. USN Air Systems Command, Department of the Navy, Washington, D.C. (USN Aeronautical Structures Lab., NAEC, Philadelphia, Penn.). (AD 489156)

A statistical analysis is made of aircraft approach and landing contact data for "carrier qualification" operations for models F-4B, A-4C, and RA-5C aircraft during the period 24-29 January 1966. The parameters are presented in the form of histograms and probability curves. Statistical values for each parameter are listed in the summary tables.
R 1

31,594
Bull, J.O., Serocki, E.L., McDowell, H.L., et al. COMPILATION OF DATA ON CREW EMERGENCY ESCAPE SYSTEMS. FINAL REPORT. Contract AF 33(615) 2378, Proj. 1362, T sk 136203, Rep. D6 60001 1, AFFDL TR 66 150, Sept. 1966, 337pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Boeing Company, Renton, Wash.). (AD 801787)

A comprehensive group of appropriate open ejection seats, encapsulated ejection seats, cockpit pod capsules, separable nose capsules, and subsystems are described. The descriptions provide information on items such as initiation, crew positioning and restraint, emergency pressurization and oxygen, seat-man separation, capsule separation, rocket motors, rocket catapults, stabilization, deceleration, recovery parachute, landing impact attenuation, flotation, location aids, and survival equipment or provisions. Information is also provided on escape system performance, tests, accelerations experienced, stability characteristics, trajectories, escape time sequence, envelope dimensions, weights, production or development status, and projected system improvements.
R Many

31,595
Smith, R.L. MONOTONY AND MOTIVATION: A THEORY OF VIGILANCE. June 1966, 44pp. Western Div., Dunlap & Associates, Inc., Santa Monica, Calif. (AD 801690)

This paper presents a motivational theory of vigilance behavior and supportive evidence for it. A brief review of existing theories and their limitations is also included. The theory is based on four assumptions and three supporting corollaries. Twenty-six predictions were derived regarding the effects on vigilance performance of 8 major variables. A ninth major variable and a number of "minor" variables are not evaluated. It is concluded that the model can easily be extended to encompass most variables known to influence vigilance performance.
R.Many

31,596
Neeland, Frances. A BIBLIOGRAPHY OF INFORMATION SCIENCE AND TECHNOLOGY FOR 1966. PART II. Contract ADI 65 1, Tech. Memo. 3008/002/00, Sept. 1966, 87pp. System Development Corporation, Santa Monica, Calif. (AD 640572)

The primary aim of this continuing bibliography is to assist the authors of the chapters in "Annual Review of Information Science and Technology" in discovering the existence or determining the identity of documents relevant to their topics. The style of entries also reflects the authors' requirements. The "abbreviations and Index for Periodicals Cited" is cumulative for parts I and II.
R Many

31,597
Webb, D.R.B. & Warren, C.H.E. AN INVESTIGATION OF THE EFFECT OF BANGS ON THE SUBJECTIVE REACTION OF A COMMUNITY. Tech. Rep. 66072, March 1966, 28pp. Royal Aircraft Establishment, Farnborough, Hampshire, England. (AD 488755)

An investigation has been made, using explosive charges as the source of the bangs, of the effect of bangs on the subjective reaction of a community. Although the Exercise had many imperfections the two main facts that emerged were that the percentage of persons annoyed became less as the bangs became an established feature of the environment, and that the exchange rate found between the effect of frequency and the effect of intensity was not inconsistent with that implied by the Noise and Number Index concept introduced by the Wilson Committee on the Problem of Noise.
R 2

31,598
Ricciardi, C.A., Kislin, B. & Rahe, A.J. THE STEREOSCOPIC ANGLE AND ITS RELATIONSHIP TO THE STANDARD AIR FORCE TESTS FOR DEPTH PERCEPTION. Proj. 7755, Task 775509, SAM TR 66 70, Aug. 1966, 20pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 640932)

The three standard Air Force depth perception tests for pilot and observer qualification are the Vision Test Apparatus--Near and Distant (VTA-ND), Verhoeff Stereopter (DPA-V), and Howard-Dolman apparatus (H-D). The stereoscopic angle (n) for the VTA-ND is 25 seconds of arc, 32 seconds for the DPA-V, and 11 seconds for the H-D. An enlarged Verhoeff (SAM-V) was utilized at equivalent calculated distances to compare with the three instruments under their individual parallactic angle conditions. Data analysis showed the following: a) Employment of the standard criteria for flying qualification resulted in the Verhoeff passing the greatest number, followed by the VTA-ND, and H-D. Neither the Verhoeff nor H-D results statistically differed from those of the VTA-ND; b) The SAM-V generally passed fewer Ss than the corresponding standard tests. The results found with the standard Air Force tests are not a full measure of depth discrimination capability. A test concept is described which would incorporate a dynamic component into depth judgments.
R 102

31,599
Rome, Beatrice K. & Rome, S.C. INFORMATION PROCESSING POTENTIALS IN LARGE-SCALE OPERATIONS. SUMMARY REPORT. Contract AF 19(628) 5166, Tech. Memo. 1128/100/00, July 1966, 40pp. USAF Office of Scientific Research, OAR, Arlington, Va. (System Development Corporation, Santa Monica, Calif.). (AD 640591)

In the study of large organizations, the information, communication, and governing processes have been extremely difficult to formulate. Towards such a formulation, the strategy of the Leviathan studies has been to pursue two lines of attack--theoretical formalization and computer-based simulation. By these means, Leviathan research has studied the interrelationships between executive policy making and control and system performance of large organizations, within experimentally controlled laboratory environments. In answer to the challenge of markedly enhanced computer capabilities just now being made available, practical and theoretical advances have been made in formalizing the communication and governing process in large organizations. These advanced formulations and their significance are explained.
R 23

31,600
Rosenheck, A.J., Abbagnaro, L.A., DiMattia, A.L. & Bauer, B.B. ACOUSTIC NOISE REJECTION AND ABSORPTION TECHNIQUES. FINAL REPORT. Contract AF 33(615) 2392, Proj. 4335, Task 433506, Rep CLD 1768, AFAL TR 66 220, Sept. 1966, 28pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (CBS Labs., Columbia Broadcasting System, Inc., Stamford, Conn.). (AD 489414)

This program was performed to determine and develop the necessary techniques for providing acoustic isolation and physical comfort for the users of full pressure and space helmets. Two helmets were fabricated to show the resultant design concepts. The helmets were made using fiberglass-foam laminated construction to give a strong structure of low weight and to offer excellent noise reduction for the wearer. Personal safety features are incorporated into the helmets for use during periods of high noise and acceleration. These features include special high attenuation ear enclosures to further isolate the wearer from the noise, and cushioning pads which protect the user from possible head injury due to high acceleration. The ear enclosures and pads are pneumatically controlled so that they are retained off the head when not needed, thereby allowing complete freedom of head movement. The helmet contains a sliding visor which is self-sealing when the helmet is pressurized. A control console was developed to pressurize the helmet and to inflate the pads and ear enclosures. Solenoid valves in the console permit electrical control of these functions. Conclusions on the performance of all the experimental devices incorporated into the helmet are given, as well as recommendations for further development work.
R 8

31,601
Control Data Corporation. DEVELOPMENT OF A FAULT INSERTION GUIDE AND INVESTIGATION OF REFRESHER TRAINING METHODS. Contract NONR 5001(00), Rep. PRM 66 3, May 1966, 29pp. USN Personnel Research Div., Bureau of Naval Personnel, Washington, D.C. (Howard Research Div., Control Data Corporation, Arlington, Va.). (AD 637860)

This research study discusses the methodology employed in developing the Fault Insertion Guide for the Fleet Submarine Training Facility, Pearl Harbor, Hawaii. The purpose of the Fault Insertion Guide is to provide information concerning the insertion of faults into the system by opening circuits through switches in the Weapons Control Subsystem simulators. Also, the Guide is to be used as a reference for developing problem cards used by instructors to train crews in responding to casualty situations.

31,602
Legg, E.D. WATER INTAKE AND RESUSCITATION EQUIPMENT FOR PROTECTIVE MASKS. FINAL REPORT. Contract DA 18 035 AMC 123(A), Projs. 1B643606D019 02 & 1B643606D019 03, Rep. UER 30, June 1966, 164pp. USA Defense Development & Engineering Labs., Edgewood Arsenal, Md. (Underseas Div., Westinghouse Electric Corporation, Baltimore, Md.). (AD 488910)

The purpose of this contract has been to develop reliable, low-cost service protective masks which will allow soldiers to drink water through these masks; and will permit resuscitating them in contaminated atmosphere without removing their masks. Drinking equipment is integral with the mask and resuscitation equipment can be attached so that the resuscitation tube is accessible to the victim's mouth. On the basis of tests so far conducted, this equipment has proven successful.

31,603
Oppenheim, J.E., Wan, G. & Cloud, P.B. XB-70A FLIGHT TEST SUMMARY REPORT. ENVIRONMENTAL CONTROL, CREW AND ELECTRICAL EQUIPMENT ENVIRONMENT AND ENVIRONMENTAL CONTROL SYSTEM (ECS) PERFORMANCE. Contract AF 33(657) 12395, NA Rep. 66 860, Oct. 1966, 386pp. USAF Aeronautical Systems Div., Wright-Patterson AFB, Ohio. (North American Aviation, Inc., Los Angeles, Calif.). (AD 800663)

The XB-70A incorporates an Environmental Control System which provides protection for the crew and the electronic equipment under all predictable normal and emergency conditions up to three times the speed of sound and flying at altitudes up to 70,000 feet and beyond. For the first time, the need for wearing protective clothing and using devices to compensate for deficiencies relative to human needs in the structural and pressurization system design is eliminated, although the critical environment in which the vehicle operates is more extreme than ever before. The ECS technology resulting from the XB-70A makes development of a triplesonic transport a practical goal. Flight test data related to the XB-70A crew, electrical and electronic equipment environments and associated environmental control systems are presented and compared with analytical predictions of performance throughout the air vehicle environmental envelope. Predicted performance is extracted from "Cabin Air Conditioning and Pressurization Analysis for the XB-70 Air Vehicle" (NA-60-736-3) and "Cabin Environmental Control Requirements and Performance Based Upon Component Laboratory Tests for the XB-70A Air Vehicle" (TFD-65-70). A general description of instrumentation and data reduction procedures and a section on total temperature are included in addition to the environmental discussions of: a) the crew compartment; b) cabin electrical and electronic equipment; c) cabin environmental control system; d) AICS package; e) flight test package; and f) remote electrical and electronic equipment.
R 32

31,604
Draddy, J.M. A STUDY OF CERTAIN MOTIVATIONAL PATTERNS IN THE UNITED STATES NAVY SUBMARINE SERVICE. (M.S. Thesis). Aug. 1966, 165pp. USN Postgraduate School, Monterey, Calif. (AD 489802)

One thousand and sixty-nine questionnaires from officers and men of 44 submarines of the U.S. Atlantic and Pacific Fleets were analyzed to determine existing motivations for service in the Navy and in submarines, and to compare the level of perceived need satisfactions with perceived need importance. Significant differences between the motivational patterns of officers and enlisted men were discovered, with the officers generally more "job motivated" than the enlisted. The implications of pay as a "motivator" were discussed. Minor differences were found among the sub-populations of the enlisted sample, primarily among different types of submarines. The fleet ballistic missile submarine group appeared to be the most highly "job oriented" and the diesel electric group the most "group or boat oriented." The nuclear attack submarine group appeared to be the least satisfied of the three submarine groups. The most significant deficiency perceived by all enlisted groups was the lack of trust and authority granted them for independent judgments and actions.
R 26

31,605
Weiss, M. A STUDY OF CRITICAL-INSTANT SAMPLING OF SPEECH PARAMETERS FOR AUTOMATIC RECOGNITION OF SPOKEN WORDS. FINAL REPORT. Contract AF 30(602) 3519, Proj. 4027, Task 402704, FSC Rep. T 1/141, RADC TR 65 371, July 1966, 148pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Federal Scientific Corporation, New York, N.Y.). (AD 638380)

A study has been made to advance the development of a general and practical procedure for automatic recognition of spoken words. Two major problems were studied: variations in parameter values of speech due to variations in speech characteristics of different talkers, and due to variations in the duration of spoken words. Included in this study was an analysis of the means and standard deviations of formant frequencies made for a group of 20 talkers, each saying a list of 30 words two times. A range of standard deviations of from 5 percent of the mean formant frequency to 50 percent was observed. For the first time, statistical information has been obtained on the spectra of fricative sounds. One of the serious problems inherent in most techniques of automatic recognition of speech is that of time normalization, since words or parts of words normally are spoken with different durations. A new technique has been investigated which avoids many of the problems of time normalization. Word patterns which are independent of word durations were generated using critical-instant sampling of the speech data. Recognition tests using these patterns were made to evaluate the relative significance of different critical instants. The results obtained indicate that critical-instant sampling provides effective and efficient patterns on which a general spoken-word recognition procedure may be based.
R 22

31,606
Hirsch, A.E. EFFECTS OF OVERPRESSURE ON THE EAR. Subproj. S F015 14 04, Rep. 2252, Aug. 1966, 11pp. USN David Taylor Model Basin, Naval Ships System Command, Washington, D.C. (AD 640921)

Tolerance levels of the human ear to various types of overpressures are discussed.
R 16

31,607
Dille, J.R. & Morris, E.W. HUMAN FACTORS IN GENERAL AVIATION ACCIDENTS. Rep. AM 66 27, July 1966, 7pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 640971)

Aviation Medical Examiner participation in accident investigation has increased rapidly. There has been 100% coverage the past 2 years in the Southwest Region. The goal is medical investigation of all aircraft accidents with serious or fatal injuries to: a) determine if human factors were primary or contributory causes of each accident; b) establish the cause of death; c) study injuries and correlate them with structure, equipment, and safety devices and recommend human engineering design improvements when indicated; and d) identify the victims. The results of this program the past year in the 9 states in the Western Region have been reviewed and tabulated for this report.
R 6

31,608
Dysinger, D.W. MOTIVATIONAL FACTORS AFFECTING ARMY RESEARCH AND DEVELOPMENT PERSONNEL. Contract DA 49 092 ARO 32, DA R&D Proj. 2J024701A722, Tech. Res. Rep. 1149, May 1966, 70pp. USA Personnel Research Office, OCRD, Washington, D.C. (American Institutes for Research, Washington, D.C.). (AD 640390)

Effective personnel management of civilian employees in the Army is hampered by a number of recurring problems. The Military Selection Research Laboratory, U.S. Army Personnel Research Office, has monitored research contracts on three pressing problems concerning a) determinants of job content for civilian executives, b) motivation factors for civilian scientists, and c) local factors affecting selection of first-line supervisors. The present study, conducted by the American Institutes for Research, deals with the second of the three problems and seeks to determine the factors in the individual research scientist and in the work environment in Army Research and Development (R&D) laboratories which contribute to positive and to negative motivation on the part of the civilian research staff. The study was begun in the summer of 1964 when approximately 600 R&D scientists and engineers from 12 Army installations were asked to describe specific events and conditions in work experience and environment that had had positive or negative effect on their job attitudes. A checklist, based on the incidents collected, was constructed and administered to a larger sample of the same population (N=4,000) in GS Grade 11 and higher during March and April 1965. In analyses of the checklist data, relationships between job events leading to work satisfaction or dissatisfaction and individual characteristics were examined. Design of the study, development of the questionnaire, analysis of respondents' information, and resulting conclusions are reported in detail. Findings of the study and their implication for practicable solution of R&D civilian personnel management problems have been transmitted to the primary sponsoring agency (DCSPER) and other interested Army organizations.
R 6

31,609
Carpenter, J.A. & Richey, E.O. EVALUATION OF TWO PERCENT GOLD VISOR. DASA Projs. 6301 & 5710, Task 630103, Subtask 03.003, SAM TR 66 71, Aug. 1966, 4pp. USAF School of Aerospace Medicine, Aerospace Medical Div., Brooks AFB, Tex. (AD 638623)

A flight evaluation was conducted to determine if use of the 2% gold visor in daylight hours degraded performance of flight duties. Thirteen TAC instructor pilots flew 17 sorties, representative of TAC mission profiles, in the F4C aircraft at Davis-Monthan AFB, Arizona. Slightly diminished vision under cloudy conditions was experienced by some individuals. Satisfactory completion of the missions was accomplished, however. The 2% gold visor is recommended for use in TAC aircraft during daylight hours for eye protection from nuclear detonations.

31,610
Laubach, L.L. & McConville, J.T. RELATIONSHIPS BETWEEN FLEXIBILITY, ANTHROPOMETRY, AND THE SOMATOTYPE OF COLLEGE MEN. Res. Quart., May 1966, 37(2), 241-251. (Antioch College, Yellow Springs, Ohio). (Reprint) (AD 638282)

Fourteen flexibility measurements, 63 direct and derived anthropometric measurements, and the somatotypes of 63 college men, mean age of 19.0 years, were obtained in order to assess the relationships between flexibility and anthropometric measurements, anthropometric measurements and somatotypes, and flexibility and somatotype. The correlations between the flexibility measurements and the anthropometric measurements were low and mostly insignificant. Body fat, as measured by skinfold calipers, yielded fairly high significant negative correlations with the flexibility measurements. The correlations between the flexibility measurements and somatotype were insignificant. Generally high correlation coefficients were obtained between the anthropometric measurements and somatotype.
R 25

31,611
London, S.A., West, A., Kitzes, G., Slonim, A.R., et al. EVALUATION OF FUEL CELL WATER FOR HUMAN CONSUMPTION. FINAL REPORT. Contract AF 33(657) 11716, NASA Defense PR R 85, Proj. 7164, Task 716410, AMRL TR 66 141, Nov. 1966, 19pp. Manned Spacecraft Center, NASA, Houston, Tex. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio). (AD 652495)

Water obtained from a hydrogen-oxygen fuel cell was subjected to chemical, organoleptic, and microbiological analyses and found to be acceptable according to the U.S. Public Health Service Standards. To ascertain the acceptability of this water, eight male subjects were confined to a self-care unit at Miami Valley Hospital, Dayton, Ohio, for a 2-week period and served a controlled 4-meal-per-day diet, low in water content. A minimum of 2 liters per day of either distilled water or fuel cell water was drunk by the subjects as follows: two subjects were served distilled water for 2 weeks, serving as controls; four were served fuel cell water for 2 weeks; and two were served fuel cell water for one week, followed by distilled water for the second week. Twenty-four hour surveillance of the subjects was maintained. They were examined by a physician at least once daily; daily urinary and periodic blood samples were taken for routine laboratory examination. The subjects showed no clinical symptoms at the end of the test period, and the fuel cell water was found to be as acceptable as distilled water in constituting part of a daily diet for the 2-week period.
R 1

31,612
Hooprich, E.A. & Steinemann, J.H. A REVIEW OF ELECTRONICS TRAINING RESEARCH LITERATURE. Tasks PF 017030303 & PF 017032104, Tech. Bull. STB 67 1, Aug. 1966, 23pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 638681)

The Navy Training Research Laboratory, while conducting research directed toward the advancement and improvement of Navy training, has endeavored to keep abreast of current developments in training technology. The present review of electronics training literature is designed to augment and update information obtained from a previous evaluative survey of military and civilian electronics training programs. The review is based primarily on available research reports published during recent years and pertaining to the training of electronics personnel in the military services. Five major areas of electronics training research are considered in the review: troubleshooting approaches and trainers, maintenance manuals and other job aids, training course variables, experimental electronics training courses, and training evaluation. General trends in electronics training research are noted, and their relationship to the findings of the previous evaluative survey is discussed.
R 37

31,613
Gogel, W.C. & Mertens, H.W. PROBLEMS IN DEPTH PERCEPTION: PERCEIVED SIZE AND DISTANCE OF FAMILIAR OBJECTS. Rep. AM 66 22, June 1966, 17pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 641477)

Judgments of the distance of familiar objects, especially other aircraft, are critical aspects of flight safety. In this study, the perception of distance as a function of the retinal size of a familiar object was investigated by simulating a stationary or a radially moving playing card in an otherwise dark visual field. When different observers were first presented with the different sizes of the stationary object, a relation between retinal size and perceived distance occurred only if perceived size was taken into consideration and only for the largest two of the three retinal sizes used. It seems that familiar size was a cue to perceived absolute distance when the simulated distances were approximately 3 feet or less, but not approximately 6 feet from the observer. Judgments of the distance of subsequent static presentation of cards, while usually more veridical than first presentation, were found to be dependent upon distance judgments made in the prior presentations. The importance of interactions between presentations or within changing presentations was reflected in the modifications of the dynamic adjustments that resulted from using different starting sizes. The results from this experiment support the view that relational distance cues occurring between successive or sequential presentations are dominant over absolute distance cues occurring with respect to a single object.
R 13

31,614
Longo, A.A. & Mayo, G.D. AN EXPERIMENT IN BASIC AIRBORNE ELECTRONICS TRAINING. PART 1, EFFECT OF REDUCTION IN TRAINING TIME UPON KNOWLEDGE OF ELECTRONICS FUNDAMENTALS. FINAL REPORT. Task PF 017034002, Tech. Bull. STB 67 3, Aug. 1966, 10pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 638439)

This is the first in a series of reports on a longitudinal study pertaining to the question of whether training time can be reduced in basic airborne electronics training through judicious revision of the course. This report compares the relative performance of two matched groups of 154 trainees each, on the basis of a comprehensive examination of knowledge of electronics fundamentals upon completion of the regular course (19 weeks of instruction) and the revised course (14 weeks of instruction). The results indicated that the course reduction of the size undertaken (26%) resulted in less knowledge on the part of the personnel receiving the shorter course, despite the best efforts of experienced training personnel who designed and implemented the shorter course. The difference between the two groups was statistically significant at the .01 level.

31,615
Green, T.H. DISCUSSION OF THE UTILITY OF AVAILABLE TECHNIQUES FOR MEASURING AIRCRAFT NOISE AND PREDICTING COMMUNITY RESPONSE. FINAL REPORT. Proj. 430 001 01R, Rep. RD 66 31, May 1966, 15pp. US National Aviation Facilities Experimental Center, FAA, Atlantic City, N.J. (AD 638491)

Perceived Noise Level (PNdB), a technique for measuring aircraft noise, is calculated from measured noise levels and correlates very well with subjective judgments in terms of annoyance and noisiness. The discussion considers the effects of physical laws and environmental factors which attenuate, both predictably and variably, the sound pressures reaching the ground. The effects of psychological factors which influence subjective judgments are also discussed. It is suggested that the effect of these factors is such that Perceived Noise Level is of useable precision and additional refinement would be superfluous. The procedure for predicting community response to airport operations using Composite Noise Ratings is discussed. Actual measurement of aircraft noise is not required. Noise contours of aircraft operations exist, and these are used in conjunction with airport operations data in a simplified procedure to derive a prediction of community response. In an effort to improve the sensitivity of the prediction process to local conditions, a separate study was made of the decision-making process on the municipal level. A definitive pattern could not be discerned and it was concluded that the existing predictive procedure cannot be made more sensitive to community reaction at this time.
R 15

31,616
Phillips, C.B. TESTING OF MASKED LAMPS IN TAXIWAY EDGE LIGHTS. FINAL REPORT. Proj. 430 207 01X, Rep. 66 44, July 1966, 12pp. US National Aviation Facilities Experimental Center, FAA, Atlantic City, N.J. (AD 638492)

This report contains the results of technical tests performed to investigate the use of masked lamps in taxiway edge lights. These lamps were tested to determine if there were advantages in their use over the ones now being used. The masked lamps were superior for use on the straight portions of the taxiway and on curves where at least three lamps were visible. They were also superior in that they reduced off-taxiway light to a minimum.

31,617
Engle, G.L. & Temple, W.J. COMPUTER ASSISTED INSTRUCTION: A SELECTED BIBLIOGRAPHY AND KWIC INDEX. NWL Tech. Memo. K 49/66, Aug. 1966, 50pp. USN Weapons Lab., Bureau of Naval Weapons, Dahlgren, Va. (AD 638892)

This technical memorandum provides an annotated bibliography, referenced by a Key Word In Context (KWIC) index, to selected articles on Computer Assisted Instruction.
R 155

31,618
Kaplan, I.E. THE PROJECTED EFFECT OF AUTOMATION ON FUTURE NAVY PERSONNEL REQUIREMENTS. PART I: SPECIFIC IMPLICATIONS FOR THE PERSONNEL STRUCTURE. FINAL REPORT. Task PF 016020401, Res. Memo. SRM 67 3, Aug. 1966, 18pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 638721)

Part I presents implications of industrial and naval automation for the Navy's human element. Consideration is given to the imminent possibility that the Navy will be required to provide a place for many personnel who cannot find employment in civilian industry, and discussion is also provided on the latter problem of the automated society as a source of naval manpower. The qualitative personnel requirements of a "fully" automated Navy are discussed and the manpower requirements of such a Navy are estimated in tabular form. A projected schedule for the advent of naval automation is omitted as the variables involved are too difficult to predict with any acceptable degree of validity.

31,619
Kaplan, I.E. THE PROJECTED EFFECT OF AUTOMATION ON FUTURE NAVY PERSONNEL REQUIREMENTS: PART 2. IMPLICATIONS FOR THE NAVY'S ENVIRONMENT, THE NATION. FINAL REPORT. Task PF 016020401, Res. Memo. SRM 67 3, Aug. 1966, 63pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 638720)

The single technological contemporary contribution which will have the greatest effect on the contemporary civilization is the microelectronic revolution. Microelectronic techniques will result in electronic systems and equipments which will be much smaller, will use less power, will be extremely reliable and maintainable, will be producible by automated methods and will therefore by very inexpensive. The great reliability and very low cost of microelectronic circuitry will lower the costs of commercial and industrial computers to a point at which industry will find it competitively necessary to automate. Since any process which can be systematized, however loosely, is subject to cybernetic control and since the pressure of competition will force industry to do so, it is anticipated that most of industry will be automated within a short time. A time frame for the industrial changeover to automation is presented. The broad implications of automation for industry, the economy, the individual, the culture, and education as they will affect the Navy are discussed.
R 195

31,620
Conner, R.D. & Colvin, R.L. COMPUTERIZED TRAINING INPUT PLAN FOR NUCLEAR POWERPLANT OPERATIONS. PROGRESS REPORT. Proj. PF016010904, SRR 66 22, June 1966, 52pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 638891)

This report describes the development and application of a computerized model for planning a continuous, sufficient input to the Basic Nuclear Power School, Class C. The Navy Enlisted Classification (NEC) code assigned to personnel designated for this school is 9901; hence, this model is referred to as the "9901 planning model." This model considers four different sources of student input, and their associated attrition rates, and programs the personnel into the school over a period of 22 calender quarters (66 months). The model, which automates all aspects of the 9901 planning procedures, will not only relieve the present computational burden and eliminate calculation errors, but also will provide results earlier in the planning period, thus permitting the testing of many more policy alternatives than is possible under current procedures.
R 6

31,621
Gunderson, E.K.E. & Kapfer, E.L. THE PREDICTIVE VALIDITY OF CLINICAL RATINGS FOR AN EXTREME ENVIRONMENT. Brit. J. Psychiat., April 1966, 112(485), 405-412, (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery. San Diego, Calif.). (Reprint) (AD 638890)

Approximately 600 Navy and scientist participants in seven exeditions of the U.S. Antarctic Research Program were examined independently by psychologist and psychiatrists and rated on personality trait scales. The clinical ratings were correlated with performance measures derived from evaluations by station supervisors and peers after approximately one year at an Antarctic scientific station. Assessment conditions varied in terms of methods of clinical appraisal (Rorschach and interview), amount of instructions given examiners, and variance in quality of performance. Validities were consistently non-significant for psychologists using the Rorschach technique; both psychologists and psychiatrists achieved significant validities utilizing a flexible interview procedure, even though criterion variance was relatively small. Predictions were most effective when examiners received most information concerning assessment objectives and the Antarctic environment.
R 15

31,622
Baldwin, H.A., Morrison, E.L., Jr. & Brown, R.L. STUDY AND DEVELOPMENT OF MUSCLE SUBSTITUTES. FINAL REPORT. Contract AF 33(615) 1232, AFAL TR 66 139, May 1966, 43pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Sensory Systems Laboratory, Tucson, Ariz.). (AD 634187)

The investigations in the current program concern the application of the low pressure contractive "muscle-like" devices to electrical power generation, peristaltic pump action, and a single function electromyograph control system. Design studies indicate typical operational characteristics for the cited device applications. Predicted pump and generator power transfer efficiencies indicate no direct advantages when compared to current systems. Areas of utility for the contractive devices in limited control functions are indicated.
R 17

31,623
Borko, H. UTILIZATION OF ON-LINE INTERACTIVE DISPLAYS. Report from: "Third Congress on Information System Science and Technology, Buck Hill Falls, Pennsylvania, November 20-23, 1966." Rep. SP 2575, Aug. 1966, 32pp. System Development Corporation, Santa Monica, Calif. (AD 640652)

The versatility and advantages of using on-line interactive displays are illustrated by examples from: a) the General Purpose Display System (GPDS), b) the Pattern Learning Parser (PLP II), and c) the Bibliographic On-Line Display System(BOLD). Although these systems are designed for different purposes they all utilize displays as communication channels by which the man and the machine are able to engage in a dialog and work together to solve problems. The computer processes data rapidly and displays the results. The information provided in the displays enables the user to steer and control the step-by-step progress of the program. Not only are problems solved more efficiently, but the users are more satisfied by the results achieved.
R 8

31,624
Burse, R.L. HUMAN FACTORS REQUIREMENTS FOR THE DESIGN OF HELICOPTER AIRCREWMEN'S SEAT AND GROIN PROTECTIVE UNITS. Proj. 1C024701A121 02, Tech. Rep. 67 28 PR, Res. Study Rep. EPR 11, Sept. 1966, 7pp. USA Natick Labs., Natick, Mass. (AD 640891)

The most important human factors requirements for the design of rigidly armored seat and groin protective units for the seated helicopter aircrewman are discussed. Included are requirements for preventing interference with mission performance, reducing fatigue and providing a compatible, safe and somewhat comfortable working environment for the fully-equiped aircrewman. Quantitative design criteria for dimensions, contours, cushioning and location of the seat and groin protective units are specified.
B 3

31,625
Cantrell, G.K., Sims, L.S., Jr. & Hartman, B.O. FACTORS IN JOB-SATISFACTION. Task 793003, SAM TR 66 46, May 1966, 34pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 637861)

A 44-item questionnaire, covering 28 management problem areas, was administered to personnel at 20 different maintenance units in the Far East, Europe, and the Continental United States. Completed questionnaires from 2,122 airmen were used to evaluate the relationship between each problem area and job-satisfaction. The analysis showed that job-satisfaction is most affected by those problems that could be controlled or corrected by the immediate supervisors and least affected by those problems which have to be solved at levels farther up the chain of command. Supporting evidence was obtained from interviews and a special psychiatric study.
R 1

31,626
Spencer, V.H., Price, H.E., Siciliani, F.A., Howard, W.J., et al. TRANS-ATTACK AND POST-ATTACK COMMUNICATION REQUIREMENTS FOR FIRE FIGHTING OPERATIONS AND CONTROL. FINAL REPORT. Contract N228(62479)69222, Work Unit 2523F, Tech. Rep. 33 66 19, NRDL Rep. TRC 50, June 1966, 171pp. USN Radiological Defense Lab., Bureau of Ships, San Francisco, Calif. (Serendipity Associates, Chatsworth, Calif.).

A systems analysis was conducted to determine the trans-attack and post-attack communications requirements for fire-fighting operations and control during a hypothetical nuclear attack on a metropolitan area. Communications functions within the metropolitan fire department were derived and, insofar as possible, the interdepartmental communications functions with interacting agencies in the disaster network. The types of information communicated, and the volume and frequency of messages were delineated. From these data a traffic model was developed and queuing theory was applied to evaluate the effects of specific communications and organizational parameters against traffic criteria. It was concluded that: a) for large attacks the communication requirements are a function of the number of fire-fighting units rather than the number of fires; b) three channels of communication are adequate to serve approximately 200 fire-fighting units if only significant information is communicated, and if the through channels are shared; c) redundant communications can be reduced by decentralizing decision centers in the fire department organizational structure.
R 27

31,627
Dressler, R.F. NEW APPROACH TO AIR SAFETY STATISTICS. Report from: "International Flight Safety Seminar, Madrid, Spain, Nov. 1966." 1966, 56pp. US Federal Aviation Agency, Washington, D.C.

There are in common usage various alternative ways of computing safety rates for air travel, e.g., fatalities or accidents expressed per passenger-mile, per flight-hour, per flight-mile, etc., but each of these methods attempts to describe the risk statistics by only one rate. It is our purpose here to show that any single number, no matter upon what basis computed, is logically insufficient for an adequate analysis of air safety; a meaningful and revealing evaluation requires at least three independent rates. This could be stated precisely by saying that the risk potentiality for air travel is representable as a point in 3-space, and hence a system of three orthogonal base-vectors must be constructed in order to span that space.
R 10

31,628
Fry, D.E., Burden, K. & Green, M.R. THE DESIGN AND FLIGHT TESTING OF A TAKE-OFF AND OVERSHOOT DIRECTOR. Tech. Rep. 66083, March 1966, 61pp. Royal Aircraft Establishment, Farnborough, Hampshire, England. (AD 637944)

The object of the work described in this Report has been to assess a particular type of control law for a take-off and overshoot director. The basic law is simple and only two internal sensors are used. A twin-seat Hunter incorporating a dual head-up display system was used for the flight trials. Several versions of the director were built, flight tested and results analysed. Detailed description of the computer is given. The results indicate that the system could well form the basis for a complete take-off director.
R 5

31,629
Curtin, J.G. & Emery, J.H. A HELICOPTER FLIGHT EVALUATION OF A HEAD-UP DISPLAY. Contract NONR 4429(00), JANAIR TR D228 420 010, Feb. 1966, 57pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Bell Helicopter Company, Fort Worth, Tex.). (AD 640598)

The purpose of the study was to determine the feasibility of using the Computing Devices of Canada, Ltd. Spectocom Head-Up Display in a helicopter for instrument landing approaches. This study was performed by the Bell Helicopter Company under Office of Naval Research Contract NONR 4429(00) with direction by the Joint Army-Navy Aircraft Instrumentation Research Steering Committee. The study was performed in 2 phases. The first phase examined IFR landing approach performance with the display in the fixed-wing design configuration. No other flight displays were presented. The second phase examined the same maneuver with the display augmented with heading information. Test conditions included: full VFR, simulated intermittent IFR and simulated full IFR. The test vehicle was an Army OH-13K Bell helicopter. Six rated and highly experienced helicopter pilots participated as test Ss. Results indicated that, when the display was used in the configuration designed for fixed wing, lateral flight path control was poor and IFR landing approaches were unacceptable. When heading information was added satisfactory approaches were made to a "break-out" altitude of 100 feet.
R 7

31,630
Curtin, J.G., Emery, J.H., Elam, C.B. & Dougherty, Dora J. FLIGHT EVALUATION OF THE CONTACT ANALOG PICTORIAL DISPLAY SYSTEM. Contracts NONR 4429(00) & NONR 1670(00), JANAIR TR D228 420 009, Feb. 1966, 161pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Bell Helicopter Company, Fort Worth, Tex.) (AD 640597)

The work reported in this document represents a series of flight test evaluations of a vertical flight display or contact analog. It was conducted by Bell Helicopter Company under the sponsorship of the Joint Army Navy Aircraft Instrumentation Research (JANAIR) Program. Three experimental flight tests were conducted in the JANAIR flight test vehicle which was a UH-1 helicopter known as Research Helicopter Number 2 (RH-2). The first study evaluated the vertical display containing the basic grid plane plus a ground position indicator. The hover flight mode was the test maneuver. Four types of control stabilization were tested with the display with varying degrees of control sensitivity. The second study examined the basic grid plane with and without a director symbol in the form of a flight pathway. Speed indices were presented on the pathway in the form of tarstrips and speed markers. During cross-country flight maneuvering, a ground position indicator defined final touch-down position. Only one flight stabilization mode was tested. The flights were comprehensive in their coverage of the spectrum of basic flight maneuvers. The final investigation was designed to determine the usefulness of augmenting the display components (horizon line and basic grid plane) with a TV presentation superimposed upon the vertical flight display. Several flight modes were investigated. The experimental results are reported and discussed for each of these studies.
R 5

31,631
Hunt, E.B. UTILIZATION OF MEMORY IN CONCEPT LEARNING SYSTEMS. Report from: "Second Annual Carnegie Institute of Technology Symposium on Cognition, April 7-8, 1966." Contract NONR 233 (75), Task 047 041, Working Paper 99, April 1966, 48pp. Western Management Science Institute, University of California, Los Angeles, Calif. (AD 634483)

As part of a series in artificial intelligence experiments, four different computer programs for concept learning were tested on five problems of varying complexity. The amount of information which a program could store while solving the problem was varied independently. Program performance could be described as a function of the location of a given study in an abstract space defined by problem complexity and the amount of memory available. The results were discussed in terms of previous work on concept learning and for their implications in the general fields of artificial intelligence and the psychology of human learning.
R 15

31,632
Hunt, E.B. COMPUTER SCIENCE DEVELOPMENTS RELEVANT TO PSYCHOLOGY. Contract NONR 233(75), Task 047 041, Working Paper 104, Aug. 1966, 33pp. Western Management Science Institute, University of California, Los Angeles, Calif. (AD 638853)

The application of computers in Psychology can be divided into 3 broad areas: mathematical computation, file manipulation, and on-line control of experimentation. New languages and better computing techniques will make the first area of application much easier. On-line consoles permitting rapid access to the computer will largely replace the present day desk calculators used in many psychological data processing problems. The use of electronically stored files will make record searching and screening much easier. The most interesting new applications, however, will be in the area of on-line control of experments by man-machine interaction. The developments in computer science which make these applications possible are discussed in some detail. In addition, there are conceptual developments in computer science, particularly in the study of artificial intelligence, which may provide leads in the development of psychological theory.
R 27

31,633
Heininger, H.G., Jr. A SYSTEMATIC METHOD FOR DETERMINING THE BEST ALTIMETER DISPLAY FOR HIGH PERFORMANCE AIRCRAFT. (M.E.A. Thesis). Feb. 1966, 181pp. George Washington University, Alexandria, Va. (AD 638318)

The display of altitude information has long been a very serious problem to both military and civil aviation. Current operational requirements established the need to replace the altimeters of all military aircraft as part of the AIMS Program. A systematic methodology was developed to determine the best existing circular display for retrofit in all high performance aircraft. The methodology was implemented by conducting static and dynamic laboratory testing at the Naval Research Laboratory and in-flight testing at the Naval Air Test Center, Patuxent River, Maryland. The results of the testing were thoroughly analyzed and presented to the Air Force and the Navy. As a result, the Air Force and the Navy standardized upon the counter-drum-pointer altimeter display which should save approximately $20,000,000 in procurement, logistics, and maintenance costs. The display should also reduce the number of aircraft accidents caused by altimeter reading errors. The methodology was further refined and extended so that it can be utilized in future flight display developments and evaluations.
R Many

31,634
Glass, J.M. SMOOTH-CURVE INTERPOLATION: A GENERALIZED SPLINE-FIT PROCEDURE. INTERIM REPORT. Contract AF AFOSR 24 65, Proj. 9769 02, AFOSR Rep. 67 0728, 1966, 17pp. USAF Office of Scientific Research, OAR, Arlington, Va. (School of Engineering & Science, New York University, University Heights, N.Y.). (AD 652437)

A method is presented for finding the smoothest curve through a set of data points. "Smoothest" refers to the equilibrium, or minimum-energy configuration of an ideal elastic beam constrained to pass through the data points. The formulation of the smoothest curve is seen to involve a multivariable boundary-value minimization problem which makes use of a numerical solution of the beam non-linear differential equation. The method is shown to offer considerable improvement over the spline technique for smooth-curve interpolation.
R 10

31,635
Gold, B. WORD-RECOGNITION COMPUTER PROGRAM. Contract DA 36 039 AMC 03200(E), Grants NSF GK 835, NIH 5 P01 MH 04737 06, & NASA NsG 496, DA Proj. 200 14501 B31F, Tech. Rep. 452, June 1966, 36pp. USA Electronics Command, Fort Monmouth, N.J. (Electronics Research Lab., Massachusetts Institute of Technology, Cambridge, Mass.). (AD 634304)

A word-recognition computer program has been designed and tested for a vocabulary of 54 words and a population of 10 male speakers. The program performs the functions of segmentation, measurements on the segments, and decision making. Out of the 540 words, 74 were incorrectly classified by the program.

31,636
Glaser, R. & Klaus, D.J. A REINFORCEMENT ANALYSIS OF GROUP PERFORMANCE. Psychol. Monog.: gen. & appl., 1966, 80(13), 1-23. (American Institutes for Research, Washington, D.C.). (Reprint) (AD 640624)

Two studies investigated response feedback and reinforcement contingencies occurring in a "team environment." Study I investigated 3-man series teams under conditions of response acquisition, extinction, spontaneous recovery, reacquisition and reextinction. Feedback to team members was based solely on group output. The results suggest team performance can be manipulated using methods which effectively control the behavior of individual organisms. Study II investigated 3-man parallel teams in which a reinforced team response could occur as a function of correct responding by only part of the team. With continued reinforced practice, performance degraded to a level equal to or below initial team performance. These findings are analyzed in terms of an operant conditioning model of team performance.
R 3

31,637
Gillingham, K.K. A PRIMER OF VESTIBULAR FUNCTION, SPATIAL DISORIENTATION, AND MOTION SICKNESS. Aeromedical Review 4 66, June 1966, 80pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 637943)

This is a review of the vestibular function, proprioceptive function, spatial disorientation and motion sickness and their effects on flying.
R 4

31,638
Fox, J.G., Ferguson, I. & Andrew, I.D.C. AN ANNOTATED BIBLIOGRAPHY OF PRESENTATION OF INFORMATION IN AIRCRAFT COCKPITS. MOA Proj. PD/28/030, S&T Memo. 3/66, COa Memo. M&P 73, May 1966, 78pp. Ministry of Aviation, Essex, England. (College of Aeronautics, Cranfield, England). (AD 634575)

The aims of the bibliography are to present: a) a comprehensive list of titles relevant to all aspects of presenting information to pilots; b) a commentary on research publications directly relevant to cockpit instrument design; this is done at two levels: (1) by means of an abstract when only that was available, (2) by a review when the actual publication has been read; c) a general survey of the direction where future research efforts might be applied. In the preparation of this bibliography only data which has been published after 1940 has been considered.
R Many

31,639
Vogel, J.A., Hansen, J.E. & Hannon, J.P. HEMODYNAMIC ALTERATIONS IN HUMANS AND ANIMALS DURING CHRONIC HIGH ALTITUDE EXPOSURE. Report from: "Army Science Conference, West Point, New York, 14-17 June 1966." June 1966, 419-432. USA Medical Research & Nutrition Lab., Fitzsimons General Hospital, Denver, Colo. (AD 634647)

It is concluded from these studies that the heart and circulation are capable of meeting the demands of oxygen delivery during heavy work at altitudes up to 14,000 ft. There was no evidence of any deleterious effect on the circulatory system nor of any reduced efficiency in the heart's action. Even though maximum performance is reduced at this elevation, it does not appear that the heart and circulation are responsible. Lastly, it can be recommended that gradual ascent to high elevation will be definitely advantageous from the standpoint of the cardiovascular system since it will significantly reduce the work load imposed upon the heart, particularly during the early stages of acclimatization when other problems such as pulmonary edema and altitude sickness are most apt to be prominent.
R 11

31,640
Lane, N.E., Oberman, A., Mitchell, R.E., Graybiel, A. THE THOUSAND AVIATOR STUDY: SMOKING HISTORY CORRELATES OF SELECTED PHYSIOLOGICAL, BIOCHEMICAL, AND ANTHROPOMETRIC MEASURES. NASA Order R 136, BuMed Proj. MF022.03.02 5007.11, NAMI Rep. 961, April 1966, 12pp. USN Aerospace Medical Institute, Pensacola, Fla. (AD 634612)

The Pensacola Thousand Aviator Study began in 1940 with the examinations of 1056 student aviators and flight instructors on a variety of physiological, psychological, and socioeconomic parameters. Follow-up examinations on the group were conducted in 1951, 1957, and 1963. During the 1963 follow-up, smoking history information on 675 Ss was obtained by questionnaire and confirmed by interview, together with concurrent data from clinical examinations, laboratory tests, anthropometry, and personal history variables. Two smoking variables were created, Cigarette Amount (CA) and Cigarette Years (CY), each on a scale of 1 to 5 points. From the concurrent data, 62 variables were selected for relevance and general interest to be examined in relation to smoking. Twenty-four of the 62 variables had significant correlations ($p < .05$) with CA, and 16 showed significant relationships to CY. Findings are related briefly to previous research, and problems of cause-effect isolation are mentioned. It is concluded that results in general support previous findings on smoker-nonsmoker differences. Contributions of the study in delineating areas of research for longitudinal investigation are discussed.
R 33

31,641
Fiske, D.L. THE MET AND THE CLO: PART 1. RESTATEMENT OF THE ORIGINAL DEFINITIONS. DA Proj. 60308200, Tech. Rep. 66 21 CM, MR&E Rep. 66 2, May 1966, 7pp. USA Natick Labs., Natick, Mass. (AD 634271)

The definitions of the met (50 Kcal/m^2 hr = 18.5 Btu/ft^2 hr) and the clo (5.55 Kcal/m^2 hr °C = 1.14 Btu/ft^2 hr °F), as derived from the original paper (1941) by the 3 physiologists Gagge, Burton, and Bazett, are discussed in terms familiar to heat transfer engineers. The number of the clo required, n, is stated as a function of the temperature, t; (in °F), by the equation: $n = 0.0814\ (92-t) - 0.792$. This gives a value of n of 1.0 at t = 70°F.
R 2

31,642
Friedman, H.S. & Ratliff, F.R. FOREIGN DEVELOPMENTS IN PROSTHETICS. AMD Proj. 7756, Task 718407, AMD CR 01 4 66, June 1966, 62pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 634766)

The Soviets are gaining considerable experience in the broad field of alloplasty, as well as in the design, construction, and application of equipment for artificial circulation, oxygenation, hypothermia, and hemodialysis. In the latter areas they seem to be suffering from a lack of technical and professional competence, as well as from poor materials and construction technology. The Soviets have introduced two new designs for the construction of artificial heart valves, a teflon-flap type and a segmented spherical model. Both of these deserve long-term clinical evaluation. Soviet technology in prosthetics development, particularly in the area of orthopedic appliances, is now firmly based on principles of biochemical, biophysical, and bioenergetic control. Achievements in this area include biostimulators for physiotherapeutic applications, as well as for long-term developments in training and performance of various tasks, as in aerospace operations, through remote use of bioelectric control systems. Greatest Soviet advances have been made in the design and construction of bioelectrically controlled prostheses for both upper and lower extremities. The ease of operation of even these prototypes is in sharp contrast to the fatiguing use and extensive training requirements of most current conventional prostheses.
R 90

31,643
Clapp, L.C., Jacobson, R.V., Jordan, D.E. & Wax, Ellen J. A STUDY OF CONVERSATIONAL ON-LINE INTERACTION IN MAN-MACHINE WAR GAMING. FINAL REPORT. Contract NONR 4861(00), Proj. J 102, Rep. R102 4, Aug. 1966, 74pp. USN Information Systems Branch, ONR, Washington, D.C. (Computer Research Corporation, Newton, Mass. (AD 640057)

This report describes the results of a study of war gaming using on-line interaction between man and computer. The study concludes that analysis and war gaming capabilities can be increased significantly using a time-sharing computer system with appropriate software and remote-access terminals. A system concept called CONSORT (CONversational System with On-Line Remote Terminals) is described, and specifications are given for a user-oriented, conversational language, JOSL, which is designed specifically for simulation and analysis applications. CONSORT includes an automated data library, computer programming management features, and the capability to operate computer programs written in languages other than JOSL. Computer-aided manual gaming using CONSORT is described.
R 13

31,644
Peterson, G.E. STUDIES IN SPEECH ANALYSIS AND SYNTHESIS. FINAL REPORT. Contract NONR 1224 (22) NR 049 122, Aug. 1966, 46pp. USN Information Systems Branch, ONR, Washington, D.C. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.). (AD 640406)

This report contains summaries of the journal articles and technical reports which have been published on a project with the Information Systems Branch of the Office of Naval Research on speech analysis and synthesis. Several of the investigations have included both theoretical and experimental studies. The subjects of investigation have included: techniques of spectrographic analysis, the recording and reproduction of speech signals with ferroelectric tapes, the automatic analysis of the information-bearing acoustical parameters of speech, the effects of certain of the acoustical parameters of speech on linguistic judgments, linguistic considerations in the measurement of speech intelligibility, aural processing of the speech wave, and techniques of speech synthesis. After a short introduction, the report presents a brief summary of each article and technical report published during the course of the research project.

31,645
Pradko, F., Lee, R. & Kaluza, V. THEORY OF HUMAN VIBRATION RESPONSE. Report from: "Army Science Conference, West Point, New York, 14-17 June 1966." June 1966, 215-228. USA Tank-Automotive Center, Warren, Mich. (AD 634632)

The basic premise of this research program has been to increase the knowledge and understanding of human response to mechanical vibration. Initial research steps were basic and conventional and centered upon vertical sinusoidal tolerance studies. Experiments followed to obtain tolerance data for random vibration in the vertical and the angular modes of pitch and roll. After this accomplishment, a temporary impasse was reached. The problem arose of describing random vibration environments which may exist in an infinite number of patterns. PSD (power spectral density) techniques appeared to be of minimal help. A new approach was selected. The validity and applicability of transfer function techniques to human dynamics was tested. The value of this analytical approach is clearly demonstrated in synthesizing such items as effective mass, impedance, spring rate, etc. from two basic expressions for acceleration and force.
R 8

31,646
Bogusz, J.F., Smith, R.F. & Strohmeyer, G.R. SYNTHETIC SPEECH STUDY. FINAL REPORT. Contract DA 02 086 AMC 0300(E), DA Proj. 1E6 34301 D244, Task 03, Tech. Rep. ECOM 0300 E F, Rep. 2659 F, June 1966, 238pp. USA Electronics Command, Fort Monmouth, N.J. (Philco Corporation, Blue Bell, Penn.). (AD 639964)

This report describes a technique to automatically evaluate the intelligibility of speech transmitted over a communication channel. The technique is called CORODIM (Correlation Of the Recognition Of Degradation with Intelligibility Measurements). It differs from other automatic intelligibility measuring techniques in that it transmits a test signal composed of speech-like sounds representative of phoneme consonants, and measures, by means of spectral channel analysis, the degradation suffered by each of the test signal constituents. The degradation manifests itself as an "effective noise spectrum" which is measured and matched to one of a library of reference noise spectra. For each reference spectrum there is stored data relating phoneme recognition probability to speech-to-noise ratio. Thus by means of the spectrum matching operation and a measurement of signal-to-noise ratio each constituent sound of the test signal is assigned a probability of recognition. These values are weighted by phoneme probability of occurrence factors, summed, and normalized to obtain a score representative of word intelligibility based on either initial or final consonant recognition of CVC-type words. CORODIM evaluates scores for both initial and final consonants and takes their product for the overall word intelligibility score.
R 37

31,647
Zimmer, H. PSYCHOPHYSIOLOGIC VARIABLES AS INDICATIONS OF EMOTIONAL STRESS. FINAL REPORT. Contract AF 30(602) 3380, Proj. 5534, Task 553404, RADC TR 65 296, Sept. 1966, 619pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Bioelectronic Computer Lab., University of Georgia, Athens, Ga.). (AD 641814)

This report covers the physiological responses of the human and means of achieving maximum discrimination between critical and neutral stimuli. Consideration is given to the social context in which the response is solicitated, the selection of the most useful psychophysiologic variable, methods of recording and analyzing the data by computers and the limits imposed by the existing knowledge. The appendix contains a rationale of those physiologic measures which have been employed by other investigations to study emotional reactions to stimuli of short duration.
R Many

31,648
Brown, J.L. (Princ. Investigator). STUDY OF VISUAL PERCEPTION IN HUMANS AND ANIMALS: SENSITIVITY AND SPECTRAL RESPONSE PROPERTIES OF HUMAN VISION AT LOW LUMINANCES. Report from: "Seminar on Electro-Optical Aids to Night Vision, Institute for Defense Analysis, May 1966." Contract NONR 3634(04), Tech. Rep. 2, Oct. 1966, 10pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Psychology Dept., Kansas State University, Manhattan, Kan.). (AD 640555)

The sensitivity of human vision is considered in relation to level of adaptation, luminance and spectral distribution of available light and the visual tasks to be performed. The relevance of these considerations to aided and unaided vision at low luminances is discussed.
R 15

31,649
Dowd, P.J. SPEED OF RECOVERY FROM CORIOLIS STIMULATION IN MOTION SICKNESS IN RELATION TO PILOTS AND NONPILOTS. Task 775003, SAM TR 66 63, July 1966, 4pp. USAF School of Aerospace Medicine, Aerospace Medical Div., Brooks AFB, Tex. (AD 639598)

Certain flight maneuvers, such as an aircraft banking and turning, can be simulated by the USAFSAM biaxial stimulator, resulting in a Coriolis effect. Motion sickness can easily be induced by Coriolis stimulation for both pilots and nonflyers. An ex post facto analysis of the rate of decay of vertical nystagmus was used to determine the differences between pilots and nonpilots who were sick or nonsick. Results implied that the more rapid the rate of decay of nystagmus, the more rapid the abatement of autonomic stimulation, which decreases the chances of summing activity over time to reach required levels for general visceral responses resulting in motion sickness. The findings demonstrate the effects of flying experience on the rate of decay of nystagmus elicited by a Coriolis stimulation.
R 19

31,650
Connelly, Marilee N. THE FEASIBILITY OF DERIVING A COST/EFFECTIVENESS FORMULA FOR MAN/MACHINE FUNCTION ALLOCATION. FINAL REPORT. Task PF 016020801, Res. Memo. SRM 67 4, Sept. 1966, 76pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 639674)

In order to investigate the feasibility of developing a cost/effectiveness formula for man/machine function allocation, a preliminary cost/effectiveness formula was constructed and evaluated. Measures of cost and effectiveness, sources of data, and availability of data were investigated. Using the preliminary formula and methodology as a basis for the analysis, it was concluded that adequate measures of cost are available but that adequate measures of variable effectiveness have not yet been developed. Due to the complexity of the cost/effectiveness formula and methodology and to the lack of accessibility of input data, a large amount of time and money will be required to perform function allocation analyses. It was determined that the derivation of a cost/effectiveness formula for man/machine function allocation is feasible. At this time cost/effectiveness analysis seems applicable to most cases of function allocation and appears to offer a reliable method for the allocation of functions between men and machines. On the basis of this research it was recommended that the structure and contents of a personnel cost data bank be delineated and that such a bank be established as soon as possible. Research should be conducted for the purpose of developing adequate variable effectiveness measures. An empirical test of the cost/effectiveness method of function allocation should be conducted in order to refine the formula and methodology and to demonstrate feasibility. Research should be conducted into other personnel research applications of cost/effectiveness.
R 98

31,651
Tillman, T.W. & Carhart, R. AN EXPANDED TEST FOR SPEECH DISCRIMINATION UTILIZING CNC MONOSYLLABIC WORDS: NORTHWESTERN UNIVERSITY AUDITORY TEST NO. 6. Contract AF 41(609) 2643, Task 775508, SAM TR 66 55, June 1966, 12pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Auditory Research Lab., Northwestern University, Evanston, Ill.). (AD 639638)

Northwestern University Auditory Test No. 6 is composed of four lists of 50 consonant-nucleus-consonant (CNC) monosyllabic words each. The construction of the test followed the same scheme employed earlier in the development of N.U. Test No. 4, a less extensive version using the same type of material. The four lists of N.U. Test No. 6 were given twice to each of two subject groups--one group with normal hearing and another with sensorineural hypoacousis. During each administration, six ascending presentation levels were used ranging from -4 dB to 40-dB sensation level. The two groups yielded articulation functions highly similar to those obtained with the earlier test (N.U. Test No. 4). The new test (N.U. Test No. 6) appears to have good interlist equivalence and high test-retest reliability. It thus retains the desirable features of the earlier tool while doubling the inventory of items available for the measurement of phonemic discrimination.
R 4

31,652
Aiken, E.G. PROMPTING VS FEEDBACK IN TRAINING AUDITORY JUDGMENTS OF VARYING DIFFICULTY. FINAL REPORT. Proj. PF017031001, Tech. Bull. STB 67 5, Aug. 1966, 13pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 639225)

Two training procedures were compared for their efficiency in training two auditory judgments. One procedure (prompting) involved presentation of the correct answer before the presentation of the stimulus. The other procedure (feedback) involved presentation of the correct answer after the Ss had judged the stimulus. Results indicate: a) A substantial trend toward superiority of feedback in improving pitch discrimination performance at two levels of difficulty; b) a trend toward superiority of prompting in the training of pitch and intensity identification; c) a substantial trend toward greater transfer to a Doppler discrimination problem following auditory identification as opposed to auditory discrimination training. Recommendations are made concerning implications of the data for Navy training and future research.
R 15

31,653
Musgrave, P.W. & Carter, D.I. AEROSPACE MEDICINE CONSIDERATIONS IN MANRATING SPACE ENVIRONMENT SIMULATORS. SPECIAL REPORT. AMD TR 66 2, June 1966, 7pp. USAF Aerospace Medical Div., Brooks AFB, Tex. (AD 639645)

Manrating of space environment simulators must include an integration of physical facility requirements and operational procedures which provide a satisfactory degree of safety for personnel inside the space environment simulator. The physical facility requirements include a repressurization system, access locks, physiologic and environmental monitoring, and certain ancillary facets such as instrumentation calibration and storage areas, emergency medical treatment areas, and pressure suit maintenance and storage areas. The operational procedures must consider both normal and abnormal operations. Additionally, personal protective equipment and routine occupational health aspects must be provided.
R 3

31,654
Boyer, R.K. & Medow, H.M. A STUDY OF THE APPLICATION OF LABORATORY TRAINING METHODS TO PROGRAMS AT AIR UNIVERSITY. FINAL REPORT. Contract AF AFOSR 784 65, Projs. 9778 02, 61445014 & 681313, AFOSR Rep. 66 1931, June 1966, 105pp. USAF Office of Scientific Research, OAR, Arlington, Va. (National Training Labs., Washington, D.C.). (AD 639757)

Over a period of one year, and under the sponsorship of the Office of Scientific Research, the National Training Laboratories, and Air University, collaborated on a project to explore applications of laboratory training methods to Air University activities. Programs at Air University were identified for which laboratory training would be particularly appropriate. An assessment was made of problems likely to be encountered in adapting laboratory training to these programs. Laboratory training designs were assessed for modifications which would be desirable to meet the specific objectives of Air University.

31,655
Laymon, R.S. STUDY OF TWO IMAGE INTERPRETER MAP DISPLAYS: CHIP VERSUS HARD COPY. Contract DA 49 092 ARO 65, DA R&D Proj. 2J620901A721, Tech. Res. Note 169, May 1966, 40pp. USA Personnel Research Office, OCRD, Washington, D.C. (System Development Corporation, Falls Church, Va.). (AD 639126)

In an experimental study conducted jointly by personnel of the System Development Corporation and the MAN-COMPUTER FUNCTIONS Task, U.S. APRO, comparison was made of 2 methods of displaying reference maps for the use of image interpreters in a tactical image interpretation facility (TIIF). Image interpreters were required to perform 2 tasks--to match imagery to a reference map and then to estimate the coordinates of a point on the image. Time taken to reach correct solutions was compared when reference maps were displayed from simulated slide chips (map sections projected onto a fixed screen) and when hard-copy map chips (standard presentation) were used. Measures of performance with both display modes were obtained under experimental conditions where the image would appear on one or two chips. Two conditions of imagery orientation for each map display mode were also imposed: one in which position of the imagery was fixed and one in which the imagery could be freely oriented to the map display. Separate analyses of variance were conducted on time scores from the matching and locating tasks. The following major conclusions were derived: a) Display of map information upon a screen instead of by hard copy increased time taken by an interpreter to match imagery and to determine map coordinates of an object on an image; the longer time required when the interpreters used map chips was attributable to need to study two slides when the imaged area lay on the boundary of one or both chips; b) Freedom to orient an image relative to a map display did not affect time taken to complete either the matching or the locating task.

31,656
Rose, A.J. JOB EVALUATION: A STUDY OF SELECTED SYSTEMS AND THEIR APPLICATION TO NAVY ENLISTED BILLETS. PROGRESS REPORT. Proj. PF 016010701, Rep. WRM 67 3, Sept. 1966, 74pp. USN Personnel Research Lab., Bureau of Naval Personnel, Washington, D.C. (AD 639165)

This is the second in a series of research reports on the design and development of a billet evaluation system for Navy enlisted billets. This report presents an assessment of selected military, industrial, and government job evaluation systems and their possible application to the design of a Navy billet evaluation system. The report concludes that, while certain features of the job evaluation systems studied are applicable to the Navy, there are no existing systems that meet the requirements or fit the circumstances of the Navy work situation. A billet evaluation system for the Navy must be tailored specifically to Navy work. The next phase of this research project will be a report on the type of system for Navy use.
R 69

31,657
Hartman, B.O., Cantrell, G.K. & Sims, L.S. AN EXPLORATORY STUDY OF FACTORS AFFECTING AIRCREW MORALE. Task 793003, SAM TR 66 62, July 1966, 9pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 639141)

Aircrew morale was studied in 176 Military Airlift Command (MAC) aircrewmen. In interviews and questionnaires, nine problem areas were identified. The primary problem reported by the aircrewmen was lack of planned free time. This factor had a negative effect both on duty and off duty. The remaining eight factors were more specific to the working environment. Several were a function of the mission of the command but some were accessible to local modification. In the face of these problems, aircrewmen maintained good motivation, probably because of the satisfactions obtained from flying and from other aspects of their Air Force careers.
R 2

31,658
Tillman, T.W., Bucy, P.C. & Carhart, R. MONAURAL VERSUS BINAURAL DISCRIMINATION FOR FILTERED CNC MATERIALS: THE IMPAIRED AUDITORY MECHANISM. Contract AF 41(609) 2643, Task 775508, SAM TR 66 64, July 1966, 9pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Auditory Research Lab., Northwestern University, Evanston, Ill.). (AD 639639)

Northwestern University Auditory Test No. 4 was altered by: a) low-pass filtering with a 1480 cps cutoff frequency and a 54 dB per octave slope and; b) high-pass filtering utilizing an 1830 cps cutoff frequency and a 36 dB per octave slope. By using these filtered materials, a single binaural and two monaural articulation functions were derived for each of 60 Ss with peripheral hearing losses and 7 Ss with unilateral CNS lesions judged to involve the auditory system. In the monaural conditions each S received either the high-pass or low-pass filtered signal. In the binaural conditions the two messages were presented simultaneously, one to each ear. The experimental hypothesis predicted that for the Ss with peripheral impairments, the slope of the binaural function would exceed that of the steeper monaural one. Conversely, it predicted that for the Ss with unilateral central involvement, the binaural function would not differ in slope from the monaural functions. Results only partially confirmed this hypothesis. For both groups, the slope of the binaural function exceeded that of the steeper monaural function; however, the slope of the binaural function for the peripheral lesion group exceeded that of the CNS lesion group. Since the hearing acuity of the latter group was within normal limits, this finding indicates that in unilateral central auditory lesions, the binaural processing of speech signals is incomplete.
R 10

31,659
O'Connor, W.F., Scow, J. & Pendergrass, G. HYPOXIA AND PERFORMANCE DECREMENT. Rep. AM 66 15, May 1966, 5pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 639780)

The concept of 'time of useful consciousness' fails to take into account the progressive decay that occurs in performance under hypoxic conditions. This study, using a means of quantitatively assessing such a decrement, presents data obtained in a series of chamber runs at 27,500 and 35,000 feet. The performance-decrement functions appear to follow the arterial-oxygen-saturation curves.
R 3

31,660
Schane, W.P. PHYSIOLOGICAL TRAINING OF HALO PARACHUTISTS. DA Proj. 3A0 2560 1A 819, Task 038, USAARU Rep. 67 2, Sept. 1966, 17pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (USA Aeromedical Research Unit, Fort Rucker, Ala.). (AD 639342)

HALO (High Altitude, Low Opening) parachuting exposes the jumper to an unusual combination of environmental changes. The HALO parachutist must be trained to prevent combat ineffectiveness in himself and in his fellow jumpers caused by this rapidly changing hostile environment. It is important to emphasize that HALO is a delivery system and not an end in itself. In a real-mission situation, the jumper's job is just beginning when he touches down. He must land in a condition such that he can immediately proceed to fulfill his tactical mission. Training should be directed toward anticipation of hazards and prevention of ill-effects therefrom. Emphasis should be placed upon self-help and upon buddy aid, since the HALO parachuting situation requires self-reliance and individual initiative.
R 12

31,661
Quillian, M.R. SEMANTIC MEMORY. Contract AF 19(628) 5065, ARPA Order 627, NIH Grant MH 07722, Proj. 8668, AFCRL Rep. 66 189, ARPA P.R. CRI 56176, BBN Rep. 1352, Sci. Rep. 2, Oct. 1966, 231pp. USAF Cambridge Research Labs., L.G. Hanscom Field, Bedford, Mass. (Bolt Beranek & Newman, Inc., Cambridge, Mass.). (AD 641671)

This report describes a model for the general structure of human long term memory. In this model, information about such things as the meanings of words is stored in a complex network, which then displays some of the desirable properties of a human's semantic memory. Most important of these properties is the capability of the memory to be used inferentially; i.e., to allow for the answering of questions besides those specifically anticipated at the time the information is stored in the memory. A computer program is described which illustrates this property by using the memory model inferentially to simulate human performance on a basic semantic task. When the meaning of some segment of natural language text is represented in the format of the model, relationships and features of this meaning must be made explicit which were not explicit in the text itself. This becomes a methodological advantage in an experiment in which a person reads text and represents its meaning in the model's format, for then certain parts of his otherwise covert "understanding" of the text become externalized, and available for study. A verbal protocol recorded in such an experiment is analyzed. From this analysis a theoretical picture is developed of how text understanding may proceed on the basis of selective interaction between the text and the reader's overall store of prior information.
R 78

31,662
Agee, F.L., Jr. & Gogel, W.C. EQUIDISTANCE JUDGMENTS IN THE VICINITY OF A BINOCULAR ILLUSION: PROBLEMS IN DEPTH PERCEPTION. Rep. AM 66 24, July 1966, 5pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 641476)

Judgments of the size and distance of objects are sometimes made in aircraft under background-viewing conditions that may themselves create false sensory impressions (illusions). In this study, the effects of a background illusion on judgments of the size and distance of objects that were independent of that background were examined. Misleading size cues associated with a binocularly observed trapezoidal window produced an apparent depth orientation of the window that was different from its physical orientation. As expected, it was found that errors occurred in adjusting two other objects (disks) to apparent equidistance with each other in the presence of the window and that the direction of the errors in apparent equidistance was related to the direction of the errors in the perceived slant of the trapezoidal window. It was less clear that errors in the judgment of apparent equidistance occurred when the orientation of the window and the separation of the disks were vertical rather than horizontal. Possible explanations for discrepancies between the magnitude of the perceptual errors associated with the trapezoidal window and those associated with the equidistance judgments are discussed.
R 11

31,663
Bavarez, E. & Newell, G.F. TRAFFIC SIGNAL SYNCHRONIZATION ON A ONE-WAY STREET. RESEARCH REPORT. Contract NONR 222(83), Projs. NR 047 033 & RR 033 07 01, ORC Rep. 66 20, Aug. 1966, 28pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (University of California, Berkeley, Calif.). (AD 641844)

A one-way street which intersects n one-way (side) streets is considered. Traffic approaching the first street is steady as are the flows on all side streets. Traffic signals are idealized as perfect on-off switches and traffic is treated as a fluid moving with a constant velocity on the main street. Total delay and total number of stops are evaluated for several types of signal coordination schemes. Some conclusions are: a) For any given common cycle time and given splits at each intersection, there is a choice of offsets (phases) which simultaneously minimizes both the total delay and stops but it is not necessarily the one which produces a "through band." b) There are signal settings for which some signals operate on half or a third the cycle time of other lights, that give a main street delay equal to that for the optimal common cycle time setting but give less delay to the side street. c) Similar models are commonly used to find maximum through bands for two-way traffic, but it is not obvious that this is a suitable objective even for one-way streets.
R 7

31,664
Bailey, G.C. AN ANALYSIS AND DELINEATION OF THE CONCEPT OF PSYCHOLOGICAL OPERATIONS. Contract NONR 4346(00), HSR RR 66/3As, March 1966, 107pp. USN Psychological Sciences Div., ONR, Washington, D.C. (Human Sciences Research, Inc., McLean, Va.). (AD 489859)

The nature and scope of psychological operations are defined through the development of a conceptual framework linking the dynamics of cross-cultural influence processes and governmental policy-making processes. The abstraction of operational events begins with the recognition of two behavioral sequences within a psychological operations paradigm: one composed of objective, actor, and influence act and the other consisting of influence act, recipient, and predicted response. These two sequences are linked on a predictive basis so as to form a feedback loop useful in planning and evaluation. A structure for research is related to a psychological operations paradigm, consisting of three categories: Personnel Research, Foreign Population Research, and International Behavior Research, and detailed research recommendations appearing in the report are organized according to this structure. Projected use of the definitional framework is described for the assessment of relative degrees of ignorance about various aspects of psychological operations. Research needs include the production of data helpful in making predictions at the operational level about recipient response to influence attempts, and for predictions about relations between the desired end-states of recipient behavior at various levels of decision-making.
R 27

31,665
Carlson, L.D. STUDY OF PERIPHERAL RESPONSE TO HEAT AND COLD AS INFLUENCED BY ENVIRONMENT. FINAL TECHNICAL REPORT. DA Proj. 49 193 MD 2519, Aug. 1966, 81pp. Physiology & Biophysics Depts., University of Kentucky, Lexington, Ky. (AD 488581)

The report deals with: a) a recommended cold induced vasodilation test for discerning differences due to environmental exposure; b) a comparison of an 8 hour overnight test with a multitemperature 2 hour test for estimating body tolerance to cold; c) details of the design and test of a hand calorimeter and plethysmograph; and d) the details of a simple finger calorimeter.

31,666
Jones, G.M. VESTIBULAR INAPTITUDE IN THE ENVIRONMENTS OF FLIGHT AND SPACE. J. Laryngol. Otol., March 1966, 207-221. (McGill University, Montreal, Quebec, Canada). (Reprint) (AD 640908)

The vestibular system has become highly adapted to the particular patterns of head movement normally associated with the environment in which it has evolved. But in flight and space, totally different patterns of movement are encountered and serious mismatching can arise between this sensory system and the new environment. The nature of such inaptitude is examined in terms of current physiological understanding of the otolith organs, semicircular canals, associated central neural mechanisms and the vestibulo-ocular reflex. Applied consequences are considered in the contexts of flight in the atmosphere and in space.
R 16

31,667
Jurenko, D.M., Abt, R. & Schultz, J.P. SPEECH BANDWIDTH REDUCTION. FINAL REPORT. Contract AF30(602) 3683, Proj. DC 64 18, RADC TR 66 455, Philco Rep. 264F, Sept. 1966, 170pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Philco Corporation, Blue Bell, Penn.). (AD 801360)

This report presents experimental results, conclusions, and recommendations resulting from research--conducted on a speech bandwidth reduction technique based on an electrical analog of the human hearing mechanism. This research centered around the Single Equivalent Formant (SEF) technique whereby it is hypothesized that intelligent speech could be transmitted with 3 parameters: SEF frequency, amplitude, and pitch. This was partially proven in that the intelligence (RT word score) was measured at 75% for experienced speakers and listeners. However, the "machine-like" quality of the synthesized speech proved to negate the system's use with all but highly trained operators. Three other systems, including resynthesizing 3 formant speech from the SEF parameter using storage, were investigated. The system that was finally decided upon as the closest to meeting the goals is a 2 formant, 3 amplitude, and pitch system with 120 Hz bandwidth. This system has a measured RT score of 85% and the quality is adjudged to be quite human-like. Transmission of the parameters is accomplished by using a Pulse Amplitude Modulation (PAM) technique that is unique in that synchronization is accomplished during silent periods (thereby not requiring additional bandwidth). Also, in the demultiplexer, distortion due to cross talk is partially canceled by digitally storing preceding channel information and using a proportional amount of it to subtract cross talk distortion from the following channel.

31,668
Lucas, R.L. (Princ. Investigator) & Stewart, J.L. COMMUNICATION WITHOUT CONVENTIONAL (ELECTRO-MECHANICAL) ACOUSTIC TRANSDUCERS. FINAL REPORT. Contracts AF 33(615) 3222, AF 33 (615) 11591 & AF 33(615) 2211, Proj. Nr. 433506, AFAL TR 66 291, Aug. 1966, 55pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Santa Rita Technology, Inc., Menlo Park, Calif.). (AD 488472)

To each speech sound, there is a discrete tactile sensation occurring in the head and mouth. A tactile communication system was developed in which synthesized low data-rate electrical signals were transmitted and remotely decoded by a senser (human) through a special pressure/vibratory transducer held in the hand. The decoded signals were recognized as being similar to mouth and head pressure and vibratory sensations which accompany speech. Such speech-analogs are known to all, but little if any attention is generally paid to them. The signal decoding rapidly becomes automatic as the senser becomes increasingly aware of his physical sensations during his own speech performance.
R 57

31,669
Malvin, H.H. METHIONINE-PYRIDOXINE AND AIRSICKNESS. FINAL REPORT. Task 775505, SAM TR 66 87, Oct. 1966, 4pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 641568)

This paper presents 2 observations made incidental to a series of unsuccessful experiments which were designed to study individual variation of response to stimuli intended to induce airsickness. The first observation suggests that capsules containing 50 mg. l-methionine and 50 mg. pyridoxine, when administered initially and midway during a 4-hour flight, have a limited ability to protect human volunteers against motion sickness. The second observation identifies a structural similarity between the therapeutically effective antimotion sickness agents, neurochemical transmitters, and the peptide linkage.
R 6

31,670
Muller, A.F. & Wilson, P.W., Jr. RESEARCH TOWARD THE DEVELOPMENT OF EYE EFFECTS SAFE SEPARATION CHARTS. FINAL REPORT. Contract AF 41(609) 2437, Proj. 6301, Task 630103, July 1966, 84pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Technology Incorporated, San Antonio, Tex.). (AD 641191)

The purpose of this report is to make known the research methods, results, and conclusions involved in a study which was to develop eye safe separation distances from nuclear detonations in terms of yield, altitude, slant range, etc. Under the precept that retinal temperature is the most significant factor in ocular damage, a mathematical model for the prediction of retinal temperature is outlined. Theoretical and empirical fireball source data are input separately to the model in an effort to determine the applicability of the theoretical data by comparing calculated retinal temperature rise. The results of the comparisons are favorable. However, it is concluded that, presently, the model retinal temperature predictions must be used with reservation.
R 12

31,671
Mohler, S.R. & Harper, C.R. PROTECTING THE AG PILOT. Rep. AM 66 30, Sept. 1966, 7pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 641478)

Conditions which affect the safety of the pilot of agricultural planes are discussed. Included are pilot factors, aircraft factors, outside forces, notes to medical aid personnel.

31,672
Musker, G. & Henman, Marian. A COMPUTER STUDY OF AUTOMATIC CONTROL ON THE I.L.S. GLIDE PATH. Tech. Rep. 66057, Feb. 1966, 49pp. Royal Aircraft Establishment, Farnborough, Hants, England. (AD 640807)

A computer study is described of the effect on I.L.S. glide path performance of the addition of various damping terms to the glide path control law of a typical autopilot. The control laws used are analysed by a number of techniques and the results achieved by the different techniques are compared. It is shown that the performance can be improved by the addition of either a vertical velocity term coupled with an acceleration term, or a vertical velocity term coupled with a pitch rate term in the control law.
R 5

31,673
Spencer, D.W. FACTOR ANALYSIS. TECHNICAL REPORT. Contract NONR 2196(00), Proj. NR 083 004, WHOI Ref. 66 39, July 1966, 80pp. Woods Hole Oceanographic Institution, Woods Hole, Mass. (AD 637792)

The technique of factor analysis, developed by psychologists, is finding application in many fields of science. This report discusses the method, some applications and gives a detailed description of a FORTRAN II computer program to perform a varimax solution and calculate factor scores. The program was written for a G. E. 225 computer with 8K memory and four tape handlers.
R 20

31,674
Stolurow, L.M. PROJECT SOCRATES: A FLEXIBLE RESEARCH FACILITY TO BE USED IN STUDIES OF PREPROGRAMED SELF-INSTRUCTION (PSI) AND SELF-PROGRAMED INDIVIDUALIZED EDUCATION (SPIE). FINAL REPORT. Contract NONR 3985 (04), Proj. NR 154 239, Sept. 1966, 29pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Training Research Lab., University of Illinois, Urbana, Ill.). (AD 638676)

This is the final report of work accomplished on NONR 3985(04) which has been called Project SOCRATES (System for Organizing Content to Review and Teach Education Subjects). The Project contributed to the development and operation of a computer-based facility for psychological research on variables associated with pre-programed self-instruction (PSI) and self-programed individualized education (SPIE). The research was concerned with the development of psychological theory and research relating to the design and use of a computer-based instructional system. Included are the lists of 13 Technical Reports, 24 Technical Memorandums, and 15 films.
R 185

31,675
Jerison, H.J. ATTENTION AND DISCRIMINATION: A BEHAVIORAL ANALYSIS. Report from: "XVIIIth International Congress of Psycology, Moscow, USSR, 1966." Contract AF AFOSR 150 66, Proj. 9778 01, Rep. AFOSR 66 1166, 1966, 4pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Behavior Research Lab., Antioch College, Yellow Springs, Ohio). (AD 640913)

In discrimination experiments, signals may be presented only occasionally during prolonged vigils. Some signals are sufficiently strong to be detected every time by an attentive S, yet too weak to attract the attention of the inattentive S. Detections or conditioned responses to such signals can, therefore, be used to indicate attentiveness. The following experimental results are considered in this report: a) During long vigils, some signals are always missed; b) Monkeys trained to avoid shocks by responding when a signal appears may stop attending to the signal and make many free responses ("false alarms") when the shock is made sufficiently strong; c) Human observers make more false alarms during prolonged vigils than would be predicted from a mathematical analysis of signal detectability. The shift from attentiveness to free responding described under (b) above is a "decision" with respect to the task which has the effect of minimizing overall costs for the animal. A sufficient explanation for Result (c), derived from decision-theory, is that observers are sometimes only partially attentive, and then nonsignal stimuli will be more frequently confused with signals. Other results presented in the report show that monkeys become attentive when it is important to become attentive and they form patterns of behavior that are best understood as the temporal conditioning of attentiveness. The results as a whole, which are partly interpretable in terms of the conditioning of observing responses, also demand decision-theory approaches to attention.

31,676
Reddy, D.R. AN APPROACH TO COMPUTER SPEECH RECOGNITION BY DIRECT ANALYSIS OF THE SPEECH WAVE. Tech. Rep. CS49, AI Memo 43, Sept. 1966, 143pp. Computer Science Dept., Stanford University, Stanford, Calif. (AD 640836)

A system for obtaining a phonemic transcription from a speech sample entered into the computer by a microphone and an analog to digital converter has been developed. Direct input of the speech signal to the computer without filters or spectrographs, the procedures for segmentation and pitch period extraction, and many of the procedures for recognizing particular features and sounds are believed to be new. Correct identification of most speech sounds was achieved for a single cooperative speaker. After an introduction in Chapter 1, in Chapter 2 the requirements of a useable computer system for speech research, its input-output configuration, and the design of a suitable man-machine communication system are discussed. An interconnected IBM 7090 - PDP-1 disk system was used in this investigation. Chapter 3 describes how the program divides a 2-second speech utterance into segments approximately corresponding to phonemes, determines the pitch of those segments, where pitch analysis is appropriate, and computes a list of parameters for each segment that is later used to assign phonemic values. Chapter 4 explains how phonemes are associated with segments of speech. First, to each segment is associated a phonemic subgroup, such as a vowel-like segment, fricative-like segment etc., using intensity and the number of zero crossings of the segment. Next, transitional tests and tests of the acoustic closeness of two adjacent segments determine whether a given segment has a phoneme associated with it or whether it is a transitional segment between two phonemes. Those segments that are not rejected as being transitions are then associated with phonemes of English. If two adjacent phonemes are identical, then only one of them is retained in the final phonetic transcription. Chapter 5 contains the results of the classification of 32 sounds of 1 to 2 seconds duration, and error analyses. Confusion matrices are given for phoneme subgrouping and final classification. About 81% of a total of 287 phonemes were classified correctly. R 35

31,677
Wildridge, J.E. EXPERIMENTAL HIGH INTENSITY FLARE SYSTEMS: DESIGN AND TESTS OF. Rep. RDTR 75, Aug. 1966, 112pp. USN Ammunition Depot, Crane, Ind. (AD 638490)

Flight and static test results of various configured parachute suspended flare systems are presented. It is shown that a 5-million candlepower, 5-minute burning time flare can be achieved by utilizing multiple flares in the vertical or the horizontal attitude. It is also shown that multiple parachutes can be utilized to obtain a low rate of descent although there appears to be a loss in efficiency as the number of parachutes is increased. Actual photometric data taken during flight tests is presented for various configured illuminating flare systems.
R 5

31,678
Young, J.W. SELECTED FACIAL MEASUREMENTS OF CHILDREN FOR OXYGEN-MASK DESIGN. Rep. AM 66 9, April 1966, 11pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 640062)

The development of a universal-type oxygen mask that will adequately fit an entire flying passenger population presents a difficult design problem. One of the primary reasons for this difficulty is due to the extreme ranges of variability found in face structure and the infinite number of face size and shape combinations. A comprehensive field survey was conducted, using 978 Caucasian male and female Ss of ages 1 month through 17 years to measure 18 specific face structures and areas. These selected measurements were considered significant for design use and establishing the ranges of dimensional variability that determine the limitations of a mask configuration. To assist design efforts in mask development and functional evaluations, sets of realistic dimensional data of face structure and areas have been provided as a guide to establish practical design criteria. Each measurement is defined, described, and discussed with respect to a particular design problem.

31,679
Tambe, J.T. & Stembridge, G.E. HUMAN FACTORS ASPECTS OF THE QM-EQUIPPED SOLDIER IN JUNGLE OPERATIONS: AN OPERATIONAL APPROACH. Proj. 1KO 24701 A122, Tech. Rep. 66 48 PR, Series EPT 3, May 1966, 57pp. USA Natick Labs., Natick, Mass. (AD 634720)

This study explores Human Factors problems associated with jungle operations by means of field observations made during tactical exercises conducted at the Jungle Warfare Training Center. The operational and physical environments, required soldier tasks and activities, and the equipment used are described. The major problems discussed concern combat load, heat, mobility, and certain features of rations.
R 20

31,680
Sergeant, R.L. FREQUENCY SHIFTS OF A WHISTLE BLOWN IN DIFFERENT GASES. INTERIM REPORT. BuMed. Proj. MF011.99 9001.07, Memo. Rep. 66 16, Sept. 1966, 2pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 640378)

In a study of the resonating characteristics of a whistle in an effort to explain variations in voice quality observed in helium speech, it was found that the pure tone production of a whistle follows the same principles for frequency resonance as that found in the human voice. Different degrees of upward shift in frequency occur for pure oxygen or a helium mixture. A taped signal does not change when played in helium-rich environment. Diffusion rates between gases appears to be important for minor shifts when the gas breathed is not the same as the environmental gas spoken into. Information presented in this report helps explain why helium speech, which is an important aspect of diving and underwater communications, sounds unusual.

31,681
Pooley, R.W., Fisher, L.E., Shaw, A.D., III & Rohs, C.S. LIGHTWEIGHT INSULATED FOOTWEAR. FINAL REPORT. Contract DA19 129 AMC 690(N), DA Proj. 1M643303 D547, Tech. Rep. 67 23 CM, Series C&OM 26, Sept. 1966, 139pp. USA Natick Labs., Natick, Mass. (United States Rubber Company, Mishawaka, Ind.). (AD 640629)

In this study, a number of candidate materials were compounded, tested, and evaluated with an aim toward the development of a lightweight (15 oz. per boot), impermeable, (water absorption maximum weight 5%), insulated, (for service down to -20) boot for periods up to 2 hours of inactivity. These materials included expanded elastomers and plastics, solid plastics, metals, fabrics, adhesives, and coating materials. Design and fabrication studies were conducted to incorporate the most promising materials into a prototype boot, and to determine the insulating properties of the materials used singly and in combination with each other. Based on the data obtained, prototype boots were assembled. An experimental pull-on type boot weighing 15 1/2 ounces was worn by the Project Officer in the Climatic Test Chambers at the U.S. Army Natick Laboratories at -30°F for a period of 2 hours. These studies indicate the feasibility of producing lightweight insulated boots through materials research.
R 39

31,682
Pendleton, W.W. A STUDY OF PERSONNEL DEMANDS AND AVAILABILITIES FOR POSTATTACK COUNTERMEASURE SYSTEMS. FINAL REPORT. Contract OCD PS 65 52, Subtask 3543A, HSR RR 66/11 Mh, June 1966, 190pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (Human Sciences Research, Inc., McLean, Va.). (AD 637833)

The report presents some of the issues related to the use and assignment of manpower to postattack countermeasure systems. Assuming that countermeasure systems must be able to utilize all potentially available manpower and that different systems must avoid competing with each other for the small pools of manpower ordinarily available for emergency action, the report uses the concept of organization to examine the quality and size of potential pools of manpower and suggests that the same concept is paramount in considering the means of assigning manpower to countermeasure systems. On the basis of an examination of 14 general organizational groupings, it is concluded, first, that the capacity of the population to generate potential manpower for emergencies is enormous and, second, that the ability to organize manpower for emergency operations, though in some respects great, is not distributed through the society in the same way as is the potential manpower. From an examination of 13 areas of need that would characterize the postattack society, the report suggests several principles for assigning manpower. The report concludes with a description of the kinds of research that are suggested by the investigation.
R 66

31,683
Passey, G.E., Alluisi, E.A. & Chiles, W.D. USE OF THE EXPERIMENTAL METHOD FOR EVALUATIONS OF PERFORMANCE IN MULTI-MAN SYSTEMS. Report from: "Seventh Annual Meeting, Human Factors Society, Palo Alto, California, 23-25 October 1963." Contract AF 33(657) 10506, Proj. 1710, Task 171002, AMRL TR 66 121, Aug. 1966, 26pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.). (AD 638183)

This report discusses the use of the experimental method as a technique for arriving at solutions to human factors engineering problems encountered in the design of multi-man systems. Of specific concern are the methodological decisions that must be made in the design of the research. Factors that are likely to influence these decisions are considered as well as the implications of these decisions with respect to the validity and generality of the data thus obtained. These various decision points are illustrated through use of data on group performance during long-term confinement.

31,684
Mullen, W.W., Jr. THE DEVELOPMENT OF A SWIMMER TRACKING DEVICE. INTERIM REPORT. Subproj. SF 011 06 03, Task 11507, Development Rep. I 108, Oct. 1966, 16pp. USN Ship Engineering Center, Department of the Navy, Washington, D.C. (USN Mine Defense Lab., Panama City, Fla.). (AD 641361)

A swimmer tracking device consisting of acoustic markers and a receiver has been developed by the U.S. Navy Mine Defense Laboratory to provide a means of tracking Navy swimmers during training exercises. The acoustic markers are tunable from 29 kHz (kilohertz, kilocycles per second) to 45 kHz and may be manually switched between continuous wave (CW) and pulse modes of operation. The receiver is a Mark 16 Mod 0 sonar receiver modified to improve its selectivity and image rejection. With the modified receiver located on a safety boat, the bearings to markers located on swimmers can be determined, and they can be identified by their marker frequencies. As many as seventeen swimmer pairs can be tracked, even at distances exceeding 1000 yards.
R 3

31,685
Mackay, D.M., Jeffreys, D.A. & Glover, R.R. NEW METHODS OF ANALYSIS OF ELECTROPHYSIOLOGICAL RESPONSES. FINAL SCIENTIFIC REPORT. Contract AF EOAR 65 18, Proj. 9777 01, Rep. AFOSR 66 2337, June 1966, 84pp. USAF Office of Scientific Research, OAR, Arlington, Va. (Communication Dept., University of Keele, Staffordshire, England). (AD 640860)

A simple 4 channel averaging system using a form of pulse frequency modulation (PFM) for signal recording and a closed loop of magnetic tape as the accumulator is described and the experimental results of its application to the study of human evoked responses to patterned visual fields reported. The use of simple pulse coincidence circuitry for cross-correlation of electroencephalograph (EEG) signals is summarized.
R 10

31,686
Moore, T.J. A SELECTIVE REVIEW OF THE LITERATURE ON TACTILE SENSITIVITY: 1940-1965. FINAL REPORT. Proj. 7232, Task 723202, AMRL TR 66 50, April 1966, 22pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 638718)

The literature from 1940 to 1965 concerned with the tactile sense has been selectively reviewed. The neurophysiological, psychophysiological, and communicatory aspects of the tactile system were considered. In each of the three areas, representative studies have been reviewed and current trends of research have been indicated.
R 69

31,687
Moore, E.W. RESPONSES TO CORIOLIS STIMULATION IN FLYING PERSONNEL WITH DIFFERENT LEVELS OF PROFICIENCY. Task 775003, SAM TR 66 36, April 1966, 5pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 634406)

The Coriolis test, as part of physical evaluations, was administered to candidates for the Gemini program, candidates for the USAF Research Test Pilot School, a representative cross section of Air Force pilots, and a group of nonflyers. The rates of decay of vertical nystagmic responses for the 4 groups were compared. A significantly different rate of decay was demonstrated between the groups. A greater amount of flying experience of the space pilot and test pilot groups resulted in a greater degree of habituation than shown by the representative cross section of Air Force pilots. All 3 groups of pilots demonstrated a significantly greater degree of habituation than the nonflyer group. The possible reasons for the significant differences found are discussed in terms of the stimuli presented and the habituation derived from flying experience.
R 10

31,688
Larue, M.A., Hagen, W.C. & Ozkaptan, H. EFFECT OF PERSPECTIVE GEOMETRY TRAINING ON TARGET AREA LOCATION. FINAL REPORT. Contract N00014 66 C0150, Rep. OR 8528, Oct. 1966, 76pp. USN Engineering Psychology Branch, NRL, Washington, D.C. (Martin Marietta Corporation, Orlando, Fla.). (AD 640712)

A study was conducted to assess the value of training in perspective geometry on a S's ability to locate target areas. Perspective geometry is defined as the study of spatial relationships on the ground and how they change when viewed from an oblique angle by means of a television (TV) system under simulated dynamic flight conditions. Simulation was accomplished by filming actual terrain from 2000 feet with a 28 degree field-of-view (FOV) camera and projecting through a closed circuit TV system. Two groups of 6 Ss each were used. One group received special training in addition to conventional training in target location. The other group received only the conventional training. The experimental group located 81 percent of the target areas as opposed to 68 percent by the control group and was quicker by a mean of 0.06 minutes (3.6 seconds). These results are significant at the .05 and .01 levels. No significant difference was found between groups in the angular accuracy of target area location; however, there was a significant difference in the variability of performance in favor of the experimental group ($p < .01$).
R 5

31,689
Clodfelter, R.G., May, C.B. & Goldman, M.B. (Chm.). NATIONAL CONFERENCE ON SPACE MAINTENANCE AND EXTRAVEHICULAR ACTIVITIES--ORLANDO, FLORIDA, 1, 2, 3 MARCH 1966. Proj. 8170, AFAPL CONF 66 8, March 1966, 504pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio & Martin Company, Orlando, Fla. (AD 641695)

This conference report covers the major order of: Session I--Space Maintenance and Extra-Vehicular Space Missions and Requirements; Session II--Space Maintenance Technology; Session III--Maneuvering Unit Technology; Session IV--Associated Space Experiments and Simulation; Session V--Man-Machine Interface Problems; Session VI--Spacecraft Maintainability and Reliability.
R 221

31,690
Furedy, J.J. INTERACTIVE CLASSIFICATION: A METHOD FOR ASSESSING THE ADEQUACY OF COUNTERBALANCING AS A MEANS OF CONTROL. ORIGINAL RESEARCH. Contract NONR 908 15, Tech. Rep. 14, Oct. 1966, 23pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Psychology Dept., Indiana University, Bloomington, Ind.). (AD 641190)

In situations where a treatment is varied over the same Ss in order that each S may serve as his own control, and where an associated source of variation is controlled for by counterbalancing between Ss, the success of this method of control depends on the absence of interaction between the treatments and the counterbalanced factor. When the data are classified into a factorial system involving the treatments and the counterbalanced factor as the two classifications, it is difficult to find a statistical model to test such an interaction. A strategy, by means of which established statistical models can be used to evaluate this interaction, is presented here, and its range of application is discussed.
R 7

31,691
Lafranchi, V.E. EXPERIMENTAL RESULTS OF A SIMULATED FLIGHT TEST USING VARIOUS CONTACT ANALOG TEXTURE FORMATS. FINAL REPORT. Contract WepTask RAV09J011/2021/F012 04 04, Prob. Assign. 8A, Rep. NADC AM 6645, Aug. 1966, 36pp. USN Air Systems Command, Department of the Navy, Washington, D.C. (USN Air Development Center, Johnsville, Penn.). (AD 638794)

This experiment was performed to investigate whether synthetic ground and sky textures, displayed on a contact analog display, affect the ability of the pliot to follow command symbols presented to him during flight. Ninety-six laboratory simulated flights were flown and errors from prescribed path were recorded on magnetic tape. The data was reduced by a CDC 3200 computer and an analysis of variance was performed. The analysis indicated that no significant changes in errors occurred for the four combinations of ground and sky textures displayed.

31,692
Charnes, A. & Cooper, W.W. SIMULATION, OPTIMIZATION AND EVALUATION OF SYSTEMS OF TRAFFIC NETWORKS. TECHNICAL REPORT. Contracts NONR 760(24), NONR 1228(10) & DA 31 124 ARO D 322, Projs. NR 047 048 & 047 021, Management Sci Res. Rep. 77, Systems Res. Memo. 154, June 1966, 42pp. USN Logistics & Mathematical Statistics Branch, ONR, Washington, D.C. (Carnegie Institute of Technology, Pittsburgh, Penn.). (AD 634239)

A sequence of linear programming models of network type are here used to illustrate how the optimizations of linear programming may be used to provide guidance and control: a) for simulating complex nonlinear systems; and b) for evaluating possible alterations in system designs. This is first illustrated by an example involving only a single extremization (=optimization). Subsequently this is extended to a polyextremization which utilizes certain concepts from the theory of n-person non-zero sum games. The latter is then replaced by a model which again utilizes only a single extremal principle which is related to linear programming by means of what are called multi-copy network models. This is used to accommodate multiple origin-to-destination requirements in which two-way flow on the links is possible. Possible extensions and use of these ideas are examined, including ways in which zoning and traffic studies might be combined for joint treatment. Routes for further research are also suggested.

31,693
Kent, P.R. VISUAL REQUIREMENT FAILURE BY CANDIDATES REPORTING FOR BASIC SUBMARINE TRAINING DURING 1965. BuMed. Proj. MF022.03.03 9018.06, Memo Rep. 66 13, July 1966, 7pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 638610)

The number of non-physically qualified officers and enlisted men receiving orders for basic submarine training continues to be a serious problem. During 1965, 14 % of all reporting candidates failed to pass the physical examination. More than one third of this number failed the visual test. This was in spite of a modified visual standard, effective during all of 1965, which passed 44 candidates who would formerly have failed.
R 3

31,694
Kelso, Barbara. PILOT OPINION SURVEY OF A MOVING TAPE VERNIER PITCH DISPLAY CONCEPT. Contract AF 33(615) 5225, Memo. Rep. 66 15, Aug. 1966, 10pp. Human Engineering Group, Bunker-Ramo Corp., Canoga Park, Calif. (AD 640717)

The report discusses the evaluation of a moving tape vernier pitch display concept. Objective of the evaluation was to elicit opinions from pilots and engineers on: a) the potential merit of the display concept for continued development; and b) suggestions for improving the display format. PIS (Photographic Instrument Synthesizer) films of the pitch indicator were shown, and comments were elicited through an open-ended questionnaire. The report describes the display concept, the method employed in the evaluation, results of the questionnaire, and suggested follow-on work.

31,695
Johnston, W.A. & Howell, W.C. THE EFFECT OF TEAM FEEDBACK ON INDIVIDUAL PERFORMANCE AND SELF-EVALUATION. FINAL SCIENTIFIC REPORT. Grant AF AFOSR 985 66, Proj. 9778 02, Rep. AFOSR 66 1948, Sept. 1966, 11pp. USAF Office of Scientific Research, OAR, Arlington, Va. (Human Performance Center, Ohio State University, Columbus, Ohio). (AD 640404)

This research program was designed to assess the role of team feedback in small-group activity. Team feedback was simulated by telling the S that he had a partner and that feedback reflected his team performance relative to average performance. Actually, feedback represented the S's individual tracking performance relative to a criterion, the stringency of which was manipulated experimentally. A stringent criterion produced poor feedback as though the S had a poor partner, and a lenient criterion simulated a good partner. In general, the Ss performed best with good partners (lenient criteria). If one partner was replaced by a poorer partner, the S's performance was retarded. The Ss accepted the credit for good team scores induced by a lenient criterion, but attributed the blame for poor scores wrought by a stringent criterion to their contrived partners. The data support the thesis that team feedback is an important determinant of individual behavior in the small group.
R 4

31,696
Lynch, C.J. NOISE CONTROL. Int. Sci. Tech., April 1966, 52, 32-41.

Noise, like air pollution and water pollution, is one of the apparently unavoidable by-products of an industrialized society. Unlike the other two, however, noise cannot be completely eliminated because noise is sound (music, conversation, etc.) and the difference between them depends on who is hearing it. Nor is noise--at least at its present levels--a hazard to society. It is mostly a nuisance and the amount of silencing that is possible depends on the source. Jet aircraft are perhaps the worst offenders because they are among the most intense of the common sources and because the noise-producing mechanism is very closely tied to the power-producing mechanism. The aircraft industry has struggled with the problem for more than five years and has effected some reduction in the noise of jets, but dramatic reductions in the future are not thought to be possible. Other noise problems--diesel trucks, railway trains, "noisy" apartment buildings and offices--may be helped by research that attempts to understand the details of noise generation and attenuation. More likely, advances will come through the diligent application of what is already known about confining or excluding noise. In either case, the prospects for a truly quiet world are dim.
R 13

31,697
Mattson, H.W. KEEPING ASTRONAUTS ALIVE. Int. Sci. Tech., June 1966, 54, 28-37.

So far, all space excursions have been just that, and their provisions have been supplied in somewhat the same fashion as for a picnic in the park. What's more, the missions planned for the near future will not be much different: They will use prepackaged food, stored water, atmospheres which we know to be safe (in short flights, at least), chemical absorption of carbon dioxide, and primitive waste disposal methods--plastic bags. When we get to longer space missions, however, things will have to be quite different. Because of the large cumulative weights involved, exhaled carbon dioxide will have to be reconverted to oxygen, water reclaimed from the air, wash water, and urine, and trace contaminants removed. Food may even have to be produced on board. Some of these needs are far off, but work must go forward now to ensure that there will be answers when they're needed.
R 4

31,698
Schmit, L.A., Jr. AUTOMATED DESIGN. Int. Sci. Tech., June 1966, 54, 63-78.

Engineering design is part judgment and part logical decision making. By applying the methods of mathematical programming, many of the judgment aspects can be quantified so that they can be handled by a high-speed digital computer. Thus the computer can be made to do more than just predict the behavior of trial designs; going beyond this purely analytical function, it can be programmed to test and retest proposed designs against clearly defined constraints. Moreover, one can devise procedures for the computer to follow so as to continually modify a trial design until the optimum design is found. These design-synthesis techniques, still pretty much in their infancy, are proving useful in the design of aerospace and civil engineering structures. Their wider application turns on how well designers and mathematical programmers can learn to communicate with one another.
R 9

31,699
Senders, J.W. HUMAN PERFORMANCE. Int. Sci. Tech., July 1966, 55, 58-68.

Though man's performance of various tasks is often described as if he were a servo or an information processor, he is really not a machine. His outer limits of performance are his physical structure; how close he operates to these is determined by his physiology and psychology. The central processor in a human transforms inputs form the senses into outputs via his motor system in ways not entirely understood. The processor can attend to only one input at a time, so man is a conditional sampler, paying attention to input signals according to the demands of the task. The upper limits of the performance seem to be set by the total load on the central processor. Inappropriate models of human operators may lead to underestimating or overestimating the capacities of man.
R 7

31,700
Carlson, H.W. & McLean, F.E. THE SONIC BOOM. Int. Sci. Tech., July 1966, 55, 70-80.

The intensity of the boom produced by a supersonic airplane depends on a great many factors, some of which can be controlled and some of which cannot. Of those that can be controlled, the most challenging to technology is the design of the airplane itself. Recent studies suggest that, aside from the gains that can be achieved by reducing the airplane's drag (and that is where most of the boom energy comes from in the first place), there are ways to reduce the boom by modifying the shape of the airplane. This applies particularly to large airplanes the size of the proposed supersonic transport. When an airplane gets that large, the pressure signature of the boom is closely related to the detailed shape of the airplane, and small changes in the shape may yield large changes in the boom.
R 6

31,701
Herbert, E. TRAFFIC SAFETY. Int. Sci. Tech., Sept. 1966, 57, 42-56.

Human skill is doubtless the weakest component in the dynamic relationships among vehicle, road, and driving environment. But because the human is also the hardest component to change, the technical community must seek ways to understand the complexities of the relationships and to forgive and compensate for human frailties in its designs. Much of the safety problem reduces to feedback of information to the driver, and communication channels must be deliberately established for him from the vehicle, the road, and the driving environment. Road geometry can forgive a driver and even provide anticipatory feedback to influence his performance. Though the ultimate answer to traffic safety may be in external automatic control of individual vehicles, the reliability required will push all the present limits of the technical arts. Meanwhile, faster corrective feedback to drivers, to designers of vehicles and of roads may have more effect than safety slogans and deterrence by punishment and penalties.
R 12

31,702
Davis, J.F. COMPUTERS IN MEDICINE. Int. Sci. Tech., Dec. 1966, 60, 40-48.

So much of medical practice is processing of information about symptoms, tests, and diseases that computers could help the doctor if he could formalize what he does. In simpler tasks, computers control and structure test procedures, codify the results of tests, maintain files centrally for remote recreation of data, and safeguard the administration of drugs. But concepts of diagnosis are hard to analyze and program. Information retrieval widens the range of input to the diagnostician while statistical analysis techniques and linear programming help decision-making in planning sequences of treatment. Computers are so expensive that time-sharing holds major promise for smaller hospitals, but this means larger machines for which programming will have to be most flexible to serve a variety of needs of characteristically independent physicians.
R 9

31,703
Mattson, H.W. FUTURE HOSPITALS. Int. Sci. Tech., Aug. 1966, 56, 30-37.

In a sense, hospitals are factories: They make healthy people out of sick ones. Considered as factories, however, they have been remarkably untouched by improvements in technology, although many innovations are now available which could substantially improve patient care. Certain classes of instruments call for a new grouping of patients, computerized record-keeping changes the old concept of the nurses station, developments in prepackaging and disposable supplies eliminate the need for many of the in-house service facilities considered essential heretofore. However, unless these developments are examined well in advance of hospital construction their benefits will be largely unavailable.
R 7

31,704
Siegel, A.I. & Fischl, M.A. STUDIES IN ADJUNCT AUTOINSTRUCTION. J. Industr. Psychol., 1966, 4(2), 37-47. (Applied Psychological Services, Wayne, Penn.).

Three studies were conducted investigating the relative effectiveness of adjunct autoinstruction in comparison with presentation of the same course materials by unaugmented methods. The segments of the population which were sampled consisted of: a) male college students; b) suburban housewives; and c) semiskilled employed adult women. The criteria of learning were performance on a postprogram knowledge test and, in one study, percentage gain in knowledge from pretest to posttest. Relative to the level of knowledge attained criterion, adjunct autoinstruction was found to be superior for the college students, but no consistent superiority was detected for adjunct autoinstruction in the other population segments. Relative to the percentage gain criterion, adjunct autoinstruction was found to be the superior instructional method in the one study investigating this criterion. Adjunct augmentation, when coupled with the most inferior of the instructional methods investigated, consistently brought learning under that method up to a level at least as high as the learning under any of the other instructional methods employed.
R 7

31,705
Kirchner, W.K. ANALYSIS AND PREDICTION OF PERFORMANCE OF EXPERIENCED KEY-PUNCH OPERATORS. J. Industr. Psychol., 1966, 4(2), 48-52. (Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Utilizing a standardized work-sample for 38 experienced female key-punch operators, psychological tests including the Card-punch Operator Aptitude Test and the Short Employment Test-Vocabulary were found to predict speed of punching. Errors, however, were not predicted well. Operators did tend to make more perceptual (misreading) errors than spatial (mispunching) ones. These operators also varied markedly, even though experienced, in terms of speed and accuracy of performance which tended, too, to be unrelated as criteria of performance.
R 2

31,706
Streimer, I., Turner, D.P.W. & Volkmer, K. AN INVESTIGATION OF THE EFFECT OF TOTAL SIMULATION SYSTEM MASS ON CERTAIN HUMAN FORCE OUTPUTS IN TRACTIONLESS ENVIRONMENTS. J. Astronautical Sciences, May-June 1966, 13(3), 106-109. (San Fernando Valley State College, Northridge, Calif.).

A number of investigators employing a variety of simulation techniques, have examined the effects of reduced traction upon the force producing capabilities of operators executing diverse manual tasks. The various studies reported have utilized simulation systems which have differed greatly in complexity, concept and simulator mass; it is this last characteristic which is a major concern of this paper. Most of the studies previously reported have not specified the inertial characteristics of the simulators used, nor, to the knowledge of the writers, have any systematic investigations been made of the effects of variations in man-simulator mass upon the characteristics of operator developed manual forces. Since this lack of knowledge may render suspect any experimental results, a research program was initiated which utilized the North American six degree of freedom (df) simulator in a study designed to provide some of the presently missing information. It was found that the magnitudes of the torques developed on the process wheels while performing in the 6 df simulator were appreciably less than the corresponding values developed in the normally tractive state. The magnitudes of the torques developed on the shafts were larger during normally tractive work than during simulator work. The variations in simulator-man system total mass did not affect the obtained values in any measurable manner.
R 24

31,707
Biernson, G. A FEEDBACK-CONTROL MODEL OF HUMAN VISION. Proc. IEEE, June 1966, 54(6), 858-872. (Applied Research Lab., Sylvania Electric Products, Inc., Waltham, Mass.).

In order for the human retina to achieve its very wide operating range (one billion to one in light intensity), high accuracy of spectral discrimination (the eye can distinguish among at least 10 million different shades of object color), constancy of object color, and uniform field of color perception, it appears necessary that the retinal receptors incorporate the following feedback-control processes: time-average feedback, spatial-average feedback, and automatic gain control. Time-average feedback would adapt each receptor to the time-average light it receives; spatial-average feedback would modify the signal from each receptor as a function of a weighted spatial-average of the receptor signals throughout the retina; and automatic gain control would keep the sensitivity of each receptor constant regardless of the adaptation conditions. This paper presents a model of a retinal receptor which incorporates these feedback control processes, and which appears to be consistent with physiological and psychological evidence.
R 37

31,708
MacNichol, E.F., Jr., Rushton, W. & Biernson, G. COMMENT ON "A FEEDBACK-CONTROL MODEL OF HUMAN VISION." Proc. IEEE, Aug. 1966, 54(8), 1129-1131. (Johns Hopkins University, Baltimore, Md.).

This note critically comments on HEIAS No. 31,707, "A feedback control model of human vision," relative to its "highly speculative" nature.

31,709
Linvill, J.G. & Bliss, J.C. A DIRECT TRANSLATION READING AID FOR THE BLIND. Proc. IEEE, Jan. 1966, 54(1), 40-51. (Electrical Engineering Dept., Stanford University, Stanford, Calif. & Stanford Research Institute, Menlo Park, Calif.).

A reading device for the blind is proposed in which a facsimile of ordinary printed material is presented tactually. The tactile image is presented by a dense array of pins which can be made to vibrate individually through perforations in a plate on which the user's finger is rested. In the arrangement proposed, the image of ordinary printed matter is focused on an array of photocells which are coupled one-to-one to piezoelectric reeds which drive the image-producing pins. The feasibility of this arrangement has been evaluated, and relations among the design parameters are derived. The power required to drive each pin for adequate tactile stimulation is shown to be only about 30 μW. Present photocell sensitivities and integrated circuit techniques appear to be adequate for a convenient miniature realization of this arrangement, although several technical development problems remain to be solved. Successful reading tests with blind Ss are reported in which a computer controller simulates the optical portion of the system. The tactile images presented on a field of 96 pelzoelectrically driven pins have been readable by the 3 Ss tested at rates of about 30 correct words per minute.
R 16

31,710
Christiansen, D. COMPUTER-AIDED DESIGN: PART I. THE MAN-MACHINE MERGER. Electronics, Sept. 1966, 39(19), 110-123.

This article is an overview of the role currently played by the computer in aiding circuit designers. Numerous examples of existing applications of computer techniques and programs are described, both successes and failures. Future trends for the computer in electronics are indicated. (HEIAS)

31,711
Levin, S.M. AIRCRAFT NOISE--CAN IT BE CUT? Space/Aeronautics, Aug. 1966, 46(3), 65-75.

Producers and operators of next-generation supertransports are--perforce--designing engine/airframes and planning flight profiles with noise very much in mind. Although a modicum of attenuation is coincidental with better performance, most anti-noise measures--duct configuration, aerodynamic control, steep climbout, and the like--are certain to be subject to economic penalties. The nature and extent of the unknowns stubbornly resist straight, analytical answers. The variables involve not only the acoustical subjectivity of people and the aberrations of noise sources, but the complex tradeoffs of any viable airframe/engine operating design. Beyond all the voluminous research and engineering effort, our direction must tend to be largely empirical (and, in some aspects, qualitative), gradually emerging from attacks on the various fronts of engine and airplane development, flight operations, and accommodation of people in critical areas. The real challenge for tomorrow's jet fleets is merely to stay within the upper bounds of noise acceptability.
R 6

31,712
David, Heather M. DOUGLAS CITES TEST RESULTS OF SIMULATED ZERO-G STUDY. Missiles & Rockets, May 1966, 18(20), 40-43.

This article reviews briefly the zero-g studies undertaken at the Douglas Aircraft Company.

31,713
Lamson, B.G. & Dimsdale, B. A NATURAL LANGUAGE INFORMATION RETRIEVAL SYSTEM. Proc. IEEE, Dec. 1966, 54(12), 1636-1640. (Health Sciences Center, University of California, Los Angeles, Calif. & IBM Los Angeles Scientific Center, Los Angeles, Calif.).

The problem of natural language information retrieval is difficult because of vocabulary size, semantics, and syntax. For some specialized disciplines, in particular tissue pathology, vocabularies are limited, semantic problems largely disappear, and syntactic structure can be replaced by a much simpler structure. Experience with the language of surgical pathology is given, also an outline of an automatic data processing system applied to the problem. A considerably expanded system, for dealing with larger data bases and larger varieties of queries, is being designed.
R 12

31,714
Allen, S.I., Barnett, G.O. & Castleman, P.A. USE OF A TIME-SHARED GENERAL-PURPOSE FILE-HANDLING SYSTEM IN HOSPITAL RESEARCH. Proc. IEEE, Dec. 1966, 54(12), 1641-1648. (Clinical Center, National Institutes of Health, Bethesda, Md.).

Techniques in automated data-handling for medical research and patient-care purposes are being investigated using a conversational time-shared computer system. This paper covers the initial design considerations, implementation experience, and user reaction with the prototype set of on-line, multiple-access, general-purpose information storage and retrieval programs. This system is designed to permit hospital personnel (without the need for special assistance or any direct intervention by trained computer programmers) to define and establish private data files, to enter or change moderately large volumes of English text or coded data, and to retrieve and manipulate selected output information. Hospital staffs, from remote terminals, have been using this system on an operational basis for more than a year. The development and implementation of the system is being carried out by Bolt Beranek and Newman Inc., and the Massachusetts General Hospital, under the support of the National Institutes of Health.
R 10

31,715
Silvern, Gloria M. & Silvern, L.C. PROGRAMMED INSTRUCTION AND COMPUTER-ASSISTED INSTRUCTION. Proc. IEEE, Dec. 1966, 54(12), 1648-1655. (Education & Training Consultants, Los Angeles, Calif.).

An overview of Programmed Instruction (PI) is presented and its philosophy described. A brief delineation of courses in programmed format for the training of computer programmers and computer maintainers is given. The extent of programmed instruction activity for educating engineers in preparation for assignments is discussed. Computer-Assisted Instruction (CAI) is defined, and the bridge between CAI and PI is examined. Attention is given to current research in CAI and to the roles of the learner, teacher, instructional programmer, and computer programmer. A major conclusion reached is that there exists a growing need for the development of instructional programmers and for the production of more adequate computer software. Finally, attention is given to the development of software and hardware for CAI systems. Specifications for a typical CAI language and system are presented, and the authors reflect upon future CAI systems.
R 28

31,716
Goldberg, A.L., Tondow, M. & Bushnell, D.D. THE COMPUTER IN EDUCATION--SOME EXAMPLES. Proc. IEEE, Dec. 1966, 54(12), 1656-1662. (Honeywell Electronic Data Processing, Wellesley Hills, Mass.).

Educational institutions are now beginning to develop projects and programs, and to find the people to carry out both administrative and instructional activities which involve computer technology. The examples in this paper cover a broad spectrum of activity in handling information which is important to educational decision makers--the teacher, the guidance counsellor, the principal, the administrator--relating to the allocation of resources, to the effectiveness of educational programming, and to learning more about the process of education itself. Included in the paper are a discussion of the Palo Alto School District Educational Data Services operation and an explanation of the developing regional data processing concept in California. Later, the notion of the Computer Utility Data Bank is explored in terms of the present and future state-of-the-art as they are related to educational applications. Finally, the relationship of information to the user outside of the formal instructional situation (in the school) is considered in the light of new styles of urban planning and the total communications requirements which may be suggested for the user's home. The focus here is on Columbia City, Md. This sampling, and it can only be that, should suggest that a major revolution is in the offing. It will change our notions of how people learn, of what information is required for the meaningful life and for the contributing and participating citizen. As with other disciplines, the dialog between the educator and the computer scientist has barely begun.
R 7

31,717
Salton, G. INFORMATION DISSEMINATION AND AUTOMATIC INFORMATION SYSTEMS. Proc. IEEE, Dec. 1966, 54(12), 1663-1678. (Computer Science Dept., Cornell University, Ithaca, N.Y.).

Automatic information dissemination, search, and retrieval systems have become increasingly important in recent years, because of the urgency of the information problems themselves, and also because of a widespread feeling that computers can help in providing the much needed solutions. Over the past few years much has been learned about the design of automatic information systems and about the effectiveness of various types of analysis and search procedures. The present report reviews the principal techniques of interest and provides a forecast of the systems design and type of operations likely to be implemented in automatic information systems of the future. The information dissemination process is first examined in detail. The main functions and organization of information systems are then reviewed, and present capabilities are described using some of the currently existing operational systems as examples. Finally, future systems are considered, including in particular those based on automatic content analysis and on user-controlled searches. Specifically examined are author indexing and automatic analysis techniques, automatic typesetting and composition procedures, automatic and semiautomatic dictionary construction, and iterative search techniques.
R 39

31,718
Holmes, W.S. AUTOMATIC PHOTOINTERPRETATION AND TARGET LOCATION. Proc. IEEE, Dec. 1966, 54(12), 1679-1686. (Computer Sciences Div., Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

The photointerpretation process is one of the most difficult, but seemingly feasible, processes to automate. The non-numeric nature of the basic input medium, the great variation in imagery representing a single target class, the absence of satisfactory mathematical models for background noise (which are often patterns of potential, but not immediate interest) as well as target class patterns, and the intuitive logical requirement of higher order inferential decisions, make this problem one of the most interesting potential applications for computers today. This paper characterizes the photointerpretation process in terms of the input pattern structure and an overall decision tree for the process. A general model for pattern recognition is presented and related to the photointerpretation process. The use of the general-purpose computer as a research tool to permit study of automatic photointerpretation is illustrated by several specific examples. Nonlinear, two-dimensional filters which were implemented and evaluated entirely within an IBM-7044 are examples treated, while experiments on linear discrimination pattern recognizers for use in photointerpretation represent an opposite extreme. The results of an extensive experimental program to explore linear discriminator pattern recognizers show that automatic photointerpretation is more heavily dependent on preprocessors than on image classifiers. These results are discussed in terms of: a) their significance to ultimate solution of current problems; b) the implication of the accomplishments to date; and c) recommended directions for research in this area.
R 24

31,719
Solomonoff, R.J. SOME RECENT WORK IN ARTIFICIAL INTELLIGENCE. Proc. IEEE, Dec. 1966, 54(12), 1687-1697. (Rockford Research Institute, Cambridge, Mass.).

This paper will review certain approaches to artificial intelligence research--mainly work done since 1960. An important area of research involves designing a machine that can adequately improve its own performance as well as solve other problems normally requiring human intelligence. Work in heuristic programming that seems most relevant to this goal will be discussed at length. Important subproblems of devising techniques for self-improvement, the general problem of deciding what task to best work on next in a network of tasks, and the general problem of how to mechanize learning or inductive inference. Some work in linguistics and pattern recognition is directly concerned with the induction problem. Another area of research that will be treated is simulation of organic evolution.
R 83

31,720
Prince, M.D. MAN-COMPUTER GRAPHICS FOR COMPUTER-AIDED DESIGN. Proc. IEEE, Dec. 1966, 54(12), 1698-1708. (Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.).

This paper reviews the history, concepts, state-of-the-art, and future directions of the use of man-computer graphics for computer-aided design. Computer-aided design is based on a real-time graphical dialogue between the man and the computer in which the man draws on a display by means of a "light pen" or other input device. The computer "understands" the picture, makes calculations based on it, and presents the results pictorially to the user for his approval or revision. This man-computer graphical conversation has been made possible by recent advances in the speed of the digital computer, time-sharing programming, computer-driven display technology, and graphical input devices. The light pen is the most commonly used graphical input device, but keyboards, joysticks, flat matrix arrays, and other devices are also used. The programming state-of-the-art is a limiting factor in the implementation of graphical computer-aided design; much work remains to be done in systems programming, efficient time sharing, list structure concepts, file organization, and memory protection. A number of experimental equipment configurations in use in various laboratories are cited and the hardware state-of-the-art is reviewed. Several experimental and production applications of computer-aided design evolved in a large aircraft company are described and illustrated by display photographs. These applications relate to structural analysis, dynamics, information retrieval, accounting, and numerical control tape preparation. For the future, advances are required in improved man-computer communication, techniques to permit the operation of displays at great distances from the central computer, and methods of inputting existing drawings into the computer in a meaningful form.
R 83

31,721
Prywes, N.S. MAN-COMPUTER PROBLEM SOLVING WITH MULTILIST. Proc. IEEE, Dec. 1966, 54(12), 1788-1801. (Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Penn.).

The paper reports on augmenting human problem solving capability in the day-to-day work in management or science through provision of information in a large integrated file with split second response to demands for data or program execution. A number of such systems have been developed. However, the description is in terms of the latest system developed at the University of Pennsylvania. In the first part, the paper deals with the Multilist technique for mass storage embedded in a system for remote consoles. Console services, a high level query language and interpreter for the query language, and a highly structured file organization are among the special subsystems described. The second part is devoted to illustrations of usages describing a number of the applications which can be concurrently serviced within the system. These include: an automatic library catalog, to illustrate storage and retrieval functions, and inventory management, to illustrate large scale management functions.
R 14

31,722
Hobbs, L.C. DISPLAY APPLICATIONS AND TECHNOLOGY. Proc. IEEE, Dec. 1966, 54(12), 1870-1884. (Hobbs Associates, Inc., Corona del Mar, Calif.).

Displays are playing an increasingly important role in providing man-machine interaction in computer systems. Small-screen displays, such as cathode-ray tubes, coupled with alphanumeric or graphic input devices, provide a console that permits close on-line interaction between the user and the computer and data base. Large-screen displays permit groups of users to interact both with one another and with the information processing system. This paper discusses several of the more important applications of computer generated displays, display systems design and characteristics, and display technologies which are the primary candidates for implementing the visual transducer portion of future display systems. Several problem areas are identified.
R 110

31,723
Leont'yeva, A.N., Zinchenko, V.P. & Panova, D. Yu. ENGINEERING PSYCHOLOGY. FTD HT 66 147/1+2, Oct. 1966, 712pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Moscow University, Moscow, Russia). (Transl: Russ.). (AD 646960)

This series of articles touches on the problems of engineering psychology, automation, and information theory. A method of quantitative analysis of the perception of spatial and spatio-temporal relations is described. Several methods for analyzing brain biocurrents are also mentioned. Even such matters as noise suppression in radio engineering and selection of personnel for industry and the armed forces are discussed. (HEIAS)
R Many

31,724
Klonglan, G.E., Beal, G.M. & Bohlen, J.M ADOPTION OF PUBLIC FALLOUT SHELTERS: A 1964 NATIONAL STUDY. Contract OCD PS 65 9, Proj. 401 44 96 09 1529, Subtask 4811 E, Rural Sociology Rep. 49, 1966, 339pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (Sociology & Anthropology Dept., Iowa State University, Ames, Iowa). (AD 641645)

A model of the adoption process is used to analyze the public's progress in adopting the idea of using public fallout shelters in the event of nuclear attack. The analysis is based on findings from the 1964 OCD National Survey of 1464 respondents. Respondents are assigned to one of five adoption stages; 44.7% of the respondents were unaware of the existance of public fallout shelters (Unaware Stage); 10.2% were aware of public fallout shelters but had no additional information about them (Aware Stage); 16.6% were aware of and had additional information about public fallout shelters but had not thought about using them (Information Stage); 10.2% were aware of, had additional information, and had thought about using public fallout shelters but had not decided to go to a public fallout shelter (Evaluation Stage); 18.2% were aware of, had additional information, had thought about using and had decided to go to a public fallout shelter in the event of nuclear attack (Adoption Stage). The relationships between selected demographic and attitude variables and stage of adoption of public fallout shelters are analyzed. Fourteen demographic variables were compared to the adoption stages; 11 were statistically related to stage of adoption. The attitude variables were divided into 4 major sectors: 22 perception of threat variables were analyzed, 7 were statistically related to stage of adoption; 20 final Cold War outcome variables were analyzed, only one was statistically related to stage of adoption; 22 fallout shelter variables were analyzed, 13 were statistically related to stage of adoption; 46 perception of antimissile missile variables were analyzed, 29 were statistically related to stage of adoption.
R 1

31,725
McKelvey, R.K. & Brown, G.S. A CONFIGURATION DESIGN CONCEPT FOR DISTANCE CODED MARKING OF CATEGORY II AND IIIA RUNWAYS. FINAL REPORT. Proj. 430 008 01R, Rep. RD 66 37, May 1966, 116pp. US National Aviation Facilities Experimental Center, FAA, Atlantic City, N.J. (AD 640602)

Eight experiments were conducted in a program with the objective of providing a configurational design concept for a system of distance coded runway marking geared particularly to the support of landing and take-off operations in Category II and III-A bright daylight contact fogs (fog extending to the surface--no ceiling). Among other criteria the system must meet are distance coding of a bidirectional runway, compatibility with runway lighting, and resistance to loss of configurational integrity through operational wear. A symbolic distance indicating system was regarded as having demonstrated the greatest potential for meeting the full array of design objectives and is recommended for service test and evaluation.
R 8

31,726
Soulé, H. ESCAPING FROM AIRCRAFT. Astronautics & Aeronautics, Dec. 1966, 4(12), 8-10.

This note considers briefly some of the evacuation problems in jumbo jets.

(Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.).

The 1970s will see passenger and cargo carried by a new fleet of great ships of the air, extraordinary in capacity, versatility, speed, and productiveness. This article discusses some of the considerations which determine new transport designs.

31,728
Miller, C.O. PRODUCT LIABILITY AND SYSTEMS MANAGEMENT. Astronautics & Aeronautics, Sept. 1966, 4(9), 62-66. (Aerospace Safety Div., University of Southern California, Los Angeles, Calif.).

This article lists some of the liability problems in aerospace equipment design and operation.
R 26

31,729
Raymond, A.E. BEYOND THE HORIZON IN AIR TRANSPORTATION. Astronautics & Aeronautics, Sept. 1966, 4(9), 68-71. (Rand Corporation, Santa Monica, Calif.).

This article takes a long view of air transport. The post-1980 air-transport world that is described is not a simple extension of past trends, for almost all these trends have practical limits--some of them already in sight. Vehicle costs cannot rise indefinitely: Already they are reaching beyond the capabilities of private financing. Government financing also has its limits. As a practical matter, Earthbound transportation clearly does not make sense much beyond ranges of 6000 mi: Only a small fraction of the market could use more. Hypersonic or orbital speeds are not called for at such ranges. Air space, enormous as it is, is finite: It can contain only a certain number of vehicles traveling at the same time over established routes. Materials, no matter how exotic, all have thermal limits. The populace will accept only a certain amount of noise without revolt. There is an economic limit to the size of airfields and the thickness of their paving. Congestion in and around air terminals can go only so far before complete immobility and frustration set in.

31,730
Rowe, N.E. FLIGHT SAFETY IN THE NEW JET ERA. Astronautics & Aeronautics, Sept. 1966, 4(9), 84-88. (de Havilland Aircraft of Canada, Ltd., Downsview, Ontario, Canada).

This article argues for certain steps to promote aviation safety as follows: a) Two new air-transport accident statistics are needed--namely, "accidents per flight or per sortie" and "fatal accidents per flight"--to replace the usual transportation statistic of accidents per 10^8 passenger miles, which now tends to be misleading as an index of operational safety; b) With the trend towards increasing aircraft seat capacity, the catastrophic type of accident must be eliminated by: (1) Providing aircraft crews with means to obtain precise position in three dimensions at all times, but especially immediately before and during descent from cruising altitude; (2) Introducing means for automatic landing as a matter of urgency; (3) Introducing vectored thrust and other means to steepen flight paths in climb and descent and to reduce takeoff and landing speeds. This demands urgent research, development, and design action; c) Applying the design philosophy of STOL aircraft to medium- and long-range aircraft also, especially the former, with the aim of greatly reducing takeoff and landing speeds. The cost of these safety measures is likely to have a significant effect on operating costs, but prevention of accidents, especially to the very large aircraft now in sight, is of paramount importance, firstly to the ultimate economic health of the air-transportation industry, in terms of its ability to attract customers to the full extent, and secondly to the discharge of its full capacity of service to civilization.
R 6

31,731
Cheaney, E.S. & Loomis, J.P. AIR-TRANSPORTATION PLANNING IN EMERGING NATIONS. Astronautics & Aeronautics, Sept. 1966, 4(9), 94-103. (Battelle Memorial Institute, Columbus, Ohio).

Emerging nations already have a substantial amount of air-transport hardware. For, in an environment of uncertain area-development potentials, limited capital-investment funds, and a crying need for prestige and stimulation of the populace, the aircraft becomes a natural choice. In comparison with other modes, moreover, it provides the greatest opportunity for transportation experimentation. The real challenge to the planners and operators will arise after the hoped-for stimulation has had its effects. Then the ability of air transport to operate efficiently and economically in competition with other modes will be of utmost importance. The attainment of this final objective will require modern-day planners to identify and account for the important effects of subtle sociological and political, as well as economic factors.

31,732
Sasaki, T. RELATION OF BASAL METABOLISM TO CHANGES IN FOOD COMPOSITION AND BODY COMPOSITION. Federation Proc., July-Aug. 1966, 25(4)Part I, 1165-1168. (Physiology Dept., Kumamoto University, Kumamoto, Japan).

Monthly changes in basal metabolism in nine male and six female Japanese were noted for the period 1949-1952. From the 766 determinations, an equation for the periodicity of basal metabolism was determined. When this equation is cross-plotted with a periodic function of outdoor temperature, a hysterisis shape results. This gives evidence that the basal metabolism is dependent not only on the current environmental temperature conditions but also on the past conditions. The article also discusses the annual range of metabolism which was studied over a time period 1949-1964 as a function of diet changes, typical of Japanese food habits in the period. In a third study, body composition was determined by means of underwater weighing of these groups of subjects, athletes, non-athletes and obese men. The basal metabolism of the three groups were expressed in terms of lean body mass. (HEIAS)
R 10

31,733
Yoshimura, M., Yukiyoshi, K., Yoshioka, T. & Takeda, H. CLIMATIC ADAPTATION OF BASAL METABOLISM. Federation Proc., July-Aug. 1966, 25(4)Part I, 1169-1174. (Physiology Dept., Kyoto Prefectural University of Medicine, Kyoto, Japan).

Japanese show a seasonal variation in basal metabolism due to adaptation of thyroid activity to changes in environmental temperature. This seasonal variation seems to be inhibited by many factors related to the physical status, dietary composition, and physical work. In a Canadian group, a high dietary fat intake and seasonal changes in physical exercise may inhibit the reduction of thyroid activity which is normally initiated by adaptation to summer heat.
R 2

31,734
Andersen, K.L. (Princ. Investigator). METABOLIC AND CIRCULATORY ASPECTS OF TOLERANCE TO COLD AS AFFECTED BY PHYSICAL TRAINING. Federation Proc., July-Aug. 1966, 25(4)Part I, 1351-1356. (Physiology Institute, University of Bergen, Bergen, Norway).

It has been suggested that improved physical fitness brought about by training in strenuous muscular exercises affects the bodily tolerance to cold. The present field study was undertaken in order to investigate this problem and to work out some of the possible physiological mechanisms involved. A group of young men (19 Ss) served as experimental Ss and underwent 6 weeks of hard physical training. During this period half of the Ss (later called "warm subjects") slept warmly and comfortably in heated quarters. The other Ss (later called "cold subjects") were cold exposed by sleeping under defined thermal conditions. The physiological factors underlying their exercise fitness and cold tolerance were assessed prior to and after the experimental period.
R 7

31,735
Bonjer, F.H. MEASUREMENT OF WORKING CAPACITY BY ASSESSMENT OF THE AEROBIC CAPACITY IN A SINGLE SESSION. Federation Proc., July-Aug. 1966, 25(4)Part I, 1363-1365. (Occupational Medicine Dept., Netherlands Institute for Preventative Medicine, Leiden, The Netherlands).

Knowledge of the aerobic capacity is important for the assessment of the individual working capacity as it reveals the extent to which the intake and transportation of oxygen can be increased in support of vital functions requiring a continuous supply of oxygen to the active tissues. Measurement of the aerobic capacity is only feasible under conditions of a high demand from the oxygen consuming tissues. Such conditions exist if the greater part of the systemic muscles are active during 4 min or more. In principle any type of exercise is acceptable for a testing procedure as long as these requirements are fulfilled. For practical reasons the preferred exercise tests are those in which the external work can be measured. Step tests, grade walking on a treadmill, or bicycle ergometer tests are suitable. The bicycle ergometer has the advantage of a well-defined pattern of movements even at different loads and different pedalling rates. Observations of physiological responses to moderate exercise only do not provide a complete understanding of the individual work capacity. This paper discusses the methodology of measurement of work capacity.
R 6

31,736
Strydom, N.B., Wyndham, C.H., Williams, C.G., Morrison, J.F., et al. ENERGY REQUIREMENTS OF ACCLIMATIZED SUBJECTS IN HUMID HEAT. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1366-1371. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

This study was designed to determine the energy cost of acclimatized Ss when at rest or at work in a range of environmental conditions which varied from mild to severe heat. It was found that the higher the body temperature of heat acclimatized man, the lower the metabolic rate. This decrease in metabolic rate with time of exposure shows good agreement with the pulse rate response, particularly for the observations at rest. The body temperatures of the Ss not only increased with time of exposure but also with more stressful temperature conditions, yet neither time nor environmental temperature resulted in any significant increases in oxygen intake. Although the oxygen consumptions in heat of the five acclimatized Ss were significantly lower than those of a comparable weight group in cool conditions, no valid conclusion can be drawn with respect to differences between them. The group was very fit and well trained and training has been shown to result in a decreased metabolic rate for a set task.
R 12

31,737
Gordon, R.S., Jr. & Andrews, H.L. POTASSIUM DEPLETION UNDER HEAT STRESS. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1372-1374. (National Institutes of Health, Bethesda, Md.).

Years ago, it was realized that losses of sodium through sweating might be so great as to exceed sodium intake. As a result, sodium depletion leading to symptoms of heat exhaustion might result. It is our intention to raise the parallel question with respect to potassium metabolism, and to show that potassium depletion due to losses in the sweat may occur. This report summarizes the results of an initial study designed to follow potassium balances in normal volunteers under conditions which simulate those of the life of the laboring man in many tropical countries.
R 11

31,738
Henrotte, J.G. VARIATION OF PLASMA POTASSIUM AND POTASSIUM TOLERANCE IN MAN IN RELATION TO CLIMATIC ADAPTATION. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1375-1379. (Laboratoire de Pathologie et Thérapeutique Générales, University of Liège, Liège, Belgium).

Plasma potassium and sodium have been determined among Indian, European, and African people in various climatic conditions. The potassium level was consistently higher among African Negroes than in the other two groups. Indian and European Ss had similar values which were more elevated in tropical than in temperate climate. Furthermore, in all groups, seasonal fluctuations were observed: mainly a sharp but transient drop of plasma potassium in October-November, concurrently with a decrease of the surrounding temperature. These findings are in good keeping with the literature and suggest that plasma potassium level in man depends upon racial, climatic, and seasonal factors. Plasma sodium also showed some fluctuations but less definite than those of potassium. In some instances, potassium tolerance tests have been carried out. On each S examined, plasma potassium determinations were made at 20-min intervals for 1 hr, after an oral intake of potassium chloride. All people had sedentary occupations and were kept on a well-balanced diet. In the case of Europeans examined in India, the longer the stay in the tropics, the higher was the potassium increase during the test. Among Indian students tested in Europe, the opposite phenomenon was observed. These results suggest that hot climate depresses and cold climate enhances the salt regulating function of the organism. They have been confirmed recently by experimentation on rats which showed furthermore that this phenomenon is partly independent of the diet.
R 10

31,739
Consolazio, C.F., Matoush, L.O. & Nelson, R.A. ENERGY METABOLISM IN MAXIMUM AND SUBMAXIMUM PERFORMANCE AT HIGH ALTITUDES. Federation Proc., July-Aug. 1966, 24(4)Part 1, 1380-1385. (USA Medical Research & Nutrition Lab., Fitzsimmons Army Hospital, Denver, Colo.).

Oxygen requirements and work performance were evaluated at 1,610-, 3,475-, and 4,300-m elevations. Maximal oxygen consumption liters per minute, STPD (Standard Temperature and Pressure, Dry), was decreased with an increase in altitude. The maximal performance, Vo_2 (oxygen consumption/min) (milliliters per kilogram body weight per minute), averaged 40.5 ml at sea level, 37.0 at 1,610 m, 33.0 at 3,475 m, and 32.1 ml/kg body weight at the 4,300-m elevation. Basal metabolic rates, sitting rest, and submaximal work (liters per minute oxygen) were practically unchanged at all altitudes, even though the pulse rates were increased. One group showed a significant increase in BMR (Basal Metabolic Rate) at 4,300 m during the first week of exposure. Pulse rates were decreased during maximal work at 3,475- and 4,300-m altitudes. On the other hand, the pulse rates during sitting rest and submaximal work were increased with an increase in high altitude. The decrease in maximal oxygen-pulse at high altitudes and the significant increase in oxygen equivalent at the 3,475- and 4,300-m elevation reflect the penalty incurred due to decreased barometric pressure at these altitudes. In this study there seemed to be no great beneficial effects of ascending to altitude either gradually or abruptly or between the groups that exercised and those who did not exercise, although the physical well-being (reduced "mountain sickness" symptoms) of the men who ascended to altitude gradually was greatly improved over the men who ascended to altitude abruptly.
R 14

31,740
Kreuzer, F. & Honda, Y. BREATH HOLDING IN UNTRAINED AND WELL-TRAINED SUBJECTS AT HIGH ALTITUDE. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1388-1391. (Physiology Dept., University of Nijmegen, Nijmegen, The Netherlands).

Breath-holding time and alveolar Po_2 (pressure of oxygen) and Pco_2 (pressure of carbon dioxide) were determined in eight members of a high-altitude expedition to Monte Rosa. The only well-trained subject, showed a considerably longer breath-holding time than the other members at the highest altitude of 4,560 m. This might be due to his high alveolar Po_2 and low Pco_2 resulting from excessive hyperventilation. This tendency to hyperventilation, acquired during long mountaineering training and habitual even at sea level, might correlate with particular physical fitness at high altitude.
R 17

31,741
Lahiri, S. & Milledge, J.S. MUSCULAR EXERCISE IN THE HIMALAYAN HIGH-ALTITUDE RESIDENTS. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1392-1396. (Physiology Dept., Presidency College, Calcutta, India & Thoracic Surgery Dept., Christian Medical College & Hospital, Vellore, India).

Mountaineering expeditions in the Himalayas have repeatedly confirmed the superior physical performance of the high-altitude residents (Sherpa) as compared to the recently acclimatized lowlanders. This ability has been accepted as a criterion of better acclimatization to altitude, but no objective physiological investigations have been made of it until recently. In 1960-1961 during the 9-month duration of the Himalayan Scientific and Mountaineering Expedition, a small group of physiologists led by Dr. Pugh made a study of the acclimatization process in the lowlanders at altitude and also a few successful measurements of a Sherpa at 5,800 m (19,000 ft). These showed that for a given workload, the Sherpa had a higher maximum heart rate, but like the Andean altitude residents, ventilated less than did the acclimatized lowlanders. Four years later this work was followed up on a Himalayan expedition of 3-month duration. Most of the measurements were made on four Sherpa, residents of 3,960 m (13,000 ft) and on two lowlanders exposed to 4,880 m (16,000 ft) from 5 October to 5 December, 1964. About 15 days prior to this, all the Ss were subjected to trekking, carrying loads which helped to maintain good physical fitness. Some of the observations made on muscular exercise are presented in this paper to demonstrate objectively the difference in response between Sherpa and the acclimatized lowlanders.
R 12

31,742
Reynafarje, B. & Velásquez, T. METABOLIC AND PHYSIOLOGICAL ASPECTS OF EXERCISE AT HIGH ALTITUDE. I. KINETICS OF BLOOD LACTATE, OXYGEN COMSUMPTION AND OXYGEN DEBT DURING EXERCISE AND RECOVERY BREATHING AIR. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1397-1399. (Instituto de Biologia Andina, Universidad Nacional Mayor de San Marcos, Lima, Perú).

It has been shown that work endurance in high-altitude natives is equal to if not higher than that in sea-level natives when performing in their respective environments. It has also been demonstrated that for the same workload, oxygen consumption, and blood lactate levels increase less in high-altitude natives than in sea-level residents. These findings would suggest that in altitude natives: a) for the same amount of oxygen consumed more chemical energy is transformed into mechanical energy; and b) either the rate of lactate disappearance is higher or the rate of lactate production is reduced, or both. Detailed analysis of the payment rate of the oxygen debt seems to allow a differentiation between the amount of oxygen used in lactate oxidation and that used in other oxidative processes; hence a better understanding of high-altitude acclimatization may be obtained from the kinetics of accumulation and disappearance of blood lactates, respectively, during and after exercise, and the relation of this to the oxygen uptake. The present work has been carried on at Morococha, at an altitude of 4,500 m and barometric pressure of 446 mm Hg. Healthy young altitude natives were used as Ss. For comparison, an analogous group of sea-level Ss was tested in Lima at 150 and 750 m mm Hg.
R 5

31,743
Velasquez, T. & Reynafarje, B. METABOLIC AND PHYSIOLOGICAL ASPECTS OF EXERCISE AT HIGH ALTITUDE. II. RESPONSE OF NATIVES TO DIFFERENT LEVELS OF WORKLOAD BREATHING AIR AND VARIOUS OXYGEN MIXTURES. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1400-1402. (Instituto de Biologia Andina, Universidad Nacional Mayor de San Marcos, Lima, Perú).

The aim of this study has been to draw more information on the mechanisms involved in the process of adaptation to physical exercise in high altitude. Mixtures containing 16.2%, 35.8%, and 100% oxygen were used in addition to room air. At the barometric pressure of Morococha (446 mm Hg), the inspired partial pressure of oxygen was 63.8, 83.8, 143.6, and 399 mm Hg. At sea level, the Ss breathed only room air (146 mm Hg inspired Po_2 (pressure of oxygen)). A total pulmonary ventilation of 49.0 liters/min per m^2 was the mean at Morococha, while at sea level, the average was 49.5 liters/min per m^2. In the altitude natives this ventilation does not change when breathing 35.8% oxygen, but a low oxygen mixture produced a moderate increase in all but one case. The amount of ventilation required for each liter of oxygen uptake increases greatly at 16% and decreases moderately at a 35.8% oxygen mixture. As the maximal ventilation capacity in altitude natives is quite high and maximal pulse rate can increase as in sea level (around 200 beats/min), the increment of oxygen uptake when room air is replaced by 35.8% oxygen mixture cannot be accounted for by an impaired cardiac or ventilatory function.
R 3

31,744
Wegmann, H.M., Brüner, H., Klein, K.E. & Voigt, E.D. ENZYMATIC AND HORMONAL RESPONSES TO EXERCISE, LOWERED PRESSURE, AND ACCELERATION IN HUMAN PLASMA AND THEIR CORRELATION TO INDIVIDUAL TOLERANCES. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1405-1408. (Institut für Flugmedzin, Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg, Germany).

Twelve untrained male students were subjected uniformly to the following 3 kinds of stress: a) they were exercised on an ergometer at a load of 12 kpm/sec for 30 min; b) they were exposed to reduced pressure of 312 mm Hg for 30 min; c) they were exposed to positive acceleration of 2.5 X g for 30 min. Each time the plasma levels of four enzyme activities--malic dehydrogenase (MDH), aldolase (ALD), glutamic-oxalacetic transaminase (GOT), glutamic-pyruvic transaminase (GPT)--and of the free 17-hydroxy-corticosteroids (17-OH-CS) were determined prior to and at intervals during and after stress. There was a significant rise of 17-OH-CS caused by lowered pressure and acceleration. Enzymatic responses to the three stressors were not uniform; MDH and GPT activities increased significantly in response to all stressors, GOT under exercise and lowered pressure, ALD under exercise. These findings indicate specific differences in the response to the examined stressors. The coefficients of correlation were calculated for the relationship between tolerances of the three stressors and the alterations of enzyme activities and of 17-OH-CS levels. A significant moderate correlation was found for MDH responses to acceleration with the acceleration tolerance ($r = -0.58$). The 17-OH-CS responses to reduced pressure showed a close and highly significant correlation with the low-pressure tolerance index ($r = -0.72$).
R 35

31,745
Margaria, R. ASSESSMENT OF PHYSICAL ACTIVITY IN OXIDATIVE AND ANAEROBIC MAXIMAL EXERCISE. Federation Proc., July-Aug. 1966, 25(4)Part 1, 1409-1412. (Istituto di Fisiologia Umana, Universita di Milano, Milano, Italy).

A method to measure the maximal anaerobic muscular power has been devised, consisting simply of measuring the maximal speed of running up an ordinary staircase of 10-12 steps. This seems to be a very good ergometric procedure as it has been shown that when running at constant speed up such an incline, the mechanical work performed is substantially due to the body lift, all other factors such as acceleration of limbs, etc., being negligible. This exercise is very easy to perform and, being habitual, it does not require special training, nor is it exhausting since it is over in less than 4 sec. Also it can be repeated several times in a relatively short time. An electronic timer sensitive to 1/100 sec and operated by two photoelectric cells can be used to measure the time interval necessary to cover an even number of steps (2 or 4 steps).
R 6

31,746
Kas'yan, I.I., Krasovskii, A.S., Kolosov, I.A., Lomova, M.A., et al. SOME PHYSIOLOGIC REACTIONS IN MAN DURING SHORT PERIODS OF WEIGHTLESSNESS. Federation Proc., July-Aug. 1966, 25 (4)Part II, T605-T611.

Periodic flights in aircraft, with production of short periods of weightlessness, serve to familiarize cosmonauts with the condition and to establish criteria for the selection of crews for space vessels. No pathologic disturbances of physiological functions or significant changes in the morphological and biochemical properties of blood and urine have been observed as a result of parabolic flights. In most cases, there is an appreciable increase of NEFA (nonesterified fatty acids) in the blood after the first parabolic flight. Satisfactory resistance to the effects of weightlessness may be indicated by the following criteria: only slight change (as compared with the initial rate) in pulse rate during the state of weightlessness; shortening of the durations of the illusion of rotation in the opposite direction and of postrotational nystagmus after a series of parabolic flights; absence of unpleasant sensory and vestibulo-autonomic reactions (spatial illusions, vertigo, nausea etc.).
R 34

31,747
Yuganov, E.M., Gorshkov, A.I., Kas'yan, I.I., Bryanov, I.I., et al. VESTIBULAR REACTIONS OF COSMONAUTS DURING FLIGHT IN THE SHIP "VOSKHOD." Federation Proc., Sept.-Oct. 1966, 25(5) Part II, T767-T770.

The vestibular resistance of members of the crew of the space ship "Voskhod" to a period of weightlessness lasting 24 hr differed; it was high in the cosmonaut Komarov and low in the cosmonauts Egorov and Feoktistov. The differences in the resistance of the cosmonauts were associated with the unequal initial sensitivity of the vestibular apparatus, and different durations of vestibular training (long in the case of Komarov, short in the case of Feoktistov and Egorov). Intensive terrestrial vestibular training for 3 months does not produce the necessary vestibular resistance in persons with a vestibular analysor of average sensitivity in conditions of weightlessness.
R 8

31,748
Akulinichev, I.T., Emel'yanov, M.D. & Maksimov, D.G. OCULOMOTOR ACTIVITY IN COSMONAUTS IN ORBITAL FLIGHT. Federation Proc., Jan.-Feb. 1966, 25(1)Part II, T31-T33.

Electro-oculograms (EOG) were recorded from four Soviet cosmonauts during orbital space flights. Analysis of the EOG revealed that none of the cosmonauts showed signs of persistently disturbed coordination of eye movements during the 3-5 days that they were in a state of weightlessness. Transient disturbances (asymmetry of oculomotor reactions and nystagmoid movements) were observed in two cosmonauts. The transient and slight nature of these disturbances pointed to an active process of adaptation to the unusual setting.
R 9

31,749
Chamberlin, J.A. MANNED SPACECRAFT DESIGN--THE PROBLEMS SOLVED. Astronautics & Aeronautics, March 1966, 4(3), 22-32. (Manned Spacecraft Center, NASA, Houston, Tex.).

This article reviews major considerations in the design of manned spacecraft (Mercury, Gemini, Apollo Command Module and Apollo Lunar Excursion Module). The role of man is discussed.
R 29

31,750
Lin, H. STRUCTURES AND MATERIALS IN THE LONG-DURATION MANNED SPACECRAFT. Astronautics & Aeronautics, March 1966, 4(3), 34-40. (Aerospace Div., Boeing Company, Seattle, Wash.).

Historically, structural design criteria have been developed through the accumulation of experience. As the experience with manned spacecraft is yet very limited, structural design is generally developed for each specific manned spacecraft system. Principal considerations include the mission requirements, natural and induced environments, and the major subsystem interfaces (including human factors). Meaningful design requirements can only be defined by simultaneous consideration of all pertinent factors. The reliability that will be demanded of long-duration manned spacecraft confronts the designer with truly difficult problems. Some of the structural and material considerations attributed to or accentuated by the presence of man have been briefly examined here. They underscore the need for research that will better establish the deep-space environment and its effect on materials, and for much development work in creating new structural concepts and devising better fabrication and test techniques.
R 5

31,751
Bowman, J.S. AIRPLANE SPINNING. Astronautics & Aeronautics, March 1966, 4(3), 64-67. (Langley Research Center, NASA, Langley Field, Va.).

Spin no longer has value as a military tactic, and serves no useful purpose in civil aviation. Practicing recovery from spin has been dropped from many flight-training programs. Many types of aircraft, moreover, no longer require satisfactory spin-recovery characteristics. Consequently, the pilot today can encounter his first spin when he least expects it, when he must act quickly and without error, in an airplane that may not recover, without practice to cope with his predicament. Aircraft spinning has not been very amenable to theoretical analysis, and consequently most spin studies have been conducted by experimental procedures. At the NASA Langley Research Center, much experience has been gained from spin-tunnel tests. Here, over a period of 30 years, spin tests have been made of models of nearly 400 different airplane designs. Very good correlation between the model tests and full-scale spin tests has been established. For the fully developed spin, the principal factors are mass distribution, by far the most important single parameter, and tail design, which is particularly important for conditions of zero or near-zero loading. Other factors, such as general aerodynamic configuration and high-lift devices, have some effect, but only minor. If the mass distribution and tail design are known, it is possible in many cases to predict whether an airplane will have satisfactory spin-recovery characteristics. In other cases, however, it is necessary to make spin tests to assure satisfactory recovery.
R 6

31,752
Blair, J.C., Lovingood, J.A. & Geissler, E.D. ADVANCED CONTROL SYSTEMS FOR LAUNCH VEHICLES. Astronautics & Aeronautics, Aug. 1966, 4(8), 30-39. (Marshall Space Flight Center, NASA, Huntsville, Ala.).

For Vehicles beyond Saturn/Apollo it may be necessary to use unconventional (advanced) control techniques to achieve satisfactory performance. This article discusses the problem areas foreseeable in launch-vehicle control, presents certain systems proposed as solutions, and indicates where some of the wealth of modern control theory that has been developed over the past few years may be applied.
R 21

31,753
O'Brien, J.P. SUPERSONIC TRANSPORT EFFECTS ON AIR-TRAFFIC CONTROL. Astronautics & Aeronautics, Aug. 1966, 4(8), 60-64. (US Federal Aviation Agency, Washington, D.C.).

This article describes a joint Federal Aviation Agency and National Aeronautic and Space Administration air traffic environment and studies: the ground-control facilities simulated in the studies; radar and altitude-separation standards for the investigations; ground-handling procedures and arrival and departure priorities established for test purposes; air-traffic-control factors measured; and conclusions drawn from the research to date.
R 9

31,754
Seamans, R.C., Jr. MANNED SPACEFLIGHT OBJECTIVES. Astronautics & Aeronautics, June 1966, 4(6), 30-33. (National Aeronautics & Sapace Administration, Washington, D.C.).

The basic capability for manned flight activities in being or soon to be available, falls into three large categories: Launch vehicles, manned spacecraft, and a wide range of ground-based support. The four basic launch vehicles--Titan II, Titan III, Saturn IV, Saturn V--represent a range of payload-in-orbit capability running from 7000 to 250,000 lb. Spacecraft include the current Gemini system; the modification of Gemini and its integration with a manned orbiting laboratory, (MOL) and the Apollo system, with its command, service and lunar-excursion modules. Ground-support capabilities include major command and control centers; a worldwide network of ground, ship, and aircraft tracking and data-acquisition stations tied back to the control facilities through satellite and cable data links; major launch facilities on both coasts; and a powerful industrial base for design, development, fabrication, and test of manned systems. This total capability in being and coming on the line is currently directed toward major goals of national significance.

31,755
Love, E.S. MANNED LIFTING ENTRY. Astronautics & Aeronautics, May 1966, 4(5), 54-64. (Langley Research Center, NASA, Langley Field, Va.).

Despite many unresolved questions of design, economics and mission requirements, manned space activities of the future could profitably employ higher-performance entry vehicles. Lift-to-drag ratios and landing modes will be focal points for entry-vehicle development planning. But most of all, the field needs a commitment for action.

31,756
Sawyer, R.H., Silsby, N.S., McLaughlin, M.D. & Fischer, M.C. SST ENGAGES THE AIR-TRAFFIC CONTROL SYSTEM. Astronautics & Aeronautics, May 1966, 4(5), 78-83. (Langley Research Center, NASA, Langley Field, Va.).

Simulated SST flights reveal new needs in displays for the pilot and air-traffic control on the ground. Investigations establish the need for command-type guidance, new piloting displays, lead-type turns, and more direct routings in the terminal area during operation of both SST concepts tested.
R 2

31,757
Soulé, H. THE NOISE PROBLEM. Astronautics & Aeronautics, May 1966, 4(5), 6-9.

Noise has plagued the air-transport industry for a long time. Despite the numerous researches that have been undertaken to determine the sources of aircraft noise and the numerous measures suggested to reduce the noise output of air transports, the problem is probably more serious and is attracting more attention now than at any time in the past. The present situation is the result of the continuous increase in the size and output of aircraft powerplants coupled with the replacement of reciprocating by jet engines. The imminent introduction of the SST with its supersonic boom contributes to the current concern. This note discusses various aspects of the noise problem, including responsibilities of several organizations.

31,758
Carpenter, M.S. MAN IN SPACE AND MAN IN THE SEA. Astronautics & Aeronautics, April 1966, 4(4), 32-35.

The astronaut, backed by a superbly sophisticated, glamorous national effort, stands in sharp contrast to the aquanat, striving to conquer the sea with mail-order equipment, under marginal conditions using outmoded techniques.

31,759
Greiner, L. MAN'S EXTENSION INTO THE SEA. Astronautics & Aeronautics, April 1966, 4(4), 70-73. (United Technology Center, United Aircraft Corporation, Sunnyvale, Calif.).

This is a brief review of a symposium on "Man's Extension into the Sea," January 11-12, 1966, in Washington, D.C.

31,760
Soulé, H. AIRPORTS FOR THE PASSENGER. Astronautics & Aeronautics, April 1966, 4(4), 8-9.

This is a brief review of problems at airports. Consideration for the passenger in airport design is stressed.

31,761
Dagle, E.F., Hill, Margaret D. & Smith, W.R. RESPONSE TIMES IN DECISION-MAKING TASKS. INTERIM REPORT. Proj. 4610 07, AFCRL Rep. 66 833, Physical Sciences Res. Paper 300, Dec. 1966, 16pp. USAF Cambridge Research Labs., L.G. Hanscom Field, Bedford, Mass. (AD 650908)

The extent to which the output in semiautomated systems that utilize human operators is quantitatively and qualitatively accurate is an obvious function of system performance. When assigned to a logical function in a system, the human operator quite often affects total performance; however, little is known about his sources of error, particularly when his response time is concerned. This study presents experimental evidence which supports the hypothesis that human operators differ widely in the time they require to make decisions and it also provides data that show the degree of consistency or reliability of time measures taken at different times. By using data gathered in the manner outlined in this study, human operators could be matched to command or control systems according to the degree of speed and accuracy required by the particular system. Greater overall efficiency and a maximum output for any given system would be the result.

31,762
Biederman, I. HUMAN PERFORMANCE IN CONTINGENT INFORMATION PROCESSING TASKS. INTERIM REPORT. (Ph.D. Thesis). Contract AF 49(638) 1235, Projs. 920F 5002, 61520015, & 681313, AFOSR Rep. 67 1801, Tech. Rep. 3, Oct. 1966, 101pp. USAF Office of Scientific Research, OAR, Arlington, Va. (Psychology Dept., University of Michigan, Ann Arbor, Mich.). (AD 656712)

Theoretical accounts of complex human information processing behavior have emphasized the utilization of contingencies whereby the processing of some information directs the processing requirements of the remaining sources of uncertainty. The manner in which such contingencies are processed, however, has received little empirical study. The present investigation examined the effects of discriminability and stimulus-response (S-R) compatibility on the speed and accuracy of response in tasks in which the relevancy of a given stimulus dimension was contingent upon the value of the stimulus on some other dimension. It was concluded that contingencies are utilized by the subject to select dimensions to process. Further, these contingencies are utilized at some stage prior to that involved in the selection of responses. Reaction times (RTs) to a repeated stimulus were faster than RTs to a different stimulus. The magnitude of these repetition effects varied as a function of the discriminability of the dimension that changed value, its relevancy, and its structural status.
R 40

31,763
Tresselt, M.E. & Mayzner, M.S. NORMATIVE SOLUTION TIMES FOR A SAMPLE OF 134 SOLUTION WORDS AND 378 ASSOCIATED ANAGRAMS. Psychon. Monogr. Suppl., 1966, 1(15), 293-298. (New York University, New York, N.Y.). (Reprint)

Normative solution times based on a sample of 134 solution words and 378 associated anagrams compiled from 9 studies are presented, as well as the 120 letter orders possible with a 5-letter word and a skeleton-word test and scoring key used for assessing the degree to which Ss store digram frequency information.
R 16

31,764
Harrell, T.W. (Princ. Investigator). PERCEPTION OF LEADERSHIP IN SMALL GROUPS: PERSONALITY DIFFERENCES BETWEEN EXTREME PERFORMERS DURING A FOURTH DISCUSSION SESSION. Projs. NONR 225 (62), & NR 171 388, Tech. Rep. 12, Aug. 1966, 37pp. USN Group Psychology Branch, ONR, Washington, D.C. (Stanford University, Stanford, Calif.). (AD 637823)

Twenty-three 5 man groups of MBA students, who had received a 9 instrument personality test battery, discussed 4 human relations cases. An observer counted the number of times each student talked. Students ranked each other on Best Ideas, Guidance, Leader, and Being Liked. Forty-two personality scales plus undergraduate grade point average were compared to the highest and lowest men on each of the 4 sociometric choices and on times talking. Twenty personality scales had 28 differences significant at the .05 level or higher between the highest and lowest men in the groups. Individual Background Survey was higher for each of the 4 choices and for frequency of talking. There were significant differences in 6 of the Guilford-Zimmerman Temperament Survey scales, 5 of the Minnesota Multiphasic Personality Inventory (MMPI) scales, 2 of the Ghiselli Self-Description Inventory (GSD) scales, 2 of the Strong Vocational Interest Blank (SVIB) scales. There were also significant differences on Consideration of the Leadership Opinion Questionnaire (LOP), Public Opinion Questionnaire (POQ) (California F-scale), and Need for Achievement. Generally the personality of the highest chosen men was ascendant, active, and dominant. Men chosen as Leader in the fourth session also talked more frequently and often chosen for Participation, Best Ideas, and Guidance in both session four and session one. Being Liked was much less closely associated with choice as Leader.
R 16

31,765
Foulke, E. A SURVEY OF THE ACCEPTABILITY OF RAPID SPEECH. New Outlook for the Blind, Nov. 1966, 5pp. (Psychology & Social Anthropology Dept., University of Louisville, Louisville, Ky.). (Reprint)

One hundred blind readers participated in a mail survey of preferred listening selection, where speed of the reader was varied. This paper reports the results of the survey.
R 5

31,766
Kochevar, R.J. & Rader, D.A. SUMMARY TEST REPORT PERSONNEL ACCOMODATIONS XB-70A. Contract AF 33(657) 12395, NA Rep. 66 373, Oct. 1966, 36pp. USAF Aeronautical Systems Div., Wright-Patterson AFB, Ohio. (North American Aviation, Inc., Los Angeles, Calif.). (AD 800262)

This report contains the summary of the pilot's subjective evaluations of the personnel accomodations as utilized in flight tests of the XB-70A. No personnel accomodations instrumentation other than the pilot's personal observations are used in subject tests. In the area of controls and displays this report describes the crew task over-loading when automatic equipment fails, difficulty of maintaining precise flight conditions with flight instruments intended for subsonic cruise aircraft and other controls and displays details. Lighting conditions encountered under high altitude daylight flying conditions are described and recommendations to improve such lighting conditions are reported. Operational vision from a vehicle providing 11 degrees over-the-nose vision is summarized for flight conditions of takeoff, landing and cruise with the nose ramp up. Safety equipment is discussed where non-emergency tests could be made to determine adequacy of such equipment. The escape capsules are discussed as to preflight tests and usage. Crew seating and restraint equipment are discussed as to suitability and pilot requested shoulder harness improvement. Liquid oxygen and pressure suit ventilation systems are described as to usage, improvements incorporated, and recommendations for future systems. Crew clothing and personal equipment are described as to function, discrepancies encountered in standard equipment, and modifications made to improve standard equipment operation.
R 3

31,767
Frederiksen, J.R. A STUDY OF PERCEPTUAL RECOGNITION IN TWO SENSE MODALITIES. TECHNICAL REPORT. Contracts NONR 1858(15) & NONR 2214(00), NSF Grant GB 3402, Public Health Research Grant 1 PO1 HD 01762 01, Projs. NR 150 088 & NR 151 174, Rep. RB 66 32, June 1966, 104pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Educational Testing Service, Princeton, N.J.). (Ph.D. Thesis, Princeton University, Princeton, N.J.). (AD 489592)

The adverse effect of early exposure to ambiguity upon subsequent recognition of ambiguous stimuli was studied in two sense modalities. In order to test the generality of previous findings in which blurred visual images served as the ambiguous stimuli, an auditory recognition test was developed which employed a previously untried technique for producing ambiguity. The Auditory Recognition Test contained a series of words which served as the objects to be recognized. These words were rendered ambiguous by masking them with a mixture of other speech sounds and ambiguity was slowly reduced by the gradual attenuation of the mask. Both recognition tasks, therefore, presented the S with a situation in which his erroneous initial hypotheses about the nature of the stimulus were gradually disconfirmed, as the degree of ambiguity (degree of focus or masking level) was slowly reduced. It was hypothesized that the reduction in the range of ambiguity covered in the presentation of auditory and visual items should result in the earlier recognition of the items. This hypothesis was strongly confirmed for both sense modalities.
R 38

31,768
Dewhurst, D.J. PHYSICAL INSTRUMENTATION IN MEDICINE AND BIOLOGY. 1966, 205pp. Pergamon Press, New York, N.Y. (University of Melbourne, Melbourne, Australia).

This book deals with the principles of medical and biological instrumentation and with practical features of its design and construction. It also provides the scientific worker with an introduction to methods of maintenance and design. A feature of the book is the emphasis on transistorized circuits which have made possible the routine investigation of many previously inaccessible physiological phenomena.
R Many

31,769
Green, D.M. & Swets, J.A. SIGNAL DETECTION THEORY AND PSYCHOPHYSICS. 1966, 455pp. John Wiley & Sons, Inc., New York, N.Y. (Psychology Dept., University of California, San Diego, Calif. & Bolt Beranek & Newman, Inc., Cambridge, Mass.).

This book gives a systematic presentation of various aspects of signal detection theory in psychophysics. It contains introductions to probability theory, statistical decision theory, waveform analysis, and experimental techniques. It reviews the basic experiments that support the application of detection theory in psychophysics, and describes experimental applications of the theory to a variety of substantive problems in psychology.
R Many

31,770
Hoff, E.C. A BIBLIOGRAPHICAL SOURCEBOOK OF COMPRESSED AIR, DIVING AND SUBMARINE MEDICINE. VOLUME I. Feb. 1948, 382pp. USN Bureau of Medicine & Surgery, Department of the Navy, Washington, D.C.

This is the first volume of a series of source books for the literature on compressed air, diving, and submarine medicine. Each group of references is preceded by a summary of the literature quoted. The sections are: history of the medical aspects, technical procedures and research apparatus, special anatomy and physiology, and biochemistry, diseases and accidents, selection and training, and several smaller chapters.
R Many

31,771
Greenbaum, L.J., Jr. & Hoff, E.C. A BIBLIOGRAPHICAL SOURCEBOOK OF COMPRESSED AIR, DIVING AND SUBMARINE MEDICINE. VOLUME III. Dec. 1966, 306pp. USN Department of the Navy, Washington, D.C. (USN Medical Research Institute, National Naval Medical Center, Bethesda, Md. & Psychiatry Dept., Medical College of Virginia, Richmond, Va.).

In this third volume on the literature on compressed air, diving, and submarine medicine, coverage has been extended from January 1950 to January 1961. In areas of particular significance where rapid advances have been made, such as pressure physiology and hyperbaric oxygen therapy, coverage is up to the end of 1964.
R Many

31,772
Gunderson, E.K.E. & Kapfer, E.L. THE PREDICTABILITY OF CLINICIANS' EVALUATIONS FROM BIOGRAPHICAL DATA. J. Clin. Psychol., April 1966, 22(2), 144-150. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.). (Reprint) (AD 632060)

The study explored relationships between biographical information input and clinical evaluation output in an assessment program designed to select men for unusual and potentially hazardous assignments. Ss were 14 experienced clinicians who served as examiners for the U.S. Antarctic research program and in this capacity evaluated Navy and civilian candidates for Antarctic scientific expeditions. Two professional groups, psychologists and psychiatrists, and two examining methods, Rorschach and interview, were compared with respect to relationships between biographical questionnaire data and clinical evaluation scores. Consistency among individual clinicians in their apparent utilization of 23 items of biographical information was revealed by the multiple regression technique. Rank or experience consistently contributed to prediction of the clinicians' evaluations, but variable weights were given to other attributes.
R 6

31,773
Haythorn, W.W. & Lanzetta, J.T. (Princ. Investigators). RESEARCH ON PSYCHIATRIC EFFECTIVENESS OF FUTURE WEAPONS SYSTEMS CREWS. FINAL TECHNICAL REPORT. Contract NONR 2285(04), BuMed. Proj. MF 022.01.03 1002, 1966, 22pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (University of Deleware, Newark, Del.). (AD 630453)

This is a final report on Project Argus, a research program concerned with the stresses of isolation and confinement as they might affect the task and psychiatric effectiveness of naval personnel. As the project has evolved, 3 classes of stress have emerged as of primary importance: those of a) sensory reduction; b) social isolation; and c) interpersonal friction. These sources of stress will be discussed in some detail before proceeding with a description of ARGUS research.
R Many

31,774
Heimer, W.I. & Tatz, S.J. PRACTICE EFFECTS, KNOWLEDGE OF RESULTS AND TRANSFER IN PITCH DISCRIMATION. Contract N61339 1337 LO 3, NAVTRADEVCEN Tech. Rep. IH 52, April 1966, 27pp. USN Training Device Center, ONR, Port Washington, N.Y. (Hofstra University, Hempstead, N.Y. & C.W. Post College, N.Y.). (AD 634221)

The effect of practice on the ability of Ss to discriminate differences in pitch between two sounds (difference thresholds or DLs) was investigated using four different experimental groups. These four groups differed in regard to the frequency at which training was given (800 or 3,000 cps), and whether or not knowledge of results was given. All discriminations were made against a white noise background. Training was given to all experimental Ss for four successive days with a fifth day devoted to both practice and a transfer test. The daily procedure consisted of listening to three tapes, each requiring 100 discriminations. A modified descending staircase procedure (method of limits) was utilized in obtaining the difference threshold. The main findings were: a) a negatively accelerated, declining curve of DLs for all four experimental groups with the largest drop taking place within the first day or two for most Ss; b) discrimination was slightly better with knowledge of results than without, but not significantly so, and c) the surprising fact that a net negative transfer of training effect was revealed when the transfer was attempted between the two different points on the frequency spectrum utilized here. Implications for auditory training procedures are discussed.
R 5

31,775
Frankenhaeuser, Marianne, Mellis, Inga, Rissler, Anita, Bjorkvall, C., et al. CATECHOLAMINE EXCRETION AS RELATED TO COGNITIVE AND EMOTIONAL REACTION PATTERNS. Rep. 206, March 1966, 14pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Excretion rates of adrenaline and noradrenaline, performance in an audiovisual conflict test, and subjective reactions to the test as well as habitual response patterns were examined in 25 Ss. It was shown: a) that Ss with high excretion rates of both hormones performed better during the entire stress session than did Ss with low excretion rates, the trend being particularly pronounced in respect of noradrenaline excretion; and b) that Ss with high vs. low excretion rates of both hormones had different time patterns of emotional involvement, high excretion rates being associated with a decrease and low excretion rates with an increase in the intensity of the reactions as the session progressed.
R 16

31,776
Greenleaf, J.E. INVOLUNTARY HYPOHYDRATION IN MAN AND ANIMALS: A REVIEW. NASA SP 110, 1966, 34pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

Involuntary hypohydration was defined as a depression in the rate of water intake following water loss in animals and in man. While most animals rehydrate fairly rapidly, the rat and man do not. Concerning the speed of voluntary rehydration, the rat is about midway between man and the dog, cat, rabbit, burro, and camel. The pertinent question to be answered is why man takes up to 72 hours or longer to regain a water deficit of 6 percent of his body weight when the other animals can do it in 1 hour or less. In man, the water intake is not proportional to the total volume of body water. Regardless of the level of the water deficit and whether the water deficit and whether the water was lost by deprivation or by sweating, man regains the lost water at a constant rate. There is no gulping of water, as in animals, until the deficit is regained. Instead, man will drink rapidly about 1 liter of water and then stop. If water is forced beyond this point, vomiting will usually ensue. Prolonged forcing of salt-free water may cause water intoxication which the vomiting would help to prevent. There are many factors that influence drinking such as: the volume of body water, osmotic concentration, gastrointestinal absorption rates and stretch receptors, food and salt ingestion, starvation, environmental temperature and humidity, physical exercise, and psychological and social parameters. It is clear that attempts to explain drinking on the basis of a single variable, that is, the osmotic concentration or the concept of volume of fluid, have not proved too successful because both factors are operating simultaneously and are mutually interdependent. The task now is to uncover the relationships between the many variables applicable to water metabolism and to determine how they relate to the time factors in drinking.
R 200

31,777
Rockwell, T.H. (Princ. Investigator), et al. STUDIES OF CAR FOLLOWING. Rep. 202B 5, Feb. 1966, 118pp. Ohio Department of Highways, State of Ohio & US Bureau of Public Roads, Washington, D.C. (Industrial Engineering Dept., Ohio State University, Columbus, Ohio).

This report is a collection of studies performed on the project "Study of Electronic Devices as Traffic Aids" sponsored by the Ohio Department of Highways in cooperation with the U.S. Bureau of Public Roads. Each of the studies is concerned with a phase of car-following performance. Specifically, the first is concerned with the effects of coupling in car-folfowing, the second with performance in a variety of traffic conditions, and the third with the effects of a prototype aiding system on car-following accuracy and variability.
R 10

31,778
Baker, C.H. TARGET DETECTION PERFORMANCE WITH A BOWTIE RADAR DISPLAY. J. engng. Psychol., 1966, 5(1), 16-20. (Human Factors Research, Inc., Santa Barbara, Calif.).

A comparison was made of 2 airborne radar displays, the conventional Plan Position Indicator and a new type, the Bowtie display, with respect to their effectiveness for detecting relatively motionless targets. It was found that the target detection performance of observers (N = 30) using the new type display is superior to that when using the conventional display.
R 7

31,779
Blanchard, R.E., Mitchell, M.B., Westland, R.A. & Smith, R.L. DEVELOPMENT OF A TECHNIQUE FOR ESTABLISHING PERSONNEL PERFORMANCE STANDARDS (TEPPS). PHASE II - FINAL REPORT. Contract NONR 4314(00), Jan. 1966, 88pp. USN Personnel Research Div., Bureau of Naval Personnel, Washington, D.C. (Western Div., Dunlap & Associates, Inc., Santa Monica, Calif.). (AD 477867)

The purpose of the study was to develop a method for a) establishing system-determined personnel performance standards related directly to the measures of system effectiveness; and b) determining the effect on system effectiveness of performance levels that deviate from established performance standards. The approach, entitled TEPPS, (Technique for Establishing Personnel Performance Standards), comprises a set of procedures for using analytic and probabilistic tools to organize system effectiveness requirements and other types of data to enable determination of system-related personnel performance standards. The types of input data required are: a) system effectiveness requirements; b) system descriptive data; and c) human capability data. Phase I of the study was devoted to developing a basic capability for meeting the objectives above (AD 609725). Phase II of the study was devoted to extending and refining the preliminary method by a) developing improved techniques for allocating system requirements to personnel and incorporating a performance time component, as well as a probability component, into the performance standard; b) developing a technique for establishing corrective maintenance performance time atandards; and c) developing computer program procedures and a procedural guide to aid in application of the technique.
R 17

31,780
Condit, P.M., Kimbrel, L.G. & Root, R.G. INFLIGHT AND GROUND-BASED SIMULATION OF HANDLING QUALITIES OF VERY LARGE AIRPLANES IN LANDING APPROACH. Contract NAS 2 3224, NASA CR 635, Oct. 1966, 61pp. Ames Research Center, NASA, Moffett Field, Calif. (Boeing Company, Seattle, Wash.).

A ground-based and inflight piloted simulator program was conducted utilizing the NASA-Ames moving base transport simulator, and the Boeing 367-80 variable stability airplane. The study examined several of the problem areas associated with handling qualities of large transport airplanes in the landing approach. With lateral-directional dynamics augmented to provide satisfactory STOL handling qualities, it was found that pilot opinion was more influenced by roll response sensitivity, as measured by the roll response obtained for a given wheel input, than by total roll control power. Having selected configurations with good roll performance sensitivity, an improvement in pilot opinion was obtained with an increase in roll damping. The longitudinal evaluation indicated that pilot opinion was dependent on both pitching moment sensitivity and lift due to elevator motion.
R 7

31,781
Todosiev, E.P., Rose, R.E., Bekey, G.A. & Williams, H.L. HUMAN TRACKING PERFORMANCE IN UNCOUPLED AND COUPLED TWO-AXIS SYSTEMS. Contract NAS 1 4419, NASA CR 532, Aug. 1966, 172pp. Langley Research Center, NASA, Langley Field, Va. (TRW Systems, Redondo Beach, Calif.).

Human pilot performance in single and two-axis systems was mathematically modeled by linear second-order describing functions. Model parameters were determined using model matching techniques. Analysis of the models showed that the amplitude ratio and phase lead of the describing function increased with training indicating an increase in open loop bandwidth. The phase margin also decreased with training. Increasing the plant lag time constant resulted in an increase in the model lead time and a decrease in the zero frequency gain. No significant difference was found to exist in the normalized tracking error per axis between the two-axis tasks and the single-axis tasks. However, the model lead time constant was significantly greater in two-axis tracking. Manual tracking of two-axis systems with cross-coupling was studied experimentally and analytically. Approximate methods for modeling two-axis performance were developed and checked using a precise spectral analysis approach. Coupled and uncoupled, symmmetrical and asymmetrical two-axis performance was compared. The results show that modeling of cross-coupled systems is feasible and that trained subjects are capable of decoupling the axes of some systems.
R 12

31,782
Gagne, G.A. & Wierwille, W.W. CHARACTERIZATION OF TIME-VARYING HUMAN OPERATOR DYNAMICS (PROJECT ICARUS). Contract NAS 1 4920, NASA CR 539, Aug. 1966, 82pp. Langley Research Center, NASA, Langley Field, Va. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

Linear time-varying, nonlinear time-varying, and nonlinear constant coefficient models of the human operator in tracking tasks were determined. The experiments were to characterize the human operator. The deterministic time varying characterization theory was used, and a set of rules by which each operator responds to the displayed signals was devised. The determination of the causes of the time-variations in the transfer characteristics was emphasized. Three experienced pilot-engineers and one non-pilot engineer were the Ss. Linear time-varying models were obtained for tracking tasks with various one- and two-axis displays with corresponding one- and two-axis dynamics. Follow-up dynamics were the same for all experiments and were identical for both axes. They were chosen so as to be similar to the pitch and roll dynamics of a jet fighter aircraft. An attempt was made to develop a "logic model" of the operators, which was to simulate their logic strategy while tracking in a control system. Instrument arrangements and data processing methods are included. The studies indicate that logic models with accuracies of 15% to 20% N.I.S.E. (normalized integral of the squared error) are theoretically possible.
R 11

31,783
Patrick, L.M. (Ed.). 8TH STAPP CAR CRASH AND FIELD DEMONSTRATION CONFERENCE. Conducted by Biomechanics Research Center, Wayne State University, Oct. 21-23, 1964. 1966, 434pp. Wayne State University Press, Detroit, Mich.

The Stapp Conferences are concerned primarily with passenger compartment safety features in automobiles. The titles of the papers in this book are: A Review of ACIR (Automotive Crash Injury Research) Findings; Injury in Non-Fatal Accidents; Computer Animation of the Crash Victim; Human Tolerance to Lateral Impact with Lap Belt Only; Federal Seat-Belt Regulation--A Progress Report; Impact Protection with the "Airstop" Restraint System; Human Simulation Techniques by Collision Researchers; The Position and Motions of the Head at Impact; A Correlation between Cadaver and In Vivo Results; Comparison of Standard and Experimental Windshields; Injuries and Deaths from Windshield and Instrument Panel Impacts; A New Crash Simulator and Biomechanics Research Program; Response of the Facial Structure to Impact; Case Studies of Racing Accidents; Studies of Three-Point Restraint Harness Systems in Full-Scale Barrier Crashes and Sled Runs; A Protective Seat for Children; Dynamic Tests of Restraints for Children; Dynamic Research of Passenger Restraining Devices. In addition, there are notes on field demonstrations and addresses and comments.
R Many

31,784
Cook, F.H. & Mott-Smith, J.C. THE INFLUENCE OF REPETITION RATE ON APPARENT MOVEMENT. INTERIM REPORT. Proj. 5628, Task 03, Physical Sciences Research Paper 194, AFCRL Rep. 66 86, Feb. 1966, 24pp. USAF Cambridge Research Labs., Bedford, Mass. (AD 630607)

It would be desirable to show that the cyclic repetition of stimuli at rates equivalent to motion pictures and television facilitate the perception of movement over broad angles. With the conditions used in this experiment, the results indicate that optimal movement can be seen over wide visual angles, with a pause between the two stimuli of 110-170 milliseconds being most effective. In general, however, the most effective optimal movement is created by small visual angles combined with rapid repetition of the stimuli. It would also be desirable to minimize apparent movement of the raster substructure in slow scan television. The results indicate that scans with substructure forms occurring at a rate of 6-9 cps over visual angles of 0.8-6.4 deg should be avoided. The results also indicate that forms occurring at a rate of 20 per sec and faster create little or no optimal movement. However, before a set of general rules for minimizing raster movement can be developed, additional work should be done on movement over very small visual angles.
R 6

31,785
Haaga, P.G. NEW CONCEPTS IN SHIPBOARD MANNING: AN ANALYSIS OF THE CANADIAN NAVY APPROACH. Proj. PF 016010403, Rep. WRM 66 48, June 1966, 131pp. USN Personnel Program Support Activity, Personnel Research Lab., Washington, D.C. (AD 489346)

This report deals with the problem caused by the increase in manpower requirements aboard U.S. Navy combatant ships. It identifies support work functions aboard U.S. destroyers and recommends concepts aimed at improved manpower utilization. Objectives are to improve utilization of available men or to reduce the numbers and/or skill levels required for support work aboard destroyers of DD-710 class. A secondary aim is to determine the feasibility of removing selected support tasks from such ships to the shore or tender. Research is based on shipboard studies on U.S. destroyers, USS MASSEY (DD-778) and USS CORRY (DD-817), and a Canadian ship, HMCS CHAUDIERE (DDE 235). Report also covers a study of Canadian support services in Maritime Command, Halifax, Nova Scotia for destroyers. Canadian experience with saving manpower aboard destroyers through ship and crew cycling, minimum manning for home port duty, and the Assisted Ship Replenishment Program is reviewed and analyzed. Manning comparisons are made between U.S. and Canadian destroyers. Certain Canadian concepts in the areas of personnel, supply, and reduced manning are recommended for test and consideration for U.S. Navy. Feasibility surveys and cost-effectiveness studies are recommended on these concepts which promise improved manpower utilization aboard destroyers. The most extensive treatment in this report is given to the Assisted Ship Replenishment Program (ASRP), a computerized system for accounting for consumable stores in which the ship's storesmen are relieved of most of the routine clerical work in preparing requisitions and stock inventory reports. Further research is recommended on certain concepts for saving manpower aboard destroyers.
R 46

31,786
Klopfenstein, R.C. SPEECH PROCESSING FOR BANDWIDTH COMPRESSION. FINAL REPORT. Contract AF 33(615) 2576, Proj. 4335, AFAL TR 66 293, Sept. 1966, 60pp. USAF Avionics Lab., Lackland AFB, Tex. (Electronics Research Lab., Melpar, Inc., Falls Church, Va.). (AD 488991)

The problem of speech bandwidth compression via automatic phoneme recognition was studied, and selected parts of that problem were explored in detail and reduced to an operating system. The frequency versus time spectral characteristics of spoken phonetic combinations were analyzed to deduce recognition clues which might be used in a real-time voice-to-teletype converter. The usefulness of these clues was then judged against the capabilities of present speech compression equipment with special emphasis on the Formant Tracking Vocoder used by this laboratory in the final system. A simple yet adequate mathematical recognition technique was then conceived, refined, and tested. The outcome of this testing became the final and most inclusive portion of the program. First, phoneme categories were eliminated from consideration, due to the lack of yet undeveloped speech analysis hardware. Then the testing was narrowed to the voiced-stop-consonants /b/, /d/, and /g/ which provides one of the most difficult tests of the recognition techniques. The further restriction of real-time system operation was required; i.e., no human intervention was allowed between the speaking of a word and the final phoneme selection and indication. The final operating system used a Formant Tracking Vocoder, a Multiplexed Input Analog-to-Digital Converter and the IBM 1410 Computer. The vocoder supplied spectral parameters of spoken words through the converter to the computer, which supplied the mathematics of the recognition technique and the final printing of selected phonemes.
R 3

31,787
Michell, G.S. AUGMENTING FEEDBACK AND TRANSFER OF TRAINING. FINAL REPORT. Proj. 7635 | P2, NAVTRADEVCEN Tech. Rep. IH 41, March 1966, 83pp. USN Training Device Center, ONR, Port Washington, N.Y. (AD 631405)

The major finding of the present study which was not expected on the basis of previous studies of augmenting feedback was that increasing amounts of information in the augmenting feedback paired with primary feedback conditions that presented little information resulted in positive transfer effects. Specifically, it was found that Ss learned something about the difficult auditory tracking task which persisted following removal of highly informative visual augmenting feedback. This indicates the need to extend the range of task difficulty in augmenting feedback studies to account for tasks presenting very little informative feedback.
R 52

31,788
Root, R.T., Waugh, D., Hewitt, K. & Donoghue, J. AN ANALYSIS OF INTERPRETER-COMPUTER REPORTING TECHNIQUES. Contract DA 49 092 ARO 41, DA Proj. 2J620901A721, Tech. Res. Note 170, June 1966, 111pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 645293)

The first step was to analyze interpreter reporting requirements for imagery obtained from both conventional and exotic sensors (infrared and radar). Factors affecting interpreter-computer communication were identified and alternatives under each factor having potential utility within a tactical facility were selected. A method was developed for rating al possible reporting techniques constructed from combinations of the alternatives. Sixteen raters made the required judgments for 4 separate reporting functions involving interpreter-computer interaction: a) Input of flight plan and mission data; b) Input of queries for retrieval of reference information; c) Hot Report generation; and d) Immediate Report generation. Two experiments designed to further evaluate the more promising alternatives were conducted. In the first experiment, selected procedural alternatives were compared, with word form, syntax, format, and equipment held constant. In the second experiment, selected alternative word form and format combinations were compared, with syntax, equipment, and procedures held constant.
R 23

31,789
Sullivan, H.J., Baker, R.L. & Schutz, R.E. THE EFFECT OF INTRINSIC AND EXTRINSIC REINFORCEMENT CONTINGENCIES ON LEARNER PERFORMANCE. FINAL REPORT. Contract AF 33(615) 1507, Proj. 1710, Task 171007, AMRL TR 66 138, Sept. 1966, 7pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Arizona State University, Tempe, Ariz.).

Seventy-six AFROTC Cadets studied a revised version of the text, "The Military Justice System," for four 50-minute class periods distributed over 2 weeks. Unit-mastery tests of about 12 multiple-choice items each were administered at 11 points throughout the text. Half of the subjects (Cadets) received no knowledge of the correctness of their responses on the unit-mastery test. The other half of the subjects used chemically treated answer sheets which immediately indicated whether or not the subject's answer was correct. A 100-item multiple-choice test over the text was administered to all subjects 2 days after the final instruction period. All subjects had been informed of the final test. Half of the subjects in each of the above groups had been assured payment of $2.50 for participation in the study. Each student in the other half had been told that he would receive $4.00 if he scored 80% or higher on the final test, $2.00 if he scored from 50 to 79% and nothing if he scored below 50%. Compared with other subjects using the chemically treated answer sheets these subjects completed the study of the text in less time and appeared to depend on the mastery test for additional instruction. They performed significantly poorer on the Unit-Mastery tests. On the final criterion test, however, none of the groups differed significantly. Rather complex factors must be considered in specifying the optimal conditions of reinforcement and incentives.
R 4

31,790
Kroll, J., Arendt, R.H. & Pritchard, F.E. DEVELOPMENT OF A GENERAL PURPOSE AIRBORNE SIMULATOR. Contract NAS 4 607, NASA CR 641, Nov. 1966, 73pp. Flight Research Center, NASA, Edwards AFB, Calif. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

This report summarizes the major design, analysis, and test efforts performed by the Cornell Aeronautical Laboratory, Inc., during the development of the variable stability system for the General Purpose Airborne Simulator (GPAS). The GPAS is a NASA-owned Lockheed JetStar incorporating a variable stability system that can operate in two modes, as a model-controlled system (MCS) and as a response feedback system (RFS). The theory and operation of both systems are discussed, but since the MCS is considered the primary system, it is given the most attention. The RFS is considered a backup system but it can also be used to augment MCS performance. Methods for computing MCS control loop gains are described. Functional and detailed designs are described for the major GPAS subsystems, the flight control system, variable feel system, pilot's instruments and control panels, airborne computer, test engineer's console, and data acquisition system. In addition, results are presented from the preliminary ground and flight test programs which illustrate the performance of the GPAS variable stability system.

31,791
Colomb, K.M. INFORMATION HANDLING PROPERTIES OF NEUROMIME NETS. FINAL REPORT. Contract AF 33(615) 1825, Proj. 7233, Task 723302, AMRL TR 66 128, Sept. 1966, 114pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

This report is a study on some elementary information handling properties of neuromime nets, giving most emphasis to the functioning of a single neuromime component, and containing some discussion of the operation of simple nets. Single component computation is treated from the point of view of changes brought about in the internal structure by operations performed during data flow. A geometrical model is presented which illustrates the pattern measurement behavior of the component, and some of the simpler differential equations of adaptation are solved to provide some insight into the effect and interaction of the component control parameters. Simple net behavior is concerned mainly with feedback interaction among components, and gives some useful notation for describing net operation.
R 10

31,792
Sorenson, R.C. & Olson, Pauline T. MANPOWER ROTATION POLICY MODELS. DA Proj. R&D PJ 2J023201A711, Tech. Res. Note 172, June 1966, 69pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 644900)

The MANPOWER MANAGEMENT SYSTEM Task seeks to integrate the growing body of psychological, mathematical, and computer technology in the solution of manpower management problems. Under Task research objectives a specific requirement was generated for the development of rotation policy models for use in evaluating alternative manpower policies for the inventory, allocation, and assignment of U.S. Army personnel in current and future systems. Eight manpower flow models, presented in this report, were developed to represent the Army personnel system under varying requirements and levels of complexity with respect to type of duty tour, flow of personnel, duration of tours, allocation of personnel, and alternation policy. Sample nomograms, facilitating estimation of effects of selected policy alternatives, are provided. Additional nomograms, based on models in the series, are presented in Technical Research Report 1147. In addition to the sample charts, a set of symbols is provided in a glossary which the user may apply in working with a specific problem selected for study. Computer programs for estimating CONUS tour lengths have been written for two of the steady-state system models described in this report. A dynamic model has also been developed, using a computer simulation to represent the system during periods of transition. This model and its application will be described in a later publication.
R 3

31,793
Jones, F.P. & Hanson, J.A. THE MOVEMENT PATTERN AS AN INDEX OF FATIGUE. Contract DA 49 193 MD 2665, Rep. 1, April 1966, 26pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Institute for Psychological Research, Tufts University, Medford, Mass.). (AD 483878)

The effects of fatigue on movement patterns, recorded by color-coded multiple-image photography, were investigated. In the main experiment, the movement patterns of 13 Ss were photographed before, during, and after fatigue inducing procedures. Patterns were obtained for the movements of broad jumping, sitting-to-standing, and standing-to-sitting. Linear and angular measures taken from pre- and post-fatigue patterns were compared. Correlations of selected broad jump measures with jump length decrement were computed. Statistically significant changes in pattern measures were found for all three movements. Some (but not all) pattern changes correlated highly with jump length decrement.
R 8

31,794
Lawrence, M. THE EFFECT OF OVERSTIMULATION AND INTERNAL FACTORS ON THE FUNCTION OF THE INNER EAR. FINAL REPORT. Contract DA 49 007 MD 634, Rep. ORA 03032, April 1966, 364pp. USA Research & Development Div., Office of the Surgeon General, Washington, D.C. (Kresge Hearing Research Institute, University of Michigan, Ann Arbor, Mich.).

This is the final report on investigations of the inner ear that have been supported by The Surgeon General of the Army during the 10-year period June 1955 to July 1965. Because the research has followed several lines, a strictly chonological sequence of reports would not always present a logical development. Therefore, the reports have been grouped according to topic, so that each of the different aspects of the research is presented as a unit. Altogether there have been 54 publications during the 10-year period of this contract. Reviews and discussion papers have been omitted, but most of the laboratory research is reported. The three major topics covered are overstimulation, internal factors and conduction deafness. (AD 484535)
R Many

31,795
Fernandez, D. & Sheldon, H.W. DESIGN STUDY AND FABRICATION OF TWO INTERCHANGEABLE UH-1 AIRCREW ARMOR SYSTEMS. FINAL REPORT. Contract DA 44 177 AMC 224(T), Task 1P121401A1500301, AGC Rep. 2950, USAAVLABS Tech. Rep. 66 23, April 1966, 52pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aerojet-General Corporation, Azusa, Calif.).

The design and evaluation of two interchangeable UH-1 aircrew armor systems capable of defeating 7.62mm, .30-caliber, and .50-caliber AP ammunition are described. The design features of the systems are described, and a structural analysis of the system is presented. (AD 634525)
R 2

31,796
Allen, Mary Ellen & Mohler, S.R. AVIATION MEDICINE REPORTS: AN ANNOTATED CATALOG OF OFFICE OF AVIATION MEDICINE REPORTS: 1961 THROUGH 1965. Rep. AM 66 1, Jan. 1966, 29pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 638732)

This report lists the FAA reports published in the 1961-1965 time period. The scientific research upon which these reports were based was conducted for the purposes of: a) preventing aircraft accidents and b) preventing injuries should accidents occur.
R Many

31,797
Neely, K.K. DIVERS' COMMUNICATIONS IMPROVED. Science, July 1966, 153(3733), p. 321. (Defence Research Medical Labs., Defence Research Board, Toronto, Ontario, Canada). (AD 639965)

Underwater communication by voice between divers and between diver and surface, whether transmitted by cable or through the water, has been inadequate because of the respiratory noises and distortions of speech associated with the use of air-conduction transducers in face masks. When a mouthpiece is used for breathing, speech is even less intelligible. The use of standard air-conduction techniques with earphones is unsatisfactory because covering the ears with earphones interferes with the equalization of pressures on opposite sides of the eardrum and with detection of sounds from the environment. This note describes how voice communication between diver and surface is made effective by the use of a system in which bone-conduction transducers are utilized. In quiet environments one transducer attached either at the forehead, top of the head, or back of the head (these sites are in order of decreasing effectiveness) is adequate for both talking and listening. For environments in which there are high levels of noise (100 decibel or higher), two transducers, one located on the upper lip for talking and the other located on the mastoid for listening, provide adequate transmission and reception.

31,798
Stevenson, Sandra A. & Trygg, L.E. A BIBLIOGRAPHY OF REPORTS ISSUED BY THE BEHAVIORAL SCIENCES LABORATORY: ENGINEERING PSYCHOLOGY, TRAINING PSYCHOLOGY, ENVIRONMENTAL STRESS, SIMULATION TECHNIQUES, AND PHYSICAL ANTHROPOLOGY. June 1966, 147pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 800241)

The Behavioral Sciences Laboratory, one of two laboratories of the Aerospace Medical Research Laboratories, conducts research and development in the fields of human engineering, training, psychophysiology, physical anthropology, and simulation techniques. The Human Engineering Division executes research and development on human performance capabilities and limitations as they relate to operation and maintenance of aircraft, missile, and manned space vehicle systems. The Training Research Division accomplishes research and technical development in the areas of training techniques, psychological and engineering aspects of training equipment, personnel requirements of new weapon systems, and the effects of environmental stress on human performance. This Bibliography lists, by functional groupings, the technical reports, technical notes, contractor reports, memorandum reports, and journal articles prepared by the Behavioral Sciences Laboratory, and its contractors, from April 1946 through December 1965.
R 1163

31,799
Borsting, J.R. & Woods, W.M. A METHOD FOR COMPUTING SERIES SYSTEM RELIABILITY WITH UNEQUAL COMPONENT SAMPLE SIZES. Special Projects Code SP 114, Proj. 46058, Subproj. 1, Task 88432, Tech. Rep./Res. Paper 62, Jan. 1966, 8pp. USN Postgraduate School, Monterey, Calif. (AD 628043)

A method is presented for constructing system reliability using component failure data when the sample sizes for testing on the component parts differ greatly. The procedure can be applied to weapons systems as easily as subsystems. No assumptions about failure distributions are made. The accuracy of the procedure was examined by computer simulations and in this manner the procedure has demonstrated high accuracy for cases of practical interest.

31,800
Fishman, G.S. PROBLEMS IN THE STATISTICAL ANALYSIS OF SIMULATION EXPERIMENTS: THE COMPARISON OF MEANS AND THE LENGTH OF SAMPLE RECORDS. Contract AF 49(638) 1700, Proj. RAND, Memo. RM 4880 PR, Feb. 1966, 29pp. Rand Corporation, Santa Monica, Calif. (AD 628626)

This is a continuation of research into statistical analysis of simulation experiments containing autocorrelated time series. The Memorandum shows how to estimate the lengths of sample records needed to use certain large sample results in measuring stability, describes analogies between autocorrelated data and independent observations, and suggests a way to test the difference of the mean of two experiments. It also shows how the variance of the sample mean relates to the spectrum of the generating process, and describes estimation of the quantities of interest. The results expand the possibilities of statistical spectral analysis as applied to simulation experiments.

31,801
Royal Aircraft Establishment. SPACE PROJECTS IN THE UNITED KINGDOM. Report from: "Sixth International Symposium on Space Technology and Science, Tokyo, Japan, Nov.-Dec. 1965." Tech. Rep. 66058, Feb. 1966, 40pp. Royal Aircraft Establishment, Farnborough, Hampshire, England. (AD 634570)

Throughout the last decade the United Kingdom has maintained an active programme of sounding rocket and ballistic missile development, from which the current space activities have emerged; the former weapon Blue Streak has become the first stage of the ELDO satellite launcher, Black Knight is being considered as the basis for a national launcher (Black Arrow), and Skylark is now used exclusively for space research. The paper describes these projects, as well as the U.K.3 and Black Arrow satellites, and concludes with a brief mention of related ground facilities.
R 1

31,802
Landis, M. & Aviv, D.G. SIMULATION OF THE 1% MINIMUM CROSSTALK LOSSES AT VOICE FREQUENCIES IN A PAIRED CABLE BY MEANS OF A LUMPED PARAMETER NETWORK. June 1966, 10pp. Rand Corporation, Santa Monica, Calif. (Communications Systems Lab., Radio Corporation of America, New York, N.Y.). (AD 634182)

The design of a crosstalk simulator, which simulates the "1% minimum" crosstalk loss condition in a paired cable at voice frequencies, is presented in this paper. The simulator is composed of two or more balanced artificial lines coupled to one another at each node by means of equivalent crosstalk capacitors. The capacitor node connections follow prescribed rules, resulting in the total unbalanced capacitance between the disturbing and the disturbed lines varying as a function of the square root of line length (number of sections). The near-end and far-end crosstalk loss calculations obtained with the simulator compare within a fraction of one decibel with the corresponding crosstalk loss evaluation in a smooth cable. Analysis of the simulator model leads to a general result, which can be used for any crosstalk condition specified by a) the number of disturbers, b) the magnitude of unbalanced capacitance, c) signal levels, or d) the probability of occurrence. The simulator is also useful in evaluation of error rate as a function of crosstalk interference.
R 1

31,803
Johnson, Laverne C. & Long M.T. NEUROLOGICAL, EEG, AND PSYCHOPHYSIOLOGICAL FINDINGS BEFORE AND AFTER SEALAB II. BuMed. Res. Task MR 005.12 2304, Rep. 66 19, April 1966, 6pp. USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif. (AD 483881)

Neurological, electroencephalogram (EEG), and psychophysiological examinations were obtained before and after SEALAB II to determine possible changes resulting from prolonged exposure to a hyperbaric environment. The psychophysiological variables included heart rate, respiration rate, skin resistance, and finger plethysmogram. The postdive examinations were completed 12 to 36 hours after decompression. No significant predive or postdive neurological or EEG changes were found. While marked individual differences were found in the psychophysiological variables, the only significant difference was a drop in arousal level from predive to postdive.
R 10

31,804
Dougherty, Dora J. FINAL TECHNICAL REPORT, JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH (JANAIR) CONTRACT 4429(00). Contract NONR 4429(00), JANAIR TR D228 100 011, Feb. 1966, 30pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Bell Helicopter Company, Fort Worth, Tex.).

This report covers work performed by Bell Helicopter Company for the Joint Army Navy Aircraft Instrumentation Research Program under Contract NONR 4429(00). The contract work was initiated May 1, 1964, and terminated February 28, 1966. Under this contract, studies were performed in both the flight simulator and the helicopter. The simulator studies were oriented about improvement and information augmentation of the contact analog. They were performed in the JANAIR/Bell Dynamic Flight Simulator and examined pilot performance as a function of: a) the use of director symbols and changes in grid texture, b) presentation of flight information on vertical tapes, c) the use of digital readout of flight information. Flight studies examined the Spectocom Head-Up Display and television in flight situations in the JANAIR research helicopter. Recommendations for solution to these problems are presented in the correspondingly appropriate technical reports. Technical reports of all researches performed under this contract have been issued and are reviewed in this document.
R 13

31,805
Lowe, D.S. (Princ. Investigator). PEACEFUL USES OF EARTH-OBSERVATION SPACECRAFT. VOLUME I: INTRODUCTION AND SUMMARY. Contract NASw 1084, NASA CR 586, Sept. 1966, 57pp. National Aeronautics & Space Administration, Washington, D.C. (Willow Run Labs., University of Michigan, Ann Arbor, Mich.).

Earth-observation spacecraft have many potential applications in the fields of geography, agriculture, forestry, hydrology, wildlife management, oceanography, geology, air pollution, and archaeology. Substantial scientific and economic benefits could result from the use of sensors carried aboard earth-orbiting spacecraft for earth mapping, collection of agricultural census data, forest inventory, wildlife habitat assessment, detection of sea ice, measurement of sea surface temperatures, and many other uses. Types of sensors to be considered for these purposes include photographic cameras with focal lengths ranging from 0.5 to 20 ft, infrared scanners, multi-spectral sensing systems, noncoherent and synthetic-aperture radar, microwave radiometers, and laser altimeters. The development of operational systems of observation spacecraft would require a research and development program which included preliminary ground-based and airborne experiments followed by a series of manned earth-orbiting experiments. The preliminary experiments would provide information on sensor characteristics and capabilities for observing natural and cultural phenomena on the earth's surface which would be necessary for design of experimental orbiting sensors and planning of orbital experiments. The objective of the manned earth-orbiting experiments would be to ascertain the optimum conditions for sensor operation and to demonstrate the feasibility of future operational systems. In the manned earth-orbiting experiments, predicted characteristics of the atmosphere would be checked, individual sensors calibrated, sensor performance measured, and imagery and other data collected over both land and water, which would be analyzed to determine the feasibility of detection and identification of earth-based objects and the best methods for employing future operational earth-observation spacecraft. R 13 Cf. HEIAS 31,806

31,806
Lowe, D.S. (Princ. Investigator). PEACEFUL USES OF EARTH-OBSERVATION SPACECRAFT. VOLUME II: SURVEY OF APPLICATIONS AND BENEFITS. Contract NASw 1084, NASA CR 587, Sept. 1966, 159pp. National Aeronautics & Space Administration, Washington, D.C. (Willow Run Labs., University of Michigan, Ann Arbor, Mich.).

This is a second volume on the same topic as that covered in 31,805.
R 76

31,807
Dickerson, T.J., Mathis, J.V., Smith, S.T. & Butler, C. SYSTEMS ANALYSIS PROCEDURES FOR ADP APPLICATION OF THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURES. VOLUME I STUDY REPORT. Contract NONR 3821(00), Rep. PTB 66 8, June 1966, 213pp. USN Personnel Research Div., Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.).

This report presents the results of a study program to develop system analysis techniques for automatic data processing (ADP) application of the Corrective Maintenance Burden (CMB) Prediction Procedures. The work described represents Phase IV of a continuing program to develop maintenance manpower requirements prediction methodologies. This report describes the work performed in analyzing the prediction procedures to determine those steps that are conducive to automatic data processing, developing input data coding formats, developing appropriately coded mathematical expressions, and developing detailed system flow diagrams. The diagrams developed, which are presented in Volume II of this report, are presented in a universally understood format, and use coding techniques and notations that are readily translated into any of several of the popular computer languages. Cf. 31,808.
R 9

31,808
Dickerson, T.J., Mathis, J.V. & Butler, C. APPLICATION OF THE CMB PREDICTION PROCEDURE TO OMEGA NAVIGATION RECEIVERS AN/WRN-3(XN-1) AND AN/SRN-12(XN-1). Contract N000 14 66 C0136, Rep. PTB 67 2, Oct. 1966, 59pp. USN Personnel Research Div., Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.).

This study presents prediction data on the primary corrective maintenance burden for the OMEGA Navigation Sets AN/SRN-12(XN-1) and AN/WRN-3(XN-1). The report predicts maintenance hours per 1000 hours of equipment operation, identifies required tasks and level of difficulty, and specifies skill and knowledge requirements. The study is one of a series by the Bureau of Naval Personnel to apply and test the utility of the Corrective Maintenance Burden Prediction Technique for use in Navy personnel planning.
R 13

31,809
Hixson, W.C. & Niven, J.I. A TORQUE MOTOR SERVOROTATOR FOR VESTIBULAR APPLICATION. NASA Order R 93, BuMed. Proj. MR005.04 0021, NAMI Rep. 979, Rep. 137, Sept. 1966, 18pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The Periodic Angular Rotator is a novel servorotator designed for studies of the dynamic response of the oculovestibular system. It will rotate a single subject about an Earth-vertical axis in a wide variety of stimulus waveforms. Step function, ramp, and sinusoidal angular motions are generated precisely by a closed-loop power servomechanism drive system. The use of a low speed DC torque motor coupled directly to the payload resulted in a system with low acoustic noise and mechanical vibration properties, fast dynamic response characteristics, and a high degree of coupling stiffness. When operated in a velocity mode of control, the device is rated to produce a maximum angular velocity of 100 rpm either clockwise or counterclockwise at angular accelerations up to 100 deg/sec^2 and sinusoidal oscillation frequencies beyond 2.0 cps. When operated in the alternative displacement mode, similar ratings apply over a $\pm$ 150 degree excursion.
R 7

31,810
Kaufman, W.C. STANDARDIZATION OF SYMBOLS AND UNITS FOR ENVIRONMENTAL RESEARCH. Proj. 7222, Task 722207, AMRL TR 66 115, Aug. 1966, 9pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A logical system of symbols to designate the widely accepted biological variables routinely measured in environmental research is described. Upper case letters are used for three major symbols of temperature, heat quantity, and rate of heat transfer. These are modified by upper case subscripts for physical variables and lower case subscripts for biological variables.
R 2

31,811
Slough, Doris C., Yens, D.P., Northrup, Judi L. & Shettel, H.H. DEVELOPMENT AND EVALUATION OF SELF-INSTRUCTIONAL TEXTS AND AN OPERATIONAL SPECIFICATION FOR COMPUTER DIRECTED TRAINING IN INTERMEDIATE QUERY LANGUAGE, MODEL II, FOR SYSTEM 473L, UNITED STATES AIR FORCE HEADQUARTERS. FINAL REPORT. Contract AF 19(628) 2935, Proj. 7682, Task 768204, ESD TR 66 637, Oct. 1966, 65pp. USAF Decision Sciences Lab., Hanscom AFB, Bedford, Mass. (American Institutes for Research, Pittsburgh, Penn.).

This report summarizes the development and evaluation of a programmed, self-instructional course for on-the-job training of Air Staff personnel in the use of Intermediate Query Language, Model II. This is an information retrieval language used with the computer based, Air Force command and control system, System 473L. In addition, it describes a computer directed training capability that was designed specifically to use System 473L itself to effectively and efficiently provide training in Query Language. The report describes the need for on-the-job training and the rationale for a computer directed training capability to provide this training. It describes the development of the programmed text, the text itself, and the effectiveness of the text materials based on tryout data. Finally, a description of the proposed computer directed training course is given, with emphasis on the training design. The 473L System configuration using the AN/FYQ-11 computer, towards which this study was oriented, will not be implemented for the Headquarters U.S. Air Force Command and Control System. However, this design study for the training subsystem may be of interest to researchers on the computer-directed instructional systems.
R 6

31,812
Bishop, D.W., Alsobrook, J.M. & Fiedler, F.E. (Princ. Investigator). THE EFFECTS OF INTER-GROUP COMPETITION IN QUASITHERAPEUTIC LEADERS ON THE ADJUSTMENT OF SMALL MILITARY GROUPS. Contract DA 49 193 MD 2060, Tech. Rep. 20, Jan. 1966, 41pp. USA Office of the Surgeon General, Washington, D.C. (Psychology Dept., University of Illinois, Urbana, Ill.). (AD 631741)

This study investigated the effects of two variables (inter-squad competition vs. non-competition, and quasi-therapeutic vs. non-therapeutic squad leaders) on the adjustment, interpersonal relations, and task effectiveness of military squads. A two-factor analysis of covariance design with two covariance control variables was used with each dependent variable in turn; the covariance control variables were the dependent variable's own pretest counterpart and a measure of trainees' perceived harassment. The major results were: a)The competitive activity and the manner in which it was implemented by the cadre of the experimental companies significantly increased perceptions of harassment by trainees in the competitive squads. b) When perceived harassment was statistically controlled by analysis of covariance, the adjustment and task effectiveness of the competitive squads improved significantly relative to the control squads. The improved adjustment appeared to be primarily in the task-related areas. No improvement in interpersonal relations was found for the competitive squads. c) No reliable main effects were found for the quasi-therapeutic leader manipulation. d) Some interactive effects of competition and quasi-therapeutic leadership were found; the interaction indicated that the adjustment of competitive squads is further enhanced by non-therapeutic leadership whereas the adjustment of non-competitive squads is reduced by non-therapeutic leadership; there was no difference in the adjustment of competitive and non-competitive squads with quasi-therapeutic leaders.
R 23

31,813
Waugh, J.D. MINEFIELD MARKER-LIGHT CHARACTERISTICS. Tech. Note 7 66, Sept. 1966, 24pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

Friendly forces passing through a minefield at night must be able to identify lights marking safe-passage corridors. Although the literature supplies some data that can be used as design criteria, they were not originally intended for a minefield situation. A study was conducted to verify the criteria and identify problems peculiar to minefield marking. Enlisted military subjects were tested with marker lights combining color-discrimination and acuity stimuli, in a darkened warehouse at night, to control atmospheric variable. The overall proportion of errors was .041 for the color trials, and .103 for the acuity trials. Although the acuity trials did not yield any firm conclusions, the study showed that errors in identifying colors were mainly confusions between amber and red. The report concludes with criteria for designing minefield marker lights, some of which are subject to further verification.
R 12

31,814
Corballis, M.C. SERIAL ORDER IN RECOGNITION AND RECALL. Contract NONR 4896(00), DRB Grant 9425 10, Tech. Rep. 3, May 1966, 21pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. & Defence Research Board, Ottawa, Ontario, Canada. (Psychology Dept., McGill University, Montreal, Quebec, Canada). (AD 483228)

Two experiments are reported in which subjects viewed 100 series of 5 digits, each followed by a 6th "critical" digit. They were required to indicate as quickly as possible by pressing 1 of 2 buttons whether or not the critical digit had appeared in the series. In Experiment I (20 subjects) presentation rate was varied. In Experiment II (10 subjects) there were 3 recall trials as well as the 100 recognition trials, but the subject did not know whether he was to recall the 5 digits or make a recognition response until after the digits had been presented. In both experiments recognition times showed a strong recency effect, i.e., faster recognition times the later the critical digit occurred in the series, while in the recall trials in Experiment II subjects generally reported the digits in the forward order. These results are interpreted to mean that the forward ordering in recall is a feature of the recall process itself rather than of storage, and that in recognition the subject has direct access to relevant elements of a serial trace without first having to scan irrelevant ones. A theory to account for serial order in recall is proposed.
R 17

31,815
Parker, J.F., Jr. & Post, T.J. THE DEVELOPMENT OF A PROTOTYPE SPECIFICATION FOR THE PREPARATION OF MILITARY FLIGHT MANUALS. FINAL REPORT. Contract N 61339 1638, Proj. 7614 1A, NAVTRADEVCEN Tech. Rep. 1638 2, Aug. 1966, 99pp. USN Training Device Center, ONR, Orlando, Fla. (BioTechnology Inc., Arlington, Va.).

The purpose of this study was to develop a new specification for the preparation of flight manuals for military aircraft. This effort was initiated with the preparation of a conceptual framework to guide the development work. The framework was rationally derived and included the results of a previous and related study, NAVTRADEVCEN 748-1, Improvement of Flight Handbooks. The central feature of the framework and the resulting specification is a set of criteria for flight manual preparation. These criteria are: a) Scope: job significance, pilot preference, operating environment, previous training; b) Depth of Detail: complexity, uniqueness, criticality; c) Readability: conditions of use, consolidation of material, logical order, presentation techniques, standardization, economy; and d) A prototype military specification has been published as NAVTRADEVCEN 1638-1.
B 8

31,816
Dickerson, T.J., Mathis, J.V., Smith, S.T. & Butler, C. SYSTEMS ANALYSIS PROCEDURES FOR ADP APPLICATION OF THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURES. VOLUME II: SYSTEMS ANALYSIS PROCEDURES. FINAL REPORT. Contract NONR 3821(00), Rep. PTB 66 8, June 1966, 62pp. USN Personnel Research Div., Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.).

This volume contains the System Analysis Procedure, including a review of the mathematical model, detailed system flow charts, coding formats and table allocations that are necessary for programming the CMB Prediction Procedure for Automatic Data Processing. The materials presented are the results of the Phase IV effort under the Corrective Maintenance Burden Prediction Procedure development program. The complete study report is presented in Volume I of this report. The System Flow Charts and supporting data are presented in sufficient detail to permit an experienced systems analyst to write a complete program for the ADP application of the prediction procedures, but is still presented in the degree of generalization necessary to permit the use of any of a number of the currently used, high-speed computers.
(Cf. HEIAS No. 31,808)

31,817
Warm, J.S. & Alluisi, E.A. BEHAVIORAL REACTIONS TO INFECTION: A REVIEW OF THE PSYCHOLOGICAL LITERATURE. Contract DA 49 193 MD 2567, Proj. 1C622401A096, Task 01, Interim Tech. Rep. 66 4, June 1966, 54pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Psychology Dept., University of Louisville, Louisville, Ky.). (AD 488568)

A review of the psychological literature on behavioral reactions to infection is presented in four major sections: a) Introduction, b) Developmental consequences of infectious disease, c) Psychosomatic aspects of infectious disease, and d) General summary and conclusions.
R 198

31,818
Gillespie, K.W. COMPARATIVE EVALUATION OF USAF STANDARD A/P22S-2 AND IMPROVED A/P22S-2A HIGH ALTITUDE, FULL PRESSURE FLYING OUTFITS. SUPPLEMENT 1. A/P22S-2A (MOD 1). Contracts AF 36(657) 10911 & AF 33(600) 10599, SEG TR 65 9, April 1966, 80pp. USAF Systems Engineering Group, Wright-Patterson AFB, Ohio. (AD 483958)

In this supplement, the A/P22S-2A (Mod 1) outfit is compared with the A/P22S-2 outfit. The components and factors compared include: Weight, leak rate and pressure relief, reach capability, work space, ventilation efficiency, and back pressure. The comments of the persons wearing the outfit were also considered. Results indicate that the A/P22S-2A (Mod 1) shows some improvement over the A/P22S-2; however further improvements are required to make the outfit more operationally acceptable. Specific recommendations are made as to those areas that need improvements.
R 5

31,819
Virga, R.R. STATISTICAL PRESENTATION OF LANDING PARAMETERS FOR MODELS F-4B, F-8E, RF-8A, A-3B, A-4C, A-4E, C-1A, AND E-1B AIRCRAFT ABOARD THE USS F.D. ROOSEVELT (CVA-42) OPERATING OFF THE EAST COAST OF FLORIDA. WepTask Problem Assign. 1 22 74, Rep. NAEC ASL 1090, Survey 13A, April 1966, 431pp. USN Air Engineering Center, Aeronautical Structures Lab., Philadelphia, Penn. (AD 484172)

A statistical analysis was made of aircraft approach and landing contact data for normal fleet operations off the east coast of Florida for models F-4B, F-8E, RF-8A, A-3B, A-4C, A-4E, C-1A, and E-1B aircraft during the period 10-21 May 1965. The parameters are presented in the form of histograms and probability curves. Statistical values for each parameter are listed in the summary tables.
R 1

31,820
Schaefer, H.J. LINEAR ENERGY TRANSFER SPECTRA AND DOSE EQUIVALENTS OF GALACTIC RADIATION EXPOSURE IN SPACE. NASA Order R 75, BuMed. Proj. MF022.03.02 5001, NAMI Rep. 987, Rep. 37, Dec. 1966, 15pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

In assessing the astronaut's exposure from galactic cosmic rays on space missions of long duration conversion of absorbed doses to dose equivalents is required. Since a large part of the dose contribution from heavy primaries is produced at Linear Energy Transfer (LET) values beyond the range for which radiobiological data are available, it seems preferable to analyze the LET distributions themselves and to compare them to standard x-rays rather than to assume arbitrary values for the Relative Biological Effectiveness (RBE). The local LET distributions in tissue are found to be extremely skewed, with a large maximum at the relativistic minimum LET. Lined up on the LET scale, they cover the very wide interval from 0.18 to 2790 kev/micron T as compared to an interval from 0.4 to 35 kev/micron T for standard x-rays. Applying the RBE formula of the RBE Committee of the ICRP and a saturation value of 10 leads to a grand mean RBE of 1.82 for the total absorbed dose of 13 millirads/24 hours from primaries.
R 16

31,821
Kulikova, G.I., Palagin, E.G., Poliakova, E.A. & Sal'man, E.M. POSSIBILITY OF RADAR DETERMINATION OF VISIBILITY IN FOGS. Contract AF 19(628) 3880, Rep. T R 534, Jan. 1966, 9pp. USAF Cambridge Research Labs., OAR, L.G. Hanscom Field, Bedford, Mass. (American Meteorological Society, Boston, Mass.). (Transl: Glavnaia Geofizicheskaia Observatoriia, Trudy, Leningrad, 1965, 173, 71-75). (AD 630554)

The feasibility of radar determination of visibility in fogs is examined. The fundamental possibility of detection of fogs at short ranges is demonstrated. Correlations are established between optical and radar characteristics of fogs. Approaches to the development of a radar method are pointed out.
R 3

31,822
Wilson, R.A. & Noste, N.V. PROJECT FIRE SCAN FIRE DETECTION. INTERIM REPORT APRIL 1962 TO DECEMBER 1964. THE EVALUATION OF AN AIRBORNE INFRARED MAPPER AS A TOOL FOR DETECTING AND MEASURING FIRES. Contract OCD OS 62 174, ARPA Order 636, ARPA Program Code 5860, Res. Paper Int 25, June 1966, 68pp. US Office of Civil Defense, Department of Defense, Washington, D.C. & US Advanced Research Projects Agency, Department of Defense, Washington, D.C. (US Forest Service, Department of Agriculture, Missoula, Mont.).

The first 3 years of Project Fire Scan's airborne infrared fire detection program are reported. The program objective is the evaluation of systems and techniques for the detection of incipient forest fires. Qualitative correlations are presented of probability of detection versus scanner aspect angle, timber type, and fire target size. Aircraft patrol navigation requirements are briefly examined. A capability is demonstrated for precise observations of timber canopy obscurations from a fixed, ground platform. Appendixes include theoretical discussions of system spectral response, scanner sensitivity, source background radiometric detection criteria, and the several mechanisms of radiation attenuation.
R 12

31,823
Giuliano, V.E. & Jones, P.E. STUDY AND TEST OF A METHODOLOGY FOR LABORATORY EVALUATION OF MESSAGE RETRIEVAL SYSTEMS. INTERIM REPORT. Contract AF19(628) 4067, ESD TR 66 405, Rep. C 66257, Aug. 1966, 183pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Arthur D. Little, Inc., Cambridge, Mass.).

This report documents two years of work on the laboratory evaluation of message and document retrieval systems. It contains a general discussion of the problems of laboratory evaluation of retrieval systems, and specific findings relating both to the methodology of evaluation and search performance results observed with a large-scale experimental collection. The initial sections of the report are devoted to developing a general framework for viewing the problems of performance evaluation under laboratory conditions. Several mathematical techniques potentially useful in the evaluation process, including methods for unbiasing and averaging the results of judgments by several independent evaluators are discussed. Also, many possible measures of system performance are discussed, compared, and evaluated. The processing of the 10,000-message experimental collection, including the steps of automatic indexing and computation of word-association measures is described. Comparison of subject matter coverage and effects of manual and automatic indexing for this collection are discussed, and several statistical characterizations of the collection are presented. Several experimental forays with this collection using combinations of conventional and associative retrieval with and without human intervention, using multiple evaluators are described and both full text and subject heading queries are considered. Numerous conclusions and findings are presented with respect to efficacy of various retrieval evaluation techniques and methods, the relative merits of machine and automatic indexing, and the comparative efficacy of various combinations of conventional and associative search options.
R 31

31,824
University of Michigan. PEACEFUL USES OF EARTH-OBSERVATION SPACECRAFT. VOLUME III. SENSOR REQUIREMENTS AND EXPERIMENTS. Contract NASw 1084, NASA CR 588, Sept. 1966, 224pp. National Aeronautics & Space Administration, Washington, D.C. (University of Michigan, Ann Arbor, Mich.).

Earth-observation spacecraft have many potential applications in the fields of geography, agriculture, forestry, hydrology, wildlife management, oceanography, geology, air pollution, and archaeology. Substantial scientific and economic benefits could result from the use of sensors carried aboard earth-orbiting spacecraft for earth mapping, collection of agricultural census data, forest inventory, wildlife habitat assessment, detection of sea ice, measurement of sea surface temperatures, and many other uses. Types of sensors to be considered for these purposes include photographic cameras with focal lengths ranging from 0.5 to 20 ft, infrared scanners, multi-spectral sensing systems, noncoherent and synthetic-aperture radar, microwave radiometers, and laser altimeters. The preliminary experiments would provide information on sensor characteristics and capabilities for observing natural and cultural phenomena on the earth's surface which would be necessary for design of experimental orbiting sensors and planning of orbital experiments. The objective of the manned earth-orbiting experiments would be to ascertain the optimum conditions for sensor operation and to demonstrate the feasibility of future operational systems. In the manned earth-orbiting experiments, predicted characteristics of the atmosphere would be checked, individual sensors calibrated, sensor performance measured, and imagery and other data collected over both land and water, which would be analyzed to determine the feasibility of detection and identification of earth-based objects and the best methods for employing future operational earth-observation spacecraft.
R 92

31,825
Pätkal, Paula, Frankenhaeuser, Marianne, Rissler, Anita & Björkvall, Christer. CATECHOLAMINE EXCRETION, PERFORMANCE, AND SUBJECTIVE STRESS. Proj. 40X 997 01, Rep. 219, Dec. 1966, 11pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Psycho-endocrine relations were explored in 52 students exposed to moderately stressful psychological tests demanding selective attention. It was shown: a) that Ss with high excretion rates of adrenaline performed better during the entire stress session than did Ss with low adrenaline excretion; and b) that the level of subjective stress increased consistently throughout the session in Ss with low excretion rates of adrenaline, while it remained relatively constant in Ss with high adrenaline excretion. No consistent relationship could be demonstrated between noradrenaline excretion and the psychological variables. Possible effects on the catecholamine-excretion patterns of factors such as severity and duration of the stress are discussed.
R 17

31,826
Adams, J.J., Kincaid, J.K. & Bergeron, H.P. DETERMINATION OF CRITICAL TRACKING TASKS FOR A HUMAN PILOT. NASA TN D 3242, Feb. 1966, 22pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Experiments have been conducted to determine the maximum amount of control element lag, and the maximum and minimum control sensitivity that can be tolerated in a single-degree-of-freedom, manually controlled compensatory tracking task. A relatively easy to satisfy error criterion was used to establish the tolerable limit. An automatic controlled element parameter adjustment was used to determine rapidly the limiting value of the parameter. An automatic model-matching method was used to determine the transfer function of the human operator in these tests. Calculations of the closed-loop system characteristics using the measured pilot transfer function show that the system is being operated with neutral closed-loop stability in the maximum lag configuration, and that the pilot is greatly restricted in his ability to identify, and adjust to, variations in control sensitivity as controlled element lag is increased.
R 3

31,827
Dixon, B.C. ZERO-GRAVITY MANEUVER INSTRUMENTS AND INSTRUMENTATION. FINAL REPORT. Contract AF 33(657) 11107, Proj. 7184, Task 718405, AMRL TR 66 1, Feb. 1966, 50pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Lear Siegler Service, Inc., Harrisburg, Penn.).

The type ARU-2B/A Attitude Director Indicator (ADI) system was evaluated as a pilot aid in flying a JC-131B aircraft on a ballistic trajectory to produce a zero- or reduced-gravity field. To provide an unburdened display to the pilot, all information necessary to fly a complete zero-G maneuver was presented on the ADI, except airspeed. A Parabola Control Panel was designed to provide six modes of presenting normal acceleration data to the ADI; i.e., zero-G, sub-G, super-G, decay, float, and program modes. The modes were effective, except for the float and program modes which are still experimental. Data from 385 maneuvers at various gravity levels from 0 G to 0.75 G revealed that when flying gravity levels below 0.25 G an accuracy of $\pm$ 0.05 G could be maintained. This is generally considered an acceptable parabola. However, when flying gravity levels greater than 0.25G the errors became greater than + 0.05G. As the desired gravity level is increased, the parabola time is increased and a high degree of accuracy is more difficult to maintain. In addition, the system errors were greater at the higher gravity levels. These two facts account for most of the errors at increased sub-gravity levels. The ARU-2B ADI system proved to be an effective aid in flying various sub-G, super-G, zero-G, and decay maneuvers.
R 11

31,828
Wasicko, R.J. APPLICATION OF APPROACH SPEED CRITERIA DERIVED FROM CLOSED-LOOP PILOT-VEHICLE SYSTEMS ANALYSES TO AN OGEE WING AIRCRAFT. Contract NAS 2 1868, NASA CR 579, Sept. 1966, 45pp. Ames Research Center, NASA, Moffett Field, Calif. (Systems Technology, Inc., Hawthorne, Calif.).

Minimum comfortable approach speed criteria for aircraft carrier and airfield VFR (visual flight reference) landings are established from closed-loop pilot-vehicle analyses. The results are applied to an F5D-1 airplane modified with an ogee shaped wing. Drag characteristics and static longitudinal stability are varied and their effects on the predicted approach speeds are determined. The analysis indicates that for most of the configurations the approach speeds should not differ greatly for the two types of approaches, with the largest difference occurring for a low drag, high static margin configuration. A reduction in zero-lift drag or an increase in static longitudinal stability has an adverse effect on the predicted approach speeds.
R 15

31,829
Newell, F.D., Parrag, M.L.E. & Bull, G. SIMULATED LANDING APPROACHES OF AN UNAUGMENTED C-5A CONFIGURATION. FINAL REPORT. Contract AF33(615) 2411, Proj. 8219, Task 821905, AFFDL TR 65 210, Rep. TB 2071 F 2, March 1966, 65pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

Expected ranges of unaugmented longitudinal and lateral-directional handling qualities of the C-5A class airplane were simulated and evaluated in a variable-stability B-26 for the instrument-landing. The longitudinal short period undamped frequency was given 3 values, 0.64, 0.10, and 0.16 cps, and a short period damping ratio of 0.7 was maintained. The elevator stick force and stick motion gradients were given 2 values each--60 lb/g and 100 lb/g, and 8 in/g and 2 in/g, respectively. The lateral directional parameters $\left(\frac{pb}{2u}\right)$ and τ_R were each given values of 0.08, 0.14, and 0.22 for $\left(\frac{pb}{2u}\right)_{max}$ and 0.6, 1.0 and 1.4 for τ_R. Although many of the configurations were judged to be acceptable, none were satisfactory, thus implying that stability augmentation is probably required.
R 7

31,830
Garren, J.F., Jr., DiCarlo, D.J. & Driscoll, N.R. FLIGHT INVESTIGATION OF AN ON-OFF CONTROL FOR V/STOL AIRCRAFT UNDER VISUAL CONDITIONS. NASA TN D 3436, June 1966, 24pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

In an effort to determine the feasibility of utilizing an on-off pitch and roll control for VTOL operation under visual conditions for hovering and low-speed flight and to evaluate the associated control requirements, a flight investigation was conducted with a variable-stability helicopter. For several maneuvering and precision tasks, pilot evaluations were obtained for selected combinations of control power, angular-velocity damping, static stability, out-of-trim conditions, and artificial random disturbances. The results indicate that the use of an on-off control, with a properly sized dead band, reduced control power to approximately one-third of the level required for satisfactory maneuverability with the proportional control. The range of satisfactory combinations of angular-velocity damping and control power appears to be relatively small. Steady moments arising from the out-of-trim conditions and from static stability could be handled satisfactorily if such moments did not exceed 20 percent of the control power. Random disturbances which produced peak angular accelerations of less than 50 percent of the control power could be handled satisfactorily during the performance of precision tasks.
R 5

31,831
Vomaske, R.F. & Drinkwater, F.J., III. A SIMULATOR STUDY TO DETERMINE PILOT OPINION OF THE TRIM CHANGES WITH POWER FOR DEFLECTED SLIPSTREAM STOL AIRPLANES. NASA TN D 3246, Feb. 1966, 33pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

A simulator study was made of the effects on pilot opinion of trim change with power. The landing approach and wave-off of a high performance deflected slipstream aircraft was simulated. A wide range of changes of pitching moments with power was investigated at several levels of static longitudinal stability. A configuration that tended to pitch-up and one that showed a reduction of static stability with increasing power were also studied. The study showed that at the more positive levels of static longitudinal stability the lift produced by power markedly affected the apparent pitching moment due to power. In general, the pilots preferred configurations which exhibited the least trim change with power or those for which the power effects did not aggravate the stall or pitch-up margin. A comparison of the test results with current and proposed stability requirements is made. In addition, the test data are compared with flight data available.
R 13

31,832
Holleman, E.C. CONTROL EXPERIENCES OF THE X-15 PERTINENT TO LIFTING ENTRY. NASA TN D 3262, Feb. 1966, 14pp. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

In the program to expand the flight envelope of the X-15 airplane, flights to and entries from altitudes up to 350,000 feet have been accomplished. During these entries, flight-control experience was obtained with 4 different control-system configurations having varying degrees of complexity. The high steady acceleration and rapidly changing aerodynamic environment did not affect the pilot's capability to control the entry. All the control systems evaluated were judged by the pilots to be satisfactory for the control of the X-15 entry from the design altitude. Entries have been made that presented more severe control problems than predicted for entries of advanced vehicles at higher velocities.
R 5

31,833
Useller, J.W., Enders, J.H. & Halse, F.W., Jr. USE OF AIRCRAFT FOR ZERO-GRAVITY ENVIRONMENT. NASA TN D 3380, May 1966, 16pp. National Aeronautics & Space Administration, Washington, D.C. (Lewis Research Center, NASA, Cleveland, Ohio).

The use of an aircraft as a test vehicle to produce a zero-gravity or weightless environment by flying a Keplerian trajectory is discussed. The experience gained with a converted, high-altitude bomber during 3 years of operation as a zero-gravity flight facility is employed to illustrate this technique and to explain the operational problems encountered. The duration of the weightless environment is determined solely by the magnitude of the angles and velocities with which the aircraft enters and exits the trajectory. Durations of up to 20 seconds have been achieved with this aircraft. Although most of the experience with this aircraft has been with a restrained installation of the experiments, a comparison is made of this mode with free-float and tethered modes of mounting experiments. With respect to other current methods of achieving a weightless state, the use of an aircraft as a weightless environment laboratory has distinct advantages when cost per experiment is considered, and when delicate handling of test equipment is necessary. The aircraft permits a large number of tests to be made in a short time. The facility also is a useful tool in the development and prelaunch testing of experiments that require the extended duration of weightlessness available only with rocket vehicles. The primary limitations of the use of an aircraft as a zero-gravity test facility are the disturbances introduced to the experiment during the maneuver entry prior to the weightless period and the requirement that the experiment be fabricated to withstand the loadings placed on it during pullup. However, these loadings are usually less than those associated with, for instance, drop-tower arrestment, or rocket launching.
R 9

31,835
Adams, J.J., Bergeron, H.P. & Hurt, G.J., Jr. HUMAN TRANSFER FUNCTIONS IN MULTI-AXIS AND MULTI-LOOP CONTROL SYSTEMS. NASA TN D 3305, April 1966, 44pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Measurements were made of the response of a human pilot in multi-axis tracking tasks. These measurements are the gains in the transfer function of the pilot and the performance measure, root-mean-square error. The measured transfer functions were used to obtain analytically the closed-loop system characteristics. The results show that the pilot changes the response so that the system frequency is reduced as additional axes requiring control are added to the work load. It is shown that these results can be correlated with a theory that the pilot has a given maximum information processing capacity. These measured multi-axis response characteristics were used to obtain a quantitative description of the characteristics of a multi-loop manually controlled guidance system. The time history of the manually controlled system can be reproduced by using two linear analog models, one for each loop, arranged in series, to represent the pilot. Measurements made in the multi-axis test can be applied to the inner loop, and the same form of the model with modified gains can be used in the outer loop. It is shown that these pilot models will give an analytical description of the instability that can occur when there is an unexpected damper failure in the system; other useful design information is also obtained from these models.
R 10

31,836
USMC Landing Force Development Center. BOOT, COMBAT, LEATHER, DIRECT MOLDED SOLE. FINAL REPORT. USMC Proj. 42 64 04, May 1966, 22pp. USMC Landing Force Development Center, Marine Corps Schools, Quantico, Va. (AD 482642)

Tests and evaluation of the Direct Molded Sole (DMS) Boot were conducted to determine suitability for the Marine Corps use. Results of testing showed the DMS Boot to be superior to the Standard combat boot relative to comfort, maintenance and troop preference and suitable for Marine Corps use. It is recommended that the DMS Boot be adopted for use as a replacement for the current standard combat boot.

31,837
Gullstrand, A. PHOTOGRAPHIC-OPHTHALMOMETRIC AND CLINICAL INVESTIGATIONS OF CORNEAL REFRACTION. Amer. J. Optom. Arch. Amer. Acad. Optom., March 1966, 43(3), 143-214.

The publication of a translation of a scientific work which originally appeared 70 years ago is an unusual occurrence in these days of rapid scientific progress. Its importance, however, is readily apparent when it is understood that Gullstrand in this treatise describes his invention of the Photokeratoscope, an instrument which constituted a major breakthrough in the capability to investigate the ocular elements. Gullstrand was the only ophthalmic practitioner to receive the Nobel Prize, that award being based partly on the work presently translated. This translation is part of an over-all program of study of the ocular dioptric elements, preparatory to a longitudinal investigation of the relationship of the ocular elements to ametropia in growing children. An important part of the photographic method being utilized rests on assumptions relating to corneal geometry. Our early research in this area led us repeatedly to references to the English translation of the Gullstrand Appendix to the 3rd Edition of Helmholtz' "Treatise on Physiological Optics" by J.P.C. Southall in 1924. Careful study of this work failed to answer many questions concerning the methodology and assumptions which defined the limitations of his determinations. The kind assistance of Dr. I.S. Finkelstein led us to Gullstrand's original work. It was only by exhaustive study of this complete manuscript that we were able to begin to evaluate his fundamentals of photokeratoscopy. Many of the pitfalls that have undermined the validity of subsequent work might have been avoided had this original study been available in translation. The present English translation is being published in the hope that future researchers may benefit from Gullstrand's fundamental investigation.
R 11

31,838
Worrall, N. & Russell, R.W. DIFFERENTIAL REINFORCEMENT OF SEMANTICALLY CONDITIONED RESPONSES: TRANSFER EFFECTS DURING INTERROGATION. Contract NONR 908(15), Tech. Rep. 15, Nov. 1966, 53pp. USN Office of Naval Research, Department of the Navy, Washington, D.C. (Psychology Dept., Indiana University, Bloomington, Ind.).

Differential semantic conditioning of somatic responses was studied in three experiments for its theoretical importance and for its practical possibilities in improving the detection of deception. The conditioned stimuli were the concepts of "true" and "false" respectively, while the unconditioned stimulus was a loud tone. The procedure was successful for the GSR (galvanic skin response) in particular. Although confusional tactics were effective, their effectiveness was reduced by the conditioning procedure, which itself was effective only if the tone was loud.
R 22

31,839
Adel, N.L. ELECTROMYOGRAPHIC AND ENTOPTIC STUDIES SUGGESTING A THEORY OF ACTION OF THE CILIARY MUSCLE IN ACCOMMODATION FOR NEAR AND ITS INFLUENCE ON THE DEVELOPMENT OF MYOPIA. Amer. J. Optom. Arch. Amer. Acad. Optom., Jan. 1966, 43(1), 27-38. (College of Optometry, Pacific University, Forest Grove, Ore.).

Electrophysiological and entoptic experiments were conducted on 12 volunteer Ss. According to the theory tested, the ciliary musculature includes a functionally primordial component consisting of the longitudinal muscle fibers and an advanced evolutionary complex composed of so-called "circular fibers" and iridic fibers. Contraction of the fibers of the advanced evolutionary complex causes a sphincter-like reduction of the circle formed by the inner margin of the ciliary processes, erection of the ciliary processes and traction of the ciliary processes toward the posterior surface of the iris. Normal tonus of the primordial unit supports the lens in the nonaccomodating eye, thus protecting the choroid from stress due to traction exerted by the pull of the elastic lens capsule. Synergistic contraction of the primordial unit in strained accommodative efforts would cause traction of the choroid. Habitual pulling forward of the choroid could produce myopia due to the stress delivered to the relatively inelastic vascular tissue causing a series of changes starting with choroidal degeneration. These could then lead to associated degenerative and atrophic changes which ultimately terminate in an axially elongated myopic eye. The evidence obtained in the electromyographic and entoptic experimentations described in this paper support the above theory
R 28

31,840
US Federal Fire Council. THE FUTURE OF THE MUNICIPAL FIRE SERVICE. INDUSTRIAL FIRE SAFETY TODAY. MINUTES OF ANNUAL MEETING, APRIL 12, 1966. 1966, 38pp. US Federal Fire Council, Washington, D.C. (AD 639913)

This report contains the minutes of the meeting and no formal topical discussions.

31,841
Flom, M.C. & Neumaief, R.W. PREVALENCE OF AMBLYOPIA. Amer. J. Optom. Arch. Amer. Acad. Optom., Nov. 1966, 43(11), 732-751. (University of California School of Optometry, Berkeley, Calif.).

The purpose of this paper is to: a) analyze previous prevalence studies in terms of their applicability to the general population; b) report on the prevalence of amblyopia in 1,561 kindergarteners and 1,201 children in grades 1 through 6; and c) describe how changing the acuity criterion affected the prevalence of amblyopia in these school children and in 7,017 adult eye patients.
R 25

31,842
Anderson, S.B. CONSIDERATIONS FOR REVISION OF V/STOL HANDLING QUALITIES CRITERIA. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 229-239. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

A review of selected V/STOL (vertical, short takeoff and landing) handling qualities has been made to provide information to be used to update and revise V/STOL handling qualities requirements. Comparisons are made of recent flight and simulator results with existing V/STOL requirements. The results show that improved guidelines are becoming available to aid the designer of V/STOL aircraft.
R 18

31,843
Greif, R.K., Fry, E.B., Gossett, T.D. & Gerdes, R.M. SIMULATOR INVESTIGATIONS OF VARIOUS CONTROL SYSTEMS FOR VTOL AIRCRAFT. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 249-267. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

The nature of this study was so basic that no attempt will be made to form specific conclusions. However, an important trend has already become clear, that is, that handling qualities improve and control powers decrease as the pilot is relieved of stabilization workloads which can be more efficiently handled by automatic stabilization techniques. With this consideration in mind, and with the information herein serving as fundamental background material, additional research is already under way to further define the requirements for a safe and efficient VTOL control system. As promising systems are developed, they will be evaluated under increasingly complex conditions, until final evaluation can be performed in actual flight.
R 15

31,844
Garren, J.F., Jr. & Kelly, J.R. FLIGHT STUDY OF ON-OFF CONTROL FOR V/STOL AIRCRAFT. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 269-279. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Because of the severe performance penalties associated with providing high levels of control power in V/STOL aircraft, methods which offer a potential for reducing control power requirements warrant consideration. One such method is the on-off type of control. The lateral results of a visual flight investigation utilizing an on-off pitch and roll control in the variable-stability helicopter at Langley are presented. The size of the control dead band was found to be a critical parameter in providing acceptable handling characteristics. The significant reduction in control power requirements realized by using the on-off control is illustrated by a comparison with the results of a similar investigation using a proportional control system. The effects of angular-velocity damping, trim requirements, and disturbances are discussed.
R 5

31,845
Fry, B.L. REVIEW AND EVALUATION OF BOEING DESIGNS FOR THE NASA SHORT-HAUL COMMERCIAL TRANSPORT STUDY. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 315-338. National Aeronautics & Space Administration, Washington, D.C. (Boeing Company, Seattle, Wash.).

The scope of this paper does not permit detailed discussion of all the design tradeoffs. Therefore, the concepts and some typical design tradeoffs are discussed briefly. The dimensions, areas, engine sizes, and similar general characteristics of the aircraft are given, and also weight summaries. The mission profile is shown.
R 3

31,846
Zabinsky, J.M. A REVIEW OF STOL DESIGNS FOR THE NASA SHORT-HAUL TRANSPORT STUDY. Report from: "conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 339-351. National Aeronautics & Space Administration, Washington, D.C. (Boeing Company, Seattle, Wash.).

Many concepts of V/STOL (vertical, short takeoff and landing) aircraft have been investigated during the last decade. This work has resulted in flying prototypes, ranging from somewhat primitive research aircraft to more sophisticated second-generation models suitable for operational evaluation. Several concepts have emerged as practical configurations. More recently, concepts of the helicopter type which can be converted in flight to a conventional aircraft configuration have evolved. The state of the art in V/STOL technology has now reached the point where the application of these V/STOL aircraft to civil transportation can be evaluated with a reasonable degree of confidence. This paper presents some of the results obtained in the first phase of a study of VTOL AND STOL short-haul transports conducted by The Boeing Company for NASA's Ames Research Center. Four VTOL aircraft were studied: the tilt wing, jet lift, lift fan, and stowed-rotor concepts. Two STOL types, the fan-in-wing and the externally blown flap turbofan, were studied.
R 5

31,847
Marsh, K.R., Santamaria, J.J. & English, R.B. SUMMARY OF LING-TEMCO-VOUGHT FEASIBILITY STUDIES. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 353-388. National Aeronautics & Space Administration, Washington, D.C.

The technical feasibility of many V/STOL (vertical, short takeoff and landing) concepts has been proven by wind-tunnel tests and flying prototypes.. It now is considered appropriate to study the applicability of V/STOL to short-haul transport requirements. A feasibility study has been performed for 10 point design of 60 passenger transports. Four of these were extended to 90 passenger and 120 passenger transports. For these 18 point designs, operational and economic analyses were made to identify specific research which will reduce the technical risk associated with their development.
R 3

31,848
Scherrer, R., Garrard, W.C.J., Davis, E.M. & Morrison, W.D. NASA-LOCKHEED SHORT-HAUL TRANSPORT STUDY. Report from: "Conference on V/STOL and STOL Aircraft, Ames Research Center, Moffett Field, California, April 4-5, 1966." NASA SP 116, 1966, 389-407. National Aeronautics & Space Administration, Washington, D.C.

The present study is divided into two principal activities. The first is a highly integrated concept-development and vehicle-optimization study. The operational analysis is included in this phase. The second phase consists of the final design work and a series of concurrent sensitivity and trade-off studies. Each concept is examined in terms of the multitude of subconcepts that dictate vehicle and propulsion system configurations. This process is repeated several times during the study which allows interim results to be fed back into the concept development process.
R 5

31,849
National Aeronautics & Space Administration. CONFERENCE ON V/STOL AND STOL AIRCRAFT. AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA, APRIL 4-5, 1966. NASA SP 116, 1966, 467pp. National Aeronautics & Space Administration, Washington, D.C.

This compilation contains results of recent NASA research on problems associated with V/STOL (vertical, short takeoff and landing) and STOL (short takeoff and landing) aircraft. The first three sections include papers presented at the NASA Conference on V/STOL and STOL Aircraft held at the Ames Research Center, Moffett Field, California, on April 4 and 5, 1966. The fourth section presents three additional papers on research testing techniques that are particularly pertinent to the subject matter, but were not presented orally at the conference. Contributors include staff members from the Ames and Langley Research Centers of NASA and industrial representatives from Lockheed Aircraft Corporation; Ling-Temco-Vought, Incorporated; and The Boeing Company.
R Many

31,850
Grover, R.F., Reeves, J.T., Grover, Estelle B. & Leathers, J.E. EXERCISE TOLERANCE AT HIGH AND LOW ALTITUDES: "MUSCULAR EXERCISE IN YOUNG MEN NATIVE TO 3100 METERS ALTITUDE (LEADVILLE, COLORADO)." ANNUAL PROGRESS REPORT 1 FEB. 1965-31 JAN. 1966. Contract DA 49 193 MD 2551, 1966, 33pp. University of Colorado Medical Center, Denver, Colo. (AD 486716)

Five young athletes native to 3100 meters altitude were studied during standardized submaximal and maximal treadmill exercise. Their performance was compared with that of similar athletes living near sea level. Both groups had impressively high values for maximum oxygen uptake (VO_2), 66-68 ml/kg/min, at low altitude. Maximum VO_2 was decreased more than 25% for the altitude natives as well as the newcomers at high altitude. The altitude natives hyperventilate at high altitude to the same degree as the newcomers, and do not display the relative hypoventilation seen in men native to the Andes and Himalayas. Limitations in the pulmonary diffusion of oxygen, and probably a depression of cardiac output, but not pulmonary ventilation, reduce exercise capacity at high altitude. It appears, therefore, that the young athlete of European ancestry acclimatized to high altitude from birth has an oxygen transport system very similar to that of the athlete at sea level.
R 24

31,851
Luxon, S.G. THE USE OF RESPIRATORY DEVICES FOR EVALUATING ENVIRONMENTAL HAZARDS. Ann. occup. Hyg., Jan. 1966, 9(1), 15-21. (Ministry of Labour, London, England).

In view of the limitations of existing methods of air sampling a direct method of estimating environmental exposure has been developed. The apparatus consists of differential particulate filter units or, alternatively, of an absorbent cartridge for gases or vapours. The device is fitted to a respirator face piece, as described, in conjunction with a respirometer for measuring the air flow. The performance is shown diagrammatically and the results obtained are analysed. The present limitations are given and possible future extensions and developments of the method are suggested.

31,852
Bloor, W.A. & Dinsdale, A. A LONG-PERIOD GRAVIMETRIC DUST-SAMPLER. Ann. occup. Hyg., Jan. 1966, 9(1), 29-39. (British Ceramic Research Association, Stoke-on-Trent, England).

As the result of work by the Research Association the pottery industry now has the means of controlling major dusty processes in which significant numbers of workers are employed. An important problem awaiting solution is that of "general atmosphere" or "background" dust. If factories were in a position to take and assess their own samples of general atmosphere dust, priority for remedial action could be given to workrooms where dust concentrations had been shown to be excessive. This paper discusses a sampling apparatus suitable for this purpose and describes a cheap and simple long-period gravimetric dust sampler, incorporating a particle-selector, that is particularly suited to the conditions met with in the pottery industry. The apparatus performs like the Hexhlet dust sampler over a wide range of dust concentrations and particle size-distributions. The widespread use of such a sampling apparatus would lead to a general improvement in conditions and would guard against subsequent deterioration.
R 11

31,853
Rapoport, A. & Dale, P. MODELS FOR PRISONER'S DILEMMA. J. math. Psychol., July 1966, 3(2), 269-286. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.).

Five models of behavior in the Prisoner's Dilemma are evaluated with respect to two sets of data. Three of the models are relatively adequate in accounting for the observed time courses of outcomes, but are further differentiated by the variances. The "best-fitting" parameters for each model are used to suggest psychological hypotheses about the gross differences observed between male and female populations. The basic methodological problem remains of choosing a model which is accurate enough and at the same time both mathematically tractable and suggestive.
R 4

31,854
Shepard, R.N. METRIC STRUCTURES IN ORDINAL DATA. J. math. Psychol., July 1966, 3(2), 287-315. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Under appropriate conditions, data merely about the ordering of objects--or of the separations between objects--is sometimes sufficient to fix the positions of those objects on an essentially numerical scale. This paper uses both mathematical and "Monte Carlo" results to establish and clarify the possibility of thus extracting metric information from purely ordinal data for two multidimensional cases: a) analysis of proximities, in which one is given a single rank order of all $n(n-1)/2$ pairs of n objects with respect to psychological similarity or "proximity"; and b) nonmetric factor analysis, in which one is given a different rank of order of n individual objects with respect to each of m psychological attributes. As n (and m) increase, the ordinal data are found to determine a spatial representation of the objects more and more nearly to within a general similarity transformation, in the case of analysis of proximities, or an affine transformation, in the case of nonmetric factor analysis. Extensions of these results to other cases are also considered.
R 58

31,855
Wickelgren, W.A. & Norman, D.A. STRENGTH MODELS AND SERIAL POSITION IN SHORT-TERM RECOGNITION MEMORY. J. math. Psychol., July 1966, 3(2), 316-347. (Massachusetts Institute of Technology, Cambridge, Mass. & Harvard University, Cambridge, Mass.).

A number of continuous strength models for memory are developed for and tested by an experimental study of recognition memory for 3-digit numbers at all serial positions in lists of length 2 through 7. Empirical estimates of trace strength in different conditions, independent of response bias, are obtained by means of the operating characteristic. The principal theoretical findings are: a) strength in short-term memory (STM) appears to decay exponentially with the number of subsequent items; b) Ss report that they recognize an item if and only if strength in memory exceeds a criterion; c) the first item of a list is remembered better than subsequent items because it receives a greater increment in strength in STM upon presentation, not because it decays more slowly in STM or because it acquires some strength in a long-term memory.
R 15

31,856
Luce, R.D. TWO EXTENSIONS OF CONJOINT MEASUREMENT. J. math. Psychol., July 1966, 3(2), 348-370. (University of Pennsylvania, Philadelphia, Penn.).

Both extensions modify the axioms of Luce and Tukey for additive conjoint measurement. The first yields a theory for more than two coordinates. The main problem is to find a weak generalization of the cancellation property; the one suggested is weaker than Krantz's generalization. The second extension weakens the solution-of-equations axiom, which has been justly criticized as too strong for most potential applications. A much more plausible version is suggested. This weakening is compensated for by adding the (necessary) independence property as an axiom and by postulating the existence of a part of a dual standard sequence. The usual representation and uniqueness theorems are proved.
R 11

31,857
Feldman, J. & Hanna, J.F. THE STRUCTURE OF RESPONSES TO A SEQUENCE OF BINARY EVENTS. J. math. Psychol., July 1966, 3(2), 371-387. (University of California, Irvine, Calif. & Michigan State University, East Lansing, Mich.).

A procedure developed by Foulkes for determining the structure of a sequence of binary events was found to be a useful base-line model of structure determination by human Ss. The structure is represented in terms of the subsequences of events (states) which lead to different probabilities of the events. While the Ss' behavior after each state is not given by the Foulkes procedure, their behavior appeared to be largely a function of the probabilities of the events after each state (matching) and the latest event in the state (positive recency).
R 14

31,858
Kintsch, W. RECOGNITION LEARNING AS A FUNCTION OF THE LENGTH OF THE RETENTION INTERVAL AND CHANGES IN THE RETENTION INTERVAL. J. math. Psychol., July 1966, 3(2), 412-433. (University of Missouri, Columbia, Mo.).

The retention interval, the interpolation of either one or ten items between successive presentations of control items, was the major independent variable in a recognition task. A group of experimental items was shifted from one retention interval to the other after three or four presentations. The shift from short to long presentation interval retarded performance while items shifted from a long to a short retention interval did not differ from control items. A Markov model was applied to the data. The theoretical objectives were: a) to separate the roles of forgetting and learning; and b) to determine whether the learning process may be viewed as a simple conditioning process or whether the subject employs different recognition criteria after varying retention intervals.
R 21

31,859
Fishburn, P.C. STATIONARY VALUE MECHANISMS AND EXPECTED UTILITY THEORY. J. math. Psychol., July 1966, 3(2), 434-457. (Advanced Research Dept., Research Analysis Corporation, McLean, Va.).

This paper explores the notions of stationary value mechanisms and stationary transition value mechanisms in time-dependent processes. Contemporary utility theory serves as the basis of the discussion. After defining the two notions of stationarity in terms of additive forms for an individual's utilities of histories of a process, they are compared to more general additive forms for utility and to stationarity concepts in the context of probability theory and managerial economics. Two axiomatizations of the stationary value mechanism and stationary transition value mechanism notions are then given in the context of expected utility theory. The first formulation uses general finite gambles; the second uses only simple 50-50 gambles. Under both formulations it is shown what must be added to the axioms for a stationary value mechanism in order that the utility function for 'state utilities' possess a mathematical expectation property in situations where the 'states' are taken to be gambles.
R 37

31,860
Myers, J.L., Suydam, Mary M. & Heuckeroth, O. CHOICE BEHAVIOR AND REWARD STRUCTURE: DIFFERENTIAL PAYOFF. J. math. Psychol., July 1966, 3(2), 458-469. (University of Massachusetts, Amherst, Mass.).

Two linear models and a finite Markov model were tested against data obtained from a noncontingent 2-choice experiment with differential payoff matrices. The relative merits of the 3 models were considered as was the problem of parameter identification, the relationship between the parameters of the model and those of the experimental situation. Identifying the parameters of each model with the regret associated with trial outcomes resulted in good data fits.
R 20

31,861
Cowan, T.M. A MARKOV MODEL FOR ORDER OF EMISSION IN FREE RECALL. J. math. Psychol., July 1966, 3(2), 470-483. (Psychology Dept., Albion College, Albion, Mich.).

A stochastic model is described which predicts the kinds of words that will appear in given recall positions. The emission of words in free recall is regarded as a Markov chain where the category of the recalled word is determined by the kind of word preceding it. The model employs 3 parameters based on associative measures between and within the categories of stimulus words. These parameters can be estimated by any one of the several existing verbal association indices. An experiment is described which tests the model. In spite of the nonmonotonic form of the data, the model proves to be a valuable predictor when only one of its 3 parameters is made free for fitting.
R 12

31,862
Addingley, C.G. ASBESTOS DUST AND ITS MEASUREMENT. Ann. occup. Hyg., April 1966, 9(2), 73-82. (British Belting & Asbestos Ltd., Cleckheaton, Yorkshire, England).

The nature of asbestos dust and the testing requirements are discussed. Existing standard methods are briefly reviewed. The development of a membrane filter method of dust counting for asbestos is described in detail. It is thought to be an improvement on existing methods. Tyndallometric methods are considered, and a description of the application of the "Royco" Particle Counter, an instrument based on this principle, to factory testing is described. It is believed that this instrument represents a big advance in routine test methods.
R 19

31,863
Stephenson, S.K. HAZARDS AND DOSES TO THE WHOLE POPULATION FROM IONISING RADIATIONS. Ann. occup. Hyg., April 1966, 9(2), 83-88.

This report summarizes the papers given at a 1-day symposium held at London University: "Biological problems: Genetic and Somatic Hazards to the Population," "General Survey of Sources of Population Exposure," "Medical Diagnostic X - Radiology," "Radiotherapy and Diagnostic Use of Radio-nuclides," "Weapon Testing and Nuclear Accidents," "Radioactive Waste Disposal," "Transport of Radioactive Material," and a final critical summary and discussion. (HEIAS)

31,864
Hirata, K. PHYSIQUE AND AGE OF TOKYO OLYMPIC CHAMPIONS. J. Sports Med. phys. Fitness, Dec. 1966, 6(4), 207-222. (Chukyo University, Nagoya, Japan).

Statistical data were collected on the physique and age of Tokyo Olympic games champions, 1964. The data are presented graphically and in tabular form. Peak ages and preferred body types for the various sports are pointed out.
R 3

31,865
Kamon, E. ELECTROMYOGRAPHY ANALYSIS OF THE 'SCISSORS' EXERCISE PERFORMED ON THE POMMEL HORSE. J. Sports Med. phys. Fitness, Dec. 1966, 6(4), 223-234. (Ergonomics & Cybernetics Dept., College of Technology, Loughborough, Leics., England).

The present study of the activity of upper limb muscles during the "scissors" exercise involved an analysis of fast movements and dynamic work during postural changes. In this exercise movements were performed while the weight of the body was supported on the arms, which is an unnatural posture. When the body weight is taken over the arms, gravitational forces act on the upper limb joints and the muscles involved in counteracting these forces in order to keep the static posture.
R 13

31,866
Teräslinna, P. & MacLeoad, D.F. THE EFFECT OF EXERCISE ON BLOOD pH and Pco_2, SERUM GLUCOSE, CHOLESTEROL, NEFA AND KETONES. J. Sports Med. phys. Fitness, Dec. 1966, 6(4), 235-243. (Purdue University, Lafayette, Ind.).

The data of this study indicate that: a) There were no distinct pattern differences due to Ss in the responses on O_2 (oxygen) uptake, heart rate, ventilation volume, RQ (respiratory quotient), and blood pH (blood acidity), which finding the reviewed literature amply confirms; b) The response of the metabolic variables Pco_2 (partial pressure of carbon dioxide), NEFA (non-esterified-fatty-acids), glucose, ketones, and cholesterol deviated considerably from the response of the former reference variables, in addition to having distinct individual response differences; c) Instead of having highest values at the "all out" exercise level, glucose, NEFA, and ketones response attained the peak concentration at the first recovery measurement indicating a sudden fall in consumption relative to production; d) The individual differences seem to indicate that for producing the same amount of mechanical work, as measured by the oxygen consumption, and manifesting the same pattern of response on the common physiological fitness variables, individuals differ considerably in their metabolism measured by selected biochemical variables; e) The individual response patterns in Pco_2, NEFA, and glucose are unique and fairly well reproducible from day to day.
R 16

31,867
Horniak, E. THE INFLUENCE OF LOCAL MUSCLE FITNESS UPON THE CHANGES OF THE HAEMOGRAM AFTER A WORKING LOAD. J. Sports Med. phys. Fitness, Dec. 1966, 6(4), 244-249. (Institute of Sports Medicine, Komensky University, Bratislava, Czechoslovakia).

Observations in 10 rowers and 10 cyclists after the same laboratory working load permitted us to reach these conclusion: a) The reaction of the organism is also conditioned by local fitness and endurance of the most trained muscle groups. These changes are clearly reflected in the pulse rate; b) Local muscle fitness has no significant influence upon the change in the number of erythrocytes, the amount of haemoglobin and the haematocrit value; c) The exertion of prevalently trained muscle groups in rowers and cyclists caused a significantly slighter leukocytosis than the equal exertion of a less trained muscle group.
R 26

31,868
Scano, A. & Meineri, G. PHYSIOLOGICAL ASPECTS OF WALKING WITH PARTIAL LIGHTENING OF BODY WEIGHT AND VARIOUS FRICTION WITH THE GROUND UNDERFOOT. J. Sports Med. phys. Fitness, Dec. 1966, 6(4), 264-266.

Man can move forward under his own steam in conditions of lunar gravity or less, even if the ground has a sandy or powdery consistency. It will involve training for the new type of jump walking, and probably a limitation on the maximum speeds achievable.

31,869
Battig, W.F. TRANSFER FROM MULTIPLE-CHOICE RECOGNITION TO PAIRED-ASSOCIATE PERFORMANCE AS A FUNCTION OF ITEM LENGTH. Canad. J. Psychol., Sept. 1966, 20(3), 252-261. (University of Maryland, College Park, Md.).

Multiple-choice recognition (MCR) pretraining was found to significantly facilitate subsequent paired-associate (PA) performance if nonsense-disyllable (DIS) materials were used either or both on the MCR and/or PA tasks. With CVC syllables, however, PA performance was not facilitated, thus replicating the discrepant results from previous studies employing DIS and CVC materials. With DIS materials, an equivalent facilitation was obtained when the CVCs constituting each MCR DIS item were re-paired on the DIS PA task, thus indicating the MCR facilitation with DIS materials to reflect a selection process instead of actual item learning or integration. The lack of PA CVC facilitation following MCR CVC pretraining is attributed to the lesser intertask facilitation resulting from low MCR intratask interference, and/or increased intertask interference from incorrect MCR CVC alternatives.
R 11

31,870
Bryden, M.P. ACCURACY AND ORDER OF REPORT IN TACHISTOSCOPIC RECOGNITION. Canad. J. Psychol. Sept. 1966, 20(3), 262-272. (University of Waterloo, Waterloo, Ontario, Canada).

The effects of exposure duration and spacing between elements on accuracy of recognition and order of report were examined in two tachistoscopic recognition experiments. In both experiments, Ss viewed horizontal rows of 8 letters. Variations in exposure time between 20 and 120 msec. had little effect on relative accuracy or on order of report. Report sequences tended to begin further to the left at the longer durations than at the shorter ones. Increasing the spacing between the elements improved the relative accuracy in the more central positions, and resulted in a decrease in the tendency to report the material from left to right.
R 13

31,871
McNulty, J.A. A PARTIAL LEARNING MODEL OF RECOGNITION MEMORY. Canad. J. Psychol., Sept. 1966, 20(3), 302-315. (Dalhousie University, Halifax, Nova Scotia, Canada).

The view was taken that recognition yields higher scores than recall because it measures "partial" as well as "complete" learning, whereas recall measures only those items that have been completely learned. Two types of partial learning were postulated--structural and associative. It has previously been shown that when one restricts the potential effectiveness of structural-type partial learning in recognition, much of the difference between recall and recognition disappears. The first experiment, therefore, was designed to demonstrate that when the potential effectiveness of associative-type partial learning is similarly restricted, some of the difference between the two methods once again disappears. The second experiment was primarily an attempt to control structural and associative partial learning simultaneously. Ss were given items of the first order of approximation to English to learn. As well as standard recall tasks, four different recognition tests were used. The first was a standard recognition task in which there was no common structure or association between correct and incorrect alternatives on the recognition test. The second recognition task controlled the potential effectiveness of structural-type partial learning. The third controlled for the potential effectiveness of associative-type partial learning, and on the last recognition test both types of partial learning were controlled simultaneously. Results of the experiment showed that the difference between recall and recognition was about the same when associative-type partial learning was controlled as it was in the standard recognition task. The difference was less when structural-type partial learning was controlled. When the potential effectiveness of both types of partial learning was restricted, there were no significant differences between recognition and recall scores. These results were interpreted as supporting a partial learning model of recognition memory.
R 12

31,872
Smith, F. & Carey, P. TEMPORAL FACTORS IN VISUAL INFORMATION PROCESSING. Canad. J. Psychol., Sept. 1966, 20(3), 337-342. (Cognitive Studies Center, Harvard University, Cambridge, Mass.).

Twelve Ss were tested on the number of trials required to read tachistoscopically presented rows of 6 letters into immediate memory. In some conditions the 20-msec. stimulus presentation was followed after a brief interval by an interfering 20-msec. presentation designed to disrupt processing of the information available from the original display. In other conditions, re-presentation of the original display after a brief interval permitted more extensive processing of the available information. A continuous presentation of 100, 200, or 400 msec. was shown to provide no more useful information than 2 20-msec. presentations separated by 60, 160, or 360 msec. respectively. The results support a 2-stage model of visual information processing, the first involving rapid registration in sensory storage and the second a less rapid transfer into immediate memory.
R 9

31,873
Forrin, B., Kumler, M.L. & Morin, R.E. THE EFFECTS OF RESPONSE CODE AND SIGNAL PROBABILITY IN A NUMERAL-NAMING TASK. Canad. J. Psychol., June 1966, 20(2), 115-124. (Scarborough College, University of Toronto, Toronto, Ontario, Canada).

Eight numeric stimuli were arbitrarily divided into two 4-element classes, termed the positive and negative subsets. Each of 25 subjects served in the 12 treatment combinations generated by: a) 4 response codes, defined by the nature of the responses required to positive and negative stimulus events, and b) 3 presentation probabilities for positive elements--.25, .50, and .75. The distinguishing characteristics of the response codes and their reference designations follow: name both positive and negative signals (Name-Name); name positive signals, remain silent to negative signals (Name-Null); name positive signals, respond "No" to negative (Name-No); respond "Yes" to positive signals and "No" to negative (Yes-No). Response times to positive elements in the Name-No and Yes-No conditions significantly exceeded those in the corresponding Name-Null conditions; reaction latencies in the latter were, in turn, significantly longer than those in the Name-Name conditions. For all response codes but Name-Name, response times to positive signals increased as the relative frequency of such signals declined. It was concluded that the time required for the verbal identification of optimally coded stimulus elements (numerals-to-be-named) was increased by the presence in the signal-response sequence of elements with suboptimal coding.
R 14

31,874
Berlyne, D.E. & Peckham, Sylvia. THE SEMANTIC DIFFERENTIAL AND OTHER MEASURES OF REACTION TO VISUAL COMPLEXITY. Canad. J. Psychol., June 1966, 20(2), 125-135. (University of Toronto, Toronto, Ontario, Canada).

Visual patterns, representing a number of complexity or irregularity variables, were used as stimuli for three of Osgood's semantic differential scales. Mean ratings on the Evaluative and Potency dimensions were similar bimodal functions of judged complexity. Mean ratings on the Activity scale were an inverted U-shaped function of judged complexity. The data are compared with judgments of "pleasingness" and "interestingness" and with electroencephalogram measures from previous experiments using the same stimulus material. Reactions to complexity seem to involve two distinct clusters of variables, which may be closely connected with specific and diversive exploration, respectively.
R 27

31,875
Dorfman, D.D. & McKenna, Helen. PATTERN PREFERENCE AS A FUNCTION OF PATTERN UNCERTAINTY. Canad. J. Psychol., June 1966, 20(2), 143-153. (San Diego State College, San Diego, Calif.).

This study tested the hypothesis that level of preference for patterns is a function of uncertainty defined in terms of matrix grain. In Experiment I, 100 women served as subjects. Preference data were obtained by the method of paired comparisons. The results showed a reliable curvilinear relation between preference level and fineness of matrix grain. These findings agreed with results obtained by Munsinger and Kessen (1964) where uncertainty was defined in terms of the co-ordinality of the patterns. The subjects were then separated according to their most preferred level of uncertainty. The results showed that each subject has a preferred level of uncertainty and that preference for other levels of uncertainty decreases as the distance increases from this preferred level. Experiment II confirmed these results on 18 art majors.
R 7

31,876
McCormack, P.D. & Haltrecht, E.J. MONITORING EYE MOVEMENTS UNDER TWO CONDITIONS OF PRESENTATION OF PAIRED-ASSOCIATE MATERIALS. Canad. J. Psychol., June 1966, 20(2), 154-159. (Carleton University, Ottawa, Ontario, Canada).

Eye movements were photographed continuously throughout the course of the learning of verbal paired associates in each of two experiments. In Experiment I an anticipation method was employed and a recall technique was used in Experiment II. The findings of each were consistent with a two-stage theory of verbal learning.
R 5

31,877
Pearce, D. & Matin, L. THE MEASUREMENT OF AUTOKINETIC SPEED. Canad. J. Psychol., June 1966, 20(2), 160-172. (Johns Hopkins University, Baltimore, Md. & Columbia University, New York N.Y.).

A psychophysical measure of autokinetic speed has been defined and tested. The measure is that physical speed of the fixated target which, when applied in a direction opposite to autokinesis, results in the condition of no perceived motion either in the direction of, or opposite to, the original autokinesis. Measures of autokinetic speed were obtained in an experiment involving two angles of regard. For the primary fixation position, the measure of autokinetic speed was of the order of 20 min. visual angle/sec. For fixation at an extreme angle of regard, the measure was of the order of 40 min. visual angle/sec.
R 10

31,878
Smith, Marilyn C. & Schiller, P.H. FORWARD AND BACKWARD MASKING: A COMPARISON. Canad. J. Psychol., June 1966, 20(2), 191-197. (Massachusetts Institute of Technology, Cambridge, Mass.).

This study investigated forward and backward masking effects by patterns and flashes under both monoptic and dichoptic viewing conditions. The results show that: a) monoptic masking effects are more prolonged in forward than in backward masking; b) flashes mask only monoptically; and c) patterns mask dichoptically as well, but to a much smaller extent in forward than in backward masking. The results are discussed in terms of various theories of masking.
R 13

31,879
Kepros, P.G. & Bourne, L.E., Jr. IDENTIFICATION OF BICONDITIONAL CONCEPTS: EFFECTS OF NUMBER OF RELEVANT AND IRRELEVANT DIMENSIONS. Canad. J. Psychol., June 1966, 20(2), 198-207. (University of Utah, Salt Lake City, Utah & University of Colorado, Boulder, Colo.).

Two experiments were conducted to investigate the effects of number of relevant and irrelevant dimensions on errors, trials, and time to solution in concept identification (CI) tasks with biconditional solutions. Experiment I was a factorial combination of a number of relevant and irrelevant dimensions and Experiment II was designed to counterbalance practice on the biconditional rule with problem complexity. The results showed that increases in number of both relevant and irrelevant dimensions produced sharp linear decrements in the subject's performance. A comparison of the present data with those from a study of conjunctive CI shows the effects of number of relevant and irrelevant dimensions as well as level of performance to be virtually the same under both rules. Finally, subjects of the present study simplified the formal biconditional rule through the use of a heuristic developed during problem solving.
R 11

31,880
Schonfield, D. & Donaldson, W. IMMEDIATE MEMORY AS A FUNCTION OF INTRASERIES VARIATION. Canad. J. Psychol., June 1966, 20(2), 218-227. (University of Calgary, Alberta, Canada).

While interference has been generally accepted as the main theoretical explanation of forgetting processes, the results of some recent experiments in immediate memory have been interpreted as supporting a "trace fading" hypothesis. Comparisons between interference and fading effects are complicated by the problem of filling the time interval between presentation of stimuli and recall. The experiments reported in this study attempt to overcome this difficulty by varying the intraseries rate of presentation. While the results of the first experiment can be interpreted as supporting a fading hypothesis, the second experiment demonstrates that fading cannot be the sole source of forgetting in immediate memory. An older group of subjects was included in the first experiment and their recall scores provide some confirmation that the aged are especially vulnerable to fading effects.
R 13

31,881
Schonfield, D. & Robertson, Betty-Anne. MEMORY STORAGE AND AGING. Canad. J. Psychol., June 1966, 20(2), 228-236. (University of Calgary, Alberta, Canada).

Recall and recognition tests were administered to subjects aged between 20 and 75 years. The results showed no deterioration with age in recognition scores and a consistent drop in recall scores. The age disparity is interpreted as due to the requirement of retrieval from storage in recall tests and the absence of this requirement in recognition tests.
R 22

31,882
Feroql, M.A. & Parameswaran, E.G. EFFECT OF THE INTERVAL BETWEEN SIGNALS ON TEMPORAL JUDGMENT. Canad. J. Psychol., March 1966, 20(1), 12-17. (University of Madras, Madras, India).

The method of constant stimulus differences is employed to study the effect of the interstimulus interval on temporal judgment. The results show that the P.S.E. (point of subjective equality) is greater for the longer interstimulus interval. The location of the "indifference point" is governed by this interval.
R 5

31,883
Mackworth, Jane F. PERCEPTUAL CODING AS A FACTOR IN SHORT-TERM MEMORY. Canad. J. Psychol., March 1966, 20(1), 18-33. (Defense Research Medical Labs., Toronto, Ontario, Canada).

Five experiments are described in which the nature of the presented and recalled items were varied independently. Digits were presented visually as normal, Bankers' or mirror digits, or coded from Japanese characters. Recall of CVC trigrams, presented in written form or coded from the characters, and recall of shape names from visual, auditory, or tactile presentation were compared. The equation $N = c - bM$ appeared to fit the data, where N was the number of items recalled from messages of length M, c varied with the material, but b was approximately constant at about 0.8. It was concluded that the effect of message length (beyond the optimum length) on recall was independent of the material.
R 8

31,884
Sekuler, R.W. CHOICE TIMES AND DETECTION WITH VISUAL BACKWARD MASKING. Canad. J. Psychol., March 1966, 20(1), 34-42. (Northwestern University, Evanston, Ill.).

Choice response times and signal detection were studied in an experiment on visual backward masking. S made "yes" or "no" judgments of whether a test stripe had appeared in the first flash of each 2-flash masking sequence. The test stripe was randomly omitted while the costs and values of "yes" and "no" responses were varied through four payoff matrices. For "yes" judgments, choice times for incorrect responses exceed those for correct responses. For "no" judgments, there was no differnece between correct and incorrect choice times. It is shown that, when both choice times and yes-no data are available, the relations between the two sets of data may be used to dissect the underlying decision-making strategy used by the Ss.
R 10

31,885
Corballis, M.C. REHEARSAL AND DECAY IN IMMEDIATE RECALL OF VISUALLY AND AURALLY PRESENTED ITEMS. Canad. J. Psychol., March 1966, 20(1), 43-51. (McGill University, Montreal, Quebec, Canada).

Immediate recall of 9-digit series was compared under two conditions, one (Condition I) in which interdigit intervals were short at first but were gradually increased within series, and one (Condition D) in which intervals were long at first but gradually decreased. Twenty-four Ss received both conditions in each of two experiments; presentation was visual in the first experiment and aural in the second. Recall was better for Condition I in Exp. I supporting a hypothesis that Ss rehearsed cumulatively during visual presentation of digits. Exp. 2 failed to show any consistent difference between conditions. A recency effect was more marked for Exp. 2 than for Exp. 1, suggesting that short-term storage of unrehearsed digits is more effective in auditory than visual modality, but there was little evidence within modalities to support decay theory.

31,886
Taylor, J.G. PERCEPTION GENERATED BY TRAINING ECHO-LOCATION. Canad. J. Psychol., March 1966, 20(1), 64-81. (Defense Research Medical Labs., Toronto, Ontario, Canada).

To test the hypothesis that perception is generated by learned behaviour, blindfolded Ss were trained to locate a target by talking to it. The sound waves reflected by the target are masked by S's own voice and by the reverberation of the room, so that initially they are undetected, and there is no perception of the position of the target. Ss were required to reach for the target. It was hypothesized that if they learned to touch the target every time, its position would be perceived as soon as talking began. Wide differences in capacity for this task were found, but in every case where S succeeded the hypothesis was confirmed. In many Ss training also generated a sensory perception, which was not necessarily auditory. It might be tactile, as in the "facial vision" of the blind, or somaesthetic, or even visual The evidence strongly suggests that perception of position is independent of this sensory perception. The results are discussed from the point of view of the behavioral theory of perception.
R 5

31,887
Satinder, K.P. EFFECTS OF INTERMODAL STIMULATION ON FIGURAL AFTER-EFFECTS. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 1-5. (Psychology Dept., Panjab University, Chandigarh, India).

The present study was conducted to determine the effects of intermodal stimulation upon figural after-effects in the auditory (A), kinesthetic (K), and visual (V) sense modalities. The following measurements were made for each of 15 Ss: a) Basal or preinspection point of subjective equality (PSE); b) Post-inspection PSE, after an inspection period of one min., c) Post-inspection PSE, after an inspection period of one min., with concurrent stimulation in one of the other sense modalities; and d) Post-inspection PSE, after an inspection period of one min., with concurrent stimulation in both modalities. The figural after-effects in the usual direction for the A, K, and V sense modalities. Further, the results indicate that the figural after-effect in one sense modality is significantly affected by concurrent stimulation in other sense modalities.
R 14

31,888
Warrington, Elizabeth K., Kinsbourne, M. & James, Merle. UNCERTAINTY AND TRANSITIONAL PROBABILITY IN THE SPAN OF APPREHENSION. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 7-16. (National Hospital, London, England).

Span of apprehension was measured for stimulus ensembles of various sizes, using letters digits and an arbitrarily selected set of simple lines. Span was significantly decreased when letters and digits were presented as mixed sequences, in proportion to the number of letter-digit juxtapositions. Span also varied with the serial position at which a single juxtaposition occurred, being greatest where this was near the mid-point. These results were thought to arise from the higher transitional probabilities between items of the same class than of different classes, and the greater ease in grouping such items. No effect of stimulus uncertainty was found. Random letter span was significantly less than digit span, but span for sequences reflecting letter frequencies in the language did not differ significantly from digit span (at 100 msec exposure duration). The unfamiliar line material yielded relatively lower spans, varying inversely with ensemble size (two, four and eight choice). This was determined not by overall stimulus uncertainty but by the degree of heterogeneity of the individual stimulus arrays. The relatively less heterogeneous stimulus assays were thought to lend themselves more readily to verbal recoding. With very familiar material transitional probability, in relation to previous experience of the language, determines span. With less familiar material not subject to such response bias, it was the recodability of the individual display which determined the span. With only a single exception, comparable results were obtained at moderately and at very brief exposure durations.
R 25

31,889
Woodhead, Muriel M. VARYING THE NUMBER OF ALTERNATIVES IN SHORT-TERM RECALL. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 45-52. (Applied Psychology Research Unit, MRC, Cambridge, England).

Two studies of the effect of number of alternatives on short-term recall are reported. The main experiment on continuing memory was preceded by a short-term single-presentation test having 2 and 6 alternatives. This study demonstrated that for the digit vocabularies used, the smaller range of alternatives was easier. The main experiment was a test of continuing memory span with 2, 6, and 10 alternatives. Performance on the continuing memory span task improved as the number of alternative items increased, in contrast to short-term recall from single presentations. The tentative explanation offered is that the difficulty of organizing items in chunks during continuing recall increases as the amount of information increases. (HEIAS)
R 13

31,890
Anthony, W.S. WORKING BACKWARD AND WORKING FORWARD IN PROBLEM-SOLVING. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 53-59. (Institute of Education, University of Hull, Hull, England).

The effectiveness and creativity of working backwards has been stressed through the use of anecdotal or fictional examples. Two groups of ten subjects each were given a series of 6 route-finding tasks in a maze-situation modified to allow observation of working forward and working backward. Two types of tasks were used: a) Type F--working forward was effective; b) Type B--working backward was effective. Subjects were given 5 tasks of one type (training task) and then a sixth of the other type (reversal task). There was a tendency for subjects to respond in the correct direction both in the training and in the reversal task. The method and results are discussed in relation to current views of problem solving. (HEIAS)
R 19

31,891
Tajfel, H. & Bruner, J.S. THE RELATION BETWEEN BREADTH OF CATEGORY AND DECISION TIME. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 71-75. (University of Oxford, Oxford, England & Harvard University, Cambridge, Mass.).

Twenty-four subjects were presented with a series of stimuli, all of equal length (5 in.), and asked to classify each as being or not being 5 in. long. The subjects were then divided into three groups (broad, middle and narrow categorizers) according to the number of including and excluding responses that they gave. It was found that: a) the decision times of both extreme groups were considerably shorter than those of the middle group; b) there was a tendency for the extreme groups to have shorter decision times for their preferred type of response; but this tendency did not reach statistical significance.
R 3

31,892
Dawes, R.M. MEMORY AND DISTORTION OF MEANINGFUL WRITTEN MATERIAL. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 77-86. (US Veterans Administration Hospital, Ann Arbor, Mich.).

A method is presented for measuring memory and distortion of meaningful written material. The method is based on the fact that meaningful material asserts set relations. The subject's memory and distortion of such material is measured by asking him to recognize or recall set relations rather than specific verbal units. In addition, a measure of "simplification" in terms of distorted set relations is proposed. Two experiments, using the proposed method, concerned with recognition and recall of set relations over 2 and 3 day time intervals, are reported. Both studies reveal that simplification, as defined, does occur, but that it does not increase over time. Forgetting and distortion effects were found, and the confounding of these two sources in the present method is discussed. (HEIAS)
R 8

31,893
Kennedy, R.A. & Keene, A.G. THE EFFECT OF SHORT PERIODS OF FOOD-DEPRIVATION ON HUMAN PERFORMANCE. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 93-97. (University of Melbourne, Melbourne, Australia).

This study reports the effects of short periods of food deprivation (0, 5, and 10 hrs.) on human performance. Three groups of 10 subjects each, one group at each deprivation level, performed two simple tasks: a) a checking task, part of the Minnesota Clerical Test; and b) a six item paired associates learning task. On both tasks an "inverted U" relationship between performance (errors) and hours of deprivation was found. The argument is advanced that an interpretation of these results in terms of traditional Hullian multiplicative drive theory is unsatisfactory. Possible alternatives to this approach are considered. (HEIAS)
R 14

31,894
Eysenck, H.J. & Thompson, W. THE EFFECTS OF DISTRACTION ON PURSUIT ROTOR LEARNING, PERFORMANCE AND REMINISCENCE. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 99-106. (Institute of Psychiatry, University of London, London, England).

Five groups of thirty subjects were equated for performance on the pursuit rotor, and were then given massed practice under conditions of no distraction, a little, medium or considerable distraction, as well as a control distracting condition. It was found that performance declined proportionally to the amount of distraction given and that the effect of distraction was on performance only, and not on learning. During a subsequent rest pause half the subjects were given a distracting task, the other half were simply rested; performance after this rest period failed to show any effect of the distracting task on consolidation processes theoretically taking place during the rest period.
R 9

31,895
Eysenck, H.J. & Willett, R.A. THE EFFECT OF DRIVE ON PERFORMANCE AND REMINISCENCE IN A COMPLEX TRACING TASK. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 107-112. (Institute of Psychiatry, University of London, London, England).

An experiment is reported in which high-drive and low-drive groups equated for intelligence were given a complex tracing task. Under conditions of spaced practice the low-drive group performed significantly better than the high-drive group, and similar differences were observed under conditions of massed practice. A rest pause of 10 minutes was interpolated in the performance of the groups tested under conditions of massed practice, and reminiscence was found to be greater for the low-drive groups than for the high-drive groups. Significant post-rest decline of performance under massed conditions was observed only for the groups having long pre-rest massed practice and not for those having short pre-rest massed practice.
R 14

31,897
Pastore, N. & Terwilliger, Marlene. INDUCTION OF STEREOSCOPIC DEPTH EFFECTS. Brit. J. Psychol., May 1966, 57(Parts 1 & 2), 201-202. (Queens College, Flushing, N.Y.).

When a pair of continuous horizontal lines of equal length is presented stereoscopically, one line to each eye, the fused lines will appear flat. Introduction of a context which itself appears in depth induces opposite depth effects in the fused lines. The present study tested the generality of this induction effect (IE) to 3 stereograms, each consisting of 2 components, critical figures and noncongruent contexts of vertical segments. Thirty subjects viewed each of the 3 sterograms. The subjects perceived the IE range from 12 to 25 for the different stereograms. It is concluded that these results support the generality of IE. However, introspective reports indicated that the IE differed in degree of pronouncedness. (HEIAS)
~~R 2~~

31,898
Levelt,W.J.M. THE ALTERNATION PROCESS IN BINOCULAR RIVALRY. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 225-238. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Alternation frequency in binocular rivalry and relative dominance of stimuli in the right and left eyes are described in terms of an alternation model. The model is based on the assumption that the mean duration of the dominance of the stimulus in one eye is independent of the strength of this stimulus; the duration is assumed to be dependent only upon the strength of the stimulus in the contralateral eye. A provisional definition of stimulus strength is given. Evidence for assumptions and model is presented by a review of experimental literature on dominance and alternation in binocular rivalry, and by a number of experiments. Normal binocular fusion is considered.
R 27

31,899
Wickelgren, W.A. NUMERICAL RELATIONS, SIMILARITY, AND SHORT-TERM RECOGNITION MEMORY FOR PAIRS OF DIGITS. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 263-274. (Massachusetts Institute of Technology, Cambridge, Mass.).

Recognition memory for pairs of digits after a 6 sec. interference task was superior for pairs containing a zero or one and for pairs consisting of two identical digits than for 'ordinary' pairs. Pairs consisting of digits in forward or backward sequence (e.g. 56 or 43) and pairs where one digit is a multiple of the other were remembered slightly better than 'ordinary' pairs. False recognition rates were highest for test pairs that had the highest degrees of 'identical elements' similarity to the presented pair (two identical digits in reversed positions or one identical digit in the same position as in the presented pair). The results are discussed in terms of an associative theory of short-term recognition memory.
R 8

31,900
Leonard, J.A. THE DEVELOPMENT OF A KEYBOARD TRAINING SITUATION IN MINIATURE. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 275-289. (Medical Research Council Applied Psychology Research Unit, Cambridge, England).

In this paper, the author describes progressive changes which have taken place in a methodology for the study of keyboard tasks. The S--R relationships progressed from a laboratory abstraction to one having high face validity; practice was extended from a single session to programmes in which two sessions were given on each of ten days; and the relationship between the experimenter and the Ss became increasingly similar to that found in actual training situations. These changes are illustrated by examples drawn from the author's work. It is claimed that increasing the general face-validity of the laboratory approach may enhance the possibilities of studying 'pure 'problems.
R 10

31,901
Taylor, F.J. THE EFFECT OF LEARNING INSTRUCTION ON MOTOR AND VERBAL RESPONSES IN RECALL. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 291-295. (Hatfield College of Technology, Hatfield, Herts., England).

The effect of instructions (set) on verbal performance (recall) was compared with its effects on overt behavior (application). Each of 6 groups of 20 Ss was given 1 of 3 types of instruction and either a recall or application test using a dotting machine. It was found that: a) a set to recall led to high recall-scores but low application scores; b) a set to apply led to high application-scores and low recall-scores; and c) a learning instruction in which Ss were asked to learn without any indication of the purpose for learning resulted in significantly lower application and lower recall scores than either of the other two sets. Thus, it appears that even a wrong instruction can be better than no instruction at all. (HEIAS)
R 4

31,902
Hotopf, W.H.N. THE SIZE-CONSTANCY THEORY OF VISUAL ILLUSIONS. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 307-318. (London School of Economics & Political Science, University of London, London, England).

The view that visual illusions, conceived as flat projections of typical views of objects lying in 3-dimensional space results from inappropriate constancy scaling is critized. The theory is critized on the basis of the Muller-Lyer illusion, angle illusions, and effects with luminous models. Contradictions in the theory and the multiple determinants of visual illusions are pointed out. It is concluded that: a) perspective interpretations of visual illusions have overemphasized the influence of geometrical environments; b) there is at present no evidence for distinguishing between primary and secondary scaling; and c) the derivation of the Muller-Lyer illusion from experience of buildings, rooms, and objects of furniture with right-angled corners is not well-founded. (HEIAS)
R 15

31,903
Over, R. AN EXPERIMENTALLY INDUCED CONFLICT BETWEEN VISION AND PROPRIOCEPTION. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 335-341. (Psychology Dept., University of Otago, Otago, New Zealand).

Settings of a bar so that it felt horizontal were examined under conditions where Ss were given false visual information of the slant of the bar. With a distortion of 15° Ss reported that the bar felt horizontal when it in fact looked horizontal. Although for larger distortions most Ss became aware of a conflict between what was seen and felt, few were able to make accurate settings. The bar tended to be set at a slant between the visual horizontal and the physical horizontal. Settings were variable over trials but there was no trend towards greater accuracy. The data indicate that in making spatial judgements more reliance is placed on visual than proprioceptive input.
R 10

31,904
Battig, W.F. EFFECTS OF SEQUENTIAL ORDERING OF ADDED PAIRS AND OF CORRECTION V. NON-CORRECTION PROCEDURES ON PAIRED-ASSOCIATE PERFORMANCE. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 343-350. (University of Maryland, College Park, Md.).

One hundred and sixty eight Ss learned an 8-pair list with fewer errors under a correction procedure, which removes each correctly recalled pair from the list until all pairs have been correctly recalled, than the standard non-correction procedure. Both interpair differences in degree of learning and retention, and variability between Ss, were reduced under the correction procedure. Each of 7 non-correction conditions was then used for a second list of 6 new pairs, learned either alone or in conjunction with the 6 best-learned list 1 pairs (either grouped together, alternated with new pairs, or randomly intermixed), in either constant or varied serial order. Neither sequential grouping nor alternation facilitated list 2 performance, and alternation after non-correction learning of list 1 elicited significantly more errors after the first correct response. Constant serial order for list 2 required fewer trials to criterion than varied serial order.
R 9

31,905
Davies, D.R. & Hockey, G.R.J. THE EFFECTS OF NOISE AND DOUBLING THE SIGNAL FREQUENCY ON INDIVIDUAL DIFFERENCES IN VISUAL VIGILANCE PERFORMANCE. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 381-389. (Psychology Dept., University of Leicester, Leicester, England).

Four groups of 6 extraverts and 4 groups of 6 introverts, selected by the Maudsley Personality Inventory, performed a 32 min visual cancellation task under one of two conditions of signal frequency, high and low, and in either noise (95 db) or quiet (70 db). In quiet, at both levels of signal frequency, extraverts showed a steady decline in the number of signals detected correctly but introverts did not. Neither group showed a decrement under noise conditions. Noise, compared with quiet, significantly increased the number of correct detections made by extraverts under low signal frequency conditions but a similar increase under high signal frequency conditions was not significant. The addition of noise had no significant effect on the number of correct detection made by introverts. Doubling the signal frequency had no significant effect on the performance of introverts or extraverts in either noise or quiet. Introverts made significantly more errors of commission in quiet than in noise while extraverts made significantly more in noise than in quiet. Possible reasons for the findings are discussed.
R 17

31,906
Tune, G.S. AGE DIFFERENCES IN ERRORS OF COMMISSION. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 391-392. (Psychology Dept., University of Liverpool, Liverpool, England).

Twenty-eight Ss, 14 older (mean age =60.6 yr.) and 14 younger (mean age = 38.9 yr), listened to a recording of 10 digits (spoken at the rate of 1/sec.) for 40 min.; each digit was followed by 10 sec. silence. The task was to report whether or not 3 consecutive and different odd digits occurred and to report the decision in the 10 sec. silent period. Correct detections did not vary as a function of time or age. The number of errors of commission increased with time on task and the older Ss made significantly more of these errors than did the younger Ss. The results are interpreted in terms of the arousal hypothesis.
R 2

31,907
Jones, Sheila. DECODING A DECEPTIVE INSTRUCTION. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 405-411. (Psychology Dept., University College, London, England).

Equivalent forms of instruction for a task (digit cancelling) requiring response to 1 of 2 equal classes of items were investigated. The class of items requiring response was defined positively (by inclusion) in one form of instruction and negatively (by exclusion) in the other. It was hypothesized that preference for positive rather than negatively defined classes would lead Ss to transform (decode) the exclusion form of instruction into the equivalent inclusion form. Performance of Ss first given the 'exclusion' instruction and afterwards transferred to the 'inclusion' form was compared with a control group, using the latter form throughout. Less than half the Ss decoded the''exclusion' instruction, and the remainder performed the task at a significantly slower speed both before and after transfer. The error pattern of these Ss indicated that an instruction of the form 'Respond to all items except x and y' generates a spurious set to make a response to the items x and y. The implicit nature of the negative in the qualifier 'except' appeared to be a contributing factor to the deceptive effect of this type of instruction.
R 7

31,908
Wason, P.C. & Kosviner, Adèle. PERCEPTUAL DISTORTION INDUCED BY REASONING. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 413-418. (Psychology Dept., University College, London, England).

The aim of this investigation was to compare the effects of three different degrees of expectancy on the perception of relative length. It was assumed that expectancy would be: a) maximal when erroneous information about the relative length of two equal lines was deduced fallaciously by the subjects; b) intermediate when the same information was presented by the experimenter; and c) zero when no such information was presented. It was predicted that the subsequent perception of length would vary in accordance with the degree of expectancy induced, i.e. a) > b) > c). The prediction was confirmed at a high confidence level for the frequency of perceptual judgments, but the amount of perceptual distortion did not differ significantly although the means were in the predicted order. The results are discussed in relation to theories of perception and cognition.
R 5

31,909
Howe, M.J.A. A NOTE ON ORDER OF RECALL IN SHORT-TERM MEMORY. Brit. J. Psychol., Nov. 1966, 57(Parts 3 & 4), 435-436. (Psychology Dept., University of Sheffield, Sheffield, England).

Sixteen subjects each heard 20 nine-consonant lists presented at 1 item/sec. Half the lists were recalled in order of presentation, half in reverse, recall order being specified before list presentation. Retention of the first 3 items in lists was better with forward recall and of the last 3 items in reverse recall. Recall of whole lists was better in the reverse than in the forward recall order. There may be practical applications to activities requiring retention over brief periods. (HEIAS)
R 2

31,910
Karush, W. & Dear, R.E. OPTIMAL STIMULUS PRESENTATION STRATEGY FOR A STIMULUS SAMPLING MODEL OF LEARNING. J. math. Psychol., Feb. 1966, 3(1), 19-47. (System Development Corporation, Santa Monica, Calif.).

Optimal stimulus presentation strategies are considered for an N-trial experiment in which, at each trial, a stimulus item is chosen for presentation from among a given set of n-items. The learning model used is the single-element model of the stimulus-sampling theory of learning. A strategy is evaluated by an expected loss over terminal states of S. The single trial "locally optimal" strategy is the one that chooses in the current trial that item which would minimize the expected loss at the end of that trial. The main result is that this strategy is in fact "globally optimal;" this strategy chooses in each trial that item for which the current probability of being in the learned state is least. For the case of presentations from a set of 2 stimulus items, it is shown how to determine domains of common optimal strategies in the space of pairs of initial probabilities that the 2 items have been learned. (HEIAS)
R 10

31,911
Luce, R.D. A MODEL FOR DETECTION IN TEMPORALLY UNSTRUCTURED EXPERIMENTS WITH A POISSON DISTRIBUTION OF SIGNAL PRESENTATIONS. J. math. Psychol., Feb. 1966, 3(1), 48-64. (University of Pennsylvania, Philadelphia, Penn.).

A model for detection in temporally unstructured experiments is derived. The model is based on the assumptions: a) that S responds after a random delay, to some random fraction b of internal detection states; and b) during the response period S ignores any new detection states. These states are assumed to occur both with probability q whenever a signal is presented and spontaneously according to a Poisson process with intensity v. Expressions are developed for 2 inter-response densities and 1 signal-response density when the signal presentations are Poisson distributed, and equations are derived to estimate bq and bv and to test the model. Two methods whereby b might be estimated independently of v and q are discussed.
R 20

31,912
Hoffman, W.C. THE LIE ALGEBRA OF VISUAL PERCEPTION. J. math. Psychol., Feb. 1966, 3(1), 65-98. (Boeing Scientific Research Labs., Boeing Airplane Company, Seattle, Wash.).

The familiar perceptual constancies of image location in the field of view, image orientation, size constancy, shape constancy, binocular distortion, and motion, have their natural mathematical expression in terms of Lie groups of transformations over the visual manifold. If Lie's three fundamental theorems are to be satisfied, three additional perceptual invariances must also be present: time, efferent binocularity, and what apparently constitutes some sort of circulating memory in space-time. This Lie algebra of visual perception admits ready explanations for the following visual phenomena: the developmental sequence of infant vision; orthogonal after-images; after-effects of seen movement; the spiral after-effect and the spiral images sometimes evoked under flicker; reading reversals; and the visual analogue of the Fitzgerald contraction. The theory also predicts certain new complementary (orthogonal) after-images, the existence of which have been verified experimentally.
R 60

31,913
Binder, A., Wolin, B.R. & Terebinski, S.J. LEARNING AND EXTINCTION OF LEADERSHIP PREFERENCES IN SMALL GROUPS. J. math. Psychol., Feb. 1966, 3(1), 129-139. (New York University, New York, N.Y.).

The experiment involved a 3-person game in which the members voted for a leader; the designated leader then made a decision for the group. The proportion with which each member was reinforced for his decisions as leader was under experimental control. Earlier work with this game had reported a reasonably good fit between observed voting behavior and that predicted from a Markov model based on the reinforcement probabilities. Voting choices showed learning trends and asymptotic states which were predictable to a significant extent from the model. In the present experiment, a variation was introduced in which a shift from differential to equal frequency of reinforcement among the members occurred mid-way through the game. The Ss showed sensitivity to the shift by the extinction of previous voting preferences. The Markov model proved generally adequate at asymptotic predictions.
R 1

31,914
Hohle, R.H. AN EMPIRICAL EVALUATION AND COMPARISON OF TWO MODELS FOR DISCRIMINABILITY SCALES. J. math. Psychol., Feb. 1966, 3(1), 174-183. (Child Behavior & Development Institute, University of Iowas, Iowa City, Iowa).

Two models purportedly leading to discriminability scales are described: one proposed by Thurstone (Model I), the other by Bradley and Terry, by Ford, and by Luce. Procedures are presented for obtaining maximum likelihood scale values from pair comparison and ranking data for both models, and a goodness-of-fit statistic for testing either model is derived. Application of tests of the models on 6 sets of data indicated that: a) neither model provided uniformly satisfactory representations of the data; and b) all 6 sets of data were more accurately represented by Model II than by Model I.
R 13

31,915
Swearingen, J.J. EVALUATION OF HEAD AND FACE INJURY POTENTIAL OF CURRENT AIRLINE SEATS DURING CRASH DECELERATIONS. AM Rep. 66 18, June 1966, 14pp. US Office of Aviation Medicine, FAA, Washington, D.C. (US Civil Aeromedical Institute, FAA, Oklahoma City, Okla.). (AD 653869)

Impact tests against the eight airline seats studied show that portions of some have good deforming characteristics. The most lethal design features were found to be tubular construction (round or square), nondeforming serving trays, rigid seat arms protruding rearward between the seats, and excessive break-over forces. An analysis of this series of head impacts based on earlier work shows that 30% would have been fatal, 80% would have produced facial fractures, 97% would have rendered the passengers unconscious, and only 3% would have produced no injuries or unconsciousness. This study shows that the following design requirements are necessary to improve the crash-safety design of seats: a) Tubular construction should only be used in areas where it cannot cause injury; b) Serving trays and seat backs should be molded of light aluminum sheet or other material that will deform at loads less than 30g and contour itself to the head and face; c) All exposed areas should be padded with sufficient slow-return foam to aid distribution of the impact force over the contour of the face; d) The forces necessary to break the seat back forward should be reduced; e) The lethal characteristics of seat arms should be eliminated.
R 3

31,916
Rosnow, R.L. WHATEVER HAPPENED TO THE "LAW OF PRIMACY"? J. Communication, March 1966, 16(1), 10-31. (Communication Research Div., Boston University, Boston, Mass.).

The Law of Primacy in Persuasion asserts that first presented arguments are significantly more effective than the second for influencing opinions. The major experimental findings which either directly or indirectly bear upon the type and intensity of order effects yielded in persuasive communications research are reviewed; and a system for classifying the independent variables associated with these findings is introduced. Several paths for future research are suggested. (HEIAS)
R 71

31,917
Simonson, N.R. & Lundy, R.M. THE EFFECTIVENESS OF PERSUASIVE COMMUNICATION PRESENTED UNDER CONDITIONS OF IRRELEVANT FEAR. J. Communication, March 1966, 16(1), 32-37. (Psychology Dept., Pennsylvania State University, University Park, Penn.).

This study examines the effect of irrelevant fear on persuasibility. A group of 180 subjects read one-sided arguments about capital punishment and responded to a Thurstone attitude scale immediately before a midterm examination. A similar group performed the same task under nonthreatening conditions. The results supported the hypothesis that irrelevant fear would facilitate the acceptance of persuasive messages. These findings and some relevant past research are discussed in terms of a cognitive model of attitude change.
R 5

31,920
Abrams, A.G. THE RELATION OF LISTENING AND READING COMPREHENSION TO SKILL IN MESSAGE STRUCTURALIZATION. J. Communication, June 1966, 16(2), 116-125. (Catonsville Community College, Catonsville, Md.).

The present study was designed to relate the ability to structuralize, measured by the Knower-Goyer Organization (KGO) Test, to comprehension. Reading comprehension was measured by the Nelson-Denny Reading (NDR) Test, listening comprehension by the Brown-Carlsen Listening Comprehension (BCLC) Test. The three tests were administered to 100 Ss with a one or two week interval between tests. Significant correlations were found between the BCLC and the KGO tests ($r = 0.39$, $p < 0.001$) and the NDR and KGO tests ($r = 0.36$, $p < 0.005$). These results indicate that the ability to recognize structure is positively correlated with reading and listening comprehension. BCLC test scores were not significantly correlated with the total score on the NDR test ($r = 0.08$), but were significantly correlated with scores on the reading section of the NDR test ($r = 0.38$, $p < 0.001$). (HEIAS)
R 14

31,922
Brooks, W.D. EFFECTS OF A PERSUASIVE MESSAGE UPON ATTITUDES: A METHODOLOGICAL COMPARISON OF AN OFFSET BEFORE-AFTER DESIGN WITH A PRETEST-POSTTEST DESIGN. J. Communication, Sept. 1966, 16(3), 180-188. (Speech Dept., University of Kansas, Lawrence, Kan.).

Two short studies testing a new experimental design are reported. The design called the "offset before-after design" is aimed at the problem of reactive measuring instruments in attitude research. In both studies the offset before-after design controlled the primary effects of extraneous variables (e.g. sex, time of day, etc.) as well as did the traditional design. However, the offset before-after design allowed for a more sensitive assessment of the subject's changes of attitude than did the traditional pretest-posttest design; it registered a change in attitude that was not detected by the traditional design. (HEIAS)
R 7

31,923
Hollingsworth, P.M. EFFECTIVENESS OF A COURSE IN LISTENING IMPROVEMENT FOR ADULTS. J. Communication, Sept. 1966, 16(3), 189-191. (Reading Clinic, University of Nevada, Reno, Nev.).

Two groups (of 18 and 17 subjects) of middle management personnel with normal hearing were given 20 hours of instruction in listening comprehension--10 two hour classes. The Brown-Carlsen Listening Comprehension Tests, Forms AM and BM were administered before and after the instruction period. Twenty-nine subjects completed the training course. Sign tests and t-tests indicated significant improvement ($p<0.01$) in listening comprehension. The average magnitude of improvement was nearly 50% on the Brown-Carlsen Test for both replications. Both of these training sessions indicate that listening skills can be trained within plant training programs. (HEIAS)
R 7

31,924
Weaver, W.W. & Garrison, N. THE CODING OF PHRASES: AN EXPERIMENTAL STUDY. J. Communication, Sept. 1966, 16(3), 192-198. (Campbell College, Buies Creek, N.C. & North Carolina State University, Raleigh, N.C.).

This paper presents a series of experiments which examines the effects of sequence on the "chunking", i.e., coding of prepositional phrases. Reading speed was the dependent variable. Eight lists of 60 phrases each were constructed; one list at each combination of 4 levels of difficulty and prepositional order--initial or terminal position in the phrase. There was a significant difference between the speed of reading the lists when the preposition was first vs. last, between the 4 difficulty levels, and between subjects. All interactions were non-significant. Associated experiments show that the difference in prepositional order was not due to fatigue or due to the fact that prepositions usually have a vowel as the first articulatory element. Further, it was found that the effect rapidly disappears with the rereading of the same lists. It was concluded that the increased latency involved in reading lists of phrases when the preposition is last is apparently an effect of the sequence alone, and supports the idea that these highly redundant elements perform a planning function which has to do with the retrieval and storage of lexical elements. (HEIAS)
R 16

31,927
Baker, R.D. MEASUREMENT OF TAKEOFF AND LANDING PERFORMANCE USING AN AIRBORNE MOTION PICTURE CAMERA. J. Aircraft, Jan.-Feb. 1966, 3(1), 59-66. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

A method is presented which will obtain the attitude and position of a conventional or V/STOL (vertical, short takeoff and landing) aircraft utilizing a motion picture camera mounted in the test vehicle and viewing a runway or some equivalent ground reference. With the use of photogrammetric techniques, the lateral and longitudinal spacing of the runway boundary lights is used to obtain vehicle position. The parallel lines formed by the runway lights are used to obtain vehicle attitude by means of the geometry of perspective. Employing standard numerical techniques, one can obtain the velocity and acceleration derivatives of roll, pitch, and heading angle and longitudinal, vertical, and lateral displacement. An instrumentation-quality camera with timing and pilot event lights may be mounted anywhere on the aircraft, which permits a view of the runway forward or aft. Calibration of the attitude and position of a camera with respect to a simulated runway has proved the validity of the method throughtout a wide variation of attitude and position. Airborne qualitative and quantitative results indicate that the method has practical applications for selective tests involving either V/STOL or conventional aircraft.
R 2

31,928
Kidd, R.O. APPLICATION OF STATISTICAL EXPERIMENTAL DESIGN TECHNIQUES TO FLIGHT-TEST PROGRAMS. J. Aircraft, Jan.-Feb. 1966, 3(1), 67-72. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

The increasing sophistication and complexity of modern airborne vehicles, coupled with continuing customer pressure for reduced development costs, necessitate the use of more refined test and data analysis techniques in order to remain efficient and competitive. The use of statistical experimental design techniques for achieving this increased efficiency in flight-test programs is discussed. Experimental designs can be used in flight-test programs for two purposes: a) to reduce the number of tests required to obtain a given amount of data, thereby reducing costs; and b) to obtain more useful data from a given number of tests in situations where the number of tests cannot be reduced appreciably. Investigation has shown that a small number of standard experimental designs is adequate to cover almost all flight testing requirements. Four general designs have been developed for use in flight testing. Computer programs to process the data from these designs have been established. One ancillary benefit of using experimental designs is the ability to conduct much of the analysis of test data on high-speed digital computers. Several typical flight-test programs are used to illustrate these techniques and the increased efficiency that can be realized through their use.
R 2

31,929
Brown, J.R. ADVANCED HYDRO-SKI VEHICLES FOR AMPHIBIOUS WARFARE. J. Aircraft, Jan.-Feb. 1966, 3(1), 91-94. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

The Lockheed hydro-ski vehicle is one of several new concepts being examined to meet a Navy requirement for advanced, high-speed, assault landing craft. The hydro-ski is a variable geometry planing hull capable of speeds ranging from 35 to 60 knots and maintenance of this speed in a seaway. The hull design is a normal, essentially flat, planing bottom; however, a pair of skis have been added which, when retracted, fit into recesses in the hull. Beyond hump speed the skis are hydraulically extended to provide two narrow planing surfaces, thus lifting the basic hull well above the water surface. In this fashion the flat-plate area that is exposed to wave impact is greatly reduced. A 25-ft test craft has been built to prove the concept. The preliminary design of a family of assault craft has been completed, all powered by waterjet propulsion systems. With gross weights varying from 4500 to 200,000 lb, these craft have been configured as suitable replacements for current landing craft. A very simple design, the hydro-ski boat may be configured for any mission for which high speed in a seaway is a fundamental requirement.

31,930
Heinrich, H.G. AERODYNAMICS OF THE SUPERSONIC GUIDE SURFACE PARACHUTE. J. Aircraft, March-April 1966, 3(2), 105-111. (University of Minnesota, Minneapolis, Minn.).

Shock waves, pressure distribution, and mass flow, which influence the performance of a parachute in supersonic flow, are discussed, and several advantageous conditions are postulated. Respective experiments were made with models consisting of modified 4-in.-diameter guide surface canopies, combined with a cone located ahead of the canopy. Textile, as well as rigid models, functioned satisfactorily up to Mach numbers of 4.5. A 4-ft. supersonic guide surface parachute, its design based on the model tests, worked satisfactorily in a wind tunnel at velocities up to Mach 2.8. It failed after 90-min. testing time because of fatigue.
R 10

31,931
Jones, J.C. & Gardner, J. AN AIRBORNE DIGITAL NAVIGATION SYSTEM IN AN ASW AIRCRAFT, MOD 1. J. Aircraft, March-April 1966, 3(2), 154-158. (Sperry Rand Corporation, Warminster, Penn. & USN Air Development Center, Johnsville, Penn.).

Efficient performance of an airborne antisubmarine warfare (ASW) mission requires accuracy and reliability in both long-range and tactical navigation. The system must be able to direct the aircraft to distant submarine contacts, and, when in the tactical area, it must be able to drop accurately short-range sensors. The positions of these sensors must be constantly and accurately maintained in a continuously moving sea environment. To accomplish these tasks, doppler, inertial, dead reckoning air mass information, and long-range navigation (Loran) are channeled into a digital computer, which uses this information to maintain the aircraft's position in geocentric latitude and longitude and in a tactical x-y system. Positions of submarine contacts, ships, and sonobouys are maintained in the tactical system. These positions are displayed to the Tactical Coordinator (TACO) on a display that is interfaced with the computer. In addition to a digital integrated navigation system, specialized techniques, such as aircraft navigation biasing and pattern correction of sonobouy fields, have been developed for ASW navigation. A system aimed at meeting the requirements of future ASW missions has been designed and flown over the past year in a long-range ASW aircraft.
R 1

31,932
Ellis, D.S. & Bovaird, R.L. TACTICAL AVIONICS MAINTENANCE SIMULATION. J. Aircraft, March-April 1966, 3(2), 158-162. (Hughes Aircraft Company, Culver City, Calif.).

This paper describes analytic and simulation techniques for the study of maintenance characteristics of tactical avionic systems and their ground support equipment. The techniques have been used to define tactical avionics and ground support equipment features required to assure avionic maintainability in the use environment and have been applied to a variety of avionics systems from the preliminary design phase through field use. Although much remains to be done, the experience to date shows that the techniques can translate operational support and maintainability requirements into design requirements when applied in a practical engineering environment. The brief summary presented here illustrates the approach by summarizing the techniques and presenting some typical results. It is believed that this data should be of interest both to maintenance and support specialists and to aerospace management personnel concerned with the problem of developing an integrated approach to maintenance and support engineering within their organizations. An analytical model and two simulation models are described. These models use avionic design parameter estimates as inputs (such as system reliability, test thoroughness, and maintenance task times), allow for various field and operational factors (such as flight schedule and logistics delays), and yield predicted operational characteristics as output (such as undetected fault probability and in-commission rate).

31,933
Bunger, D.R. & Dibble, D.R. TECHNIQUE FOR EVALUATION AND ANALYSIS OF MAINTAINABILITY (TEAM). J. Aircraft, May-June 1966, 3(3), 252-254. (Martin Company, Martin Marietta Corporation, Orlando, Fla.).

Random access and correlation for extended performance, (RACEP), a concept in radio communications, was selected as the trial system for this approach to maintainability. This application, revealed several items that degraded the maintainability of the product and pointed out areas requiring redesign in later systems. As a result, the RACEP production model (482L-type developed for the U.S. Air Force) has been designed with additional features that enhance its maintainability. In addition to the improvements that were determined to be needed by the evaluation of the prototype equipment, the technique for evaluation analysis of maintainability (TEAM) was used on the RACEP 482L program for control of the design for better maintainability. As a further application, the TEAM technique was applied to the RADA design study program and was included as the maintainability input in technical volumes of the RADA System Design Plan (OR 3758B)
R 1

31,934
Kisslinger, R.L. & Vetsch, G.J. MANUAL TERRAIN-FOLLOWING SYSTEM DEVELOPMENT FOR A SUPERSONIC FIGHTER AIRCRAFT. J. Aircraft, July-Aug. 1966, 3(4), 305-309. (McDonnell Aircraft Corporation, St. Louis, Mo.).

The requirements for a low-level, high-speed penetration to a target are briefly reviewed. The design constraints on the pitch command system are then evolved, and the effects of load factor, flight path angle, and type of command display on system design and performance are presented. During the incorporation of manual terrain-following systems into two different versions of the F-4 airplane, fixed base flight simulators were utilized to optimize system design as well as to finalize system parameters. As a result of these studies, each system was modified to provide improved performance and to obtain a command display acceptable to the pilot. A scoring technique that allows optimization of the system parameters without tailoring the system to a particular terrain type was developed. An ideal profile is generated for the terrain being used, and the actual flight path is compared to the ideal. Therefore, comparison will show how well the system allowed the pilot to follow the terrain within the design constraints and will indicate the type of system deficiency which must be removed in order to bring the flight path closer to the optimum.

31,935
Mallery, C.G. & Neebe, F.C. FLIGHT TEST OF GENERAL ELECTRIC SELF-ADAPTIVE CONTROL. J. Aircraft, Sept.-Oct. 1966, 3(5), 449-453. (General Electric Company, Johnson City, N.Y.).

The General Electric self-adaptive control (GESAC) was flight tested at the Naval Air Test Center in a F-4A aircraft. In addition to three axis self-adaptive control, system features included solid-state gain error integrators in each axis and proportional force maneuvering in the pitch and roll axes. The objective of the program was to achieve essentially invariant dynamic response over the complete flight envelope without use of programmed gain changes. The system received a generally high level of pilot acceptance using the Cooper rating system. The system provided basically constant and linear variation of roll rate with lateral control force. Adverse yaw caused by roll was eliminated. The high gain in the roll and yaw stability augmentation loops essentially eliminated aerodynamic coupling between the roll and yaw axes. The aircraft thus appeared to have zero dihedral effect. The pitch axis high gain proportional force maneuvering and automatic trim system relieved the pilot of trim adjustments during takeoff, during configuration changes, rapid accelerations, and bombing runs. It did give the effect of apparent neutral static stability which was considered undesirable during air-to-air combat maneuvers at high altitude and landing approaches. Results of the program will yield future flight control performance improvements.
R 5

31,936
Kramer, K.C. A-7A AFCS: A FLIGHT-PROVED HIGH-GAIN SYSTEM. J. Aircraft, Sept.-Oct. 1966, 3(5), 454-461. (Lear Siegler, Inc., Santa Monica, Calif.).

The automatic flight control system (AFCS) for the A-7A is a production version of a prototype system developed over the past three years, utilizing in its last phase an F-8D aircraft, which is quite similar to the A-7A in many aerodynamic and control characteristics. This paper presents the developmental philosophy that led to the selection of the final configuration: a completely dual, fixed-gain control-augmentation system, using series hydraulic servos and with attitude, altitude, heading-hold, and heading-select capabilities. Results of the Navy flight evaluation in the F-8D are presented along with capabilities of this type of system in providing improved airplane-handling qualities. The simple go-no-go cockpit self-test is discussed also.
R 9

31,937
Handler, E.H. TILT AND VERTICAL FLOAT AIRCRAFT FOR OPEN OCEAN OPERATIONS. J. Aircraft, Nov.-Dec. 1966, 3(6), 481-489. (USN Air Systems Command, Washington, D.C.).

The open ocean aircraft studies of the Naval Air Systems Command emphasize practical methods and techniques. Theoretical analyses and model tests provide immediate and useable information for aircraft design engineers. Irrefutable evidence has been presented of the effectiveness of tilt and vertical floats' remarkable alleviation of aircraft motions in a seaway. Numerous contractors have cooperated in the development of inflatable-retractable float systems for research, test-bed, and prototype water-based aircraft. Following normal refinement and improvement, it is anticipated that these floats can be successfully incorporated into production aircraft. The proposed first generation of open ocean aircraft, modified from the contemporary CH-46A, XC-142A, and P-5A, will have the capability of providing structural, physiological, and mission effectiveness data to be used in the formulation of of the specifications leading to the Navy's first true open ocean aircraft.
R 13

31,938
Cannon, C.H. MILITARY AND CIVIL ALL WEATHER LANDING SYSTEMS FOR C-141. J. Aircraft, Nov.-Dec. 1966, 3(6), 529-534. (Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.).

The landing function without dependence on ground base systems is accomplished through the vertical navigation computer. A two step programed let-down to a predetermined longitude and latitude is a concept of the system. In favorable terrain the let-downs and approaches are planned to 200 ft altitude. The computer outputs can be used by the flight director for manual pilot control and by the automatic flight control system (AFCS) for automatic modes. The system is designed for future improvements so that when precision radar systems are developed, utilizing ground reflectors, landings to touch-down can be accomplished. Automatic throttles provide air speed control, and the AFCS relieves the pilot of flight path control. Radar altimeter indicates precise altitudes to the pilot to within ±1 ft. Automatic landing utilizing instrument landing system (ILS) ground based system is accomplished through the auto pilot coupled to glide slope and localizer. At 100 ft altitude the radar altimeter gives the signal to the landing flare computer and programs let-down flare, and touch-down. Commands are presented to the pilot through the flight director system for manual control. The go-around computer determines optimum path if the pilot determines to abort.

31,939
Hirsch, D.L. & McCormick, R.L. EXPERIMENTAL INVESTIGATION OF PILOT DYNAMICS IN A PILOT-INDUCED OSCILLATION SITUATION. J. Aircraft, Nov.-Dec. 1966, 3(6), 567-573. (Northrop Corporation, Hawthorne, Calif.).

Results are presented for an experimental fixed and moving-base flight simulator investigation of a generalized aircraft longitudinal pilot induced oscillation (PIO) situation. Data are given relative to four handling-quality areas: a) pilot dynamic performance when tracking sinusoidal inputs following the occurrence of PIO; b) the influence of motion cues on such performance; c) the effects of varying stick force on pilot dynamic behavior in the PIO situation; and d) the effect of varying the vehicle short-period transfer function numerator term, pitch attitude numerator inverse time constant, 1/sec ($1/T_{\theta 2}$). Increases in this term to values above the normal level associated with the simulated airframe yielded experimental PIO's. The intentional increases were accomplished at a high input rate in an effort to preclude significant initial pilot gain adaptation. Approximately five times the increase in $1/T_{\theta 2}$ which produced the moving-base PIO was needed to produce instances of fixed-based PIO. With only external visual cues available during an oscillation, the pilot did not appear to operate in a synchronous (pure gain) manner. The availability of full-scale motion cues with visual cures causes the pilot to appear more nearly synchronous in the visual loop; however, the same data more consistently show the pilot operating with lag dynamics on the load factor cues.
R 5

31,940
McGregor, D.M. & Smith, R.E. HANDLING QUALITIES RESEARCH AT THE NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA, USING AIRBORNE V/STOL SIMULATORS. J. Aircraft, Nov.-Dec. 1966, 3(6), 578-585. (National Research Council, Ottawa, Ontario, Canada).

A brief description of the two V/STOL aircraft simulators operated by the National Aeronautical Establishment will be presented. One of these variable stability helicopters has the capability of varying its characteristics in the three rotational degrees of freedom over wide limits and has been flying for several years. The other uses the same basic "model-controlled" method of simulation but has many improvements including the capacity to alter its response in the vertical or heave degree of freedom. These aircraft have been used for general research into V/STOL handling qualities requirements and for simulation of particular aircraft. An investigation into the effects of weathercock stability on directional handling qualities during both visual and simulated instrument flying tasks illustrated the pilots' desire for higher levels of angular rate damping while flying on instruments. A simulation of a tilt-wing V/STOL aircraft, the Canadair CL-84, indicated maximum satisfactory and acceptable levels of backlash and flexibility in the flight control systems with the stability augmentation system fully operative and following a variety of selected failures.
R 16

31,941
Levine, B. USING MAINTENANCE FLOAT TO MEASURE THE VALUE OF MAINTAINABILITY AND RELIABILITY. J. Aircraft, Nov.-Dec. 1966, 3(6), 588-590. (USA Office of the Chief of Engineers, Department of the Army, Washington, D.C.).

One of the problems associated with product design is to measure the value of increased reliability or maintainability; that is, how much more maintainability and reliability to work for, or, conversely, to determine the value of the levels achieved. This note describes an analytic method for doing this quickly and with reasonable accuracy, using the amount of equipment in the "maintenance float" as the criterion.
R 7

31,942
National Safety Council. NATIONAL SAFETY COUNCIL, SECTION 2: POSTER DIRECTORY, 1966/1967. 42-104. National Safety Council, Chicago, Ill.

There are three methods of obtaining National Safety Council posters: through your NSC membership; through an automatic poster subscription service; by ordering the posters that you want, individually and in the exact quantity and size you want. These methods are not mutually exclusive--many organizations use all three. This article illustrates many posters, classified under the following headings: General Appeal; Miscellaneous (Score Sheets, Signs, Rules, New Employees, Etc.); Seasonal & Holiday; Falls; Housekeeping; Clothing/Personal Protective Equipment; First Aid/Health; Chemicals/Gases; Tools (Hand & Powered); Electricity; Fire/Explosion; Materials Handling/Mechanical; Materials Handling/Manual; Machinery; Motor Transportation (Trucks, Buses, Taxicabs); Traffic (including Pedestrians); Home.

31,943
Mandell, R.B. BILATERAL MONOCULAR DIPLOPIA FOLLOWING NEAR WORK. Amer. J. Optom. Arch. Amer. Acad. Optom., Aug. 1966, 43(8), 500-504. (University of California School of Optometry, Berkeley, Calif.).

From the tests performed, it appears definite that the cause of monocular diplopia for this patient was due to changes in the corneal contour but the reason for the corneal pliability is obsure. The patient's palpebral aperture was wider than normal. She had never worn contact lenses previously. A biomicroscopic examination revealed no apparent corneal abnormality and the cornea appeared to be of normal thickness. In view of the frequency of unexplained visual symptoms associated with near work, it is interesting to speculate as to the possible prevalence of this anomaly in less severe form. A study by Fincham demonstrated that some degree of monocular diplopia was present in 40 per cent of 70 eyes. In most of his Ss the effect was shown to have an optical origin but no irregularity could be detected in the corneal or lens surfaces. It was concluded that the defect must be caused by a different refractive index in the upper and lower portions of the crystalline lens. It should be pointed out that the keratometry test used by Fincham may not have been adequate to reveal a slight corneal irregularity, which might have been responsible for the diplopia.
R 2

31,944
Halass, S. ANISEIKONIA--A SURVEY OF THE LITERATURE. Amer. J. Optom. Arch. Amer. Acad. Optom., Aug. 1966, 43(8), 505-524. (University of New South Wales, Sydney, Australia).

Interest in aniseikonia is at a low ebb. Aniseikonia, whatever its origin, has to be corrected on the basis of the Space Eikonometer test. The importance of the correction of aniseikonia in the treatment of strabismus is gradually becoming recognized. Relying on questionable evidence, OEP (Optometric Extension Program) writers in general accept the psychological theory that visual perception is mainly, if not completely, learned. From this assumption they proceed to reshape the entire concept of visual care. The learning theory of behavior and perception is by no means universally accepted by psychologists. There are about a dozen psychological theories of perception in current circulation, ranging from the crudest nativism to its exact opposite. In general ophthalmic practice, aniseikonia is most frequently encountered in anisometropia. If spatial perception is well developed in unaided vision, then the main problem consists of some form of safeguarding against the introduction of unwanted size corrections. In the opinion of this reviewer, it would be a mistake to assess the importance of aniseikonia today on the basis of the number of publications alone. Important research work is being carried out at various centers by psychologists, ophthalmologists and optometrists. In psychology, the problem of perception has been badly neglected for many years, due to the preoccupation with learning theories. Today perception is in the forefront of research in both psychology and neurophysiology.
R 47

31,945
Pyle, D.M. & Smith, Janice. SOVIET HIGH-ALTITUDE EQUIPMENT FOR AIRCREW PROTECTION. Contract 72202, Proj. PT A67002, ATD Rep. 66 67, June 1966, 75pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 642178)

This report consists of abstracts of the following topics: the pilot endurance barrier; protective equipment for high altitude flights; functions of automatic equipment on aircraft; flight safety; construction of aircraft, airplanes, rockets and helicopters; aircraft equipment.

31,947
Maritime Transportation Research Board. SHIPBOARD SYSTEMS COSTS: A FUNCTIONAL ANALYSIS OF WORK ABOARD SHIP--THE SS PRESIDENT LINCOLN, A DRY CARGO SHIP IN THE TRANS-PACIFIC SERVICE. Contract NONR 2300(23), Oct. 1966, 23pp. USN Logistics & Mathematical Statistics Branch, ONR, Washington, D.C. (Maritime Transportation Research Board, National Academy of Sciences-National Research Council, Washington, D.C.). (AD 642518)

This report is one in a series detailing the results of systems analysis work aboard 20 different merchant ships. It presents information relating to one of these ships. This report also describes a system for the retrieval and analysis of data required for the effective management of a ship.

31,948
Wright, G.H. & Fenstermacher, N.H. THE PSYCHOLOGICAL ENVIRONMENT OF PROTECTIVE SHELTERS. Contract OCD PS 65 5, Rep. 75111 2F, July 1966, 9pp. HRB-Singer, Inc., State College, Penn. (AD 642315)

This research is focused upon studying the psychological environment that would prevail in a public fallout shelter during the shelter period. Will there be psychological and sociological problems? If so, what would be the basis for them? What preventative measures are available? How would problems express themselves? When? What remedial actions could be taken? What controls could be applied? What recommendations would be useful to shelter managers? The research described herein has attempted to answer these and other questions through studying the dynamics of behavior during a period of confinement. It was set up to define and measure psycho-social behaviors and to offer recommendations for control. The purpose of this program of research is to discover, through carefully controlled methods, a set of criteria for identifying the psychological environment found in confinement; to discover changes in behavior during confinement; and to develop methods, techniques, and bases for future research in enshelterment.

31.949
Sperling, H.G., Sidley, N.A., Dockens, W.B. & Jolliffe, C.L. THE EFFECTS OF HIGH-INTENSITY RADIANT STIMULATION OF VARYING WAVELENGTHS AND DURATIONS ON RETINAL SENSITIVITY. THIRD ANNUAL PROGRESS REPORT. Contract DA 49 193 MD 2457, Rep. 1549 TDR3, Sept. 1966, 16pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Research Dept., Honeywell Incorporated, St. Paul, Minn.). (AD 642318)

This report presents data on the spectral sensitivity of the eye for a baseline condition of 3000 trolands of planckian-radiator (white) light, and a comparison with the eye's sensitivity when 10,000 trolands of a narrow-band radiation from the blue, green or red parts of the spectrum are added to the white light. The results show a quantitatively greater reduction of sensitivity over the spectral region of the added spectral light, which qualitatively appears to take the form of nearly or completely eliminating the peak found in that region of the spectrum under the white-light condition. There is less effect on the adjacent parts of the function. These results begin to suggest spectral mechanisms which have considerably narrower ranges of spectral sensitivity than are shown in rod and isolated-cone photopigment spectral bleaching data. The questions which these results raise with regard to currently proposed general explanations of color and brightness vision are discussed.
R 9

31,950
Swearingen, J.J. INJURY POTENTIALS OF LIGHT-AIRCRAFT INSTRUMENT PANELS. AM Rep. 66 12, April 1966, 3pp. US Office of Aviation Medicine, FAA, Oklahoma City, Okla. (AD 642114)

Simple attenuators for reduction of head injuries in light-aircraft crashes have been described, tested, and discussed. Such devices could be installed on present aircraft with meager weight and cost penalty and would save hundreds of lives in survivable crashes.
R 10

31,951
Iampietro, P.F. & Adams, T. THE ACHIEVEMENT OF THERMAL BALANCE AND ITS MAINTENANCE DURING ENVIRONMENTAL STRESS. AM Rep. 66 23, June 1966, 13pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 642350)

Aviation activities are conducted in a wide variety of environments, and knowledge concerning the effects of these environments on man is necessary in order to insure adequate performance. Environmental temperature is one factor that may profoundly alter performance or personal well-being or both. This paper describes in some detail the means, both physical and physiological, available to man for maintenance of thermal balance. It is also concernec with some aspects of thermal balance and performance when work is performed in hot or cold environments and the enhancement of performance that thermal acclimatization imparts.
R 76

31,952
Peterson, C.J. SOLID STATE DISPLAY TECHNIQUES. FINAL REPORT. Proj. 6190, Task 619009, AFFDL TR 66 123, Oct. 1966, 37pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (AD 643530)

During the past two years significant improvements have been made on the basic properties of materials used in solid state displays. The capabilities of increased electroluminescent (EL) phosphor maintenance, new high contrast filter techniques, and mass produced control circuitry arrays have greatly motivated Air Force interest in advanced display techniques. Critical to the analysis of such displays is the understanding of electrical and optical phenomena resulting in the microscopic and macroscopic characteristics of solid state displays. Due to the extremely short persistence of EL emission, the only realistic way of generating a useful level of display intensity for cockpit applications has been to drive the EL phosphor continuously. This requires the combination of EL phosphor layers with mass produced control circuitry. Such circuitry must accept and store high speed input signals, and switch, apply or restrict EL drive signals so that legible presentations can appear on the face of the display. Display requirements are first determined by the pilot's basic range of perceptual sensitivities and second by operational needs. Considerable effort has been directed towards both of these areas to achieve a practical solid state display capability. The most important result of such efforts has been a breakthrough in display filtering techniques which has permitted the fabrication of displays reflecting 2 percent of all incident light and transmitting 35 percent of all emitted light. Combining this capability with that of improved high intensity zinc sulfo-selenide EL phosphors, it has been possible to fabricate and flight test solid state displays that can be clearly seen under bright ambient conditions.
R 14

31,953
Rothwell, J.C. & Avner, R.A. LOADING OF LITTER PATIENTS IN ARMY AIRCRAFT. Proj. 3A0 2560 1A 819, Task 035, USAARU Rep. 67 3, Oct. 1966, 8pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (USA Aeromedical Research Unit, Fort Rucker, Ala.). (AD 642371)

Two types of aircraft, the CV-2 "Caribou" and the CH-47 "Chinook", are presently available for medical evacuation of relatively large loads (14 and 24 litters respectively) from minimally prepared landing sites. This report indicates maximum rigging times for conversion of these aircraft to ambulance use, optimal crew sizes for minimum loading times, and some suggestions for loading methods and design of future large medical evacuation aircraft.

31,954
Hammes, J.A. & Ahearn, T.R. SHELTER OCCUPANCY STUDIES AT THE UNIVERSITY OF GEORGIA. FINAL REPORT. Contract OCD PS 66 25, Proj. 1500, Task 1520, Dec. 1966, 369pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (Civil Defense Research, University of Georgia, Athens, Ga.). (AD 653881)

In the period 1962-66, the Civil Defense Research staff at the University of Georgia has conducted 10 simulated fallout shelter occupancy studies. These tests involved healthy men, women, and children, 9 months through 73 years of age, in groups of 30 to 500 persons, confined for periods of 2 days to 2 weeks under rather austere shelter conditions. Detailed findings of these occupancy tests have been presented in previous annual reports. The present report contains findings of the 1966 occupancy tests, as well as a synthesis of all studies to date, and the implications for research in the National Shelter Program. A research prototype "Community Shelter Handbook for Untrained Management" is included.
R 71

31,955
Wiley, L.N. DESCRIBING AIRMAN PERFORMANCE IN THE ADMINISTRATIVE CAREER LADDER BY IDENTIFYING PATTERNS OF TRAIT RATINGS. Proj. 7734, Task 773404, PRL TR 66 13, Nov. 1966, 49pp. USAF Personnel Research Lab., Lackland AFB, Tex. (AD 653544)

Trait ratings were used to account for the variance in airman performance reports and in overall experimental performance ratings. Airmen in the administrative career ladder, DAFSCs 70230, 50, 70 and 70490, across all commands, were rated by supervisors on overall performance and on 65 traits. Current overall airman performance reports (APRs) were obtained from base records. Among the 2,606 sets of ratings with complete data, 1,083 individuals were evaluated twice, representing personnel rated by two supervisors. Broken down by skill levels, the smallest N was 140, for 9-level men who had been rated twice. Using data undifferentiated by skill, in which a man might appear twice if so rated, trait ratings accounted for 70 per cent of the variance in experimental performance ratings and about 43 per cent of the variance in APRs, after grade was removed as a predictor. When data were sorted by skill level, prediction held up in all skills except DAFSC 70270, where it dropped to 60 per cent. Patterns of traits which were more predictive of performance in one skill level than another were found, and these patterns could be sensibly interpreted in terms of the expected demands of the jobs. In a cross-validation against different raters, the predictive advantage of selected patterns was found to be statistically significant for the 5-, 7-, and 9-skill levels. The study is discussed in terms of its implications for criterion development, particularly in respect to its place in the sequence of current criterion research studies.
R 6

31,956
Easter, M. STABILITY/CONTROL AUGMENTATION SYSTEM EVALUATION. Contract FA65WA 1179, Proj. 560 011 01X, FAA Tech. Rep. ADS 67, Feb. 1966, 21pp. US Aircraft Development Service, FAA, Washington, D.C. (Aviation Dept., Ohio State University, Columbus, Ohio). (AD 653742)

The purpose of this project is to evaluate competency of pilots trained in aircraft having a stability augmentation system. This is to determine the necessity of issuing restricted certificates to private pilots if they are unable to pass the private flight check by manual operation of controls. This project was to train five students to required flight performance for a private pilot certificate in a Cherokee-140 equipped with the Mitchell AK-153 Stability Augmentation System. These students were selected as typical businessmen pilots. The stability system was on at all times and used according to manufacturer's recommendations. When the students reached private pilot proficiency, they were given three flight checks, the first with the system on, the second with it off, and the third in a different aircraft without the stability system. All students passed the checks without difficulty. The results of the project indicate that all students reached pilot proficiency in an average time. The stability system had no particular effect on the students' control of the aircraft with or without visual references. Therefore, it would seem unnecessary to issue restricted pilot certificates.

31,957
Stokes, A.W., Hughes, W.P., Wood, D.J. & Druett, J.E. THE COMPARATIVE THERMAL INSULATION OF FOOTWEAR ASSEMBLIES: BOOTS, ANKLE, GENERAL SERVICE, D.M.S. (DIRECT MOULDED SOLE) MK. I AND II AND BOOTS, C.W.W. (COLD WEATHER WARFARE). APRE Rep. 5/66, June 1966, 23pp. Army Personnel Research Establishment, Farnborough, Hants., England. (AD 802193)

The insulation of the footwear assemblies was assessed by foot skin temperature and sensation ratings, during two hour work-rest routines in a climatic chamber at 13° ±5°F (-10.5° ±2.8°C). Five trials were carried out using two 4 x 4 Latin Squares (8 men; 8 periods) in trial 1 and one 4 x 4 Latin Square in each of Trials 2-5. The results lead to the following conclusions: Trials 1 and 3--The thermal insulation provided by the Boot, D.M.S. (direct moulded sole) Mk. I assembly (5-ply insole and one Sock G.S.) is inferior to that of the Boot, C.W.W. (cold weather warfare) (7-ply insole and two Socks G.S.) and the Boot, D.M.S. cannot be recommended as a replacement, for cold temperate conditions, for the Boot C.W.W. Trial 2--Similarly, neither can the Boot, D.M.S. Mk. II be considered as a replacement for the Boot, C.W.W. Trial 4--Although the insulation of Boots, D.M.S. Mk. I when fitted and worn over two pairs of Socks G.S. is not significantly less than Boots, C.W.W. the present fitting difficulties experienced with the D.M.S. Boot does not permit the recommendation that the Boot be worn over two socks. Trial 5--The removal of the Saran insole from the Boot, D.M.S. to accommodate an extra sock largely nullifies the insulation conferred by the extra sock and is not recommended.
R 9

31,958
Chapman, G.C. AN EXPERIMENTAL ASSESSMENT OF A GROUND PILOT TRAINER IN GENERAL AVIATION. Contract FA65WA 1179, Proj. 560 004 02X, FAA Tech. Rep. ADS 63, Feb. 1966, 73pp. US Aircraft Development Service, FAA, Washington, D.C. (Aviation Dept., Ohio State University, Columbus, Ohio). (AD 653736)

Three groups of Ss were trained to private pilot proficiency. Each group used a ground pilot trainer in a specified manner in an effort to determine how many hours of ground pilot trainer time can be substituted for aircraft dual instruction. Results of training time required were compared between groups and to a fourth control group not using a trainer. The group that used the trainer the greatest amount before going to the aircraft had significantly less time at private pilot certification and solo. The primary cause for the significant success is attributed to the instructors' influence rather than trainer usage, however. When groups were compared by their total flight time added to ground pilot trainer time (or observer) the fourth control group had the least total time in training. Results are considered to be inconclusive. Ten pilots were also trained to instrument pilot proficiency using a ground pilot trainer in an effort to determine the minimum number of flight hours required to reach certification standards. The average times required were near the minimums currently required by F.A.R.'s (Federal Aviation Regulations). Pilots with less than total flying experience requirements were as successful as those with high experience levels. Further study is necessary to determine if the total experience requirements can be lowered in the F.A.R.'s.

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13. ABSTRACT

This bibliography is the fourth in a planned series of bibliographies of literature pertinent to the field of human factors engineering. It covers literature of 1966. This bibliography consists primarily of: (1) an index to the human factors literature, and (2) the annotated bibliography.

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