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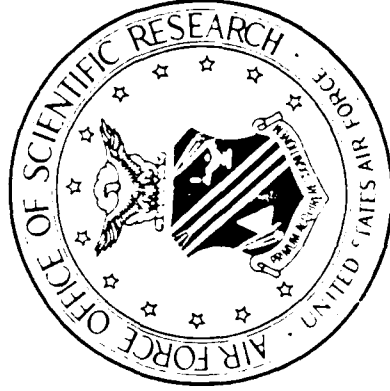
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# AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

## Air Force Systems Command

### AFOSR

#### TECHNICAL REPORT SUMMARIES



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**TECHNICAL REPORT SUMMARIES**

**THIRD QUARTER 1989**

**PREPARED BY  
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TECHNICAL DOCUMENTS SECTION  
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## INTRODUCTION

The Air Force Office of Scientific Research Technical Report Summaries are published quarterly as of March, June, September, and December of each calendar year. They consist of a brief summary of each AFOSR technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for that quarter. The summaries contain two indexes for easily locating the technical reports that may be of interest to the user. These are followed by abstracts of the reports.

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- b. Title of Report
- c. AD Number (Accession Number)

### 2) PERSONAL AUTHOR INDEX

- a. Primary Author
- b. Title of Report
- c. AD Number

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The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting.

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The Air Force Office of Scientific Research (AFOSR) is the Single Manager of the Air Force Defense Research Sciences Program (Program Element 61102F) and the primary Air Force agency for the extramural support of fundamental scientific research. The AFOSR is organizationally under the DCS/Science and Technology, Air Force Systems Command.

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DTIC Report Bibliography - DTIC's brief description of a technical report.

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Title - The title of the technical report.

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Date - Date of the technical report.

Pages - Total number of pages contained in the technical report.

Personal Author - Person or persons who wrote the report.

Contract/Grant Number - The instrument control number identifying the contracting activity and funding year under which the research is initiated.

Project Number - A number unique to a particular area of science; e.g., 2374 is the project number for mathematics.

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**Abstract** - A brief summary describing the research of the report.

**Descriptors** - Key words describing the research.

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Prog Mgr Dr Alan Craig	4931
Prog Mgr Dr Harold Weinstock	4933
Prog Mgr Dr Liselotte Schioler	4933

# **SUBJECT INDEX**

UNCLASSIFIED  
SUBJECT INDEX

- \*ABSORPTION SPECTRA  
Reprint: Absolute Infrared  
Transition Moments for Open Shell  
Diatomics from J Dependence of  
Transition Intensities: Application  
to OH.  
AD-A209 894
- \*ACETYLENES  
Reprint: The Vibrational  
Spectrum of Tetrafluoropropyne.  
AD-A211 596
- \*ACOUSTIC SCATTERING  
The Inverse Scattering Problem  
for Acoustic and Electromagnetic  
Waves.\*  
AD-A209 202  
Reprint: The Inverse Scattering  
Problem for Time-Harmonic Acoustic  
Waves in an Inhomogeneous Medium:  
Numerical Experiments.  
AD-A210 848
- \*ACTIVATION  
Reprint: Mechanism of  
Electrochemical Activation of  
Carbon Electrodes: Role of Graphite  
Lattice Defects.  
AD-A211 644
- \*ADAPTATION(PHYSIOLOGY)  
Higher Order Mechanisms of Color  
Vision.\*  
AD-A209 838
- \*ADAPTIVE SYSTEMS  
Biological Investigations of  
Adaptive Networks: Neuronal Control  
of Conditioned Responses.\*  
AD-A211 043
- \*ADENOSINE  
Binding of Adenosine  
Diphosphoribosyltransferase to the  
Termini and Internal Regions of  
Linear DNAs.\*  
AD-A211 272
- \*ADSORBATES  
Reprint: The Symmetrization  
Method for Enhancement of Digital  
ESDIAD Measurements: Increased  
Resolution for Study of Adsorbate  
Bond Directions.  
AD-A211 707
- \*ADSORPTION  
Reprint: Comparison of Vacuum-  
Annealed and Electrochemically  
Cycled Electrodes in Adsorption and  
Electrocatalysis: Aromatic  
Compounds at Platinum(111) and  
Polycrystalline Platinum.  
AD-A210 011  
Reprint: Carbon Monoxide-Oxygen  
Interaction on the Pt(111) Surface:  
An Electron Stimulated Desorption  
Ion Angular Distribution (ESDIAD)  
study.  
AD-A211 088  
Reprint: Studies of Thiophene  
and Substituted Thiophenes at  
Platinum (111) Electrodes by  
Vibrational Spectroscopy and Auger  
Spectroscopy: Monomers, Dimers, and  
Polymers.  
AD-A211 092  
Reprint: The Adsorption and  
Reaction of Fluorine on the Si(100)  
Surface.  
AD-A211 595
- \*AERODYNAMIC LOADING  
Unsteady Gas Dynamics Problems  
Related to Flight Vehicles.\*  
AD-A210 317
- \*AERODYNAMIC NOISE  
Aerodynamically Generated Sound  
and Subsonic Aerodynamics.\*  
AD-A209 920
- \*AERODYNAMIC STABILITY  
Unsteady Gas Dynamics Problems  
Related to Flight Vehicles.\*  
AD-A210 317
- \*AEROELASTICITY  
Unsteady Gas Dynamics Problems  
Related to Flight Vehicles.\*  
AD-A210 317
- \*AERONAUTICAL ENGINEERING  
AFRAPT (Air Force Research in  
Aero Propulsion Technology) Trainee  
Program.\*  
AD-A211 540
- \*AEROSPACE SYSTEMS  
AFRAPT (Air Force Research in  
Aero Propulsion Technology) Trainee  
Program.\*  
AD-A211 540
- \*AIR FORCE RESEARCH  
United States Air Force Research  
Initiation Program for 1987. Volume  
1.\*  
AD-A209 726  
United States Air Force Research  
Initiation Program for 1987. Volume  
2.\*  
AD-A209 727  
United States Air Force Research  
Initiation Program for 1987. Volume  
3.\*  
AD-A209 728  
United States Air Force Research  
Initiation Program for 1987. Volume  
4.\*  
AD-A209 729
- \*AIRCRAFT DEFENSE SYSTEMS  
A Simulation Study of Four Real  
Time Heuristic Algorithms for  
Multiple Missile Missile Evasion. A  
Game Theoretic Approach.\*  
AD-A211 093
- \*AIRCRAFT EQUIPMENT  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.\*  
AD-A210 307
- \*AIRCRAFT MODEL'S  
Reprint: Aircraft Sortie  
Effectiveness Model.  
AD-A211 594
- \*AIRCRAFTS  
Basic Studies of the Unsteady  
Flow Past High Angle of Attack

## UNCLASSIFIED

- Airfoils.\*  
AD-A210 252  
Control of Turbulent Mixing  
Layers.\*  
AD-A211 413
- \*AIRFRAMES  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.\*  
AD-A210 307
- \*ALGORITHMS  
Data Compression Algorithms.\*  
AD-A209 921  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path, Fusion and Convergence Over  
Multiple Scans.\*  
AD-A209 984  
Automatic Construction of  
Polyhedral Surfaces from Voxel  
Representations.\*  
AD-A210 009  
The Generalized Map Makers  
Problem: Optimal Flattening of  
Polyhedral Surfaces.\*  
AD-A210 013  
Computing Minimal Distances on  
Arbitrary Polyhedral Surfaces.\*  
AD-A210 015  
Studies in Statistical Signal  
Processing.\*  
AD-A210 054  
Reprint: Computer-Aided  
Neuroanatomy: Differential Geometry  
of Cortical Surfaces and an Optimal  
Flattening Algorithm.  
AD-A210 333  
Reprint: Cepstral Filtering on a  
Columnar Image Architecture: A Fast  
Algorithm for Binocular Stereo  
Segmentation.  
AD-A210 574  
Comparing Barrier Algorithms.\*  
AD-A211 515
- \*ALKANES  
Reprint: Negative Temperature  
Dependence in the Decay of Triplet  
Biradicals
- AD-A209 886
- \*ALKENES  
Reprint: Allylations of  
((Diethoxyphosphinyl)difluoromethyl)  
zinc Bromide as a Convenient Route  
to 1,1-Difluoro-3-  
alkenephosphonates.  
AD-A211 702
- \*ALLOYS  
The Effect of Transients on  
Crack Tip Stress Fields during  
Thermal Fatigue Loading.\*  
AD-A210 084  
Laser Cladding of Ni, Nb, and Mg  
Alloys for Improved Environmental  
Resistance at High Temperature.\*  
AD-A210 134  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.\*  
AD-A210 307  
Reprint: Reaction of Protons and  
Molybdenum Divers in an Ambient-  
Temperature Molten Salt.  
AD-A211 698
- \*ALLUVIUM  
Deterministic and Stochastic  
Wavefields in the Near-Field from  
Explosive Sources.\*  
AD-A210 057
- \*ALTIITUDE  
Metacognition and Retrieval from  
Long-Term Memory at Mount Everest.\*  
AD-A211 629
- \*ALUMINATES  
Reprint: Donor-Acceptor  
Properties of Ambient-Temperature  
Chloraluminat Melts.  
AD-A211 525  
Reprint: 1-Methyl-3-  
Ethylimidazolium Hydrogen  
Dichloride: Synthesis and  
Application to the Study of Protons  
in Ambient-Temperature  
Chloroaluminat Ionic Liquids.  
AD-A211 526
- \*ALUMINUM  
Reprint: Aluminum Anodization in  
a Basic Ambient Temperature Molten  
Salt.  
AD-A211 598
- \*ALUMINUM COMPOUNDS  
Reprint: Photochemical Probes  
for Structure of Zeolites and for  
Dynamics of Reactions of Molecules  
Adsorbed on Porous Solids  
AD-A208 989  
Reprint: Photochemistry of  
Dibenzyl Ketone Adsorbed on  
Size/Shape Selective Faujasite  
Zeolites: Steric Effects on Product  
Distributions.  
AD-A211 376  
Reprint: The Ferro/Ferricyanide  
Couple in an Aluminum Chloride-1-  
Methyl-3-ethylimidazolium Chloride  
Ambient-Temperature Molten Salt.  
AD-A211 541
- \*ALUMINUM GALLIUM ARSENIDES  
Transport and Submillimeter Wave  
Spectroscopy of GaAs/Al sub xGa sub  
1-x and In sub x Ga sub 1-x As  
Heterostructures.\*  
AD-A209 838
- \*ALUMINUM OXIDES  
Effect of Alloying, Rapid  
Solidification, and Surface  
Kinetics on the High Temperature  
Environmental Resistance of  
Niobium.\*  
AD-A209 934
- \*AMINES  
Reprints: Synthesis of Unusual  
Perfluorocarbon Ethers and Amines  
Containing Bulky Fluorocarbon  
Groups: New Biomedical Materials  
AD-A211 576
- \*AMINO ACIDS  
Reprint: Surface  
Electrochemistry of Amino Acids.  
Voltammetry Assisted by EELS  
(Electron Energy-Loss Spectra)

SUBJECT INDEX-2  
UNCLASSIFIED EVI09K

AIR AMI

## UNCLASSIFIED

- Auger and LEED.  
AD-A210 509
- \*AMMONIA  
Reprint: Observation of NH(a1  
Delta, v=1) from the H + N3  
Reaction.  
AD-A210 681
- \*ANATOMICAL MODELS  
Reprint: Towards a Non-Network  
Approach to Neural Modeling: Some  
Basic Issues of Measurement,  
Simulation and Computational  
Significance of Brain Maps.  
AD-A209 982
- \*ANATOMY  
Reprint: Computer-Aided  
Neuroanatomy: Differential Geometry  
of Cortical Surfaces and an Optimal  
Flattening Algorithm.  
AD-A210 333
- \*ANGLE OF ATTACK  
Basic Studies of the Unsteady  
Flow Past High Angle of Attack  
Airfoils.\*  
AD-A210 252
- \*ANGLES  
Reprint: A SANS (Small Angle  
Neutron Scattering) of Catalyst on  
the Growth Process of Silica Gels.  
AD-A211 694
- \*ANIONS  
Reprint: The Effect of Fluoride  
on the Sol-Gel Process.  
AD-A209 217  
Reprint: Photodetachment Cross  
Sections of Negative Halogen Ions  
in Discharge Media.  
AD A209 343  
Optical Production of Negative  
Ions.\*  
AD-A210 234  
Reprint: The Effect of Fluoride  
on the Sol-Gel Process.  
AD A211 403
- \*ANODES  
Plasma-Anode Electron Gun  
Research.\*  
AD-A211 547
- \*ANODIC COATINGS  
Reprint: Aluminum Anodization in  
a Basic Ambient Temperature Molten  
Salt.  
AD-A211 598
- \*APPROXIMATION(MATHEMATICS)  
Statistical Communication Theory  
and Robust Estimation.\*  
AD-A209 996  
Polynomial Approximation of  
Functions of Matrices and Its  
Application to the Solution of a  
General System of Linear  
Equations.\*  
AD-A211 390
- \*APTIITUDE TESTS  
Slope-Controlled Performance  
Testing.\*  
AD-A211 041
- \*AROMATIC COMPOUNDS  
Reprint: Comparison of Vacuum-  
Annealed and Electrochemically  
Cycled Electrodes in Adsorption and  
Electrocatalysis: Aromatic  
Compounds at Platinum(111) and  
Polycrystalline Platinum.  
AD-A210 011  
Reprint: Cope Rearrangement of  
3,3-Dicyanohexa-1,5-diene.  
AD-A211 023  
Reprint: Aromatic Energies of  
Some Heteroaromatic Molecules.  
AD-A211 204
- \*AROMATIC HYDROCARBONS  
Reprint: DEWAR-PI Study of  
Electrophilic Substitution in  
Selected Polycyclic Fluoranthene  
Hydrocarbons.  
AD-A211 121
- \*ARTIFICIAL INTELLIGENCE  
The Back Propagation Technique  
AD-A211 403
- \*ATTACK AIRCRAFT  
Reprint: Aircraft Sortie  
Effectiveness Model.  
AD-A211 594
- \*ATTENTION  
Attention, Imagery and Memory: A  
Neuromagnetic Investigation.\*  
AD-A209 917  
Attention and Vigilance in  
Speech Perception.\*  
AD-A210 493  
The Role of Central  
Monoaminergic Systems in Arousal  
and Selective Attention.\*  
AD-A211 371
- \*AUDITORY PERCEPTION  
Time-Frequency Factors in  
Auditory Perception.\*  
AD-A211 491  
Binaural Masking: An Analysis of  
Models.\*  
AD-A211 578
- \*AUDITORY SIGNALS  
Binaural Masking: An Analysis of  
Models.\*  
AD-A211 578
- \*AUGER ELECTRON SPECTROSCOPY  
Reprint: Photon Energy Sensitive  
Si L(2,3) VV Auger Satellite  
AD-A209 039
- \*AURORAE  
Development of Computer Codes to  
AD-A211 403
- for Modeling Cortical Computation ,  
AD-A209 855  
Topographic Map Reading ,  
AD-A211 269
- \*ATOMIC SPECTROSCOPY  
Reprint: Dynamics of Flexible  
Triplet Biradicals.  
AD-A210 334  
Reprint: Recent Progress in the  
Theory of Laser-Assisted  
Collisions.  
AD-A210 636

SUBJECT INDEX 3  
UNCLASSIFIED EVI09K

AMM AUR

## UNCLASSIFIED

- Model Dynamics of the Earth's Magnetosphere. \*  
AD-A211 532
- \*AUTOCORRELATION  
Reprint: Rank-Preserving Extensions of Band Matrices.  
AD-A211 531
- \*AVALANCHE EFFECT(ELECTRONICS)  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.\*  
AD-A210 549
- \*AZIDES  
Reprint: Structures of Two Organosilyl Azides.  
AD-A211 632
- \*BACKGROUND NOISE  
Binaural Masking: An Analysis of Models.\*  
AD-A211 578
- \*BAND SPECTRA  
Reprint: Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.  
AD-A211 563
- \*BAND THEORY OF SOLIDS  
Band Calculations on Ferroelectric and Piezoelectric Solids.\*  
AD-A210 143
- \*BARRIERS  
Comparing Barrier Algorithms.\*  
AD A211 515  
SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607
- \*BEAMS(ELECTROMAGNETIC)  
Electromagnetic Pulse Interaction at a Dielectric Interface.\*  
AD-A211 081
- \*BEARINGS  
of Flight Safety.\*  
AD-A209 919
- \*BLOOD PLASMA  
24-Hour Mean Plasma Hormone Levels in Men with Coronary Heart Disease.\*  
AD-A209 868
- \*BOLTZMANN EQUATION  
Physics of High Energy Photoconductive Switches.\*  
AD-A210 341
- \*BOUNDARY VALUE PROBLEMS  
Analysis of a Parallelized Nonlinear Elliptic Boundary Value Problem Solver with Application to Reacting Flows.\*  
AD-A211 487
- \*BRAIN  
The Back Propagation Technique for Modeling Cortical Computation.\*  
AD A209 855  
Modulation of Spontaneous Brain Activity During Mental Imagery.\*  
AD-A209 918  
Reprint: Towards a Non-Network Approach to Neural Modeling: Some Basic Issues of Measurement, Simulation and Computational Significance of Brain Maps.  
AD-A209 982  
The Generalized Map Makers Problem: Optimal Flattening of Polyhedral Surfaces.\*  
AD-A210 013
- \*BREAKDOWN(ELECTRONIC THRESHOLD)  
Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.\*  
AD-A210 366
- \*BRIGHTNESS  
Eye Movement and Spatial Pattern Vision.\*  
AD-A211 650
- \*BROMINE COMPOUNDS  
Reprint: Experimental and ab
- Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.\*  
AD-A209 875
- \*BENZENE  
Reprint: ETA(2)-(H,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (SiIox)3Ta (SiIox = t-Bu3SiO-).  
AD-A209 887  
Reprint: Methane and Benzene Activation via Transient (t-Bu3SiNH)2Zr-NSi-t-BU3.  
AD-A210 364
- \*BENZOXAZOLES  
Reprint: Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl).  
AD-A210 546
- \*BENZYL RADICALS  
Reprint: Photochemistry of Dibenzyl Ketone Adsorbed on Size/Shape Selective Faujasite Zeolites: Steric Effects on Product Distributions.  
AD-A211 376
- \*BIOLOGICAL RHYTHMS  
Visualizing and Rhythming Cause Differences in Alpha Suppression.\*  
AD-A210 005
- \*BIONICS  
Role of Retinocortical Processing in Spatial Vision.\*  
AD-A210 995
- \*BIOPHYSICS  
Role of Retinocortical Processing in Spatial Vision.\*  
AD-A210 995
- \*BIRD STRIKES  
Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement

SUBJECT INDEX-4  
UNCLASSIFIED EVI09K

AUT BRO

## UNCLASSIFIED

- Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211 268
- \*CANCER  
Molecular Toxicology of Chromatin.\*  
AD A211 156
- \*CARBENES  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86.  
Alkylidynes(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes: Crystal Structure of (NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4)(Mu-C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>8</sub>).  
AD-A210 340  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
AD-A210 847
- \*CARBON  
Reprint: Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects.  
AD-A211 644
- \*CARBON CARBON COMPOSITES  
Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.\*  
AD-A211 737
- \*CARBON MONOXIDE  
Reprint: Carbon Monoxide-Oxygen Interaction on the Pt(111) Surface: An Electron Stimulated Desorption Ion Angular Distribution (ESDIAD)
- study.  
AD-A211 088  
Reprint: Compressed Co Overlayers on Pt(111) Evidence for Tilted Co Species at High Coverages by Digital ESDIAD.  
AD-A211 671  
Reprint: The Symmetrization Method for Enhancement of Digital ESDIAD Measurements: Increased Resolution for Study of Adsorbate Bond Directions.  
AD-A211 707
- \*CARBONATES  
Reprint: Synthesis of Perfluorotetraalkyl Orthocarbonates Using Elemental Fluorine.  
AD-A211 600
- \*CARDIAC PATIENTS  
24-Hour Mean Plasma Hormone Levels in Men with Coronary Heart Disease.\*  
AD-A209 868
- \*CASCADE STRUCTURES  
Analytical Study of Mistuning/Friction/Aerodynamics Interaction in a Bladed Disk Assembly.\*  
AD-A211 139
- \*CATALYSIS  
Reprint: Comparison of Vacuum-Annealed and Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum.  
AD-A210 011  
Reprint: The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388
- \*CAVITATION  
Superplasticity - A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.\*  
AD-A209 997
- \*CELLS  
Surface, Interface, and Bulk Properties of High Tc Superconductors.\*  
AD-A211 490  
High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.\*  
AD-A211 691
- \*CEMENTS  
High-Strain-Rate Behavior of Hydrated Cement Paste.\*  
AD-A210 180
- \*CENTRIFUGAL COMPRESSORS  
Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.\*  
AD-A209 875
- \*CERAMIC CAPACITORS  
Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.\*  
AD-A210 366
- \*CERAMIC FIBERS  
Reprint: Generate Reinforcing Particles in Place.  
AD-A209 656
- \*CERAMIC MATERIALS  
Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.\*  
AD-A210 366  
New Mechanism for Toughening Ceramic Materials.\*  
AD-A211 651  
Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.\*  
AD-A211 737
- \*CEREBRAL CORTEX  
Extrathalamic Modulation of Cortical Function.\*  
AD-A211 044
- \*CHANNELS

SUBJECT INDEX-5  
UNCLASSIFIED EVI09K

CAN CHA

## UNCLASSIFIED

- Communications Using Channels Formed by Meteor Bursts.\*  
AD-A209 856
- \*CHARGE CARRIERS  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.\*  
AD-A210 549
- \*CHEMICAL BONDS  
Reprint: The Activation of Chemical Bonds at Surfaces.  
AD-A211 527  
Reprint: The Symmetrization Method for Enhancement of Digital ESDIAD Measurements: Increased Resolution for Study of Adsorbate Bond Directions.  
AD-A211 707
- \*CHEMICAL DISSOCIATION  
Ion Formation by Electron Impact.\*  
AD-A211 367
- \*CHEMICAL ENGINEERING  
Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.\*  
AD-A211 324
- \*CHEMICAL LASERS  
Laser Mixing Processes.\*  
AD-A209 870
- \*CHEMICAL RADICALS  
Reprint: Negative Temperature Dependence in the Decay of Triplet Biradicals.  
AD-A209 886  
Reprint: Observation of NH(a1 Delta, v=1) from the H + N3 Reaction.  
AD-A210 681
- \*CHEMICAL REACTIONS  
Reprint: Use of Quantum Mechanical Models in Studies of Reaction Mechanisms.  
AD-A208 930
- Reprint: Reaction of E-1,4-Poly(2-Triethylsilyl-1,3-Butadiene) with Iodine Monochloride.  
AD-A209 899  
Reprint: Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane.  
AD-A210 290  
Reprint: Methane and Benzene Activation via Transient (t-Bu3SiNH)2Zr-NSi-t-BU3.  
AD-A210 364  
Chemical Reactions in Turbulent Mixing Flows.\*  
AD-A211 240  
Synthesis and Chemistry of Strained and Conjugated Fluorocarbons.\*  
AD-A211 633
- \*CHEMICAL SHIFTS  
Reprint: Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds.  
AD-A210 010
- \*CHEMISORPTION  
Reprint: Compressed Co Overlayers on Pt(111) Evidence for Tilted Co Species at High Coverages by Digital ESDIAD.  
AD-A211 671
- \*CHEMISTRY  
Evaluation of Chemical Research Relevant to Current and Projected U.S. Air Force Interests.\*  
AD-A210 313
- \*CHLORIDES  
Reprint: Reaction of E-1,4-Poly(2-Triethylsilyl-1,3-Butadiene) with Iodine Monochloride.  
AD-A209 899  
Reprint: The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
AD-A211 541
- \*CHLOROPRENES  
Reprint: Reduction Silylation of Chloroprene.  
AD-A209 888
- \*CHLOROSILANES  
Reprint: Reduction Silylation of Chloroprene.  
AD-A209 888
- \*CHROMATIN  
Molecular Toxicology of Chromatin.\*  
AD-A211 156
- \*CIRCUIT INTERCONNECTIONS  
Integrated Opto-Electronic Computing.\*  
AD-A209 936
- \*CLADDING  
Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature.  
AD-A210 134
- \*CLIMATOLOGY  
Sensitivity Evaluation Plan for Lowtran.\*  
AD-A211 484
- \*CLIMBING  
Metacognition and Retrieval from Long-Term Memory at Mount Everest.\*  
AD-A211 629
- \*COATINGS  
Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.\*  
AD-A211 737
- \*CODING  
Stimulus-Response Compatibility in Spatial Precuing and Symbolic Identification: Effects of Coding Practice, Retention and Transfer.\*  
AD-A210 745

UNCLASSIFIED  
SUBJECT INDEX-6  
EVI09K

CIA CDD

## UNCLASSIFIED

- \*COGNITION  
Visualizing and Rhyming Cause Differences in Alpha Suppression.\*  
AD-A210 005  
Models of Mental Functioning.\*  
AD-A210 456  
Cognitive and Neural Bases of Skilled Performance.\*  
AD-A210 851  
Institute for the Study of Human Capabilities Summary Descriptions of Research for the Period September 1988 through June 1989.\*  
AD-A211 232  
The Role of Central Monoaminergic Systems in Arousal and Selective Attention.\*  
AD-A211 371  
Metacognition and Retrieval from Long-Term Memory at Mount Everest.\*  
AD-A211 629
- \*COHERENT RADIATION  
Organization of the Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts.\*  
AD-A209 847
- \*COLD CATHODE TUBES  
Plasma-Anode Electron Gun Research.\*  
AD-A211 547
- \*COLLISION AVOIDANCE  
Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement of Flight Safety.\*  
AD-A209 919
- \*COLLOIDS  
Reprint: The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211 510
- \*COLOR VISION  
Higher Order Mechanisms of Color Vision.\*
- AD-A209 838  
Eye Movements and Spatial Pattern Vision.\*  
AD-A211 650
- \*COMBINATORIAL ANALYSIS  
Statistical Communication Theory and Robust Estimation.\*  
AD-A209 998  
Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences. Volume 555).  
AD-A210 672
- \*COMBUSTION  
Process Diagnostics: Materials. Combustion Fusion. Volume 117. Materials Research Society.\*  
AD-A211 324  
Premixed Turbulent Flame Propagation.\*  
AD-A211 489
- \*COMMUNICATION AND RADIO SYSTEMS  
Communications Using Channels Formed by Meteor Bursts.\*  
AD-A209 856
- \*COMMUNICATIONS NETWORKS  
Finding Efficient Pipelining in Concurrent Structures.\*  
AD-A210 346
- \*COMPENSATION  
Phase Compensation for High Power Lasers Using Refracting Gas Prisms.\*  
AD-A209 869
- \*COMPOSITE MATERIALS  
Mechanical Response of Structural Elements to Dynamic Loads.\*  
AD-A209 827
- \*COMPRESSIBLE FLOW  
Experimental Research on Swept Shock Wave/Boundary Layer
- AD-A209 838  
The Back Propagation Technique for Modeling Cortical Computation.\*  
AD-A209 855  
Integrated Opto-Electronic Computing.\*  
AD-A209 936  
Computing Minimal Distances on Arbitrary Polyhedral Surfaces.\*  
AD-A210 015  
Multiprocessor Sparse L/U decomposition with Controlled Fill-In.\*  
AD-A211 570
- \*COMPUTER APPLICATIONS  
Development of Analytical and Semi-Numerical Methods of Flow Calculation.\*  
AD-A209 916  
A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.\*  
AD-A210 008  
Hyperdimensional Data Analysis and Structural Inference.\*  
AD-A210 056  
Topographic Map Reading.\*  
AD-A211 269
- \*COMPUTER GRAPHICS  
Reprint: Applications of Computer Graphics and Image Processing to 2D and 3D Modeling of the Functional Architecture of the Visual Cortex.  
AD-A209 985  
A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.\*  
AD-A210 008  
Conformal Image Warping.\*  
AD-A210 016  
Reprint: Computer-Aided
- AD-A209 838  
Eye Movements and Spatial Pattern Vision.\*  
AD-A211 650
- \*COMBINATORIAL ANALYSIS  
Statistical Communication Theory and Robust Estimation.\*  
AD-A209 998  
Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences. Volume 555).  
AD-A210 672
- \*COMBUSTION  
Process Diagnostics: Materials. Combustion Fusion. Volume 117. Materials Research Society.\*  
AD-A211 324  
Premixed Turbulent Flame Propagation.\*  
AD-A211 489
- \*COMMUNICATION AND RADIO SYSTEMS  
Communications Using Channels Formed by Meteor Bursts.\*  
AD-A209 856
- \*COMMUNICATIONS NETWORKS  
Finding Efficient Pipelining in Concurrent Structures.\*  
AD-A210 346
- \*COMPENSATION  
Phase Compensation for High Power Lasers Using Refracting Gas Prisms.\*  
AD-A209 869
- \*COMPOSITE MATERIALS  
Mechanical Response of Structural Elements to Dynamic Loads.\*  
AD-A209 827
- \*COMPRESSIBLE FLOW  
Experimental Research on Swept Shock Wave/Boundary Layer
- AD-A209 838  
The Back Propagation Technique for Modeling Cortical Computation.\*  
AD-A209 855  
Integrated Opto-Electronic Computing.\*  
AD-A209 936  
Computing Minimal Distances on Arbitrary Polyhedral Surfaces.\*  
AD-A210 015  
Multiprocessor Sparse L/U decomposition with Controlled Fill-In.\*  
AD-A211 570
- \*COMPUTER APPLICATIONS  
Development of Analytical and Semi-Numerical Methods of Flow Calculation.\*  
AD-A209 916  
A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.\*  
AD-A210 008  
Hyperdimensional Data Analysis and Structural Inference.\*  
AD-A210 056  
Topographic Map Reading.\*  
AD-A211 269
- \*COMPUTER GRAPHICS  
Reprint: Applications of Computer Graphics and Image Processing to 2D and 3D Modeling of the Functional Architecture of the Visual Cortex.  
AD-A209 985  
A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.\*  
AD-A210 008  
Conformal Image Warping.\*  
AD-A210 016  
Reprint: Computer-Aided

SUBJECT INDEX-7  
UNCLASSIFIED EVI09K

COG-COM

## UNCLASSIFIED

- Neuroanatomy: Differential Geometry of Cortical Surfaces and an Optimal Flattening Algorithm.  
AD-A210 333  
Reprint: Cepstral Filtering on a Columnar Image Architecture: A Fast Algorithm for Binocular Stereo Segmentation.  
AD-A210 574
- \*COMPUTER PROGRAMMING  
The Force on the Flex: Global Parallelism and Portability.\*  
AD-A211 391  
Parallel Computation with the Force.\*  
AD-A211 488  
Comparing Barrier Algorithms.\*  
AD-A211 515
- \*COMPUTER PROGRAMS  
Sensitivity Evaluation Plan for Lowtran.\*  
AD-A211 484
- \*COMPUTERIZED SIMULATION  
Reprint: Computer-Aided Neuroanatomy: Differential Geometry of Cortical Surfaces and an Optimal Flattening Algorithm.  
AD-A210 333  
Time-Frequency Factors in Auditory Perception.\*  
AD-A211 491
- \*CONDENSATION REACTIONS  
Reprint: The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388  
Reprint: The Effect of Fluoride on the Sol-Gel Process.  
AD-A211 403
- \*CONFORMAL MAPPING  
Conformal Image Warping.\*  
AD-A210 016
- \*CONTRAST  
Reprint: Two Motion Perception Mechanisms Revealed Through Distance-Driven Reversal of
- Apparent Motion.  
AD-A211 214  
Kinetic Depth Effect and Optic Flow 1. 3D Shape from Fourier Motion.\*  
AD-A211 260
- \*CONTROL SYSTEMS  
Control and Optimization for Observations of Systems Governed by Controlled Partial Differential Equations.\*  
AD-A211 122
- \*CONVECTION  
Effect of Body Forces on Motion and Heat Transfer of Confined Fluids.\*  
AD-A210 667
- \*CORROSION  
Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.\*  
AD-A211 737
- \*COUPLING (INTERACTION)  
Coupling between Radiation and Gas Dynamics.\*  
AD-A209 657
- \*CRACKS  
Stress Wave Induced Damage in Rock.\*  
AD-A211 599
- \*CROSS SECTIONS  
Reprint: Photodetachment Cross Sections of Negative Halogen Ions in Discharge Media.  
AD-A209 343
- \*CRYOGENICS  
Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.\*  
AD-A209 875  
Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.\*
- AD-A210 366  
Reprint: Kapitza Conductance of Crystals Cleaved under He II.  
AD-A211 509
- \*CRYSTAL GROWTH  
Autonomous Control System for Czochralski Growth of LEC GaAs.\*  
AD-A210 190
- \*CRYSTAL STRUCTURE  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4))(Mu-C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>18</sub>.  
AD-A210 340  
Reprint: Structures of Two Organosilyl Azides.  
AD-A211 632
- \*CURRENT DENSITY  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.\*  
AD-A210 549
- \*CYANIDES  
Reprint: The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
AD-A211 541  
Reprint: Non-Linear and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597
- \*CYCLIC COMPOUNDS  
Reprint: Three-, Four-, and Five Membered Rings from Disilenes.  
AD-A209 904  
Reprint: Use of <sup>29</sup>P INEPT-INADEQUATE 29Si NMR to Determine Structures of Organosilicon Rings.  
AD-A211 100

SUBJECT INDEX-8

UNCLASSIFIED EV109K

COM-CYC

## UNCLASSIFIED

- Reprint: Synthesis of Perfluoro  
Crown Ethers: A New Class of Cyclic  
Fluorocarbons.  
AD-A211 601
- \*CZOCHEKRALSKI CRYSTALS  
Autonomous Control System for  
Czochralski Growth of LEC GaAs.\*  
AD-A210 190
- \*DATA COMPRESSION  
Data Compression Algorithms.\*  
AD-A209 921
- \*DATA RATE  
Communications Using Channels  
Formed by Meteor Bursts.\*  
AD-A209 856
- \*DATA TRANSMISSION SYSTEMS  
Communications Using Channels  
Formed by Meteor Bursts.\*  
AD-A209 856
- \*DECAY  
Reprint: Negative Temperature  
Dependence in the Decay of Triplet  
Biradicals.  
AD-A209 886
- \*DELTA WINGS  
Studies of Unsteady Vortex Flap  
Aerodynamics.\*  
AD-A209 837
- \*DEOXYRIBONUCLEIC ACIDS  
Binding of Adenosine  
Diphosphoribosyltransferase to the  
Termini and Internal Regions of  
Linear DNAs.\*  
AD-A211 272
- \*DETECTION  
Pre-Attentive and Attentive  
Visual Information Processing.\*  
AD-A209 884
- \*DETECTORS  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path, Fusion and Convergence Over
- Multiple Scans.\*  
AD-A209 984  
SIS (Superconductor-Insulator-  
Superconductor) Mixer Research.\*  
AD-A211 607
- \*DIAGNOSIS(GENERAL)  
Process Diagnostics: Materials,  
Combustion Fusion, Volume 117.  
Materials Research Society.\*  
AD-A211 324
- \*DIAMONDS  
Development of Photodeposited  
Diamond Films.\*  
AD-A209 576
- \*DIATOMIC MOLECULES  
Reprint: Analytical Evaluation  
of the Electrostatic Potential for  
Diatomic Molecules.  
AD-A209 665  
Reprint: Absolute Infrared  
Transition Moments for Open Shell  
Diatomic from J Dependence of  
Transition Intensities: Application  
to OH.  
AD-A209 894
- \*DIELECTRIC PROPERTIES  
Capacitive Energy Storage at  
Cryogenic Temperatures. Phase 2.\*  
AD-A210 366
- \*DIELECTRIC STRENGTH  
Capacitive Energy Storage at  
Cryogenic Temperatures. Phase 2.\*  
AD-A210 366
- \*DIELECTRICS  
Electromagnetic Pulse  
Interaction at a Dielectric  
Interface.\*  
AD-A211 081
- \*DIENES  
Reprint: Cope Rearrangement of  
3,3-Dicyanohexa-1,5-diene.  
AD-A211 023
- \*DIFFUSION
- Wavefront Propagation for  
Reaction-Diffusion Systems of PDE.\*  
AD-A210 862
- \*DILUENTS  
Reprint: Properties of Solutions  
of Rodlike Chains from Dilute  
Solutions to the Nematic State.  
AD-A210 601
- \*DIMERS  
Reprint: Reaction of Protons and  
Molybdenum Divers in an Ambient-  
Temperature Molten Salt.  
AD-A211 698
- \*DIPOLE MOMENTS  
Reprint: Absolute Infrared  
Transition Moments for Open Shell  
Diatomic from J Dependence of  
Transition Intensities: Application  
to OH.  
AD-A209 894  
Reprint: The Dipole Moment,  
Function and Vibrational Transition  
Intensities of OH.  
AD-A209 895  
High Precision Dipole Moments in  
A 1(A2) Formaldehyde Determined via  
Stark Quantum Beat Spectroscopy.  
AD-A211 731
- \*DISPERSING  
Reprint: The Slowly Varying  
Phase Shift for Perturbed, Single  
and Multi-Phased, Strongly  
Nonlinear, Dispersive Waves.  
AD-A211 434
- \*DISPLACEMENT  
Reprint: Dimesitylsilyl  
Derivatives of Zirconium.  
AD-A208 932
- \*DISPLAY SYSTEMS  
Ratings of Kinetic Depth in  
Multi-Dot Displays.\*  
AD-A211 138
- \*DISTORTION  
Phase Compensation for High

SUBJECT INDEX-9  
UNCLASSIFIED EVI09K

CZO DIS

- Power Lasers Using Refracting Gas Prisms. \*  
AD-A209 869
- \*DISTRIBUTED DATA PROCESSING Parallel Processing and Learning in Simple Systems. \*  
AD-A210 225
- \*ELASTOMERS  
Reprint: Generate Reinforcing Particles in Place.  
AD-A209 656
- \*ELECTRIC FIELDS  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch. \*  
AD-A210 549  
Electromagnetic Pulse Interaction at a Dielectric Interface. \*  
AD-A211 081
- \*ELECTRIC SWITCHES  
Physics of High Energy Photoconductive Switches \*  
AD-A210 341  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch. \*  
AD-A210 549
- \*ELECTRICAL EQUIPMENT  
Electronics Research at the University of Texas at Austin. \*  
AD-A209 989
- \*ELECTRICAL IMPEDANCE  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch. \*  
AD-A210 549
- \*ELECTRICAL PROPERTIES  
Ultrastructure Processing and Characterization of Polymers. \*  
AD-A211 460
- \*ELECTROCHEMISTRY  
Reprint: Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
AD-A210 326  
Reprint: Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (electron Energy-Loss Spectra) Auger and LEED.  
AD-A210 509  
Reprint: Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
AD-A211 645  
Reprint: Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
AD-A211 674
- \*ELECTRODES  
Reprint: Comparison of Vacuum-Annealed and Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum.  
AD-A210 011  
Reprint: Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
AD-A210 325  
Reprint: Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
AD-A210 326  
Reprint: Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597  
Reprint: Raman Spectroscopy of
- Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
AD-A211 603  
Reprint: Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects.  
AD-A211 644  
Reprint: Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
AD-A211 645  
Reprint: Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
AD-A211 674  
Reprint: Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Aqueous Temperature Molten Salt.  
AD-A211 699
- \*ELECTROMAGNETIC FIELDS  
Electromagnetic Pulse Interaction at a Dielectric Interface. \*  
AD-A211 081
- \*ELECTROMAGNETIC PULSES  
Electromagnetic Pulse Interaction at a Dielectric Interface. \*  
AD-A211 081
- \*ELECTROMAGNETIC RADIATION  
Coupling between Radiation and Gas Dynamics. \*  
AD-A209 657  
Electromagnetic Pulse Interaction at a Dielectric Interface. \*  
AD-A211 081
- \*ELECTRON DIFFRACTION  
Reprint: Structure and

## UNCLASSIFIED

- Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
AD-A210 325
- \*ELECTRON EMISSION  
Plasma-Anode Electron Gun Research.\*  
AD-A211 547
- \*ELECTRON ENERGY  
Reprint: Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
AD-A210 325  
Physics of High Energy Photoconductive Switches.\*  
AD-A210 341
- \*ELECTRON GUNS  
Plasma-Anode Electron Gun Research.\*  
AD-A211 547
- \*ELECTRON IMPACT SPECTRA  
Ion Formation by Electron Impact.\*  
AD-A211 367
- \*ELECTRON TRANSFER  
Reprint: Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
AD-A211 603  
Reprint: Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
AD-A211 645  
Reprint: Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
AD-A211 674
- \*ELECTRON TRANSITIONS  
Reprint: Absolute Infrared Transition Moments for Open Shell Diatomics from J Dependence of Transition Intensities: Application to OH.  
AD-A209 894
- \*ELECTRONIC EQUIPMENT  
Electronics Research at the University of Texas at Austin.\*  
AD-A209 989
- \*ELECTRONIC STATES  
Reprint: Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209 039  
International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
AD-A210 400
- \*ELECTRONICS  
Electronics Research at the University of Texas at Austin.\*  
AD-A209 989
- \*ELECTROOPTICS  
Integrated Opto-Electronic Computing.\*  
AD-A209 936  
Reprint: Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials.  
AD-A210 298
- \*ELECTROPHYSIOLOGY  
Extrathalamic Modulation of Cortical Function.\*  
AD-A211 044
- \*ELECTROSTATIC CHARGE  
Reprint: Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahydroanes and Nitroazetetrahydroanes.  
AD-A211 667
- \*EMISSION SPECTRA  
Reprint: Emission Properties of Dioxorhenium(V) Complexes in Aqueous Solutions of Anionic and Monionic Surfactants: A Sensitive Probe of Hydrophobic Binding Regions.  
AD-A209 896  
Reprint: Dynamics of Flexible Triplet Biradicals.  
AD-A210 334
- \*ENERGETIC PROPERTIES  
Reprint: Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NFnH(5-n) Compounds.  
AD-A210 674
- \*ENERGY STORAGE  
Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.\*  
AD-A210 366
- \*ENERGY TRANSFER  
Reprint: Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane.  
AD-A210 290  
International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
AD-A210 400  
Reprint: Vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties.
- \*EPITHELIUM  
The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.\*  
AD-A209 834
- \*ERROR DETECTION CODES  
Research in Mathematics and Computer Science: Calculation of the Probability of Undetected Error

SUBJECT INDEX-1  
UNCLASSIFIED EV:09K

ELE ERR

## UNCLASSIFIED

- for Certain Error Detection Codes.  
Phase 1. \*  
AD-A210 302
- \*ESTIMATES  
Statistical Communication Theory  
and Robust Estimation. \*  
AD-A209 996  
Studies in Statistical Signal  
Processing. \*  
AD-A210 054  
Parameter Estimation in  
Functional and Partial Differential  
Equations. \*  
AD-A211 040
- \*ETHANES  
Reprint: Intramolecular Energy  
Transfer and Mode-Specific Effects  
in Unimolecular Reactions of 1,2-  
Difluoroethane.  
AD-A210 290
- \*ETHERS  
Reprints: Synthesis of Unusual  
Perfluorocarbon Ethers and Amines  
Constraining Bulky Fluorocarbon  
Groups New Biomedical Materials.  
AD-A211 576  
Reprint: Synthesis of Perfluoro  
Crown Ethers: A New Class of Cyclic  
Fluorocarbons.  
AD-A211 601
- \*EVASION  
A Simulation Study of Four Real-  
Time Heuristic Algorithms for  
Multiple Missile Evasion: A  
Game Theoretic Approach. \*  
AD-A211 093
- \*EXPERIMENTAL DESIGN  
Design of Experiments and  
Reliability Models. \*  
AD-A209 880
- \*EXPLOSION EFFECTS  
Reprint: Effects of Source Depth  
on Near-Source Seismograms.  
AD-A209 897
- \*EXPLOSIONS  
Deterministic and Stochastic  
Wavefields in the Near-Field from  
Explosive Sources. \*  
AD-A210 057
- \*EYE MOVEMENTS  
Eye Movements and Visual  
Information Processing. \*  
AD-A209 817  
Eye Movements and Spatial  
Pattern Vision. \*  
AD-A211 650
- \*FAULTS  
Fault Tolerant Multiprocessors  
and VLSI-Based Systems. \*  
AD-A209 579
- \*FERROELECTRIC MATERIALS  
Band Calculations on  
Ferroelectric and Piezoelectric  
Solids. \*  
AD-A210 143
- \*FILMS  
Development of Photodeposited  
Diamond Films. \*  
AD-A209 576
- \*FINITE ELEMENT ANALYSIS  
Efficient Finite Element  
Solution of Navier-Stokes Equations  
and Related Topics. \*  
AD-A211 647
- \*FLAMES  
Reprint: Laser-Induced Saturated  
Fluorescence of SrOH in Flames.  
AD-A211 389  
Premixed Turbulent Flame  
Propagation. \*  
AD-A211 489
- \*FLAPS (CONTROL SURFACES)  
Studies of Unsteady Vortex Flap  
Aerodynamics. \*  
AD-A209 837
- \*FLEXIBLE STRUCTURES  
Control and Optimization for
- Observations of Systems Governed by  
Controlled Partial Differential  
Equations. \*  
AD-A211 122
- \*FLIGHT SIMULATORS  
Study of the Design and  
Performance Characteristics of  
Aircraft Simulators. \*  
AD-A210 053
- \*FLOW  
Analysis of a Parallelized  
Nonlinear Elliptic Boundary Value  
Problem Solver with Application to  
Reacting Flows. \*  
AD-A211 487
- \*FLOW FIELDS  
Coupling between Radiation and  
Gas Dynamics. \*  
AD-A209 657  
Computational Methods for  
Complex Flowfields. \*  
AD-A211 485
- \*FLOW SEPARATION  
Separated Flows, Turbulence  
Production Mechanisms and Free  
Shear Layers. \*  
AD-A210 355
- \*FLUID DYNAMICS  
Development of Analytical and  
Semi-Numerical Methods of Flow  
Calculation. \*  
AD-A209 916  
International Conference on  
Numerical Grid Generation in  
Computational Fluid Dynamics. \*  
AD-A211 082  
Computational Methods for  
Complex Flowfields. \*  
AD-A211 485
- \*FLUID FLOW  
Effect of Body Forces on Motion  
and Heat Transfer of Confined  
Fluids. \*  
AD-A210 667

SUBJECT INDEX-12  
UNCLASSIFIED EVI09K

EST-FLU

## UNCLASSIFIED

- \*FLUORIDES  
 Reprint: The Effect of Fluoride on the Sol-Gel Process.  
 AD-A209 217  
 Reprint: The Pore Morphology of Fluoride Catalyzed Xerogels.  
 AD-A211 388  
 Reprint: The Effect of Fluoride on the Sol-Gel Process.  
 AD-A211 403
- \*FLUORINATED HYDROCARBONS  
 Reprint: Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane.  
 AD-A210 290  
 Reprints: Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.  
 AD-A211 576  
 Reprint: The Vibrational Spectrum of Tetrafluoropropyne.  
 AD-A211 586  
 Reprint: Synthesis of Perfluoro Crown Ethers: A New Class of Cyclic Fluorocarbons.  
 AD-A211 601  
 Synthesis and Chemistry of Strained and Conjugated Fluorocarbons.\*  
 AD-A211 633  
 Reprint: Alkylations of ((Diethoxyphosphinyl)difluoromethyl) zinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates.  
 AD-A211 702
- \*FLUORINE  
 Reprint: The Adsorption and Reaction of Fluorine on the Si(100) Surface.  
 AD-A211 595  
 Reprint: Synthesis of Perfluorotetraalkyl Orthocarbonates Using Elemental Fluorine.  
 AD-A211 600
- \*FLUORINE COMPOUNDS
- Reprints: Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.  
 AD-A211 576
- \*FLUOROPOLYMERS  
 Reprint: Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole: 2,4,7-Trinitrofluorenone Composite Polymer Photoconductor.  
 AD-A210 363
- \*FORMALDEHYDE  
 High Precision Dipole Moments in A 1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy.  
 AD-A211 731
- \*FOURIER ANALYSIS  
 Reprint: Psychophysical Studies of Shape with Fourier Descriptor Stimuli.  
 AD-A210 018  
 Fourier Analysis of the SOR iteration.\*  
 AD-A211 571
- \*FRACTURE(MECHANICS)  
 Stress Wave Induced Damage in Rock.\*  
 AD-A211 599
- \*FRAMES  
 Shape Description with a Space Variant Sensor: Algorithms for Scan Path, Fusion and Convergence Over Multiple Scans.\*  
 AD-A209 984
- \*FREE ELECTRON LASERS  
 Reprint: Tunable Microvibrators for Free-Electron Lasers.  
 AD-A209 062  
 Microwave Emission from Relativistic Electron Beams \*  
 AD-A209 653
- \*FREQUENCY
- Time-Frequency Factors in Auditory Perception.\*  
 AD-A211 491  
 Reprint: Decomposition of Normal Coordinate Vibrational Frequencies.  
 AD-A211 604
- \*FREQUENCY RESPONSE  
 Wave-Mode Coordinate Analysis of 'L' Junction in LSS.\*  
 AD-A211 116
- \*GALLIUM ARSENIDES  
 Transport and Submillimeter Wave Spectroscopy of GaAs/Al sub xGa sub 1-x and In sub x Ga sub 1-x As Heterostructures.\*  
 AD-A209 836
- \*GAME THEORY  
 A Simulation Study of Four Real Time Heuristic Algorithms for Multiple Missile Evasion: A Game Theoretic Approach.\*  
 AD-A211 093
- \*GAS DYNAMIC LASERS  
 Laser Mixing Processes.\*  
 AD-A209 870
- \*GAS DYNAMICS  
 Coupling between Radiation and Gas Dynamics.\*  
 AD-A209 657
- \*GELATION  
 Reprint: The Effect of Fluoride on the Sol-Gel Process.  
 AD-A209 217  
 Reprint: The Effect of Fluoride on the Sol-Gel Process.  
 AD-A211 403  
 Reprint: The Structural and Dynamical Properties of the Sol-Gel Transition.  
 AD-A211 510
- \*GERMANIUM COMPOUNDS  
 Reprint: AM1 Calculations for Compounds Containing Germanium.  
 AD-A211 066

SUBJECT INDEX-13  
 UNCLASSIFIED EVI09K

FLU GER

## UNCLASSIFIED

- \* INVERSE SCATTERING  
Inverse Scattering: Ionospheric Structure Determination.\*  
AD-A209 063  
The Inverse Scattering Problem for Acoustic and Electromagnetic Waves.\*  
AD-A209 202  
Reprint: The Inverse Scattering Problem for Time-Harmonic Acoustic Waves in an Inhomogeneous Medium: Numerical Experiments.  
AD-A210 848
- \* IODINE COMPOUNDS  
Reprint: Reaction of E-1,4-Poly(2-Triethylsilyl-1,3-Butadiene) with Iodine Monochloride.  
AD-A209 899
- \* ION BEAMS  
Reprint: Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).  
AD-A210 858
- \* ION EXCHANGE RESINS  
Reprint: Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
AD-A208 889
- \* IONOSPHERE  
Inverse Scattering: Ionospheric Structure Determination.\*  
AD-A209 063
- \* IONOSPHERIC MODELS  
Development of Computer Codes to Model Dynamics of the Earth's Magnetosphere.\*  
AD-A211 532
- \* IRON COMPOUNDS  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes;  
AD-A210 847
- Crystal Structure of (NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4)(Mu-Sigma. Sigma: Eta 5 - C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>8</sub>).  
AD-A210 340  
Reprint: Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597
- \* IRRADIATION  
An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.\*  
AD-A211 406
- \* ISOMERIZATION  
Reprint: Intrinsic Reaction Coordinate Calculations for Very Flat Potential Energy Surfaces: Application to Singlet S12H2 Isomerization.  
AD-A211 673
- \* ISOTOPE EFFECT  
Reprint: Dynamics of Flexible Triplet Biradicals.  
AD-A210 334
- \* ITERATIONS  
Fourier Analysis of the SOR iteration.\*  
AD-A211 571
- \* JET AIRCRAFT NOISE  
Aerodynamically Generated Sound and Subsonic Aerodynamics.\*  
AD-A209 920
- \* JET ENGINE INLETS  
Separated Flows, Turbulence Production Mechanisms and Free Shear Layers.\*  
AD-A210 355
- \* JUNCTIONS  
SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607
- \* LAGRANGIAN FUNCTIONS  
Reprint: The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves.  
AD-A211 434
- \* LASER APPLICATIONS  
Laser Physics and Laser Techniques.\*  
AD-A211 117
- \* LASER INDUCED FLUORESCENCE  
Reprint: Laser-Induced Saturated Fluorescence of SrOH in Flames.  
AD-A211 389  
Reprint: Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.  
AD-A211 563
- \* LEAD(METAL)  
Reprint: Synthesis of Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672
- \* LEARNING  
The Back Propagation Technique for Modeling Cortical Computation.\*  
AD-A209 855  
Parallel Processing and Learning in Simple Systems.\*  
AD-A210 225  
Synaptic Plasticity and Memory Formation.\*  
AD-A211 368
- \* LIFE TESTS  
Nonparametric and Sequential Analysis of Life Testing and Reliability Problems.\*  
AD-A209 867
- \* LIGANDS  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
AD-A210 847

SUBJECT INDEX-16  
UNCLASSIFIED EVI09K

INV LIG

## UNCLASSIFIED

- \*LIGHT  
The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.\*  
AD-A209 834
- \*LIMESTONE  
Stress Wave Induced Damage in Rock.\*  
AD-A211 599
- \*LINEAR ALGEBRA  
Studies in Statistical Signal Processing.\*  
AD-A210 054  
Polynomial Approximation of Functions of Matrices and Its Application to the Solution of a General System of Linear Equations.\*  
AD-A211 390
- \*LINEAR FILTERING  
Statistical Communication Theory and Robust Estimation.\*  
AD-A209 996
- \*LIPID METABOLISM  
Perfluorodecanoic Acid and Lipid Metabolism in the Rat.\*  
AD-A210 007
- \*LIQUID CRYSTALS  
Reprint: Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.  
AD-A210 601  
Reprint: Rheological Properties of Nematic Solutions of Rodlike Polymers.  
AD-A210 602  
Reprint: Studies on Aligned Nematic Solutions of a Rodlike Polymer.  
AD-A210 603  
Reprint: Liquid Crystalline Phosphazenes: High Polymeric and Cyclic Trimeric Systems with Aromatic Azobenzene Groups.  
AD-A210 673
- \*MAGNETIC FIELDS  
Electromagnetic Pulse Interaction at a Dielectric Interface.\*  
AD-A211 081
- \*MAGNETIC PROPERTIES  
High Temperature Superconducting Compounds.\*  
AD-A211 511
- \*MAGNETOSPHERE  
Development of Computer Codes to Model Dynamics of the Earth's Magnetosphere.\*  
AD-A211 532
- \*MANAGEMENT  
Support of Travel for U.S. Participants in 5th International Biophysics Congress (5th) Held in Copenhagen, Denmark 4-9 August 1975.\*  
AD-A210 004
- \*MAP READING  
Topographic Map Reading.\*  
AD-A211 269
- \*MAPPING  
A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.\*  
AD-A210 008  
The Generalized Map Makers Problem: Optimal Flattening of Polyhedral Surfaces.\*  
AD-A210 013
- \*MAPS  
Reprint: Towards a Non-Network Approach to Neural Modeling: Some Basic Issues of Measurement, Simulation and Computational Significance of Brain Maps.  
AD-A209 982
- \*MASERS  
Microwave Emission from Relativistic Electron Beams.\*  
AD-A209 653
- \*MASKING  
Binaural Masking: An Analysis of Models.\*  
AD-A211 578
- \*MASS  
Wave-Mode Coordinate Analysis of 'L' Junction in LSS.\*  
AD-A211 118
- \*MASS SPECTROMETERS  
State-Resolved Reaction Dynamics.\*  
AD-A211 613
- \*MASS SPECTROMETRY  
Reprint: The Adsorption and Reaction of Fluorine on the Si(100) Surface.  
AD-A211 595
- \*MATERIALS  
Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.\*  
AD-A211 324
- \*MATHEMATICAL MODELS  
The Back Propagation Technique for Modeling Cortical Computation.\*  
AD-A209 855  
Statistical Communication Theory and Robust Estimation.\*  
AD-A209 998  
Monte Carlo Reliability Analysis.\*  
AD-A210 052  
Reprint: The Verification of Numerical Models with Multivariate Randomized Block Permutation Procedures.  
AD-A211 539  
Reprint: Aircraft Sortie Effectiveness Model.  
AD-A211 594
- \*MATRICES (MATHEMATICS)  
Polynomial Approximation of

SUBJECT INDEX-17  
UNCLASSIFIED EV109K

LIG MAI

## UNCLASSIFIED

- Functions of Matrices and Its Application to the Solution of a General System of Linear Equations.  
 AD-A211 390
- \*MATRIX THEORY  
 Reprint: Rank-Preserving Extensions of Band Matrices.  
 AD-A211 531
- \*MELTS  
 Reprint: Donor-Acceptor Properties of Ambient-Temperature Chloroaluminate Melts.  
 AD-A211 525  
 Reprint: 1-Methyl-3-Ethylimidazolium Hydrogen Dichloride: Synthesis and Application to the Study of Protons in Ambient-Temperature Chloroaluminate Ionic Liquids.  
 AD-A211 528  
 Reprint: Reaction of Protons and Molybdenum Divers in an Ambient-Temperature Molten Salt.  
 AD-A211 698
- \*MEMORY (PSYCHOLOGY)  
 Attention, Imagery and Memory: A Neuromagnetic Investigation.\*  
 AD A209 917  
 Synaptic Plasticity and Memory Formation.\*  
 AD-A211 368  
 Metacognition and Retrieval from Long-Term Memory at Mount Everest.\*  
 AD-A211 629
- \*MENTAL ABILITY  
 Models of Mental Functioning.\*  
 AD-A210 456
- \*MESH  
 High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.  
 AD-A211 691
- \*METAL COMPLEXES  
 Reprint: Sigma Bond Metathesis  
 Reprint: Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr-NSi-t-BU<sub>3</sub>.  
 AD-A210 364
- Reactions of Si-H and M-Si Bonds New Routes to diO Metal Silyl Complexes  
 AD-A210 065  
 Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86  
 Alkylidyne(Carborane)Molybdenum Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4)(Mu-Sigma: Sigma: Eta 5 - C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>8</sub>).  
 AD-A210 340  
 Reprint: Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr-NSi-t-BU<sub>3</sub>.  
 AD-A210 364  
 Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
 AD-A210 847  
 Reprint: Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me<sub>3</sub>CO)<sub>3</sub>ZrSi(SiMe)<sub>3</sub>.  
 AD-A211 095
- \*METALS  
 Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.\*  
 AD-A211 737
- \*METEOROLOGICAL DATA  
 Reprint: Mapping the Wind in the Polar Atmosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
 AD-A211 087
- \*METHANE  
 Reprint: Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr-NSi-t-BU<sub>3</sub>.  
 AD-A210 364
- \*METHANES  
 Reprint: Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
 AD-A211 268
- \*METHYL RADICALS  
 Reprint: Use of 2-D INEPT-INADEQUATE 29Si NMR to Determine Structures of Organosilicon Rings.  
 AD-A211 100  
 Reprint: The Vibrational Spectrum of Tetrafluoropropyne.  
 AD-A211 596
- \*MICROSTRUCTURE  
 Influence of Microstructure and Microdamage Processes on Fracture at High Loading Rates.\*  
 AD-A210 307
- \*MICROWAVE AMPLIFIERS  
 Microwave Emission from Relativistic Electron Beams.\*  
 AD-A209 653
- \*MICROWAVE EQUIPMENT  
 A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.\*  
 AD-A209 942
- \*MILLIMETER WAVES  
 A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.\*  
 AD-A209 942
- \*MINIATURIZATION  
 Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.

SUBJECT INDEX-18  
 UNCLASSIFIED EV109K

MAT MIN

## UNCLASSIFIED

- AD-A209 875  
 \*MISSIONS  
 Reprint: Aircraft Sortie Effectiveness Model.  
 AD-A211 594
- \*MIXING  
 SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
 AD-A211 607
- \*MODULUS OF ELASTICITY  
 Reprint: Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl).  
 AD-A210 546
- \*MOLECULAR BEAMS  
 International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
 AD-A210 400  
 Reprint: The Absorption and React on of Fluorine on the Si(100) Surface.  
 AD-A211 595
- \*MOLECULAR COMPLEXES  
 Reprint: Coupled-Cluster Methods That Include Connected Quadruple Excitations. T4: CCSDTQ-1 and Q(CCSDT).  
 AD-A211 538
- \*MOLECULAR PROPERTIES  
 Reprint: vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties.  
 AD-A211 675
- \*MOLECULAR ROTATION  
 Reprint: He2-(4II sub g) Yields He2(X1 Sigma+) Autodetachment Energy Spectrum: Assessment of the He2- and He2 Ground-State Potentials.  
 AD-A209 983
- AD-A209 983  
 \*MOLECULAR SPECTROSCOPY  
 Resonant and Non-Resonant Optical Frequency Mixing in Simple Molecular Systems.\*  
 AD-A210 191  
 International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
 AD-A210 400
- \*MOLECULAR STRUCTURE  
 Reprint: Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
 AD-A208 989  
 Reprint: Three-, Four-, and Five-Membered Rings from Disitenes.  
 AD-A209 904  
 Reprint: Cope Rearrangement of 3,3-Dicyanohexa-1,5-diene.  
 AD-A211 023  
 Ultrastructure Processing and Characterization of Polymers.\*  
 AD-A211 460  
 Reprint: The Structural and Dynamical Properties of the Sol-Gel Transition.  
 AD-A211 510  
 Reprint: Decomposition of Normal-Coordinate Vibrational Frequencies.  
 AD-A211 604  
 Reprint: Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahydrofuranes and Nitroazetetrhydrofuranes.  
 AD-A211 667
- \*MOLECULAR VIBRATION  
 Reprint: He2-(4II sub g) Yields He2(X1 Sigma+) Autodetachment Energy Spectrum: Assessment of the He2- and He2 Ground-State Potentials.  
 AD-A209 983  
 Unimolecular Dynamics Following Vibrational Overtone Excitation of
- HN3 v1=5 and v1=6: HN3(X, v, J, K) Yields HN(X(3)Sigma-(V, J, Omega)+N2(X(1)Sigma+g).  
 AD-A210 001  
 International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
 AD-A210 400
- \*MOLTEN SALTS  
 Reprint: The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
 AD-A211 541  
 Reprint: Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Am Ient Temperature Molten Salt.  
 AD-A211 699
- \*MOLYBDENUM  
 Reprint: Reaction of Protons and Molybdenum Divers in an Ambient-Temperature Molten Salt.  
 AD-A211 698
- \*MOLYBDENUM COMPOUNDS  
 Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86.  
 Alkylidyne(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NEt4)(MoFe2(Mu3-CC6H4Me-4)(Mu-Sigma: Sigma: Eta 5-C2B9H7Me2)(CO)8).  
 AD-A210 340  
 Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
 AD-A210 847
- \*MONOLITHIC STRUCTURES(ELECTRONICS)  
 Electronics Research at the University of Texas at Austin.

SUBJECT INDEX-19

UNCLASSIFIED EVI09K

MIS MUN

## UNCLASSIFIED

- AD-A209 989
- \*MONTE CARLO METHOD  
Monte Carlo Reliability  
Analysis.\*  
AD-A210 052
- \*MOTION  
Reprint: The Perception of  
Moving Plaids Reveals Two Motion-  
Processing Stages.  
AD-A210 064  
Visual Motion Perception.\*  
AD-A210 994  
Reprint: Second-Order Motion  
Perception: Space/Time Separable  
Mechanisms.  
AD-A211 028  
Reprint: Drift-Balanced Random  
Stimuli: A General Basis for  
Studying Non-Fourier Motion  
Perception.  
AD-A211 063  
Reprint: Two Motion Perception  
Mechanisms Revealed Through  
Distance-Driven Reversal of  
Apparent Motion.  
AD-A211 214  
Kinetic Depth Effect and Optic  
Flow 1. 3D Shape from Fourier  
Motion.\*  
AD-A211 260
- \*MOUNTAINS  
Reprint: Heavy Rainfall in  
Complex Terrain: Insights from a  
Numerical Model.  
AD-A211 530
- \*MOVING TARGETS  
A Simulation Study of Four Real-  
Time Heuristic Algorithms for  
Multiple Missile Evasion: A  
Game Theoretic Approach.\*  
AD-A211 093
- \*MULTIPROCESSORS  
Fault Tolerant Multiprocessors  
and VLSI-Based Systems.\*  
AD-A209 579
- \*MULTIVARIATE ANALYSIS  
Hyperdimensional Data Analysis  
and Structural Inference.\*  
AD-A210 056  
Life Testing, Reliability, and  
Multivariate Nonparametric  
Methods.\*  
AD-A210 147
- \*MYOCARDIAL INFARCTION  
24-Hour Mean Plasma Hormone  
Levels in Men with Coronary Heart  
Disease.\*  
AD-A209 868
- \*NAVIER STOKES EQUATIONS  
Efficient Finite Element  
Solution of Navier-Stokes Equations  
and Related Topics.\*  
AD-A211 647
- \*NEOPLASMS  
Molecular Toxicology of  
Chromatin.\*  
AD-A211 156
- \*NERVE CELLS  
An Investigation into the  
Effects of Peptide  
Neurotransmitters and Intracellular  
Second Messengers in Rat Central  
Neurons in Culture.\*  
AD-A211 030  
Biological Investigations of  
Adaptive Networks: Neuronal Control  
of Conditioned Responses.\*  
AD-A211 043  
Extrathalamic Modulation of  
Cortical Function.\*  
AD-A211 044
- \*NERVE FIBERS  
Heterosynaptic Modulation of  
Long-Term Potentiation at Mossy  
Fiber Synapses in Hippocampus.\*  
AD-A209 835
- \*NERVE IMPULSES  
Modulation of Spontaneous Brain  
Activity During Mental Imagery.\*  
AD-A209 918
- \*NERVE TRANSMISSION  
Heterosynaptic Modulation of  
Long-Term Potentiation at Mossy  
Fiber Synapses in Hippocampus.\*  
AD-A209 835  
Extrathalamic Modulation of  
Cortical Function.\*  
AD-A211 044  
Synaptic Plasticity and Memory  
Formation.\*  
AD-A211 368  
The Role of Central  
Monoaminergic Systems in Arousal  
and Selective Attention.\*  
AD-A211 371
- \*NETWORK ANALYSIS(MANAGEMENT)  
Basic Research in Reliability  
for Real Systems.\*  
AD-A209 649
- \*NETWORK FLOWS  
Stochastic Flows in Networks.\*  
AD-A211 209
- \*NEURAL NETS  
Modulation of Spontaneous Brain  
Activity During Mental Imagery.\*  
AD-A209 918
- \*NEUROBIOLOGY  
Reprint: Cepstral Filtering on a  
Columnar Image Architecture: A Fast  
Algorithm for Binocular Stereo  
Segmentation.  
AD-A210 574
- \*NEUROCHEMISTRY  
Visualizing and Rhyming Cause  
Differences in Alpha Suppression.\*  
AD-A210 005  
Synaptic Plasticity and Memory  
Formation.\*  
AD-A211 368  
The Role of Central  
Monoaminergic Systems in Arousal  
and Selective Attention.\*  
AD-A211 371
- \*NEUROMUSCULAR TRANSMISSION  
An Investigation into the

SUBJECT INDEX-20  
UNCLASSIFIED EVI09K

MON NEU

## UNCLASSIFIED

- Effects of Peptide Neurotransmitters and Intracellular Second Messengers in Rat Central Neurons in Culture.\*  
AD-A211 030
- \*NEUROPHYSIOLOGY  
Modulation of Spontaneous Brain Activity During Mental Imagery.\*  
AD-A209 918  
Biological Investigations of Adaptive Networks: Neuronal Control of Conditioned Responses.\*  
AD-A211 043  
Synaptic Plasticity and Memory Formation.\*  
AD-A211 368
- \*NIOBIUM  
An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.\*  
AD-A211 406
- \*NIOBIUM ALLOYS  
Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.\*  
AD-A209 934
- \*NITRO RADICALS  
Reprint: Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahydrofuran and Nitroazetetrathranes.  
AD-A211 667
- \*NITROGEN  
Coupling between Radiation and Gas Dynamics.\*  
AD-A209 657
- \*NITROGEN COMPOUNDS  
Reprint: Ab Initio Studies of Molecular Structures and Energetics 3. Pentacoordinated MF<sub>n</sub>H(5-n) Compounds.
- AD-A210 674
- \*NOISE (ELECTRICAL AND ELECTROMAGNETIC) SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607
- \*NONLINEAR ANALYSIS  
Some Problems in Nonlinear Analysis.\*  
AD-A209 991
- \*NONLINEAR SYSTEMS  
Statistical Communication Theory and Robust Estimation.\*  
AD-A209 996  
SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607
- \*NONPARAMETRIC STATISTICS  
Nonparametric and Sequential Analysis of Life Testing and Reliability Problems.\*  
AD-A209 867  
Life Testing, Reliability, and Multivariate Nonparametric Methods.\*  
AD-A210 147
- \*NOREPINEPHRINE  
The Role of Central Monoaminergic Systems in Arousal and Selective Attention.\*  
AD-A211 371
- \*NUCLEAR MAGNETIC RESONANCE  
Reprint: Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds.  
AD-A210 010
- \*NUMERICAL ANALYSIS  
Studies in Statistical Signal Processing.\*  
AD-A210 054  
International Conference on Numerical Grid Generation in Computational Fluid Dynamics.\*  
AD-A211 082
- \*NUMERICAL METHODS AND PROCEDURES  
Computational Methods for Complex Flowfields.\*  
AD-A211 485
- \*OPTICAL CIRCUITS  
Reprint: Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials.  
AD-A210 298
- \*OPTICAL DETECTORS  
Kinetic Depth Effect and Optic Flow 1. 3D Shape from Fourier Motion.\*  
AD-A211 260
- \*OPTICAL IMAGES  
Pre-Attentive and Attentive Visual Information Processing.\*  
AD-A209 884  
Attention, Imagery and Memory: A Neuromagnetic Investigation.\*  
AD-A209 917
- \*OPTICAL PROCESSING  
Integrated Opto-Electronic Computing.\*  
AD-A209 936
- \*OPTICAL PROPERTIES  
Reprint: Ultrafast Third-Order Non-Linear Optical Processes in Polymeric Films.  
AD-A210 336  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.\*  
AD-A210 549  
Ultrastructure Processing and Characterization of Polymers.\*  
AD-A211 460
- \*OPTICAL PUMPING  
Optical Production of Negative Ions.\*  
AD-A210 234
- \*OPTIMIZATION  
Control and Optimization for

SUBJECT INDEX-21  
UNCLASSIFIED EVI09K

NEU OPT

## UNCLASSIFIED

- Observations of Systems Governed by Controlled Partial Differential Equations.\*  
AD-A211 122
- \*ORGANIC COMPOUNDS  
Reprint: Lewis Base Adducts to Diorganosilylenes.  
AD-A209 631  
Reprint: Ultrafast Third-Order Non-Linear Optical Processes in Polymeric Films.  
AD-A210 336  
Reprint: Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisilolidine and 1,3,4,2,5-Dioxazadisilolidine.  
AD-A211 096  
Reprint: Synthesis of (Sulfodifluoromethyl)Phosphonic Acid.  
AD-A211 524  
Reprint: Structures of Two Organosilyl Azides.  
AD-A211 632  
Reprint: Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahydro- and Nitroazetetrahydro-  
AD-A211 667
- \*ORGANOMETALLIC COMPOUNDS  
Reprint: ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (SiOx)3Ta (SiOx = t-Bu3SiO-).  
AD-A209 887  
Reprint: Synthesis of Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672
- \*OXIDATION RESISTANCE  
Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.\*  
AD-A209 934
- \*OXIDES  
Reprint: Emission Properties of Dioxorhenium(V) Complexes in Aqueous Solutions of Anionic and Nonionic Surfactants: A Sensitive Probe of Hydrophobic Binding Regions.  
AD-A209 896
- \*OXYGEN  
Reprint: Carbon Monoxide-Oxygen Interaction on the Pt(111) Surface: An Electron Stimulated Desorption Ion Angular Distribution (ESDIAD) study.  
AD-A211 088
- \*PACKING DENSITY  
Reprint: Comparison of Vacuum-Annealed and Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum.  
AD-A210 011
- \*PARALLEL PROCESSING  
Parallel Processing and Learning in Simple Systems.\*  
AD-A210 225  
The Force on the Flex: Global Parallelism and Portability.\*  
AD-A211 391  
Analysis of a Parallelized Nonlinear Elliptic Boundary Value Problem Solver with Application to Reacting Flows.\*  
AD-A211 487  
Parallel Computation with the Force.\*  
AD-A211 488  
Multiprocessor Sparse L/U decomposition with Controlled Fill-In.\*  
AD-A211 570
- \*PARAMETRIC ANALYSIS  
Parameter Estimation in Functional and Partial Differential Equations.\*  
AD-A211 040
- \*PARTIAL DIFFERENTIAL EQUATIONS  
Probabilistic Analysis of Semilinear Partial Differential Equations.\*  
AD-A209 903  
Wavefront Propagation for Reaction-Diffusion Systems of PDE.\*  
AD-A210 862  
Control and Optimization for Observations of Systems Governed by Controlled Partial Differential Equations.\*  
AD-A211 122
- \*PARTICLE COLLISIONS  
Reprint: Recent Progress in the Theory of Laser-Assisted Collisions.  
AD-A210 636
- \*PARTICLE TRAJECTORIES  
Plasma-Anode Electron Gun Research.\*  
AD-A211 547
- \*PATHS  
Sensitivity evaluation Plan for Lowtran.\*  
AD-A211 484
- \*PATTERN RECOGNITION  
Eye Movements and Spatial Pattern Vision.\*  
AD-A211 650
- \*PENTAFLUORIDES  
Reprint: Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NFnH(5-n) Compounds.  
AD-A210 674
- \*PEPTIDES  
An Investigation into the Effects of Peptide Neurotransmitters and Intracellular Second Messengers in Rat Central Neurons in Culture.\*  
AD-A211 030
- \*PERCEPTION(PSYCHOLOGY)

SUBJECT INDEX-22  
UNCLASSIFIED EVI09K

ORG PER

## UNCLASSIFIED

- Attention and Vigilance in  
Speech Perception.\*  
AD-A210 493
- The Kinetic Depth Effect and  
Identification of Shape.\*  
AD-A211 481
- \*PERFORMANCE TESTS  
Slope-Controlled Performance  
Testing.\*  
AD-A211 041
- \*PHASE DISTORTION  
Phase Compensation for High  
Power Lasers Using Refracting Gas  
Prisms.\*  
AD-A209 869
- \*PHASE SHIFT  
Phase Compensation for High  
Power Lasers Using Refracting Gas  
Prisms.\*  
AD-A209 869
- \*PHASE TRANSFORMATIONS  
Solidation Front/Viscous Phase  
Transitions, Forwards-Backward Heat  
Equations.\*  
AD-A211 068
- Reprint: The Structural and  
Dynamical Properties of the Sol-Gel  
Transition.  
AD-A211 510
- \*PHOSPHAZENE  
Reprint: Synthesis of  
Polyphosphazenes Bearing Geminal  
(Trimethylsilyl)methylene and Alkyl  
or Phenyl Side Groups.  
AD-A209 261
- Reprint: Liquid Crystalline  
Phosphazenes, High Polymeric and  
Cyclic Trimeric Systems with  
Aromatic Azo Side Groups.  
AD-A210 673
- \*PHOSPHONATES  
Reprint: Alkylations of  
(Diethoxyphosphinyl)difluoromethyl  
zinc Bromide as a Convenient Route  
to 1,1-Difluoro-3-
- alkenephosphonates.  
AD-A211 702
- \*PHOSPHONIC ACIDS  
Reprint: Synthesis of  
(Sulfo)difluoromethyl)phosphonic  
Acid.  
AD-A211 524
- \*PHOSPHORUS  
Reprint: AM1 Parameters for  
Phosphorus.  
AD-A211 033
- \*PHOTOCHEMICAL REACTIONS  
Reprint: Dimesitylsilyl  
Derivatives of Zirconium.  
AD-A208 932
- Reprint: Sigma Bond Metathesis  
Reactions of Si-H and M-Si Bonds.  
New Routes to d(0) Metal Silyl  
Complexes.  
AD-A210 065
- Reprint: Photochemistry of  
Dibenzyl Ketone Adsorbed on  
Size/Shape Selective Faujasite  
Zeolites. Steric Effects on Product  
Distributions.  
AD-A211 376
- \*PHOTOCONDUCTIVITY  
Physics of High Energy  
Photoconductive Switches.\*  
AD-A210 341
- \*PHOTOCONDUCTORS  
Reprint: Picosecond Degenerate  
Four-Wave Mixing Study of Nonlinear  
Optical Properties of the Poly-N-  
Vinyl Carbazole: 2,4,7-  
Trinitrofluorenone Composite  
Polymer Photoconductor.  
AD-A210 363
- \*PHOTODETECTORS  
Laser Physics and Laser  
Techniques.\*  
AD-A211 117
- \*PHOTOELECTRIC CRYSTALS  
Band Calculations on  
Ferroelectric and Piezoelectric  
Solids.\*
- Studies of High Power Density.
- Pico-Second Rise-Time Light  
Activated Semiconductor Switch.\*  
AD-A210 549
- \*PHOTODISSOCIATION  
Reprint: Photodetachment Cross  
Sections of Negative Halogen Ions  
in Discharge Media.  
AD-A209 343
- Unimolecular Dynamics Following  
Vibrational Overtone Excitation of  
HN3 v1=5 and v1=6: HN3(X,V,J,K)  
Yields HN(X(3)Sigma-  
(V,J,Omega)+N2(X(1)Sigma+g).  
AD-A210 001
- Reprint: Energetics and Spin-  
and Lambda-Doublet Selectivity in  
the Infrared Multiphoton  
Dissociation DN3 yields DN(X 3  
Sigma(-), a 1 Delta) + N2(X 1 Sigma  
g (+)): Experiment.  
AD-A210 250
- Reprint: Observation of NH(a1  
Delta, v=1) from the H + N3  
Reaction.  
AD-A210 681
- \*PHOTOIONIZATION  
Reprint: Quantum  
Electrodynamical Approach to  
Multiphoton Ionization in the High-  
Intensity Field.  
AD-A209 082
- State-Resolved Reaction  
Dynamics.\*  
AD-A211 613
- \*PHOTOLYSIS  
Reprint: Photochemical Probes  
for Structure of Zeolites and for  
Dynamics of Reactions of Molecules  
Adsorbed on Porous Solids.  
AD-A208 989
- Reprint: Lewis Base Adducts to  
Diorganosilylenes.  
AD-A209 631
- \*PIEZOELECTRIC CRYSTALS  
Band Calculations on  
Ferroelectric and Piezoelectric  
Solids.\*

SUBJECT INDEX-23

UNCLASSIFIED EVI09K

PER PIE

UNCLASSIFIED

- AD-A210 143
- \*PIEZOELECTRIC MATERIALS  
Band Calculations on  
Ferroelectric and Piezoelectric  
Solids.\*  
AD-A210 143
- \*PIGMENTS  
The Phototoxicity of Blue Light  
on the Functional Properties of the  
Retinal Pigment Epithelium.\*  
AD-A209 834
- \*PIN DIODES  
Studies of High Power Density,  
Pico-Second Rise-Time Light  
Activated Semiconductor Switch.\*  
AD-A210 549
- \*PITCH(MOTION)  
Control of Turbulent Mixing  
Layers.\*  
AD-A211 413
- \*PLASMA DIAGNOSTICS  
Process Diagnostics: Materials,  
Combustion Fusion. Volume 117.  
Materials Research Society.\*  
AD-A211 324
- \*PLASMA JETS  
Plasma-Anode Electron Gun  
Research.\*  
AD-A211 547
- \*PLASMAS(PHYSICS)  
Coupling between Radiation and  
Gas Dynamics.\*  
AD-A209 657  
Optical Production of Negative  
Ions.\*  
AD-A210 234
- \*POLYATOMIC MOLECULES  
Reprint: Vibrationally Excited  
Formaldehyde: The Relationship  
between Vibrational Structure and  
Collisional Properties.  
AD-A211 675
- \*POLYBUTADIENE  
Reprint: Reduction Silylation of  
Chloroprene.  
AD-A209 888  
Reprint: Reaction of E-1,4-  
Poly(2-Triethylsilyl-1,3-Butadiene)  
with Iodine Monochloride.  
AD-A209 899
- \*POLYCYCLIC COMPOUNDS  
Reprint: DEWAR-PI Study of  
Electrophilic Substitution in  
Selected Polycyclic Fluoranthene  
Hydrocarbons.  
AD-A211 121
- \*POLYMERIC FILMS  
Reprint: Ultrafast Third-Order  
Non-Linear Optical Processes in  
Polymeric Films.  
AD-A210 336  
Reprint: Picosecond Laser-  
Induced Transient Grating Probe of  
the Mechanical Properties of High-  
Modulus Poly(p-  
phenylenebenzobisoxazole-2,6-diyl).  
AD-A210 546
- \*POLYMERIZATION  
Reprint: The Effect of Fluoride  
on the Sol-Gel Process.  
AD-A209 217  
Reprint: Synthesis of  
Polyphosphazenes Bearing Geminal  
(Trimethylsilyl)methylene and Alkyl  
or Phenyl Side Groups.  
AD-A209 261  
Reprint: Molecular Theories of  
Rubberlike Elasticity and Some  
Recent Results on Model Networks  
and Unusual Fillers.  
AD-A209 633
- \*POLYMERS  
Reprint: Properties of Solutions  
of Rodlike Chains from Dilute  
Solutions to the Nematic State.  
AD-A210 601  
Reprint: Rheological Properties  
of Nematic Solutions of Rodlike  
Polymers.
- AD-A210 602  
Reprint: Liquid Crystalline  
Phosphazenes. High Polymeric and  
Cyclic Trimeric Systems with  
Aromatic Azo Side Groups.  
AD-A210 673  
Reprint: The Pore Morphology of  
Fluoride Catalyzed Xerogels.  
AD-A211 388  
Ultrastructure Processing and  
Characterization of Polymers.\*  
AD-A211 460
- \*POLYNOMIALS  
Studies in Statistical Signal  
Processing.\*  
AD-A210 054
- \*POLYPHENYLENES  
Reprint: Picosecond Laser-  
Induced Transient Grating Probe of  
the Mechanical Properties of High-  
Modulus Poly(p-  
phenylenebenzobisoxazole-2,6-diyl).  
AD-A210 546  
Reprint: Studies on Aligned  
Nematic Solutions of a Rodlike  
Polymer.  
AD-A210 603
- \*POTENTIAL ENERGY  
Reprint: Computational Analysis  
of the Structures, Bond Properties,  
and Electrostatic Potentials of  
Some Nitrotetrahydrazes and  
Nitroazetetrahydrazes.  
AD-A211 667  
Reprint: Intrinsic Reaction  
Coordinate Calculations for Very  
Flat Potential Energy Surfaces:  
Application to Singlet S12H2  
Isomerization.  
AD-A211 673
- \*PROBABILITY  
Probabilistic Analysis of  
Semilinear Partial Differential  
Equations.\*  
AD-A209 903
- \*PSYCHOMOTOR TESTS

SUBJECT INDEX-24  
UNCLASSIFIED EVI09K

PIE-PSY

## UNCLASSIFIED

Eye Movements and Visual Information Processing.\*  
AD-A209 817

## \*PSYCHOPHYSICS

Reprint: Cepstral Filtering on a Columnar Image Architecture: A Fast Algorithm for Binocular Stereo Segmentation.  
AD-A210 574

## \*PSYCHOPHYSIOLOGY

Cognitive and Neural Bases of Skilled Performance.\*  
AD-A210 851  
Institute for the Study of Human Capabilities Summary Descriptions of Research for the Period September 1988 through June 1989.\*  
AD-A211 232

## \*PYRIDINES

Reprint: ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (Si10x)3Ta (Si10x = t-Bu3Si0-).  
AD-A209 887

## \*QUADRUPOLE MOMENT

Reprint: Coupled-Cluster Methods That Include Connected Quadruple Excitations. T4: CCSDTQ-1 and Q(CCSDT).  
AD-A211 538

## \*QUANTUM CHEMISTRY

Reprint: Use of Quantum Mechanical Models in Studies of Reaction Mechanisms.  
AD-A208 930  
Reprint: Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NF<sub>3</sub>(5-n) Compounds.  
AD-A210 674  
Reprint: AM1 Calculations for Compounds Containing Germanium.  
AD-A211 066  
Reprint: Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-

1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211 268

## \*QUANTUM ELECTRODYNAMICS

Reprint: Quantum Electrodynamical Approach to Multiphoton Ionization in the High-Intensity Field.  
AD-A209 082

## \*QUANTUM ELECTRONICS

SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607

## \*QUANTUM THEORY

Reprint: Use of Quantum Mechanical Models in Studies of Reaction Mechanisms.  
AD-A208 930  
Reprint: Spin Statistics: An Error in Landau and Lifachitz' Quantum Mechanics.  
AD-A211 602

## \*QUEUEING THEORY

Discrete Time Analysis of a Shut Down Queueing Systems.\*  
AD-A209 630

## \*RADIANCE

Sensitivity Evaluation Plan for Lowtran.\*  
AD-A211 484

## \*RADIATION ABSORPTION

Coupling between Radiation and Gas Dynamics.\*  
AD-A209 657

## \*RADIOFREQUENCY GENERATORS

A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.\*  
AD-A209 942

## \*RAINFALL INTENSITY

Reprint: Heavy Rainfall in Complex Terrain: Insights from a

Numerical Model.  
AD-A211 530

## \*RAMAN SPECTROSCOPY

Reprint: Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
AD-A211 603

## \*RANGE(DISTANCE)

Computing Minimal Distances on Arbitrary Polyhedral Surfaces.\*  
AD-A210 015

## \*REACTION KINETICS

Effect of Alloying. Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.\*  
AD-A209 934  
Reprint: Observation of NH(a1 Delta, v=1) from the H + N3 Reaction.  
AD-A210 681  
Reprint: Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
AD-A211 674

## \*REDUCTION(CHEMISTRY)

Reprint: Reduction Silylation of Chloroprene.  
AD-A209 888

## \*REFUELING

Discrete Time Analysis of a Shut Down Queueing Systems.\*  
AD-A209 630

## \*REINFORCING MATERIALS

Reprint: Generate Reinforcing Particles in Place.  
AD-A209 656

## \*RELIABILITY

Design of Experiments and Reliability Models.\*

SUBJECT INDEX-25

UNCLASSIFIED EVI09K

PSY-REL

## UNCLASSIFIED

- AD-A209 880  
Monte Carlo Reliability  
Analysis.\*  
AD-A210 052
- \*RESPONSE(BIOLOGY)  
Biological Investigations of  
Adaptive Networks: Neuronal Control  
of Conditioned Responses.\*  
AD-A211 043
- \*RHENIUM COMPOUNDS  
Reprint: Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896
- \*RHEOLOGY  
Reprint: Rheological Properties  
of Nematic Solutions of Rodlike  
Polymers.  
AD-A210 602
- \*RHODIUM COMPOUNDS  
Reprint: Chemistry of  
Polynuclear Metal Complexes with  
Bridging Carbene or Carbyne  
Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-  
Gold, -Rhodium and -Iron Complexes;  
Crystal Structure of  
(NEt4)(MoFe2(Mu3-CC6H4Me-4))(Mu-  
Sigma: Sigma: Eta 5 -  
C2B9H7Me2)(CO)8).  
AD-A210 340
- \*RIGIDITY  
Wave-Mode Coordinate Analysis of  
L' Junction in LSS.\*  
AD-A211 116
- \*ROCK MECHANICS  
Stress Wave Induced Damage in  
Rock.\*  
AD-A211 599
- \*SATURATION  
SIS (Superconductor-Insulator-  
and Robust Estimation.\*  
AD-A209 996
- \*SEROTONIN  
The Role of Central  
Monoaminergic Systems in Arousal  
and Selective Attention.\*  
AD-A211 371
- \*SHOCK WAVES  
Experimental Research on Swept  
Shock Wave/Boundary Layer  
Interactions.\*  
AD-A211 744
- \*SHUTDOWNS  
Discrete Time Analysis of a Shut  
Down Queuing Systems.\*  
AD-A209 630
- \*SIGNAL PROCESSING  
Studies in Statistical Signal  
Processing.\*  
AD-A210 054
- \*SILANES  
Reprint: Lewis Base Adducts to  
Diorganosilylenes.  
AD-A209 631  
Reprint: Ab Initio Computation  
of Silicon-29 Nuclear Magnetic  
Resonance Chemical Shifts for a  
Range of Representative Compounds.  
AD-A210 010  
Reprint: Sigma Bond Metathesis  
Reactions of Si-H and M-Si Bonds.  
New Routes to d(O) Metal Silyl  
Complexes.  
AD-A210 065  
Reprint: Use of 2-D INEPT-  
INADEQUATE 29S, NMR to Determine  
Structures of Organosilicon Rings.  
AD-A211 100  
Reprint: Structures of Two  
Organosilyl Azides.  
AD-A211 632  
Reprint: Intrinsic Reaction  
Coordinate Calculations for Very  
Flat Potential Energy Surfaces:  
Application to Singlet S12H2  
Isomerization.
- Superconductor) Mixer Research.\*  
AD-A211 607
- \*SCANNING  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path Fusion and Convergence Over  
Multiple Scans.\*  
AD-A209 984
- \*SCIENTISTS  
Evaluation of Chemical Research  
Relevant to Current and Projected  
U.S. Air Force Interests.\*  
AD-A210 313
- \*SEARCHING  
Pre-Attentive and Attentive  
Visual Information Processing.\*  
AD-A209 884
- \*SECONDARY EMISSION  
Plasma-Anode Electron Gun  
Research.\*  
AD-A211 547
- \*SEISMIC WAVES  
Reprint: Effects of Source Depth  
on Near-Source Seismograms.  
AD-A209 897  
Deterministic and Stochastic  
Wavefields in the Near-Field from  
Explosive Sources.\*  
AD-A210 057  
High-Amplitude Mobile Vibrator  
for Exciting Body and Surface Waves  
in Soil, Pavement And Structural  
Systems.\*  
AD-A210 130
- \*SEMICONDUCTORS  
Reprint: The Activation of  
Chemical Bonds at Surfaces.  
AD-A211 527
- \*SEQUENTIAL ANALYSIS  
Nonparametric and Sequential  
Analysis of Life Testing and  
Reliability Problems.\*  
AD-A209 867  
Statistical Communication Theory

SUBJECT INDEX-26  
UNCLASSIFIED EVI09K

RES-SIL

## UNCLASSIFIED

- AD-A211 673
- \*SILICA GELS  
Reprint: The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388
- \*SILICA GLASS  
Reprint: The Effect of Fluoride on the Sol-Gel Process.  
AD-A209 217
- \*SILICATES  
Reprint: Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
AD-A208 989  
Reprint: The Effect of Fluoride on the Sol-Gel Process.  
AD-A211 403  
Reprint: The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211 510
- \*SILICON  
Reprint: Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209 039  
Reprint: A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.  
AD-A211 694
- \*SILICON COMPOUNDS  
Reprint: Three-, Four-, and Five-Membered Rings from Disilenes.  
AD-A209 904  
Reprint:  
Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me3CO)3ZrSi(SiMe)3.  
AD-A211 095  
Reprint: Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisiletidine and 1,3,4,2,5-Dioxazadisilolidine.  
AD-A211 096
- \*SILICON DIOXIDE  
Reprint: Generate Reinforcing Particles in Place.  
AD-A209 656  
Reprint: A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.  
AD-A211 694
- \*SILOXANES  
Reprint: ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (SiIox)3Ta (SiIox = t-Bu3SiO-).  
AD-A209 887
- \*SINGLE CRYSTALS  
The Orientation of Chemical Bonds at Surfaces: A Key to Understanding the Structure and Bonding of Surface Species.\*  
AD-A209 833  
Surfaces, Interface, and Bulk Properties of High Tc Superconductors.\*  
AD-A211 490  
Reprint: Kapitza Conductance of Crystals Cleaved under He II.  
AD-A211 509
- \*SKILLS  
Cognitive and Neural Bases of Skilled Performance.\*  
AD-A210 851
- \*SLOPE  
Slope-Controlled Performance Testing.\*  
AD-A211 041
- \*SODIUM  
Reprint: The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388
- \*SODIUM NITRIDE  
Band Calculations on Ferroelectric and Piezoelectric Solids.\*  
AD-A210 143
- \*SOLAR CELLS  
Graded Bandgap Solar Cells.\*  
AD-A211 537
- \*SOLAR ENERGY  
Coupling between Radiation and Gas Dynamics.\*  
AD-A209 657
- \*SOLAR RADIATION  
Coupling between Radiation and Gas Dynamics.\*  
AD-A209 657
- \*SOLID STATE ELECTRONICS  
Electronics Research at the University of Texas at Austin.\*  
AD-A209 989
- \*SOLID STATE LASERS  
New, Efficient Optically Pumped Solid State Lasers.\*  
AD-A209 998
- \*SOLIDIFICATION  
Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.\*  
AD-A209 934
- \*SOLUTIONS(MIXTURES)  
Reprint: Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.  
AD-A210 601  
Reprint: Rheological Properties of Nematic Solutions of Rodlike Polymers.  
AD-A210 602  
Reprint: The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211 510
- \*SPACE PERCEPTION  
A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.\*

UNCLASSIFIED  
SUBJECT INDEX-27  
EVI09K

SIL-SPA

## UNCLASSIFIED

- AD-A211 630
- \*SPACE SYSTEMS  
Wave-Mode Coordinate Analysis of  
'L' Junction in LSS.\*  
AD-A211 116
- \*SPACECRAFT  
Wave-Mode Coordinate Analysis of  
'L' Junction in LSS.\*  
AD-A211 116
- \*SPARSE MATRIX  
Multiprocessor Sparse L/U  
decomposition with Controlled Fill-  
in.\*  
AD-A211 570
- \*SPECTROSCOPY  
Coupling between Radiation and  
Gas Dynamics.\*  
AD-A209 657  
Reprint: Trajectory Analysis of  
Low-Energy and Hyperthermal Ions  
Scattered from CU(110).  
AD-A210 858
- \*SPEECH RECOGNITION  
Attention and Vigilance in  
Speech Perception.\*  
AD-A210 493
- \*SPIN STATES  
Reprint: Dynamics of Flexible  
Triplet Biradicals.  
AD-A210 334
- \*SPUTTERING  
High Temperature Superconducting  
Compounds.\*  
AD-A211 511
- \*STABILITY  
Studies in Statistical Signal  
Processing.\*  
AD-A210 054
- \*STATISTICAL ANALYSIS  
Basic Research in Reliability  
for Real Systems.\*  
AD-A209 649
- \*STATISTICAL INFERENCE  
Hyperdimensional Data Analysis  
and Structural Inference.\*  
AD-A210 056
- \*STATISTICAL PROCESSES  
Studies in Statistical Signal  
Processing.\*  
AD-A210 054
- \*STATISTICAL SAMPLES  
Hyperdimensional Data Analysis  
and Structural Inference.\*  
AD-A210 056
- \*STIMULATION(GENERAL)  
Stimulus-Response Compatibility  
in Spatial Precogning and Symbolic  
Identification: Effects of Coding  
Practice, Retention and Transfer.\*  
AD-A210 745
- \*STOCHASTIC PROCESSES  
Research in Stochastic  
Processes.\*  
AD-A209 935  
Stochastic Flows in Networks.\*  
AD-A211 209  
Reprint: Aircraft Sortie  
Effectiveness Model.  
AD-A211 594
- \*STRESS WAVES  
Stress Wave Induced Damage in  
Rock.\*  
AD-A211 599
- \*STRONTIUM  
Reprint: Laser-Induced Saturated  
Fluorescence of SrOH in Flames.  
AD-A211 389
- \*STRUCTURAL PROPERTIES  
Wave-Mode Coordinate Analysis of  
'L' Junction in LSS.\*  
AD-A211 116  
Reprint: A SANS (Small Angle  
Neutron Scattering) of Catalyst on  
the Growth Process of Silica Gels.  
AD-A211 694
- \*SUBSTITUTION REACTIONS  
Reprint: DEWAR-PI Study of  
Electrophilic Substitution in  
Selected Polycyclic Fluoranthene  
Hydrocarbons.  
AD-A211 121
- \*SULFONIC ACIDS  
Perfluorodecanoic Acid and Lipid  
Metabolism in the Rat.\*  
AD-A210 007
- \*SUPERCONDUCTIVITY  
High Temperature Superconducting  
Compounds.\*  
AD-A211 511
- \*SUPERCONDUCTORS  
Superconducting Meissner Effect  
Bearings for Cryogenic  
Turbomachines. Phase 1.\*  
AD-A209 875  
Surface, Interface, and Bulk  
Properties of High Tc  
Superconductors.\*  
AD-A211 490
- \*SUPERPLASTICITY  
Superplasticity - A Fundamental  
Investigation on Deformation  
Mechanism and Cavitation  
Phenomena.\*  
AD-A209 997
- \*SURFACE ACTIVE SUBSTANCES  
Reprint: Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896
- \*SURFACE CHEMISTRY  
Reprint: Carbon Monoxide-Oxygen  
Interaction on the Pt(111) Surface;  
An Electron Stimulated Desorption  
Ion Angular Distribution (ESDIAD)  
study.  
AD-A211 088  
Reprint: Studies of Thiophene

SUBJECT INDEX-2  
UNCLASSIFIED EVI09K

SPA SUR

## UNCLASSIFIED

- and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.  
AD-A211 092  
Reprint: The Activation of Chemical Bonds at Surfaces.  
AD-A211 527  
Reprint: Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597
- \*SURFACE REACTIONS  
Reprint: Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
AD-A208 989  
Reprint: Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
AD-A210 326  
Reprint: Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (electron Energy-Loss Spectra) Auger and LEED.  
AD-A210 509  
Reprint: Intrinsic Reaction Coordinate Calculations for Very Flat Potential Energy Surfaces: Application to Singlet S12H2 Isomerization.  
AD-A211 673
- \*SURFACES  
Surface, Interface, and Bulk Properties of High Tc Superconductors.\*  
AD-A211 490
- \*SYMMETRY  
Reprint: Compressed Co Overlayers on Pt(111) Evidence for Tilted Co Species at High Coverages by Digital ESDIAD.  
AD-A211 671  
Reprint: The Symmetrization Method for Enhancement of Digital ESDIAD Measurements: Increased Resolution for Study of Adsorbate Bond Directions.  
AD-A211 707
- \*SYMPOSIA  
International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.\*  
AD-A210 400  
Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.\*  
AD-A211 324
- \*SYNAPSE  
Heterosynaptic Modulation of Long-Term Potentiation at Mossy Fiber Synapses in Hippocampus.\*  
AD-A209 835  
Synaptic Plasticity and Memory Formation.\*  
AD-A211 368
- \*SYNCHROTRON RADIATION  
Reprint: Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209 039
- \*SYNTHESIS(CHEMISTRY)  
Reprint: Sigma Bond Metathesis Reactions of Si-H and M-Si Bonds. New Routes to d(O) Metal Silyl Complexes.  
AD-A210 065  
Reprint: Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
AD-A210 847  
Reprint: Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisilolethine and 1,3,4,2,5-Dioxazadisilolethine.  
AD-A211 096
- \*SYNTHETIC STONES  
Development of Photodeposited Diamond Films.\*  
AD-A209 576
- \*SYSTEMS ANALYSIS  
Discrete Time Analysis of a Shut Down Queueing Systems.\*  
AD-A209 630  
Basic Research in Reliability for Real Systems.\*  
AD-A209 649
- \*TARGETS  
Pre-Attentive and Attentive Visual Information Processing.\*  
AD-A209 884
- \*THERMAL EXPANSION  
An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.\*  
AD-A211 406
- \*THERMAL RESISTANCE  
Reprint: Kapitza Conductance of Crystals Cleaved under He II.  
AD-A211 509
- \*THERMIONIC EMISSION  
Plasma-Anode Electron Gun Research.\*
- Reprint: Synthesis of Perfluoro Crown Ethers: A New Class of Cyclic Fluorocarbons.  
AD-A211 601  
Reprint: Synthesis of Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672  
Reprint: Allylations of ((Diethoxyphosphinyl)difluoromethyl) zinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates.  
AD-A211 702

UNCLASSIFIED  
SUBJECT INDEX-29  
EVI09K

SUR THE

## UNCLASSIFIED

- AD-A211 547
- \*THERMOCHEMISTRY  
Reprint: Sigma Bond Metathesis Reactions of Si-H and M-Si Bonds. New Routes to d(O) Metal Silyl Complexes.  
AD-A210 065
- \*THERMOSPHERE  
Reprint: Mapping the Wind in the Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD-A211 087
- \*THIAZOLES  
Reprint: Studies on Aligned Nematic Solutions of a Rodlike Polymer.  
AD-A210 603
- \*THIN FILMS  
Transport and Submillimeter Wave Spectroscopy of GaAs/Al sub xGa sub 1-x and In sub x Ga sub 1-x As Heterostructures.\*  
AD-A209 836
- Surface, Interface, and Bulk Properties of High Tc Superconductors.\*  
AD-A211 490
- Reprint: The Activation of Chemical Bonds at Surfaces.  
AD-A211 527
- \*THIOPHENES  
Reprint: Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.  
AD-A211 092
- \*THREE DIMENSIONAL  
A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.\*
- AD-A211 630
- \*TIME  
Time-Frequency Factors in Auditory Perception.\*  
AD-A211 491
- \*TITANIUM ALLOYS  
The Effect of Transients on Crack Tip Stress Fields during Thermal Fatigue Loading.\*  
AD-A210 084
- Influence of Microstructure and Microdamage Processes on Fracture at High Loading Rates.\*  
AD-A210 307
- \*TOLERANCE  
Fault Tolerant Multiprocessors and VLSI-Based Systems.\*  
AD-A209 579
- \*TOXICITY  
The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.\*  
AD-A209 834
- \*TOXICOLOGY  
Molecular Toxicology of Chromatin.\*  
AD-A211 156
- \*TRAINEES  
AFRAPT (Air Force Research in Aero Propulsion Technology) Trainee Program.\*  
AD-A211 540
- \*TRANSITIONS  
Complex Turbulent Flows.\*  
AD-A210 242
- \*TRANSMISSION LINES  
Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.\*  
AD-A210 549
- \*TRANSMITTANCE  
Sensitivity Evaluation Plan for
- Lowtran.\*  
AD-A211 484
- \*TRANSMITTER RECEIVERS  
Integrated Opto-Electronic Computing.\*  
AD-A209 936
- \*TRANSPORT PROPERTIES  
Physics of High Energy Photoconductive Switches.\*  
AD-A210 341
- \*TRAVEL  
Support of Travel for U.S. Participants in 5th International Biophysics Congress (5th) Held in Copenhagen, Denmark 4-9 August 1975.\*  
AD-A210 004
- \*TRIANGULATION  
Automatic Construction of Polyhedral Surfaces from Voxel Representations.\*  
AD-A210 009
- \*TUNING  
Analytical Study of Mistuning/Friction/Aerodynamics Interaction in a Bladed Disk Assembly.\*  
AD-A211 139
- \*TUNNELING(ELECTRONICS)  
SIS (Superconductor-Insulator-Superconductor) Mixer Research.\*  
AD-A211 607
- \*TURBINE BLADES  
Analytical Study of Mistuning/Friction/Aerodynamics Interaction in a Bladed Disk Assembly.\*  
AD-A211 139
- \*TURBINES  
Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.\*  
AD-A209 875

SUBJECT INDEX-30  
UNCLASSIFIED EVI09K

THE TUR

## UNCLASSIFIED

- \*TURBOMACHINERY  
Superconducting Meissner Effect  
Bearings for Cryogenic  
Turbomachines. Phase 1. \*  
AD-A209 875
- \*TURBULENT BOUNDARY LAYER  
Experimental Research on Swept  
Shock Wave/Boundary Layer  
Interactions. \*  
AD-A211 744
- \*TURBULENT FLOW  
Complex Turbulent Flows. \*  
AD-A210 242  
Separated Flows, Turbulence  
Production Mechanisms and Free  
Shear Layers. \*  
AD-A210 355  
Chemical Reactions in Turbulent  
Mixing Flows. \*  
AD-A211 240  
Control of Turbulent Mixing  
Layers. \*  
AD-A211 413
- \*ULTRAVIOLET SPECTROSCOPY  
Organization of the Topical  
Meeting on Short Wavelength  
Coherent Radiation: Generation and  
Applications (4th) Held in North  
Falmouth, Massachusetts. \*  
AD-A209 847
- \*UNSTEADY FLOW  
Studies of Unsteady Vortex Flap  
Aerodynamics. \*  
AD-A209 837  
Basic Studies of the Unsteady  
Flow Past High Angle of Attack  
Airfoils. \*  
AD-A210 252  
Unsteady Gas Dynamics Problems  
Related to Flight Vehicles. \*  
AD-A210 317
- \*VALIDATION  
Reprint: The Verification of  
Numerical Models with Multivariate  
Randomized Block Permutation  
Procedures.
- AD-A211 539
- \*VAPOR DEPOSITION  
Development of Photodeposited  
Diamond Films. \*  
AD-A209 576
- \*VECTOR ANALYSIS  
Reprint: Fast Reaction, Slow  
Diffusion, and Curve Shortening.  
AD-A211 605
- \*VIBRATION  
Analytical Study of  
Mistuning/Friction/Aerodynamics  
Interaction in a Bladed Disk  
Assembly. \*  
AD-A211 139
- \*VIBRATIONAL SPECTRA  
Reprint: Absolute Infrared  
Transition Moments for Open Shell  
Diatomics from J Dependence of  
Transition Intensities: Application  
to OH.  
AD-A209 894  
Reprint: The Dipole Moment  
Function and Vibrational Transition  
Intensities of OH.  
AD-A209 895  
Reprint: Comparison of Vacuum-  
Annealed and Electrochemically  
Cycled Electrodes in Adsorption and  
Electrocatalysis: Aromatic  
Compounds at Platinum(111) and  
Polycrystalline Platinum.  
AD-A210 011  
Reprint: Structure and  
Composition of Pt(111) and Pt(100)  
Surfaces as a Function of Electrode  
Potential in Aqueous Sulfide  
Solutions.  
AD-A210 325  
Reprint: Experimental and ab  
Initio Vibrational Spectra of 1,2-  
Dibromoethane, Meso-1,2-Dideuterio-  
1,2-Dibromoethane, and Chiral 1,2-  
Dideuterio-1,2-Dibromoethane.  
AD-A211 268  
Reprint: The Vibrational  
Spectrum of Tetrafluoropropyne.
- AD-A211 596
- \*VIBRATORS(MECHANICAL)  
High-Amplitude Mobile Vibrator  
for Exciting Body and Surface Waves  
in Soil, Pavement And Structural  
Systems. \*  
AD-A210 130
- \*VIGILANCE  
Attention and Vigilance in  
Speech Perception. \*  
AD-A210 493
- \*VISION  
Pre-Attentive and Attentive  
Visual Information Processing. \*  
AD-A209 884  
Attention, Imagery and Memory: A  
Neuromagnetic Investigation. \*  
AD-A209 917  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path, Fusion and Convergence Over  
Multiple Scans. \*  
AD-A209 984  
Role of Retinocortical  
Processing in Spatial Vision. \*  
AD-A210 995
- \*VISUAL CORTEX  
Attention, Imagery and Memory: A  
Neuromagnetic Investigation. \*  
AD-A209 917  
Reprint: Applications of  
Computer Graphics and Image  
Processing to 2D and 3D Modeling of  
the Functional Architecture of  
Visual Cortex.  
AD-A209 985  
Visualizing and Rhyming Cause  
Differences in Alpha Suppression. \*  
AD-A210 005  
A New Method for Measuring the  
Visuotopic Map Function of Striate  
Cortex: Validation with Macaque  
Data and Possible Extension to  
Measurement of the Human Map. \*  
AD-A210 008  
Reprint: Computer-Aided  
Neuroanatomy: Differential Geometry

SUBJECT INDEX-31

UNCLASSIFIED EVI09K

TUR-VIS

- of Cortical Surfaces and an Optimal Flattening Algorithm.  
AD-A210 333  
Reprint: Cepstral Filtering on a Columnar Image Architecture: A Fast Algorithm for Binocular Stereo Segmentation.  
AD-A210 574
- \*VISUAL PERCEPTION  
Pre-Attentive and Attentive Visual Information Processing.\*  
AD-A209 884  
Reprint: Psychophysical Studies of Shape with Fourier Descriptor Stimuli.  
AD-A210 018  
Reprint: The Perception of Moving Plaids Reveals Two Motion-Processing Stages.  
AD-A210 064  
AD-A210 994  
Reprint: Second-Order Motion Perception: Space/Time Separable Mechanisms.  
AD-A211 028  
Reprint: Drift-Balanced Random Stimuli: A General Basis for Studying Non-Fourier Motion Perception.  
AD-A211 063  
Ratings of Kinetic Depth in Multi-Dot Displays.\*  
AD-A211 138  
Reprint: Two Motion Perception Mechanisms Revealed Through Distance-Driven Reversal of Apparent Motion.  
AD-A211 214  
Institute for the Study of Human Capabilities Summary Descriptions of Research for the Period September 1988 through June 1989.\*  
AD-A211 232  
Kinetic Depth Effect and Optic Flow 1 3D Shape from Fourier Motion.\*  
AD-A211 260  
The Kinetic Depth Effect and Identification of Shape.\*
- AD-A211 481  
A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.\*  
AD-A211 530
- \*VOLTAMMETRY  
Reprint: Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597
- \*VOLUME  
High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.\*  
AD-A211 691
- \*WAKE  
Control of Turbulent Mixing Layers.\*  
AD-A211 413
- \*WAVE PROPAGATION  
Wave-Mode Coordinate Analysis of 'L' Junction in LSS.\*  
AD-A211 116  
High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.\*  
AD-A211 691
- \*WAVEFRONTS  
Wavefront Propagation for Reaction-Diffusion Systems of PDE.\*  
AD-A210 862
- \*WEATHER FORECASTING  
Reprint: Heavy Rainfall in Complex Terrain: Insights from a Numerical Model.  
AD-A211 530
- \*WIGGLER MAGNETS  
Reprint: Tunable Microwigglers for Free-Electron Lasers.  
AD-A209 062
- \*WIND  
Reprint: Mapping the Wind in the
- Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD-A211 087
- \*X RAY SPECTROSCOPY  
Organization of the Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts.\*  
AD-A209 847
- \*ZIRCONIUM COMPOUNDS  
Reprint: Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr-NSi-t-BU<sub>3</sub>.  
AD-A210 364  
Reprint: Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me<sub>3</sub>CO)<sub>3</sub>ZrSi(SiMe)<sub>3</sub>.  
AD-A211 095

# PERSONAL AUTHOR INDEX

## UNCLASSIFIED

## PERSONAL AUTHOR INDEX

- \*AARUNSON, H. I. \* \* \*  
Fundamental Studies of B Phase  
Decomposition Modes in Titanium  
Alloys.  
AD-A209 866
- \*ABERSON, T. \* \* \*  
Quantum Electrodynamical Approach  
to Multiphoton Ionization in the  
High-Intensity Field.  
AD-A209 082
- \*ADAMS, BRUCE R. \* \* \*  
Use of 2-D INEPT-INADEQUATE 29SI  
NMR to Determine Structures of  
Organosilicon Rings.  
AD-A211 100
- \*ALAGHBAND, GITA. \* \* \*  
Multiprocessor Sparse L/U  
decomposition with Controlled Fill-  
In.  
AD-A211 570
- \*ALFRED, CHRISTIE. \* \* \*  
Fast Heterogeneous Electron  
Transfer Rates for Glassy Carbon  
Electrodes without Polishing or  
Activation Procedures.  
AD-A211 674
- \*ALLCOCK, HARRY R. \* \* \*  
Synthesis of Polyphosphazenes  
Bearing Geminal  
(Trimethylsilyl)methylene and Alkyl  
or Phenyl Side Groups.  
AD-A209 261
- \*ALLOCK, HARRY R. \* \* \*  
Liquid, Crystalline Phosphazenes,  
High Polymeric and Cyclic Trimeric  
Systems with Aromatic Azo Side  
Groups.  
AD-A210 673
- \*AREND, LAWRENCE E. \* \* \*  
Eye Movements and Spatial Pattern  
Vision.  
AD-A211 650
- \*ARENSTORF, NORBERT S. \* \* \*  
Comparing Barrier Algorithms.  
AD-A211 515
- \*ARHENS, THOMAS J. \* \* \*  
Stress Wave Induced Damage in Rock.  
AD-A211 599
- \*ARNOLDUS, HENK F. \* \* \*  
Recent Progress in the Theory of  
Laser-Assisted Collisions.  
AD-A210 636
- \*ASHLEY, HOLT \* \* \*  
Unsteady Gas Dynamics Problems  
Related to Flight Vehicles.  
AD-A210 317
- \*BAE, Y. K. \* \* \*  
He2-(4II sub y) Yields He2(X1  
Sigma+) Autodetachment Energy  
Spectrum: Assessment of the He2  
and He2 Ground-State Potentials.  
AD-A209 983
- \*BAILEY, WEBB I., JR. \* \* \*  
Synthesis of Perfluoro Crown  
Ethers: A New Class of Cyclic  
Fluorocarbons.  
AD-A211 601
- \*BAJAJ, R. \* \* \*  
An Investigation of the Irradiation  
Swelling Mechanisms in Refractory  
Metals at High Temperatures.  
AD-A211 406
- \*BARKATT, A. \* \* \*  
Structure and Composition of  
Pt(111) and Pt(100) Surfaces as a  
Function of Electrode Potential in
- \*BARKER, D. \* \* \*  
Materials Research Society  
Symposium Proceedings Held in Reno,  
Nevada on 5-7 April 1988. Volume  
125. Materials Stability and  
Environmental Degradation.  
AD-A211 737
- \*BARLES, G. \* \* \*  
Wavefront Propagation for Reaction-  
Diffusion Systems of PDE.  
AD-A210 862
- \*BARON, JUDSON R. \* \* \*  
Computational Methods for Complex  
Flowfields.  
AD-A211 485
- \*BARTLETT, RODNEY J. \* \* \*  
Couple-Cluster Methods That Include  
Connected Quadruple Excitations.  
T4: CCSDTQ-1 and Q(CCSDT).  
AD-A211 538
- \*BASS, MICHAEL. \* \* \*  
New, Efficient Optically Pumped  
Solid State Lasers.  
AD-A209 998
- \*BASU, ASIT P. \* \* \*  
Nonparametric and Sequential  
Analysis of Life Testing and  
Reliability Problems.  
AD-A209 867
- \*BATINA, NIKOLA. \* \* \*  
Structure and Composition of  
Pt(111) and Pt(100) Surfaces as a  
Function of Electrode Potential in

PERSONAL AUTHOR INDEX - 1  
UNCLASSIFIED EV109K

## UNCLASSIFIED

- Aqueous Sulfide Solutions.  
AD-A210 325
- \* \* \*  
Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
AD-A210 326
- \* \* \*  
Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.  
AD-A211 092
- \*BATINA, NIKOLAS \* \* \*  
Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.  
AD-A210 509
- \*BAXTER, STEVEN M \* \* \*  
Methane and Benzene Activation via Transient (t-BU<sub>3</sub>SiH)Zr=NSi-t-BU<sub>3</sub>.  
AD-A210 364
- \*BEKEFI, G \* \* \*  
Tunable Microwigglers for Free-Electron Lasers.  
AD-A209 062
- \*BEKEFI, GEORGE \* \* \*  
Microwave Emission from Relativistic Electron Beams.  
AD-A209 653
- \*BERRY, GUY C \* \* \*  
Studies on Aligned Nematic Solutions of a Rodlike Polymer.  
AD-A210 603
- \*BERRY, GUY C.@@@ \* \* \*  
Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.  
AD-A210 601
- \* \* \*  
Rheological Properties of Nematic Solutions of Rodlike Polymers.  
AD-A210 602
- \*BHAPKAR, V. P \* \* \*  
Life Testing, Reliability, and Multivariate Nonparametric Methods.  
AD-A210 147
- \*BIEDERMAN, IRVING@@@ \* \* \*  
A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.  
AD-A211 630
- \*BIELER, T. R.@@@ \* \* \*  
Superplasticity - A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.  
AD-A209 997
- \*BIRNBAUM, MILTON@@@ \* \* \*  
New, Efficient Optically Pumped Solid State Lasers.  
AD-A209 998
- \*BLOOM, GARY S \* \* \*  
Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences. Volume 555).  
AD-A210 872
- \*BLUMENTHAL, SAUL \* \* \*  
Life Testing, Reliability, and Multivariate Nonparametric Methods.
- Aqueous Sulfide Solutions.  
AD-A210 147
- \*BOATZ, J. A \* \* \*  
Heats of Formation of Alkylsilanes.  
AD-A211 575
- \*BOATZ, JERRY A \* \* \*  
Decomposition of Normal-Coordinate Vibrational Frequencies.  
AD-A211 604
- \*BOGAARDS, M \* \* \*  
Deterministic and Stochastic Wavefields in the Near-Field from Explosive Sources.  
AD-A210 057
- \*BOGDANOFF, D \* \* \*  
Phase Compensation for High Power Lasers Using Refracting Gas Prisms.  
AD-A209 869
- \*BONCZYK, PAUL A.@@ \* \* \*  
Laser-Induced Saturated Fluorescence of SrOH in Flames.  
AD-A211 389
- \*BOSE, P. K \* \* \*  
Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211 268
- \*BOURLAND, F. J \* \* \*  
The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves.  
AD-A211 434
- \*BOWEN, KENNETH A.@@ \* \* \*

## UNCLASSIFIED

Testbeds for Logic Programming and Very Large Databases.  
AD-A209 632

\*BOWLING, ROBERT \* \* \*

Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
AD-A211 603

\*BOWLING, ROBERT J \* \* \*

Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects,  
AD-A211 644

\* \* \*

Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
AD-A211 645

\*BOYD, G. T. @ \* \* \*

Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials.  
AD-A210 298

\*BRENNAN, DAVID T. J \* \* \*

Synthesis of Polyphosphazenes Bearing Geminal (Trimethylsilyl)methylene and Alkyl or Phenyl Side Groups,  
AD-A209 261

\*BRIDGER, K \* \* \*

High-Strain-Rate Behavior of Hydrated Cement Paste.  
AD-A210 180

\*BROADWELL, JAMES E \* \* \*

Chemical Reactions in Turbulent

Mixing Flows.  
AD-A211 240

\*BUKI, KALMAN G \* \* \*

Binding of Adenosine Diphosphoribosyltransferase to the Termini and Internal Regions of Linear DNAs.  
AD-A211 272

\*BURTON, DONALD J \* \* \*

Synthesis of Sulfodifluoromethylphosphonic Acid,  
AD-A211 524

\* \* \*

The Vibrational Spectrum of Tetrafluoropropyne,  
AD-A211 596

Allylations of ((Diethoxyphosphinyldifluoromethyl) zinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates,  
AD-A211 702

\*BURZYNSKI, RYSZARD \* \* \*

Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl),  
AD-A210 546

\*CAMPANIS, S \* \* \*

Statistical Communication Theory and Robust Estimation.  
AD-A209 996

\*CAMPANIS, STAMATIS \* \* \*

Research in Stochastic Processes.  
AD-A209 935

\*CAMERA-PALINO, M. E \* \* \*

High Precision Dipole Moments in A

1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy.  
AD-A211 731

\*CAMPBELL, G. A. @@@ \* \* \*

Process Diagnostics: Materials, Combustion Fusion, Volume 117. Materials Research Society.  
AD-A211 324

\*CARLIN, R \* \* \*

The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
AD-A211 541

\*CARLIN, RICHARD T \* \* \*

Aluminum Anodization in a Basic Ambient Temperature Molten Salt.  
AD-A211 598

\* \* \*

Reaction of Protons and Molybdenum Dimers in an Ambient-Temperature Molten Salt.  
AD-A211 698

\* \* \*

Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Ambient Temperature Molten Salt.  
AD-A211 699

\*CARROLL, R. J. @@@ \* \* \*

Statistical Communication Theory and Robust Estimation.  
AD-A209 998

\*CARROLL, RAYMOND J \* \* \*

Research in Stochastic Processes.  
AD-A209 935

\*CASASSA, M. P \* \* \*

Unimolecular Dynamics Following Vibrational Overtone Excitation of

PERSONAL AUTHOR INDEX-3  
UNCLASSIFIED EV109K

BOW CAS

UNCLASSIFIED

HN3 V1=5 and v1=6: HN3(X, Y, Z, K)  
yields HN(x(3)Sigma-  
(vJ0mega)+N2(X(1)Sigma+g)).  
AD-A210 001

\*CASASSA, MICHAEL P

Energetics and Spin- and Lambda-  
Doublet Selectivity in the Infrared  
Multiphoton Dissociation DN3 yields  
DN1 X 3 Sigma(-), a 1 Delta) + N2(X  
1 Sigma g (+)): Experiment.  
AD-A210 250

\*CEN, WENBIAO@

Synthesis of  
Sulfodifluoromethyl)Phosphonic  
Acid  
AD-A211 524

\*CHAN, J. B

The Effect of Fluoride on the Sol-  
Gel Process.  
AD-A209 217

\* \* \*

The Pore Morphology of Fluoride  
Catalyzed Xerogels.  
AD-A211 388

\*CHEN, JING

Observation of NH(a1 Delta, v=1)  
from the H + N3 Reaction.  
AD-A210 681

\*CHEN, S. C

Tunable Microwigglers for Free-  
Electron Lasers.  
AD-A209 062

\*CHEN, SHING@

Analytical Study of  
Mistuning/Friction/Aerodynamics

Interaction in a Bladed Disk  
Assembly.  
AD-A211 139

\*CHENG, H. K.@

Studies of Unsteady Vortex Flap  
Aerodynamics.  
AD-A209 837

\*CHIANG, K. T

Effect of Alloying, Rapid  
Solidification, and Surface  
Kinetics on the High Temperature  
Environmental Resistance of  
Niobium.  
AD-A209 934

\*CHILDS, G

High-Strain-Rate Behavior of  
Hydrated Cement Paste.  
AD-A210 180

\*CHOPRA, PRATIBHA

Picosecond Degenerate Four-Wave  
Mixing Study of Nonlinear Optical  
Properties of the Poly-N-Vinyl  
Carbazole: 2,4,7-Trinitrofluorenone  
Composite Polymer Photoconductor,  
AD-A210 363

\*CHRISTIANSEN, W

Phase Compensation for High Power  
Lasers Using Refracting Gas Prisms.  
AD-A209 869

\*CHUBB, CHARLES

Drift-Balanced Random Stimuli: A  
General Basis for Studying Non-  
Fourier Motion Perception.  
AD-A211 063

\* \* \*

Two Motion Perception Mechanisms  
Revealed Through Distance-Driven  
Reversal of Apparent Motion.  
AD-A211 214

\*CHUNG, KAI L.@

Probabilistic Analysis of  
Semilinear Partial Differential  
Equations.  
AD-A209 903

\*CLARK, C. F

Capacitive Energy Storage at  
Cryogenic Temperatures. Phase 2.  
AD-A210 368

\*CLARK, LELAND C., JR

Synthesis of Unusual  
Perfluorocarbon Ethers and Amines  
Containing Bulky Fluorocarbon  
Groups: New Biomedical Materials.  
AD-A211 576

\*CLARK, WAYNE D

Synthesis of Perfluorotetraalkyl  
Orthocarbonates Using Elemental  
Fluorine.  
AD-A211 600

\*COHEN, JEFFREY M.@

Inverse Scattering: Ionospheric  
Structure Determination.  
AD-A209 063

\*COLDREN, L. A.@

Use of Depletion Edge Translation  
for High-Speed Modulation and  
Switching of Lightwaves.  
AD-A211 186

\*COLTON, D. L

The Inverse Scattering Problem for  
Time-Harmonic Acoustic Waves in an  
Inhomogeneous Medium: Numerical  
Experiments.  
AD-A210 841

\*COLTON, DAVID

\* \* \*

PERSONAL AUTHOR INDEX-4  
UNCLASSIFIED EV109K

CAS 001

UNCLASSIFIED

The Inverse Scattering Problem for Acoustic and Electromagnetic Waves.  
AD-A209 202

\*CONNOR, JOHN A.@@@  
\* \* \*

An Investigation into the Effects of Peptide Neurotransmitters and Intracellular Second Messengers in Rat Central Neurons in Culture.  
AD-A211 030

\*COOPER, B. H.@@@  
\* \* \*

Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).  
AD-A210 858

\*CRANDALL, MICHAEL G.@@@  
\* \* \*

Some Problems in Nonlinear Analysis.  
AD-A209 991

\*CRASEMANN, B.@@@  
\* \* \*

Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209 039

\*CUMMINS, CHRISTOPHER C  
\* \* \*

Methane and Benzene Activation via Transient (t-Bu3SiNH)2Zr=NSi-t-BU3.  
AD-A210 364

\*CUNNINGHAM, S. E.@@@  
\* \* \*

The Effect of Transients on Crack Tip Stress Fields during Thermal Fatigue Loading.  
AD-A210 084

\*CUTLER, RAYMOND A  
\* \* \*

New Mechanism for Toughening Ceramic Materials.  
AD-A211 651

\*CYRUS, MICHAEL

\* \* \*

Study of the Design and Performance Characteristics of Aircraft Simulators.  
AD-A210 053

\*DAGDIGIAN, PAUL J.@@@  
\* \* \*

Observation of NH(1) Delta, v=1) from the H + N3 Reaction.  
AD-A210 681

\*DANDL, RAPHAEL A.@@  
\* \* \*

A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.  
AD-A209 942

\*DARRAH, RODNEY C.@@  
\* \* \*

United States Air Force Research Initiation Program for 1987. Volume 1.  
AD-A209 726

\* \* \*

United States Air Force Research Initiation Program for 1987. Volume 2.  
AD-A209 727

\* \* \*

United States Air Force Research Initiation Program for 1987. Volume 3.  
AD-A209 728

\* \* \*

United States Air Force Research Initiation Program for 1987. Volume 4.  
AD-A209 729

\*DAS, B

The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
AD-A211 541

\*DAVIES, SIMON J

\* \* \*

Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
AD-A210 847

\*DENNINGTON, ROY D. II.@@@  
\* \* \*

DEWAR-PI Study of Electrophilic Substitution in Selected Polycyclic Fluoranthene Hydrocarbons.  
AD-A211 121

\*DESSAU, DANIEL  
\* \* \*

Surface, Interface, and Bulk Properties of High Tc Superconductors.  
AD-A211 490

\*DEFTERMAN, DOUGLAS K.@@@  
\* \* \*

Models of Mental Functioning.  
AD-A210 456

\*DEVORE, DAVID D  
\* \* \*

Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86. Alkylidyne(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NET4)(MoFe2(Mu3-CC6H4Me-4) (Mu-Sigma: Sigma: Eta 5 - C2B9H7Me2)(CO)8).  
AD-A210 340

\*DEVRIES, PAUL L.@@  
\* \* \*

Recent Progress in the Theory of Laser-Assisted Collisions.  
AD-A210 636

\*DEWAR, MICHAEL J  
\* \* \*

Cope Rearrangement of 3,3-Dicyanohexa-1,5-diene.  
AD-A211 023

PERSONAL AUTHOR INDEX-5  
UNCLASSIFIED EVI09K

CON DEW

## UNCLASSIFIED

- \* \* \*  
AM1 Parameters for Phosphorus,  
AD-A211 033
- \* \* \*  
AM1 Calculations for Compounds  
Containing Germanium,  
AD-A211 066
- \* \* \*  
DEVAR-PI Study of Electrophilic  
Substitution in Selected Polycyclic  
Fluoranthene Hydrocarbons,  
AD-A211 121
- \* \* \*  
Aromatic Energies of Some  
Heteroaromatic Molecules,  
AD-A211 204
- \*DEWAR, MICHAEL J.@  
\* \* \*  
Use of Quantum Mechanical Models in  
Studies of Reaction Mechanisms,  
AD-A208 930
- \*DICECCA, S \* \* \*  
Tunable Microwigglers for Free-  
Electron Lasers,  
AD-A209 062
- \*DIMOTAKIS, PAUL E \* \* \*  
Chemical Reactions in Turbulent  
Mixing Flows,  
AD-A211 240
- \* \* \*  
Control of Turbulent Mixing Layers,  
AD-A211 413
- \*DITCHFIELD, ROBERT@  
\* \* \*  
Ab Initio Computation of Silicon-29  
Nuclear Magnetic Resonance Chemical  
Shifts for a Range of  
Representative Compounds,  
AD-A210 010
- \*DOOSHER, BARBARA A \* \* \*  
Ratings of Kinetic Depth in Multi-  
Dot Displays,  
AD A211 138
- \* \* \*  
Kinetic Depth Effect and Optic Flow  
1. 3D Shape from Fourier Motion,  
AD-A211 260
- \* \* \*  
The Kinetic Depth Effect and  
Identification of Shape,  
AD-A211 481
- \*DOUBLEDAY, CHARLES, JR \* \* \*  
Dynamics of Flexible Triplet  
Biradicals,  
AD-A210 334
- \* \* \*  
Large Magnetic Field Effect on the  
Decay Rates of Triplet Hydrocarbon  
Diradicals,  
AD-A210 680
- \*DOUBLEDAY, CHARLES E., JR \* \* \*  
Negative Temperature Dependence in  
the Decay of Triplet Biradicals,  
AD-A209 886
- \*DUNN, BEVERLY S.@@ \* \* \*  
Synthesis of Polyphosphazenes  
Bearing Geminal  
(Trimethylsilyl)methylene and Alkyl  
or Phenyl Side Groups,  
AD-A209 281
- \*EARLEY, JOSEPH E.@ \* \* \*  
Evaluation of Chemical Research  
Relevant to Current and Projected  
U.S. Air Force Interests,  
AD-A210 313
- \*ECKBRETH, A. C \* \* \*  
Process Diagnostics: Materials,  
Combustion Fusion, Volume 117,  
Materials Research Society,  
AD-A211 324
- \*ECKELS, P. W \* \* \*  
Kapitza Conductance of Crystals
- \*EGETH, H. E \* \* \*  
Cleaved under He II,  
AD-A211 509
- \* \* \*  
Pre-Attentive and Attentive Visual  
Information Processing,  
AD-A209 884
- \*ELLIS, ROBERT L \* \* \*  
Rank-Preserving Extensions of Band  
Matrices,  
AD-A211 531
- \*EL-NEWWEIHI, E \* \* \*  
Design of Experiments and  
Reliability Models,  
AD-A209 880
- \*EMMERICH, CHRISTIANE \* \* \*  
Chemistry of Polynuclear Metal  
Complexes with Bridging Carbene or  
Carbene Ligands, Part 86,  
Alkylidyne(Carborane)Molybdenum-  
Gold, -Rhodium and -Iron Complexes;  
Crystal Structure of  
(NEt4)(MoFe2(Mu3-CC6H4Me-4) (Mu-  
Sigma: Sigma: Eta 5 -  
C28H7Me2)(CO)8),  
AD-A210 340
- \*ENGEL, THOMAS@@ \* \* \*  
The Adsorption and Reaction of  
Fluorine on the Si(100) Surface,  
AD-A211 595
- \*ENGSTROM, J. R \* \* \*  
The Adsorption and Reaction of  
Fluorine on the Si(100) Surface,  
AD-A211 595
- \*ETEMADI, B \* \* \*  
Analytical Evaluation of the  
Electrostatic Potential for  
Diatomic Molecules,

PERSONAL AUTHOR INDEX-6  
UNCLASSIFIED  
EVI09K

DEW-EYE

## UNCLASSIFIED

- AD-A209 665
- \*EVANS, L. C \* \* \*  
Wavefront Propagation for Reaction-Diffusion Systems of PDE.  
AD-A210 862
- \*EWIG, C. S \* \* \*  
Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211 268
- \*EWIG, CARL S \* \* \*  
Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds.  
AD-A210 010
- \*FELDMAN, MARC J.@@ \* \* \*  
SIS (Superconductor-Insulator-Superconductor) Mixer Research.  
AD-A211 607
- \*FENSKE, G. R \* \* \*  
An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.  
AD-A211 406
- \*FERZIGER, J. H.@@ \* \* \*  
Separated Flows, Turbulence Production Mechanisms and Free Shear Layers.  
AD-A210 355
- \*FIELD, R. W.@@@ \* \* \*  
High Precision Dipole Moments in A 1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy.  
AD-A211 731
- \*FIELD, ROBERT W \* \* \*  
Vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties.  
AD-A211 675
- \*FIELD, ROBERT W.@@@ \* \* \*  
Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.  
AD-A211 563
- \*FLYNN, E \* \* \*  
Deterministic and Stochastic Wavefields in the Near-Field from Explosive Sources.  
AD-A210 057
- \*FLYNN, ELIZABETH C \* \* \*  
Effects of Source Depth on Near-Source Seismograms.  
AD-A209 897
- \*FOGARTY, LAURENCE@@ \* \* \*  
Study of the Design and Performance Characteristics of Aircraft Simulators.  
AD-A210 053
- \*FOOTE, STEPHEN L.@@ \* \* \*  
Extrathalamic Modulation of Cortical Function.  
AD-A211 044
- \*FOY, B. R \* \* \*  
Unimolecular Dynamics Following Vibrational Overtone Excitation of HN3 V1=5 and V1=6: HN3(X,V,J,K) Yields HN(X(3)Sigma-(vJ0mega)+N2(X(1)Sigma+g)).  
AD-A210 001
- \*FRANK, DOUGLAS G \* \* \*  
Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole: 2,4,7-Trinitrofluorenone
- Surface Electrodynamics of Amino Acids: Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.  
AD-A210 509
- \*FRATTINI, R \* \* \*  
The Effect of Fluoride on the Sol-Gel Process.  
AD-A209 217
- \*FRATTINI, R \* \* \*  
The Effect of Fluoride on the Sol-Gel Process.  
AD-A211 403
- \*FREDRICKSON, LYLE J \* \* \*  
Research in Mathematics and Computer Science: Calculation of the Probability of Undetected Error for Certain Error Detection Codes.  
Phase 1.  
AD-A210 302
- \*FRIEDRICH, H. F \* \* \*  
The Vibrational Spectrum of Tetrafluoropropylene.  
AD-A211 596
- \*GAUTHREAU, SIDNEY A., JR@@ \* \* \*  
Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement of Flight Safety.  
AD-A209 919
- \*GEORGE, THOMAS F \* \* \*  
Recent Progress in the Theory of Laser-Assisted Collisions.  
AD-A210 636
- \*GHOSHAL, SUNITI K \* \* \*  
Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole: 2,4,7-Trinitrofluorenone

PERSONAL AUTHOR INDEX-7  
UNCLASSIFIED  
EVI09K

EVA GH0

## UNCLASSIFIED

Composite Polymer Photoconductor,  
AD-A210 363

\*GILKEY, ROBERT H. @  
\* \* \*

Binaural Masking: An Analysis of  
Models.  
AD-A211 578

\*GILLETTE, GREGORY R  
\* \* \*  
Lewis Base Adducts to  
Diorganosilylenes,  
AD-A209 631

\* \* \*  
Three-, Four-, and Five-Membered  
Rings from Disilenes,  
AD-A209 904

\* \* \*  
Synthesis of the Novel Ring Systems  
1,2,3,4-Oxazadisiloleidine and  
1,3,4,2,5-Dioxazadisiloleidine,  
AD-A211 096

\*GIOVANDLA, J H \* \* \*  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307

\*GLANZ, JEFFREY I \* \* \*  
Synthesis of  
Tetrakis(trifluoromethyl) Lead,  
AD-A211 672

\*GLASSMAN, IRVIN @ @ @ @ @  
\* \* \*  
AFRAPT (Air Force Research in Aero  
Propulsion Technology) Trainee  
Program,  
AD-A211 540

\*GLOVER, JOSEPH \* \* \*  
Probabilistic Analysis of  
Semilinear Partial Differential  
Equations.  
AD-A209 903

\*GOLDMAN, A. M \* \* \*  
High Temperature Superconducting  
Compounds.  
AD-A211 511

\*GOODSTEIN, D. M \* \* \*  
Trajectory Analysis of Low-Energy  
and Hyperthermal Ions Scattered  
from Cu(110).  
AD-A210 858

\*GORDON, MARK S \* \* \*  
Heats of Formation of Alkylsilanes,  
AD-A211 575

\* \* \*  
Structures of Two Organosilyl  
Azides,  
AD-A211 632

\*GORDON, MARK S. @ @ @ @ @  
\* \* \*  
Decomposition of Normal-Coordinate  
Vibrational Frequencies,  
AD-A211 604

\*GORDON, MARK S. @ @ \* \* \*  
Intrinsic Reaction Coordinate  
Calculations for Very Flat  
Potential Energy Surfaces:  
Application to Singlet Si2H2  
Isomerization.  
AD-A211 673

\*GRAHAM, RONALD L \* \* \*  
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Conference (3rd) on Combinatorial  
Mathematics Held in New York on 10-  
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York Academy of Sciences. Volume  
555).  
AD-A210 672

\*GRANT, L \* \* \*  
Deterministic and Stochastic  
Wavefields in the Near-Field from

Explosive Sources.  
AD-A210 057

\*GRAY, HARRY B \* \* \*  
Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896

\*GRAY, ROBERT M. @ @ @  
\* \* \*  
Data Compression Algorithms.  
AD-A209 921

\*GREGGI, J. C \* \* \*  
An Investigation of the Irradiation  
Swelling Mechanisms in Refractory  
Metals at High Temperatures.  
AD-A211 406

\*GRIFFIN, J. H \* \* \*  
The Effect of Transients on Crack  
Tip Stress Fields during Thermal  
Fatigue Loading.  
AD-A210 084

\*GUEST, GARETH E \* \* \*  
A Two-Stream Plasma Electron  
Microwave Source for High-Power  
Millimeter Wave Generation. Phase  
I.  
AD-A209 942

\*GUI, JOHN Y \* \* \*  
Comparison of Vacuum-Annealed and  
Electrochemically Cycled Electrodes  
in Adsorption and Electrocatalysis:  
Aromatic Compounds at Platinum(111)  
and Polycrystalline Platinum.  
AD-A210 011

\* \* \*  
Studies of Thiophene and  
Substituted Thiophenes at Platinum

PERSONAL AUTHOR INDEX-8  
UNCLASSIFIED  
EVI09K

GIL GUI

## UNCLASSIFIED

- (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.  
AD-A211 092
- \*GUNERATNE, RANIL \* \* \*  
Synthesis of Sulfodifluoromethyl Phosphonic Acid.  
AD-A211 524
- \*GUO, D-S \* \* \*  
Quantum Electrodynamical Approach to Multiphoton Ionization in the High-Intensity Field.  
AD-A209 082
- \*HABERMAN, RICHARD@@@ \* \* \*  
The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves.  
AD-A211 434
- \*HALL, B O \* \* \*  
An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.  
AD-A211 406
- \*HALLE, SCOTT \* \* \*  
Vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties.  
AD-A211 675
- \*HALLER, KENNETH J \* \* \*  
Structures of Two Organosilyl Azides.  
AD-A211 632
- \*HAYS, A K \* \* \*
- Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.  
AD-A211 324
- \*HEDAYAT, A S \* \* \*  
Design of Experiments and Reliability Models.  
AD-A209 880
- \*HENDERSON, D O \* \* \*  
Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211 268
- \*HENKEL, J H \* \* \*  
Band Calculations on Ferroelectric and Piezoelectric Solids.  
AD-A210 143
- \*HERNANDEZ, GONZALO \* \* \*  
Mapping the Wind in the Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD-A211 087
- \*HERRMANN, GEORGE@@@ \* \* \*  
Mechanical Response of Structural Elements to Dynamic Loads.  
AD-A209 827
- \*HEUVEL, JOHN P \* \* \*  
Perfluorodecanoic Acid and Lipid Metabolism in the Rat.  
AD-A210 007
- \*HEYN, RICHARD H \* \* \*  
Dimethylsilyl Derivatives of Zirconium.
- AD-A208 932  
Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me3CO)3ZrSi(SiMe)3.  
AD-A211 095
- \*HIBSHOOSH, ELIPHAZ@@@ \* \* \*  
Communications Using Channels Formed by Meteor Bursts.  
AD-A209 856
- \*HOBBS, R. H.@@@ \* \* \*  
He2-(411 sub g) Yields He2(X1 Sigma+) Autodetachment Energy Spectrum: Assessment of the He2 and He2 Ground-State Potentials.  
AD-A209 983
- \*HOGAN, MICHAEL@@@ \* \* \*  
Sensitivity Evaluation Plan for Lowtran.  
AD-A211 484
- \*HOLDER, ANDREW J \* \* \*  
Aromatic Energies of Some Heteroaromatic Molecules.  
AD-A211 204
- \*HOWARD, JUDITH A \* \* \*  
Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86. Alkylidyne (Carbaborane)Molybdenum-Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NET4)(MoFe2(Mu3-CC6H4Me-4) (Mu Sigma: Sigma: Eta 5 - C2B9H7Me2)(CO)8).  
AD-A210 340
- \*HUA, D. W \* \* \*  
The Pore Morphology of Fluoride

PERSONAL AUTHOR INDEX-9  
UNCLASSIFIED  
EVI09K

GUN HUA

UNCLASSIFIED

- Catalyzed Xerogels.  
AD-A211 388
- \*HUJA, D. W. \* \* \*  
The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211 510
- A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.  
AD-A211 694
- \*HUANG, HSU-NAN \* \* \*  
Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.  
AD-A211 576
- \*HUBBARD, ARTHUR T. \* \* \*  
Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.  
AD-A210 509
- \*HULLING, STEPHEN F. \* \* \*  
A Simulation Study of Four Real-Time Heuristic Algorithms for Multiple Missile Evade: A Game Theoretic Approach.  
AD-A211 093
- \*IANNELLO, VICTOR \* \* \*  
Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.  
AD-A209 875
- \*JIANG, WAN \* \* \*  
Reduction Silylation of Chloroprene.  
AD-A209 888
- \*JIE, CADXIAN@ \* \* \*  
AM1 Parameters for Phosphorus.  
AD-A211 033
- AM1 Calculations for Compounds Containing Germanium.  
AD-A211 066
- \*JIE, COAXIAN@ \* \* \*  
Cope Rearrangement of 3,3-Dicyanohexa-1,5-diene.  
AD-A211 023
- \*JOHNSON, DANIEL@ \* \* \*  
Heterosynaptic Modulation of Long-Term Potentiation at Mossy Fiber Synapses in Hippocampus.  
AD-A209 835
- \*JONAS, DAVID M. \* \* \*  
Spin Statistics: An Error in Landau and Lifschitz' Quantum Mechanics.  
AD-A211 602
- \*JONAS, J. \* \* \*  
The Effect of Fluoride on the Sol-Gel Process.  
AD-A209 217
- \* \* \*  
The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388
- \* \* \*  
The Effect of Fluoride on the Sol-Gel Process.  
AD-A211 403
- \*JONAS, J. \* \* \*  
The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211 510
- \*JONAS, J. \* \* \*  
Comparison of Vacuum Annealed and
- A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.  
AD-A211 694
- \*JONES, H. W. \* \* \*  
Analytical Evaluation of the Electrostatic Potential for Diatomic Molecules.  
AD-A209 665
- \*JONES, MARSHALL B. \* \* \*  
Slope-Controlled Performance Testing.  
AD-A211 041
- \*JORDAN, HARRY@ \* \* \*  
Parallel Computation with the Force.  
AD-A211 488
- \*JORDAN, HARRY F. \* \* \*  
Multiprocessor Sparse L/U decomposition with Controlled Fill-In.  
AD-A211 570
- \*JORDAN, HARRY F. \* \* \*  
Comparing Barrier Algorithms.  
AD-A211 515
- \*JORDAN, HARRY F. \* \* \*  
The Force on the Flex: Global Parallelism and Portability.  
AD-A211 391
- \*JUHLKE, TIMOTHY J. \* \* \*  
Synthesis of Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672
- \*KAHN, BRUCE E. \* \* \*  
Comparison of Vacuum Annealed and

## UNCLASSIFIED

Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum, AD-A210 011

\* \* \*  
Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes, AD-A210 326

\* \* \*  
Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers, AD-A211 092

\*KAILATH, THOMAS@@@  
\* \* \*  
Studies in Statistical Signal Processing, AD-A210 054

\*KALLIANPUR, GOPINATH  
\* \* \*  
Research in Stochastic Processes, AD-A209 935

\*KAR, A  
\* \* \*  
Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature, AD-A210 134

\*KARASZ, FRANK E.@@  
\* \* \*  
Ultrastructure Processing and Characterization of Polymers, AD-A211 460

\*KAUFMAN, LLOYD  
\* \* \*  
Attention, Imagery and Memory: A neuromagnetic Investigation, AD-A209 917

\* \* \*  
Modulation of Spontaneous Brain Activity During Mer. al Imagery, AD-A209 918

\* \* \*  
Visualizing and Rhyming Cause Differences in Alpha Suppression, AD-A210 005

\* \* \*  
Cognitive and Neural Bases of Skilled Performance, AD-A210 851

\*KELLER, JOSEPH B @@@@  
\* \* \*  
Fast Reaction, Slow Diffusion, and Curve Shortening, AD-A211 605

\*KELLY, DONALD H.@@  
\* \* \*  
Role of Retinocortical Processing in Spatial Vision, AD-A210 995

\*KEYES, DAVID E  
\* \* \*  
Analysis of a Parallelized Nonlinear Elliptic Boundary Value Problem Solver with Application to Reacting Flows, AD-A211 487

\*KIM, CHULHEE@@  
\* \* \*  
Liquid, Crystalline Phosphazenes, High Polymeric and Cyclic Trimeric Systems with Anomalous Azo Side Groups, AD-A210 673

\*KING, D. S.@@  
\* \* \*  
Unimolecular Dynamics Following of Vibrational Overtone Excitation of HN3 V1=5 and V1=6: HN3(X, v, J, K) Yields HN(X(3)Sigma- (vJ0mega)+N2(X(1)Sigma+g)), AD-A210 001

\*KING, DAVID S.@@@  
\* \* \*

\* \* \*  
Energetics and Spin- and Lambda-Doublet Selectivity in the Infrared Multiphoton Dissociation DN3 Yields DN(X 3 Sigma(-), a 1 Delta) + N2(X 1 Sigma g (+)): Experiment, AD-A210 250

\*KING, RICHARD M.@@  
\* \* \*  
Finding Efficient Pipelining in Concurrent Structures, AD-A210 346

\*KINSEY, J. L  
\* \* \*  
High Precision Dipole Moments in A 1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy, AD-A211 731

\*KINSEY, JAMES L.@@  
\* \* \*  
Vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties, AD-A211 675

\*KISKINOVA, M  
\* \* \*  
Carbon Monoxide-Oxygen Interaction on the Pt(111) Surface: An Electron Stimulated Desorption Ion Angular Distribution (ESDIAD) Study, AD-A211 088

\* \* \*  
Compressed Co Overlayers on Pt(111) Evidence for Tilted Co Species at High Coverages by Digital ESDIAD, AD-A211 671

\* \* \*  
The Symmetrization Method for Enhancement of Digital ESDIAD Measurements: Increased Resolution for Study of Adsorbate Bond Directions, AD-A211 707

\*KLIMKO, EUGENE M.@@  
\* \* \*

PERSONAL AUTHOR INDEX-11  
UNCLASSIFIED EVI09K

KAI KLI

## UNCLASSIFIED

- Discrete Time Analysis of a Shut  
Down Queuing Systems.  
AD-A209 630
- \*KLINE, S. J \* \* \*  
Separated Flows, Turbulence  
Production Mechanisms and Free  
Shear Layers.  
AD-A210 355
- \*KLOOP, R. W \* \* \*  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307
- \*KNAUSS, W. G. @@@ \* \* \*  
An Experimental and Analytical  
Program to Develop Crack Tip  
Fracture Criteria.  
AD-A211 565
- \*KOBAYASHI, T \* \* \*  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307
- \*KOOCHESFAHANI, MANOCHER M. @ \* \* \*  
Control of Turbulent Mixing Layers.  
AD-A211 413
- \*KOSEKI, SHIRO \* \* \*  
Intrinsic Reaction Coordinate  
Calculations for Very Flat  
Potential Energy Surfaces:  
Application to Singlet S12H2  
Isomerization.  
AD-A211 673
- \*KOVASZNAV, LESLIE S. @@@ \* \* \*  
Complex Turbulent Flows.  
AD-A210 242
- \*KOWLER, EILEEN \* \* \*  
Eye Movements and Visual  
Information Processing.  
AD-A209 817
- \*KRAUSKOPF, JOHN @@@@ \* \* \*  
Higher Order Mechanisms of Color  
Vision.  
AD-A209 138
- \*KROTHAPALLI, ANJANEYULU \* \* \*  
Basic Studies of the Unsteady Flow  
Past High Angle of Attack Airfoils.  
AD-A210 252
- \*KUCHARSKI, STANISLAW A \* \* \*  
Couple-Cluster Methods That Include  
Connected Quadruple Excitations,  
T4: CCSDTQ-1 and Q(CCSDT).  
AD-A211 538
- \*KUMAR, CHALLA V \* \* \*  
Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896
- \*KUN, ERNEST @@@ \* \* \*  
Molecular Toxicology of Chromatin.  
AD-A211 158
- \*KUN, ERNEST \* \* \*  
Binding of Adenosine  
Diphosphoribosyltransferase to the  
Termini and Internal Regions of  
Linear DNAs.  
AD-A211 272
- \*KUNHARDT, ERICH E \* \* \*  
Physics of High Energy
- Photoconductive Switches.  
AD-A210 341
- \*LAGOW, RICHARD \* \* \*  
Synthesis of Unusual  
Perfluorocarbon Ethers and Amines  
Containing Bulky Fluorocarbon  
Groups: New Biomedical Materials.  
AD-A211 576
- \*LAGOW, RICHARD J. @@@ \* \* \*  
Synthesis of Perfluorotetraalkyl  
Orthocarbonates Using Elemental  
Fluorine.  
AD-A211 600
- \*LAGOW, RICHARD J. @@@ \* \* \*  
Synthesis of  
Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672
- \*LAGOW, RICHARD J. @@@ \* \* \*  
Synthesis of Perfluoro Crown  
Ethers: A New Class of Cyclic  
Fluorocarbons.  
AD-A211 601
- \*LAGUREN-DAVIDSON, LAARNI @ \* \* \*  
Structure and Composition of  
Pt(111) and Pt(100) Surfaces as a  
Function of Electrode Potential in  
Aqueous Sulfide Solutions.  
AD-A210 325
- \*LAGUREN-DAVIDSON, LAARNI \* \* \*  
Comparison of Vacuum-Annealed and  
Electrochemically Cycled Electrodes  
in Adsorption and Electrocatalysis:  
Aromatic Compounds at Platinum(111)  
and Polycrystalline Platinum.  
AD-A210 011
- LAM, KAI-SHUE \* \* \*  
Recent Progress in the Theory of

PERSONAL AUTHOR INDEX-12  
UNCLASSIFIED EVI09K

KLI LAM

## UNCLASSIFIED

- Laser-Assisted Collisions.  
AD-A210 636
- \*LANDY, MICHAEL S. \* \* \*  
The Kinetic Depth Effect and  
Identification of Shape.  
AD-A211 481
- \*LANDY, MICHAEL S. @ \* \* \*  
Ratings of Kinetic Depth in Multi-  
Dot Displays.  
AD-A211 138
- \* \* \* \*  
Kinetic Depth Effect and Optic Flow  
1. 3D Shape from Fourier Motion.  
AD-A211 260
- \*LAY, DAVID C. @ @ @ @ @ \* \* \* \*  
Rank-Preserving Extensions of Band  
Matrices.  
AD-A211 531
- \*LEADBETTER, M. R. @ @ \* \* \* \*  
Research in Stochastic Processes.  
AD-A209 935
- \*LEE, L. C. @ \* \* \* \*  
Photodetachment Cross Sections of  
Negative Halogen Ions in Discharge  
Media.  
AD-A209 343
- \*LEE, M. H. @ @ @ @ \* \* \* \*  
Band Calculations on Ferroelectric  
and Piezoelectric Solids.  
AD-A210 143
- \*LEMAL, D. M. \* \* \* \*  
Synthesis and Chemistry of Strained  
and Conjugated Fluorocarbons.  
AD-A211 633
- \*LEONARD, ANTHONY' @ @ @ @ @ \* \* \* \*  
Chemical Reactions in Turbulent  
Mixing Flows.  
AD-A211 240
- \*LEVEQUE, RANDALL J. \* \* \* \*  
Fourier Analysis of the SOR  
Iteration.  
AD-A211 571
- \*LEVEQUE, RANDALL J. @ @ @ \* \* \* \*  
High Resolution Finite Volume  
Methods on Arbitrary Grids via Wave  
Propagation.  
AD-A211 691
- \*LEWIS, ELMIR E. @ @ @ \* \* \* \*  
Monte Carlo Reliability Analysis.  
AD-A210 052
- \*LI, VICTOR O. @ @ @ @ @ \* \* \* \*  
Basic Research in Reliability for  
Real Systems.  
AD-A209 649
- \*LIN, CHIU-HSUN \* \* \* \*  
Comparison of Vacuum-Annealed and  
Electrochemically Cycled Electrodes  
in Adsorption and Electroanalysis:  
Aromatic Compounds at Platinum(111)  
and Polycrystalline Platinum.  
AD-A210 011
- \* \* \* \*  
Comparison of the Voltammetric  
Behavior of Adsorbed or Dissolved  
Unsaturated Alcohols at Vacuum-  
Annealed and Electrochemically  
Cycled Pt(111) and  
Pt(Polycrystalline) Electrodes.  
AD-A210 326
- \* \* \* \*  
Studies of Thiophene and  
Substituted Thiophenes at Platinum  
(111) Electrodes by Vibrational  
Spectroscopy and Auger  
Spectroscopy: Monomers, Dimers, and  
Polymers.
- AD-A211 092
- \*LIN, WEN-HUEY \* \* \* \*  
Synthesis of Perfluorotetraalkyl  
Orthocarbonates Using Elemental  
Fluorine.  
AD-A211 600
- \* \* \* \*  
Synthesis of Perfluoro Crown  
Ethers: A New Class of Cyclic  
Fluorocarbons.  
AD-A211 601
- \*LINDBERG, PER \* \* \* \*  
Surface, Interface, and Bulk  
Properties of High Tc  
Superconductors.  
AD-A211 490
- \*LOBER, R. @ \* \* \* \*  
Laser Cladding of Ni, Nb, and Mg  
Alloys for Improved Environmental  
Resistance at High Temperature.  
AD-A210 134
- \*LOURENCO, LUIZ \* \* \* \*  
Basic Studies of the Unsteady Flow  
Past High Angle of Attack Airfoils.  
AD-A210 252
- \*LU, FRANK @ @ @ @ @ \* \* \* \*  
Comparison of Vacuum-Annealed and  
Electrochemically Cycled Electrodes  
in Adsorption and Electroanalysis:  
Aromatic Compounds at Platinum(111)  
and Polycrystalline Platinum.  
AD-A210 011
- \* \* \* \*  
Studies of Thiophene and  
Substituted Thiophenes at Platinum  
(111) Electrodes by Vibrational  
Spectroscopy and Auger  
Spectroscopy: Monomers, Dimers, and  
Polymers.  
AD-A211 092

PERSONAL AUTHOR INDEX-13  
UNCLASSIFIED EVI09K

I AN 111

## UNCLASSIFIED

- \* \* \*  
 +LU, FRANK  
 Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
 AD-A210 325
- \* \* \*  
 +LYNCH, GARY@@@  
 Synaptic Plasticity and Memory Formation.  
 AD-A211 368
- \* \* \*  
 +MALKEVITCH, JOSEPH@@@  
 Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences, Volume 555).  
 AD-A210 672
- \* \* \*  
 +MARK, J. E. @  
 Molecular Theories of Rubberlike Elasticity and Some Recent Results on Model Networks and Unusual Fillers.  
 AD-A209 633
- \* \* \*  
 +MARK, JAMES E. @@@@  
 Generate Reinforcing Particles in Place.  
 AD-A209 656
- \* \* \*  
 +MARSHALL, JEFFREY S  
 Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.  
 AD-A209 875
- \* \* \*  
 +MAXKA, JIM  
 Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisiloletidine and 1,3,4,2,5-Dioxazadisiloletidine.  
 AD-A211 096
- \* \* \*  
 Use of 2-D INEPT-INADEQUATE 29Si NMR to Determine Structures of Organosilicon Rings.  
 AD-A211 100
- \* \* \*  
 +MAXWORTHY, T  
 Studies of Unsteady Vortex Flap Aerodynamics.  
 AD-A209 837
- \* \* \*  
 +MAZUMDER, J  
 Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature.  
 AD-A210 134
- \* \* \*  
 +MCCARGAR, JAMES W  
 Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
 AD-A210 325
- \* \* \*  
 Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
 AD-A210 326
- \* \* \*  
 +MCCREERY, RICHARD@@@  
 Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
 AD-A211 674
- \* \* \*  
 +MCCREERY, RICHARD L. @@@  
 Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects.  
 AD-A211 644
- \* \* \*  
 Activation of Highly Ordered
- \* \* \*  
 +MCCREERY, RICHARD L. @@@  
 Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
 AD-A211 603
- \* \* \*  
 +MCEACHERN, R. L  
 Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).  
 AD-A210 858
- \* \* \*  
 +MCGEOCH, M. W. @@@  
 Optical Production of Negative Ions.  
 AD-A210 234
- \* \* \*  
 +MECARTNEY, M. L. @@@@  
 High Temperature Superconducting Compounds.  
 AD-A211 511
- \* \* \*  
 +MEIER, G. H  
 Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.  
 AD-A209 934
- \* \* \*  
 +MENAHAN, LAWRENCE A  
 Perfluorodecanoic Acid and Lipid Metabolism in the Rat.  
 AD-A210 007
- \* \* \*  
 +MERTWETHER, JOHN W., JR  
 Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
 AD-A211 645

PERSONAL AUTHOR INDEX-14  
 UNCLASSIFIED  
 EVI09K

I U. MER

## UNCLASSIFIED

- Mapping the Wind in the Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD-A211 087
- \*MERKER, BJORN \* \* \*  
Computer-Aided Neuroanatomy: Differential Geometry of Cortical Surfaces and an Optimal Flattening Algorithm.  
AD-A210 333
- \*MERKLE, CHARLES L \* \* \*  
Coupling between Radiation and Gas Dynamics.  
AD-A209 657
- \*MICCI, MICHAEL M. @@@@  
Coupling between Radiation and Gas Dynamics.  
AD-A209 657
- \*MICHELS, H. H \* \* \*  
He<sub>2</sub>-(4II sub g) Yields He<sub>2</sub>(X1 Sigma<sub>g</sub>) Autodetachment Energy Spectrum: Assessment of the He<sub>2</sub> and He<sub>2</sub> Ground-State Potentials.  
AD-A209 983
- \*MIELKE, P. W., JR \* \* \*  
The Verification of Numerical Models with Multivariate Randomized Block Permutation Procedures.  
AD-A211 539
- \*MILLER, R. A. @ \* \* \*  
Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.  
AD A209 934
- \*MILLEVOLTE, A. J. @@@ \* \* \*  
Three-, Four-, and Five-Membered Rings from Disilenes.  
AD-A209 904
- \*MINTZ, MAX @@@ \* \* \*  
A Simulation Study of Four Real-Time Heuristic Algorithms for Multiple Missile Evasion: A Game Theoretic Approach.  
AD-A211 093
- \*MITCHELL, JOHN F \* \* \*  
ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (SiIox)3Ta (SiIox = t-Bu3SiO-).  
AD-A209 887
- \*MODAK, ANIL S \* \* \*  
Synthesis of Sulfodifluoromethyl Phosphonic Acid.  
AD-A211 524
- \*MONK, P. B. @@@ \* \* \*  
The Inverse Scattering Problem for Time-Harmonic Acoustic Waves in an Inhomogeneous Medium: Numerical Experiments.  
AD-A210 848
- \*MONK, PETER \* \* \*  
The Inverse Scattering Problem for Acoustic and Electromagnetic Waves.  
AD-A209 202
- \*MOORE, J. P. @ \* \* \*  
Fundamental Studies of B Phase Decomposition Modes in Titanium Alloys.  
AD-A209 866
- \*MOORE, JOHN W. @@@ \* \* \*  
PERSONAL AUTHOR INDEX-15  
UNCLASSIFIED  
EVI09K
- Biological Investigations of Adaptive Networks: Neuronal Control of Conditioned Responses.  
AD-A211 043
- \*MPIITOS, GEORGE J \* \* \*  
Parallel Processing and Learning in Simple Systems.  
AD-A210 225
- \*MUKHERJEE, A. K \* \* \*  
Superplasticity: A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.  
AD-A209 997
- \*MURMAN, EARLL M \* \* \*  
Computational Methods for Complex Flowfields.  
AD-A211 485
- \*MURPHY, KATHERINE A. @@@ \* \* \*  
Parameter Estimation in Functional and Partial Differential Equations.  
AD-A211 040
- \*NEITHAMER, DAVID R \* \* \*  
ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (SiIox)3Ta (SiIox = t-Bu3SiO-).  
AD-A209 887
- \*NELSON, DAVID D., JR \* \* \*  
Absolute Infrared Transition Moments for Open Shell Diatomics from J Dependence of Transition Intensities: Application to OH.  
AD-A209 894
- \* \* \*  
The Dipole Moment Function and Vibrational Transition Intensities of OH.  
AD-A209 895

## UNCLASSIFIED

- \*NELSON, MARK M \* \* \*  
The Adsorption and Reaction of  
Fluorine on the Si(100) Surface.  
AD-A211 595
- \*NELSON, THOMAS O. @ \* \* \*  
Metacognition and Retrieval from  
Long-Term Memory at Mount Everest.  
AD-A211 629
- \*NESBITT, DAVID J \* \* \*  
Absolute Infrared Transition  
Moments, for Open Shell Diatomics  
from J Dependence of Transition  
Intensities: Application to OH.  
AD-A209 894
- \*NESBITT, DAVID J. @ \* \* \*  
The Dipole Moment Function and  
Vibrational Transition Intensities  
of OH.  
AD-A209 895
- \*NICOLAIDES, R. A. @ \* \* \*  
Efficient Finite Element Solution  
of Navier-Stokes Equations and  
Related Topics.  
AD-A211 647
- \*NOREN, GEORGE H \* \* \*  
Lewis Base Adducts to  
Diorganosilylenes.  
AD-A209 631
- \*NOVICK-COHEN, AMY @ \* \* \*  
Solidation Front/Viscous Phase  
Transitions. Forwards-Backward Heat  
Equations.  
AD A211 068
- \*NUSBAUM, HARVARD C \* \* \*  
Attention and Vigilance in Speech  
Perception.
- AD-A210 493
- \*OGHS, R. L. @ \* \* \*  
The Inverse Scattering Problem for  
Acoustic and Electromagnetic Waves.  
AD-A209 202
- \*O'KEEFE, ANTHONY @ @ @ @ \* \* \*  
Development of Photodeposited  
Diamond Films.  
AD-A209 576
- \*OLSEN, LARRY C. @ @ @ \* \* \*  
Graded Bandgap Solar Cells.  
AD-A211 537
- \*OSTERYOUNG, R. A. @ @ @ @ @ \* \* \*  
1-Methyl-3-Ethylimidazolium  
Hydrogen Chloride: Synthesis and  
Application to the study of Protons  
in Ambient-Temperature  
Chloroaluminate Ionic Liquids.  
AD-A211 526
- \*OSTERYOUNG, R. A. @ @ \* \* \*  
The Ferro/Ferricyanide Couple in an  
Aluminum Chloride 1-Methyl-3-  
ethylimidazolium Chloride Ambient-  
Temperature Molten Salt.  
AD-A211 541
- \*OSTERYOUNG, ROBERT A \* \* \*  
Aluminum Anodization in a Basic  
Ambient Temperature Molten Salt.  
AD-A211 598
- \*OSTERYOUNG, ROBERT A. @ @ @ @ @ \* \* \*  
Normal and Reverse Pulse  
Voltammetry from Polised Systems at  
Microdisk Electrodes.  
AD-A211 597
- \*OSTERYOUNG, ROBERT A. @ \* \* \*  
Donor-Acceptor Properties of  
Ambient-Temperature Chloroaluminate  
Melts.  
AD-A211 525
- \* \* \* \*  
Reaction of Protons and Molybdenum  
Dimers in an Ambient-Temperature  
Molten Salt.  
AD-A211 698
- \* \* \* \*  
Microelectrodes in the Examination  
of Anodic and Cathodic Limit  
Reactions of an Ambient Temperature  
Molten Salt.  
AD-A211 899
- \*OSTRACH, SIMON \* \* \* \*  
Effect of Body Forces on Motion and  
Heat Transfer of Confined Fluids.  
AD-A210 667
- \*DOUGHSTUN, KURT E. @ \* \* \* \*  
Electromagnetic Pulse Interaction  
at a Dielectric Interface.  
AD-A211 081
- \*PACKARD, RICHARD \* \* \* \*  
Raman Spectroscopy of Carbon  
Electrodes: Correlation between  
Defect Density and Heterogeneous  
Electron Transfer Rate.  
AD-A211 603
- \*PACKARD, RICHARD T \* \* \* \*  
Mechanism of Electrochemical  
Activation of Carbon Electrodes:  
Role of Graphite Lattice Defects.  
AD-A211 644
- \* \* \* \*  
Activation of Highly Ordered  
Pyrolytic Graphite for  
Heterogeneous Electron Transfer:  
Relationship between  
Electrochemical Performance and  
Carbon Microstructure.  
AD-A211 845

PERSONAL AUTHOR INDEX-16  
UNCLASSIFIED EVI09K

NEL PAC

UNCLASSIFIED

\*PANG, YANG \* \* \*

Picosecond Laser-Induced Transient  
Grating Probe of the Mechanical  
Properties of High-Modulus Poly(p-  
phenylenebisisoxazole-2,6-diyl),  
AD-A210 546

\*PARKANYI, LASZLO \* \* \*

ETA(2)-(N,C)-Pyridine Micrometers-  
ETA(2)(1,2):ETA(2)(4,5)-Benzene  
Complexes of (SiIox)3Ta (SiIox = t-  
Bu3SiO-),  
AD-A209 887

\*PARKER, J. H., JR \* \* \*

Kapitza Conductance of Crystals  
Cleaved under He II,  
AD-A211 509

\*PATTERSON, A. @@@@ \* \* \*

Kapitza Conductance of Crystals  
Cleaved under He II,  
AD-A211 509

\*PAULTER, @ \* \* \*

The Phototoxicity of Blue Light on  
the Functional Properties of the  
Retinal Pigment Epithelium,  
AD-A209 834

\*PERKINS, MARK E. @ \* \* \*

The Kinetic Depth Effect and  
Identification of Shape,  
AD-A211 481

\*PERKINS, R. A \* \* \*

Effect of Alloying, Rapid  
Solidification, and Surface  
Kinetics on the High Temperature  
Environmental Resistance of  
Niobium,  
AD-A209 934

\*PERSICO, DANIEL F \* \* \*

\* \* \*

Synthesis of Unusual  
Perfluorocarbon Ethers and Amines  
Containing Bulky Fluorocarbon  
Groups: New Biomedical Materials,  
AD-A211 576

\*PETERSON, J. R \* \* \*

He2-(4II sub g) Yields He2(X1  
Sigma+) Autodetachment Energy  
Spectrum: Assessment of the He2 -  
and He2 Ground-State Potentials,  
AD-A209 983

\*PETERSON, RICHARD E. @@@@ \* \* \*

Perfluorodecanoic Acid and Lipid  
Metabolism in the Rat,  
AD-A210 007

\*PIANETTA, P \* \* \*

Photon-Energy-Sensitive Si L(2,3)  
VV Auger Satellite,  
AD-A209 039

\*PICK, HERBERT L \* \* \*

Topographic Map Reading,  
AD-A211 269

\*PLICHTA, M. R \* \* \*

Fundamental Studies of B Phase  
Decomposition Modes in Titanium  
Alloys,  
AD-A209 866

\*POLAVARAPU, P. L. @@@@ \* \* \*

Experimental and ab Initio  
Vibrational Spectra of 1,2-  
Dibromoethane, Meso-1,2-Dideuterio-  
1,2-Dibromoethane, and Chiral 1,2-  
Dideuterio-1,2-Dibromoethane,  
AD-A211 268

\*POLITZER, PETER \* \* \*

Computational Analysis of the

Structures, Bond Properties, and  
Electrostatic Potentials of Some  
Nitrotetrahydrofuran and  
Nitroazetetrhydrofuran,  
AD-A211 667

\*POWERS, EDWARD J. @ \* \* \*

Electronics Research at the  
University of Texas at Austin,  
AD-A209 989

\*PRADHAN, DHIRAJ @@@@ \* \* \*

Fault Tolerant Multiprocessors and  
VLSI-Based Systems,  
AD-A209 579

\*PRASAD, PRAS N. @@@@ \* \* \*

Picosecond Laser-Induced Transient  
Grating Probe of the Mechanical  
Properties of High-Modulus Poly(p-  
phenylenebisisoxazole-2,6-diyl),  
AD-A210 546

\*PRASAD, PRAS N. @@@@ \* \* \*

Ultrafast Third-Order Non-Linear  
Optical Processes in Polymeric  
Films,  
AD-A210 336

\* \* \*

Picosecond Degenerate Four-Wave  
Mixing Study of Nonlinear Optical  
Properties of the Poly-N-Vinyl  
Carbazole: 2,4,7-Trinitrofluorenone  
Composite Polymer Photoconductor,  
AD-A210 363

\*PROCTOR, ROBERT W \* \* \*

Stimulus-Response Compatibility in  
Spatial Precuing and Symbolic  
Identification: Effects of Coding  
Practice, Retention and Transfer,  
AD-A210 745

\*QUINN, JARUS W. @@@@ \* \* \*

Organization of the Topical Meeting

PERSONAL AUTHOR INDEX-17  
UNCLASSIFIED EVI09K

PAN QUI

## UNCLASSIFIED

- on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts.  
AD-A209 847
- \*QUINONES, EDWIN \* \* \*  
Observation of  $NH(a1 \Delta)$ ,  $v=1$  from the  $H + N_3$  Reaction,  
AD-A210 681
- \*RAFF, LIONEL M. \* \* \*  
Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane,  
AD-A210 290
- \*RAMASWAMY, R. V. \* \* \*  
Linear (Passive) and Non-Linear Guided and Studies in Glass,  
AD-A211 693
- \*RAO, D. N. \* \* \*  
Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl),  
AD-A210 546
- \*RAO, K. N. \* \* \*  
International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.  
AD-A210 400
- \*REDINGTON, RICHARD L. \* \* \*  
Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone,  
AD-A211 563
- \*REES, DAVID \* \* \*  
Mapping the Wind in the Polar
- Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program,  
AD-A211 087
- \*REEVE, T. G. \* \* \*  
Stimulus-Response Compatibility in Spatial Precuing and Symbolic Identification: Effects of Coding Practice, Retention and Transfer,  
AD-A210 745
- \*REINKE, R. \* \* \*  
Deterministic and Stochastic Wavefields in the Near-Field from Explosive Sources,  
AD-A210 057
- \*REITER, E. R. \* \* \*  
The Verification of Numerical Models with Multivariate Randomized Block Permutation Procedures,  
AD-A211 539
- \*REITER, E. R. \* \* \*  
Heavy Rainfall in Complex Terrain: Insights from a Numerical Model,  
AD-A211 530
- \*RIBAUDO, C. \* \* \*  
Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature,  
AD-A210 134
- \*RIBNER, H. S. \* \* \*  
Aerodynamically Generated Sound and Subsonic Aerodynamics,  
AD-A209 920
- \*RICE, RONALD \* \* \*  
Fast Heterogeneous Electron Transfer Rates for Glassy Carbon
- Electrodes without Polishing or Activation Procedures,  
AD-A211 674
- \*RITTER, A. \* \* \*  
High-Strain-Rate Behavior of Hydrated Cement Paste,  
AD-A210 180
- \*RODDICK, DEAN M. \* \* \*  
Dimethylsilyl Derivatives of Zirconium,  
AD-A208 932
- \*RUBIN, ALLAN M. \* \* \*  
Stress Wave Induced Damage in Rock,  
AD-A211 599
- \*RUBINSTEIN, JACOB \* \* \*  
Fast Reaction, Slow Diffusion, and Curve Shortening,  
AD-A211 605
- \*RUSSELL, DAVID A. \* \* \*  
Laser Mixing Processes,  
AD-A209 870
- \*SALAITA, GHALEB N. \* \* \*  
Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions,  
AD-A210 325
- \*SALAITA, GHALEB N. \* \* \*  
Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes,  
AD-A210 328
- \*SANTAVICCA, D. A. \*  
PERSONAL AUTHOR INDEX-18  
UNCLASSIFIED  
EVI09K

QUI SAN

UNCLASSIFIED

- \* \* \*  
Premixed Turbulent Flame  
Propagation.  
AD-A211 489
- \*SANTORU, JOSEPH \* \* \*  
Plasma-Anode Electron Gun Research.  
AD-A211 547
- \*SASTRY, SRINIVAS S \* \* \*  
Binding of Adenosine  
Diphosphoribosyltransferase to the  
Termini and Internal Regions of  
Linear DNAs.  
AD-A211 272
- \*SANCHUK, A. A. @ \* \* \*  
Integrated Opto-Electronic  
Computing.  
AD-A209 936
- \*SCARR, G. K \* \* \*  
Fundamental Studies of B Phase  
Decomposition Modes in Titanium  
Alloys.  
AD-A209 866
- \*SCHEMMER, PAMELA A. @@@ \* \* \*  
The Vibrational Spectrum of  
Tetrafluoropropyne.  
AD-A211 596
- \*SCHIFFMAN, ARAM \* \* \*  
Absolute Infrared Transition  
Moments for Open Shell Diatomics  
from J Dependence of Transition  
Intensities: Application to OH,  
AD-A209 894
- \* \* \*  
The Dipole Moment Function and  
Vibrational, Transition Intensities  
of OH.  
AD-A209 895
- \*SCHILLING, DONALD L \* \* \*  
Automatic Construction of  
Polyhedral Surfaces from Voxel  
Representations.  
AD-A210 009
- \* \* \*  
Computer-Aided Neuroanatomy:  
Differential Geometry of Cortical  
Surfaces and an Optimal Flattening  
Algorithm,  
AD-A210 333
- \*SCHWARTZ, ERIC L. @ \* \* \*  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path, Fusion and Convergence Over  
Multiple Scans.  
AD-A209 984
- \* \* \*  
Applications of Computer Graphics  
and Image Processing to 2D and 3D  
modeling of the Functional  
Architecture of Visual Cortex.  
AD-A209 985
- \* \* \*  
Cepstral Filtering on a Columnar  
Image Architecture: A Fast  
Algorithm for Binocular Stereo  
Segmentation.  
AD-A210 574
- \*SCHWUTTKE, G. H. @ \* \* \*  
Autonomous Control System for  
Czocharalski Growth of LEC GaAs.  
AD-A210 190
- \*SCIPIONE, J. F \* \* \*  
Recent Progress in the Theory of  
Laser-Assisted Collisions,  
AD-A210 636
- \*SEMINARIO, JORGE M. @ \* \* \*  
Computational Analysis of the  
Structures, Bond Properties, and  
Electrostatic Potentials of Some  
Nitrotetrahydrofuranes and  
Nitroazetetrahydrofuranes.  
AD-A211 667
- \* \* \*  
Communications Using Channels  
Formed by Meteor Bursts.  
AD-A209 856
- \*SCHULTHEISZ, C. R \* \* \*  
An Experimental and Analytical  
Program to Develop Crack Tip  
Fracture Criteria.  
AD-A211 565
- \*SCHUMACHER, ROBERT W \* \* \*  
Plasma-Anode Electron Gun Research.  
AD-A211 547
- \*SCHWARTZ, ERIC \* \* \*  
A New Method for Measuring the  
Visuotopic Map Function of Striate  
Cortex: Validation with Macaque  
Data and Possible Extension to  
Measurement of the Human Map.  
AD-A210 008
- \* \* \*  
The Generalized Map Makers Problem:  
Optimal Flattening of Polyhedral  
Surfaces.  
AD-A210 013
- \* \* \*  
Computing Minimal Distances on  
Arbitrary Polyhedral Surfaces.  
AD-A210 015
- \* \* \*  
Conformal Image Warping.  
AD-A210 016
- \* \* \*  
Psychophysical Studies of Shape  
with Fourier Descriptor Stimuli.  
AD-A210 018
- \*SCHWARTZ, ERIC L \* \* \*  
Towards a Non-Network Approach to  
Neural Modeling: Some Basic Issues  
of Measurement, Simulation and  
Computational Significance of Brain  
Maps,  
AD-A209 982

## UNCLASSIFIED

- \*SENGUPTA, SUBRATA<sup>@@@</sup>  
\* \* \*  
International Conference on  
Numerical Grid Generation in  
Computational Fluid Dynamics.  
AD-A211 082
- \*SERFOZO, RICHARD F.<sup>@@@</sup>  
\* \* \*  
Stochastic Flows in Networks.  
AD-A211 209
- \*SETTLES, GARY S.<sup>@</sup>  
\* \* \*  
Experimental Research on Swept  
Shock Wave/Boundary Layer  
Interactions.  
AD-A211 744
- \*SHAW, ALAN<sup>@@</sup>  
\* \* \*  
Automatic Construction of  
Polyhedral Surfaces from Voxel  
Representations.  
AD-A210 009
- \*SHEKETOFF, MICHAEL S.  
\* \* \*  
A Simulation Study of Four Real-  
Time Heuristic Algorithms for  
Multiple Missile Evasion: A  
Game Theoretic Approach.  
AD-A211 093
- \*SHEN, Z. X.  
\* \* \*  
Surface, Interface, and Bulk  
Properties of High Tc  
Superconductors.  
AD-A211 490
- \*SHEPPARD, HARVEY E.<sup>@@@</sup>  
\* \* \*  
Support of Travel for U.S.  
Participants in 5th International  
Biophysics Congress (5th) Held in  
Copenhagen, Denmark 4-9 August  
1975.  
AD-A210 004
- \*SHOCKEY, D. A.<sup>@@@</sup>
- \*SINGH, BHANU P.  
\* \* \*  
Picosecond Degenerate Four-Wave  
Mixing Study of Nonlinear Optical  
Properties of the Poly-N-Vinyl  
Carbazole: 2,4,7-Trinitrofluorenone  
Composite Polymer Photoconductor.  
AD-A210 363
- \*SINHA, ALOK  
\* \* \*  
Analytical Study of  
Mistuning/Friction/Aerodynamics  
Interaction in a Bladed Disk  
Assembly.  
AD-A211 139
- \*SINRU, LIN  
\* \* \*  
Normal and Reverse Pulse  
Voltammetry from Poised Systems at  
Microdisk Electrodes.  
AD-A211 597
- \*SIRCAR, S.  
\* \* \*  
Laser Cladding of Ni, Nb, and Mg  
Alloys for Improved Environmental  
Resistance at High Temperature.  
AD-A210 134
- \*SIVAZLIAN, BOGHOS D.<sup>@@@</sup>  
\* \* \*
- \*SMITH, L. R.<sup>@</sup>  
\* \* \*  
Aircraft Sortie Effectiveness  
Model,  
AD-A211 594
- \*SMITH, RUGGER W.  
\* \* \*  
Mapping the Wind in the Polar  
Thermosphere: A Case Study within  
the CEDAR (Coupling, Energetics and  
Dynamics of Atmospheric Regions)  
Program.  
AD-A211 087
- \*SMOOKIE, MITCHELL D.  
\* \* \*  
Analysis of a Parallelized  
Nonlinear Elliptic Boundary Value  
Problem Solver with Application to  
Reacting Flows.  
AD-A211 487
- \*SONG, X.  
\* \* \*  
The Structural and Dynamical  
Properties of the Sol-Gel  
Transition,  
AD-A211 510
- \*SORENSEN, S. L.  
\* \* \*  
Photon-Energy-Sensitive Si L(2,3)  
VV Auger Satellite,  
AD-A209 039
- \*SOUGANIDIS, P. E.<sup>@</sup>  
\* \* \*  
Wavefront Propagation for Reaction-  
Diffusion Systems of PDE,  
AD-A210 862
- \*SPERLING, GEORGE<sup>@@@</sup>  
\* \* \*
- \*STEGMAN, A. E.<sup>@@@</sup>  
\* \* \*  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307
- \*LASER Physics and Laser Techniques.  
AD-A211 117
- \*SIMONS, J. W.  
\* \* \*  
Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307
- \*SINGH, BHANU P.  
\* \* \*  
Picosecond Degenerate Four-Wave  
Mixing Study of Nonlinear Optical  
Properties of the Poly-N-Vinyl  
Carbazole: 2,4,7-Trinitrofluorenone  
Composite Polymer Photoconductor.  
AD-A210 363
- \*SINHA, ALOK  
\* \* \*  
Analytical Study of  
Mistuning/Friction/Aerodynamics  
Interaction in a Bladed Disk  
Assembly.  
AD-A211 139
- \*SINRU, LIN  
\* \* \*  
Normal and Reverse Pulse  
Voltammetry from Poised Systems at  
Microdisk Electrodes.  
AD-A211 597
- \*SIRCAR, S.  
\* \* \*  
Laser Cladding of Ni, Nb, and Mg  
Alloys for Improved Environmental  
Resistance at High Temperature.  
AD-A210 134
- \*SIVAZLIAN, BOGHOS D.<sup>@@@</sup>  
\* \* \*
- \*SMITH, RUGGER W.  
\* \* \*  
Mapping the Wind in the Polar  
Thermosphere: A Case Study within  
the CEDAR (Coupling, Energetics and  
Dynamics of Atmospheric Regions)  
Program.  
AD-A211 087
- \*SMOOKIE, MITCHELL D.  
\* \* \*  
Analysis of a Parallelized  
Nonlinear Elliptic Boundary Value  
Problem Solver with Application to  
Reacting Flows.  
AD-A211 487
- \*SONG, X.  
\* \* \*  
The Structural and Dynamical  
Properties of the Sol-Gel  
Transition,  
AD-A211 510
- \*SORENSEN, S. L.  
\* \* \*  
Photon-Energy-Sensitive Si L(2,3)  
VV Auger Satellite,  
AD-A209 039
- \*SOUGANIDIS, P. E.<sup>@</sup>  
\* \* \*  
Wavefront Propagation for Reaction-  
Diffusion Systems of PDE,  
AD-A210 862
- \*SPERLING, GEORGE<sup>@@@</sup>  
\* \* \*

UNCLASSIFIED

- Visual Motion Perception.  
AD-A210 994 \* \* \*
- Second-Order Motion Perception:  
Space/Time Separable Mechanisms,  
AD-A211 028 \* \* \*
- \*SPERLING, GEORGE@  
\* \* \*
- Drift-Balanced Random Stimuli: A  
general Basis for Studying Non-  
Fourier Motion Perception,  
AD-A211 063 \* \* \*
- Two Motion Perception Mechanisms  
Revealed Through Distance-Driven  
Reversal of Apparent Motion,  
AD-A211 214 \* \* \*
- \*SPERLING, GEORGE \* \* \*  
Ratings of Kinetic Depth in Multi-  
Dot Displays.  
AD-A211 138 \* \* \*
- Kinetic Depth Effect and Optic Flow  
1. 3D Shape from Fourier Motion,  
AD-A211 260 \* \* \*
- The Kinetic Depth Effect and  
Identification of Shape,  
AD-A211 481 \* \* \*
- \*SPICER, WILLIAM E \* \* \*  
Surface, Interface, and Bulk  
Properties of High Tc  
Superconductors.  
AD-A211 490 \* \* \*
- \*SPRAGUE, LEE G.@ \* \* \*  
Allylations of  
(Diethoxyphosphinyl)difluoromethyl  
zinc Bromide as a Convenient Route  
to 1,1-Difluoro-3-  
alkenephosphonates,  
AD-A211 702 \* \* \*
- \*SRINIVASARAO, MOHAN@ \* \* \*  
Systems.  
AD-A210 130 \* \* \*
- \*STONE, F. G \* \* \*  
Chemistry of Polynuclear Metal  
Complexes with Bridging Carbene or  
Carbyne Ligands. Part 85. Synthesis  
of Chain and Ring Compounds  
Containing Molybdenum.  
AD-A210 847 \* \* \*
- \*STONE, F. G.@ \* \* \*  
Chemistry of Polynuclear Metal  
Complexes with Bridging Carbene or  
Carbyne Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-  
Gold, -Rhodium and -Iron Complexes;  
Crystal Structure of  
(NEt4)(MoFe2(Mu3-CC6H4Me-4) (Mu-  
C2B9H7Me2)(CO)8).  
AD-A210 340 \* \* \*
- \*STUMP, BRIAN W \* \* \*  
Effects of Source Depth on Near-  
Source Seismograms,  
AD-A209 897 \* \* \*
- Deterministic and Stochastic  
Wavefields in the Near-Field from  
Explosive Sources.  
AD-A210 057 \* \* \*
- \*SU, DEBAO \* \* \*  
Synthesis of  
Sulfodifluoromethyl)Phosphonic  
Acid,  
AD-A211 524 \* \* \*
- \*SU, RENJENG@ \* \* \*  
Control and Optimization for  
Observations of Systems Governed by  
Controlled Partial Differential  
Equations.  
AD-A211 122 \* \* \*
- Studies on Aligned Nematic  
Solutions of a Fodlike Polymer,  
AD-A210 603 \* \* \*
- \*SRIVASTAVA, SANTOSH K.@ \* \* \*  
Ion Formation by Electron Impact.  
AD-A211 367 \* \* \*
- \*STACY, W. D.@ \* \* \*  
Superconducting Meissner Effect  
Bearings for Cryogenic  
Turbomachines. Phase 1.  
AD-A209 875 \* \* \*
- \*STEIER, W. H \* \* \*  
Integrated Opto-Electronic  
Computing.  
AD-A209 936 \* \* \*
- \*STEPHENSON, J. C \* \* \*  
Unimolecular Dynamics Following  
Vibrational Overtone Excitation of  
HN3 V1=5 and v1=6: HN3(X, v, J, K)  
Yields HN(x(3)Sigma-  
(vJ0mega)+N2(X(1)Sigma+g)).  
AD-A210 001 \* \* \*
- \*STEPHENSON, JOHN C \* \* \*  
Energetics and Spin- and Lambda-  
Doublet Selectivity in the Infrared  
Multiphoton Dissociation DN3 Yields  
DN(X 3 Sigma(-), a 1 Delta) + N2(X  
1 Sigma g (+)); Experiment,  
AD-A210 250 \* \* \*
- \*STERNBERG, PETER \* \* \*  
Fast Reaction, Slow Diffusion, and  
Curve Shortening,  
AD-A211 605 \* \* \*
- \*STOKOE, KENNETH H., II \* \* \*  
High-Amplitude Mobile Vibrator for  
Exciting Body and Surface Waves in  
Soil, Pavement And Structural

PERSONAL AUTHOR INDEX-21  
UNCLASSIFIED EVI09K

SPE SU.

## UNCLASSIFIED

- \*SWIATKIEWICZ, JACEK \* \* \*  
Picosecond Degenerate Four-Wave  
Mixing Study of Nonlinear Optical  
Properties of the Poly-N-Vinyl  
Carbazole; 2,4,7-Trinitrofluorenone  
Composite Polymer Photoconductor,  
AD-A210 383
- \*SWIFT, DANIEL W. @ \* \* \*  
Development of Computer Codes to  
Model Dynamics of the Earth's  
Magnetosphere.  
AD-A211 532
- \*SZABO, A \* \* \*  
Carbon Monoxide-Oxygen Interaction  
on the Pt(111) Surface: An Electron  
Stimulated Desorption Ion Angular  
Distribution (ESDIAD) Study,  
AD-A211 088
- \*TAL-EZER, HILLEL @ \* \* \*  
Compressed Co Overlayers on Pt(111)  
Evidence for Tilted Co Species at  
High Coverages by Digital ESDIAD,  
AD-A211 671
- \*TAL-EZER, HILLEL @ \* \* \*  
The Symmetrization Method for  
Enhancement of Digital ESDIAD  
measurements: Increased Resolution  
for Study of Adsorbate Bond  
Directions,  
AD-A211 707
- \*TARLOV, MICHAEL J \* \* \*  
Polynomial Approximation of  
Functions of Matrices and Its  
Application to the Solution of a  
General System of Linear Equations.  
AD-A211 390
- \*TARLOV, MICHAEL J \* \* \*  
Surface Electrochemistry of Amino  
Acids: Voltammetry Assisted by EELS  
(Electron Energy-Loss Spectra),  
Auger and LEED,  
AD-A210 509
- \*TAYLOR, A. T. @ \* \* \*  
An Investigation of the Irradiation  
Swelling Mechanisms in Refractory  
Metals at High Temperatures.  
AD-A211 406
- \*TEMKIN, R. @ @ \* \* \*  
Tunable Microwigglers for Free-  
Electron Lasers,  
AD-A209 062
- \*TEMPS, FRIEDRICH \* \* \*  
Vibrationally Excited Formaldehyde:  
The Relationship between  
Vibrational Structure and  
Collisional Properties,  
AD-A211 675
- \*THIYAGARAJAN, P \* \* \*  
A SANS (Small Angle Neutron  
Scattering) of Catalyst on the  
Growth Process of Silica Gels,  
AD-A211 694
- \*THOMPSON, WILLIAM B. @ @ @ \* \* \*  
Topographic Map Reading.  
AD-A211 269
- \*THORP, H. H \* \* \*  
Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896
- \*TILLEY, T. D. @ @ @ @ \* \* \*  
Dimethylsilyl Derivatives of  
Zirconium,  
AD-A208 932
- \*TILLEY, T. D. @ \* \* \*  
Tris(trimethylsilyl)silyl  
Derivatives of Tri-tert-
- butoxyzirconium and Tri-tert-  
butoxyhafnium. X-ray Crystal  
Structure of (Me3CO)3ZrSi(SiMe)3,  
AD-A211 095
- \*TILLEY, T. D. @ \* \* \*  
Sigma Bond Metathesis Reactions of  
Si-H and M-Si Bonds. New Routes to  
d(O) Metal Silyl Complexes,  
AD-A210 065
- \*TOMIYAMA, KEN \* \* \*  
Sensitivity Evaluation Plan for  
Lowtran,  
AD-A211 484
- \*TREFETHEN, LLOYD N \* \* \*  
Fourier Analysis of the SOR  
iteration.  
AD-A211 571
- \*TSUI, D. C. @ \* \* \*  
Transport and Submillimeter Wave  
Spectroscopy of GaAs/Al sub xGa sub  
1-x and In sub x Ga sub 1-x As  
Heterostructures.  
AD-A209 836
- \*TUCKER, D. F \* \* \*  
Heavy Rainfall in Complex Terrain:  
Insights from a Numerical Model,  
AD-A211 530
- \*TUCKER, D. F \* \* \*  
The Verification of Numerical  
Models with Multivariate Randomized  
Block Permutation Procedures,  
AD-A211 539
- \*TURRO, NICHOLAS J \* \* \*  
Photochemical Probes for Structure  
of Zeolites and for Dynamics of  
Reactions of Molecules Adsorbed on  
Porous Solids.  
AD-A208 989

PERSONAL AUTHOR INDEX-22  
UNCLASSIFIED  
EVI09K

SWI-TUR

UNCLASSIFIED

- Emission Properties of  
Dioxorhenium(V) Complexes in  
Aqueous Solutions of Anionic and  
Nonionic Surfactants: A Sensitive  
Probe of Hydrophobic Binding  
Regions.  
AD-A209 896
- Dynamics of Flexible Triplet  
Biradicals.  
AD-A210 334
- Photochemistry of Dibenzyl Ketone  
Adsorbed on Size/Shape Selective  
Faujasite Zeolites. Steric Effects  
on Product Distributions.  
AD-A211 378
- \*TURRO, NICHOLAS J.@@@  
\* \* \*  
Negative Temperature Dependence in  
the Decay of Triplet Biradicals,  
AD-A209 886
- \*TURRO, NICHOLAS J.@@@  
\* \* \*  
Large Magnetic Field Effect on the  
Decay Rates of Triplet Hydrocarbon  
Diradicals.  
AD-A210 680
- \*UZES, C. A. \* \* \*  
Band Calculations on Ferroelectric  
and Piezoelectric Solids.  
AD-A210 143
- \*VACCARO, P. H. \* \* \*  
High Precision Dipole Moments in A  
1(A2) Formaldehyde Determined via  
Stark Quantum Beat Spectroscopy,  
AD-A211 731
- \*VACCARO, PATRICK H.  
\* \* \*  
Vibrationally Excited Formaldehyde:  
The Relationship between  
Vibrational Structure and  
Collisional Properties,  
AD-A211 675
- \*VAN DOMMELEN, LEON@@@  
\* \* \*  
Basic Studies of the Unsteady Flow  
Past High Angle of Attack Airfoils.  
AD-A210 252
- \*VAN DYKE, MILTON@@  
\* \* \*  
Development of Analytical and Semi-  
Numerical Methods of Flow  
Calculation.  
AD-A209 516
- \*VAN RAFELGHEM, MARC J.  
\* \* \*  
Perfluorodecanoic Acid and Lipid  
Metabolism in the Rat.  
AD-A210 007
- \*VAN WAZER, JOHN R.  
\* \* \*  
Ab Initio Computation of Silicon-29  
Nuclear Magnetic Resonance Chemical  
Shifts for a Range of  
Representative Compounds.  
AD-A210 010
- \*VAN WAZER, JOHN R. @  
\* \* \*  
Ab Initio Studies of Molecular  
Structures and Energetics. 3.  
Pentacoordinated NFnH(5-n)  
Compounds.  
AD-A210 674
- \*VERINK, E. D., JR.  
\* \* \*  
Materials Research Society  
Symposium Proceedings Held in Reno,  
Nevada on 5-7 April 1988. Volume  
125. Materials Stability and  
Environmental Degradation.  
AD-A211 737
- \*VIRKAR, ANIL V. @  
\* \* \*  
New Mechanism for Toughening  
Ceramic Materials.  
AD-A211 651
- \*VITERBI, ANDREW J.@@@  
\* \* \*  
Research in Mathematics and  
Computer Science: Calculation of  
the Probability of Undetected Error  
for Certain Error Detection Codes.  
Phase 1.  
AD-A210 302
- \*WAKEFIELD, GREGORY H.@@@  
\* \* \*  
Time-Frequency Factors in Auditory  
Perception.  
AD-A211 491
- \*WALSH, ROBIN@  
\* \* \*  
Heats of Formation of Alkylsilanes.  
AD-A211 575
- \*WALTON, NICHOLAS@@  
\* \* \*  
Surface Electrochemistry of Amino  
Acids: Voltammetry Assisted by EELS  
(Electron Energy-Loss Spectra).  
Auger and LEED.  
AD-A210 509
- \*WAN, JIANG \* \* \*  
Reaction of E-1,4-Poly(2-  
Triethylsilyl-1,3-Butadiene) with  
Iodine Monochloride.  
AD-A209 899
- \*WANG, JINFENG \* \* \*  
Negative Temperature Dependence in  
the Decay of Triplet Biradicals.  
AD-A209 886
- Large Magnetic Field Effect on the  
Decay Rates of Triplet Hydrocarbon  
Diradicals.  
AD-A210 680
- \*WANG, JIN-FENG \* \* \*  
Dynamics of Flexible Triplet  
Biradicals.  
AD-A210 334

PERSONAL AUTHOR INDEX-23  
UNCLASSIFIED EVI09K

TUR WAN

## UNCLASSIFIED

- \*WATSON, W. C. \* \* \*  
Photodetachment Cross Sections of  
Negative Halogen Ions in Discharge  
Media.  
AD-A209 343
- \*WARD, J. F. @ \* \* \*  
Resonant and Non-Resonant Optical  
Frequency Mixing in Simple  
Molecular Systems.  
AD-A210 191
- \*WASSERSTROM, F. \* \* \*  
Phase Compensation for High Power  
Lasers Using Refracting Gas Prisms.  
AD-A209 869
- \*WATERHOUSE, BARRY D. @@@@ \* \* \*  
The Role of Central Monoaminergic  
Systems in Arousal and Selective  
Attention.  
AD-A211 371
- \*WATSON, CHARLES S. \* \* \*  
Institute for the Study of Human  
Capabilities Summary Descriptions  
of Research for the Period  
September 1988 through June 1989.  
AD-A211 232
- \*WEAMAN, EDWARD J. @ \* \* \*  
Hyperdimensional Data Analysis and  
Structural Inference.  
AD-A210 056
- \*WEATHERFORD, C. A. @@@@ \* \* \*  
Analytical Evaluation of the  
Electrostatic Potential for  
Diatomic Molecules.  
AD-A209 665
- \*WEBB, DERRICK S. @@@@ \* \* \*  
Wave-Mode Coordinate Analysis of
- 'L' Junction in LSS.  
AD-A211 116
- \*WEBER, WILLIAM @ \* \* \*  
Reduction Silylation of  
Chloroprene.  
AD-A209 888
- \*WEBER, WILLIAM P. @@@ \* \* \*  
Reaction of E-1,4-Poly(2-  
Triethylsilyl-1,3-Butadiene) with  
Iodine Monochloride.  
AD-A209 893
- \*WEIG, CARL S. \* \* \*  
Ab Initio Studies of Molecular  
Structures and Energetics. 3.  
Pentacoordinated NFnH(5-n)  
Compounds.  
AD-A210 674
- \*WELCH, LESLIE @ \* \* \*  
The Perception of Moving Plaids  
Reveals Two Motion-Processing  
Stages.  
AD-A210 064
- \*WELLS, BARRETT \* \* \*  
Surface, Interface, and Bulk  
Properties of High Tc  
Superconductors.  
AD-A211 490
- \*WEST, ROBERT @@@@ \* \* \*  
Use of 2-D INEPT-INADEQUATE 29Si  
NMR to Determine Structures of  
Organosilicon Rings.  
AD-A211 100
- \*WEST, ROBERT @@@ \* \* \*  
Lewis Base Adducts to  
Diorganosilylenes.  
AD-A209 631
- \*WEST, ROBERT \* \* \*  
Three-, Four-, and Five-Membered  
Rings from Disilenes,  
AD-A209 974
- \* \* \*  
Synthesis of the Novel Ring Systems  
1,2,3,4-Oxazadisilolethine and  
1,3,4,2,5-Dioxazadisilolethine.  
AD-A211 098
- \* \* \*  
Structures of Two Organosilyl  
Azides.  
AD-A211 632
- \*WICKWAR, VINCENT @ \* \* \*  
Mapping the Wind in the Polar  
Thermosphere: A Case Study within  
the CEDAR (Coupling, Energetics and  
Dynamics of Atmospheric Regions)  
Program.  
AD-A211 087
- \*WILLIAMS, JAMES H., JR. \* \* \*  
Wave-Mode Coordinate Analysis of  
'L' Junction in LSS.  
AD-A211 116
- \*WINTER, R. \* \* \*  
The Effect of Fluoride on the Sol-  
Gel Process.  
AD-A209 217
- \* \* \*  
The Pore Morphology of Fluoride  
Catalyzed Xerogels.  
AD-A211 388
- \* \* \*  
The Effect of Fluoride on the Sol-  
Gel Process.  
AD-A211 403
- \* \* \*  
The Structural and Dynamical  
Properties of the Sol-Gel  
Transition.  
AD-A211 510
- \* \* \*  
A SANS (Small Angle Neutron  
Scattering) of Catalyst on the

PERSONAL AUTHOR INDEX-24  
UNCLASSIFIED EVI09K

MAN WIN

## UNCLASSIFIED

- Growth Process of Silica Gels,  
AD-A211 694
- \*WINZER, S \* \* \*  
High-Strain-Rate Behavior of  
Hydrated Cement Paste.  
AD-A210 180
- \*WOJCIK, J. C \* \* \*  
Photon-Energy-Sensitive Si L(2,3)  
VV Auger Satellite.  
AD-A209 039
- \*WOLCZANSKI, PETER T. \* \* \*  
ETA(2)-(N,C)-Pyridine Micrometers-  
ETA(2)(1,2):ETA(2)(4,5)-Benzene  
Complexes of (Si10x)3Ta (Si10x = t-  
Bu3SiO-),  
AD-A209 887
- \* \* \*  
Methane and Benzene Activation via  
Transient (t-Bu3SiNH)2Zr=NSi-t-BU3,  
AD-A210 364
- \*WOLF, JACK K \* \* \*  
Research in Mathematics and  
Computer Science: Calculation of  
the Probability of Undetected Error  
for Certain Error Detection Codes,  
Phase 1.  
AD-A210 302
- \*WOOD, HEE-GWEON \* \* \*  
Sigma Bond Metathesis Reactions of  
Si-H and M-Si Bonds. New Routes to  
d(O) Metal Silyl Complexes,  
AD-A210 065
- \*YARON, DAVID J. \* \* \*  
Absolute Infrared Transition  
Moments for Open Shell Diatomics  
from J Dependence of Transition  
Intensities: Application to OH,  
AD-A209 894
- \*YATES, J. T., JR. \* \* \*  
The Activation of Chemical Bonds at  
Surfaces.  
AD-A211 527
- \*YATES, J. T., JR. \* \* \*  
Carbon Monoxide-Oxygen Interaction  
on the Pt(111) Surface: An Electron  
Stimulated Desorption Ion Angular  
Distribution (ESDIAD) Study,  
AD-A211 088
- \* \* \*  
Compressed Co Overlayers on Pt(111)  
Evidence for Tilted Co Species at  
High Coverages by Digital ESDIAD,  
AD-A211 671
- \* \* \*  
The Symmetrization Method for  
Enhancement of Digital ESDIAD  
Measurements: Increased Resolution  
for Study of Adsorbate Bond  
Directions,  
AD-A211 707
- \*YATES, JOHN T., JR. \* \* \*  
The Orientation of Chemical Bonds  
at Surfaces: A Key to Understanding  
the Structure and Bonding of  
Surface Species.  
AD-A209 833
- \*YESHURUN, YEHEZKEL \* \* \*  
Towards a Non-Network Approach to  
Neural Modeling: Some Basic Issues  
of Measurement, Simulation and  
Computational Significance of Brain  
Maps,  
AD-A209 982
- \*YESHURUN, YEHEZKEL \* \* \*  
Shape Description with a Space  
Variant Sensor: Algorithms for Scan-  
Path, Fusion and Convergence Over  
Multiple Scans.  
AD-A209 984
- \* \* \*  
Cepstral Filtering on a Columnar  
Image Architecture: A Fast  
Algorithm for Binocular Stereo  
Segmentation.  
AD-A210 574
- \*YOKELSON, H. B \* \* \*  
Three-, Four-, and Five-Membered  
Rings from Disilenes,  
AD-A209 904
- \*YU, PAUL L. \* \* \*  
Studies of High Power Density, Pico-  
Second Rise-Time Light Activated  
Semiconductor Switch.  
AD-A210 549
- \*ZABLUDOFF, A \* \* \*  
High Precision Dipole Moments in A  
1(A2) Formaldehyde Determined via  
Stark Quantum Beat Spectroscopy.  
AD-A211 731
- \*ZARE, RICHARD N. \* \* \*  
State-Resolved Reaction Dynamics.  
AD-A211 613
- \*ZAWODZINSKI, THOMAS A., JR \* \* \*  
Donor-Acceptor Properties of  
Ambient-Temperature Chloroaluminate  
Melts.  
AD-A211 525
- \* \* \*  
1-Methyl-3-Ethylimidazolium  
Hydrogen Dichloride: Synthesis and  
Application to the study of Protons  
in Ambient-Temperature  
Chloroaluminate Ionic Liquids.  
AD-A211 526
- \*ZHANG, ZHENYU \* \* \*  
Photochemistry of Dibenzyl Ketone  
Adsorbed on Size/Shape Selective  
Faujasite Zeolites. Steric Effects  
on Product Distributions.

PERSONAL AUTHOR INDEX-25  
UNCLASSIFIED EV109K

WIN ZHA

UNCLASSIFIED

AD-A211 376

\*ZIGLER, STEVEN S \* \* \*

Structures of Two Organosilyl  
Azides.

AD-A211 632

\*ZIPSER, DAVID@ \* \* \*

The Back Propagation Technique for  
Modelling Cortical Computation.

AD-A209 855

\*ZUMOFF, BARNETT@ \* \* \*

24-Hour Mean Plasma Hormone Levels  
in Men With Coronary Heart Disease.

AD-A209 868

PERSONAL AUTHOR INDEX-26  
UNCLASSIFIED EVI09K

ZIG ZUM

# ABSTRACTS

## UNCLASSIFIED

## TITLE INDEX

- 1-Methyl-3-Ethylimidazolium Hydrogen Dichloride: Synthesis and Application to the study of Protons in Ambient-Temperature Chloroaluminate Ionic Liquids. AD-A211 526
- 24-Hour Mean Plasma Hormone Levels in Men with Coronary Heart Disease. AD-A209 868
- Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds. AD-A210 010
- Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NF<sub>3</sub>(5-n) Compounds. AD-A210 374
- Absolute Infrared Transition Moments for Open Shell Diatomics from the Absence of Transition Intensity. Application to OH. AD-A209 394
- The Activation of Chemical Bonds at Surfaces. AD-A211 527
- Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure. AD-A211 645
- The Adsorption and Reaction of Fluorine on the Si(100) Surface. AD-A211 595
- Aerodynamically Generated Sound and Subsonic Aerodynamics. AD-A209 920
- AFRAPT (Air Force Research in Aero Propulsion Technology) Trainee Program. AD-A211 540
- Aircraft Sortie Effectiveness Model. AD-A2' 594
- Allylations of ((Diethoxyphosphinyl)difluoromethyl) zinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates. AD-A211 702
- Aluminum Anodization in a Basic Ambient Temperature Molten Salt. AD-A211 598
- AM1 Calculations for Compounds Containing Germanium. AD-A211 066
- AM1 Parameters for Phosphorus. AD-A211 033
- Analysis of a Parallelized Nonlinear Elliptic Boundary Value Problem Solver with Application to Reacting Flows. AD-A211 487
- Analytical Evaluation of the Electrostatic Potential for Diatomic Molecules. AD-A209 665
- Analytical Study of Mistuning/Friction/Aerodynamics/Interaction in a Bladed Disk Assembly. AD-A211 139
- Applications of Computer Graphics and Image Processing to 2D and 3D modeling of the Functional Architecture of Visual Cortex. AD-A209 985
- Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials. AD-A209 985
- Aromatic Energies of Some Heteroaromatic Molecules. AD-A211 204
- Attention and Vigilance in Speech Perception. AD-A210 493
- Attention, Imagery and Memory: A neuromagnetic Investigation. AD-A209 917
- Automatic Construction of Polyhedral Surfaces from Voxel Representations. AD-A210 009
- Autonomous Control System for Czochralski Growth of LEC GaAs. AD-A210 190
- The Back Propagation Technique for Modeling Cortical Computation. AD-A209 855
- Band Calculations on Ferroelectric and Piezoelectric Solids. AD-A210 143
- Basic Research in Reliability for Real Systems. AD-A209 649
- Basic Studies of the Unsteady Flow Past High Angle of Attack Airfoils. AD-A210 252
- Binaural Masking: An Analysis of Models. AD-A211 578
- Binding of Adenosine Diphosphoribosyltransferase to the Termini and Internal Regions of Linear DNAs. AD-A211 272
- Biological Investigations of Adaptive Networks: Neuronal Control

## UNCLASSIFIED

- of Conditioned Responses.  
AD A211 043
- Capacitive Energy Storage at  
Cryogenic Temperatures. Phase 2  
AD A210 366
- Carbon Monoxide-Oxygen Interaction  
on the Pt(111) Surface: An Electron  
Stimulated Desorption Ion Angular  
Distribution (ESDIAD) Study.  
AD A211 088
- Cepstral Filtering on a Columnar  
Image Architecture: A Fast  
Algorithm for Binocular Stereo  
Segmentation.  
AD-A210 574
- Chemical Reactions in Turbulent  
Mixing Flows.  
AD-A211 240
- Chemistry of Polynuclear Metal  
Complexes with Bridging Carbene or  
Carbyne Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-  
Gold, -Rhodium and -Iron Complexes;  
Crystal Structure of  
(NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4) (Mu-  
Sigma: Sigma: Eta 5 -  
C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>8</sub>).  
AD-A210 340
- Cognitive and Neural Bases of  
Skilled Performance.  
AC A210 851
- Communications Using Channels  
Formed by Meteor Bursts.  
AD-A209 856
- Comparing Barrier Algorithms.  
AD-A211 515
- Comparison of the Voltammetric  
Behavior of Adsorbed or Dissolved  
Unsaturated Alcohols at Vacuum-  
Annealed and Electrochemically  
Cycled Pt(111) and  
Pt(Polycrystalline) Electrodes.  
AD-A210 326
- Comparison of Vacuum-Annealed and  
Electrochemically Cycled Electrodes  
in Adsorption and Electroanalysis:  
Aromatic Compounds at Platinum(111)  
and Polycrystalline Platinum.  
AD-A210 011
- Complex Turbulent Flows.  
AD-A210 242
- Compressed Co Overlayers on Pt(111)  
Evidence for Tilted Co Species at  
High Coverages by Digital ESDIAD.  
AD-A211 671
- Computational Analysis of the  
Structures, Bond Properties, and  
Electrostatic Potentials of Some  
Nitrotetrahydroanes and  
Nitroazetetrahydroanes.  
AD-A211 667
- Computational Methods for Complex  
Flowfields.  
AD-A211 485
- Computer-Aided Neuroanatomy:  
Differential Geometry of Cortical  
Surfaces and an Optimal Flattening  
Algorithm.  
AD-A210 333
- Computing Minimal Distances on  
Arbitrary Polyhedral Surfaces.  
AD-A210 015
- A Conference on Three-Dimensional  
Representation Held in University  
of Minnesota on 24-26 May 1989.  
AD-A211 630
- Conformal Image Warping.  
AD-A210 016
- Control and Optimization for  
Observations of Systems Governed by  
Controlled Partial Differential  
Equations.  
AD-A211 122
- Control of Turbulent Mixing Layers.  
AD A211 413
- Cope Rearrangement of 3,3-  
Dicyanonhexa-1,5-diene.  
AD-A211 023
- Couple-Cluster Methods That Include  
Connected Quadruple Excitations.  
T4: CCSDTQ-1 and Q(CCSDT).  
AD-A211 538
- Coupling between Radiation and Gas  
Dynamics.  
AD-A209 657
- Data Compression Algorithms.  
AD-A209 921
- Decomposition of Normal-Coordinate  
Vibrational Frequencies.  
AD-A211 604
- Design of Experiments and  
Reliability Models.  
AD-A209 880
- Deterministic and Stochastic  
Wavefields in the Near-Field from  
Explosive Sources.  
AD-A210 057
- Development of Analytical and Semi-  
Numerical Methods of Flow  
Calculation.  
AD-A209 916
- Development of Computer Codes to  
Model Dynamics of the Earth's  
Magnetosphere.  
AD-A211 532
- Development of Photodeposited  
Diamond Films.  
AD-A209 576

TITLE INDEX-2  
UNCLASSIFIED EVI09K

CAP DEV

## UNCLASSIFIED

- DEWAR PI Study of Electrophilic Substitution in Selected Polycyclic Fluoranthene Hydrocarbons, AD A211 121
- Dimesitylsilyl Derivatives of Zirconium, AD A208 932
- The Dipole Moment Function and Vibrational Transition Intensities of OH, AD A209 895
- Discrete Time Analysis of a Shut Down Queueing Systems, AD A209 630
- Donor-Acceptor Properties of Ambient-Temperature Chloroaluminate Melts, AD A211 525
- Drift-Balanced Random Stimuli: A General Basis for Studying Non-Fourier Motion Perception, AD A211 063
- Dynamics of Flexible Triplet Biradicals, AD A210 334
- Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium, AD A209 934
- Effect of Body Forces on Motion and Heat Transfer of Confined Fluids, AD A210 667
- The Effect of Fluoride on the Sol-Gel Process, AD A209 217
- The Effect of Fluoride on the Sol-Gel Process, AD A211 403
- The Effect of Transients on Crack Tip Stress Fields during Thermal Fatigue Loading, AD A210 084
- Effects of Source Depth on Near-Source Seismograms, AD A209 897
- Efficient Finite Element Solution of Navier-Stokes Equations and Related Topics, AD A211 647
- Electromagnetic Pulse Interaction at a Dielectric Interface, AD A211 081
- Electronics Research at the University of Texas at Austin, AD A209 989
- Emission Properties of Dioxorhenium(V) Complexes in Aqueous Solutions of Anionic and Nonionic Surfactants: A Sensitive Probe of Hydrophobic Binding Regions, AD A209 896
- Energetics and Spin- and Lambda-Double Selectivity in the Infrared Multiphoton Dissociation DN3 Yields DNIX 3 Sigma(-), a 1 Delta + N2IX 1 Sigma g (+): Experiment, AD A210 250
- ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (Si10x)3Ta (Silox = t-Bu3SiO-), AD A209 887
- Evaluation of Chemical Research Relevant to Current and Projected U.S. Air Force Interests, AD A210 313
- Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-
- 1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane, AD A211 268
- An Experimental and Analytical Program to Develop Crack Tip Fracture Criteria, AD A211 565
- Experimental Research on Swept Shock Wave/Boundary Layer Interactions, AD A211 744
- Extrathalamic Modulation of Cortical Function, AD A211 044
- Eye Movements and Spatial Pattern Vision, AD A211 650
- Eye Movements and Visual Information Processing, AD A209 817
- Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures, AD A211 674
- Fast Reaction, Slow Diffusion, and Curve Shortening, AD A211 605
- Fault Tolerant Multiprocessors and VLSI-Based Systems, AD A209 579
- The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient Temperature Molten Salt, AD A211 541
- Finding Efficient Pipelining in Concurrent Structures, AD A210 346
- The Force on the Flex: Global

TITLE INDEX-3

UNCLASSIFIED EVI09K

DEW THE

## UNCLASSIFIED

- Parallelism and Portability.  
AD-A211 391
- Fourier Analysis of the SOR  
Iteration.  
AD-A211 571
- Fundamental Studies of B Phase  
Decomposition Modes in Titanium  
Alloys  
AD-A209 866
- The Generalized Map Makers Problem:  
Optimal Flattening of Polyhedral  
Surfaces.  
AD-A210 013
- Generate Reinforcing Particles in  
Place.  
AD-A209 656
- Graded Bandgap Solar Cells.  
AD-A211 537
- He2-(4II sub g) Yields He2(X1  
Sigma+) Autodetachment Energy  
Spectrum: Assessment of the He2  
and He2 Ground-State Potentials.  
AD-A209 983
- Heats of Formation of Alkylsilanes.  
AD-A211 575
- Heavy Rainfall in Complex Terrain:  
Insights from a Numerical Model.  
AD-A211 530
- Heterosynaptic Modulation of Long-  
Term Potentiation at Mossy Fiber  
Synapses in Hippocampus.  
AD-A209 835
- High-Amplitude Mobile Vibrator for  
Exciting Body and Surface Waves in  
Soil, Pavement And Structural  
Systems.  
AD-A210 130
- High Precision Dipole Moments in A  
1(A2) Formaldehyde Determined via  
Stark Quantum Beat Spectroscopy.  
AD-A211 731
- High Resolution Finite Volume  
Methods on Arbitrary Grids via Wave  
Propagation.  
AD-A211 691
- High-Strain-Rate Behavior of  
Hydrated Cement Paste.  
AD-A210 180
- High Temperature Superconducting  
Compounds.  
AD-A211 511
- Higher Order Mechanisms of Color  
Vision.  
AD-A209 838
- Hyperdimensional Data Analysis and  
Structural Inference.  
AD-A210 056
- Influence of Microstructure and  
Microdamage Processes on Fracture  
at High Loading Rates.  
AD-A210 307
- Institute for the Study of Human  
Capabilities Summary Descriptions  
of Research for the Period  
September 1988 through June 1989.  
AD-A211 232
- Integrated Opto-Electronic  
Computing.  
AD-A209 936
- International Conference on  
Numerical Grid Generation in  
Computational Fluid Dynamics.  
AD-A211 082
- International Symposium (43rd) on  
Molecular Spectroscopy Held in Ohio  
State University on 13-17 June  
1988.  
AD-A210 400
- Intramolecular Energy Transfer and  
Mode-Specific Effects in  
Unimolecular Reactions of 1,2-  
Difluoroethane.  
AD-A210 290
- Intrinsic Reaction Coordinate  
Calculations for Very Flat  
Potential Energy Surfaces:  
Application to Singlet S1ZH2  
Isomerization.  
AD-A211 673
- Inverse Scattering: Ionospheric  
Structure Determination.  
AD-A209 063
- The Inverse Scattering Problem for  
Acoustic and Electromagnetic Waves  
AD-A209 202
- The Inverse Scattering Problem for  
Time-Harmonic Acoustic Waves in an  
Inhomogeneous Medium: Numerical  
Experiments.  
AD-A210 848
- An Investigation into the Effects  
of Peptide Neurotransmitters and  
Intracellular Second Messengers in  
Rat Central Neurons in Culture.  
AD-A211 030
- An Investigation of the Irradiation  
Swelling Mechanisms in Refractory  
Metals at High Temperatures.  
AD-A211 408
- Ion Formation by Electron Impact.  
AD-A211 367
- Kapitza Conductance of Crystals  
Cleaved under He II.  
AD-A211 509
- The Kinetic Depth Effect and  
Identification of Shape.  
AD-A211 481
- Kinetic Depth Effect and Optic Flow  
1. 3D Shape from Fourier Motion.  
AD-A211 260

TITLE INDEX-4  
UNCLASSIFIED EVI09K

FOU KIN

## UNCLASSIFIED

- Large Magnetic Field Effect on the Decay Rates of Triplet Hydrocarbon Diradicals  
AD-A210 580
- Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature.  
AD-A210 134
- Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.  
AD-A211 563
- Laser-Induced Saturated Fluorescence of SrOH in Flames.  
AD-A211 389
- Laser Mixing Processes.  
AD-A209 870
- Laser Physics and Laser Techniques.  
AD-A211 117
- Lewis Base Adducts to Diorganosilylenes.  
AD-A209 631
- Life Testing, Reliability, and Multivariate Nonparametric Methods.  
AD-A210 147
- Linear (Passive) and Non-Linear Guided and Studies in Glass.  
AD-A211 693
- Liquid, Crystalline Phosphazenes. High Polymeric and Cyclic Trimeric Systems with Armoatic Azo Side Groups.  
AD-A210 673
- Mapping the Wind in the Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD A211 087
- Materials Research Society Symposium Proceedings Held in Reno.
- Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.  
AD-A211 737
- Mechanical Response of Structural Elements to Dynamic Loads.  
AD-A209 827
- Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects.  
AD-A211 644
- Metacognition and Retrieval from Long-Term Memory at Mount Everest.  
AD-A211 629
- Methane and Benzene Activation via Transient (t-Bu3SiNH)2Zr=NSi-t-BU3.  
AD-A210 364
- Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Ambient Temperature Molten Salt.  
AD-A211 899
- Microwave Emission from Relativistic Electron Beams.  
AD-A209 653
- Models of Mental Functioning.  
AD-A210 456
- Modulation of Spontaneous Brain Activity During Mental Imagery.  
AD-A209 918
- Molecular Theories of Rubberlike Elasticity and Some Recent Results on Model Networks and Unusual Fillers.  
AD-A209 633
- Molecular Toxicology of Chromatin.  
AD-A211 158
- Monte Carlo Reliability Analysis.  
AD-A210 052
- Multiprocessor Sparse L/U decomposition with Controlled Fill In.  
AD-A211 570
- Negative Temperature Dependence in the Decay of Triplet Biradicals.  
AD-A209 886
- New, Efficient Optically Pumped Solid State Lasers.  
AD-A209 998
- New Mechanism for Toughening Ceramic Materials.  
AD-A211 651
- A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.  
AD-A210 008
- Nonparametric and Sequential Analysis of Life Testing and Reliability Problems.  
AD-A209 867
- Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211 597
- Observation of NH(at Delta, v=1) from the H + N3 Reaction.  
AD-A210 681
- Optical Production of Negative Ions.  
AD-A210 234
- Organization of the Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts.  
AD-A209 847
- The Orientation of Chemical Bonds at Surfaces: A Key to Understanding

TITLE INDEX-5  
UNCLASSIFIED EVI09K

LAR THE

## UNCLASSIFIED

- the Structure and Bonding of Surface Species.  
AD-A209 833
- Parallel Computation with the Force.  
AD-A211 488
- Parallel Processing and Learning in Simple Systems.  
AD-A210 225
- Parameter Estimation in Functional and Partial Differential Equations.  
AD-A211 040
- The Perception of Moving Plaids Reveals Two Motion-Processing Stages.  
AD-A210 064
- Perfluorodecanoic Acid and Lipid Metabolism in the Rat.  
AD-A210 007
- Phase Compensation for High Power Lasers Using Refracting Gas Prisms.  
AD-A209 869
- Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
AD-A208 989
- Photochemistry of Dibenzyl Ketone Adsorbed on Size/Shape Selective Faujasite Zeolites. Steric Effects on Product Distributions.  
AD-A211 378
- Photodetachment Cross Sections of Negative Halogen Ions in Discharge Media.  
AD-A209 343
- Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209 039
- The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.  
AD-A209 834
- Physics of High Energy Photoconductive Switches.  
AD-A210 341
- Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole: 2,4,7-Trinitrofluorenone Composite Polymer Photoconductor.  
AD-A210 363
- Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl).  
AD-A210 546
- Plasma-Anode Electron Gun Research.  
AD-A211 547
- Polynomial Approximation of Functions of Matrices and Its Application to the Solution of a General System of Linear Equations.  
AD-A211 390
- The Pore Morphology of Fluoride Catalyzed Xerogels.  
AD-A211 388
- Pre-Attentive and Attentive Visual Information Processing.  
AD-A209 884
- Premixed Turbulent Flame Propagation.  
AD-A211 489
- Probabilistic Analysis of Semilinear Partial Differential Equations.  
AD-A209 903
- Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences. Volume 555).  
AD-A210 672
- Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.  
AD-A211 324
- Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.  
AD-A210 601
- Psychophysical Studies of Shape with Fourier Descriptor Stimuli.  
AD-A210 018
- Quantum Electrodynamical Approach to Multiphoton Ionization in the High-Intensity Field.  
AD-A209 082
- Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement of Flight Safety.  
AD-A209 919
- Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
AD-A211 603
- Rank-Preserving Extensions of Band Matrices.  
AD-A211 531
- Ratings of Kinetic Depth in Multi-Dot Displays.  
AD-A211 138
- Reaction of E-1,4-Poly(2-Triethylsilyl-1,3-Butadiene) with Iodine Monochloride.  
AD-A209 899
- Reaction of Protons and Molybdenum Dimers in an Ambient-Temperature Molten Salt.

TITLE INDEX-6  
UNCLASSIFIED EVI09K

PAR REA

## UNCLASSIFIED

- AD-A211 698  
Recent Progress in the Theory of Laser-Assisted Collisions, AD-A210 636
- Reduction Silylation of Chloroprene, AD-A209 888
- Research in Mathematics and Computer Science: Calculation of the Probability of Undetected Error for Certain Error Detection Codes. Phase 1, AD-A210 302
- Research in Stochastic Processes, AD-A209 935
- Resonant and Non-Resonant Optical Frequency Mixing in Simple Molecular Systems, AD-A210 191
- Rheological Properties of Nematic Solutions of Rodlike Polymers, AD-A210 602
- The Role of Central Monoamnergic Systems in Arousal and Selective Attention, AD-A211 371
- Role of Retinocortical Processing in Spatial Vision, AD-A210 995
- A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels, AD-A211 694
- Second-Order Motion Perception: Space/Time Separable Mechanisms, AD-A211 028
- Sensitivity Evaluation Plan for Lowtran, AD-A211 484
- Separated Flows, Turbulence Production Mechanisms and Free Shear Layers, AD-A210 355
- Shape Description with a Space Variant Sensor: Algorithms for Scan-Path, Fusion and Convergence Over Multiple Scans, AD-A209 984
- Sigma Bond Metathesis Reactions of Si-H and M-Si Bonds. New Routes to d(O) Metal Silyl Complexes, AD-A210 065
- A Simulation Study of Four Real-Time Heuristic Algorithms for Multiple Missile Evasion: A Game Theoretic Approach, AD-A211 093
- SIS (Superconductor-Insulator-Superconductor) Mixer Research, AD-A211 607
- Slope-Controlled Performance Testing, AD-A211 041
- The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves, AD-A211 434
- Solidation Front/Viscous Phase Transitions, Forwards-Backward Heat Equations, AD-A211 068
- Some Problems in Nonlinear Analysis, AD-A209 991
- Spin Statistics: An Error in Landau and Lifachitz' Quantum Mechanics, AD-A211 602
- State-Resolved Reaction Dynamics, AD-A211 613
- Statistical Communication Theory and Robust Estimation, AD-A209 996
- Stimulus-Response Compatibility in Spatial Precuing and Symbolic Identification: Effects of Coding Practice, Retention and Transfer, AD-A210 745
- Stochastic Flows In Networks, AD-A211 209
- Stress Wave Induced Damage in Rock, AD-A211 599
- The Structural and Dynamical Properties of the Sol-Gel Transition, AD-A211 510
- Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions, AD-A210 325
- Structures of Two Organosilyl Azides, AD-A211 632
- Studies in Statistical Signal Processing, AD-A210 054
- Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch, AD-A210 549
- Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers, AD-A211 092
- Studies of Unsteady Vortex Flap Aerodynamics, AD-A209 837

TITLE INDEX-7  
UNCLASSIFIED EVI09K

REC SIU

## UNCLASSIFIED

- Studies on Aligned Nematic Solutions of a Rodlike Polymer.  
AD-A210 603
- Study of the Design and Performance Characteristics of Aircraft Simulators.  
AD-A210 053
- Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.  
AD-A209 875
- Superplasticity - A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.  
AD-A209 997
- Support of Travel for U.S. Participants in 5th International Biophysics Congress (5th) Held in Copenhagen, Denmark 4-9 August 1975.  
AD-A210 004
- Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.  
AD-A210 509
- Surface, Interface, and Bulk Properties of High Tc Superconductors.  
AD-A211 490
- The Symmetrization Method for Enhancement of Digital ESDIAD measurements: Increased Resolution for Study of Adsorbate Bond Directions.  
AD-A211 707
- Synaptic Plasticity and Memory Formation.  
AD-A211 368
- Synthesis and Chemistry of Strained and Conjugated Fluorocarbons.  
AD-A211 633
- Synthesis of Perfluoro Crown Ethers: A New Class of Cyclic Fluorocarbons.  
AD-A211 601
- Synthesis of Perfluorotetraalkyl Orthocarbonates Using Elemental Fluorine.  
AD-A211 600
- Synthesis of Polyphosphazenes Bearing Geminal (Trimethylsilyl)methylene and Alkyl or Phenyl Side Groups.  
AD-A209 261
- Synthesis of Sulfodifluoromethyl)Phosphonic Acid.  
AD-A211 524
- Synthesis of Tetrakis(Trifluoromethyl) Lead.  
AD-A211 672
- Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisiletidine and 1,3,4,2,5-Dioxazadisiletidine.  
AD-A211 096
- Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.  
AD-A211 578
- Testbeds for Logic Programming and Very Large Databases.  
AD-A209 632
- Three-, Four-, and Five-Membered Rings from Disilenes.  
AD-A209 904
- Time-Frequency Factors in Auditory Perception.  
AD-A211 491
- Topographic Map Reading.  
AD-A211 269
- Towards a Non-Network Approach to Neural Modeling: Some Basic Issues of Measurement, Simulation and Computational Significance of Brain Maps.  
AD-A209 982
- Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).  
AD-A210 858
- Transport and Submillimeter Wave Spectroscopy of GaAs/Al sub xGa sub 1-x and In sub x Ga sub 1-x As Heterostructures.  
AD-A209 836
- Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me3CO)3ZrSi(SiMe)3.  
AD-A211 095
- Tunable Microwigglers for Free-Electron Lasers.  
AD-A209 062
- Two Motion Perception Mechanisms Revealed Through Distance-Driven Reversal of Apparent Motion.  
AD-A211 214
- A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.  
AD-A209 942
- Ultrafast Third-Order Non-Linear Optical Processes in Polymeric Films.  
AD-A210 338
- Ultrastructure Processing and Characterization of Polymers.  
AD-A211 460
- Unimolecular Dynamics Following Vibrational Overtone Excitation of

UNCLASSIFIED  
EVI09K

STU UNI

UNCLASSIFIED

- H13 V1=5 and v1=6: HN3(X,Y,J,K)  
yields  $HN(x(3)Sigma-  
(J0mega)+N2(X(1)Sigma+g))$ .  
AD-A210 001
- United States Air Force Research  
Initiation Program for 1987. Volume  
1  
AD-A209 726
- United States Air Force Research  
Initiation Program for 1987. Volume  
2.  
AD-A209 727
- United States Air Force Research  
Initiation Program for 1987. Volume  
3.  
AD-A209 728
- United States Air Force Research  
Initiation Program for 1987. Volume  
4.  
AD-A209 729
- Unsteady Gas Dynamics Problems  
Related to Flight Vehicles.  
AD-A210 317
- Use of 2-D INEPT-INADEQUATE 29SI  
NMR to Determine Structures of  
Organosilicon Rings.  
AD-A211 100
- Use of Depletion Edge Translation  
for High-Speed Modulation and  
Switching of Lightwaves.  
AD A211 186
- Use of Quantum Mechanical Models in  
Studies of Reaction Mechanisms.  
AD-A208 930
- The Verification of Numerical  
Models with Multivariate Randomized  
Block Permutation Procedures.  
AD A211 539
- The Vibrational Spectrum of  
Tetrafluoropropylene.  
AD-A211 596
- Vibrationally Excited Formaldehyde:  
The Relationship between  
Vibrational Structure and  
Collisional Properties.  
AD-A211 675
- Visualizing and Rhyming Cause  
Differences in Alpha Suppression.  
AD-A210 005
- Visual Motion Perception.  
AD-A210 994
- Wave-Mode Coordinate Analysis of  
'L' Junction in LSS.  
AD-A211 116
- Wavefront Propagation for Reaction-  
Diffusion Systems of PDE.  
AD-A210 862

UNCLASSIFIED  
TITLE INDEX-9  
EVI09K

UNI WAV

## UNCLASSIFIED

## TITLE INDEX

Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds.  
AD-A210010 REPORT DATE: 89 FINAL REPORT

Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NF<sub>n</sub>H(5-n) Compounds.  
AD-A210674 REPORT DATE: 89

Absolute Infrared Transition Moments for Open Shell Diatomics from J Dependence of Transition Intensities: Application to CH.  
AD-A209894 REPORT DATE: 15 MAY 89 FINAL REPORT

The Activation of Chemical Bonds at Surfaces.  
AD-A211527 REPORT DATE: 89 FINAL REPORT

Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure.  
AD-A211645 REPORT DATE: 89 FINAL REPORT

The Adsorption and Reaction of Fluorine on the Si(100) Surface.  
AD-A211595 REPORT DATE: 89 FINAL REPORT

Aerodynamically Generated Sound and Subsonic Aerodynamics.  
AD-A209920 REPORT DATE: JAN 79 FINAL REPORT

AFRAPT (Air Force Research in Aero Propulsion Technology) Trainee Program.  
AD-A211540 REPORT DATE: 13 JUN 89 FINAL REPORT

Aircraft Sortie Effectiveness Model.  
AD-A211594 REPORT DATE: 89 FINAL REPORT

Allylations of (1-Diethoxyphosphinyl)difluoromethylzinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates.  
AD-A211702 REPORT DATE: 89 FINAL REPORT

Aluminum Anodization in a Basic Ambient Temperature Molten Salt.  
AD-A211598 REPORT DATE: MAY 89 FINAL REPORT

AMI Calculations for Compounds Containing Germanium.  
AD-A211066 REPORT DATE: 89 FINAL REPORT

AMI Parameters for Phosphorus.  
AD-A211033 REPORT DATE: 89 FINAL REPORT

Analysis of a Parallelized Nonlinear Elliptic Boundary Value Problem Solver with Application to Reacting Flows.  
AD-A211487 REPORT DATE: APR 87 FINAL REPORT

Analytical Evaluation of the Electrostatic Potential for Diatomic Molecules.  
AD A209665 REPORT DATE: 88

Analytical Study of Mistuning/Friction/Aerodynamics Interaction in a Bladed Disk Assembly.  
AD A211139 REPORT DATE: 06 FEB 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Applications of Computer Graphics and Image Processing to 2D and 3D Modeling of the Functional Architecture of Visual Cortex.  
AD-A209985 REPORT DATE: JUL 88 FINAL REPORT

Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials.  
AD-A210298 REPORT DATE: APR 89 FINAL REPORT

Aromatic Energies of Some Heteroaromatic Molecules,  
AD-A211204 REPORT DATE: 89 FINAL REPORT

Attention and Vigilance in Speech Perception.  
AD-A210493 REPORT DATE: 23 JUN 89 FINAL REPORT

Attention, Imagery and Memory: A Neuromagnetic Investigation.  
AD-A209917 REPORT DATE: 12 MAY 89 ANNUAL REPORT

Automatic Construction of Polyhedral Surfaces from Voxel Representations.  
AD-A210009 REPORT DATE: JUN 89 FINAL REPORT

Autonomous Control System for Czochralski Growth of LEC GaAs.  
AD-A210190 REPORT DATE: 89 FINAL REPORT

The Back Propagation Technique for Modeling Cortical Computation.  
AD-A209855 REPORT DATE: 31 JAN 89 FINAL REPORT

Band Calculations on Ferroelectric and Piezoelectric Solids.  
AD-A210143 REPORT DATE: JAN 79 FINAL REPORT

Basic Research in Reliability for Real Systems.  
AD-A209649 REPORT DATE: 05 AUG 88 FINAL REPORT

Basic Studies of the Unsteady Flow Past High Angle of Attack Airfoils.  
AD-A210252 REPORT DATE: 15 MAY 89 FINAL REPORT

Binatural Masking: An Analysis of Models.  
AD A211578 REPORT DATE: 01 AUG 89 FINAL REPORT

Binding of Adenosine Diphosphoribosyltransferase to the Terminal and Internal Regions of Linear DNAs.  
AD A211272 REPORT DATE: 89 FINAL REPORT

Biological Investigations of Adaptive Networks: Neuronal Control of Conditioned Responses.  
AD-A211043 REPORT DATE: JUL 89 FINAL REPORT

Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.  
AD A210366 REPORT DATE: 12 FEB 89 FINAL REPORT

Carbon Monoxide-Oxygen Interaction on the Pt(111) Surface: An Electron Stimulated Desorption Ion Angular Distribution (ESDIAD) Study.  
AD A211088 REPORT DATE: 15 APR 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

- Cepstral Filtering on a Columnar Image Architecture: A Fast Algorithm for Binocular Stereo Segmentation.  
AD-A210574 REPORT DATE: 24 MAY 89 FINAL REPORT
- Chemical Reactions in Turbulent Mixing Flows.  
AD-A211240 REPORT DATE: 01 JUN 89 FINAL REPORT
- Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.  
AD-A210847 REPORT DATE: 89 FINAL REPORT
- Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86. Alkylidene(Carborane)Molybdenum-Gold, -Rhodium and -Iron Complexes; Crystal Structure of (NEt<sub>4</sub>)(MoFe<sub>2</sub>(Mu<sub>3</sub>-CC<sub>6</sub>H<sub>4</sub>Me-4)(Mu-Sigma: Sigma: Eta 5 - C<sub>2</sub>B<sub>9</sub>H<sub>7</sub>Me<sub>2</sub>)(CO)<sub>8</sub>).  
AD-A210340 REPORT DATE: 89 FINAL REPORT
- Cognitive and Neural Bases of Skilled Performance.  
AD-A210851 REPORT DATE: 12 MAY 89 ANNUAL REPORT
- Communications Using Channels Formed by Meteor Bursts.  
AD-A209856 REPORT DATE: 30 NOV 88 FINAL REPORT
- Comparing Barrier Algorithms.  
AD-A211515 REPORT DATE: SEP 87 FINAL REPORT
- Comparison of the voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes.  
AD-A210326 REPORT DATE: 89 FINAL REPORT
- Comparison of Vacuum-Annealed and Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum.  
AD-A210011 REPORT DATE: 89 FINAL REPORT
- Complex Turbulent Flows.  
AD-A210242 REPORT DATE: FEB 79 FINAL REPORT
- Compressed Co Overlayers on Pt(111) Evidence for Tilted Co Species at High Coverages by Digital ESDIAD.  
AD-A211671 REPORT DATE: 88 FINAL REPORT
- Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahydrofuran and Nitroazetetrans.  
AD-A211667 REPORT DATE: 89 FINAL REPORT
- Computational Methods for Complex Flowfields.  
AD-A211485 REPORT DATE: 05 JUL 89 FINAL REPORT
- Computer-Aided Neuroanatomy: Differential Geometry of Cortical Surfaces and an Optimal Flattening Algorithm.  
AD-A210333 REPORT DATE: MAR 86 FINAL REPORT
- Computing Minimal Distances on Arbitrary Polyhedral Surfaces.  
AD-A210015 REPORT DATE: JAN 87 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

- A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.  
AD-A211630 REPORT DATE: JUN 89 FINAL REPORT
- Conformal Image Warping.  
AD-A210016 REPORT DATE: OCT 88 FINAL REPORT
- Control and Optimization for Observations of Systems Governed by Controlled Partial Differential Equations.  
AD-A211122 REPORT DATE: 19 MAY 89 FINAL REPORT
- Control of Turbulent Mixing Layers.  
AD-A211413 REPORT DATE: 30 APR 89 FINAL REPORT
- Cope Rearrangement of 3,3-Dicyanohexa-1,5-diene.  
AD-A211023 REPORT DATE: JAN 89 FINAL REPORT
- Couple-Cluster Methods That Include Connected Quadruple Excitations, T4: CCSDTQ-1 and Q(CCSDT).  
AD-A211538 REPORT DATE: 23 JUN 89 FINAL REPORT
- Coupling between Radiation and Gas Dynamics.  
AD-A209657 REPORT DATE: 24 MAY 89 FINAL REPORT
- Data Compression Algorithms.  
AD-A209921 REPORT DATE: APR 79 FINAL REPORT
- Decomposition of Normal-Coordinate Vibrational Frequencies.  
AD-A211604 REPORT DATE: 89 FINAL REPORT
- Design of Experiments and Reliability Models.  
AD-A209880 REPORT DATE: 01 MAY 89 FINAL REPORT
- Deterministic and Stochastic Wavefields in the Near-Field from Explosive Sources.  
AD-A210057 REPORT DATE: 24 MAY 89 FINAL REPORT
- Development of Analytical and Semi-Numerical Methods of Flow Calculation.  
AD-A209916 REPORT DATE: JAN 79 FINAL REPORT
- Development of Computer Codes to Model Dynamics of the Earth's Magnetosphere.  
AD-A211532 REPORT DATE: APR 89 FINAL REPORT
- Development of Photodeposited Diamond Films.  
AD-A209576 REPORT DATE: 31 MAR 89 FINAL REPORT
- DEWAR-PI Study of Electrophilic Substitution in Selected Polycyclic Fluoranthene Hydrocarbons.  
AD-A211121 REPORT DATE: 89 FINAL REPORT
- Dimesitylsilyl Derivatives of Zirconium.  
AD-A208932 REPORT DATE: 89 FINAL REPORT
- The Dipole Moment Function and Vibrational Transition Intensities of OH.  
AD-A209895 REPORT DATE: 15 MAY 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Discrete Time Analysis of a Shut Down Queueing Systems.  
AD A209630 REPORT DATE: 77 FINAL REPORT

Donor-Acceptor Properties of Ambient-Temperature Chloroaluminate Melts.  
AD A211525 REPORT DATE: 89 FINAL REPORT

Drift-Balanced Random Stimuli: A General Basis for Studying Non-Fourier Motion Perception.  
AD A211063 REPORT DATE: NOV 88 FINAL REPORT

Dynamics of Flexible Triplet Biradicals.  
AD A210334 REPORT DATE: JUN 89 FINAL REPORT

Effect of Alloying, Rapid Solidification, and Surface Kinetics on the High Temperature Environmental Resistance of Niobium.  
AD A209934 REPORT DATE: 23 JUN 89 FINAL REPORT

Effect of Body Forces on Motion and Heat Transfer of Confined Fluids.  
AD A210667 REPORT DATE: 79 FINAL REPORT

The Effect of Fluoride on the Sol-Gel Process.  
AD A211403 REPORT DATE: 27 JUN 89 FINAL REPORT

The Effect of Fluoride on the Sol-Gel Process.  
AD A209217 REPORT DATE: 88 FINAL REPORT

The Effect of Transients on Crack Tip Stress Fields during Thermal Fatigue Loading.  
AD A210084 REPORT DATE: 25 APR 89 FINAL REPORT

Effects of Source Depth on Near-Source Seismograms.  
AD A209837 REPORT DATE: 10 MAY 88 FINAL REPORT

Efficient Finite Element Solution of Navier-Stokes Equations and Related Topics.  
AD A211647 REPORT DATE: 89 FINAL REPORT

Electromagnetic Pulse Interaction at a Dielectric Interface.  
AD A211081 REPORT DATE: 19 APR 89 FINAL REPORT

Electronics Research at the University of Texas at Austin.  
AD A209989 REPORT DATE: 31 MAY 89 FINAL REPORT

Emission Properties of Dioxorhenium(V) Complexes in Aqueous Solutions of Anionic and Nonionic Surfactants: A Sensitive Probe of Hydrophobic Binding Regions.  
AD A209896 REPORT DATE: 89 FINAL REPORT

Energetics and Spin- and Lambda-Doublet Selectivity in the Infrared Multiphoton Dissociation DN3 yields DN(X 3 Sigma<sup>-</sup>), a 1 Delta + N2(X 1 Sigma<sub>g</sub><sup>+</sup>): Experiment.  
AD A210250 REPORT DATE: 01 AUG 88 FINAL REPORT

ETA(2) (N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2)(4,5)-Benzene Complexes of (Silox)3Ta (Silox = t-Bu3SiO-).  
AD A209887 REPORT DATE: 88 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Evaluation of Chemical Research Relevant to Current and Projected U.S. Air Force Interests.  
AD-A210313 REPORT DATE: 02 JUL 79 FINAL REPORT

Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.  
AD-A211268 REPORT DATE: 89 FINAL REPORT

An Experimental and Analytical Program to Develop Crack Tip Fracture Criteria.  
AD-A211565 REPORT DATE: 19 JUL 89 FINAL REPORT

Experimental Research on Swept Shock Wave/Boundary Layer Interactions.  
AD-A211744 REPORT DATE: 28 JUN 89 FINAL REPORT

Extrathalamic Modulation of Cortical Function.  
AD-A211044 REPORT DATE: 15 JUL 89 FINAL REPORT

Eye Movements and Spatial Pattern Vision.  
AD-A211650 REPORT DATE: 15 JUL 89 FINAL REPORT

Eye Movements and Visual Information Processing.  
AD-A209817 REPORT DATE: 27 APR 89 FINAL REPORT

Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.  
AD-A211674 REPORT DATE: 89 FINAL REPORT

Fast Reaction, Slow Diffusion, and Curve Shortening.  
AD-A211605 REPORT DATE: FEB 89 FINAL REPORT

Fault Tolerant Multiprocessors and VLSI-Based Systems.  
AD-A209579 REPORT DATE: 16 MAR 88 FINAL REPORT

The Ferro/Ferricyanide Couple in an Aluminum Chloride-1-Methyl-3-ethylimidazolium Chloride Ambient-Temperature Molten Salt.  
AD-A211541 REPORT DATE: 89 FINAL REPORT

Finding Efficient Pipelining in Concurrent Structures.  
AD-A210346 REPORT DATE: 18 JAN 88 FINAL REPORT

The Force on the Flex: Global Parallelism and Portability.  
AD-A211391 REPORT DATE: 31 AUG 87 FINAL REPORT

Fourier Analysis of the SOR Iteration.  
AD-A211571 REPORT DATE: SEP 86 FINAL REPORT

Fundamental Studies of B Phase Decomposition Modes in Titanium Alloys.  
AD-A209866 REPORT DATE: 17 AUG 79 FINAL REPORT

The Generalized Map Makers Problem: Optimal Flattening of Polyhedral Surfaces.  
AD-A210013 REPORT DATE: JAN 87 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Generate Reinforcing Particles in Place.  
AD A209856 REPORT DATE: 89 FINAL REPORT

Graded Bandgap Solar Cells  
AD A211537 REPORT DATE: JUN 89 FINAL REPORT

Heat: of Formation of Alkyls Ianes.  
AD A211575 REPORT DATE: 89 FINAL REPORT

Heavy Rainfall in Complex Terrain: Insights from a Numerical Model.  
AD A211530 REPORT DATE: 89 FINAL REPORT

Heterosynaptic Modulation of Long-Term Potentiation at Mossy Fiber Synapses in Hippocampus.  
AD A209845 REPORT DATE: 16 MAY 89 ANNUAL REPORT

He2 (4II sub g) Yields He2(X1 Sigma+) Aut detachment Energy Spectrum: Assessment of the He2 - and He2 Ground-State Potentials.  
AD A209983 REPORT DATE: 15 APR 88 FINAL REPORT

High Precision Dipole Moments in A1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy.  
AD A211731 REPORT DATE: 15 APR 89 FINAL REPORT

High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.  
AD A211691 REPORT DATE: OCT 87 FINAL REPORT

High Temperature Superconducting Compounds.  
AD A211511 REPORT DATE: 31 MAR 89 FINAL REPORT

Higher Order Mechanisms of Color Vision.  
AD A209838 REPORT DATE: 12 MAY 89

High Amplitude Mobile Vibrator for Exciting Body and Surface Waves in Soil, Pavement And Structural Systems.  
AD A210130 REPORT DATE: 12 JUN 89 FINAL REPORT

High Strain Rate Behavior of Hydrated Cement Paste.  
AD A210180 REPORT DATE: 31 MAY 89 FINAL REPORT

Hyperdimensional Data Analysis and Structural Inference.  
AD A210056 REPORT DATE: 18 MAY 89 FINAL REPORT

Influence of Microstructure and Microdamage Processes on Fracture at High Loading Rates.  
AD A210307 REPORT DATE: 26 JUN 89 FINAL REPORT

Institute for the Study of Human Capabilities Summary Descriptions of Research for the Period September 1988 through June 1989  
AD A211232 REPORT DATE: JUN 89 ANNUAL REPORT

Integrated Opto-Electronic Computing.  
AD A209936 REPORT DATE: 15 APR 89 FINAL REPORT

TITLE INDEX

7

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## UNCLASSIFIED

## TITLE INDEX

- International Conference on Numerical Grid Generation in Computational Fluid Dynamics.  
AD A211082 REPORT DATE: 30 APR 89 FINAL REPORT
- International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.  
AD A210400 REPORT DATE: JUN 88 FINAL REPORT
- Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane.  
AD A210290 REPORT DATE: 01 JUN 89 FINAL REPORT
- Intrinsic Reaction Coordinate Calculations for Very Flat Potential Energy Surfaces: Application to Singlet S12H2 Isomerization.  
AD A211673 REPORT DATE: 89 FINAL REPORT
- The Inverse Scattering Problem for Acoustic and Electromagnetic Waves.  
AD A209202 REPORT DATE: 31 MAY 89 FINAL REPORT
- The Inverse Scattering Problem for Time-Harmonic Acoustic Waves in an Inhomogeneous Medium: Numerical Experiments.  
AD A210848 REPORT DATE: 89 ANNUAL REPORT
- Inverse Scattering: Ionospheric Structure Determination.  
AD A209063 REPORT DATE: AUG 80 FINAL REPORT
- An Investigation into the Effects of Peptide Neurotransmitters and Intracellular Second Messengers in Rat Central Neurons in Culture.  
AD A211030 REPORT DATE: 30 JUN 89 FINAL REPORT
- An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.  
AD A211406 REPORT DATE: JUN 89 FINAL REPORT
- Ion Formation by Electron Impact.  
AD A211367 REPORT DATE: 31 NOV 88 FINAL REPORT
- Kapitza Conductance of Crystals Cleaved under He II.  
AD A211509 REPORT DATE: JUL 86 FINAL REPORT
- The Kinetic Depth Effect and Identification of Shape.  
AD A211481 REPORT DATE: 87 FINAL REPORT
- Kinetic Depth Effect and Optic Flow 1. 3D Shape from Fourier Motion.  
AD A211260 REPORT DATE: 87 FINAL REPORT
- Large Magnetic Field Effect on the Decay Rates of Triplet Hydrocarbon Diradicals.  
AD A210680 REPORT DATE: 89 FINAL REPORT
- Laser Cladding of Ni, Nb, and Mg Alloys for Improved Environmental Resistance at High Temperature.  
AD A210134 REPORT DATE: JAN 89 FINAL REPORT
- Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.  
AD A211563 REPORT DATE: 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Laser Mixing Processes.  
AD A209870 REPORT DATE: 79 FINAL REPORT

Laser Physics and Laser Techniques.  
AD A211117 REPORT DATE: JUN 89 FINAL REPORT

Laser Induced Saturated Fluorescence of SrOH in Flames.  
AD A211389 REPORT DATE: 15 APR 89 FINAL REPORT

Lewis Base Adducts to Diorganosilylenes.  
AD A209531 REPORT DATE: 89 FINAL REPORT

Life Testing, Reliability, and Multivariate Nonparametric Methods.  
AD A210147 REPORT DATE: FEB 79 FINAL REPORT

Linear (Passive) and Non-Linear Guided and Studies in Glass.  
AD A211693 REPORT DATE: JUL 89 FINAL REPORT

Liquid, Crystalline Phosphazenes, High Polymeric and Cyclic Trimeric Systems with Aromatic Azo Side Groups.  
AD A210573 REPORT DATE: 30 JUN 89

Mapping the Wind in the Polar Thermosphere: A Case Study within the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Program.  
AD A211067 REPORT DATE: 21 MAR 89 FINAL REPORT

Materials Research Society Symposium Proceedings Held in Reno, Nevada on 5-7 April 1988. Volume 125. Materials Stability and Environmental Degradation.  
AD A211737 REPORT DATE: DEC 88 FINAL REPORT

Mechanical Response of Structural Elements to Dynamic Loads.  
AD A209827 REPORT DATE: JAN 89 FINAL REPORT

Mechanism of Electrochemical Activation of Carbon Electrodes: Role of Graphite Lattice Defects.  
AD A211644 REPORT DATE: 89 FINAL REPORT

Metacognition and Retrieval from Long-Term Memory at Mount Everest.  
AD A211629 REPORT DATE: 27 JUN 89 FINAL REPORT

Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr=NSi-t-BU<sub>3</sub>.  
AD A210364 REPORT DATE: 88 FINAL REPORT

Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Ambient Temperature Molten Salt.  
AD A211693 REPORT DATE: 88 FINAL REPORT

Microwave Emission from Relativistic Electron Beams.  
AD A209653 REPORT DATE: MAR 89 FINAL REPORT

Models of Mental Functioning.  
AD A210456 REPORT DATE: 14 MAY 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Modulation of Spontaneous Brain Activity During Mental Imagery.  
AD-A209918 REPORT DATE: 12 MAY 89 FINAL REPORT

Molecular Theories of Rubberlike Elasticity and Some Recent Results on Model Networks and Unusual Fillers.  
AD-A209633 REPORT DATE: 89 FINAL REPORT

Molecular Toxicology of Chromatin.  
AD-A211156 REPORT DATE: 04 JUL 89 FINAL REPORT

Monte Carlo Reliability Analysis.  
AD-A210052 REPORT DATE: 24 APR 89 FINAL REPORT

Multiprocessor Sparse L/U Decomposition with Controlled Fill-In.  
AD-A211570 REPORT DATE: OCT 85 FINAL REPORT

Negative Temperature Dependence in the Decay of Triplet Biradicals.  
AD-A209886 REPORT DATE: 88 FINAL REPORT

New Mechanism for Toughening Ceramic Materials.  
AD-A211651 REPORT DATE: 19 MAY 89 FINAL REPORT

A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.  
AD-A210008 REPORT DATE: 87 FINAL REPORT

New, Efficient Optically Pumped Solid State Lasers.  
AD-A209998 REPORT DATE: 21 FEB 89 FINAL REPORT

Nonparametric and Sequential Analysis of Life Testing and Reliability Problems.  
AD-A209867 REPORT DATE: 79 FINAL REPORT

Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes.  
AD-A211597 REPORT DATE: 88 FINAL REPORT

Observation of NH<sub>4</sub> Delta, v=1) from the H + N<sub>3</sub> Reaction.  
AD-A210681 REPORT DATE: 15 JUN 89 FINAL REPORT

Optical Production of Negative Ions.  
AD-A210234 REPORT DATE: FEB 89 FINAL REPORT

Organization of the Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts.  
AD-A209847 REPORT DATE: 01 MAR 89 FINAL REPORT

The Orientation of Chemical Bonds at Surfaces: A Key to Understanding the Structure and Bonding of Surface Species  
AD-A209833 REPORT DATE: 22 JUN 89 FINAL REPORT

Parallel Computation with the Force  
AD-A211488 REPORT DATE: OCT 85 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Parallel Processing and Learning in Simple Systems.  
AD-A210225 REPORT DATE: 15 MAR 89 FINAL REPORT

Parameter Estimation in Functional and Partial Differential Equations.  
AD-A211040 REPORT DATE: 31 MAY 89 FINAL REPORT

The Perception of Moving Plaids Reveals Two Motion-Processing Stages.  
AD-A210064 REPORT DATE: 25 FEB 89 FINAL REPORT

Perfluorodecanoic Acid and Lipid Metabolism in the Rat.  
AD-A210007 REPORT DATE: 25 MAY 89 ANNUAL REPORT

Phase Compensation for High Power Lasers Using Refracting Gas Prisms.  
AD-A209869 REPORT DATE: JAN 79 FINAL REPORT

Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.  
AD-A208989 REPORT DATE: 89 FINAL REPORT

Photochemistry of Dibenzyl Ketone Adsorbed on Size/Shape Selective Faujasite Zeolites. Steric Effects on Product Distributions.  
AD-A211376 REPORT DATE: 89 FINAL REPORT

Photodetachment Cross Sections of Negative Halogen Ions in Discharge Media.  
AD-A209343 REPORT DATE: 88 FINAL REPORT

Photon Energy-Sensitive Si L(2,3) VV Auger Satellite.  
AD-A209039 REPORT DATE: 89 FINAL REPORT

The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.  
AD-A209834 REPORT DATE: MAY 89 ANNUAL REPORT

Physics of High Energy Photoconductive Switches  
AD-A210341 REPORT DATE: JUN 89 FINAL REPORT

Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole: 2.4.7-Trinitrofluorenone Composite Polymer Photoconductor.  
AD-A210363 REPORT DATE: 01 MAY 89 FINAL REPORT

Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenbenzobisoxazole-2,6-diyl).  
AD-A210546 REPORT DATE: 89 FINAL REPORT

Plasma-Anode Electron Gun Research.  
AD-A211547 REPORT DATE: 30 MAY 89 FINAL REPORT

Polynomial Approximation of Functions of Matrices and Its Application to the Solution of a General System of Linear Equations.  
AD-A211390 REPORT DATE: 31 AUG 87 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Reduction Silylation of Chloroprene.  
AD-A209888      REPORT DATE: 89      FINAL REPORT

Research in Mathematics and Computer Science: Calculation of the Probability of Undetected Error for Certain Error Detection Codes. Phase 1.  
AD-A210302      REPORT DATE: 31 MAR 89      FINAL REPORT

Research in Stochastic Processes.  
AD-A209935      REPORT DATE: 31 AUG 88      FINAL REPORT

Resonant and Non-Resonant Optical Frequency Mixing in Simple Molecular Systems.  
AD-A210191      REPORT DATE: 04 NOV 80      FINAL REPORT

Rheological Properties of Nematic Solutions of Rodlike Polymers.  
AD-A210602      REPORT DATE: 88      FINAL REPORT

The Role of Central Monoaminergic Systems in Arousal and Selective Attention.  
AD-A211371      REPORT DATE: 30 JUN 89      ANNUAL REPORT

Role of Retinocortical Processing in Spatial Vision.  
AD-A210995      REPORT DATE: JUN 89      ANNUAL REPORT

A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.  
AD-A211694      REPORT DATE: 89      FINAL REPORT

Second-Order Motion Perception: Space/Time Separable Mechanisms.  
AD-A211028      REPORT DATE: 89      FINAL REPORT

Sensitivity Evaluation Plan for Lowtran.  
AD-A211484      REPORT DATE: 28 AUG 88      FINAL REPORT

Separated Flows, Turbulence Production Mechanisms and Free Shear Layers.  
AD-A210355      REPORT DATE: JAN 79      FINAL REPORT

Shape Description with a Space Variant Sensor: Algorithms for Scan-Path, Fusion and Convergence Over Multiple Scans.  
AD-A209984      REPORT DATE: APR 87      FINAL REPORT

Sigma Bond Metathesis Reactions of Si-H and M-Si Bonds. New Routes to d(O) Metal Silyl Complexes.  
AD-A210065      REPORT DATE: 89      FINAL REPORT

A Simulation Study of Four Real-Time Heuristic Algorithms for Multiple Missile Evasion: A Game Theoretic Approach.  
AD-A211093      REPORT DATE: JUN 79      FINAL REPORT

SIS (Superconductor-Insulator-Superconductor) Mixer Research.  
AD-A211607      REPORT DATE: JUL 89      FINAL REPORT

Slope Controlled Performance Testing.  
AD-A211041      REPORT DATE: 18 JUL 89      FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

The Pore Morphology of Fluoride Catalyzed Xerogels.  
 AD-A211388 REPORT DATE: JUN 89 FINAL REPORT

Premixed Turbulent Flame Propagation.  
 AD-A211489 REPORT DATE: 10 APR 89 ANNUAL REPORT

Pre-Attentive and Attentive Visual Information Processing.  
 AD-A209884 REPORT DATE: 01 JUN 89 ANNUAL REPORT

Probabilistic Analysis of Semilinear Partial Differential Equations.  
 AD-A209903 REPORT DATE: 28 MAY 89 FINAL REPORT

Proceedings of the International Conference (3rd) on Combinatorial Mathematics Held in New York on 10-14 June 1985. (Annals of the New York Academy of Sciences. Volume 555).  
 AD-A210672 REPORT DATE: 28 MAY 89

Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.  
 AD-A211324 REPORT DATE: APR 89 FINAL REPORT

Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.  
 AD-A210601 REPORT DATE: NOV 88 FINAL REPORT

Psychophysical Studies of Shape with Fourier Descriptor Stimuli.  
 AD-A210018 REPORT DATE: 88 FINAL REPORT

Quantum Electrodynamical Approach to Multiphoton Ionization in the High-Intensity Field.  
 AD-A209082 REPORT DATE: DEC 88 FINAL REPORT

Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement of Flight Safety.  
 AD-A209919 REPORT DATE: 01 FEB 79 FINAL REPORT

Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.  
 AD-A211603 REPORT DATE: JUN 88 FINAL REPORT

Rank-Preserving Extensions of Band Matrices.  
 AD-A211531 REPORT DATE: 88 FINAL REPORT

Ratings of Kinetic Depth in Multi-Dot Displays.  
 AD-A211138 REPORT DATE: 89 FINAL REPORT

Reaction of E-1,4-Poly(2-Triethylsilyl-1,3-Butadiene) with Iodine Monochloride.  
 AD-A209899 REPORT DATE: 89 FINAL REPORT

Reaction of Protons and Molybdenum Dimers in an Ambient-Temperature Molten Salt.  
 AD-A211698 REPORT DATE: 88 FINAL REPORT

Recent Progress in the Theory of Laser-Assisted Collisions.  
 AD-A210636 REPORT DATE: 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves.  
AD-A211434 REPORT DATE: 89 FINAL REPORT

Solidation Front/Viscous Phase Transitions, Forwards-Backward Heat Equations.  
AD-A211068 REPORT DATE: 26 JUL 89 FINAL REPORT

Some Problems in Nonlinear Analysis.  
AD-A209991 REPORT DATE: 89 FINAL REPORT

Spin Statistics: An Error in Landau and Lifachitz' Quantum Mechanics.  
AD-A211602 REPORT DATE: 15 MAY 89 FINAL REPORT

State-Resolved Reaction Dynamics.  
AD-A211613 REPORT DATE: 12 JUL 89 FINAL REPORT

Statistical Communication Theory and Robust Estimation.  
AD-A209996 REPORT DATE: JAN 80 FINAL REPORT

Stimulus-Response Compatibility in Spatial Precuing and Symbolic Identification: Effects of Coding Practice, Retention and Transfer.  
AD-A210745 REPORT DATE: 31 MAY 89 FINAL REPORT

Stochastic Flows in Networks.  
AD-A211209 REPORT DATE: 15 JUN 89 FINAL REPORT

Stress Wave Induced Damage in Rock.  
AD-A211599 REPORT DATE: 01 JUN 89 FINAL REPORT

The Structural and Dynamical Properties of the Sol-Gel Transition.  
AD-A211510 REPORT DATE: SEP 88 FINAL REPORT

Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.  
AD-A210325 REPORT DATE: 89 FINAL REPORT

Structures of Two Organosilyl Azides.  
AD-A211632 REPORT DATE: 89 FINAL REPORT

Studies in Statistical Signal Processing.  
AD-A210054 REPORT DATE: 30 JUN 88 FINAL REPORT

Studies of High Power Density, Pico-Second Rise-Time Light Activated Semiconductor Switch.  
AD-A210549 REPORT DATE: 31 DEC 88 FINAL REPORT

Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.  
AD A211092 REPORT DATE: 89 FINAL REPORT

Studies of Unsteady Vortex Flap Aerodynamics.  
AD A209837 REPORT DATE: 20 JUN 89 FINAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Studies on Aligned Nematic Solutions of a Rodlike Polymer.  
AD-A210503 REPORT DATE: 88 FINAL REPORT

Study of the Design and Performance Characteristics of Aircraft Simulators.  
AD-A210053 REPORT DATE: FEB 79 FINAL REPORT

Superconducting Meissner Effect Bearings for Cryogenic Turbomachines. Phase 1.  
AD-A209875 REPORT DATE: MAY 89 FINAL REPORT

Superplasticity - A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.  
AD-A209997 REPORT DATE: JUN 80 FINAL REPORT

Support of Travel for U.S. Participants in 5th International Biophysics Congress (5th) Held in Copenhagen, Denmark 4-9 August 1975  
AD-A210004 REPORT DATE: 07 JAN 76 FINAL REPORT

Surface Electrochemistry of Amino Acids: Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.  
AD-A210509 REPORT DATE: 88 FINAL REPORT

Surface, Interface, and Bulk Properties of High Tc Superconductors.  
AD-A211490 REPORT DATE: 30 JUN 89 FINAL REPORT

The Symmetrization Method for Enhancement of Digital ESDIAD Measurements: Increased Resolution for Study of Adsorbate Bond Directions.  
AD-A211707 REPORT DATE: 88 FINAL REPORT

Synaptic Plasticity and Memory Formation.  
AD-A211368 REPORT DATE: 30 MAY 89 FINAL REPORT

Synthesis and Chemistry of Strained and Conjugated Fluorocarbons.  
AD-A211633 REPORT DATE: 20 JUL 89 FINAL REPORT

Synthesis of Perfluoro Crown Ethers: A New Class of Cyclic Fluorocarbons.  
AD-A211601 REPORT DATE: 88 FINAL REPORT

Synthesis of Perfluorotetraalkyl Orthocarbonates Using Elemental Fluorine.  
AD-A211600 REPORT DATE: 89 FINAL REPORT

Synthesis of Polyphosphazenes Bearing Geminal (Trimethylsilyl)methylene and Alkyl or Phenyl Side Groups.  
AD-A209261 REPORT DATE: 09 MAY 89 FINAL REPORT

Synthesis of Sulfodifluoromethyl)Phosphonic Acid.  
AD-A211524 REPORT DATE: 89 FINAL REPORT

Synthesis of Tetrakis(trifluoromethyl) Lead.  
AD-A211672 REPORT DATE: 89 FINAL REPORT

Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisilolidine and 1,3,4,2,5-Dioxazadisilolidine.  
AD-A211096 REPORT DATE: 89 ANNUAL REPORT

## UNCLASSIFIED

## TITLE INDEX

Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.  
AD-A211576 REPORT DATE: 88 FINAL REPORT

Testbeds for Logic Programming and Very Large Databases.  
AD-A209632 REPORT DATE: 30 SEP 87 FINAL REPORT

Three-, Four-, and Five-Membered Rings from Disilenes.  
AD-A209904 REPORT DATE: 89 FINAL REPORT

Time-Frequency Factors in Auditory Perception.  
AD-A211491 REPORT DATE: 30 JUN 89 ANNUAL REPORT

Topographic Map Reading.  
AD-A211269 REPORT DATE: 20 JUN 89 FINAL REPORT

Towards a Non-Network Approach to Neural Modeling: Some Basic Issues of Measurement, Simulation and Computational Significance of Brain Maps.  
AD-A209982 REPORT DATE: JUN 87 FINAL REPORT

Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).  
AD-A210858 REPORT DATE: 15 MAY 89 ANNUAL REPORT

Transport and Submillimeter Wave Spectroscopy of GaAs/Al sub xGa sub 1-x and In sub x Ga sub 1-x As Heterostructures.  
AD-A209836 REPORT DATE: 16 JUN 89 FINAL REPORT

Tris(trimethylsilyl)silyl Derivatives of Tri-tert-butoxyzirconium and Tri-tert-butoxyhafnium. X-ray Crystal Structure of (Me3CO)3ZrSi(SiMe3).  
AD-A211095 REPORT DATE: 89 ANNUAL REPORT

Tunable Microwigglers for Free-Electron Lasers.  
AD-A209062 REPORT DATE: 03 APR 89 FINAL REPORT

Two Motion Perception Mechanisms Revealed Through Distance-Driven Reversal of Apparent Motion.  
AD-A211214 REPORT DATE: APR 89 ANNUAL REPORT

A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.  
AD-A209942 REPORT DATE: 29 MAR 89 FINAL REPORT

Ultrafast Third-Order Non-Linear Optical Processes in Polymeric Films.  
AD-A210336 REPORT DATE: 89 FINAL REPORT

Ultrastructure Processing and Characterization of Polymers.  
AD-A211460 REPORT DATE: 88 FINAL REPORT

Unimolecular Dynamics Following Vibrational Overtone Excitation of HN3 V1=5 and v1=6: HN3(X,v,J,K) Yields  $\text{HN}_2(X^3\Sigma_g^-(v_0\Omega_g)+N_2(X^1\Sigma_g^+g))$ .  
AD-A210001 REPORT DATE: JUL 88 FINAL REPORT

United States Air Force Research Initiation Program for 1987. Volume 1.  
AD-A209726 REPORT DATE: APR 89

TITLE INDEX 16

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## UNCLASSIFIED

## TITLE INDEX

United States Air Force Research Initiation Program for 1987, Volume 2.  
AD-A209727 REPORT DATE: APR 89

United States Air Force Research Initiation Program for 1987, Volume 3.  
AD-A209728 REPORT DATE: APR 89

United States Air Force Research Initiation Program for 1987, Volume 4.  
AD-A209729 REPORT DATE: APR 89

Unsteady Gas Dynamics Problems Related to Flight Vehicles.  
AD-A210317 REPORT DATE: MAY 79 FINAL REPORT

Use of Depletion Edge Translation for High-Speed Modulation and Switching of Lightwaves.  
AD-A211186 REPORT DATE: MAY 89 FINAL REPORT

Use of Quantum Mechanical Models in Studies of Reaction Mechanisms.  
AD-A208930 REPORT DATE: 88 FINAL REPORT

Use of 2-D INEPT-INADEQUATE 29SI NMR to Determine Structures of Organosilicon Rings.  
AD-A211100 REPORT DATE: 89 ANNUAL REPORT

The Verification of Numerical Models with Multivariate Randomized Block Permutation Procedures.  
AD-A211539 REPORT DATE: 89 FINAL REPORT

The Vibrational Spectrum of Tetrafluoropropyne.  
AD-A211596 REPORT DATE: 89 FINAL REPORT

Vibrationally Excited Formaldehyde: The Relationship between Vibrational Structure and Collisional Properties.  
AD-A211675 REPORT DATE: 88 FINAL REPORT

Visual Motion Perception.  
AD-A210994 REPORT DATE: 31 JAN 89 ANNUAL REPORT

Visualizing and Rhyming Cause Differences in Alpha Suppression.  
AD-A210005 REPORT DATE: 12 MAY 89 ANNUAL REPORT

Wavefront Propagation for Reaction-Diffusion Systems of PDE.  
AD-A210862 REPORT DATE: MAR 89 ANNUAL REPORT

Wave-Mode Coordinate Analysis of 'L' Junction in LSS.  
AD-A211116 REPORT DATE: 30 MAR 89 ANNUAL REPORT

1-Methyl-3-Ethylimidazolium Hydrogen Dichloride: Synthesis and Application to the study of Protons in Ambient-Temperature Chloroaluminate Ionic Liquids.  
AD-A211526 REPORT DATE: 88 FINAL REPORT

24-Hour Mean Plasma Hormone Levels in Men with Coronary Heart Disease.  
AD A209868 REPORT DATE: 26 JUL 79 FINAL REPORT

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 744 20/4

AD-A211 744 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

FLOW FIELDS, LASER APPLICATIONS, LAYERS, MACH NUMBER,  
MATHEMATICAL PREDICTION, OPTICAL ANALYSIS, SKIN FRICTION,  
SUPERSONIC CHARACTERISTICS, SUPERSONIC WIND TUNNELS,  
COMPUTER PROGRAM VERIFICATION.

(U) Experimental Research on Swept Shock Wave/Boundary  
Layer Interactions.

DESCRIPTIVE NOTE: Final rept. 1 Apr 86-31 Mar 89.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A1.

JUN 89

PERSONAL AUTHORS: Settles, Gary S.

REPORT NO. PSU-ME-R-88/89-0068

CONTRACT NO. AFOSR-86-0082

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-89-1055

UNCLASSIFIED REPORT

ABSTRACT: (U) An experimental research effort on the subject of swept shock wave interactions with turbulent boundary layers is reported. The research relied largely on non-intrusive, laser-based optical flow diagnostics. Experiments were carried out to define the Mach number influence, flowfield structure, and quantitative skin friction behavior of fin-generated swept interactions over the supersonic range from Mach 2.5 to 4.0, including weak, moderate, and strong interactions. The results of this research have given new insight into the fin-interaction flowfield structure, which involves a jet-impingement process caused by shockwave bifurcation. High skin friction levels were measured in the vicinity of this jet impingement and were used for the validation of computational predictions carried out by others. Keywords: Shock wave interactions; Interactional aerodynamics; Compressible boundary layers; Turbulent Boundary Layers; Supersonic wind tunnels; Flow visualization; Optical measuring (JHD)

DESCRIPTORS: (U) \*COMPRESSIBLE FLOW, \*INTERACTIONS,  
\*SHOCK WAVES, \*TURBULENT BOUNDARY LAYER, AERODYNAMICS,  
COMPRESSIVE PROPERTIES, COMPUTATIONS, DIAGNOSIS(GENERAL).

AD A211 744

AD-A211 744

UNCLASSIFIED

PAGE

1

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY REPORT NUMBER NO. EVI09K

AD-A211 737 CONTINUED

11/2 20/11

11/6.1

11/3

MATERIALS RESEARCH SOCIETY PITTSBURGH PA

(U) Materials Research Society Symposium Proceedings in Reno, Nevada on 5-7 April 1988. Materials Stability and Environmental Degradation.

sufficiently reactive to bond to human bone and soft tissue yet durable enough to resist dissolution in the body. Composites are generally suitable for use in implants. Corrosion in ceramics, glasses, and metals and crack propagation studies were reported. Keywords: Nuclear reactor materials; Composite materials; Alloys; Radiation damage; Coatings; Surfaces; Corrosion inhibition; Hydration; Deterioration. (aw)

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-31 Dec 88.

DEC 88 417P

DESCRIPTORS: (U) \*CARBON CARBON COMPOSITES, \*CERAMIC MATERIALS, \*COATINGS, \*CORROSION, \*GLASS, \*METALS, ALLOYS, ATTACK, BONES, CHEMICAL REACTIONS, COMPOSITE MATERIALS, CORROSION, DETERIORATION, CORROSION RESISTANCE, CRACK PROPAGATION, CRACKS, CRYSTALS, DEGRADATION, DETERIORATION, ENVIRONMENTS, HIGH STRENGTH, HUMAN BODY, HYDRATION, IMPLANTATION, INTERACTIONS, LIGHTWEIGHT, MATERIALS, MOISTURE, NUCLEAR REACTORS, OXIDATION, RADIATION DAMAGE, REACTIVITIES, REACTOR MATERIALS, SOFT TISSUES, STABILITY, SURFACES, SYMPOSIA, TEMPERATURE, TENSILE STRENGTH, VOLATILITY.

PERSONAL AUTHORS: Barkatt, A.; Verink, E. D., Jr.; Smith, L. R.

CONTRACT NO. AFOSR-85-2308

TASK NO. 51

MONITOR: AFOSR TR-89-1191

IDENTIFIERS: (U) PE61102F, WUAFOSR2306B1.

UNCLASSIFIED REPORT

Availability: Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237 HC \$47.00. No copies furnished by DTIC/NTIS.

ABSTRACT: (U) The symposium covered a broad range of subjects related to materials stability and corrosion phenomena. Stability and corrosion resistance have become the primary considerations. Combinations of materials, rather than single materials, are needed in many cases to satisfy such needs. Corrosion and degradation mechanisms in different materials--metals, crystalline composites, and glasses--exhibit a surprisingly high potential for correlation and cross-fertilization. Carbon/carbon composites have become the materials of choice for applications requiring high tensile strength and light weight at temperatures between 2000 F and 3200 F. The development of such materials is based on study of the mechanisms of oxidation, volatilization, interaction, and

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 731

7/4

7/3

AD-A211 731

CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) High Precision Dipole Moments in A 1(A2) Formaldehyde Determined via Stark Quantum Beat Spectroscopy.

APR 89

PERSONAL AUTHORS: Vaccaro, P. H.; Zabludoff, A.; Camera-Palino, M. E.; Kinsey, J. L.; Field, R. W.

CONTRACT NO AFOSR-85-0381

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR TR-89-1161

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90 n8 p4150-4167, 15 Apr 89.

ABSTRACT: (U) The high resolution technique of Stark quantum beat spectroscopy is used to examine the electric dipole moment function for the first excited singlet state (A1, A2) of formaldehyde-h2 and formaldehyde-d2. The high precision of these measurements enables detailed determination of alpha-axis dipole moment components  $\mu_{\alpha}(a)$  for individual  $J = 2$  rovibronic levels in the  $V_4$  out-of-plane bending mode. In the case of  $2(1,1)$  rotational levels, we find  $\mu_{\alpha}(a)$  to the 0 power = 1.4784 (7) D and  $\mu_{\alpha}(a)$  4 to the 1st power = 1.4678 4 to the 1st power D for H2CO. For D2CO the measured  $2(1,1)$  dipole moments are  $\mu_{\alpha}(a)$  4 to the 0 power = 1.4693 (3) D, and  $\mu_{\alpha}(a)$  4 to the 3rd power = 1.4786(7) D. The state specific variations in  $\mu_{\alpha}(a)$  revealed by this study reflect the structural influences exerted by the pervasive  $S(1) - S(0)$  nonadiabatic interactions and the pyramidally distorted equilibrium configuration which characterizes the A state of formaldehyde. The origin and experimental manifestation of the out-of-plane dipole moment component  $\mu_{\alpha}(a)$  in nonrigid A 1A2 formaldehyde is also discussed. Reprints: (AW)

DESCRIPTORS: (U) \*DIPOLE MOMENTS, \*FORMALDEHYDE, CONFIGURATIONS, DIPOLES, DISTORTION, ELECTRIC MOMENTS.

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AD A211 731

UNCLASSIFIED

PAGE

3

EVI09K

EQUILIBRIUM(GENERAL), FUNCTIONS, HIGH RESOLUTION, PRECISION, REPRINTS, ELECTRONIC STATES, EXCITATION, MOLECULAR ENERGY LEVELS, MOLECULAR ROTATION, MOLECULAR VIBRATION, HYDROGEN, DEUTERIUM, SPECTROSCOPY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B1, Stark Quantum Beat Spectroscopy, Rovibronic Levels.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 707 CONTINUED

AD-A211 707 7/4 20/2

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) The Symmetrization Method for Enhancement of Digital  
ESDIAD Measurements: Increased Resolution for Study of  
Adsorbate Bond Directions,

88

PERSONAL AUTHORS: Szabo, A.; Kiskinova, M.; Yates, J. T.,  
Jr

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-1187

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v205 p207-  
214 1988.

ABSTRACT: (U) A new data smoothing method for  
distinguishing the symmetrical features of digital ESDIAD  
patterns has been developed. The method is based on the  
assumption that ESDIAD patterns from adsorbed molecules  
on an 'n-fold' symmetric single crystal should in  
some cases this may be below the detection limit. The  
symmetrization method is applied to real ESDIAD data with  
the expected enhancement of the azimuthal symmetry of the  
ESDIAD pattern. Two strenuous tests have been devised to  
determine the reliability of the method: (i) quantitative  
comparison of azimuthal symmetry elements in the digital  
ESDIAD pattern with the substrate symmetry as determined  
by digital LEED in the same apparatus; (ii) qualitative  
comparison of physically-meaningful symmetry elements  
with non-physical symmetries. It is also shown in model  
calculations that the symmetrization procedure is  
effective in removing systematic noise from digital  
ESDIAD data. Keywords: Electron stimulated desorption;  
Ion angular distribution; Spectroscopy; Crystallographic  
symmetries; Chemisorption; Carbon monoxide; Crystals; Low  
energy electron diffraction; Platinum (111). Reprints.  
(AW)

AD-A211 707

AD-A211 707

UNCLASSIFIED

PAGE

4

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K  
AD-A211 702 CONTINUED

AD-A211 702 7/3

IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

(U) Allylations of ((Diethoxyphosphinyl)difluoromethyl) zinc Bromide as a Convenient Route to 1,1-Difluoro-3-alkenephosphonates.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Allylation, Zinc Bromides, Bromide/((Diethoxyphosphinyl) Difluoromethyl) Zinc, Alkene Phosphonates, Phosphonate/ Difluoro-2-3-Butadiene, Phosphonate/1-1-Difluoro 3-Alkene, Allyl Acetate, Propargyl Chloride.

89

PERSONAL AUTHORS: Burton, Donald J.; Sprague, Lee G.

CONTRACT NO. AFOSR-87-0067

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1086

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v54 n3 p613-617 1989.

ABSTRACT: (U) The reaction of (diethoxyphosphinyl) difluoromethylzinc bromide, (EtO)2P(O) CF2ZnBr, with allylic halides was found to be catalyzed by Copper Bromide and represents a synthetically viable and convenient route to the title phosphonates. However, the reaction could be readily extended to allyl acetate. Propargyl chloride gave predominantly an allenic product, diethyl 1,1-difluoro-2,3-butadienephosphonate (4). The regiochemistry of the allylation reactions is controlled by steric factors such that the (EtO)2P(O)CF2 moiety is bound to the least sterically hindered allylic terminus. Evidence is presented for an SN2 vs SN2' type mechanistic interpretation, rather than the involvement of a symmetrical (Pi-allyl)Cu(III) intermediate and an oxidative addition/reductive elimination type mechanism. Reprints. (AW)

DESCRIPTORS: (U) \*PHOSPHONATES, \*SYNTHESIS(CHEMISTRY), \*ALKENES, \*FLUORINATED HYDROCARBONS, BROMIDES, COPPER, REPRINTS, ZINC, ORGANIC PHOSPHORUS COMPOUNDS, METHYL RADICALS, ETHYL RADICALS, CATALYSIS, STEREOCHEMISTRY, OXIDATION REDUCTION REACTIONS, ADDITION REACTIONS, ELIMINATION REACTIONS.

AD-A211 702

AD-A211 702

UNCLASSIFIED

PAGE

5

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 699 9/1

AD-A211 699 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

observed for the nitrobenzene reduction using cyclic voltammetry at slow scan rates. Reprints. (jes)

(U) Microelectrodes in the Examination of Anodic and Cathodic Limit Reactions of an Ambient Temperature Molten Salt.

DESCRIPTORS: (U) \*ELECTRODES, \*MOLTEN SALTS, CHEMICAL REACTIONS, CONCENTRATION (COMPOSITION), CURRENTS, CYCLES, DIFFUSION, ELECTROCHEMISTRY, ELECTROLYTES, FARADAY EFFECT, HIGH RATE, MELTS, NITROBENZENES, PLATEAUS, RATES, REDUCTION, REPRINTS, SALTS, SCANNING, SLOW SCAN TELEVISION, TEMPERATURE, VOLTAMMETRY, WAVES, WINDOWS.

DESCRIPTIVE NOTE: Rept. for 1 Dec 86-30 Jun 89.

88

PERSONAL AUTHORS: Carlin, Richard T.; Osteryoung, Robert A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-1075

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Electroanalytical Chemistry, v252 p81-89 1988.

ABSTRACT: (J) Microelectrodes with dimensions of only a few micrometers offer numerous advantages over conventional electrodes. We have recently become interested in examining the electrochemical reactions constituting the anodic and cathodic limits of molten salts where the electroactive species are in concentrations exceeding 1 M. Two properties of microelectrodes which make them ideal for studying such high concentrations of electroactive species are: (1) low faradaic currents are realized, thus making it possible to employ standard electrochemical equipment for analyses, and (2) IR drop is minimal, thus reducing errors in applied potentials and reducing distortions of voltammograms. The highest possible concentration of electroactive species is achieved when the electrochemical window of the solvent itself is studied. For example, a Pt microelectrode has been employed to examine the solvent cathodic limit of undiluted nitrobenzene with 0.1 tetrabutylammonium perchlorate added as support electrolyte. Nearly nerstian reduction waves with diffusion limited current plateaus were

AD A211 699

AD A211 699

UNCLASSIFIED

PAGE

6

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 698 11/6

AD-A211 698 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2.

(U) Reaction of Protons and Molybdenum Dimers in an Ambient-Temperature Molten Salt.

DESCRIPTIVE NOTE: Rept. for 1 Dec 86-30 Jun 89.

88

PERSONAL AUTHORS: Carlin, Richard T.; Osteryoung, Robert A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1082

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v27n20  
p3675-3677 1988.

ABSTRACT: (U) We have recently reported the electrochemical interconversions of several molybdenum dimers in the ambient-temperature molten salt  $\text{AlCl}_3$ -1-ethyl-3-methylimidazolium chloride (ImCl) the results of the study performed in a basic melt are summarized in Scheme I. Acidic melts are defined as melts where the  $\text{AlCl}_3$ :ImCl molar ratio is greater than one, and basic melts are melts where this ratio is less than one. These previous studies were hampered in part by the presence of protonic impurities in the melt. We have since found that the addition of  $\text{EtAlCl}_2$  to  $\text{AlCl}_3$ -ImCl melts effectively removes these protonic impurities, forming  $\text{AlCl}_3$ , a component of melt. We have applied this purification method to melts containing molybdenum dimer and which wish to report several interesting reactions involving the addition and removal of hydrogen to the Mo-Mo quacruple judge bond  $\text{Mo}_2\text{Cl}_8$ . Melts, Reprints. (jes)

DESCRIPTORS: (U) \*ALLOYS, \*MELTS, \*MOLYBDENUM, \*DIMERS, ACIDS, HYDROGEN, PROTONS, PURIFICATION, RATIOS, REPRINTS, RESPONSE.

AD-A211 698

AD-A211 698

UNCLASSIFIED

PAGE

7

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 694 11/2

AD-A211 694 CONTINUED

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

properties and the growth mechanism of silicon polymer in the course of the sol-gel transition is discussed.

(U) A SANS (Small Angle Neutron Scattering) of Catalyst on the Growth Process of Silica Gels.

Keywords: Reprints; Glass. (kt)

89

DESCRIPTORS: (U) \*ANGLES, \*SILICON, \*SILICON DIOXIDE, \*STRUCTURAL PROPERTIES, CATALYSTS, CHEMICAL COMPOSITION, COMPUTERIZED SIMULATION, EVOLUTION (GENERAL), FABRICATION, GELATION, GELS, GLASS, GROWTH (GENERAL), HOMOGENEITY, LOW TEMPERATURE, NEUTRON SCATTERING, OXIDES, PARTICLE SIZE, PERCOLATION, POLYMERS, PREPARATION, REPRINTS, THEORY.

PERSONAL AUTHORS: Winter, R.; Hua, D.-W.; Thiagarajan, P.; Jonas, J.

CONTRACT NO. AFOSR-85-0345

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1137

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Non-Crystalline Solids, v108 p137-142 1989.

ABSTRACT: (U) The sol-gel process for preparing oxide glasses has attracted widespread attention in the last few years because it allows the preparation of glasses with very high homogeneity and the fabrication of glasses with special chemical composition; besides, processing can be performed at relatively low temperatures. It has been shown that the fluoride anion F<sup>-</sup> is one of the most effective catalysts in accelerating the gelation process. Small angle neutron scattering (SANS) experiments have been employed to investigate the structural evolution of uncatalyzed and fluoride catalyzed tetramethoxysilicate Si(OCH<sub>3</sub>)<sub>4</sub>/CH<sub>3</sub>OH/H<sub>2</sub>O solutions from the sol to the gel state. The F<sup>-</sup> anion has been shown to be one of the most effective catalysts for the polycondensation of silica gels. The analysis of the Guinier and Porod regions of the scattering curves yields valuable information about the particle size, the structural evolution and the growth process of these systems. The theoretical concepts of percolation and fractal geometry are applied to interpret the experimental results and to compare them with computer simulations for different growth processes in order to ascertain the origin of the developing random polymer network structure. The effects of adding a strong nucleophilic catalyst, such as NaF, on the structural

AD-A211 694

AD-A211 694

UNCLASSIFIED

PAGE

8

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 693 20/6

FLORIDA UNIV GAINESVILLE DEPT OF CHEMICAL ENGINEERING  
(U) Linear (Passive) and Non-Linear Guided and Studies in Glass.

DESCRIPTIVE NOTE: Final rept. 1 May 88-30 Apr 89.

JUL 89

PERSONAL AUTHORS: Ramaswamy, R. V.

CONTRACT NO. AFOSR-88-0199

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1142

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary object of the project is to investigate theoretically as well as experimentally the ion-exchange process and solgel technology for glass for signal processing applications. This report deals with the progress made in both the ion-exchange and the gel-silica waveguide technology. The study involved several sub-projects. 1. Passive, low-loss waveguides and tapers by Ag+ -Na+ exchange. 2. Surface and buried channel waveguides by K+ -Na exchange. 3. Fabrication and characterization of 3 dB cross-couplers. 4. Laser-assisted fabrication of waveguides in gel-silica. Keywords: Silver; Sodium; Solgel; Ion exchange. (KT)

DESCRIPTORS: (U) \*GLASS, BURIED OBJECTS, CHANNELS, INTEGRATED CIRCUITS, ION EXCHANGE, LOW LOSS, OPTICAL CIRCUITS, PASSIVE SYSTEMS, SIGNAL PROCESSING, SILVER, SODIUM, WAVEGUIDES.

AD-A211 693

UNCLASSIFIED

AD-A211 691 20/6

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING HAMPTON VA

(U) High Resolution Finite Volume Methods on Arbitrary Grids via Wave Propagation.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87.

OCT 87

PERSONAL AUTHORS: LeVeque, Randall J.

REPORT NO. ICASE-87-68

CONTRACT NO. AFOSR-85-0189

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-1129

UNCLASSIFIED REPORT

ABSTRACT: (U) In previous work by the author, a generalization of Godunov's method for systems of conservation laws has been developed and analyzed that can be applied with arbitrary time steps on arbitrary grids in one space dimension. Stability for arbitrary time steps is achieved by allowing waves to propagate through more than one mesh cell in a time step. In this paper the method is extended to second order accuracy and to a finite volume method in two space dimensions. This latter method is based on solving one dimensional normal and tangential Riemann problems at cell interfaces and again propagating waves through one or more mesh cells. By avoiding the usual time step restriction of explicit method, it is possible to use reasonable time steps on irregular grids where the minimum cell area is much smaller than the average cell. Boundary conditions for the Euler equations are discussed and special attention is given to the case of a Cartesian grid cut by an irregular boundary. In this case small grid cells arise only near the boundary, and it is desirable to use a time step appropriate for the regular interior cells. Numerical results in two dimensions show that this can be achieved. (RH)

AD-A211 691

PAGE 9 EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 691 CONTINUED

AD-A211 675 20/5

DESCRIPTORS: (U) \*CELLS, \*GRIDS, \*INTERFACES, \*MESH,  
\*VOLUME, \*WAVE PROPAGATION, ACCURACY, BOUNDARIES,  
CONSERVATION, DIFFERENTIAL EQUATIONS, INTERNAL, NUMERICAL  
ANALYSIS, TIME.

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Vibrationally Excited Formaldehyde: The Relationship  
between Vibrational Structure and Collisional  
Properties.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A3.

88

PERSONAL AUTHORS: Temps, Friedrich; Halle, Scott; Vaccafo,  
Patrick H.; Field, Robert W.; Kinsey, James L.

CONTRACT NO. AFOSR-85-C381

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1166

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society,  
Faraday Transactions 2, v84 n9 p1457-1482 1988.

ABSTRACT: (U) Investigations of the physical and  
chemical properties of highly vibrationally excited  
polyatomic molecules at chemically significant energies  
are of fundamental interest for a detailed understanding  
of the dynamics of chemical reactions. A central question  
is that of state specific properties at 'low' energies vs.  
statistical molecular properties at 'high' energies and  
the spectral features which signal the transition between  
the two regimes. Reliable information on the distinctive  
molecular dynamics under these two conditions is of  
central importance for successful modelling of  
unimolecular reactions. Particular interest arises in the  
collisional excitation and relaxation of highly excited  
molecules. Current research focuses on the rates of  
energy transfer, the significance on intramolecular  
perturbations, the amount of energy transferred per  
collision, and the dependence of these properties on the  
initial and final vibrational states and excitation  
energies. Keywords: Molecular physics; Formaldehyde;  
Reprints. (KT)

DESCRIPTORS: (U) \*ENERGY TRANSFER, \*MOLECULAR PROPERTIES,  
\*POLYATOMIC MOLECULES, CHEMICAL PROPERTIES, CHEMICAL

AD-A211 691

AD-A211 675

UNCLASSIFIED

PAGE 10 EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 675 CONTINUED

AD-A211 674 9/1 7/1 7/4

REACTIONS, COLLISIONS, DYNAMICS, ENERGY, EXCITATION, FORMALDEHYDE, HIGH ENERGY, LOW ENERGY, MOLECULAR STRUCTURE, MOLECULES, PHYSICAL PROPERTIES, RATES, RELIABILITY, REPRINTS, STATISTICS, VIBRATION.

OHIO STATE UNIV COLUMBUS DEPT OF CHEMISTRY

(U) Fast Heterogeneous Electron Transfer Rates for Glassy Carbon Electrodes without Polishing or Activation Procedures.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B1.

89

PERSONAL AUTHORS: Rice, Ronald; Alfred, Christie; McCreery, Richard

CONTRACT NO. AFOSR-88-0071

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-1149

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. Electroanalytical Chemistry, v263 p163-169 1989.

ABSTRACT: (U) Glassy carbon (GC) is an attractive choice for an electrode material because it has a wide potential range, is inexpensive, readily available, and chemically inert in most electrolytes. The typical preparation of a GC electrode includes the removal of gross surface features by abrasion with silicon carbide paper and subsequent polishing with alumina. The electrochemistry of many redox systems such as ascorbic acid (AA), ferri/ferrocyanide, and dopamine on GC are very sensitive to the polishing procedure, with variations in the heterogeneous electron transfer rate constant  $k_{10}$ , for the Fe(CN)<sub>6</sub> (3-/4-) redox system covering at least three orders of magnitude. This variation has been attributed primarily to superficial impurities and polishing debris. Reprints. (AW)

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*ELECTRODES, \*GLASSY CARBON, \*ELECTRON TRANSFER, \*REACTION KINETICS, \*ABRASION, ACTIVATION, ALUMINUM OXIDES, ASCORBIC ACID, DEBRIS, DOPAMINE, ELECTROLYTES, MATERIALS, OXIDATION REDUCTION REACTIONS, PAPER, POLISHING, RANGE(EXTREMES), REPRINTS, SILICON CARBIDES.

AD-A211 675

AD-A211 674

UNCLASSIFIED

PAGE 11

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 674 CONTINUED

AD-A211 673 7/4

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1, Ferricyanide,  
Ferrocyanide.

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) Intrinsic Reaction Coordinate Calculations for Very  
Flat Potential Energy Surfaces: Application to Singlet  
Si2H2 Isomerization.

DESCRIPTIVE NOTE: Rept. for 1 Nov 86-3) Oct 89.

89

PERSONAL AUTHORS: Koseki, Shiro; Gordon, Mark S.

CONTRACT NO. AFOSR-87-0049

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-1170

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v93 n1 p118-125 1989.

ABSTRACT: (U) Silasilene is an important species that  
may appear in the chemical vapor deposition of silicon.  
This paper reports an intrinsic reaction coordinate (IRC),  
or a minimum energy path (MEP), of the isomerization from  
silasilene to bridged disilyne obtained by using the  
local cubic and quadratic approximations. These new  
approximations generate a correct IRC for this  
isomerization, while some conventional methods fail to  
predict a reasonable IRC because of the very flat  
potential energy surface. This reaction path bifurcates  
to two identical IRCs to reach bridged disilyne. The  
activation energy for this isomerizations is predicted to  
be less than 3 kcal/mol. This energy barrier may  
disappear at high temperatures. The paper also compares  
the IRCs on the simple potential energy surfaces of the  
ammonia inversion and the Hydrogen cyanide isomerization  
generated by using the local cubic and quadratic  
approximations with those obtained by some conventional  
methods. Reprints. (AW)

DESCRIPTORS: (U) +ISOMERIZATION, +POTENTIAL ENERGY,  
+SILANES, +SURFACE REACTIONS, ACTIVATION ENERGY, AMMONIA.

AD A211 674

AD-A211 673

UNCLASSIFIED

PAGE 12

EV105K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 673 CONTINUED

AD-A211 672 7/3

APPROXIMATION(MATHEMATICS), BARRIERS, CHEMICAL REACTIONS, ENERGY, HIGH TEMPERATURE, HYDROGEN CYANIDE, INVERSION, PATHS, QUADRATIC EQUATIONS, REPRINTS, RESPONSE, SILICON, SURFACES, VAPOR DEPOSITION, BIFURCATION(MATHEMATICS).

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Synthesis of Tetrakis(Trifluoromethyl) Lead.

89

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, \*Potential Energy Surfaces, Flatness, Singlet States, \*Silasilene, Intrinsic Reaction Coordinates, Minimum Energy Paths, Bridged Compounds, \*Disilyne, Cubic Approximations, Energy Barriers.

PERSONAL AUTHORS: Juhlke, Timothy J.; Glanz, Jeffrey I.; Lagow, Richard J.

CONTRACT NO. AFOSR-88-0084

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1155

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28 p980 1989.

ABSTRACT: (U) An interesting new compound tetrakis(trifluoromethyl) has been prepared by a technique which promises to be a very broadly adaptable route to synthesis of new sigma-bonded metal compounds of relatively low thermal stability. This trifluoromethyl compound is one of the last remaining unsynthesized trifluoromethyl compounds of Groups IV, and although it is too unstable to be isolated at temperatures required for conventional synthetic methods (>100 C), it is stable at room temperature when isolated from radiation sources Reprints. (AW)

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*LEAD(METAL), \*ORGANOMETALLIC COMPOUNDS, FLUORINATED HYDROCARBONS, ISOLATION, METHYL RADICALS, RADIATION, REPRINTS, ROOM TEMPERATURE, SOURCES, STABILITY, TEMPERATURE, THERMAL STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Trifluoromethyl lead, Lead/Tetrakis (Trifluoromethyl)

AD-A211 673

AD-A211 672

UNCLASSIFIED

PAGE 13

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 671 CONTINUED

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) Compressed Co Overlayers on Pt(111) Evidence for  
Tilted Co Species at High Coverages by Digital ESDIAD.

88

PERSONAL AUTHORS: Kiskinova, M.; Szabo, A.; Yates, J. T.,  
JR

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-1189

UNCLASSIFIED REPORT

ABSTRACT: (U) The existence of tilted carbon monoxide molecules in compressed Carbon monoxide overlayers on Platinum(111) has been detected using the digital ESDIAD method with enhanced resolution achieved by applying a retarding potential procedure to separate CO(+), CO\*, and O(+)-ESD products. Digital symmetrization was used for analysis of the ESDIAD data collected under field-free conditions. The CO tilting is consistent with the building of antiphase domain. Boundaries of close-packed terminal-CO species. It has been found that CO molecules tilt about 6 degs. off-normal at Co coverages higher than 0.6 CO/Pt. The azimuthal directions (equivalent to (110) of CO tilting indicate that the close-packed CO molecules are repelled along the nearest Pt-Pt neighbor directions. Studies of the thermal broadening of the CO+ ESDIAD pattern due to the tilted-CO molecules have shown that the maximum amplitude of the vibrational motion of the tilted-CO species occurs along the directions normal to the tilting plane. A comparison of the CO(+) and CO+ ESDIAD patterns has permitted approximate estimation of the distance of the image plane from the center of the charge for the CO(+) ESD product at the point of its origin. Keywords: Electron stimulated desorption angular distribution; Electron stimulated desorption spectroscopy; Chemisorption; Tilted adsorbate molecules; Adsorbate-adsorbate interactions; Reprints. (aw)

DESCRIPTORS: (U) CARBON MONOXIDE, CHEMISORPTION, SYMMETRY, AZIMUTH, COMPRESSION, DESORPTION, ELECTRONS, ESTIMATES, IMAGES, MOLECULES, MOTION, ORIENTATION(DIRECTION), REPRINTS, RETARDATION, STIMULATION(GENERAL), TILT, VIBRATION OVERLAYS, ADSORBATES, MOLECULAR VIBRATION, AMPLITUDE, MOLEFCULE MOLEUCLE INTERACTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, Digital symmetrization, Antiphase domain boundaries, Close packing, Repelling, Thermal broadening, Image planes, Electron stimulated desorption angular distribution, Electron stimulated desorption spectroscopy, ESDIAD(Electron Stimulated Desorption Angular Distribution).

AD A211 571

AD A211 671

UNCLASSIFIED

PAGE

14

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 667 7/3 7/4

AD-A211 667 CONTINUED

NEW ORLEANS UNIV LA DEPT OF CHEMISTRY

(U) Computational Analysis of the Structures, Bond Properties, and Electrostatic Potentials of Some Nitrotetrahedranes and Nitroazetetrahedranes.

DESCRIPTORS: (U) \*ELECTROSTATIC CHARGE, \*NITRO RADICALS, \*MOLECULAR STRUCTURE, \*POTENTIAL ENERGY, \*ORGANIC COMPOUNDS, BARRIERS, CARBON, CHEMICAL BONDS, CHEMICAL DERIVATIVES, COMPUTATIONS, CONFORMITY, CONSISTENCY, ENERGY INDEXES, MOLECULES, NITROGEN, REACTIVITIES, REPRINTS, MOLECULAR ROTATION.

DESCRIPTIVE NOTE: Journal article.

89

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3.

\*Nitrotetrahedranes, \*Nitroazetetrahedranes, Ab Initio Computations, Bond Deviation Indices, Bond Strain, Bond Orders, Bond Strength, Electrostatic Potentials, Conformation, Carbon Carbon Bonds, Strained Molecules

PERSONAL AUTHORS: Politzer, Peter; Seminario, Jorge M.

CONTRACT NO. AFOSR-88-0068

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-1019

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n12 p4742 4745 1989.

ABSTRACT: (U) The structures and properties of six nitro derivatives of tetrahedrane and its mono and diaza analogues have been determined by means of ab initio self-consistent field computations. Geometries optimized at the 3-21G level were used to calculate bond deviation indices (as measures of bond strain), bond orders (to determine reactive bond strengths) and molecular electrostatic potentials, as guides to reactive behavior. The bond properties (length, degree of strain, and strength) are significantly influenced by the conformation of the nitro group, although there was found to be essentially no energy barrier to its rotation. For the polynitro derivatives, the general result is a slight strengthening of C-C bonds. The molecular electrostatic potentials are also considerably affected by the electron-withdrawing -NO2 substituents; the negative potentials associated with the strained C-C bonds in unsubstituted systems are absent, and the basicities of the azo nitrogens are greatly reduced. Keywords: Strained molecules; Bond strain; Chemical bonds; Carbon; Nitro radicals. Reprints. (AM)

AD A211 667

AD A211 667

UNCLASSIFIED

PAGE 15

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 651 11/2

AD-A211 651 CONTINUED

CERAMATEC INC SALT LAKE CITY UT

titanate, (P2T, Tetragonal Zirconate Polycrystalline,  
(T2P)). (sdw)

(U) New Mechanism for Toughening Ceramic Materials.

DESCRIPTIVE NOTE: Final rept. 15 Jul 87-14 Dec 88.

MAY 89

DESCRIPTORS: (U) \*CERAMIC MATERIALS, ALUMINATES, BLOOD  
PLATELETS, ELASTIC PROPERTIES, FRACTURE(MECHANICS), LEAD  
TITANATES, MEASUREMENT, POLYCRYSTALLINE, SINTERING,  
STRONTIUM, SWITCHING, TEMPERATURE, TIME DEPENDENCE,  
TOUGHNESS, TRANSFORMATIONS, UTAH, ZIRCONATES, ZIRCONIUM  
OXIDES.

PERSONAL AUTHORS: Cutler, Raymond A.; Virkar, Anil V.

REPORT NO. CERAMATEC-8961701

IDENTIFIERS: (U) PE61102F, WJAFOSR9999999.

CONTRACT NO. F49620-87-C-0077, \$DARPA Order-5994

PROJECT NO. 9999

TASK NO. 99

MONITOR: AFOSR  
TR-89-1097

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Utah  
Univ., Salt Lake City, Dept. of Materials Science.

ABSTRACT: (U) A 14 month study by Ceramtec, with a subcontract to the University of Utah, was initiated in order to determine if ferroelastic switching contributes to toughening in ceramic materials. Domain switching in ZrO2 single crystals (heat treated to minimize transformation) at 1400 C was used to show that ferroelastic switching is a process which occurs at temperatures in excess of the monoclinic to tetragonal transformation temperature. These data, coupled with fracture toughness measurements of 8 MPa.m<sup>1/2</sup> at 1000 C, show that ferroelastic toughening has the potential for toughening at temperatures in excess of that possible by transformation toughening. Experiments on PZT, SrZrO3 and Gd2 (MoO4) 3 were used to show that ferroelastic switching can contribute to toughening. The time dependence of switching was demonstrated using PZT ceramics. Dopants were added to polycrystalline TZP materials in order to substantially increase their fracture toughness. In the case of SrO additions, strontium aluminate platelets, formed in-situ during sintering, contributed to toughness. Keywords: Zirconium oxides, Ceramic materials, Polycrystalline lead Zirconate

AD-A211 651

AD-A211 651

UNCLASSIFIED

PAGE 16

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 650 CONTINUED

AD-A211 650 6/4 5/8

EYE RESEARCH INST OF RETINA FOUNDATION BOSTON MA

(U) Eye Movements and Spatial Pattern Vision. IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, \*Spatial Pattern Vision, Lightness, Achromaticity, Hue(Color).

DESCRIPTIVE NOTE: Final rept. 1 Mar 86-30 Apr 89,

JUL 89

PERSONAL AUTHORS: Arend, Lawrence E.

CONTRACT NO. AFOSR-86-0128

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-1151

UNCLASSIFIED REPORT

ABSTRACT: (U) Models of lightness and color perception must take account of human color constancy, a tendency for apparent surface color to be relatively independent of the color and intensity of the illuminating light source. Observers matched the lightness and brightness of regions in simple and complex achromatic spatial patterns. The data showed that the observers' knowledge of the surface reflectances (revealed by lightness matches) was unaffected by changing brightness of the same surfaces (revealed by brightness matches). In the analogous chromatic experiments, observers matched the hue and saturation of patches or the patches' apparent surface colors. The observers' knowledge of the surface colors was not as reliable as in the achromatic case. Patches' hues and saturations matched when their chromaticities were approximately the same. Shifts of hue attributable to simultaneous color contrast were in the correct direction but too small to produce hue constancy. Keywords: Visual perception, Spatial pattern vision, Visual illusions, Color vision. (AW)

DESCRIPTORS: (U) \*COLOR VISION, \*EYE MOVEMENTS, \*PATTERN RECOGNITION, \*BRIGHTNESS, CHROMATICITY, COLORS, CONTRAST, HUMANS, ILLUMINATION, ILLUSIONS, LIGHT SOURCES, OPTICAL IMAGES, PATTERNS, REFLECTANCE, SATURATION, SPATIAL DISTRIBUTION, SURFACES, SYNCHRONISM, VISION, VISUAL PERCEPTION.

AD-A211 650

AD-A211 650

UNCLASSIFIED

PAGE 17

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 647 AD-A211 647 CONTINUED

IDENTIFIERS: (U) Stream Functions, Deflated Conjugate Gradients, PE61102F, WUAFOSR2304A3.

AD-A211 647 20/4 12/1

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MATHEMATICS  
(U) Efficient Finite Element Solution of Navier-Stokes Equations and Related Topics.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 84-31 May 89.

89

PERSONAL AUTHORS: Nicolaidas, R. A.

CONTRACT NO. AFOSR-84-0137

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-1180

UNCLASSIFIED REPORT

ABSTRACT: (U) Research efforts were directed towards a number of different topics connected with numerical methods for incompressible fluid flows. The subject groupings were as follows: 1. Finite element techniques (7 Papers) Stability of discretizations, Stream function methods and pressure recovery, Nonconforming schemes. 2. Vortex techniques (3 Papers) Higher order vortex algorithms, Analysis and computation. 3. Solution algorithms (5 Papers) Deflated conjugate gradients, Iterative methods for arbitrary meshes, Domain decomposition methods. 4. Fluid mechanics and phase transitions (3 Papers) Cahn-Hilliard equation analysis and algorithms, Stationary and evolutionary cases. 5. Complementary volume methods (2 Papers) Vorticity-velocity methods, Primitive variable methods. 6. Control theory (1 Paper). (JHD)

DESCRIPTORS: (U) \*FINITE ELEMENT ANALYSIS.  
\*INCOMPRESSIBLE FLOW, \*NAVIER STOKES EQUATIONS, ALGORITHMS, CONTROL THEORY, DECOMPOSITION, EFFICIENCY, FLUID MECHANICS, FUNCTIONS(MATHEMATICS), ITERATIONS, NUMERICAL METHODS AND PROCEDURES, PHASE TRANSFORMATIONS, PRESSURE, RECOVERY, SOLUTIONS(GENERAL), VARIABLES, VORTICES.

AD-A211 647

AD-A211 647

UNCLASSIFIED

PAGE

18

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 645

9/1

OHIO STATE UNIV COLUMBUS DEPT OF CHEMISTRY

AD-A211 645

CONTINUED

(U) Activation of Highly Ordered Pyrolytic Graphite for Heterogeneous Electron Transfer: Relationship between Electrochemical Performance and Carbon Microstructure,

89

PERSONAL AUTHORS: Bowling, Robert J.; Packard, Richard T.; McCreery, Richard L.

CONTRACT NO. AFOSR-88-0071

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-1147

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 n4 p1217-1223 1989.

ABSTRACT: (U) The electrochemical and vibrational spectroscopic properties of highly ordered pyrolytic graphite (HOPG) were determined before and after modification by anodization or pulsed laser irradiation. Both treatments greatly accelerated the heterogeneous electron transfer rate constants for the Fe(CN)<sub>6</sub>(<sup>3-</sup>/<sub>4-</sub>) and dopamine redox systems on HOPG by approximately six orders of magnitude. At intermediate electrochemical pretreatment (ECP) potentials, a spatially heterogeneous surface resulted, with surface regions exhibiting the 1360/cm band being separated by tens of microns. The results clearly indicate that graphitic edge plane is necessary for fast electron transfer, and that the pretreatment procedures accelerate k<sub>0</sub> by generating edge plane defects in the HOPG lattice. The mechanisms of defect generation for the two procedures appear very different, with ECP appearing to follow a nucleation process leading to a spatially heterogeneous surface, while the laser pulse appears to shatter the HOPG lattice, leading to a more uniform distribution of active sites. The results provide important conclusions about the relationship between carbon electrode microstructure and heterogeneous electron transfer activity. Of particular

interest is the heterogeneous electron transfer rate between carbon electrodes and various well-known redox systems such as ascorbic acid, ferri/ferrocyanide, and the catecholamines. Not only are these systems of significant analytical interest, but they serve as benchmarks for comparisons of electrode performance. Keywords: Electrodes; Reprints. (kt)

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*ELECTRODES, \*ELECTRON TRANSFER, ACTIVATION, ANODIC COATINGS, ASCORBIC ACID, CARBON, CATECHOLAMINES, DEFECTS(MATERIALS), DISTRIBUTION, DOPAMINE, EDGES, GRAPHITE, HETEROGENEITY, HIGH RATE, IRRADIATION, MICROSTRUCTURE, MODIFICATION, NUCLEATION, OXIDATION REDUCTION REACTIONS, PERFORMANCE(ENGINEERING), PHYSICAL PROPERTIES, PULSED LASERS, RATES, REGIONS, REPRINTS, SITES, SPECTROSCOPY, STANDARDS, SURFACES, VIBRATION.

IDENTIFIERS: (U) WUAFDSR2303A1, PE61102F.

AD-A211 645

AD-A211 645

UNCLASSIFIED

PAGE 19

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 644 CONTINUED

AD-A211 644 7/4

OHIO STATE UNIV COLUMBUS DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*ACTIVATION, \*CAPACITANCE, \*ELECTRODES,  
DENSITY, EDGES, ELECTROCHEMISTRY, ELECTRON TRANSFER,  
GRAPHITE, HETEROGENEITY, LASERS, MICROSTRUCTURE,  
OXIDATION, OXIDES, OXYGEN, RAMAN SPECTROSCOPY, RATES,  
REACTION KINETICS, REPRINTS.

(U) Mechanism of Electrochemical Activation of Carbon  
Electrodes: Role of Graphite Lattice Defects,

89

IDENTIFIERS: (U) WUAFOSR2303A1, PE61102F.

PERSONAL AUTHORS: Bowling, Robert J.; Packard, Richard T.;  
McCreery, Richard L.

CONTRACT NO. AFSR-88-0071

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFSR  
TR-89-1148

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Langmuir, v5 n3 p683-688 1989.

ABSTRACT: (U) By use of Raman spectroscopy as a probe, the relationship between carbon microstructure and increases in the heterogeneous electron-transfer rate for carbon electrodes was examined. A distinctive Raman band at  $1360 \text{ cm}^{-1}$  is proportional to the density of graphitic edge planes and may be used to monitor changes in edge plane density induced by carbon pretreatment procedures. It was shown that electrochemical oxidation of highly ordered pyrolytic graphite (HOPG) caused fracturing of the graphite lattice, thus increasing edge plane density. This result is consistent with other reports from laser activation of HOPG, which correlate increased edge plane density with increased electron-transfer rate. Creation of edge plane is a phenomenon common to both oxidative and nonoxidative activation procedures and is responsible for HOPG activation. Arguments about the involvement of graphitic oxide or oxygen containing functional groups in electron-transfer activation are presented. After the present results are combined with those from the literature, it appears unlikely the oxygen functional groups are involved in electron-transfer activation of several benchmark redox systems on carbon electrodes. Keywords: Reaction kinetics; Electrochemistry; Electrodes; Carbon; Reprints. (kt)

AD-A211 644

AD-A211 644

UNCLASSIFIED

PAGE 20

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 633 7/3

AD-A211 633 CONTINUED

DARTMOUTH COLL HANOVER N H DEPT OF CHEMISTRY

(U) Synthesis and Chemistry of Strained and Conjugated Fluorocarbons.

Negative hyperconjugation; Thermodynamic parameters; Kinetic parameters; Reaction mechanisms. (KY)

DESCRIPTORS: (U) \*FLUORINATED HYDROCARBONS, \*CHEMICAL REACTIONS, ARRAYS, BARRIERS, CHEMISTRY, CYCLIC COMPOUNDS, FLUORINE, ISOMERS, KINETICS, METHODOLOGY, MOLECULES, NEUTRAL, ORGANIC CHEMISTRY, ORGANIC MATERIALS, PARAMETERS, POTENTIAL ENERGY, RESPONSE, ROTATION, SURFACES, SYNTHESIS(CHEMISTRY), TARGETS, THERMODYNAMICS, VALERCE.

DESCRIPTIVE NOTE: Final rept. 1 Apr 86-31 Mar 89.

JUL 89

PERSONAL AUTHORS: Lema1, D. M.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, \*Fluorocarbons.

CONTRACT NO. AFOSR-86-0130

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1098

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this project was to synthesize and study the chemistry of an array of fluorocarbons and fluorocarbon derivatives in order to further understanding of fluorine as substituent in organic chemistry. Target molecules, all of which incorporated conjugation and/or strain, were chosen on the basis of unusual and/or interesting structural features. This investigation has accomplished the synthesis of many new fluorocarbons and derived molecules, and has included exploration of new synthetic methodology in fluorocarbon chemistry, determination of thermodynamic and kinetic parameters for fluorocarbon valence isomerizations, study of negative hyperconjugation, and examination of mechanisms of fluorocarbon reactions. Much has been learned about how to synthesize perfluorinated annulenes and their relatives, and much information has been acquired about potential energy surfaces for fluorocarbon valence isomerizations. A study of rotational barriers in alpha-fluoramines has revealed that negative hyperconjugation can have powerful energetic consequences even in neutral molecules. Insights into fluorocarbon reaction mechanisms, both thermal and photochemical, have emerged from synthetic explorations as well as from explicitly mechanistic studies. Keywords: Fluorocarbons; Organic synthesis; Annulenes; Ring strain; Dynamic NMR; Valence isomers;

AD-A211 633

AD-A211 633

UNCLASSIFIED

PAGE 21

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 632 7/3 7/4

AD-A211 630 6/4 12/9

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

MINNESOTA UNIV ST PAUL

(U) Structures of Two Organosilyl Azides.

(U) A Conference on Three-Dimensional Representation Held in University of Minnesota on 24-26 May 1989.

89

PERSONAL AUTHORS: Zigler, Steven S.; Haller, Kenneth J.; West, Robert; Gordon, Mark S.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 89.

JUN 89

CONTRACT NO. F49620-86-C-0010

PERSONAL AUTHORS: Bierlerman, Irving

PROJECT NO. 2303

CONTRACT NO. AFOSR-89-0232

TASK NO. B2

PROJECT NO. 2313

MONITOR: AFOSR  
TR-89-1173

TASK NO. A5

MONITOR: AFOSR  
TR-89-1090

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v8 p1656-1660 1989.

ABSTRACT: (U) X-ray crystal structures were determined for trimethylazidosilane (3) and 1, 1-dimethyl-2, 2-diphenyl-2-tert-butylazidodisilane (4). The N1-N2 and N2-N3 bond lengths (pm) in both compounds are nearly equal, being 115.8 and 117.0 for 3 and 117.0 and 114.7 for 4, respectively. These silyl azides thus differ markedly from organic azides, in which N2-N3 is much shorter than N1-N2. Molecular orbital calculations predict N2-N3 to be 6 pm shorter than N1-N2 in trinitrosilane (5). The N-N-N angle is 173.7 degs for 3 and 174.9 degs for 4, in good agreement with the calculated value for 5. Reprints. (AW)

DESCRIPTORS: (U) \*AZIDES, \*CRYSTAL STRUCTURE, \*SILANES, \*ORGANIC COMPOUNDS, COMPUTATIONS, MOLECULAR ORBITALS, REPRINTS, X RAYS, PHENYL RADICALS, BUTYL RADICALS, NITRO RADICALS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Organosilyl Azides, Trimethylazidosilane, Silane/Trimethylazido, Disilane/1-1-Dimethyl-2-2-Diphenyl-2-Tert-Butylazido, Trinitrosilane.

AD-A211 632

UNCLASSIFIED

ABSTRACT: (U) This is the final report for a conference grant entitled: A conference on Three-Dimensional Representation. The two and one-half day conference was held at the University of Minn. on May 24-26, 1989 to evaluate the current status of problem associated with three-dimensional representations from current computational, psychological, development, and neurophysiological perspectives. Nineteen presentations were made spanning these approaches. One hundred sixty-six individuals attended the conference. Of 44 evaluations received, 75% rated the conference as excellent, 20% as good, and 5% as fair. None rated it poor. The report consists of the original and revised program, conference abstracts evaluation summary and the roster of attendees. Keywords: Depth perception; Binocular space perception; Three dimensional; Visual motion; Object recognition; Parallel processing; Depth cues; Occlusion. (KR)

DESCRIPTORS: (U) \*SPACE PERCEPTION, \*VISUAL PERCEPTION, \*THREE DIMENSIONAL, ABSTRACTS, BINOCULARS, MINNESOTA, MOTION, OPTICAL IMAGES, PARALLEL PROCESSING, RECOGNITION, SYMPOSIA, TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

AD-A211 630

PAGE 22 EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 629 5/8

AD-A211 629 CONTINUED

WASHINGTON UNIV SEATTLE DEPT OF PSYCHOLOGY

ALCOHOLS, BEHAVIOR, FEAR, FINLAND, HYPOXIA, INTOXICATION,  
JUDGEMENT(PSYCHOLOGY), MOUNTAINS, MOUNTS, PATTERNS,  
PICTURES, RETENTION(PSYCHOLOGY).

(U) Metacognition and Retrieval from Long-Term Memory at  
Mount Everest.

IDENTIFIERS: (U) PE61102F, WJAFOSR2313A4.

DESCRIPTIVE NOTE: Final rept. 13 May 88-23 Jun 89,

JUN 89

PERSONAL AUTHORS: Nelson, Thomas O.

CONTRACT NO. AFOSR-88-0226

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-1113

UNCLASSIFIED REPORT

ABSTRACT: (U) Behavioral data were collected from  
climbers at various altitudes on Mount Everest. In  
contrast to earlier findings that altitude impairs the  
acquisition of information into memory, we found no  
changes in the accuracy or latency of retrieving  
information from memory, even at extreme altitudes above  
21,000' (6,400 m). This lack of effect on retrieval  
occurred for both the recall and recognition of answers  
to general-information questions (e.g., What is the  
capital of Finland?). Self-confidence about the accuracy  
of recent retrieval was also not affected by altitude.  
However, the feeling of knowing (i.e., self-confidence  
about upcoming retrieval) declined at extreme altitudes  
and remained lower even after return to Kathmandu. This  
pattern of results is close to opposite of the pattern  
obtained when the independent variable is alcohol  
intoxication and the same test battery is employed. These  
and related results are described in an attempt to give a  
relatively comprehensive picture of the climbers'  
performance, and suggestions are offered for future  
research. Keywords: Cognition, Memory, Metacognition,  
Judgment, Hypoxia, Fear, Danger, Mountaineering,  
Retrieval, Confidence, Altitude. (SDW)

DESCRIPTORS: (U) \*ALTITUDE, \*COGNITION,  
\*MEMORY(PSYCHOLOGY), \*CLIMBING, ACCURACY, ACQUISITION,

AD-A211 629

AD-A211 629

UNCLASSIFIED

PAGE 23

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 613 20/5 14/2

AD-A211 613 CONTINUED

STANFORD UNIV CA

DISTRIBUTION, INTERNAL, ION BEAMS, ION ION INTERACTIONS,  
LASER INDUCED FLUORESCENCE, MOLECULAR BEAMS, MOLECULES,  
PHOTOELECTRIC EMISSION, RADIOFREQUENCY, SPECTROSCOPY,  
TIME, TRAPS.

(U) State-Resolved Reaction Dynamics.

DESCRIPTIVE NOTE: Final rept. 1 Nov 85-31 Oct 88.

IDENTIFIERS: (U) Multiphoton Ionization, Time of Flight,  
PEG1102F, WUAFOSR2303B1.

JUL 89

PERSONAL AUTHORS: Zare, Richard N.

CONTRACT NO. F49620-88-C-0016

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1060

UNCLASSIFIED REPORT

ABSTRACT: (U) Resonance-Enhanced Multiphoton Ionization-Photoelectron Spectroscopy. A single time-of-flight (TOF) photo-electron spectrometer is to be used in conjunction with the MPI of jet-cooled molecules. This apparatus will measure energy and single-resolved photoelectron spectra. Such information has been of direct use in measuring the internal state distribution of REMPI-formed ions used in ion-molecule reaction studies. REMPI Spectroscopy of HBr and DBr. The laser induced fluorescence (LIF) technique has been developed to probe ion species. The ions produced directly from REMPI can have their rotational propensity roles in photoionization processes. The ions produced from a reaction between the state selected ions generated by REMPI and other molecules can be observed for studying state to state ion molecule reaction dynamics. State Selected Ion Molecule Reactions. The reactions of ammonia cations with neutral molecule, were conducted using a tandem quadrupole mass spectrometer. A new tapole ion trap was proposed to increase vastly our control over and understanding of biomolecular ion-molecular reactions. To make the quadrupole/octapole/quadrupole ion trap operational it was necessary to solve the technically challenging problem of interfacing three dissimilar radio frequency (rf) devices. (jhd)

DESCRIPTORS: (U) \*MASS SPECTROMETERS, \*PHOTOIONIZATION, AMMONIA, BIOMOLECULES, CATIONS, CHEMICAL REACTIONS,

AD-A211 613

AD-A211 613

UNCLASSIFIED

PAGE 44

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 607 9/1 20/3 20/13 20/12 AD-A211 607 CONTINUED

VIRGINIA UNIV CHARLOTTEVILLE DEPT OF ELECTRICAL  
ENGINEERING

edge junctions with excellent current-voltage characteristics were fabricated using a novel barrier formation process. (rh)

(U) SIS (Superconductor-Insulator-Superconductor) Mixer Research.

DESCRIPTORS: (U) \*BARRIERS, \*DETECTORS, \*JUNCTIONS, \*MIXING, \*NOISE(ELECTRICAL AND ELECTROMAGNETIC), \*NONLINEAR SYSTEMS, \*QUANTUM ELECTRONICS, \*SATURATION, \*TUNNELING(ELECTRONICS), BEHAVIOR, COMPUTATIONS, COMPUTER APPLICATIONS, DELAY, EDGES, ELECTRIC CURRENT, FREQUENCY IMAGES, INPUT, LIMITATIONS, NIOBIUM COMPOUNDS, NITRIDES, NOISE, PHYSICS, QUALITY, QUANTUM THEORY, REACTANCE, SOURCES, TIME INTERVALS, VOLTAGE.

DESCRIPTIVE NOTE: Final Technical rept. Nov 87-Nov 88,

JUL 89

PERSONAL AUTHORS: Feidman, Marc J.

REPORT NO. UVA/525659/EE90/101

CONTRACT NO. AFOSR-86-0056

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C3.

PROJECT NO. 2305

TASK NO. C3

MONITOR: AFOSR  
TR-89-1165

UNCLASSIFIED REPORT

ABSTRACT: (U) Theoretical and experimental research has been conducted to elucidate the basic physics behind the properties of superconductor-insulator-superconductor (SIS) tunnel junction receiving devices. The saturation behavior of the SIS mixer and the SIS direct detector was calculated. The direct detector was found to saturate at far higher powers than previously believed, allowing the possibility of practical application. SIS mixer saturation was measured using both monochromatic and thermal signals, and these experiments dramatically verified the theoretical expression. Quantum noise in the quantum theory of mixing was identified as the residual remaining when the usual noise sources are minimized. The quantum noise limit was shown to be reached in only two special cases. Computer calculations determined that the behavior of SIS receivers divides into two frequencies regimes, the cross-over frequency depending upon junction quality. The properties of these two regimes were delineated. A study of the role of the image termination of SIS mixers found that the nonlinear quantum reactance results in an effective time delay at the input port. Many aspects of the operation of SIS mixers at submillimeter wavelengths were clarified. Niobium nitride

AD-A211 607

AD-A211 607

UNCLASSIFIED

PAGE 25

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 605 12/1 7/4 AD-A211 604 20/5  
STANFORD UNIV CA DEPT OF MATHEMATICS NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY  
(U) Fast Reaction, Slow Diffusion, and Curve Shortening. (U) Decomposition of Normal-Coordinate Vibrational Frequencies.

FEB 89

89

PERSONAL AUTHORS: Rubinstein, Jacob; Sternberg, Peter; Keller, Joseph B.

PERSONAL AUTHORS: Boatz, Jerry A.; Gordon, Mark S.

CONTRACT NO. AFOSR-88-0053

CONTRACT NO. AFOSR-87-0049, \$NSF-CHE83-09948

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A4

TASK NO. B3

MONITOR: AFOSR TR-89-1178

MONITOR: AFOSR TR-89-1171

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. on Applied Mathematics, v49 n1 p116-133 Feb 89.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n5 p1817-1826 1989. Sponsored in part by Grants AFOSR-86-0237 and NSF-CHE85-11697.

ABSTRACT: (U) A reaction-diffusion problem for a vector is considered in a domain. An asymptotic solution is constructed for epsilon small. It shows that at each x, u tends quickly to a minimum of V(u). When V has several minima, u tends to a piecewise constant function. Boundary layer expansions are constructed around the resulting surface of discontinuity or fronts. Each front is found to move along its normal with a constant velocity determined by the discontinuity V in V across it. When V=0, the front normal velocity is epsilon k, where k is its mean curvature. The motion of fronts in this manner is studied for arcs in the plane which are normal to omega at their endpoints, and for fronts that are closed curves. It is shown a front can shrink to a point in a finite time or tend to a locally shortest diameter of omega. In the latter case, a nonconstant steady state u(x, y, epsilon) results. Keywords: Reprint. (KR)

DESCRIPTORS: (U) +VECTOR ANALYSIS, ASYMPTOTIC SERIES, CURVATURE, DIFFUSION, DISCONTINUITIES, GRAPHS, MEAN, QUICK REACTION, REPRINTS, SURFACES, TIME, VELOCITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4.

AD A211 605

AD-A211 604

UNCLASSIFIED

PAGE 26

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 603 9/1

AD-A211 602 20/10

OHIO STATE UNIV COLUMBUS DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Raman Spectroscopy of Carbon Electrodes: Correlation between Defect Density and Heterogeneous Electron Transfer Rate.

(U) Spin Statistics: An Error in Landau and Lifschitz' Quantum Mechanics.

JUN 88

MAY 89

PERSONAL AUTHORS: Bowling, Robert; Packard, Richard; McCreedy, Richard L.

PERSONAL AUTHORS: Jonas, David M.

CONTRACT NO. AFOSR-88-0071

CONTRACT NO. AFOSR-88-0062

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A1

TASK NO. B1

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-1148

TR-89-1163

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in the Electrochemical Society, v135 n6 p1605-1606 Jun 88.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90 n10 p5563-5565, 15 May 1989.

ABSTRACT: (U) This communication discusses a specific observation related to the general question of what factors affect the heterogeneous electron transfer rate, k, at carbon electrodes. We report a correlation between the presence of defects on highly ordered pyrolytic graphite (HOPG) and the k value observed for ferri/ferrocyanide on electrochemically and laser pretreated HOPG surfaces. Keywords: Roman spectroscopy; Carbon electrodes. (jes)

ABSTRACT: (U) In Quantum Mechanics, Landau and Lifschitz derive a formula for the direct calculation of rovibronic statistical weights. If it were correct, this formula would dramatically reduce the effort necessary to calculate statistical weights in large molecules. Unfortunately, due to a common misapplication of the Pauli principle, the formula derived is incorrect, as are the subsequent examples and problem solutions. The correct formula derived in this paper is used to calculate statistical weights for hydrogen, ethylene, and ammonia which agree with those of Herzberg, Townes and Schawlow, and Bunker. Reprints. (JHD)

DESCRIPTORS: (U) \*ELECTRODES, \*ELECTRON TRANSFER, \*RAMAN SPECTROSCOPY, CARBON, DENSITY, HETEROGENEITY, LASERS, OBSERVATION, RATES, SPECTROSCOPY.

DESCRIPTORS: (U) \*QUANTUM THEORY, AMMONIA, COMPUTATIONS, ETHYLENE FORTIFICATIONS, HYDROGEN, MOLECULAR VIBRATION, PROBLEM SOLVING, REPRINTS, SPIN STATES, STATISTICS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1.

AD-A211 603

AD-A211 602

UNCLASSIFIED

PAGE

27

EVI09K

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 601 7/2

AD-A211 600 7/2

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Synthesis of Perfluoro Crown Ethers: A New Class of Cyclic Fluorocarbons.

(U) Synthesis of Perfluorotetraalkyl Orthocarbonates Using Elemental Fluorine.

88

89

PERSONAL AUTHORS: Lin, Wen-Huey; Bailey, Webb I, Jr.; Lagow, Richard J.

PERSONAL AUTHORS: Lin, Wen-Huey; Clark, Wayne D.; Lagow, Richard J.

CONTRACT NO. AFOSR-87-0016, \$AFOSR-82-0197

CONTRACT NO. AFOSR-88-0084, NAG3-602

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR TR-89-1152

MONITOR: AFOSR TR-89-1156

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Pure and Applied Chemistry, v60 n4 p473-476 1988.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v54 n8 p1990-1992 1989.

ABSTRACT: (U) The first perfluoro crown ethers, perfluoro-18-crown-6, perfluoro 15-crown-5 and perfluoro 12-crown-4, have been prepared by carefully controlled elemental fluorination. Although they are weaker bases, crown ethers are materials which will have a number of applications. Keywords: Fluorine compounds; Fluorocarbons; Reprints; Synthesis chemistry; Ethers; Fluorination; chemical stability. (KT)

ABSTRACT: (U) An extraordinarily significant application of direct fluorination is in the synthesis of oxygen-containing fluorocarbons that are inaccessible by other techniques. Thus, recent research on the synthesis of 'spherical' fluorocarbons in our laboratory has led to the preparation of perfluorotetraalkyl orthocarbonates C(OCRf)4 by controlled direct elemental fluorine reactions. Hydrocarbon orthocarbonates are generally synthesized by the action of sodium alkoxides on trichloronitromethane or trichloromethanesulfenyl chloride. Perfluorotetraalkyl orthocarbonates are inaccessible via conventional fluoroorganic techniques. While fluorinated alkoxides are known, they are very weak nucleophiles and, at the temperatures required for reaction, are highly dissociated or undergo competing side reactions. Reprints. (kr)

DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, \*ETHERS, \*FLUORINATED HYDROCARBONS, \*SYNTHESIS(CHEMISTRY), CHEMICALS, FLUORINATION, FLUORINE COMPOUNDS, REPRINTS, STABILITY, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*perfluoro Crown Ethers

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*CARBONATES, \*FLUORINE, ALKOXY RADICALS, CHLORIDES, FLUORINATION, ION STRENGTH, REPRINTS, SIDE REACTIONS, SODIUM, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Perfluorotetraalkyl Orthocarbonates.

AD A211 601

AD-A211 600

UNCLASSIFIED

PAGE 28

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 599 CONTINUED

AD-A211 599 8/7 20/11 8/11

CALIFORNIA INST OF TECH PASADENA

(U) Stress Wave Induced Damage in Rock.

DESCRIPTIVE NOTE: Final rept. 15 Apr 88-14 Mar 89.

JUN 89

PERSONAL AUTHORS: Rubin, Allan M.; Arhens, Thomas J.

CONTRACT NO. AFOSR-88-0134

PROJECT NO. 2302

TASK NO. C2

MONITOR AFOSR TR-89-1101

UNCLASSIFIED REPORT

ABSTRACT: (U) Blocks of San Marcos Gabbro and Bedford Limestone were impacted with high-velocity projectiles and longitudinal elastic velocity measurements were carried out on oriented cubes throughout a cross-section of each block. For both rock types the velocity increases rather uniformly with distance from the impact site, reaching the unshocked velocity at a distance of approximately 1 crater radius. The maximum observed velocity reduction is to slightly < half the unshocked seismic velocity for both gabbro and limestone(lS); however, the average velocity reduction within the damaged zone is significantly greater for lS. Observed anisotropy in velocity reduction in the gabbro sample clearly can be related to the preferred orientation of macroscopic cracks, suggesting that velocity measurements can be a powerful tool for characterizing crack density and orientation in shocked rock. Microscopic observations of the gabbro indicate that both the number of cracks/unit area and crack size increase as seismic velocity decreases. Observational estimates of crack density are generally slightly lower than estimates made from theoretical consideration of observed velocity reduction. Microscopic observation of the porous lS indicates that both the percentage of fractured grains and their degree of comminution increase as seismic velocity decreases. Anisotropy of crack orientation and seismic velocity is less pronounced in the lS than in the gabbro, possibly

AD-A211 599

UNCLASSIFIED

PAGE 29

EVI09K

because fracture growth is controlled by grain-grain contacts which tend to be distributed homogeneously. The peak dynamic pressures induced by the quasi-spherical shock waves reached maxima of about 0.97 GPa and 0.84 GPa in the gabbro and lS, respectively, immediately below the crater floor. (EDC)

DESCRIPTORS: (U) \*ROCK MECHANICS, \*CRACKS, \*FRACTURE(MECHANICS), \*LIMESTONE, \*STRESS WAVES, ANISOTROPY, COMMUNITION, CRATERS, DAMAGE, DENSITY, DYNAMIC PRESSURE, ELASTIC PROPERTIES, ESTIMATES, GRAIN SIZE, GROWTH(GENERAL), HIGH VELOCITY, IGNEOUS ROCK, IMPACT TESTS, LENGTH, MEASUREMENT, MICROSCOPY, OBSERVATION, ORIENTATION(DIRECTION), PEAK VALUES, POROSITY, PROJECTILES, RECTANGULAR BODIES, REDUCTION, SEISMIC WAVES, SHOCK WAVES, SITES, SIZES(DIMENSIONS), VELOCITY

IDENTIFIERS: (U) \*Gabbro, Shocked rock, Seismic velocity, PE61102F, WUAFOSR2302C2.

AD-A211 599

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K  
AD-A211 598 CONTINUED

AD-A211 598 11/3 20/3

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

Chloroaluminates.

(U) Aluminum Anodization in a Basic Ambient Temperature Molten Salt.

MAY 89

PERSONAL AUTHORS: Carlin, Richard T.; Osteryoung, Robert A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1078

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Electrochemical Society, v136 n5 May 89.

ABSTRACT: (U) Aluminum anodization has been studied in the basic AlCl<sub>3</sub>:1-methyl-3-ethylimidazolium chloride (ImCl) ambient temperature molten salt (AlCl<sub>3</sub>:ImCl molar ratio <1.0). The anodization process was studied as a function of chloride anion concentration. Two different anodization processes are observed. The more cathodic anodization involves formation of the tetrachloroaluminate anion and exhibits a limiting current controlled by diffusion of chloride to the electrode surface. The more anodic anodization shows no diffusion control. A value for the diffusion coefficient of chloride was obtained which is lower than previously reported; the difference involves using a value of 1, rather than 2/3. No reduction of the tetrachloroaluminate anion was observed even at elevated temperatures. Keywords: Chloroaluminates; Reprints; Anodizing. (kt)

DESCRIPTORS: (U) \*ALUMINUM, \*ANODIC COATINGS, ALUMINATES, ANIONS, CHLORIDES, CHLORINE COMPOUNDS, CONCENTRATION(CHEMISTRY), CONTROL, DIFFUSION, DIFFUSION COEFFICIENT, ELECTRODES, HIGH TEMPERATURE, LIMITATIONS, MELTS, REPRINTS, SALTS, SURFACES, TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Anodizing.

AD A211 598

AD-A211 598

UNCLASSIFIED

PAGE 30

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 597 7/4 9/1

AD-A211 597 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Normal and Reverse Pulse Voltammetry from Poised Systems at Microdisk Electrodes, 8P  
IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Microdisk Electrodes, Ultramicroelectrodes, Microelectrodes, Current Time Reactions, Chronoamperometrics, Ferricyanide, Ferrocyanide.

PERSONAL AUTHORS: Sinru, Lin; Osteryoung, Robert A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-2084

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Analytical Chemistry, v60 p1845-1850 1988.

ABSTRACT: (U) Electrodes with dimensions in the micrometer regime, so called ultramicroelectrodes, have been of considerable interest. The small area results in small IR drops for carrying out fast voltammetry, the small RC time constants should permit very rapid pulse voltammetry, and nonplanar diffusion permits operation in a steady-state and, at sufficiently short times, a transient regime. The current-time behavior for a chronoamperometric experiment to a potential on a diffusion plateau of a reaction at a disk embedded in a plane has been examined. Normal and reverse pulse voltammetry have been carried out at microdisk electrodes under conditions where the electrode is effectively in a poised medium. This is accomplished by initiating the experiments from a potential so that the surface concentrations of the oxidized and reduced species, ferri- and ferrocyanide, are both finite. Agreement between theory and experiment is shown to be excellent. Reprints. (AW)

DESCRIPTORS: (U) \*ELECTRODES, \*VOLTAMMETRY, \*SURFACE CHEMISTRY, \*CYANIDES, \*IRON COMPOUNDS, CONSTANTS, CURRENTS, DIFFUSION, MICROMETERS, NONPLANAR, OXIDATION, PULSES, REDUCTION/CHEMISTRY, REPRINTS, REVERSIBLE, SHORT RANGE(TIME), TIME, TRANSIENTS.

AD A211 597

AD-A211 597

UNCLASSIFIED

PAGE 31

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 596 7/4 7/3

AD-A211 595 20/5

IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

WASHINGTON UNIV SEATTLE DEPT OF CHEMISTRY

(U) The Vibrational Spectrum of Tetrafluoropropyne.

(U) The Adsorption and Reaction of Fluorine on the Si(100) Surface.

89

89

PERSONAL AUTHORS: Friedrich, H. B.; Burton, Donald J.;  
Schenmer, Pamela A.

PERSONAL AUTHORS: Engstrom, J. R.; Nelson, Mark M.; Engel,  
Thomas

CONTRACT NO. AFOSR-87-0067, NSF-CHE87-12734

CONTRACT NO. AFOSR-87-0166

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. 82

TASK NO. A2

MONITOR: AFOSR  
TR-89-1088

MONITOR: AFOSR  
TR-89-1167

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Spectrochimica Acta, v45A  
p181-185 1989.

SUPPLEMENTARY NOTE: Pub. in Surface Science, v215 p437-  
500 1989.

ABSTRACT: (U) The I.R. spectrum of gaseous tetrafluoropropyne has been measured from 4000 to 100/cm, and all of the observed bands have been assigned. The e mode frequencies of the trifluoromethane group are similar to those of other Cf3CCX species, and even though the a1 modes are less regular, the variations can be explained without changes in force constants other than those involving the C-X bond. Several bands, particularly v1 and combinations with v1 show pronounced sequence structure due to excited levels of v10, the C-C-C skeletal bend. Reprints. (AW)

DESCRIPTORS: (U) \*VIBRATIONAL SPECTRA, \*FLUORINATED HYDROCARBONS, \*ACETYLENES, \*METHYL RADICALS, CONSTANTS, FLUORINE COMPOUNDS, FORCE(MECHANICS), FREQUENCY, METHANE, REPRINTS, SEQUENCES, MOLECULAR VIBRATION, INFRARED SPECTRA, VAPOR PHASES, MOLECULAR STRUCTURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.  
\*Tetrafluoropropyne, Trifluoromethane.

AD-A211 596

AD-A211 595

UNCLASSIFIED

PAGE 02

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 595 CONTINUED

AD-A211 594 1/2 12/4

DESCRIPTORS: (U) \*ADSORPTION, \*FLUORINE, \*MASS SPECTROMETRY, \*MOLECULAR BEAMS, DEFECTS(MATERIALS), ENERGY, ENERGY CONVERSION, GASES, IONS, LOW ENERGY MOLECULES, PROBABILITY, QUADRUPOLE MOMENT, REACTIVITIES, REPRINTS, RESPONSE, SCATTERING, SPECTROSCOPY, STEADY STATE, SUPERSONIC CHARACTERISTICS, SURFACE TEMPERATURE, SURFACES, ULTRAHIGH VACUUM, X RAY PHOTOELECTRON SPECTROSCOPY.

FLORIDA UNIV GAINESVILLE DEPT OF INDUSTRIAL AND SYSTEMS ENGINEERING

(U) Aircraft Sortie Effectiveness Model, 89

PERSONAL AUTHORS: Sivazlian, Boghos D.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2.

CONTRACT NO. F49620-85-C-0013

PROJECT NO. 3396

TASK NO. D5

MONITOR: AFOSR TR-89-1099

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Naval Research Logistics, v36 p127-137 1989.

ABSTRACT: (U) A mathematical model describing the sortie of a single aircraft under enemy threats, attacking a single passive target, is developed. Emphasis is placed on the determination of the probabilities associated with the various events in the sortie. These probabilities are then used to derive appropriate measures of effectiveness. The optimum sortie time is analyzed. In this document the author develops a methodology for modeling mathematically and aircraft sortie in order to arrive at various measures of effectiveness to evaluate the sortie. The stochastic model, which is similar to a Lancaster-type model, considers only a single aircraft attacking a single passive target. The analytical expressions obtained incorporate several useful input parameters reflecting both aircraft attrition and target kill. The results are used to arrive at an optimum sortie time which maximizes a gain function. Keywords: Reprints. (KR)

DESCRIPTORS: (U) \*ATTACK AIRCRAFT, \*AIRCRAFT MODELS, \*MATHEMATICAL MODELS, \*MISSIONS, \*STOCHASTIC PROCESSES, \*ATTRITION, \*DETERMINATION, ENEMY, GAIN, INPUT, KILL PROBABILITIES, MATHEMATICAL ANALYSIS, OPERATIONAL EFFECTIVENESS, PARAMETERS, PASSIVE SYSTEMS, PROBABILITY, COMBAT EFFECTIVENESS, REPRINTS, TARGETS, THREATS.

AD-A211 595

AD-A211 594

UNCLASSIFIED

PAGE 33

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 594 CONTINUED

AD-A211 578 5/8 3/4

IDENTIFIERS: (U) PEG1102F, WUAFOSR3396D5, \*Sorties.

CENTRAL INST FOR THE DEAF ST LOUIS MO

(U) Binaural Masking: An Analysis of Models.

DESCRIPTIVE NOTE: Final technical rept. 15 Jul 86-14 Mar 89,

AUG 89

PERSONAL AUTHORS: Gilkey, Robert H.

CONTRACT NO. AFOSR-86-0298

PROJECT NO. 2313

TASK NO. A6

MONITOR: AFOSR  
TR-89-1164

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall goal of this program of research is to specify the processes used by the auditory system to detect signals presented in noisy backgrounds. A wide variety of experimental approaches were used to examine these processes. The data suggest that subjects often detect the signal as a change in the spectral/temporal pattern of stimulus information. These results conflict with the classical models of simple auditory masking that suggest that subjects restrict their analysis to a narrow frequency band and a brief temporal window. Quantitative models of the process that compares information across spectral/temporal regions were developed, which combine excitatory and inhibitory components. While it has traditionally been assumed that quite different mechanisms govern monaural and binaural masking phenomena, very similar models were successfully applied to the two sets of data. Other significant results include a more complete description on internal noise processes, evidence that the external masker is not cancelled by the binaural processor, empirical and theoretical evaluations of the efficiency of psychophysical procedures, and hardware and software developments to aid psychacoustic research. Overall, the work examined issues and models of contemporary interest and thus has implications for auditory theory in general and for the study of auditory pattern analysis and

AD A211 594

AD-A211 578

UNCLASSIFIED

PAGE J4

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 578 CONTINUED

AD-A211 576 7/2 7:3

auditory masking in specific. (AW)

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*AUDITORY SIGNALS, \*MASKING, \*AUDITORY PERCEPTION, \*BACKGROUND NOISE, COMPUTER PROGRAMS, CONFLICT, FREQUENCY BANDS, HEARING, INHIBITION, INTERNAL, MODELS, NARROWBAND, NOISE, PSYCHOACOUSTICS, PSYCHOPHYSICS, STIMULI, TEST AND EVALUATION, THEORY, SIGNAL PROCESSING.

(U) Synthesis of Unusual Perfluorocarbon Ethers and Amines Containing Bulky Fluorocarbon Groups: New Biomedical Materials.

88

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A6, \*Binaural Masking, Spectral Temporal Patterns, Auditory Masking, Temporal Windows, Internal Noise, Psychoacoustics, Auditory Pattern Analysis.

PERSONAL AUTHORS: Huang, Hsu-Nan; Persico, Daniel F.; Lagow, Richard J.; Clark, Leland C., Jr

CONTRACT NO. AFOSR-82-0197

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR TR-89-1157

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v53 n1 p78-85 1988.

ABSTRACT: (U) The reactions of elemental fluorine with structurally crowded hydrocarbon ethers and amines have been studied. The perfluorinated products are currently of interest in biomedical or electronic industrial applications. The 19F and 13C(19F) (19F decoupled) NMR assignments are also discussed. Keywords: Reaction kinetics; Synthesis chemistry; Nuclear magnetic resonance; Perfluorocarbon ethers; Fluorocarbons; Direct fluorination; Elemental fluorine; Fluorine compounds. Reprints. (KT)

DESCRIPTORS: (U) \*AMINES, \*ETHERS, \*FLUORINATED HYDROCARBONS, \*FLUORINE COMPOUNDS, BIOMEDICINE, ELECTRONICS, FLUORINATION, HYDROCARBONS, INDUSTRIES, NUCLEAR MAGNETIC RESONANCE, REACTION KINETICS, REPRINTS, SYNTHESIS, SYNTHESIS(CHEMISTRY).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, \*Perfluorocarbon Ethers.

AD-A211 578

AD-A211 576

UNCLASSIFIED

PAGE 35

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 575

7/4

AD-A211 575 CONTINUED

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

IDENTIFIERS: (U) PEG1102F, WJAFDSR230383

(U) Heats of Formation of Alkylsilanes,

89

4P

PERSONAL AUTHORS: Gordon, Mark S.; Boatz, J. A.; Walsh, Robin

CONTRACT NO. AFOSR-87-0049, \$NSF-CHE86-40771

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-1175

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: Pub. In Jnl. of Physical Chemistry, v93 n4 p1584-1585 1989.

ABSTRACT: (U) Theoretical heats of formation at 298 K for several alkylsilanes, predicted at the MP2/6-31G(d) level of theory, are compared with recently obtained experimental and additivity values. Excellent agreement is obtained between the ab initio and additivity values and with the more reliable experimental values for acyclic alkylsilanes. The ab initio heats of formation for the silacycloalkanes permits the evaluation of strain energy increments for the additivity scheme. Comparison is made with limited experimental data. In a recent paper the heats of formation for several cyclic and acyclic alkylsilanes were predicted by using computer energy differences for appropriate homodesmic reactions. The heats of formation were obtained by first calculating energy differences for the homodesmic reactions using second-order many-body perturbation theory (MP2) 3 and the 6-31G(d) basis set at the self-consistent field (SCF) geometries. Reprints. (JES)

DESCRIPTORS: (U) \*HEAT OF FORMATION, COMPUTATIONS, COMPUTERS, CONSISTENCY, ENERGY, EXPERIMENTAL DATA, RELIABILITY, REPRINTS, VALUE.

AD-A211 575

AD-A211 575

UNCLASSIFIED

PAGE 36

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 571 12/2

AD-A211 570 12/5

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

(U) Fourier Analysis of the SOR Iteration.

(U) Multiprocessor Sparse L/U Decomposition with  
Controlled Fill-In.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87,

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87.

SEP 86

OCT 85

PERSONAL AUTHORS: LeVeque, Randall J.; Trefethen, Lloyd N.

PERSONAL AUTHORS: Alaghabard, Gita; Jordan, Harry F.

REPORT NO. ICASE-86-63

REPORT NO. ICASE-85-48

CONTRACT NO. NAS1-18107, \$AFOSR-85-0189

CONTRACT NO. NAS1-17070, \$AFOSR-85-0189

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR  
TR-89-1130

MONITOR: AFOSR  
TR-89-1111

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Supported in part by grants NSF-DMS86-01363, NSF-DMS85-0470 and NAS1-18107.

ABSTRACT: (U) The SOR iteration for solving linear systems of equations depends upon an overrelaxation factor  $\omega$ . We show that for the standard model problem of Poisson's equation on a rectangle, the optimal  $\omega$  and corresponding convergence rate can be rigorously obtained by Fourier analysis. The trick is to tilt the space-time grid so that the SOR Successive overrelaxation stencil becomes symmetrical. The tilted grid also gives insight into the relation between convergence rates of several variants. Keywords: Successive overrelaxation. Iterative methods. (KR)

DESCRIPTORS: (U) \*FOURIER ANALYSIS, \*ITERATIONS, CONVERGENCE, GRIDS, EQUATIONS, RATES, SPACE PERCEPTION, TILT, TIME, VARIATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, SOR(Successive Overrelaxation)

AD-A211 571

AD-A211 570

UNCLASSIFIED

PAGE 37

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K  
AD-A211 570 CONTINUED AD-A211 565 20/11

proposed that combines the idea of an ordered compatible set with a limited binary tree search to generate several sets of compatible pivots in linear time. Finally, an elimination set to reduce the matrix is selected. (KR)

DESCRIPTORS: (U) \*PARALLEL PROCESSING, \*COMPUTATIONS, \*SPARSE MATRIX, ALGORITHMS, ELIMINATION, PIVOTS, SEARCHING, TIME, TREES.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A3.

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

(U) An Experimental and Analytical Program to Develop Crack Tip Fracture Criteria.

DESCRIPTIVE NOTE: Final rept. 1 Sep 84-31 Oct 88.

JUL 89

PERSONAL AUTHORS: Schultheisz, C. R.; Knauss, W. G.

CONTRACT NO. AFOSR-84-0254

PROJECT NO. 2302

TASK NO. B2

MONITOR: AFOSR  
TR-89-1181

UNCLASSIFIED REPORT

ABSTRACT: (U) The large plastic deformations at the tip of a crack in a ductile heat treatment of 4340 steel are studied numerically and experimentally. The numerical simulation of the experiment uses a small strain, incremental plasticity law, with a power law hardening behavior. Both the inplane and out-plane deformations are measured on the same specimen at the same time. The experimental technique of moire interferometry is used to measure the in-plane displacements. This technique is described in detail, including an analysis of the effort of out-of-plane rotations on the use of the technique. A three beam interferometer and a four beam interferometer are compared. The out-of-plane displacements are measured with a Twyman-Green interferometer. The analysis of this data is still underway and will be forward when completed. The numerical model is described in detail. The material properties are determined from a uniaxial test on specimens taken from the same bar as the fracture specimens and with identical heat treatment. A numerical model of the fracture specimen having 7581 degrees of freedom is used to provide data for comparison between 400 N (linear behavior) up to 75000 N (catastrophic failure of the steel specimen) in fourteen steps. (JES)

DESCRIPTORS: (U) AXES, CATASTROPHIC CONDITIONS, CRACKS.

AD-A211 570

AD-A211 565

UNCLASSIFIED

PAGE 58

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 565 CONTINUED

AD-A211 563 20/5 9/3

DISPLACEMENT, DUCTILITY, FAILURE, FRACTURE(MECHANICS), HARDENING, HEAT TREATMENT, INTERFEROMETERS, INTERFEROMETRY, LABORATORY PROCEDURES, LINEARITY, MATHEMATICAL ANALYSIS, MATHEMATICAL MODELS, MOIRE EFFECTS, NUMERICAL ANALYSIS, PLASTIC DEFORMATION, PLASTIC PROPERTIES, POWER, ROTATION.

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Laser Fluorescence Excitation Band Profiles of Jet-Cooled Tropolone.

89

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B2.

PERSONAL AUTHORS: Redington, Richard L.; Field, Robert W.

CONTRACT NO. AFOSR-88-0062

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1162

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Spectrochimica Acta, v45A n1 p41-46 1989.

ABSTRACT: (U) Spectroscopic studies demonstrating resolved tunneling doublets suggest that tropolone is a molecule highly suited for investigating the participation of remote heavy atoms in the OH...O tunneling process. Fluorescence excitation band profiles and relative emission intensities complement tunneling doublets and other spectroscopic information useful for the analysis of intramolecular dynamics. This type of data is particularly useful for considerations of the vibronic couplings, nonradiative relaxation processes, and photochemical dissociation that appear in the previous studies of tropolone. Therefore, in this article we report our initial observations of laser fluorescence excitation transitions of the system of jet-cooled tropolone investigated as a function of the laser intensity. Reprints. (kt)

DESCRIPTORS: (U) \*LASER INDUCED FLUORESCENCE, \*BAND SPECTRA, COUPLINGS, DISSOCIATION, EXCITATION, INTENSITY, LASERS, PHOTOCHEMICAL REACTIONS, RELAXATION, REPRINTS, SPECTROSCOPY, TRANSITIONS, TUNNELING, VIBRATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Tropolone.

AD-A211 565

AD-A211 563

UNCLASSIFIED

PAGE

39

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 547 9/1 20/9 20/7 AD-A211 547 CONTINUED

HUGHES RESEARCH LABS MALIBU CA

(U) Plasma-Anode Electron Gun Research.

DESCRIPTIVE NOTE: Final rept. 15 Jul 86-15 Feb 89.

MAY 89

PERSONAL AUTHORS: Schumacher, Robert W.; Santoru, Joseph

CONTRACT NO. F49620-88-C-0105

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-89-1190

UNCLASSIFIED REPORT

ABSTRACT: (U) The plasma-anode electron gun (PAG) is a new cold-cathode electron source which exhibits many novel features. These include instant starting, no cathode heater power, minimal vacuum requirements, a nonpoisoning cathode, long-pulse operation without gap closure, and beam modulation at ground potential with constant beam energy. The basic concept involves a collective interaction between counterpropagating streams of electrons and ions in a high-voltage diode gap. A Pierce electron-gun configuration is employed, but the thermionic cathode is replaced with a cold, secondary-electron-emitting electrode. Electron emission is stimulated by bombarding the cathode with high-energy ions. The ions are injected into the high-voltage gap through a gridded structure from a plasma source, which is embedded inside the anode electrode. The gridded structure serves as both a cathode for the plasma discharge and as an anode for the PAG. As high-voltage ions impact the cathode surface, secondary electrons are emitted, accelerated back through the diode gap, and focused through an on-axis aperture in the anode. Under this program, a modified Herrmannsfeldt computer code was constructed that calculates electron and ion trajectories and limiting particle currents in realistic geometries in the self-consistent space-charge fields of both particle species. (RH)

DESCRIPTORS: (U) \*ANODES, \*COLD CATHODE TUBES, \*ELECTRON EMISSION, \*ELECTRON GUNS, \*GRIDS, \*HEATERS, \*PARTICLE TRAJECTORIES, \*PLASMA JETS, \*SECONDARY EMISSION, \*THERMIONIC EMISSION, CATHODES, COMPUTER PROGRAMS, CONFIGURATIONS, CONSISTENCY, CURRENTS, ELECTRODES, ELECTRONS, ENERGY, GROUND LEVEL, HIGH ENERGY, HIGH VOLTAGE, IMPACT, INTERACTIONS, IONS, LIMITATIONS, MODULATION, PARTICLES, PLASMAS(PHYSICS), POWER, PROPAGATION, REQUIREMENTS, SOURCES, SPACE CHARGE, STARTING, STREAMS, SURFACES, VACUUM.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A8.

AD-A211 547

AD-A211 547

UNCLASSIFIED

PAGE 40

EVI09K

UNCLASSIFIED

AD-A211 541 7/2 20/5 7/4 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K  
AD-A211 541 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) The Ferro/Ferricyanide Couple in an Aluminum Chloride-  
1-Methyl-3-ethylimidazolium Chloride Ambient-  
Temperature Molten Salt.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, \*Ferrocyanide,  
\*Ferricyanide.

DESCRIPTIVE NOTE: Interim rept. 1 Dec 86-30 Jun 89.

89

PERSONAL AUTHORS: Das, B.; Carlin, R.; Osteryoung, R. A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1079

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In Inorganic Chemistry, v28 n3  
p421-426 1989.

ABSTRACT: (U) Ambient-temperature molten salts consisting of AlCl<sub>3</sub> and an organic chloride are of considerable interest as solvents for a variety of electrochemical and spectroscopic studies. One such solvent, aluminum chloride-1-methyl-3-ethylimidazolium chloride (AlCl<sub>3</sub>-ImCl), is a liquid at room temperature over the composition range 33-67 mol% AlCl<sub>3</sub>. The solvent shows Lewis acidity and basicity depending upon the AlCl<sub>3</sub>:ImCl mole ratio. If the ratio is greater than, equal to or less than 1, the solvent is acidic, neutral, or basic, respectively. Electrochemical and spectroscopic studies of organic and inorganic solutes have been carried out in these solvents. Here we describe spectrochemical and electrochemical studies on the ferricyanide/ferrocyanide couple in the AlCl<sub>3</sub>-ImCl molten salt solvent. Reprints. (kt)

DESCRIPTORS: (U) \*CHLORIDES, \*CYANIDES, \*MOLTEN SALTS, \*ALUMINUM COMPOUNDS, ACIDS, CHEMICAL ANALYSIS, ELECTROCHEMISTRY, INORGANIC MATERIALS, LIQUIDS, RATIOS, REPRINTS, ROOM TEMPERATURE, SOLUTES, SOLVENTS, SPECTROSCOPY, SPECTRUM ANALYSIS.

AD A211 541

AD-A211 541

UNCLASSIFIED

PAGE

41

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 540 5/9

AD-A211 539 12/3

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE ENGINEERING

COLORADO STATE UNIV FORT COLLINS ENGINEERING RESEARCH CENTER

(U) AFRAPT (Air Force Research in Aero Propulsion Technology) Trainee Program.

(U) The Verification of Numerical Models with Multivariate Randomized Block Permutation Procedures.

JUN 89

89

PERSONAL AUTHORS: Glassman, Irvin

PERSONAL AUTHORS: Tucker, D. F.; Mielke, P. W., Jr.; Reiter, E. R.

CONTRACT NO. AFOSR-85-0292

CONTRACT NO. F49620-86-C-0080, NSF-ATM86-10796

PROJECT NO. 2308

PROJECT NO. 2310

TASK NO. A2

TASK NO. A1

MONITOR: AFOSR TR-89-1182

MONITOR: AFOSR TR-89-1089

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Four AFRAPT students were in residence in Princeton University's Department of Mechanical and Aerospace Engineering during the subject period. Two have been awarded M.S.E. degrees and accepted positions in the aircraft propulsion fields. Another will receive the M.S.E. degree in 1989 and has also accepted a position in the jet engine field. The fourth has continued his studies to pursue the Ph.D. degree. These students performed their industrial traineeships with General Electric-Cincinnati, Pratt & Whitney East Hartford and West Palm Beach, and United Technologies Research Center. Keywords: Aero propulsion technology trainees. (SDW)

DESCRIPTORS: (U) \*AERONAUTICAL ENGINEERING, \*AEROSPACE SYSTEMS, \*TRAINEES, AIR FORCE RESEARCH, AIRCRAFT, JET ENGINES, PROPULSION SYSTEMS, RESEARCH FACILITIES, STUDENTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2

SUPPLEMENTARY NOTE: Pub. in Meteorology and Atmospheric Physics, v40 n4 p181-188.

ABSTRACT: (U) Multivariate randomized block permutation procedures (MRBP) can be used effectively to verify numerical models. Compared to other statistical methods, MRBP shows several distinct advantages. First of all, MRBP operates in the same Euclidean analysis space as its input data. The root mean square error (RMSE) is discussed, since it is a natural choice as a distance measure between two data sets and is closely related to the distance measure on which MRBP is based. The RMSE by itself provides no basis for inferential comparisons, whereas MRBP is well suited for such deductions. Since MRBP is computationally economical and required only a few case studies for meaningful comparisons, it is also useful for model development. Keywords: Reprints (KR)

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*VALIDATION, CASE STUDIES, DATA BASES, ERRORS, INPUT, MEAN, MEASUREMENT, MULTIVARIATE ANALYSIS, PERMUTATIONS, RANGE(DISTANCE), REPRINTS, STATISTICAL PROCESSES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1

AD A211 540

AD-A211 539

UNCLASSIFIED

PAGE 42

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 538 7/4

AD-A211 537 10/3

FLORIDA UNIV GAINESVILLE

WASHINGTON UNIV SEATTLE

(U) Couple-Cluster Methods That Include Connected Quadruple Excitations, T4: CCSDTQ-1 and Q(CCSDT),

(U) Graded Bandgap Solar Cells.

JUN 89

PERSONAL AUTHORS: Kucharski, Stanislaw A.; Bartlett, Rodney J.

JUN 89

PERSONAL AUTHORS: Olsen, Larry C.

CONTRACT NO. AFOSR-88-0041

CONTRACT NO. AFOSR-84-0355

PROJECT NO. 2301

PROJECT NO. 2301

TASK NO. A4

TASK NO. A7

MONITOR: AFOSR TR-89-1100

MONITOR: AFOSR TR-89-1186

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v158 n6 p550-555, 23 Jun 89.

ABSTRACT: (U) Several coupled-cluster methods that include the connected, T4 contribution have been formulated and implemented. All are correct through the fifth-order energy. CCSDTQ-1 reproduces the full CI results for BH, FH AND H2O to a mean absolute error of 0.36 mhartree, compare to 0.93 mhartree for CCSDT. Based on CCSDTQ-1, some noniterative methods for the inclusion of quadruples have also been considered. One of them, denoted as Q(CCSDT), has an average error of 0.23 mhartree and has only an N superscript 7 basis set dependence. This method offers a convenient estimate of the principal effects due to T4. Reprints. (JHD)

DESCRIPTORS: (U) \*QUADRUPOLE MOMENT, \*MOLECULAR COMPLEXES, REPRINTS.

IDENTIFIERS: (U) WUAFOSR2301A4, PE61102F.

AD A211 538

UNCLASSIFIED

AD-A211 537

PAGE 43

EVI09K

ABSTRACT: (U) This program has emphasized investigations of graded bandgap solar cells. The key objective was to determine the feasibility of obtaining high efficiencies with a graded emitter heterojunction structure. The Al(x)Ga(1-x)As ternary system was selected for actual device fabrication and characterization. Interpretation of photoreponse data for graded devices indicated that the minority carrier diffusion length was essentially zero for x equal to or greater than .25. This property of the AlGaAs films made it impossible to obtain the expected photocurrent from the graded devices. However, studies were carried out which clearly indicated that the structures with graded emitters were characterized by an enhanced photoreponse relative to homojunction devices. (JES)

DESCRIPTORS: (U) \*SOLAR CELLS, CHARGE CARRIERS, DIFFUSION, EFFICIENCY, EMITTERS, HETEROJUNCTIONS, LENGTH, PHOTONSENSITIVITY, TERNARY COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 532 4/1 8/4 12/5

AD-A211 531 12/1

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

MARYLAND UNIV COLLEGE PARK DEPT OF MATHEMATICS

(U) Development of Computer Codes to Model Dynamics of the Earth's Magnetosphere.

(U) Rank-Preserving Extensions of Band Matrices.

DESCRIPTIVE NOTE: Final rept. 1 Dec 85-31 May 89.

88

APR 89

PERSONAL AUTHORS: Swift, Daniel W.

PERSONAL AUTHORS: Ellis, Robert L.; Lay, David C.

CONTRACT NO. AFOSR-86-0037

CONTRACT NO. AFOSR-87-0287

PROJECT NO. 2311

PROJECT NO. 2304

TASK NO. A1

TASK NO. A6

MONITOR: AFOSR  
TR-89-1108

MONITOR: AFOSR  
TR-89-1080

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Linear and Multilinear Algebra, 1988.

ABSTRACT: (U) The objective of the research has been to develop models of plasma processes in the earth's magnetosphere and ionosphere to understand processes responsible for auroral and magnetic phenomena. One major accomplishment has been the tentative identification of the process for generation of the electric potentials that accelerate auroral electrons. Another major accomplishment is a numerical model of auroral precipitation. The simulation indicate that anomalous resistivity plays little role in electron acceleration processes. The auroral simulation model indicates that the auroral beam may excite upper hybrid electrostatic waves, which may stochastically accelerate a portion of the electron beam to many tens of keV. (JHD)

DESCRIPTORS: (U) \*AURORAE, \*IONOSPHERIC MODELS, \*MAGNETOSPHERE, ANOMALIES, COMPUTER PROGRAMS, DYNAMICS, ELECTRIC POWER, ELECTRICAL RESISTANCE, ELECTRON ACCELERATORS, ELECTRON BEAMS, ELECTRONS, ELECTROSTATICS, HYBRID SYSTEMS, MAGNETIC PROPERTIES, MATHEMATICAL MODELS, PLASMAS(PHYSICS), PRECIPITATION, SIMULAT. JN.

IDENTIFIERS: (U) WUAFOSR2311A1, PE81102F.

AD A211 532

AD A211 531

UNCLASSIFIED

PAGE 44

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 530 CONTINUED

COLORADO STATE UNIV FORT COLLINS ENGINEERING RESEARCH CENTER

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1.

(U) Heavy Rainfall in Complex Terrain: Insights from a Numerical Model.

89

PERSONAL AUTHORS: Tucker, D. F.; Reiter, E. R.

CONTRACT NO. F49620-86-C-0080, NSF-ATM86-10796

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-1085

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Meteorology and Atmospheric Physics, v40 n4 p194-210 1989.

ABSTRACT: (U) A numerical model is employed to study heavy rainfall events in complex terrain. The model uses a limited-fine-mesh grid and a nested grid, but does not utilize the same set of equations on both grids. Two similar, heavy rainfall cases are contrasted with each other and with a moderate precipitation case. Sensitivity experiments illustrate the effects of topography, synoptic forcing and diabatic heating on these episodes. Model results indicate that heavy rainfall in complex terrain requires a suitable superposition of mass, momentum and moisture fields in relation to the topography. It is the mass and momentum fields, however, which primarily control the location of heaviest precipitation. Synoptically similar events may be different in their underlying causes. The diabatic heating distribution may in some cases be essential to creating such episodes of heavy rain. Keywords: Numerical modeling; Heavy rainfall; Complex terrain; Reprints. (JHD)

DESCRIPTORS: (U) \*WEATHER FORECASTING, \*MOUNTAINS, \*RAINFALL INTENSITY, DISTRIBUTION, HEAT TRANSFER, HEATING, HIGH RATE, MATHEMATICAL MODELS, MOISTURE, MOMENTUM, RAIN, REPRINTS, SENSITIVITY, TERRAIN, THERMODYNAMIC PROPERTIES, TOPOGRAPHY.

AD A211 530

AD-A211 530

UNCLASSIFIED

PAGE

45

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 527 7/4 9/1

AD-A211 527 CONTINUED

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

Surface reactions; Chemisorption; Bond activation; Defect sites; Catalysis; ESDIAD; Molecular rotation. (KT)

(U) The Activation of Chemical Bonds at Surfaces,

89

DESCRIPTORS: (U) \*CHEMICAL BONDS, \*SEMICONDUCTORS, \*SURFACE CHEMISTRY, \*THIN FILMS, ACTIVATION, ADSORBATES, ADSORPTION, BONDING, CATALYSIS, CHEMICAL REACTIONS, CHEMISORPTION, CORROSION, DESORPTION, DIFFUSION, ELECTRONS, ENERGY, EXCITATION, HETEROGENEITY, MATERIALS, MOLECULAR PROPERTIES, MOLECULAR ROTATION, MOLECULAR STATES, MOLECULES, POLYATOMIC MOLECULES, REACTION KINETICS, REPRINTS, SITES, STARTING, SURFACE REACTIONS, SURFACES, VAPOR DEPOSITION.

PERSONAL AUTHORS: Yates, J. T., JR

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-1184

IDENTIFIERS: (U) PEG1102F, WUAF(SR2303A2, Chemical vapor deposition.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface science, v14 p74-109, n.d.

ABSTRACT: (U) The activation of chemical bonds in molecules adsorbed on surfaces is of fundamental interest in many types of surface chemistry. For example, all heterogeneous catalytic processes proceed by way of bond activation in adsorbed species. Chemical vapor deposition onto semiconductor surfaces to produce thin film semiconductor materials depends upon bond activation at the surface. Surface corrosion processes generally involve activated molecular surface reactions. Thus, it is important to understand the activation of chemical bonds in surface species so that better understanding and control of surface chemical processes may be achieved. In this lecture, a variety of activated surface processes will be discussed with two primary objectives. The first is to illustrate the activation of chemical bonds in surface species starting from very low activation energy molecular events such as hindered molecular rotation on a chemisorption site and proceeding to higher energy activated processes such as surface diffusion and desorption, and finally to chemical bond scission in polyatomic adsorbates, caused either by thermal or by electronic excitation processes. The second objective of the lecture is to use the examples chosen to illustrate certain methods of research which can give detailed molecular level insight into the details of bond activation in surface chemistry. Keywords: Reprints;

AD A211 527

AD-A211 527

UNCLASSIFIED

PAGE 46

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 526 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

AD-A211 526 CONTINUED

(U) 1-Methyl-3-Ethylimidazolium Hydrogen Dichloride:  
Synthesis and Application to the Study of Protons in  
Ambient-Temperature Chloroaluminate Ionic Liquids.

SYNTHESIS, VOLTAMMETRY.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B2.

DESCRIPTIVE NOTE: Rept. for 1 Dec 86-30 Jun 89.

88

PERSONAL AUTHORS: Zawodzinski, Thomas A., Jr.;  
Osteryoung, R. A.

CONTRACT NO. AFOSR-87-0088

PROJECT NO. 2303

TASK NO. 62

MONITOR: AFOSR  
TR-89-1076

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v27  
p4383-4384 1988.

ABSTRACT: (U) The syntheses of 1-methyl-3-ethylimidazolium hydrogen dichloride (ImHC12) and its deuterium analogue (Im2HC12) and their use as proton/deuterium donors in ambient-temperature chloroaluminate melts are described. The material exists as a liquid at room temperature and has been characterized by <sup>1</sup>H NMR spectroscopy. ImHC12 is itself an ambient-temperature molten salt composed of Im cation and HC12 anion. The <sup>2</sup>H NMR chemical shifts of species derived from Im2HC12 in 1-methyl-3-ethylimidazolium chloride/aluminum chloride melts lead us to suggest that HC1 interacts with second chloride in basic melt solutions, whereas it is more weakly complexed in acidic melt solutions. The quantitative addition of a proton by ImHC12 is demonstrated by use of pulse voltammetry. Chloroaluminates; Proton containing molten salt. (jes)

DESCRIPTORS: (U) \*ALUMINATES, \*MELTS, ACIDS, ADDITION, CHEMICAL SHIFTS, CHLORIDES, CHLORINE COMPOUNDS, DEUTERIUM, DONORS(MEDICINE), LIQUIDS, PROTONS, PULSES, ROOM TEMPERATURE, SALTS, SOLUTIONS(GENERAL), SPECTROSCOPY,

AD-A211 526

AD-A211 526

UNCLASSIFIED

PAGE 47

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 525 7/2

AD-A211 524 7/3

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

(U) Donor-Acceptor Properties of Ambient-Temperature Chloroaluminate Melts.

(U) Synthesis of Sulfodifluoromethylphosphonic Acid.

89

DESCRIPTIVE NOTE: Interim rept. 1 Dec 86-30 Jun 89.

PERSONAL AUTHORS: Zawodzinski, Thomas A., Jr.; Osteryoung, Robert A.

PERSONAL AUTHORS: Burton, Donald J.; Modak, Anil S.; Guneratne, Ranil; Su, Debao; Cen, Wenbiao

CONTRACT NO. AFOSR-87-0088

CONTRACT NO. AFOSR-87-0067

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-1077

TR-89-1087

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorg. Chem. Soc. Trans., 1989, 11, 1173-1176.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, V111 n5 p1773-1776 1989.

ABSTRACT: (U) The donor-acceptor properties of room-temperature chloroaluminate ionic liquids composed of mixtures of AlCl<sub>3</sub> with either N-(1-butyl)pyridinium chloride or 1-ether-3-methylimidazolium chloride were studied. Gutmann donor and acceptor numbers were determined by using the Eu(III) reduction potential and the 3lp chemical shift of triethylphosphine oxide, respectively. Acidic melts are extremely poor donor and strong acceptor media. Basic melts are similar in basicity to DMF. No conclusions concerning the acceptor properties of the basic melt are drawn from this work since the strongly basic probe molecule, Et<sub>3</sub>P=O, is leveled by the solvent. Conditions under which these parameters are potentially useful are outlined. Keywords: Chloroaluminates; Donor-acceptor numbers. (KT)

ABSTRACT: (U) The incorporation of fluorine into organic compounds has a significant effect on the acidity of the resultant molecule. When the initial substrate is an acid, such as a carboxylic, sulfonic, or phosphonic acid, the acidity is increased several orders of magnitude, and the perfluorinated acid analogues are some of the strongest organic acids known. Acids, such as trifluoroacetic acid and triflic acid, have also become important products of commerce, and derivatives of the long chain analogues are utilized industrially as surfactants and fabric treatment agents. Although not investigated as extensively as the carboxylic or sulfonic acids, the perfluoroalkane phosphonic acids have recently attracted attention as biological chelating agents and electrolytes. (Sulfo)difluoromethylphosphonic acid, (HO)2P(O)CF2SO3H, has been synthesized for the first time. This mixed phosphonic-sulfonic acid was prepared from (C<sub>2</sub>H<sub>5</sub>O)2P(O)CF2SO<sub>3</sub>Na, which had been synthesized via oxidation of the corresponding sulfinate salt, (C<sub>2</sub>H<sub>5</sub>O)2P(O)CF2SO<sub>2</sub>Na. (jes)

DESCRIPTORS: (U) \*ALUMINATES, \*MELTS, ACIDS, CHLORINE COMPOUNDS, ELECTRON ACCEPTORS, MEDIA, MOLECULES, NUMBERS, PROBES.

DESCRIPTORS: (U) \*ORGANIC COMPOUNDS, \*PHOSPHONIC ACIDS, ACIDS, BIOLOGICAL AGENTS, CARBOXYLIC ACIDS, CHELATING AGENTS, COMMERCE, ELECTROLYTES, FAP+CS, FLUORINE, ORGANIC ACIDS, OXIDATION, SUBSTRATES, SULFONIC ACIDS, SURFACE ACTIVE SUBSTANCES, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382.

AD-A211 525

AD-A211 524

UNCLASSIFIED

PAGE -48

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 524 CONTINUED

AD-A211 515 12/5

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

(U) Comparing Barrier Algorithms.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87.

SEP 87

PERSONAL AUTHORS: Arenstorff, Norbert S.; Jordan, Harry F.

REPORT NO. ICASE-87-65

CONTRACT NO. AFOSR-85-0189, NASI-18107

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-1127

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Contract NAG-1-640.

ABSTRACT: (U) A barrier is a method for synchronizing a large number of concurrent computer processes. After considering some basic synchronization mechanisms, a collection of barrier algorithms with either linear or logarithmic depth will be presented. A graphical model is described that profiles the execution of the barriers and other parallel programming constructs. This model shows how the interaction between the barrier algorithms and the work that they synchronize can impact their performance. One result is that logarithmic tree structured barriers show good performance when synchronizing fixed length work, while linear self-scheduled barriers show better performance when synchronizing fixed length work with an imbedded critical section. The linear barriers are better able to exploit the process skew associated with critical sections. Timing experiments, performed on an eighteen processor Flex/32 shared memory multiprocessor, that support these conclusions are detailed. (kr)

DESCRIPTORS: (U) \*ALGORITHMS, \*BARRIERS, \*COMPUTER

AD-A211 524

AD-A211 515

UNCLASSIFIED

PAGE 49

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 515 CONTINUED

AD-A211 511 20/3

PROGRAMMING, MULTIPROCESSORS, DATA ACQUISITION, COMPUTERS,  
DEPTH, GRAPHICS, LENGTH, LOGARITHM FUNCTIONS, MODELS,  
PARALLEL PROCESSING, SYNCHRONIZATION(ELECTRONICS), TIME,  
TREES.

MINNESOTA UNIV ST PAUL

(U) High Temperature Superconducting Compounds.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A3.

DESCRIPTIVE NOTE: Technical rept. 1 Sep 87-28 Feb 89.

MAR 89

PERSONAL AUTHORS: Goldman, A. M.; Mecartney, M. L.

CONTRACT NO. AFOSR-87-0372

PROJECT NO. 2308

TASK NO. C1

MONITOR: AFOSR  
TR-89-1107

UNCLASSIFIED REPORT

ABSTRACT: (U) High TC superconductors have been investigated in both bulk and thin film form. Investigations have been carried out on the magnetic properties of both polycrystalline and single crystal forms of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> focussing on time-dependent effects. Single crystals of this material have been studied using scanning tunneling microscopy. Techniques for fabricating thin films have been developed. These include sputtering using spherical targets and co-evaporation using pure ozone an oxidant. The latter permits the insitu formation of films without any post-deposition annealing step. Superconducting fluctuations and the Kosterlitz-Thouless transition have been studied in the Ti-Ba-Ca-Cu O films. Keywords: High temperature superconductivity. (JES)

DESCRIPTORS: (U) \*MAGNETIC PROPERTIES, \*SPUTTERING, \*SUPERCONDUCTIVITY, ANNEALING, DEPOSITION, FILMS, HIGH TEMPERATURE, MICROSCOPY, OXIDIZERS, OZONE, PURITY, SCANNING, SINGLE CRYSTALS, SUPERCONDUCTORS, THIN FILMS, TUNNELING, VARIATIONS.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2306C1.

AD-A211 515

AD-A211 511

UNCLASSIFIED

PAGE 50

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 510 CONTINUED

AD-A211 510 7/4 7/6

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) The Structural and Dynamical Properties of the Sol-Gel Transition.

SEP 88

PERSONAL AUTHORS: Winter, R.; Hua, D. -W.; Song, X.; Jonas, J.

CONTRACT NO. AFOSR-85-0345, NSF-CHE85-09870

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1139

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in ILL Workshop Dynamics of Disordered Materials, p1-6 Sep 88.

ABSTRACT: (U) Different experimental techniques have been employed to investigate the macroscopic and microscopic structural and dynamical properties of the sol-gel transition of tetramethoxysilicate. In conclusion, we note that no drastic changes in structure occur at the gelation threshold and the polymer network still changes considerably after gelation. The formed silica network exhibits a self-similar structure, its underlying growth process may be classified as reaction-limited cluster-cluster growth. In comparison, macroscopic dynamical properties like the bulk viscosity diverge at the gel point. Microscopic dynamical properties of molecules much smaller than the correlation length of the clusters exhibit only small motional changes in course of the sol-gel transition, which proceed the appearance of the macroscopic changes by about 10-20% in relative time  $t/t_{gel}$ . The gross features of the sol-gel transition of the silicon alkoxide TMOS can be described within the framework of percolation theory. However, the detailed chemical structure of the monomer, e.g., its time dependent functionality, and probably also solvent effects seem to play an important role in describing finer details and have to be taken into account for a more quantitative theoretical description of the gelation

process. Keywords: Small angle neutron scattering, Nuclear magnetic resonance, Raman spectroscopy, Fluorescence, Dynamic light scattering, Polarization Reprints. (AW)

DESCRIPTORS: (U) \*GELATION, \*MOLECULAR STRUCTURE, \*COLLOIDS, \*SOLUTIONS(MIXTURES), \*PHASE TRANSFORMATIONS, \*SILICATES, ANGLES, CORRELATION, DYNAMICS, EXPERIMENTAL DESIGN, FLUORESCENCE, GELS, GROWTH(GENERAL), LENGTH, LIGHT SCATTERING, METHODOLOGY, MICROSCOPY, MOLECULES, NETWORKS, NEUTRON SCATTERING, NUCLEAR MAGNETIC RESONANCE, PERCOLATION, POLARIZATION, POLYMERS, RAMAN SPECTROSCOPY, REPRINTS, SILICON DIOXIDE, SOLVENTS, PHASE STUDIES, MOLECULAR PROPERTIES, THEORY, THRESHOLD EFFECTS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A3, \*Sol Gel Transition, \*Tetramethoxysilicate, Molecular Dynamics, Silicon Alkoxide.

AD-A211 510

AD-A211 510

UNCLASSIFIED

PAGE 51

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 509 20/3 20/2

AD-A211 491 6/4 12/4

WESTINGHOUSE RESEARCH LABS PITTSBURGH PA

MICHIGAN UNIV ANN ARBOR DEPT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

(U) Kapitza Conductance of Crystals Cleaved under He II,

(U) Time-Frequency Factors In Auditory Perception.

JUL 86

PERSONAL AUTHORS: Eckels, P. W.; Parker, J. H., Jr.; Patterson, A.

DESCRIPTIVE NOTE: Annual rept. 15 Apr 88-14 Apr 89,

JUN 89

CONTRACT NO. F49620-83-C-0129

PERSONAL AUTHORS: Wakefield, Gregory H.

PROJECT NO. 2301

CONTRACT NO. AFOSR-87-0193

TASK NO. A7

PROJECT NO. 2313

MONITOR: AFOSR TR-89-1106

TASK NO. A6

MONITOR: AFOSR TR-89-1081

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Cryogenics, v26 p427-430 Jul 86.

ABSTRACT: (U) The Kapitza conductance of LiF and KBr single crystals has been measured immediately after cleaving under superfluid helium. Heating techniques were used to evaluate the conductance and it approached the phonon radiation limit for these materials. Cleaving LiF under He II reduced the Kapitza conductance compared to an aged, cleaved surface by only a few percent. Despite the very good cleaved surface obtained with LiF crystals, the results suggest that sufficient microfracturing of the surface occurs upon cleaving to significantly increase the Kapitza conductance over the acoustic mismatch theory values. These results are in contradiction to results obtained by phonon reflection techniques. Keywords: Kapitza; Crystals; Helium; Physical properties; Heat transfer; Reprints. (JHD)

DESCRIPTORS: (U) \*THERMAL RESISTANCE, \*SINGLE CRYSTALS, \*CRYOGENICS, CONDUCTIVITY, HEAT TRANSFER, HEATING, HELIUM, LIMITATIONS, PHONONS, RADIATION, REFLECTION, REPRINTS, SUPERFLUIDITY, LITHIUM FLUORIDES.

IDENTIFIERS: (U) \*Kapitza resistance, Potassium bromides, PEG1102F, WUAFOSR2301A7.

AD-A211 509

UNCLASSIFIED

AD-A211 491

PAGE 52

EVI09K

ABSTRACT: (U) This research investigates how the human auditory system processes temporal properties of a complex signal across two or more regions of the frequency spectrum. Much of the primary research from the original proposal on envelope phase disparity using AM carriers is complete. Several findings are outlined. A computer model has also been developed and analyzed to consider issues of cross-spectral temporal disparities. The model is based on localization by Colburn, among others. Keywords: Hearing; Auditory signals; Auditory signal processing; Computerized simulation. (KT)

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, \*COMPUTERIZED SIMULATION, \*FREQUENCY, \*TIME, AUDITORY SIGNALS, ENVELOPE(SPACE), HEARING, SIGNAL PROCESSING, SIGNALS, SPECTRA.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A6.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIOSK

AD-A211 490 CONTINUED

AD-A211 490 20/12 20/13

STANFORD UNIV CA STANFORD ELECTRONICS LABS

RANGE(TIME), LOW ENERGY, MATERIALS, PELLETS,  
PHOTOELECTRIC EMISSION, POLYCRYSTALLINE, SAMPLING,  
SUPERSTRUCTURES, SYMMETRY, ULTRAHIGH VACUUM.

(U) Surface, Interface, and Bulk Properties of High Tc  
Superconductors.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306C1.

DESCRIPTIVE NOTE: Final rept. 30 Sep 87-29 Apr 89,

JUN 89

PERSONAL AUTHORS: Spicer, William E.; Shen, Z. X.;  
Lindberg, Per; Dessau, Daniel; Wells, Barrett

CONTRACT NO. AFOSR-87-0389

PROJECT NO. 2306

TASK NO. C1

MONITOR: AFOSR  
TR-89-1104

UNCLASSIFIED REPORT

ABSTRACT: (U) We have performed extensive studies of the Bi2Sr2CaCu2O8 material ever since its discovery in early 1988. Single crystals, polycrystalline pellets and thin film samples of the Bi2Sr2CaCu2O8 material were examined using various photoemission related techniques. Especially the single crystalline Bi2Sr2CaCu2O8 material was found to have an extraordinary inertness in ultrahigh vacuum conditions, allowing a detailed examination of the surface electronic structure. Consequently, most of our investigations were focused on the single crystalline materials. Low-Energy Electron Diffraction (LEED) was used to confirm the single crystallinity of the in situ cleaved crystals of Bi2Sr2CaCu2O8. Sharp diffraction spots indicative of long range periodicity were observed. The observed LEED pattern showed that the Bi2Sr2CaCu2O8 material preferentially cleaves parallel to the a-b plane. In addition, a superstructure was seen extending along one of the symmetry axes in the a-b plane. The superstructure was found to have a periodicity about 5 times as long as the cell dimensions of the a and b axes, in agreement with the bulk structure. (RH)

DESCRIPTORS: (U) \*CELLS, \*SINGLE CRYSTALS,  
\*SUPERCONDUCTORS, \*SURFACES, \*THIN FILMS, AXES, ELECTRONIC  
DIFFRACTION, ELECTRONICS, LONG RANGE(DISTANCE), LONG

AD-A211 490

AD-A211 490

UNCLASSIFIED

PAGE 53

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 489 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK

(U) Premixed Turbulent Flame Propagation.

DESCRIPTIVE NOTE: Annual rept. 1 Nov 87-31 Oct 88.

APR 89

PERSONAL AUTHOR: Santavicca, D. A.

CONTRACT NO. AFOSR-87-0097

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-1183

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also rept. dated 8 Jan 88, AD-A192 955.

ABSTRACT: (U) An experimental study has been conducted of turbulence-flame interactions in premixed turbulent flames and their effect on flame-generated turbulence, flame structure and flame propagation. The flame configuration used for this study is that of a freely propagating, one-dimensional (in the mean) turbulent flame which is free of the flame stabilization, free stream shear, and post-flame flow restriction effects of other flame configurations. Flame-generated turbulence has been studied in an atmospheric pressure, propane-air flame at one turbulence condition, where LDV measurements of the mean velocity, turbulence intensity, time scale, energy spectrum, length scale and Reynolds stress have been made as a function of time through the propagating flame front. A three-fold increase in the density weighted turbulent kinetic energy across the flame front is observed. Based on a comparison with similar results from other experiments, this result suggests that the heat release parameter has a greater effect on flame-generated turbulence than the turbulence intensity to laminar flame speed ratio. A heuristic model has been developed which accurately predicts the observed variation in flame structure fractal dimension based on the competition between turbulence which acts to

AD-A211 489

UNCLASSIFIED

AD-A211 489

PAGE 54

EVI09K

convectively distort the flame surface and burning which acts to smooth the flame surface. The model has been compared with the limited turbulent flame kernel growth measurements which are available and very good agreement has been obtained between the measurements and the predictions of the fractal turbulent flame kernel model. (KT)

DESCRIPTORS: (U) \*COMBUSTION, \*FLAMES, BAROMETRIC PRESSURE, ENERGY, FLAME PROPAGATION, FREE STREAM, HEAT, HEURISTIC METHODS, INTENSITY, LAMINAR FLOW, LENGTH, MEAN, MIXING, MODELS, MOMENTUM TRANSFER, PARAMETERS, RATIOS, RELEASE, SCALE, SHEAR PROPERTIES, SPECTRA, STABILIZATION, STRESSES, SURFACES, TIME, TURBULENCE, VELOCITY.

IDENTIFIERS: (U) PE61102F, WJAFOSR2308A2.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 488 12/5

AD-A211 487 12/2 20/4 12/5

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

(U) Parallel Computation with the Force.

(U) Analysis of a Parallelized Nonlinear Elliptic Boundary  
Value Problem Solver with Application to Reacting  
Flows.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Sep 87.

OCT 85

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87.

PERSONAL AUTHORS: Jordan, Harry

APR 87

REPORT NO. ICASE-85-45

PERSONAL AUTHORS: Keyes, David E.; Smooke, Mitchell D.

CONTRACT NO. AFOSR-85-0189, NASI-17070

REPORT NO. ICASE-87-21

PROJECT NO. 2304

CONTRACT NO. AFOSR-85-0189, NASI-18107

TASK NO. A3

PROJECT NO. 2304

MONITOR: AFOSR, NASA  
TR-89-1126, CR-177999

TASK NO. A3

MONITOR: AFOSR, NASA  
TR-89-1110, CR-178274

UNCLASSIFIED REPORT

ABSTRACT: (U) A methodology, called the force, supports the construction of programs to be executed in parallel by a force of processes. The number of processes in the force is unspecified, but potentially very large. The force idea is embodied in a set of macros which produce multiprocessors of fairly different character. The method has simplified the writing of highly parallel programs within a limited class of parallel algorithms and is being extended to cover a broader class. This paper deals with the individual parallel constructs which comprise the force methodology. Of central concern are their semantics, implementation on different architectures and performance implications. (KR)

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, \*PARALLEL PROCESSING, ALGORITHMS, COMPUTATIONS, CONSTRUCTION, METHODOLOGY, MULTIPROCESSORS, SEMANTICS.

IDENTIFIERS: (U) WUAFOSR2304A3, PEG1102F, The Force.

UNCLASSIFIED REPORT

ABSTRACT: (U) A parallelized finite difference code based on Newton's method for systems of non-linear elliptic boundary value problems in two dimensions is analyzed in terms of computational complexity and parallel efficiency. An approximate cost function depending on 15 dimensionless parameters (including discrete problem dimensions, convergence parameters, and machine characteristics) is derived for algorithms based on stripewise and boxwise decompositions of the domain and a 1:1 assignment of the strip or box subdomains to processors. Sensitivity of the cost function to the parameters is explored in regions of parameter space corresponding to model small-order systems with inexpensive function evaluations and also a coupled system of 19 equations with very expensive function evaluations (a reacting flow model of engineering interest which motivates the work. The algorithm was implemented on the Intel Hypercube, and some experimental results for the model problems with stripewise decompositions are presented and compared with the theory. In the context of computational combustion problems, multiprocessors of either message-passing or shared-

AD A211 488

AD-A211 487

UNCLASSIFIED

PAGE 55

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 487

CONTINUED

memory type may be employed with stripwise decompositions to realize speedups of  $O(n)$ , where  $n$  is mesh resolution in one direction, for reasonable  $n$ . To realize speedups of  $O(n^2)$ , the total number of mesh points, only hypercubes appear attractive. These results must be qualified by hardware assumptions, including sufficient local memory per processor to hold all of the data defined on the associated subdomain, and selection of machine parameters typical of presently commercially available components. CFD. (edc)

DESCRIPTORS: (U) \*BOUNDARY VALUE PROBLEMS, \*FLOW, \*PARALLEL PROCESSING, ALGORITHMS, CODING, COMBUSTION, COMPUTATIONS, CONVERGENCE, COSTS, COUPLING(INTERACTION), DECOMPOSITION, EFFICIENCY, ENGINEERING, FINITE DIFFERENCE THEORY, FUNCTIONS(MATHEMATICS), MEMORY DEVICES, MESH, MATHEMATICAL MODELS, MULTIPROCESSORS, NONLINEAR ANALYSIS, PARAMETERS, PROBLEM SOLVING, RESOLUTION, TWO DIMENSIONAL.

IDENTIFIERS: (U) \*Reacting flow, Decomposition(Mathematics), Stripwise decomposition, WUAFDSR2304A3, PEB1102F.

AD-A211 485

20/4

12/1

MASSACHUSETTS INST OF TECH CAMBRIDGE COMPUTATIONAL FLUID DYNAMICS LAB

(U) Computational Methods for Complex Flowfields.

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-31 May 89.

JUL 89

PERSONAL AUTHORS: Murman, Earl M.; Bartz, Judson R.

CONTRACT NO. AFOSR-87-0218

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-89-1072

UNCLASSIFIED REPORT

ABSTRACT: (U) Development of solution algorithms for complex flowfields has been the objective of this research. Embedded subdomains were used to resolve relevant physical processes in a global flow around aerodynamic bodies. Adaptive approaches were studied and developed for the two- and three-dimensional Euler equations and two-dimensional Navier Stokes equations using finite volume and finite element methods. A new approach is reported for combining expert system approaches with adaptive procedural algorithms into a totally integrated methodology. Recent results on formulation of outflow boundary conditions for the Navier Stokes equations and compact high-order schemes for the Euler equations are also presented. Additional tasks included: studying the performance of CFD algorithms on several parallel processors; a short study on turbulent spot measurements; and the prediction of dispersive errors in numerical solution of the Euler equations. Keywords: Numerical methods and procedures; Euler equations; Navier-Stokes equations; Finite element methods; Embedded grids; Adaptive grids; Computational fluid dynamics. (edc)

DESCRIPTORS: (U) \*FLOW FIELDS, \*FLUID DYNAMICS, \*NUMERICAL METHODS AND PROCEDURES, ADAPTIVE SYSTEMS AERODYNAMICS, ALGORITHMS, BOUNDARIES, COMPUTATIONS.

AD-A211 487

AD-A211 485

UNCLASSIFIED

PAGE 56

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EV109K

AD-A211 485 CONTINUED

AD-A211 484 20/6 12/5 4/2

COMPUTER PROGRAMS, DIFFERENTIAL EQUATIONS, DISPERSING, EMBEDDING, ERRORS, FINITE ELEMENT ANALYSIS, GRIDS, INTEGRATED SYSTEMS, MEASUREMENT, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, PARALLEL PROCESSORS, MATHEMATICAL PREDICTION, SOLUTIONS(GENERAL), THREE DIMENSIONAL, TURBULENCE, TWO DIMENSIONAL, VOLUME.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL ENGINEERING

(U) Sensitivity Evaluation Plan for Lowtran.

DESCRIPTIVE NOTE: Final rept..

IDENTIFIERS: (U) Euler equations, Expert systems, Computational fluid dynamics, Complex flow fields, WUAFOSR2307A1, PE61102F.

AUG 88

PERSONAL AUTHORS: Tomiyama, Ken; Hogan, Michael

CONTRACT NO. F49620-87-C-0057

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-1056

UNCLASSIFIED REPORT

ABSTRACT: (U) The computer code LOWTRAN, developed by the Air Force Geophysics Laboratory, computes transmittance and radiance for given climatological conditions and path geometrics over given spectral regions within 350 to 10,000 per cm. Naturally, usefulness of its output is determined by the accuracy of the input variables. Input climatological conditions should be specified as accurate as possible for successful utilization of LOWTRAN results. However, atmospheric variables are inherently difficult to specify with high accuracy due to their significant variability. Therefore, it is critical to evaluate the effects of input uncertainties on the output accuracy, in other words, the sensitivity of LOWTRAN outputs to input variations. This requires a compilation of numerous LOWTRAN computations and an appropriate method of presenting the sensitivity. (RH)

DESCRIPTORS: (U) \*CLIMATOLOGY, \*COMPUTER PROGRAMS, \*PATHS, \*RADIANCE, \*TRANSMITTANCE, ACCURACY, COMPUTATIONS, GEOMETRY, HIGH RATE, INPUT, OUTPUT, PLANNING, REGIONS, SENSITIVITY, SPECTRA, TEST AND EVALUATION, VARIABLES.

IDENTIFIERS: (U) WUAFOSR2310A1, PE61102F.

AD-A211 485

AD-A211 484

UNCLASSIFIED

PAGE

57

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 481 6/4 5/8

AD-A211 481 CONTINUED

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

(U) The Kinetic Depth Effect and Identification of Shape.

87

PERSONAL AUTHORS: Sperling, George; Landy, Michael S.;  
Doshier, Barbara A.; Perkins, Mark E.

CONTRACT NO. AFOSR-88-0140

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-1058

UNCLASSIFIED REPORT

ABSTRACT: (U) This paper introduces an objective shape-identification task for measuring the kinetic depth effect. The observer views an array of many randomly positioned dots that move from frame to frame. The dot motions define a 3D shape consisting of bumps and depressions on an otherwise flat ground. On each trial, a presented shape is chosen from a large lexicon of shapes that vary in size, position, and number of bumps. The observer's task is to identify the shape and its overall direction of rotation. Identification accuracy in the 3D shape identification task is an objective measure, with a low guessing base rate, of the observer's perceptual ability to reconstruct a global 2D motion flow field. Objective accuracy data are shown to be generally consistent with previously obtained subjective rating judgments of depth and coherence. Along with motion cues, rotation of real 3D dot-defined shapes inevitably produces a cue of changing dot density. By using a dot-lifetime manipulation, to control dot density in our computer generated shapes, we show that changing density is neither necessary nor sufficient to account for the KDE. Extractions of motion cues from 6 optimally relevant locations would support perfect KDE performance with our stimuli. A simplified 2D motion identification task with 6 perceptually flat flow-fields was derived from the 3D KDE task. Subjects' performance in the 2D and 3D tasks is equivalent, indicating that the information

processing capacity in KDE is comparable to information processing in other domains. Visual perception. (edc)

DESCRIPTORS: (U) \*INFORMATION PROCESSING, \*PERCEPTION(PSYCHOLOGY), \*VISUAL PERCEPTION, ACCURACY, COHERENCE, COMPUTER GRAPHICS, CUES(STIMULI), DENSITY, DEPTH, DIRECTIONAL, FRAMES, GEOMETRIC FORMS, IDENTIFICATION, KINETICS, MOTION, OBSERVERS, OBSERVATION, PERFORMANCE(HUMAN), POSITION(LOCATION), PSYCHOLOGICAL TESTS, OBSERVATION, RATES, ROTATION, SHAPE, SIZES(DIMENSIONS), THREE DIMENSIONAL, VARIABLES, VISUAL TARGETS.

IDENTIFIERS: (U) Kinetic depth effect, Depth perception, Motion perception, WUAFOSR2313A5, PE61102F.

AD-A211 481

AD-A211 481

UNCLASSIFIED

PAGE 58

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 460 7/6 20/5 20/6 20/3 AD-A211 460 CONTINUED

MASSACHUSETTS UNIV AMHERST DEPT OF POLYMER SCIENCE AND ENGINEERING

MIXTURES, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, PHASE STUDIES, PHYSICAL PROPERTIES, POROUS MATERIALS, SEQUENCES, STATE OF THE ART, TWO DIMENSIONAL, X RAYS.

(U) Ultrastructure Processing and Characterization of Polymers.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, Conjugated polymers, Phenylene vinylene.

DESCRIPTIVE NOTE: Final rept. 7 Oct 87-30 Sep 88.

88

PERSONAL AUTHORS: Karasz, Frank E.

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1185

UNCLASSIFIED REPORT

ABSTRACT: (U) During this period the research program contained components dealing inter alia with polymer blends, electro- and optically-active polymers, computer simulation of blend phenomena, dynamic light scattering measuring diffusion in porous media, and aspects of ultrastructural processing. New state-of-the-art instrumentation was developed, including a two-dimensional x-ray system and solid state NMR. In the area of polymer blends we have continued to emphasize the effect of chain microstructure on miscibility in multi-component systems. This has involved phase behavior studies of copolymer-containing blends, where the structure of the copolymer have been varied in terms of chemistry, tacticity and/or sequence distribution. In the electro-active polymer area, we have concentrated on research involving poly(p-phenylene vinylene) (PPV) and its derivatives, copolymers, and blends. The electrical and, more recently, the non-linear optical properties of this family of conjugated polymers has proved to be of particular interest and potential applicability. Keywords: Polymer chemistry; Physical properties; Molecular physics. (KT)

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*ELECTRICAL PROPERTIES, \*MOLECULAR STRUCTURE, \*POLYMERS, BEHAVIOR, CHAINS, CHEMISTRY, COMPUTERIZED SIMULATION, COPOLYMERS, DISTRIBUTION, INSTRUMENTATION, MICROSTRUCTURE, MIXING,

AD-A211 460

AD-A211 460

UNCLASSIFIED

PAGE 59

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 434 20/14

AD-A211 413 1/1

SOUTHERN METHODIST UNIV DALLAS TX DEPT OF MATHEMATICS

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

(U) The Slowly Varying Phase Shift for Perturbed, Single and Multi-Phased, Strongly Nonlinear, Dispersive Waves,

(U) Control of Turbulent Mixing Layers.

89

DESCRIPTIVE NOTE: Final rept. 1 Jun 84-31 Dec 88.

PERSONAL AUTHORS: Bourland, F. J.; Haberman, Richard

APR 89

CONTRACT NO. AFOSR-87-0134

PERSONAL AUTHORS: Dimotakis, Paul E.; Koochesfahani, Manoocher M.

MONITOR: AFOSR TR-89-1065

CONTRACT NO. AFOSR-84-0120

UNCLASSIFIED REPORT

PROJECT NO. 2308

SUPPLEMENTARY NOTE: Pub. in Physica D, v35 p127-147 1989.

TASK NO. A2

ABSTRACT: (U) Slowly varying, strongly nonlinear, dispersive, oscillatory waves are analyzed for equations which may be represented by a Lagrangian, including the effects of perturbations. The linear partial differential equation for the modulations of the phase shift follows from a perturbation analysis of the exact equation for wave action. For purely dissipative perturbations, it is shown that variations of the wave action, its flux, and its dissipation are due to perturbations of the wave number and frequency (if, in addition, the dissipative effect of a higher-order perturbation is included), a result the authors have previously developed for some specific problems. Similar conclusions are also derived for strongly nonlinear dispersive waves with higher spatial dimension and with multiple oscillatory phases. Furthermore, only the nonhomogeneous terms for the phase shift are altered for more general perturbations. Reprints. (JHD)

MONITOR: AFOSR TR-89-1036

UNCLASSIFIED REPORT

ABSTRACT: (U) Study of the open-loop forcing of the shear layer by a pitching airfoil led to the following results: it is possible to induce very large changes in the shear layer growth rate downstream of the disturbance location, while leaving the portion of the layer between the splitter plate and the disturbance location essentially unaffected; upstream forcing can be used to modify the shear layer in the region upstream of the disturbance; two different mechanisms are responsible for coupling such disturbances to the flow in the cases of upstream and downstream forcing. An investigation into the structure of the wake of a pitching airfoil in a uniform stream revealed that the proper choice of the pitch oscillation parameters can result in significant alterations of the wake. In particular, flow regimes corresponding to wake, jet, double-wake and mixed jet-wake structures can be generated. Further study of the axial flow along the wake vortices indicated that the magnitude of the flow increases approximately linearly with both the amplitude and frequency of oscillation. The closed-loop feedback phase of the project was initiated by the demonstration of a cancellation experiment in a forced turbulent shear layer. Keywords: Turbulent flow control; feedback control systems; Turbulent shear layer flow; Unsteady separated flow; Two dimensional flow;

DESCRIPTORS: (U) \*DISPERSING, \*LAGRANGIAN FUNCTIONS, DISSIPATION, LINEAR DIFFERENTIAL EQUATIONS, NONLINEAR SYSTEMS, OSCILLATION, PARTIAL DIFFERENTIAL EQUATIONS, PERTURBATIONS, PHASE, PHASE SHIFT, REPRINTS, SIZES(DIMENSIONS), SPATIAL DISTRIBUTION, WATER WAVES, WAVES.

IDENTIFIERS: (U) WUAFOSR2304A9, PE61102F.

AD A211 434

AD-A211 413

UNCLASSIFIED

PAGE 60

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 413 CONTINUED

AD-A211 406 11/6.1

Vortices; Oscillating airfoils wake. (EDC)

WESTINGHOUSE ELECTRIC CORP PITTSBURGH PA ADVANCED ENERGY SYSTEMS DIV

DESCRIPTORS: (U) \*AIRFOILS, \*PITCH(MOTION), \*TURBULENT FLOW, \*WAKE, AXIAL FLOW, CANCELLATION, CLOSED LOOP SYSTEMS, CONTROL, CONTROL SYSTEMS, FEEDBACK, FLOW, FLOW SEPARATION, FREQUENCY, LAYERS, MIXING, OPEN LOOP SYSTEMS, OSCILLATION, PARAMETERS, POSITION(LOCATION), SHEAR PROPERTIES, STREAMS, TURBULENCE, TWO DIMENSIONAL FLOW, UNSTEADY FLOW, VORTICES.

(U) An Investigation of the Irradiation Swelling Mechanisms in Refractory Metals at High Temperatures.

DESCRIPTIVE NOTE: Final scientific rept. 1 Mar 85-31 Jul 88.

JUN 89

IDENTIFIERS: (U) Turbulent mixing layer, Pitching airfoils, PE61102F, WUAFOSR2308A2.

PERSONAL AUTHORS: Bajaaj, R.; Hall, B. O.; Fenske, G. R.; Gregg, J. C.; Taylor, A. T.

REPORT NO. WAES-TR-89-0010

CONTRACT NO. F49620-85-C-0060

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR TR-89-1051

UNCLASSIFIED REPORT

ABSTRACT: (U) This report presents the results of an investigation of elevated temperature irradiation swelling in refractory metals with an objective of understanding swelling mechanisms in these materials and demonstrating practicality of swelling-resistant materials. The study was divided into three phases. During the first phase a theoretical model was developed for the swelling in body-centered cubic (bcc) metals. The model was based on chemical reaction rate formalism. Calculations were carried out on a model material, niobium, which was selected for the study. Experimental and theoretical work was conducted to determine the swelling mechanism. Niobium was irradiated with Nb(+) ions to a dose of 50 dpa and swelling was determined by transmission electron microscopy. A peak swelling at 900C of 7% was observed. No swelling was observed above 1300C. The experimental data were compared to those predicted by the theoretical model. Reasonable agreements were obtained between the experimental and theoretical swelling curve when niobium-oxygen interaction was included. Sink strength ratios were also calculated from

AD A211 413

AD-A211 406

UNCLASSIFIED

PAGE 61

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 406 CONTINUED

AD-A211 403 7/4 7/3

the data. The theoretical model was extended during the second phase to include loop growth/shrinkage in bcc metals. During the third phase of the program, two alloys, Nb-5Hf and Nb-5W, were irradiated with Nb(++) alone and with Nb(++) + He(+) over a temperature range of 800 - 1350C. (AW)

DESCRIPTORS: (U) \*NIOBIUM, \*THERMAL EXPANSION, \*IRRADIATION, ALLOYS, CHEMICAL REACTIONS, ELECTRON MICROSCOPY, EXPERIMENTAL DATA, GROWTH(GENERAL), HIGH TEMPERATURE, LOOPS, MATERIALS, METALS, MODELS, PHASE, RATES, REACTION TIME, REFRACTORY METALS, SECONDARY, SHRINKAGE, THEORY, TRANSMITTANCE, NIOBIUM ALLOYS, CATIONS, REACTION KINETICS, HELIUM, OXYGEN.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7, \*Swelling, Body Centered Cubic Lattices, Sink Strength Ratios.

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) The Effect of Fluoride on the Sol-Gel Process.

JUN 89

PERSONAL AUTHORS: Winter, R.; Chan, J. B.; Frattini, R.; Jonas, J.

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1140

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Non-Crystalline Solids, v105 p214-222 1988.

ABSTRACT: (U) Natural abundance Silicon 29 Nuclear Magnetic Resonance employed to investigate the effects of fluoride ion on the gelation process in tetramethylorthosilicate at pH = 6.4. In addition, the BET method was used to carry out the pore analysis of the dried gels. Both the NMR and Raman data show that the presence of fluoride anions not only accelerates the gelation process but lead to a different polymerization process. The condensation proceeds via the formation of higher branched polymers, and the dimers and trimers do not play a significant role in the polymerization process. A high percentage of organic-OCH<sub>3</sub> groups is present in the silicon network at the gelation point. The pore analysis of dried gels shows that the fluoride ion leads to the formation of a loose and relatively open silica network with a large fraction of mesopores. (AW)

DESCRIPTORS: (U) \*ANIONS, \*CONDENSATION REACTIONS, \*FLUORIDES, \*GELATION, \*SILICATES, DRY MATERIALS, GELS, IONS, NETWORKS, POLYMERIZATION, POLYMERS, RAMAN SPECTRA, SILICON, SILICON DIOXIDE, NUCLEAR MAGNETIC RESONANCE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Sol Gel processes, Mesopores, \*Tetramethylorthosilicate, Silicate/Tetramethylortho, Methoxy groups.

AD A211 406

AD-A211 403

UNCLASSIFIED

PAGE 62

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 391

12/5

AD-A211 391

CONTINUED

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

Corporation's Concurrent C language. Subsequently, the  
macros were caused to directly produce the system calls  
which form the basis for Concurrent C. (Kr)

(U) The Force on the Flex: Global Parallelism and  
Portability.

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, \*PARALLEL  
PROCESSING, COMPUTATIONS, CONSTRUCTION, CONTROL, FLUID  
DYNAMICS, FORTRAN INTERFACES, MACHINE CODING, MEMORY  
DEVICES, METHODOLOGY, MULTIPROCESSORS, PERFORMANCE(HUMAN),  
PROCESSING EQUIPMENT, SCALE SYNCHRONIZATION(ELECTRONICS),  
TARGETING, TIME SHARING, USER NEEDS.

DESCRIPTIVE NOTE: Final rept. 1 Jun 83-31 Aug 87,  
AUG 87

PERSONAL AUTHORS: Jordan, Harry F.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, \*Parallel  
programming, Concurrent C programming language, C  
programming language.

REPORT NO. ICASE-86-54

CONTRACT NO. NAS1-17070, \$AFOSR-85-0189

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR, NASA  
TR-89-1128, CR-178161

UNCLASSIFIED REPORT

ABSTRACT: (U) A parallel programming methodology, called  
the force, supports the construction of programs to be  
executed in parallel by an unspecified, but potentially  
large, number of processes. The methodology was  
originally developed on a pipelined, shared memory  
multiprocessor, the Denelcor HEP, and embodies the  
primitive operations of the force in a set of macros  
which expand into multiprocessor Fortran code. A small  
set of primitives is sufficient to write large parallel  
programs, and the system has been used to produce 10,000  
line programs in computational fluid dynamics. The level  
of complexity of the force primitives is intermediate. It  
is high enough to mask detailed architectural differences  
between multiprocessors but low enough to give the user  
control over performance. The system is being ported to a  
medium scale multiprocessor, the Flex/32, which is a 20  
processor system with a mixture of shared and local  
memory. Memory organization and the type of processor  
synchronization supported by the hardware on the two  
machines lead to some differences in efficient  
implementations of the force primitives, but the user  
interface remains the same. An initial implementation was  
done by retargeting the macros to Flexible Computer

AD A211 391

AD-A211 391

UNCLASSIFIED

PAGE 63

LV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 390 12/1

AD-A211 390 CONTINUED

INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND  
ENGINEERING HAMPTON VA

SOLVING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3.

(U) Polynomial Approximation of Functions of Matrices and  
Its Application the the Solution of a General System  
of Linear Equations.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-31 Aug 87.

AUG 87

PERSONAL AUTHORS: Tal-Ezer, Hillel

REPORT NO. ICASE-87-63

CONTRACT NO. NAS1-18107, \$AFOSR-85-0189

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR, NASA  
TR-89-1109, CR-178378

UNCLASSIFIED REPORT

ABSTRACT: (U) Frequently, during the process of solving a mathematical model numerically, we end up with a need to operate on a vector  $v$  by an operator which can be expressed as  $f(A)$  while  $A$  is  $N \times N$  matrix. Except for very simple matrices, it is impractical to construct the matrix  $f(A)$  explicitly. Usually an approximation to it is used. In the present research, we develop an algorithm which uses a polynomial approximation to  $f(A)$ . It is reduced to a problem of approximating  $f(z)$  by a polynomial in  $z$  while  $z$  belongs to the domain  $D$  in the complex plane which includes all the eigenvalues of  $A$ . This problem of approximation is approached by interpolating the function  $f(z)$  in a certain set of points which is known to have some maximal properties. The approximation thus achieved is almost best. Implementing the algorithm to some practical problem is described.

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), \*LINEAR ALGEBRA, \*MATRICES(MATHEMATICS), ALGORITHMS, EIGENVALUES, LINEAR ALGEBRAIC EQUATIONS, MATHEMATICAL MODELS, POLYNOMIALS, NUMERICAL METHODS AND PROCEDURES, PROBLEM

AD A211 390

AD-A211 390

UNCLASSIFIED

PAGE 64

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 389 21/2 7/5

AD-A211 388 7/6 7/3 7/2

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) Laser-Induced Saturated Fluorescence of SrOH in Flames.

(U) The Pore Morphology of Fluoride Catalyzed Xerogels.

APR 89

DESCRIPTIVE NOTE: Rept. for 1 Nov 88-31 May 89.

PERSONAL AUTHORS: Bonczyk, Paul A.

JUN 89

CONTRACT NO. F49620-83-C-0113

PERSONAL AUTHORS: Chan, J. B.; Hua, D. W.; Winter, R.; Jonas, J.

PROJECT NO. 2308

CONTRACT NO. AFOSR-85-0345

TASK NO. A2

PROJECT NO. 2303

MONITOR: AFOSR TR-89-1105

TASK NO. A3

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-89-1138

SUPPLEMENTARY NOTE: Pub. in Applied Optics, v28 n8 p1529-1532, 15 Apr 89.

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser-induced fluorescence measurements of Strontium Hydroxide have been made in a fuel-rich sooting atmospheric pressure Ethylene air diffusion flame seeded with a strontium salt. The dependence of fluorescence intensity on laser spectral intensity was observed to reach near full saturation at a laser spectral intensity of 10 to the 10th power w/sq. cm/cm. To our knowledge, this is the first observation of the saturated fluorescence of a polyatomic species in a flame. The precise conditions which saturation can be observed, and the factors which hinder its observation, are discussed in detail. Comparisons are made with OH fluorescence measurements in the same flame. Reprints. (AW)

SUPPLEMENTARY NOTE: Pub. in Jnl. of Materials Research, v4 n3 p693-697 May/June 89.

ABSTRACT: (U) The fluoride anion has been shown to be one of the most effective catalysts in accelerating the polycondensation of alkoxide-derived silica gels. A detailed pore analysis study has been employed to investigate the effect of Sodium Fluoride on the pore structure of the resulting xerogels and its evolution during thermal heat treatment up to 800 C. addition of NaF to tetramethylorthosilicate-sols leads to an increase in average pore size, and the pore size distribution become narrower. By changing the fluoride concentration and the heating temperature, the surface properties of the xerogels can be tuned over a wide range. The possible application of the F anion catalyzed sol gel process to prepare porous host materials for the studies of fluids in restricted geometries is also discussed. Reprints. (AW)

DESCRIPTORS: (U) \*FLAMES, \*HYDROXIDES, \*LASER INDUCED FLUORESCENCE, \*STRONTIUM, INTENSITY, LASERS, MEASUREMENT, OBSERVATION, POLYATOMIC MOLECULES, PRECISION, REPRINTS, SALTS, SATURATION, SPECTRAL ENERGY DISTRIBUTION, FUEL AIR RATIO, FUEL BURN UP, SOOT, ETHYLENE, SEEDING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2, \*Strontium Hydroxides, Ethylene Air Diffusion Flames, Diffusion Flames.

DESCRIPTORS: (U) \*FLUORIDES, \*SODIUM, \*SILICA GELS, \*CATALYSIS, \*CONDENSATION REACTIONS, \*POLYMERS, ANIONS, CATALYSTS, FLUIDS, GELS, HEAT TREATMENT, HEATING, LIMITATIONS, POROUS MATERIALS, REPRINTS, SURFACE PROPERTIES, TEMPERATURE, MORPHOLOGY, SOLUTIONS(MIXTURES), COLLOIDS, SILICATES.

AD-A211 389

AD-A211 388

UNCLASSIFIED

PAGE 65

PAGE 65

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 388 CONTINUED

AD-A211 376 7/2

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Xerogels,  
Polycondensation, Alkoxides, Pore Size,  
Tetramethylorthosilicates, Sols, Sol Gel Interactions.

COLUMBIA UNIV NEW YORK

(U) Photochemistry of Dibenzyl Ketone Adsorbed on Size/  
Shape Selective Faujasite Zeolites. Steric Effects on  
Product Distributions.

DESCRIPTIVE NOTE: Rept. for 1987-1988.

89

PERSONAL AUTHORS: Turro, Nicholas J.; Zhang, Zhenyu

CONTRACT NO. AFOSR-88-0043

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-1132

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Studies in Surface Science &  
Catalysis, v47 p197-215 1989.

ABSTRACT: (U) Zeolites are robust, crystalline, porous aluminosilicates possessing an enormous internal surface area that is capable of adsorbing large quantities of guest molecules, the size and shape of whose structures allow them to pass from the external to the internal zeolitic surface and to diffuse on the internal surface. The framework composition, the presence of cations associated with the framework, and the topology of the void space internal to the zeolite all contribute to imbue these materials with special properties that contribute to their widespread use as catalysts, ion exchange materials and molecular sieves. Photochemical probes have been developed to explore the structure of zeolites near the sites of adsorption and to examine the dynamics of reactions of molecules adsorbed on the internal zeolite surface. In this chapter, we review the structure of zeolites in general, and then survey the structure of an important class of zeolites, the faujasites. We then show how a photochemical probe, the photochemistry of dibenzyl ketone, can yield information on how intracrystalline dynamics can be influenced by cation type, cation number density and coadsorbed guests and, in turn, how

AD A211 388

AD-A211 376

UNCLASSIFIED

PAGE 66

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 376 CONTINUED

AD-A211 371 6/4 5/8 6/1 6/15

intracrystalline dynamics can determine the products of photoreactions. Keywords: Reprints; Zeolites; Dibenzyl ketone; Catalysts; Faujasites; Molecular sieves; Diffusion; Photochemical probes; Supercages; Primary radical pairs; Cations. (KT)

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS. \*BENZYL RADICALS. \*PHOTOCHEMICAL REACTIONS. ADSORPTION. CATALYSTS. CATIONS. DENSITY. DISTRIBUTION. DYNAMICS. INTERNAL. ION EXCHANGE. KETONES. MATERIALS. MOLECULAR SIEVES. MOLECULES. POROUS MATERIALS. PROBES. REPRINTS. SILICATES. SITES. SURFACES. TOPOLOGY.

HANEMANN MEDICAL COLL AND HOSPITAL PHILADELPHIA PA DEPT OF PHYSIOLOGY AND BIO PHYSICS

(U) The Role of Central Monoaminergic Systems in Arousal and Selective Attention.

DESCRIPTIVE NOTE: Annual technical rept. 1 Apr 88-31 Jan 89.

JUN 89

PERSONAL AUTHORS: Waterhouse, Barry D.

IDENTIFIERS: (U) PE81102F. WUAFOSR2303B2.

CONTRACT NO. AFOSR-87-0138

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-89-1133

UNCLASSIFIED REPORT

ABSTRACT: (U) The work described here is part of an ongoing set of studies aimed at characterizing the physiological actions and anatomical organization of the monoaminergic projection systems to the rat cerebral cortex, cerebellum and hypothalamus. The underlying theme of this work is that the endogenous monoamines, norepinephrine (NE) and serotonin (5-HT), serve to modulate central neuronal responsiveness to afferent synaptic inputs and by so doing participate in the cognitive process of selective attention. Individual studies conducted during the past year have investigated: 1) the adrenergic and amino acid receptor specificity of NE-induced facilitation of glutamate efficacy, 2) transmembrane effects of NE on morphologically characterized neocortical neurons and 3) the pharmacological specificity of cocaine actions on single cells in central neuronal circuits. Overall, the data provide further support for the contention that the diffusely distributed monoamine systems of the mammalian brain may enhance the performance of target neuronal circuits as a function of changing behavioral conditions (aw)

DESCRIPTORS: (U) \*COGNITION, \*NOREPINEPHRINE, \*SEROTONIN.

AD-A211 376

AD-A211 371

UNCLASSIFIED

PAGE 67

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 371 CONTINUED

AD-A211 368 5/8 6/4 6/1

\*ATTENTION, \*NEUROCHEMISTRY, \*NERVE TRANSMISSION, ANATOMY, BEHAVIOR, BRAIN, CEREBELLUM, CEREBRAL CORTEX, CIRCUITS, COCAINE, GLUTAMIC ACID, HYPOTHALAMUS, MAMMALS, NERVE CELLS, PHYSIOLOGY, RATS, RESPONSE(BIOLOGY), SALTS, STIMULATION(PHYSIOLOGY), CENTRAL NERVOUS SYSTEM.

CALIFORNIA UNIV IRVINE

(U) Synaptic Plasticity and Memory Formation.

DESCRIPTIVE NOTE: Final rept. Apr 86-Mar 89.

IDENTIFIERS: (U) WUAFOSR2312A2, PE61102F, \*Monoaminergic Receptors, Monoamines, Adrenergic Nerves, Amino Acid Receptors, Transmembrane Effects, Neocortical Neurons.

MAY 89

PERSONAL AUTHORS: Lynch, Gary

CONTRACT NO. AFDSR-86-0099

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-89-1141

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of the proposed research was to test and elaborate on an hypothesis regarding cellular mechanisms responsible for storing recognition memory in mammalian telencephalon. We proposed that the encoding process involves: 1) an unusual pattern of physiological activity in the relevant neural pathways, 2) influx of calcium into dendritic spines postsynaptic to the active axons, 3) activation of the calcium-sensitive protease, calpain, 4) partial degradation of spectrin, a cytoskeleton protein that regulates membrane surface chemistry and possibly spine shape, and 5) anatomical reorganization of postsynaptic structure resulting in a stable increase of postsynaptic potentials. Central to the hypothesis is the phenomenon of long-term potentiation (LTP) of synaptic transmission; much of the research conducted in the past three years has been aimed at characterizing the physiological and biochemical steps responsible for this remarkably persistent synaptic change and examining its role in memory storage. We have also hypothesized that excessive activation of the calpain system can lead to the neuronal degeneration that is associated with experimental age-related neuropathologies. Keywords: Hippocampus, Learning, Olfactory learning, Spatio-temporal activity; Synaptic plasticity, Glutamate receptors. (aw)

DESCRIPTORS: (U) \*LEARNING, \*MEMORY (PSYCHOLOGY),

AD A211 371

AD-A211 368

UNCLASSIFIED

PAGE

- 2

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 368 CONTINUED

AD-A211 367 20/5

\*SYNAPSE, \*NERVE TRANSMISSION, \*NEUROPHYSIOLOGY,  
\*NEUROCHEMISTRY, ACTIVATION, BIODETERIORATION, CALCIUM,  
CELL STRUCTURE, CODING, CYTOLOGY, DEGRADATION, DENDRITIC  
STRUCTURE, FIBERS, HIPPOCAMPUS, HYPOTHESES,  
MEMBRANES(BIOLOGY), NERVE CELLS, NERVE FIBERS, PATTERNS,  
PHYSIOLOGY, PLASTIC PROPERTIES, PROTEINS, RECOGNITION,  
SHAPE, SMELL, PEPTIDE HYDROLASES, STORAGE, SURFACE  
CHEMISTRY.

JET PROPULSION LAB PASADENA CA

(U) Ion Formation by Electron Impact.

DESCRIPTIVE NOTE: Final rept. 31 May 85-30 Nov 88.

NOV 88

PERSONAL AUTHORS: Srivastava, Santosh K.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A2, \*Synaptic  
Plasticity, Telencephalon, Dendritic Spines, Proteases,  
Calpain, Spectrin, Cytoskeleton, Postsynaptic Potentials,  
Long Term Potentiation, LTP(Long Term Potentiation),  
Neuropathology, Neuronal degeneration, Spatiotemporal  
Activity, Glutamate Receptors.

CONTRACT NO. AFOSR-ISSA-87-0070, \$AFOSR-ISSA-88-0014

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-1102

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grants AFOSR-  
ISSA-85-0070 and AFOSR-ISSA-86-0036.

ABSTRACT: (U) Dissociative attachment and polar  
dissociation cross sections were measured for the  
following molecules: HCl, NO, N2O, C6H6, SiH4, Si2H6, and  
LiH. Direct ionization and dissociative ionization cross  
sections were determined for the following molecules: H2,  
D2, N2, O2, He, Ne, Ar, Kr, Xe, H2O, Co, CO2, CH4, SiH4,  
SiH4, Si2H6, N2\*, and NH3. An experimental apparatus for  
a pulsed extraction technique was fabricated and  
successfully tested. Keywords: Electron impact spectra;  
Hydrogen chloride; Nitrogen oxides; Nitrous oxide;  
Benzene; Silane; Disilane; Lithium hydride; Hydrogen;  
Deuterium; Nitrogen; Oxygen; Helium; Neon; Argon; Krypton;  
Xenon; Water; Carbon monoxide; Carbon dioxide; Methane;  
Ammonia. (JHD)

DESCRIPTORS: (U) \*CHEMICAL DISSOCIATION, \*ELECTRON  
IMPACT SPECTRA, AMMONIA, ARGON, ATTACHMENT, BENZENE,  
CARBON DIOXIDE, CARBON MONOXIDE, CROSS SECTIONS,  
DEUTERIUM, EXTRACTION, HELIUM, HYDROGEN, HYDROGEN  
CHLORIDE, IONIZATION, IONS, KRYPTON, LITHIUM HYDRIDE,  
METHANE, NEON, NITROGEN, NITROGEN OXIDES, NITROUS OXIDE,  
OXYGEN, POLAR REGIONS, PULSES, SILANES, WATER, XENON

IDENTIFIERS: (U) WUAFOSR2301A7, PEG1102F.

AD A211 368

AD-A211 367

UNCLASSIFIED

PAGE

69

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 324 7/1 13/8 20/9 14/2 AD-A211 272 6/2 6/1

MATERIALS RESEARCH SOCIETY PITTSBURGH PA

SAN FRANCISCO STATE UNIV CA

(U) Process Diagnostics: Materials, Combustion Fusion. Volume 117. Materials Research Society.

(U) Binding of Adenosine Diphosphoribosyltransferase to the Termini and Internal Regions of Linear DNAs.

DESCRIPTIVE NOTE: Final rept. 6-7 Mar 89, APR 89 328P

89

PERSONAL AUTHORS: Hays, A. K.; Eckbreth, A. C.; Campbell, G. A. PERSONAL AUTHORS: Sastry, Srinivas S.; Buki, Kalman G.; Kun, Ernest

CONTRACT NO. DAAL03-88-G-0017, AFOSR-85-0355

CONTRACT NO. AFOSR-86-0064

MONITOR: ARO, AFOSR 25361.1-MS-CF, TR-89-1033

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR TR-89-1014

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The papers contained in this volume were originally presented at the symposium on Process Diagnostics held at the Spring Meeting of the Materials Research Society. The papers given by the invited speakers in the areas of combustion and fusion were designed to overview major diagnostic techniques (laser-induced fluorescence, spontaneous Raman spectroscopy, interferometry, imaging, Langmuir probes, multiphoton excitation/detection techniques, etc.) as applied to diagnostic papers represent the current state-of-the-art welding, vacuum arc remelting, metal extrusion, and plasma a reference volume for professionals working in the area of for a course in applied spectroscopy or process engineering that might be given as part of a chemistry, physics, chemical or materials engineering curriculum. (AW)

DESCRIPTORS: (U) \*CHEMICAL ENGINEERING, \*COMBUSTION, \*DIAGNOSIS(GENERAL), \*MATERIALS, \*SYMPOSIUM, \*PLASMA DIAGNOSTICS, CHEMISTRY, DETECTION, EDUCATION, ENGINEERING, EXCITATION, EXTRUSION, INTERFEROMETRY, LANGMUIR PROBES, LASER INDUCED FLUORESCENCE, METALS, PHOTONS, PHYSICS, RAMAN SPECTROSCOPY, SOCIETIES, SPECTROSCOPY, STATE OF THE ART, VOLUME, WELDING.

IDENTIFIERS: (U) Fusion, Langmuir Probes, Multiphoton Excitation Detection Techniques, Vacuum Arc Remelting.

AD A211 324

UNCLASSIFIED

PAGE 70

EVI09K

SUPPLEMENTARY NOTE: Pub. in Biochemistry, v28 p5670-5680 1989.

ABSTRACT: (U) Adenosine diphosphoribosyltransferase ADPRT; is a specific nuclear protein of higher eucaryotes that has been known primarily as a DNA-dependent enzyme catalyzing the polymerization of ADP-R derived from NAD+ to helical homopolymers that are covalently bound to ADPRT and certain other nuclear proteins. We have recently described a second molecular activity of this enzyme that is only secondarily regulated by the metabolic substrate of ADPRT, which is NAD+, and consists of DNA condensation following the binding of ADPRT to certain circular double-stranded DNAs, an activity that is cooperative with histones. In the present paper we identify the binding of ADPRT to DNA termini with the aid of specific exonucleases by methods that have been tested in other systems (Riley & Wientraub, 1978; Vonder Ahe et al., 1985; Slater et al., 1985; Shalloway et al., 1980; Wu, 1985; Elbrecht et al., 1985). On the other hand, the binding of ADPRT to internal regions of certain restricted double-strand DNAs proved to regions of certain restricted double-strand DNAs proved to be more discriminating because it depended on the nature of the restricted DNA fragments. Reprints. (kt)

DESCRIPTORS: (U) \*ADENOSINE, \*DEOXYRIBONUCLEIC ACIDS.

AD-A211 272

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 272 CONTINUED

AD-A211 269 12/9 8/2

ENZYMES, FRAGMENTS, PHOSPHORUS TRANSFERASES, HELIXES,  
HISTONES, INTERNAL, LIMITATIONS, METABOLISM, MOLECULES,  
POLYMERS, REGIONS, REPRINTS, SUBSTRATES.

MINNESOTA UNIV MINNEAPOLIS

(U) Topographic Map Reading.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A5, Exonucleases,  
ADPRT.

DESCRIPTIVE NOTE: Final rept. 1 May 88-31 Oct 89.

JUN 89

PERSONAL AUTHORS: Pick, Herbert L.; Thompson, William B.

CONTRACT NO. AFOSR-88-0187

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-1029

UNCLASSIFIED REPORT

ABSTRACT: (U) Efforts for the second six months of the subject project have continued to focus on determining how expert subjects solve map reading problems. A procedure for collecting and analyzing protocols of expert subjects as they solve problems has been worked out and this is being validated on new subjects. A simulated map reading situation has been developed for laboratory research and this is being exploited to manipulate information available in the map reading situation. Work is also continuing on the characterization of the map readings problem for computational modeling. (JHG)

DESCRIPTORS: (U) \*COMPUTER APPLICATIONS, \*MAP READING, \*ARTIFICIAL INTELLIGENCE, COMPUTATIONS, MATHEMATICAL MODELS, SIMULATION, TOPOGRAPHIC MAPS.

IDENTIFIERS: (U) Expert Systems, PEG1102F, WUAFOSR2313A4

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 268

7/3

7/4

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Experimental and ab Initio Vibrational Spectra of 1,2-Dibromoethane, Meso-1,2-Dideuterio-1,2-Dibromoethane, and Chiral 1,2-Dideuterio-1,2-Dibromoethane.

89

PERSONAL AUTHORS: Bose, P. K.; Henderson, D. O.; Ewig, C. S.; Polavarapu, P. L.

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR TR-89-1018

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n13 p5070-5078 1989.

ABSTRACT: (U) The vibrational spectra of 1,2-dibromoethane and the meso and chiral forms of 1,2-dideuterio-1,2-dibromoethane are presented. The experimental spectra were obtained for neat liquid samples as well as for the molecules isolated in low-temperature matrices. The ab initio calculations of the vibrational frequencies and intensities were carried out with different basis sets. Reprints. (AW)

DESCRIPTORS: (U) \*VIBRATIONAL SPECTRA, \*METHANES, \*BROMINE COMPOUNDS, \*QUANTUM CHEMISTRY, FREQUENCY, LIQUIDS, MOLECULES, REPRINTS, SAMPLING, MOLECULAR VIBRATION, MOLECULAR STRUCTURE, COMPUTATIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230383, Ab Initio Calculations, \*Dibromethanes, Methane/1-2-Dibromo, Methane/Meso-1-2-Dideuterio-1-2-Dibromo.

AD A211 268

UNCLASSIFIED

PAGE 72

LV109K

AD-A211 260

12/9

6/4

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

(U) Kinetic Depth Effect and Optic Flow 1. 3D Shape from Fourier Motion.

87

PERSONAL AUTHORS: Sperling, George; Doshier, Barbara A.; Landy, Michael S.

CONTRACT NO. AFOSR-88-0140

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR TR-89-1037

UNCLASSIFIED REPORT

ABSTRACT: (U) Fifty-three different shapes were defined by sequences of 2 D views (frames) of dots on a rotating 3D surface. (1) Subjects' accuracy of shape identifications dropped from over 90% to less than 10% when either the polarity of the stimulus dots was alternated from light-on-gray on successive frames or when neutral gray interframe intervals were interposed. Both manipulations interfere with motion extraction by spatio-temporal (Fourier) and gradient first-order detectors. Second-order (non-Fourier) detectors that use full-wave rectification are unaffected by alternating polarity but disrupted by interposed gray-frames. (2) To equate the accuracy of 2AFC planar direction of motion discrimination in standard and polarity-alternated stimuli, standard contrast was reduced. 3D discrimination survived contrast reduction in standard stimuli whereas it failed completely with polarity-alternation even at full contrast. (3) When individual dots were permitted to remain in the image sequence for only two frames, performance showed little loss compared to standard displays where individual dots had an expected lifetime of 20 frames, showing that 3D shape identification does not require continuity of stimulus tokens. (4) Performance in all discrimination tasks is predicted (up to a monotone transformation) by considering the quality of first-order information (as given by a simple computation on Fourier power) and the number of locations

AD-A211 260

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 260 CONTINUED

AD-A211 240 20/4 21/2 7/4

at which motion information is required. (JHD)

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

DESCRIPTORS: (U) \*CONTRAST, \*OPTICAL DETECTORS, \*VISUAL PERCEPTION, \*MOTION, ACCURACY, COMPUTATIONS, CONTINUITY, DEPTH, SHAPE, DISCRIMINATION, DISPLAY SYSTEMS, FOURIER ANALYSIS, FRAMES, GRADIENTS, GRAY(COLOR), OPTICAL IMAGES, KINETICS, LOSSES, MONOTONE FUNCTIONS, NEUTRAL, POLARITY, POWER, QUALITY, REDUCTION, SEQUENCES, SHAPE, STIMULI, TRANSFORMATIONS(MATHEMATICS).

(U) Chemical Reactions in Turbulent Mixing Flows.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 88,

JUN 89

IDENTIFIERS: (U) PE61102F, WUAFOSR2313AS.

PERSONAL AUTHORS: Dimotakis, Paul E.; Broadwell, James E.; Leonard, Anthony

CONTRACT NO. AFOSR-83-0213

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR TR-89-1035

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this research has been to conduct fundamental investigations of turbulent mixing, chemical reaction and combustion processes in turbulent, subsonic and supersonic flows. Progress in this effort thus far has uncovered important deficiencies in conventional modeling of these phenomena, and offered alternative suggestions and formulations to address some of these deficiencies. This program is comprised of an experimental effort, an analytical modeling effort, a computational effort, and a diagnostics development and data-acquisition effort, the latter as dictated by specific needs of our experiments. Our approach has been to carry out a series of detailed theoretical and experimental studies primarily in two, well-defined, fundamentally important flow fields: free shear layers and axisymmetric jets. To elucidate molecular transport effects, experiments and theory concern themselves with both liquids and gases. Modeling efforts have been focused on both shear layers and turbulent jets, with an effort to include the physics of the molecular transport processes, as well as formulations of models that permit the full chemical kinetics of the combustion process to be incorporated. The computational studies are at present focused at fundamental issues pertaining to the computational simulation of both compressible and

AD A211 250

AD-A211 240

UNCLASSIFIED

PAGE 73

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 240 CONTINUED

AD-A211 232 5/8 6/4

incompressible flows. (aw)

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*TURBULENT FLOW, COMBUSTION, COMPRESSIBLE FLOW, COMPUTATIONS, DIAGNOSIS(GENERAL), EXPERIMENTAL DATA, FLOW FIELDS, FORMULATIONS, GASES, INCOMPRESSIBLE FLOW, JET FLOW, LAYERS, MATHEMATICAL MODELS, MIXING, MODELS, MOLECULAR PROPERTIES, PHYSICS, REACTION KINETICS, SHEAR PROPERTIES, SIMULATION, SUPERSONIC FLOW, THEORY, TRANSPORT PROPERTIES.

IDENTIFIERS: (U) WUAFOSR2308A2, PEG1102F.

INSTITUTE FOR THE STUDY OF HUMAN CAPABILITIES  
BLOOMINGTON IN DEPT OF SPEECH AND HEARING SCIENCES

(U) Institute for the Study of Human Capabilities Summary  
Descriptions of Research for the Period September 1988  
through June 1989.

DESCRIPTIVE NOTE: Annual rept. no. 2.

JUN 89

PERSONAL AUTHORS: Watson, Charles S.

CONTRACT NO. AFOSR-87-0089

PROJECT NO. 3484

TASK NO. A4

MONITOR: AFOSR  
TR-89-1028

UNCLASSIFIED REPORT

ABSTRACT: (U) During the second year of its URI/AFOSR support, two new psychophysical testing stations have been completed for use in cross-modality sensory and cognitive research. Initial experiments underway with these systems include a visual detection task with auditory cuing and a tactile-visual identification experiment. The Institute, by these means, has provided partial support of research leading to the publication, during the past year, of 31 journal articles and book chapters, and the presentation of 30 papers at meeting of scientific societies. The Institute has also supported travel by faculty investigators to Air Force research facilities where they participated in discussions of current research projects. Institute investigators gave a series of research presentations to scientists visiting from Wright-Patterson Air Force Base. (SDW)

DESCRIPTORS: (U) \*VISUAL PERCEPTION, \*PSYCHOPHYSIOLOGY, \*COGNITION, AIR FORCE FACILITIES, AIR FORCE RESEARCH, CUEING, DETECTION, HEARING, HUMANS, INSTRUCTORS, SCIENTIFIC ORGANIZATIONS, TRAVEL.

IDENTIFIERS: (U) PEG1102F, WUAFOSR3484A.

AD A211 240

AD-A211 232

UNCLASSIFIED

PAGE

74

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 214 6/4

AD-A211 209 12/4

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

GEORGIA INST OF TECH ATLANTA SCHOOL OF INDUSTRIAL AND SYSTEMS ENGINEERING

(U) Two Motion Perception Mechanisms Revealed Through Distance-Driven Reversal of Apparent Motion.

(U) Stochastic Flows in Networks.

APR 89

DESCRIPTIVE NOTE: Final technical rept. 16 Feb 88--15 Apr 89.

PERSONAL AUTHORS: Chubb, Charles; Sperling, George

JUN 89

CONTRACT NO. AFOSR-88-(140

PERSONAL AUTHORS: Serfozo, Richard F.

PROJECT NO. 2313

CONTRACT NO. AFOSR-88-0137

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR

TR-89-1020

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFJSR  
TR-89-1066

SUPPLEMENTARY NOTE: Pub. in Proceedings of the National Academy of Sciences of the USA. V86 p2985-2989 Apr 89.

UNCLASSIFIED REPORT

ABSTRACT: (U) Two kinds of visual stimuli are demonstrated that exhibit motion in one direction when viewed from near and in the opposite direction from afar. These striking reversals occur because each kind of stimulus is constructed to simultaneously activate two different mechanisms: a short-range mechanism that computes motion from space time correspondences in stimulus luminance and a long-range mechanism in which motion computations are performed, instead, on stimulus contrast that has been full-wave rectified (e.g., on the absolute value of contrast). Reprints. (J4D)

ABSTRACT: (U) This report summarizes research accomplishments on stochastic flows in networks. The highlight is a new family of probability distributions for describing the numbers of units at the nodes in partially balanced stochastic networks. Such a distribution is a key tool for evaluating the performance and design of a network. Another major accomplishment is the solution of a long-standing problem of finding an expression for the mean time for one unit to move from one sector of a network to another sector. We also developed several models for concurrent movement of units in networks and batch processing at nodes. Keywords: Ergodics; Mathematical programming; Probability distribution. (KR)

DESCRIPTORS: (U) \*CONTRAST, \*MOTION, \*VISUAL PERCEPTION, COMPUTATIONS, LUMINANCE, REPRINTS, RANGE(DISTANCE), STIMULI

DESCRIPTORS: (U) \*NETWORK FLOWS, \*STOCHASTIC PROCESSES, BATCH PROCESSING, LONG RANGE(TIME), ERGODIC PROCESSES, MATHEMATICAL PROGRAMMING, MEAN, NETWORKS, NODES, PROBABILITY DISTRIBUTION FUNCTIONS, TIME, TOOLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313AS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304AS.

AD A211 214

AD A211 209

UNCLASSIFIED

PAGE 75

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A211 204 7/3 7/4

AD-A211 186 20/6

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

CALIFORNIA UNIV SANTA BARBARA DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

(U) Aromatic Energies of Some Heteroaromatic Molecules,  
89

(U) Use of Depletion Edge Translation for High-Speed  
Modulation and Switching of Lightwaves.

PERSONAL AUTHORS: Devar, Michael J.; Holder, Andrew J.

DESCRIPTIVE NOTE: Final rept. 1 Mar 88-30 Apr 89.

CONTRACT NO. AFOSR-86-0022

MAY 89

PROJECT NO. 2303

PERSONAL AUTHORS: Coldren, L. A.

TASK NO. B2

REPORT NO. CU-ECE-TR-89-01

MONITOR: AFOSR  
TR-89-1048

CONTRACT NO. AFOSR-85-0323

PROJECT NO. 2305

UNCLASSIFIED REPORT

TASK NO. B4

SUPPLEMENTARY NOTE: Pub. in Heterocycles, v28 n2 p1135-  
1155 1989.

MONITOR: AFOSR  
TR-89-1054

ABSTRACT: (U) Heats of formation derived from the AM1  
semiempirical method were used to determine the aromatic  
energies of the following systems: pyrimidine, pyridine,  
pyridazine, pyrazine, 1,2,4,5-tetraazine, phosphabenzene,  
1,2-1,3-1,4-diphosphabenzene, hexaazine,  
hexaphosphabenzene, silabenzene, thiophene, pyrrole, and  
furan. Two methods were employed for AE estimates. One  
used the heats of union of atomic pairs (with elimination  
of H2) of appropriate nonaromatic precursors. The other  
method used comparison of the heats of hydrogenation of  
aromatic species to estimate the AE. Reprints. (aw)

DESCRIPTORS: (U) \*AROMATIC COMPOUNDS, \*HETEROCYCLIC  
COMPOUNDS, \*HEAT OF FORMATION, ENERGY, FURANS,  
HYDROGENATION, MOLECULES, PYRROLES, REPRINTS, THIOPHENES,  
PYRIMIDINES, PYRIDINES, PHOSPHAZENE, TETRAZENES, BENZENE,  
COMPUTATIONS, FURANS.

IDENTIFIERS: (U) PE61102F WJAFOSR2303B2, \*Aromatic  
Energies, Tetrazine/1-2-4-5, Phosphabenzene,  
Diphosphabenzene, Hexaazines, Hexaphosphabenzene,  
Silabenzene, Heat Of Hydrogenation.

AD A211 204

AD A211 186

UNCLASSIFIED REPORT

ABSTRACT: (U) We report on our work for the period 1  
March 1988 to 28 February 1989. The primary emphasis has  
been the Fabry-Perot modulator which we introduced in  
last year's interim report. Over the past year, we have  
completed the design, optimization and sensitivity  
analysis for the modulator. Experimentally, we have made  
good progress in improving the device performance going  
from a 2:1 on: off ratio to a 25:1, drive to a 10:1 on:  
off ratio for a 7 V drive. In section V.3 of the present  
report, we present a brief comparison of our modulator  
results with those of other groups. With supplemental  
support from other contracts, we have also made  
significant advances in fundamental areas which should  
open new avenues for continued improvement of existing  
devices and lead to new device structures. We have  
observed a new effect in superlattices Field Induced  
Stark Localization which leads to a blue-shift in  
absorption edge rather than a conventional red shift. We  
have also observed optical properties ascribable only to  
quantum wire effects in quantum wire structures grown  
directly by molecular beam epitaxy using a process  
pioneered at UCSB. Both of these new structures should  
prove to be promising active regions for the Fabry Perot

UNCLASSIFIED

PAGE 76

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 186 CONTINUED

AD-A211 156 6/15 6/2 6/5

device. Additionally, the Fabry-Perot will serve as an excellent vehicle with which to fully characterize the electro-optic properties of these new structures. (rh)

SAN FRANCISCO STATE UNIV TIBURON CA TIBURON CENTER FOR ENVIRONMENTAL STUDIES

DESCRIPTORS: (U) . ABSORPTION, DEPLETION, EDGES, ELECTROOPTICS, EPITAXIAL GROWTH, FABRY PEROT INTERFEROMETERS, HIGH RATE, MODULATION, MODULATORS, MOLECULAR BEAMS, OPTICAL PROPERTIES, OPTIMIZATION, QUANTUM THEORY, RATIOS, RATIOS, RED(COLOR), REGIONS, SHIFTING, STRUCTURES, TRANSLATIONS, WIRE.

(U) Molecular Toxicology of Chromatin.

DESCRIPTIVE NOTE: Final progress rept. Jan 85-Jul 89.

JUL 89

PERSONAL AUTHORS: Kun, Ernest

CONTRACT NO. AFOSR-86-0064

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-1013

UNCLASSIFIED REPORT

ABSTRACT: (U) During the tenure of this grant period, extending previous studies, a novel physiological regulatory function of a specific DNA binding nuclear protein, ADPRT, has been uncovered, which can explain its cell physiological role as a gene regulator by way of topological modification of DNA structure. The relevance of this approach to the general theme of chromatin toxicology consists in the fact that subtle cellular responses to environmental and genetic factors do not necessarily lead only to a short term lethal outcome, but may result in sustained alteration of gene expression, leading to degenerative diseases and cancer. It was assumed that an understanding of molecular mechanisms that lead to these conditions will allow us to develop molecular pharmacological means to prevent or reverse pathophysiological processes. Results obtained during this research period provide evidence that supports above prediction. Notably the inhibition of malignant growth by specific ligands of ADPRT (185, 191) lead to a molecular pharmacological approach to the control of neoplasia and more recently of DNA- and retro-viral DNA synthesis. (KT)

DESCRIPTORS: (U) \*CANCER, \*CHROMATIN, \*NEOPLASMS, \*TOXICOLOGY, CELLS, DEOXYRIBONUCLEIC ACIDS, GENES, GENETICS, INHIBITION, LIGANDS, MODIFICATION, CHEMOTHERAPEUTIC AGENTS, MOLECULAR PROPERTIES, MOLECULES.

AD A211 186

AD-A211 156

UNCLASSIFIED

PAGE 77

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD A211 156 CONTINUED

AD-A211 139 20/11 12/3

PATHOLOGY, PHARMACOLOGY, PHYSIOLOGICAL EFFECTS,  
PHYSIOLOGY, REGULATORS, RESPONSE, REVERSIBLE, TOPOLOGY.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F, ADPRT.

(U) Analytical Study of Mistuning/Friction/Aerodynamics  
Interaction in a Bladed Disk Assembly.

DESCRIPTIVE NOTE: Final rept. May 87-Jan 89.

FEB 89

PERSONAL AUTHORS: Sinha, Alok; Chen, Shing

CONTRACT NO. AFOSR-87-0142

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-89-1059

UNCLASSIFIED REPORT

ABSTRACT: (U) The analytical technique is shown to be valid for the computation of the statistics of blade's vibratory amplitude when the distributions of modal parameters of a mistuned bladed disk assembly are non-gaussian. The results from the analytical technique are compared with those from numerical simulations for triangular and uniform distributions. It was found that the probability density function of the amplitude is insensitive to the types of mistuning distributions. Next, an analytical technique was developed to efficiently compute the probability density function of the maximum amplitude on a mistuned bladed assembly. This technique uses the direct Taylor series expansion in terms of the perturbation in an amplitude as a function of perturbations in modal stiffnesses. The validity of the techniques has been corroborated by comparison with the results from numerical simulations. Lastly, the statistic of the forced response of a structurally and aerodynamically coupled bladed disk assembly were computed efficiently by the analytical technique. The results from the analytical technique agree well with those from numerical simulations. The effects of the following parameters on the statistics of the maximum amplitude were studied; for the aerodynamic couplings among blades, the fluid density and the cascade stagger

AD A211 156

AD-A211 139

UNCLASSIFIED

PAGE 78

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 139 CONTINUED

AD-A211 138 6/4

angle. Keywords: Cascade structures; Subsonic flow;  
Turbine blades. (edc)

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

(U) Ratings of Kinetic Depth in Multi-Dot Displays.

DESCRIPTORS: (U) \*CASCADE STRUCTURES, \*TUNING, \*TURBINE  
BLADES, \*VIBRATION, AERODYNAMICS, AMPLITUDE, ASSEMBLY,  
BLADES, COUPLING(INTERACTION), DENSITY, DISKS,  
STATISTICAL DISTRIBUTIONS, EXPANSION, FLUIDS, FRICTION,  
INTERACTIONS, STATISTICAL ANALYSIS, NUMERICAL ANALYSIS,  
PARAMETERS, PERTURBATIONS, PROBABILITY DENSITY FUNCTIONS,  
RESPONSE, SUBSONIC FLOW, TAYLORS SERIES, VALIDATION.

89

PERSONAL AUTHORS: Sperling, George; Doshier, Barbara A.;  
Landy, Michael S.

CONTRACT NO. AFOSR-88-0140

IDENTIFIERS: (U) Mistuning, PE61102F, WUAFOSR2302B1.

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-1057

UNCLASSIFIED REPORT

ABSTRACT: (U) Subjects viewed kinetic depth displays whose shape (sphere or cylinder) was defined by luminous dots distributed randomly on the surface or throughout the volume of the object. Subjects rated the amount of perceived 3D depth, rigidity, and coherence. (Coherence is high when all the dots are perceived as a single object.) There were significant individual variations in ratings but, on the whole, all three ratings increased with the number of dots. Luminance of dots had no effect on any of the ratings. Points within the volume yielded ratings equal to or greater than surface points. Each of the three ratings varied with a least 3 of the 4 factors (shape, distribution, numerosity, and perspective), but the ratings did not necessarily covary either between trials or between conditions-often they were uncorrelated or negatively correlated. For example, object shape affected ratings of rigidity but not of depth; when perceived vertically, polar perspective displays were rated slightly less rigid than parallel projection displays but they received higher depth ratings. (When perceived in reversed perspective, polar displays were grossly nonrigid, independent of the other factors.) The complex but understandable interplay of stimulus parameters and ratings forces an examination of previous experimental results and theories in which different KDE ratings were treated interchangeably.

DESCRIPTORS: (U) \*DISPLAY SYSTEMS, \*VISUAL PERCEPTION.

AD-A211 139

AD-A211 138

UNCLASSIFIED

PAGE 79

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 138 CONTINUED

AD-A211 122 12/9 12/1

DEPTH, KINETICS, LUMINANCE, PARALLEL ORIENTATION,  
PARAMETERS, RATINGS, REVERSIBLE, VISION, THREE  
DIMENSIONAL, RIGIDITY, SHAPE, SPHERES, STIMULI, VERTICAL  
ORIENTATION, VOLUME.

COLORADO UNIV AT BOULDER DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

(U) Control and Optimization for Observations of Systems  
Governed by Controlled Partial Differential Equations.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, +Kinetic Depth.

DESCRIPTIVE NOTE: Final rept. 1 Aug 86-15 Dec 88.

MAY 89

PERSONAL AUTHORS: Su, Renjeng

CONTRACT NO. AFOSR-86-0198

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-1067

UNCLASSIFIED REPORT

ABSTRACT: (U) This project was focused on fundamental issues of modeling and control of flexible structures. Particular problems considered were: patterns of transmission zeroes, sensor placement, robust control, and high-performance control using iterative learning approach. During the grant period a flexible beam control devise for experimental purpose was also developed. With most of the work carried out to the extent of laboratory implementation, the following results were concluded: 1) For flexible structure control the location of transmission zeroes in the mathematical models critically depend on the location of sensors. For flexible beams the movement of zeroes were mapped out for control design; 2) For flexible structures a class of new compensators called generalized lead/lag compensators were developed. Their implementation is very simple with delay elements; and 3) Optimal sensor placement can be based on the robustness of the dynamic observer to parameter uncertainty. A design procedure was developed for this purpose. (kr)

DESCRIPTORS: (U) +CONTROL SYSTEMS, +FLEXIBLE STRUCTURES,  
+OPTIMIZATION, +PARTIAL DIFFERENTIAL EQUATIONS,  
COMPENSATORS, DELAY, DETECTORS, DYNAMICS, EMPLACEMENT,  
ITERATIONS, LEARNING, MATHEMATICAL MODELS, NUMERICAL

AD-A211 138

AD-A211 122

UNCLASSIFIED

PAGE 80

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 122 CONTINUED

AD-A211 121 7/3 7/4

METHODS AND PROCEDURES, OBSERVERS, PARAMETERS, PATTERNS,  
TRANSMITTANCE.

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) DEWAR-PI Study of Electrophilic Substitution in  
Selected Polycyclic Fluoranthene Hydrocarbons.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

89

PERSONAL AUTHORS: Dewar, Michael J.; Dennington, Roy D.,  
II

CONTRACT NO. AFOSR-86-0022, \$NSF-CHE87-12022

MONITOR: AFOSR  
TR-89-1050

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical  
Society, v111 p3804-3808 1989.

ABSTRACT (U) DEWAR-PI molecular orbital calculations  
are reported for 14 nonalternant polycyclic aromatic  
hydrocarbon derivatives of fluoranthene and for the  
Wheland intermediates (arenium ions) to study  
electrophilic substitution at all the methine groups in  
them. Calculations were also carried out for related  
alternant aromatic hydrocarbons. The species studied were  
indeno-(1,2,3-hi)chrysene, benz(def)indeno(1,2,3-hi)  
chrysene fluoreno(3,2,1,9-defg)chrysene, benz(a)  
aceanthrylene, benz(e)acephenanthrylene, indeno(1,2,3-cd)  
pyrene, fluoreno(9,1,2,3-cdef)chrysene, benz(def)indeno(1,  
2,3-qr)chrysene, dibenz(a,e)aceanthrylene, dibenz(aj)  
aceanthrylene, dibenz(e,k)acephenanthrylene, dibenz(a,l)  
aceanthrylene, and benzo(k)fluoranthene, benzo(j)  
fluoranthene, phenanthrene, pyrene, chrysene, benzo(Def)  
chrysene, benz(a)anthracene, anthracene, and naphthalene.  
Keywords: Computer programs, Reprints. (AW)

DESCRIPTORS: (U) \*AROMATIC HYDROCARBONS, \*POLYCYCLIC  
COMPOUNDS, \*SUBSTITUTION REACTIONS, ANTHRACENES, COMPUTER  
PROGRAMS, IONS, NAPHTHALENES, PHENANTHRENES, REPRINTS,  
MOLECULAR ORBITALS, COMPUTATIONS, QUANTUM CHEMISTRY,  
BENZYL RADICALS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Fluoranthene  
Hydrocarbons, \*Electrophilic Substitution Reactions,  
Electrophilic Reactions, Dewar Pi Molecular Orbital  
Calculations, Arenium Ions, Methine Groups, Chrysenes.

AD-A211 122

AD-A211 121

UNCLASSIFIED

PAGE 81

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 121 CONTINUED

AD-A211 117 9/3 20/8

Indeno Radicals, Fluoreno Radicals, Aceanthrylenes,  
Acephenanthrylenes

STANFORD UNIV CA EDWARD L GINZTON LAB OF PHYSICS

(U) Laser Physics and Laser Techniques.

DESCRIPTIVE NOTE: Final rept..

JUN 89

PERSONAL AUTHORS: Siegman, A. E.

CONTRACT NO. F49620-86-K-0013

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-1073

UNCLASSIFIED REPORT

ABSTRACT: (U) Several areas of Laser Physics and Laser Techniques are reported on, including ultrafast physical measurements; the development of a new subpicosecond time-response photodetector; identification and analysis of an important new quantum noise limit for unstable laser oscillators; and useful advances in stable and unstable laser resonator theory. Keywords: Optics; Lasers; Nonlinear optics; Unstable resonators; Excess biuse; Spontaneous emission; Ultrafast photo-detectors; Optical Kerr effect. (Jhd)

DESCRIPTORS: (U) \*LASER APPLICATIONS, \*PHOTODETECTORS, OSCILLATORS, QUANTUM ELECTRONICS, CAVITY RESONATORS, KERR MAGNETOOPTICAL EFFECT, NOISE(ELECTRICAL AND ELECTROMAGNETIC).

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A1, Subpicosecond time, Laser oscillators, Nonlinear optics, Unstable resonators.

AD-A211 121

AD-A211 117

UNCLASSIFIED

PAGE 82

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UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 116 22/2 20/11

AD-A211 116 CONTINUED

WEA CAMBRIDGE MA

\*RIGIDITY, \*SPACE SYSTEMS, \*SPACECRAFT, \*STRUCTURAL PROPERTIES, \*WAVE PROPAGATION, COEFFICIENTS, FREQUENCY, FUNCTIONS, MATHEMATICS, NONDESTRUCTIVE TESTING, PROPAGATION, RODS, ROTATION, TIMOSHENKO BEAM, TRANSMITTANCE.

(U) Wave-Mode Coordinate Analysis of 'L' Junction in LSS.

DESCRIPTIVE NOTE: Annual rept. 15 Jan 88-30 Mar 89.

MAR 89

IDENTIFIERS: (U) PE61102F, WJAFDSR2303B1.

PERSONAL AUTHORS: Williams, James H., Jr.; Webb, Derrick S.

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1063

UNCLASSIFIED REPORT

ABSTRACT: (U) The propagation of structural disturbances through large space structures is of practical interest in the design and nondestructive evaluation of such large space systems. Many wave propagation analyses of large space structures must consider the reflection and transmission of waves at interconnecting junctions. Using the concepts of wave-mode coordinate analysis, a frequency domain study of wave propagation through an 'L' lattice junction is conducted. Each lattice member is modeled as a combined longitudinal rod and Timoshenko beam. The joint in the assembly is modeled as a rigid mass of negligible geometric extent with mass rotary inertia. In order to determine the input wave-mode vector, the joint coupling matrix is applied to a point along a lattice member which is subjected to externally applied sinusoidal loads. The input wave-mode vector contains a mathematical description of the waves generated by the applied sinusoidal loads. The joint coupling matrix for the rigid joint with mass and rotary inertia is presented and used to obtain the scattering matrix of the 'L' junction. The scattering matrix contains the reflection and transmission coefficients which the incoming waves will encounter as they enter the joint. Finally, the frequency response function of each Fourier transformed state variable of the transmitted waves is presented analytically. (RH)

DESCRIPTORS: (U) \*FREQUENCY RESPONSE, \*INERTIA, \*MASS,

AD A211 116

AD-A211 116

UNCLASSIFIED

PAGE 83

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

AD A211 100 7/3

AD-A211 096 7/3

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Use of 2-D INEPT-INADEQUATE 29Si NMR to Determine Structures of Organosilicon Rings.

(U) Synthesis of the Novel Ring Systems 1,2,3,4-Oxazadisiletidine and 1,3,4,2,5-Dioxazadisiletidine.

89

89

PERSONAL AUTHORS: Maxka, Jim; Adams, Bruce R.; West, Robert

PERSONAL AUTHORS: Gillette, Gregory R.; Maxka, Jim; West, Robert

CONTRACT NO. F49620-88-C-0010

CONTRACT NO. F49620-86-C-0010

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR TR-89-0796

MONITOR: AFOSR TR-89-0797

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society. p3447-3449 1989.

SUPPLEMENTARY NOTE: Pub. in Angewandte Chemie International Edition in English, v28 n1 p54-55 Jan 89.

ABSTRACT: (U) The structures of two branched cyclic permethylsilanes have been established by 2d Inept-Inadequate Si NMR spectroscopy. Hexadecamethylcyclooctasilane rearranges with AlCl3 to 1, 1,3-tris (trimethylsilyl) permethylcyclopentasilane 1 and octadecamethylcyclononasilane rearranges to 1,1,3,3-tetrakis (trimethylsilyl)permethylcyclopentasilane 7. These are the first 2D Si NMR experiments to be reported as well as the first use of 2D Inept-Inadequate spectroscopy for structural determination. Reprints. *Organic chemistry*. (jes)

ABSTRACT: (U) The novel organosilicon rings 2 and 3 were synthesized from the reaction of tetramethyldisilene, 1, with nitrosobenzene and nitrobenzene, respectively. The silicon-silicon coupling constants for the adducts 2 and 3 were determined utilizing the Inept-Inadequate pulse sequence as modified for Silicon 29 Nuclear Magnetic Resonance. The values obtained support the proposed cyclic structures. Reprints. (aw)

DESCRIPTORS: (U) \*SILANES, \*CYCLIC COMPOUNDS, \*METHYL RADICALS, DETERMINATION, ORGANIC CHEMISTRY, REPRINTS, RINGS, SPECTROSCOPY, MOLECULAR STRUCTURE, ORGANIC COMPOUNDS, ALUMINUM COMPOUNDS, CHLORIDES, NUCLEAR MAGNETIC RESONANCE.

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*SILICON COMPOUNDS, \*ORGANIC COMPOUNDS, CONSTANTS, COUPLING(INTERACTION), CYCLES, REPRINTS, SILICON, SILICON DIOXIDE, MOLECULAR STRUCTURE, OXYGEN, NUCLEAR MAGNETIC RESONANCE.

IDENTIFIERS: (U) PF61102F, WUAFOSR2303B2, Organic Silicon Compounds, Silane/Hexadecamethylcycloocta, Silane/1-3-3-Tetrakis(trimethylsilyl) Perethylcyclopenta, Silane/Octadecamethylcyclonona, Nuclear Magnetic Resonance Spectroscopy.

IDENTIFIERS: (U) PF61102F, WUAFOSR2303B2, \*Siletidines, \*Silolidines, Siletidinetri(1-2-3-4-Oxaza, Silolidinetri(1-3-4-2-5-Dioxaza).

AD-A211 100

AD-A211 096

UNCLASSIFIED

PAGE 84

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD A211 095 7/3

AD-A211 093 15/3.1 12/5 12/4

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

MOORE SCHOOL OF ELECTRICAL ENGINEERING PHILADELPHIA PA  
DEPT OF SYSTEMS ENGINEERING RING

(U) Tris(trimethylsilyl)silyl Derivatives of Tri-tert-  
butoxyzirconium and Tri-tert-butoxyhafnium. X-ray  
Crystal Structure of (Me3CO)3ZrSi(SiMe)3.

89

(U) A Simulation Study of Four Real-Time Heuristic  
Algorithms for Multiple Missile Evasion: A  
Game Theoretic Approach.

DESCRIPTIVE NOTE: Final rept..

PERSONAL AUTHORS: Heyn, Richard H.; Tilley, T. D.

JUN 79

CONTRACT NO. AFOSR-88-0473

PERSONAL AUTHORS: Sheketoff, Michael S.; Huling, Stephen  
F.; Mintz, Max

PROJECT NO. 2303

TASK NO. 82

CONTRACT NO. AFOSR-77-3327

MONITOR: AFOSR  
TR-89-0816

PROJECT NO. 2304

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-0985

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28  
p1768-1769 1989.

UNCLASSIFIED REPORT

ABSTRACT: (U) BY reaction of (Me3CO)3MCL(M=Zr or Hf)  
with (THF)3LiSi(SiMe)3, the new silyl complexes(Me3CO)  
3MSi(SiMe)3(1, M=Zr, 2, M=Hf) have been prepared and  
characterized. These colorless complexes represent the  
first group 4 metal silyl derivatives that do not contain  
ancillary cyclopentadienyl ligands. Crystals of 1 are  
orthorhombic, Pnma, a=21.48 (1), b = 16.850 (8), c = 10.  
033 (5) A, V = 3631 (3) Cu, A, Z=4, RF=6.00%. Compound 1  
contains the shortest Zr-Si bond yet reported, 2.753 (4)  
A. Preliminary reactivity studies with 1 and 2 are  
described. Keywords: Metal complexes; Zirconium compounds;  
Hafnium compounds; Lithium compounds; Silicon compounds;  
Carbonyl complexes; Reprints. (aw)

DESCRIPTORS: (U) \*HAFNIUM COMPOUNDS, \*METAL COMPLEXES,  
\*SILICON COMPOUNDS, \*ZIRCONIUM COMPOUNDS, CRYSTAL  
STRUCTURE, LITHIUM COMPOUNDS, REACTIVITIES, REPRINTS, X  
RAYS, METAL CARBONYLS, ORGANOMETALLIC COMPOUNDS, BUTYL  
RADICALS, OXYGEN

IDENTIFIERS: (U) PE6102F, WUAFOSR2303B2, Trimethylsilyl  
Compounds, Silyl Radicals, Zirconium/Tritertbutoxy,  
Hafnium/Tritertbutoxy, Butoxy Radicals.

AD A211 095

AD-A211 093

UNCLASSIFIED

PAGE

85

EVI09K

ABSTRACT: (U) Four real-time heuristic algorithms for  
determining aircraft evasion strategies against a  
multiple missile threat are described. Algorithms 1 and 2  
are based on a myopic saddle-point calculation which  
apportions the projection of the instantaneous aircraft  
acceleration among the normals to the individual maneuver  
or guidance planes defined by each missile and its target.  
Algorithms 3 and 4 are also based on myopic saddle-point  
calculations. These latter two algorithms apportion the  
projection of the instantaneous aircraft acceleration  
into the individual maneuver planes so as to maximize the  
minimum of a function which is related to the line of  
sight rate of each missile threat. These latter two  
algorithms are motivated by the concept of anti-  
proportional navigation. Simulation results using each  
algorithm with generic F-4 and AIM-9 truth models,  
characterized by nonlinear differential equations,  
including lift, drag, gravity, 3-dimensional point mass  
dynamics, aircraft load factor and roll rate limits, and  
missile autopilot dynamics and load factor limits are  
presented. All four heuristic algorithms are motivated by  
a formal game theoretic model for multiple missile  
evasion. This formal game theoretic analysis is included

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD A211 093 CONTINUED

AD A211 092 7/2

as part of this study. Keywords: Computerized simulation; Game theory; Control theory; Mathematical models. (kr)

DESCRIPTORS: (U) \*AIRCRAFT DEFENSE SYSTEMS, \*EVASION, \*GAME THEORY, \*HEURISTIC METHODS, \*MOVING TARGETS, ACCELERATION, ALGORITHMS, AUTOMATIC PILOTS, COMPUTERIZED SIMULATION, CONTROL THEORY, DRAG, DYNAMICS, GRAVITY, GUIDED MISSILE COMPONENTS, GUIDED MISSILES, LIMITATIONS, LINE OF SIGHT, LOADS(FORCES), MANEUVERS, MATHEMATICAL MODELS, MODEL THEORY, NONLINEAR DIFFERENTIAL EQUATIONS, RATES, REAL TIME, ROLL, SIMULATION, STRATEGY, THEORY, THREATS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Studies of Thiophene and Substituted Thiophenes at Platinum (111) Electrodes by Vibrational Spectroscopy and Auger Spectroscopy: Monomers, Dimers, and Polymers.

89

PERSONAL AUTHORS: Batina, Nikola; Gul, John Y.; Kahn, Bruce E.; Lin, Chiu-Hsun; Lu, Frank

CONTRACT NO. AFOSR-86-0200

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0932

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Langmuir, v5 n3 p588-600 1989. Presented at the Symposium on Adsorption on Solid Surfaces, Colloid and Surface Science Symposium (62nd), State College, PA, 19-22 Jun 88.

ABSTRACT: (U) The adsorption behavior of various thiophenes from organic as well as aqueous solutions at well-defined Pt(111) surfaces is examined in this study. The adsorbates studied include 3-thiophenecarboxylic acid (3TCA), 2-thiophenecarboxylic acid (2TCA), 3-thiopheneacetic acid (3TAA), 2-thiophenecarboxylic acid (2TAA), thiophene (TPE), 3-methylthiophene (3MT), 3,3'-dimethyl-2,2-bithiophene (33 DMBT), and 4,4-dimethyl-2,2-bithiophene (44 DMBT). Packing Densities (moles adsorbed per unit area) were measured for each compound by Auger spectroscopy. Surface vibrational spectra were obtained by electron energy loss spectroscopy (EELS) and were assigned by comparison with the IR spectra of the pure compounds. The Pt(111) surfaces used in this study were characterized by LEED. All the thiophenes studied are adsorbed with the ring plane nearly perpendicular to the platinum surface. Vibrational spectra of thiophenecarboxylic acids, and the dependence of adsorption on electrode potential, give valuable information about the adsorbate structure. Reprints (jes)

AD A211 093

AD-A211 092

UNCLASSIFIED

PAGE 06

EVJ09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 092 CONTINUED

AD-A211 088 7/4

DESCRIPTORS: (U) \*ADSORPTION, \*THIOPHENES, \*SURFACE CHEMISTRY, ACIDS, AUGER ELECTRON SPECTROSCOPY, ELECTRODES, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, LOSSES, MONOMERS, PACKING DENSITY, PLATINUM, POLYMERS, PURITY, REPRINTS, RINGS, SOLUTIONS(MIXTURES), SPECTROSCOPY, SUBSTITUTES, SURFACES, VIBRATIONAL SPECTRA, WATER, DIMERS, CARBOXYLIC ACIDS, ACETIC ACID, METHYL RADICALS.

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) Carbon Monoxide-Oxygen Interaction on the Pt(111) Surface: An Electron Stimulated Desorption Ion Angular Distribution (ESDIAD) Study.

APR 89

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A1, Thiophenecarboxylic Acids, Carboxylic Acid/2-Thiophene, Carboxylic Acid/3-Thiophene, Methylthiophenes, Thiophene/3-Methyl, Thiopheneacetic Acids, Acetic Acid/3-Thiophene, Acetic Acid/2-Thiophene, Thiophene(bi)/3-3-Dimethyl-2-2, Thiophene(bi)/4-4-Dimethyl-2-2.

PERSONAL AUTHORS: Szabo, A.; Kiskinova, M.; Yates, J. T. Jr

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR TR-89-0793

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90 n8 p4604-4612 1989.

ABSTRACT: (U) CO adsorption on the p(2x2)0-Pt(111) surface was studied by the digital ESDIAD (electron stimulated desorption ion angular distribution) method in combination with TPD, Leed, and work function measurements. Three ESD products were detected: CO, O, and metastable CO. The ESDIAD patterns of each of these species were measured. The most significant difference in the ESD behavior of chemisorbed CO on the oxygen covered surface from that of CO adsorbed on clean platinum surface was found at low CO coverages. This indicates that there is no preferential adsorption on the surface sites unaffected by oxygen. A small tilting of CO was found. Keywords: Chemisorption, Carbon Monoxide, Oxygen, Platinum, Electron Stimulated Desorption, Reprint. (JES)

DESCRIPTORS: (U) \*ADSORPTION, \*CARBON MONOXIDE, \*OXYGEN, \*SURFACE CHEMISTRY, CHEMISORPTION, DESORPTION, ELECTRONS, PLATINUM, REPRINTS, SITES, STIMULATION(GENERAL), SURFACES, WORK FUNCTIONS, MEASUREMENT.

AD A211 092

AD-A211 088

UNCLASSIFIED

PAGE 87

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. FV109K

AD-A211 087 4/1

AD-A211 082 20/4

WASHINGTON UNIV SEATTLE

MIAMI UNIV CORAL GABLES FLA DEPT OF MECHANICAL  
ENGINEERING

(U) Mapping the Wind in the Polar Thermosphere: A Case  
Study within the CEDAR (Coupling, Energetics and  
Dynamics of Atmospheric Regions) Program.

(U) International Conference on Numerical Grid Generation  
in Computational Fluid Dynamics.

MAR 89

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-30 Apr 89.

PERSONAL AUTHORS: Smith, Roger W.; Meriwether, John W.,  
Jr.; Hernandez, Gonzalo; Rees, David; Wickwar, Vincent

APR 89  
PERSONAL AUTHORS: Sengupta, Subrata

CONTRACT NO. AFOSR-87-0174

CONTRACT NO. AFOSR-88-0082

PROJECT NO. 2310

PROJECT NO. 2304

TASK NO. A2

TASK NO. A3

MONITOR: AFOSR  
TR-89-0803

MONITOR: AFOSR  
TR-89-1070

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in EOS Transactions, American  
Geophysical Union, v70 p161-169, 21 Mar 89.

ABSTRACT: (U) The purpose of this paper is to present  
one part of the CEDAR program which illustrates the power  
of the combination of full vector wind data from several  
data sites in the northern arctic. A special,  
internationally coordinated campaign was organized for  
the 4-day period January 14-17, 1986. This campaign had a  
global distribution of 22 possible optical stations and  
six possible radars specially organized to participate  
covering both hemispheres. Ionosonde stations were also  
alerted to the existence of the special period. This  
paper concentrates on the dynamics of the high-latitude  
regions using the optical wind data and the radar ion  
drifts to study the situation. Keywords: Polar atmosphere  
dynamics; Polar atmosphere emission; Polar atmosphere  
motions; Reprints. (jhd)

DESCRIPTORS: (U) \*METEOROLOGICAL DATA, \*THERMOSPHERE,  
\*WIND, ARCTIC REGIONS, DRIFT, DYNAMICS, EMISSION,  
ENERGETIC PROPERTIES, HIGH LATITUDES, IONOSONDES, IONS,  
OPTICAL DATA, OPTICAL PROPERTIES, POLAR REGIONS, RADAR,  
REGIONS, REPRINTS, STATIONS, VECTOR ANALYSIS.

IDENTIFIERS: (U) CEDAR Program, PE61102F, WUAFOSR2310A2

AD A211 087

AD-A211 082

UNCLASSIFIED

PAGE 66

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 081 20/15 20/3 20/14

AD-A211 068 7/4

VERMONT UNIV BURLINGTON DEPT OF COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

MICHIGAN STATE UNIV EAST LANSING DEPT OF MATHEMATICS

(U) Electromagnetic Pulse Interaction at a Dielectric Interface.

(U) Solidation Front/Viscous Phase Transitions, Forwards Backward Heat Equations.

DESCRIPTIVE NOTE: Final rept. 1 Mar 88-28 Feb 89.

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-28 Feb 89.

APR 89

JUL 89

PERSONAL AUTHORS: Oughstun, Kurt E.

PERSONAL AUTHORS: Novick-Cohen, Amy

CONTRACT NO. AFOSR-88-0149

CONTRACT NO. AFOSR-87-0267

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A4

TASK NO. A9

MONITOR. AFOSR

MONITOR: AFOSR

TR-89-1069

TR-89-1064

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The research on pulsed electromagnetic beam fields is nearing completion with some rather interesting results. In particular, the rigorous angular spectrum representation of pulsed beam fields has been found to differ from the given by the simpler plane-wave spectrum representation. This latter formulation (as given by W.H. Carter), 'Electromagnetic Beam Fields', Optica Acta, 21, 87,-892 (1974) assumes the form of the propagated transverse field components for either the electric or magnetic field vector and then solves the Maxwell field equation for the remaining field components in a self-consistent manner. The rigorous derivation for a general pulsed electromagnetic beam field clearly shows that this assumption is valid only for very special cases of the spatial field distribution and polarization state. (rh)

DESCRIPTORS: (U) \*PHASE TRANSFORMATIONS, SOLIDIFICATION, HEAT TRANSFER, DIFFUSION.

DESCRIPTORS: (U) \*BEAMS(ELECTROMAGNETIC), \*DIELECTRICS, \*ELECTRIC FIELDS, \*ELECTROMAGNETIC FIELDS, \*ELECTROMAGNETIC PULSES, \*ELECTROMAGNETIC RADIATION, \*INTERACTIONS, \*INTERFACES, \*MAGNETIC FIELDS, ANGLES, POLARIZATION, PULSES, SPATIAL DISTRIBUTION, SPECTRA, TRANSVERSE.

IDENTIFIERS: (U) WUAFOSR2304A1, PE61102F.

IDENTIFIERS: (U) Sivashinsky equation, Cahn Hilliard equation, WUAFOSR2304A9, PE61102F.

AD A211 081

AD-A211 068

UNCLASSIFIED

PAGE 89

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 066 7/4 7/2 7/3

AD-A211 063 23/3 12/7

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

(U) AMI Calculations for Compounds Containing Germanium,  
89

(U) Drift-Balanced Random Stimuli: A General Basis for  
Studying Non-Fourier Motion Perception,

PERSONAL AUTHORS: Dewar, Michael J.; Jie, Caoxian

NOV 88

CONTRACT NO. AFOSR-86-0022, NSF-CHE87-12022

PERSONAL AUTHORS: Chubb, Charles; Sperling, George

PROJECT NO. 2303

CONTRACT NO. AFOSR-88-0140

TASK NO. B2

PROJECT NO. 2313

MONITOR: AFOSR  
TR-89-1049

TASK NO. A5

MONITOR: AFOSR  
TR-89-1022

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v8 n6 p1544-1547 1989.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society of America A, v5 n11 p1986-2007 Nov 88.

ABSTRACT: (U) Now that germanium is readily available as a result of its importance in electronics, increasing attention is being paid to its chemistry. As a result, there is a growing need for a practical theoretical procedure for studying the behavior of germanium compounds. AMI has been parametrized for germanium. Calculations are reported for a number of compounds of germanium. The results are generally superior to those from MNDO, especially in geometries. Reprints. (AW)

ABSTRACT: (U) To some degree, all current models of visual motion-perception mechanisms depend on the power of the visual signal in various spatiotemporal-frequency bands. Here counterexamples are constructed: visual stimuli that are consistently perceived as obviously moving in a fixed direction yet for which Fourier-domain power analysis yields no systematic motion components in any given direction. A random stimulus  $S$  is drift balanced if its expected power in the frequency domain is symmetric with respect to temporal frequency, that is, if the expected power in  $S$  of every drifting sinusoidal component is equal to the expected power of the sinusoid of the same spatial frequency, drifting at the same rate in the opposite direction. Additionally,  $S$  is microbalanced if the result  $W$  of windowing  $S$  by any space-time-separable function  $W$  is drift balanced. Any space-time-separable random (or nonrandom) stimulus is microbalanced; any linear combination of pairwise independent microbalanced (respectively, drift-balanced) random stimuli is microbalanced and drift-balanced if the expectation of each component is uniformly zero; the convolution of independent microbalanced and drift-balanced random stimuli is microbalanced; and the expected response of any Reichardt detector to any microbalanced random stimulus is zero at every instant in

DESCRIPTORS: (U) \*GERMANIUM COMPOUNDS. \*QUANTUM CHEMISTRY. CHEMISTRY. ELECTRONICS. GERMANIUM, REPRINTS, COMPUTATIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, AM1 Calculations, MNDO(Modified Neglect of Differential Overlap).

AD A211 066

AD-A211 063

UNCLASSIFIED

PAGE 90

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 063 CONTINUED

AD-A211 044 6/4 5/8

time. Examples are provided of classes of microbalanced random stimuli that display consistent and compelling motion in one direction. All the results and examples from the domain of motion perception are transposable to the space-domain problem of detecting orientation in a texture pattern. Reprints. (JHD)

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF PSYCHIATRY  
(U) Extrathalamic Modulation of Cortical Function.

DESCRIPTIVE NOTE: Interim rept. 1 Apr 88-31 Mar 89.

JUL 89

DESCRIPTORS: (U) \*MOTION, \*VISUAL PERCEPTION, DRIFT, FREQUENCY, MODELS, PATTERNS, REPRINTS, SPATIAL DISTRIBUTION, STIMULI, TEXTURE, VISUAL SIGNALS.

PERSONAL AUTHORS: Foote, Stephen L.

CONTRACT NO. F49620-87-C-0038

IDENTIFIERS: (U) Reichardt Detectors, PEG1102F, WUAFOSR2313A5.

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR TR-89-1012

UNCLASSIFIED REPORT

ABSTRACT: (U) The focus of the research is to understand the role that the widely-divergent, globally-acting locus coeruleus (LC)-noradrenergic (NA) system plays in sensory information processing. Completed light-microscopic studies of the regional and laminar distribution of cortical innervation by extrathalamic systems (e.g., noradrenergic, cholinergic, serotonergic, and dopaminergic) indicate that axons of each system exhibit a different density and laminar distribution. They also display individual developmental sequences in terms of the time innervation begins and the evolution of its specialized laminar distribution in each cortical region. These anatomic data support the proposal that each extrathalamic system contacts a distinct population of neurons in specific cortical regions. Each population of neurons may be involved in different aspects of cortical activity in the LC-NA has specific modulatory effects on the sensory responsiveness of cortical neurons. It alters the excitatory and inhibitory components of these sensory responses. Functionally, the LC-NA system may be involved in the orienting and attentional mechanisms. Keywords: Auditory perception, Electroencephalography, Lesions, Nucleus. (aw)

DESCRIPTORS: (U) \*ELECTROPHYSIOLOGY, \*INFORMATION

AD A211 063

AD A211 044

UNCLASSIFIED

PAGE 91

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 044 CONTINUED

AD-A211 043 5/8 6/4

PROCESSING, \*NERVE CELLS, \*NERVE TRANSMISSION, \*CEREBRAL  
CORTEX, ANATOMY, AUDITORY PERCEPTION, DISTRIBUTION, DRUGS,  
ELECTROENCEPHALOGRAPHY, INHIBITION, LAMINAR FLOW, LESIONS,  
NERVE FIBERS, POPULATION, RESPONSE(BIOLOGY),  
SENSES(PHYSIOLOGY), VISUAL PERCEPTION, THALAMUS, EXTERNAL,  
CHOLINERGIC NERVES.

MASSACHUSETTS UNIV AMHERST

(U) Biological Investigations of Adaptive Networks:  
Neuronal Control of Conditioned Responses.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-18 Jul 89.

IDENTIFIERS: (U) WUAFOSR2312A2, PE61102F, Locus  
Coeruleus, Noradrenergic Receptors, Serotonergic  
Receptors, Dopaminergic Receptors.

JUL 89

PERSONAL AUTHORS: Moore John W.

CONTRACT NO. AFOSR-86-0182

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-1016

UNCLASSIFIED REPORT

ABSTRACT: (U) Investigations of adaptive neural networks were conducted using the classically conditioned nictitating membrane response (NMR) of rabbit. Work involved both neurobiological and theoretical approaches based on mathematical models and computer simulation. Recordings were done from single brain stem neurons in awake, behaving animals for the purpose of determining the loci and activity relate to CRs. Computational tools for applying systems analysis to neurophysiological data obtained from single-unit recordings from awake behaving animals were developed. The relationship between single neurons' dynamic behavior and the CR in terms of differential equations and sophisticated correlational analyses based on Fourier and Laplace transform methods was characterized. Theoretical studies revolved around two mathematical models of learning. The Sutton-Barto-Desmond (SBD) model was designed to describe real-time features of the NM CR. A cerebellar network implementation of this model was constructed by combining parametric constraints of the model dictated by behavioral data with constraints based on anatomy and physiology of the cerebellum. The second major theoretical development was the construction of a two element neural-network architecture that elegantly describes adaptive timing as manifested in the fine grain temporal characteristics of CRs. (aw)

AD A211 044

AD-A211 043

UNCLASSIFIED

PAGE 92

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 043 CONTINUED

AD-A211 041 5/8

MILTON S HERSHEY MEDICAL CENTER PA

DESCRIPTORS: (U) \*ADAPTIVE SYSTEMS, \*NERVE CELLS,  
\*NEUROPHYSIOLOGY, \*RESPONSE(BIOLOGY), ANATOMY, ANIMALS,  
BEHAVIOR, BIOLOGY, BRAIN, CEREBELLUM, COMPUTATIONS,  
COMPUTERIZED SIMULATION, CONTROL, DIFFERENTIAL EQUATIONS,  
DYNAMIC RESPONSE, FOURIER ANALYSIS, LAPLA E  
TRANSFORMATION, LEARNING, MATHEMATICAL MC ELS, NETWORKS,  
NEUTRAL, PHYSIOLOGY, RABBITS, SYSTEMS ANALYSIS, THEORY.

(U) Slope-Controlled Performance Testing.

DESCRIPTIVE NOTE: Final rept. 15 Jun 87-30 Sep 88.

JUL 89

PERSONAL AUTHORS: Jones, Marshall B.

IDENTIFIERS: (U) WUAFOSR2312A1, PEG1102F.

CONTRACT NO. AFOSR-87-0216

PROJECT NO. 2313

TASK NO. A7

MONITOR: AFOSR  
TR-89-1031

UNCLASSIFIED REPORT

ABSTRACT: (U) Cognitive ability tests, though promising in other respects, often show pronounced practice effects and have weak test-retest reliabilities. One reason for the low reliabilities appears to be that practice effects themselves vary from individual to individual, so that subjects differ not only in the levels at which they are performing when testing ends but also in the slopes leading up to those levels. Since slope of the performance curve late in practice has been shown to affect performance at reacquisition (retest), uncontrolled variation in slope may lower test-retest reliability. A possible approach to this problem is experimentally to control slope during testing so that all subjects are improving at roughly the same rates when testing ends. Under this treatment testing (practice) is continued until an individual's improvement from the just preceding to the last block of trials drops below a critical value; at this point testing stops. Individual subjects vary in both level of performance at the end of testing and number of test blocks, but they are all roughly comparable in the slopes of their performance curves at the end of testing (acquisition). Keywords: Standard deviation. (KR)

DESCRIPTORS: (U) \*APTITUDE TESTS, \*PERFORMANCE TESTS,  
\*SLOPE, ACQUISITION, COGNITION, CONTROL, GRAPHS, STANDARD  
DEVIATION, TEST AND EVALUATION, VARIATIONS

AD-A211 043

AD-A211 041

UNCLASSIFIED

PAGE 93

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 041 CONTINUED

AD-A211 040 12/2

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A7.

(U) Parameter Estimation in Functional and Partial  
Differential Equations.

DESCRIPTIVE NOTE: Final rept. 1 Sep 86-30 Apr 89.

MAY 89

PERSONAL AUTHORS: Murphy, Katherine A.

CONTRACT NO. AFOSR-86-0256

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-1068

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant supported research in parameter estimation in distributed parameter systems, the research focused on theoretical and computational methods for estimation of unknown variable parameters in nonlinear partial differential equations. Also methods for estimating time delays in functional differential equations and boundary parameters in moving boundary problems were developed. Seven publications were produced under this grant, including 'Estimation of discontinuous coefficients and boundary parameters for hyperbolic systems' and 'Estimation of time - and state - dependent delays and other parameters in functional differential equations.' Keywords: Algorithms; Differential equations; Approximation theory.

DESCRIPTORS: (U) \*PARAMETRIC ANALYSIS, \*ESTIMATES, ALGORITHMS, APPROXIMATION(MATHEMATICS), BOUNDARIES, BOUNDARY VALUE PROBLEMS, COEFFICIENTS, DELAY, DIFFERENTIAL EQUATIONS, DISTRIBUTION, FUNCTIONAL ANALYSIS, MOTION, NONLINEAR DIFFERENTIAL EQUATIONS, NUMERICAL METHODS AND PROCEDURES, PARAMETERS, PARTIAL DIFFERENTIAL EQUATIONS, THEORY, TIME, TIME INTERVALS, VARIABLES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1, Functional Equations.

AD-A211 041

AD-A211 040

UNCLASSIFIED

PAGE

94

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A211 033 7/2 7/3 20/5

AD-A211 030 6/4 6/1

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

AT AND T BELL LABS MURRAY HILL NJ

(U) AM1 Parameters for Phosphorus,

(U) An Investigation into the Effects of Peptide Neurotransmitters and Intracellular Second Messengers in Rat Central Neurons in Culture.

89

PERSONAL AUTHORS: Dewar, Michael J.; Jie, Caoxian

DESCRIPTIVE NOTE: Final rept. Oct 84-Feb 89.

CONTRACT NO. AFOSR-89-0179

JUN 89

PROJECT NO. 2303

PERSONAL AUTHORS: Connor, John A.

TASK NO. 82

CONTRACT NO. F49620-85-C-0009

MONITOR: AFOSR TR-89-1025

PROJECT NO. 2312

TASK NO. K2

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-89-1030

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Structure (Theochem), v187 p1-13 1989.

UNCLASSIFIED REPORT

ABSTRACT: (U) AM1 has been parametrized for phosphorus. Calculations are reported for an extensive series of phosphorus-containing compounds. Although d ADs are not included in the basis set, the results are satisfactory for both trivalent and pentavalent phosphorus. Keywords: Inorganic chemistry; Reprints; Organic chemistry; Molecular structure. (KT)

DESCRIPTORS: (U) \*PHOSPHORUS, INORGANIC CHEMISTRY, MOLECULAR STRUCTURE, ORGANIC CHEMISTRY, PHOSPHORUS COMPOUNDS, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, \*AM1.

ABSTRACT: (U) Studies addressing the interrelationship between intracellular messengers and neurotransmitters have been conducted on four types of nerve cell preparations from the mammalian central nervous system and from molluscan neurons using electrophysiological and high resolution digital imaging techniques. Preparations utilized were primary cell cultures from embryonic rat diencephalon and cerebellum, acutely dissociated neurons from the hippocampus of adult guinea pig, and brain slices from the cerebellum of adult guinea pig. Major research accomplishments are listed. 1) First measurements of calcium ion levels in living functional growth cones of mammalian and molluscan neurons and the demonstration of an optimum range of intracellular calcium promotes outgrowth. 2) First reported measurements of membrane conductances in granule neurons of the cerebellum and study of the developmental time course of these conductances. 3) First demonstration of persisting modulation of intracellular calcium levels by brief applications of neurotransmitters glutamate and GABA in Purkinje and granule neurons of the rat cerebellum. 4) First measurements of changes in free calcium levels produced by excitatory amino acid neurotransmitters in the dendrites of hippocampal neurons, a focus of research on memory mechanism. 5) First

AD A211 033

AD-A211 030

UNCLASSIFIED

PAGE 95

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 030 CONTINUED

AD-A211 028 23/3

measurements of calcium levels and oscillations in neurons in the brain slice. 6) The development of membrane conductances and responsiveness to neurotransmitters and of expression of cell specific antigens has been studied in cerebellar Purkinje neurons in culture and in vivo. (KT)

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY  
(U) Second-Order Motion Perception: Space/Time Separable Mechanisms,  
89

DESCRIPTORS: (U) \*NERVE CELLS, \*NEUROMUSCULAR TRANSMISSION, \*PEPTIDES, ADDRESSING, ADULTS, AMINO ACIDS, BRAIN, CALCIUM, CELLS(BIOLOGY), CENTRAL NERVOUS SYSTEM, CEREBELLUM, CONDUCTIVITY, CONICAL BODIES, CULTURES(BIOLOGY), DEMONSTRATIONS, DENDRITIC STRUCTURE, GLUTAMIC ACID, GROWTH(GENERAL), GUINEA PIGS, HIPPOCAMPUS, IN VIVO ANALYSIS, IONS, LIFE(BIOLOGY), MAMMALS, MEASUREMENT, MEMBRANES(BIOLOGY), MEMORY DEVICES, MODULATION, OPTIMIZATION, OSCILLATION, PREPARATION, RATS, RESPONSE(BIOLOGY), SALTS.

PERSONAL AUTHORS: Sperling, George

CONTRACT NO. AFOSR-88-0140

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-1023

IDENTIFIERS: (U) WUAFOSR2312K2, PE61102F, Purkinje neurons.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings Workshop on Visual Motion, p126-138 1989.

ABSTRACT: (U) Microbalanced stimuli are dynamic displays which do not stimulate motion mechanisms that apply standard (Fourier-energy or autocorrelational) motion analysis directly to the visual signal. Because they bypass such first-order mechanisms, microbalanced stimuli are uniquely useful for studying second-order motion perception (motion perception served by the mechanisms that require a grossly nonlinear stimulus transformation prior to standard motion analysis). Some stimuli are microbalanced under all pointwise stimulus transformations and therefore are immune to early visual nonlinearities. These are used to disable motion information derived from spatial (temporal) filtering in order to isolate the temporal (spatial) properties of space/time separable second-order motion mechanisms. The motion of all of the microbalanced stimuli one considers can be extracted by (1a) band-selective spatial filtering and (1b) biphasic temporal filtering, nonzero in dc, followed by (2) a rectifying nonlinearity and (3) standard motion analysis. Reprints. (jhd)

DESCRIPTORS: (U) \*VISUAL PERCEPTION, \*MOTION, DISPLAY SYSTEMS, DYNAMICS, NONLINEAR SYSTEMS, OPTICAL IMAGES, REPRINTS, SEPARATION, STIMULI, AUTOCORRELATION, SPATIAL FILTERING, TRANSFORMATIONS, VISUAL SIGNALS.

AD A211 030

AD A211 028

UNCLASSIFIED

PAGE 96

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A211 028 CONTINUED

AD-A211 023 7/3 7/4

IDENTIFIERS: (U) Biphasic Temporal Filtering.  
WUAFOSR2313AS, PE61102F.

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Cope Rearrangement of 3,3-Dicyanohexa-1,5-diene.

JAN 89

PERSONAL AUTHORS: Devar, Michael J.; Jie, Coaxian

CONTRACT NO. AFOSR-89-0179

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1026

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Society of Chemical Communications n2 p98-100 Jan 89. Original contains color plates: All DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) AM1 Calculations indicate that the Cope rearrangement of 3,3-dicyanohexa1,5diene takes place by a synchronous pericyclic mechanism involving an aromatic transition state rather than by the biradicaloid path usual in chair Cope rearrangements. Reprints. (AW)

DESCRIPTORS: (U) \*AROMATIC COMPOUNDS, \*DIENES,  
\*MOLECULAR STRUCTURE, REPRINTS, TRANSITIONS, CYCLIC  
COMPOUNDS.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, Diene/3-3  
Dicyanohexa-1-5, Rearrangement, AM1 Calculations.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

AD A210 995 23/3

AD-A210 995 CONTINUED

SRI INTERNATIONAL MENLO PARK CA

DESCRIPTORS: (U) \*BIOPHYSICS, \*BIONICS, \*VISION, \*COMPUTATIONS, CONFORMAL STRUCTURES, CONVOLUTION, FILTERS, FOVEA, FRAMES, IMAGE PROCESSING, MATHEMATICAL MODELS, MODELS, OUTPUT, RETINA, SPATIAL DISTRIBUTION, STABILITY

(U) Role of Retinocortical Processing in Spatial Vision.

DESCRIPTIVE NOTE: Annual rept. no. 2. 1 May 88-1 May 89.

IDENTIFIERS: (U) Retinocortical processing, Gabor filtering, PE61102F, WUAFOSR2313A5, LPN-SRI-3358.

JUN 89

PERSONAL AUTHORS: Kelly, Donald H.

CONTRACT NO. F49-20-87-K-0009

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR TR-89-1027

UNCLASSIFIED REPORT

ABSTRACT: (U) The inhomogeneous retinal filtering algorithms is incorporated into a more general model that includes conformal projection of the retinal filtered outputs into cortical input images, suitable for further processing, such as Gabor filtering. Our new cortical images seem to show much less loss of information relative to the retina. We no longer restore some of the dc (zero-frequency) component that is filtered out by the (Laplacian/Gaussian) retinal receptive-field model. We also provide both right- and left-hemisphere images, corresponding retinal image. Study of these cortical images is yielding new insights. Peripheral objects, while remaining otherwise relatively undistorted, will be rotated either clockwise or counterclockwise as for as + or - 90 deg in cortical coordinates if they lie above or below the horizontal meridian. This is consistent with other cortical image models, but it does not bode well for the possibility of creating a stable frame by any known array-processing operation on cortical outputs. We are now beginning the third major phase of this project: modeling cortical filtering, as by Gabor functions. It is already clear that a simple, linear convolution without further refinements is not a good model for this process. Keywords: Spatial vision; Retinocortical projection; Computational model. (JHD)

AD A210 995

AD A210 995

UNCLASSIFIED

PAGE 98

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A210 994 6/4

AD-A210 862 12/1

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Visual Motion Perception.

(U) Wavefront Propagation for Reaction-Diffusion Systems of PDE.

DESCRIPTIVE NOTE: Interim rept. 1 Feb 88-31 Jan 89.

JAN 89

MAR 89

PERSONAL AUTHORS: Sperling, George

PERSONAL AUTHORS: Barles, G.; Evans, L. C.; Souganidis, P. E.

CONTRACT NO. AFOSR-88-0140

REPORT NO. LCDS-89-3

PROJECT NO. 2313

CONTRACT NO. AFOSR-ISSA-860078

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR

TASK NO. A1

TR-89-1021

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-0574

ABSTRACT: (U) (1) Explorations of two separate motion-computation systems and the derivation of the functional properties of each. Demonstrated: A dynamic stimulus that caused the first- and second-order motion perception systems to perceive motion in opposite directions, depending on viewing distance. Discovered: Motion/texture interactions-stimuli that are accessible to only to second order motion analysis and then only after their texture has first been extracted. (2) Demonstrated: Perceiving 3D structure from 2D visual inputs depends primarily on the first-order motion perception system. (3) New spatial interaction: A textured area surrounded by a similar high-contrast texture appears to be of lower contrast when surrounded by neutral gray. This remarkable phenomenon contradicts all current theories of lightness perception. Investigation continuing. (SDW)

DESCRIPTORS: (U) \*MOTION, \*VISUAL PERCEPTION, CONTRAST, DYNAMICS, FUNCTIONAL ANALYSIS, GRAY(COLOR), INTERACTIONS, NEUTRAL, PERCEPTION, RANGE(DISTANCE), SPATIAL DISTRIBUTION, STIMULI, TEXTURE, THEORY, VIEWERS.

IDENTIFIERS: (U) PEG1102F.

AD A210 994

AD-A210 862

UNCLASSIFIED

PAGE 99

EVI09K

UNCLASSIFIED REPORT

ABSTRACT: (U) The theory of viscosity solutions for Hamilton-Jacob' equations is used to study the asymptotic behavior of solutions to certain systems of reaction-diffusion PDE. Our principal result characterizes the region of convergence of the solution to an unstable rest point as the set where the solution of an appropriate Hamilton-Jacobi equation is positive. Keywords include: Partial differential equations; Wavefront propagation. (Jhd/rh)

DESCRIPTORS: (U) \*PARTIAL DIFFERENTIAL EQUATIONS, \*DIFFUSION, \*WAVEFRONTS, ASYMPTOTIC SERIES, SOLUTIONS(GENERAL), VISCOSITY, WAVE PROPAGATION.

IDENTIFIERS: (U) Hamilton Jacobi Equation, PEG1102F, WUAFOSR2304A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 858 CONTINUED

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

interactions, Energy spectra. Reprints. (edc)

(U) Trajectory Analysis of Low-Energy and Hyperthermal Ions Scattered from Cu(110).

DESCRIPTORS: (U) \*SPECTROSCOPY, \*ION BEAMS, ATOMS, ENERGETIC PROPERTIES, ENERGY, EXPERIMENTAL DATA, FOCUSING, HIGH TEMPERATURE, IMPACT, INTERACTIONS, IONS, LAYERS, LOW ENERGY, PARAMETERS, PLOTTING, REPRINTS, SCATTERING, SIMULATION, SPECTRA, SURFACES, SURFACE PROPERTIES, PARTICLE TRAJECTORIES, PARTICLE SPECTRA.

MAY 89

PERSONAL AUTHORS: McEachern, R. L.; Goodstein, D. M.; Cooper, B. H.

IDENTIFIERS: (U) SAFARI Computer program, Ion surface interactions, PE6110ZF, WUAFOSR2303A2.

CONTRACT NO. AFOSR-88-0069

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-09-1000

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v39 n15 p503-510, 15 May 89.

ABSTRACT: (U) We investigated the trajectories of Na<sup>+</sup> ions scattered from the Cu(110) surface in the <1 1bar 0> and <001> azimuths for a range of incident energies from 56 eV to 4 KeV. Our goal is to explain the trends observed in the energy spectra and determine what types of trajectories contribute to these spectra. Using the computer program SAFARI, we have performed simulations with trajectory analyses for 100-, 200-, and 400-eV scattering. We show results from the 100-eV simulations in both azimuths and compare them with the experimental data. The simulated energy spectra are in excellent agreement with the data. Ion trajectories and impact parameter plots from the simulations are used to determine the relative importance of different types of ion-surface-atom collisions. The simulations have shown that the striking differences observed in comparing the <1 1bar 0> and <001> spectra are mostly due to ions which scatter from second-layer atoms. This system exhibits strong focusing onto the second-layer atoms by the first-layer rows, and the focusing is very sensitive to the spacing between the rows. At the lower beam energies, scattering from the second layer dominates the measured spectra. Keywords: Energetic ion beams, Ion-surface

AD-A210 858

AD-A210 858

UNCLASSIFIED

PAGE 100

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 851 6/4 5/8

AD-A210 851 CONTINUED

NEW YORK UNIV N Y

sources for the cardinal directions in color space. In a study of visual spatial attention we found enhanced responses to stimuli located at positions on which attention was focused. Keywords: Electroencephalography, Neuromagnetism. (SDW)

(U) Cognitive and Neural Bases of Skilled Performance.

DESCRIPTIVE NOTE: Annual technical rept. 1 Oct 87-30 Sep 88.

MAY 89

DESCRIPTORS: (U) \*COGNITION, \*SKILLS, \*PSYCHOPHYSIOLOGY, ATTENTION, BANDWIDTH, BRAIN, COLORS, CONFIGURATIONS, ELECTROENCEPHALOGRAPHY, HEMISPHERES, MODULATION, OPTICAL IMAGES, RESPONSE, SOURCES, SPATIAL DISTRIBUTION, STIMULI, PERFORMANCE (HUMAN).

PERSONAL AUTHORS: Kaufman, Lloyd

CONTRACT NO. F49620-88-C-0131

PROJECT NO. 3484

IDENTIFIERS: (U) PE61103D, WUAFOSR3484A4, Neuromagnetism, P300, Evoked potentials.

TASK NO. A4

MONITOR: AFOSR  
TR-89-0929

UNCLASSIFIED REPORT

ABSTRACT: (U) The results obtained using an odd-ball paradigm were inconclusive, but a new procedure was developed which uses all trials rather than trials on which only infrequent events lead to P300 responses. It is tentatively concluded that different source configurations underly P300s associated with different modalities, and possibly also different tasks within a modality. In the previous report we described a new method for analyzing spontaneous brain activity in the alpha bandwidth. We extended this method to other bandwidths and conducted some of the first studies of the modulation of spontaneous brain activity, independent of the evoked response, during the performance of high-level cognitive tasks. Research based on this methodology is now being conducted under the aegis of a separate grant. In the course of this report period we conducted a study using the 14-channel neuromagnetometer at Bellevue Hospital. The left hemisphere tends to display a monotonic increase in N100 amplitude with ISIs up to 16 sec, while the right hemisphere is not differently affected by ISIs in excess of 4 sec. In a collaborative effort with the Los Alamos National Laboratory we found that different components of auditory evoked responses originate at different locations in the two hemispheres. Also, in a study of visual responses to equiluminance color stimuli we found the first evidence for separate

AD-A210 851

AD-A210 851

UNCLASSIFIED

PAGE 101

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AI -A210 848 20/1

AD-A210 847 7/3

DELAWARE UNIV NEWARK DEPT OF MATHEMATICAL SCIENCES

BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

(U) The Inverse Scattering Problem for Time-Harmonic Acoustic Waves in an Inhomogeneous Medium: Numerical Experiments.

(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 85. Synthesis of Chain and Ring Compounds Containing Molybdenum.

DESCRIPTIVE NOTE: Rept. for 22 Apr-1 May 88.

89

89

PERSONAL AUTHORS: Colton, D. L.; Monk, P. B.

PERSONAL AUTHORS: Davies, Simon J.; Stone, F. G.

CONTRACT NO. AFOSR-86-0087

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A9

TASK NO. B2

MONITOR: AFOSR  
TR-89-0807

MONITOR: AFOSR  
TR-89-0792

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IMA Jnl. of Applied Mathematics v42 p77-95 1989.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Dalton Transactions, p785-795 1989. See also Part 86. AD-A210 340.

ABSTRACT: (U) In this paper, the authors describes a novel algorithm for solving the inverse scattering problem of reconstructing the shape of acoustic waves in an inhomogeneous medium from far-field data. Limited testing has shown that the algorithm has some capacity for reconstructing simple shapes using data over a limited range of frequencies. Reprints. (JHD)

ABSTRACT: (U) We have recently developed rational procedures for preparing heteropolynuclear metal complexes with structures based on chains of metal atoms, and in which the metal-metal bonds are bridged by alkylidene groups. In the majority of these species Tungsten-Platinum or Tungsten-Nickel bonds form the spine of the molecules, and compounds with up to seven metal atoms in the chain have been characterised. A few complexes in which Mo replaces W in the chains have also been described. In attempts to extend the length of the chains beyond seven metal atoms cyclisation reactions were observed, affording metallacycles which we have termed star clusters. In this paper we report several other compounds in which Molybdenum atoms are present in the spines of the molecules, thus placing the initial observation on a firmer basis. We have also established that 'star clusters' can be prepared having Mo atoms in the metallacycle. Moreover, an interesting form of isomerism occurs which is related to different metal atom sequences within the metal cluster framework. In a subsequent paper we shall show that the presence of molybdenum atoms in these systems allows the synthesis of compounds having structures with chains of more than

DESCRIPTORS: (U) \*ACOUSTIC SCATTERING, \*INVERSE SCATTERING, ACOUSTIC WAVES, ALGORITHMS, FAR FIELD, HARMONICS, NUMERICAL METHODS AND PROCEDURES, REPRINTS, SHAPE, TEST AND EVALUATION, TIME.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A9.

AD-A210 848

AD-A210 847

UNCLASSIFIED

PAGE 102

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 847 CONTINUED

AD-A210 745 5/8

seven metal atoms. Reprints. (AW)

AUBURN UNIV AL

DESCRIPTORS: (U) \*CARBENES, \*LIGANDS, \*METAL COMPLEXES, \*MOLYBDENUM COMPOUNDS, \*SYNTHESIS(CHEMISTRY), ATOMS, CHEMICAL BONDS, CHAINS, CHEMISTRY, CLUSTERING, CYCLIC COMPOUNDS, LENGTH, METAL METAL BONDS, METALS, MOLECULES, NICKEL ALLOYS, REPRINTS, RINGS, SEQUENCES, STARS, TUNGSTEN ALLOYS, ALKYL RADICALS.

(U) Stimulus-Response Compatibility in Spatial Precuing and Symbolic Identification: Effects of Coding Practice, Retention and Transfer.

DESCRIPTIVE NOTE: Final rept. 1 Oct 87-31 Mar 89.

MAY 89

IDENTIFIERS: (U) PE62202F, WUAFOSR2303B2, Alkylidyne Groups, \*Carbynes, Bridges(Chemical Bonds).

PERSONAL AUTHORS: Proctor, Robert W.; Reeve, T. G.

CONTRACT NO. AFOSR-84-0002

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR TR-89-0810

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on stimulus-response compatibility effects is reviewed, with an integrated theoretical perspective provided that stresses mental coding of the stimulus and response sets. Eleven experiments, plus two follow-up experiments, are described in detail. The first six evaluate the nature of the codings used in spatial-precuing tasks. The remaining seven experiments examine the influence of practice on performance in the spatial-precuing tasks, as well as in symbolic-compatibility tasks. The experiments show that the codings used by subjects are affected by manipulations of the stimulus set but not of the response set. Compatibility effects within both tasks are reduced greatly by three sessions of practice. Transfer of these benefits to related tasks occurs in situations for which the response set is not altered. However, after more extended practice, partial transfer occurs even when the response set is changed. The results are interpreted in terms of an account that emphasizes salient-feature codings in a declarative stage of skill acquisition, with task-specific procedures acquired from practice. (KR)

DESCRIPTORS: (U) \*STIMULATION(GENERAL), \*CODING, ACQUISITION, COMPATIBILITY, IDENTIFICATION, MENTAL ABILITY, RESPONSE, SKILLS, STIMULI, STRESSES, SYMBOLS.

AD-A210 847

AD-A210 745

UNCLASSIFIED

PAGE 103

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 745 CONTINUED

AD-A210 681 7/4 7/5

TRANSFER.

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A4.

(U) Observation of  $\text{NH}(a^1\Delta, v=1)$  from the  $\text{H} + \text{N}_3$  Reaction.

JUN 89

PERSONAL AUTHORS: Chen, Jing; Quinones, Edwin; Dagdigian, Paul J.

CONTRACT NO. F49620-88-C-0056

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1007

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90  
n12 p7603-7604, 15 Jun 89.

ABSTRACT: (U) Because of the current interest in the photodissociation dynamics of molecules such as hydrazoic acid and ammonia the spectroscopy and kinetics of the  $\text{NH}$  radical have received special attention in recent years. The photolysis of these molecules involves several potential energy surfaces, and it has been established that spin-forbidden pathways are important in their decomposition in some cases. However, to the best of our knowledge, no examples of full collision processes leading to the formation of the  $\text{NH}$  radical have been studied in detail. The observation and preliminary characterization, in a molecular beam scattering experiment, of the  $\text{NH}(a^1\Delta)$  product from the reaction of hydrogen atoms with the azide radical,  $\text{HN}_3 + (\text{X } 2 \text{ pt g}) \text{NH} + \text{N}_2(\text{x } 1 \text{ sigma g}^+, \text{ is reported. Three electronic states of NH are energetically accessible (X } 3 \text{ sigma}^-, \text{ } 2 \text{ } 1 \text{ Delta, b } 1 \text{ sigma}^+)$  in this reaction. The  $\text{N}_3$  radical was generated by reacting hydrazoic acid with fluorine atoms in a discharge-flow prereactor. A beam of hydrogen atoms was generated by a microwave discharge source using an extended Evenson-Broida cavity in a differentially pumped chamber. The  $\text{NH}(a^1\Delta)$  product was detected in its  $v=1$  level by laser fluorescence excitation. The nascent  $\text{NH}(a^1\Delta, v=1)$  rotational

AD-A210 745

AD-A210 681

UNCLASSIFIED

PAGE 104

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 681 CONTINUED

AD-A210 680 7/3

distribution was parameterized by a Boltzmann form, and the distribution was fit to a 'temperature' of 750 + or - 100 K. Reprints. (AW)

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Large Magnetic Field Effect on the Decay Rates of Triplet Hydrocarbon Diradicals.

DESCRIPTORS: (U) \*AMMONIA, \*HYDRAZOIC ACID, \*PHOTODISSOCIATION, \*CHEMICAL RADICALS, \*REACTION KINETICS, ATOMS, AZIDES, BEAMS(RADIATION), CHAMBERS, COLLISIONS, DECOMPOSITION, DISTRIBUTION, DYNAMICS, ELECTRONIC STATES, EXCITATION, FLUORINE, HYDROGEN, LASER INDUCED FLUORESCENCE, MICROWAVES, MOLECULAR BEAMS, MOLECULES, PHOTOLYSIS, POTENTIAL ENERGY, PUMPING, REPRINTS, ROTATION, SCATTERING, SOURCES, SPECTROSCOPY, SURFACES, NITROGEN.

DESCRIPTIVE NOTE: Scientific rept. for 1986-1988.

89

PERSONAL AUTHORS: Wang, Jinfeng; Doubleday, Charles, Jr.; Turro, Nicholas J.

PROJECT NO. 2303

IDENTIFIERS: (U) Potential Energy Surfaces, Spin Forbidden Pathways.

TASK NO. 82

MONITOR: AFOSR TR-89-1001

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 p4780-4782 1989.

ABSTRACT: (U) Intersystem crossing rate constants, kISC, of triplet 1, n-diphenyl 1, n-diy) diradicals (n=number of carbons in diradical chain) generated by type I photolyses of alpha-diphenylcycloalkanones were measured in an external magnetic field H variable up to 2 kG. No magnetic field effect was observed for n=4 and 5, but for n=9, 11, and 14, kISC first increased then decreased as H was increased. For n=11 and 14, the value of kISC decreased to an apparent asymptotic value at high field equal to 0.17 and 0.07, respectively, of the value of kISC at H = 0. For diradicals it is proposed that, at H = 0 electron-nuclear hyperfine coupling is the only important ISC mechanism, that at H=2kG electronic spin lattice relaxation is the major ISC mechanism, that the three triplet magnetic sublevels do not equilibrate during the diradical lifetime, and that one of the outer two triplet magnetic sublevels is preferentially populated initially. Magnetic field effect; Diradicals; Hyperfine coupling; Intersystem crossing; Hydrocarbons; Reprints. (jes)

DESCRIPTORS: (U) \*HYDROCARBONS, CONSTANTS, CROSSINGS, DECAY, EXTERNAL, MAGNETIC FIELDS, RATES, REPRINTS.

AD A210 681

AD-A210 680

UNCLASSIFIED

PAGE 105

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 680 CONTINUED

AD-A210 674 7/4

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Ab Initio Studies of Molecular Structures and Energetics. 3. Pentacoordinated NFnH(5-n) Compounds.

89

PERSONAL AUTHORS: Weig, Carl S.; Van Wazer, John R.

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-1006

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report 2, AD-A179 601. Pub. in Jnl. of the American Chemical Society, v111 p4172-4178 1989.

ABSTRACT: (U) An ab initio quantum-chemical study has been made of the possible existence in terms of structural and thermodynamic stabilities of the pentacoordinated nitrogen hydrides and fluorides, NF(n)H(5-n) for n=0 to 5. Three structurally stable species have been identified corresponding to n=3 to 5. We report computed energies, vibrational frequencies, structural parameters, and multicenter analyses of total energies. For all except the last of these properties we employed the second-order perturbation approximation to the correlation energy. Nitrogen pentafluoride was studied in especial detail, including the enthalpies and free energies of two likely formation and decomposition reactions. Our analysis shows that each of these compounds contains a truly pentacoordinated first row element, with five independent linkages to the central nitrogen atom. Reprints. (AW)

DESCRIPTORS: (U) \*ENERGETIC PROPERTIES, \*HYDRIDES, \*NITROGEN COMPOUNDS, \*PENTAFLUORIDES, \*QUANTUM CHEMISTRY, ATOMS, CORRELATION, DECOMPOSITION, ENERGY, FLUORIDES, FREQUENCY, LINKAGES, MOLECULAR STRUCTURE, PARAMETERS, REPORTS, REPRINTS, STABILITY, THERMODYNAMICS, MOLECULAR VIBRATION, VIBRATIONAL SPECTRA, PERTURBATION THEORY.

AD-A210 680

AD-A210 674

UNCLASSIFIED

PAGE 106

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 674 CONTINUED

AD-A210 673 7/6

APPROXIMATION(MATHEMATICS).

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B3, \*Nitrogen Pentahydride, \*Nitrogen Pentafuoride, Nitrogen Hydrides, Nitrogen Fluorides, Ab Initio Calculations.

(U) Liquid, Crystalline Phosphazenes. High Polymeric and Cyclic Trimeric Systems with Aromatic Azo Side Groups.

JUN 89

PERSONAL AUTHORS: Allock, Harry R.; Kim, Chulhee

CONTRACT NO. WJAFOSR-84-0174

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-1008

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v22 p2:196-2606 1989.

ABSTRACT: (U) Liquid crystalline polymers are an important subject for fundamental and technological studies because of their unusual anisotropic optical, electrical, and mechanical properties. Liquid crystalline polymers fall into two general categories: 1) species with rigid mesogenic groups incorporated into the backbone structure (main-chain liquid crystalline polymers); 2) polymers with mesogenic units in the side-group structure. This present work deals with polymers of the second type. Side-chain liquid crystallinity generally requires a molecular structure in which a flexible polymer chain, or flexible connector group between the mesogen and backbone, provides sufficient conformational freedom to allow the rigid mesogenic units to form stacks or organized domains. Liquid crystallinity has been detected when mesogenic side groups are linked to highly flexible when the carrier macromolecule is less flexible chain such as a polymethacrylate or polyacrylate system, provided the spacer group is sufficiently long and flexible. Reprints. (JES)

DESCRIPTORS: (U) \*LIQUID CRYSTALS, \*PHOSPHAZENE, \*POLYMERS, CHAINS, CONNECTORS, CRYSTALS, DIAZO COMPOUNDS, LIQUIDS, MACROMOLECULES, MECHANICAL PROPERTIES, MOLECULAR STRUCTURE, POLYACRYLATES, REPRINTS, SIDES, CHEMICAL

AD-A210 674

AD-A210 673

UNCLASSIFIED

PAGE 107

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 679 CONTINUED

AD-A210 672 12/3

RADICALS, AROMATIC COMPOUNDS, METHACRYLATES.

NEW YORK ACADEMY OF SCIENCES NY

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B2, Triners, Azo  
Groups, Side Groups, Mesogenic Groups.

(U) Proceedings of the International Conference (3rd) on  
Combinatorial Mathematics Held in New York on 10-14  
June 1985. (Annals of the New York Academy of Sciences,  
Volume 555).

MAY 89 446P

PERSONAL AUTHORS: Bloom, Gary S.; Graham, Ronald L.;  
Malkevitch, Joseph

CONTRACT NO. AFOSR-85-0104

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-87-1730

UNCLASSIFIED REPORT

Availability: The New York Academy of Sciences, 2 East  
63rd St., New York, NY 10021. PC \$109.00. (No copies  
furnished by DTIC/NFIS).

ABSTRACT: (U) This volume collects the papers and  
problems from the Third International Conference on  
Combinatorial Mathematics held at the Barbizon Plaza  
Hotel in New York City under the auspices of the New York  
Academy of Sciences from June 10 through June 14, 1985.  
These papers explore aspects of such topics as structural  
graph theory, extremal set theory, Ramsey theory,  
combinatorial group theory, random graphs, matroids,  
finite geometries, game theory block designs, coding  
theory, polyhedral combinatorics, irregularities of  
distribution, and combinatorial number theory, to name a  
few, as well as a healthy dose of the increasingly  
important algorithmic aspects of these various subjects.  
Keywords: Hypergraphs; Trees; Theorems. (KR)

DESCRIPTORS: (U) COMBINATORIAL ANALYSIS, CODING, GAME  
THEORY, GRAPHS, GROUPS(MATHEMATICS), INTERNATIONAL,  
MATHEMATICS, NEW YORK(NEW YORK), NUMBER THEORY,  
STRUCTURAL PROPERTIES, SYMPOSIA, THEORY, TREES.

AD A210 673

AD-A210 672

UNCLASSIFIED

PAGE 108

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 667 20/13 20/4

AD-A210 636 20/5

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STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Effect of Body Forces on Motion and Heat Transfer of Confined Fluids.

(U) Recent Progress in the Theory of Laser-Assisted Collisions.

DESCRIPTIVE NOTE: Final scientific rept. 1 Nov 76-31 Oct 78.

89 25P

79

PERSONAL AUTHORS: Arnoldus, Henk F.; George, Thomas F.; Lam, Kai-Shue; Scipione, J. F.; DeVries, Paul L

PERSONAL AUTHORS: Ostrach, Simon

REPORT NO. TR-98

CONTRACT NO. AFOSR-77-3171

CONTRACT NO. F49620-86-C-0009

PROJECT NO. 2307

PROJECT NO. 2303

TASK NO. A4

TASK NO. B3

MONITOR: AFOSR TR-89-0876

MONITOR: AFOSR TR-89-0826

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Despite the numerous natural and technological occurrences of transport processes due to complex driving forces little information about them is available. Under this grant we have begun to study several different coupled convection problems. Study topics include: Combined thermal and hydrodynamic instability; Effects of stabilizing temperature gradients on confined natural convection flows; Convection induced by combined horizontal temperature and concentration gradients; and Waste heat disposal into a stratified environment. (EDC)

SUPPLEMENTARY NOTE: Pub. in Laser Applications in Physical Chemistry, p329-375 1989.

ABSTRACT: (U) This is a review article which addresses the following topics: (1) atomic collision processes in the presence of ultrashort laser pulses; (2) laser induced bound states; and (3) collisional spectroscopy, which includes lineshapes of a laser driven atom in a perturber gas and new applications of the electronic field representation. Keywords: Atomic collisions, ultrashort laser pulses; Laser induced bound states; Collisional spectroscopy; Lineshapes; Electronic field representation; Reprints. (JHD)

DESCRIPTORS: (U) \*CONVECTION, \*FLUID FLOW, \*HEAT TRANSFER, CONFINEMENT(GENERAL), CONCENTRATION(COMPOSITION), CONVECTION(HEAT TRANSFER), COUPLING(INTERACTION), FLUIDS, GRADIENTS, HORIZONTAL ORIENTATION, HYDRODYNAMICS, MOTION, STABILIZATION, STRATIFICATION, TEMPERATURE, TEMPERATURE GRADIENTS, THERMAL INSTABILITY, TRANSPORT PROPERTIES, WASTE DISPOSAL.

DESCRIPTORS: (U) \*PARTICLE COLLISIONS, \*ATOMIC SPECTROSCOPY, ELECTRIC FILTERS, LASER PUMPING, SPECTRAL LINES, SHAPE, PULSED LASERS, REPRINTS, SHORT PULSES

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A4

IDENTIFIERS: (U) Collisional Spectroscopy, PE61102F, WUAFOSR230383

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 603 CONTINUED

AD-A210 603 7/6 20/4 7/4

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF CHEMISTRY

IDENTIFIERS: (U) PEG1102F, WUAFDSR2303A3, PBT(Poly(1,4-phenylene-2,6-benzobisthiazole)), \*Polyphenylene Benzobisthiazoles, \*Nematic Solutions, Thiazole/Poly(1,4-phenylene-2,6-benzobis), Rodlike Polymers.

(J) Studies on Aligned Nematic Solutions of a Rodlike Polymer.

88 5P

PERSONAL AUTHORS: Berry, Guy C.; Srinivasarao, Mohan

CONTRACT NO. AFDSR-89-0125

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFDSR  
TR-89-1004

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Liquid Crystals and Biological Systems, ch9 p389-392 1988.

ABSTRACT: (U) The dynamics of rodlike chains in nematic solutions have not yet been definitely elucidated. Theoretical calculations of the constitution relation for the stress tensor rely on the notion of restricted rotational diffusion. Several variations of this model have been employed to compute the six viscosity coefficients  $\alpha_{ijkl}$  in the Leslie-Eriksen stress tensor as functions of the order parameter  $S$  of the orientation of the rods along a preferred direction. These results differ significantly including, for example, in the prediction of whether or not shear flow is stable (in the absence of external fields). Nematic solutions of poly(1,4-phenylene-2,6-benzobisthiazole), PBT, a rodlike polymer, afford an opportunity for experimental studies of the flow behavior of rodlike chains. Keywords: Monodomain; Nonlinear optics; Light scattering; Reprint. (aw)

DESCRIPTORS: (U) \*LIQUID CRYSTALS, \*THIAZOLES, \*POLYPHENYLENES, COEFFICIENTS, COMPUTATIONS, DIFFUSION, EXPERIMENTAL DATA, EXTERNAL, FLOW, LIGHT SCATTERING, LIMITATIONS, NONLINEAR SYSTEMS, OPTICS, PARAMETERS, POLYMERS, REPRINTS, RODS, ROTATION, SHEAR PROPERTIES, SOLUTIONS(MIXTURES), THEORY, VISCOSITY, MOLECULAR STRUCTURE, CRYSTAL STRUCTURE, ALIGNMENT.

AD A210 603

AD A210 603

UNCLASSIFIED

PAGE 110

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A210 602 CONTINUED

AD A210 602 7/6 20/4 7/4

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF CHEMISTRY

ELASTIC PROPERTIES, FLOW, ISOTROPISM, LIGHT SCATTERING, LIMITATIONS, LIQUID PHASES, MATHEMATICAL PREDICTION, METHODOLOGY, MOLECULES, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, OPTICS, RANGE(EXTREMES), RATES, REPRINTS, SHEAR PROPERTIES, STEADY STATE, THEORY, VISCOSITY.

(U) Rheological Properties of Nematic Solutions of Rodlike Polymers.

88

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A3, Nematic Solutions, Nematic Phase, Rodlike Polymers, Nematogens, Monodomain, Nonlinear Optics, Rheooptical Properties.

PERSONAL AUTHORS: Berry, Guy C.

CONTRACT NO. AFOSR-89-0125

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1003

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Mol. Cryst. Liquid Crystals, v165 p333-360 1988.

ABSTRACT: (U) It has long been known that solutions of nematic polymers exhibit peculiar flow behavior with increasing concentration  $c$  of the polymer as  $c$  is increased beyond the value  $c_{NI}$  required to form a nematic phase. For example, although a limiting viscosity  $\eta_{a0}$  is found under steady-state shear at small shear rate for  $c < c_{NI}$ , for  $c > c_{NI}$  the apparent viscosity seems to increase without limit as the deformation rate is reduced, being essentially a constant  $\eta_{aP}$  over a range of rates that are neither too slow nor too fast. The rheological properties of nematic solutions of rodlike polymers are discussed. Comparisons are made with the behavior of isotropic solution of rodlike polymers as well as that of small molecule nematogens. Evaluation of the Frank elastic constants and the Leslie-Ericksen viscosity coefficients by light scattering methods is discussed, along with theoretical prediction of the latter of rodlike systems. The nature of shear deformation over a wide range of shear rates is discussed in terms of possible flow instabilities revealed by rheological and rheo-optical observations. Keywords: Monodomain; Nonlinear optics; Reprints. (aw)

DESCRIPTORS: (U) LIQUID CRYSTALS, RHEOLOGY, SOLUTIONS(MIXTURES), POLYMERS, CONSTANTS, DEFORMATION.

AD A210 602

AD A210 602

UNCLASSIFIED

PAGE 111

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 601

7/6

7/4

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF CHEMISTRY

(U) Properties of Solutions of Rodlike Chains from Dilute Solutions to the Nematic State.

NOV 88 15P

PERSONAL AUTHORS: Berry, Guy C.

CONTRACT NO. AFOSR-89-0125

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1005

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings, Materials Research Society, Nov 88

ABSTRACT: (U) Certain aspects of the physical chemistry of solutions rodlike polymers are reviewed. The range of concentrations includes infinite dilution ( $e + a$ ), dilute solutions ( $E+Ac<1$ ), moderately concentrated solutions ( $1<E+Ac<E+Acn1$ ), and concentrated solutions ( $c>cn1$ ), where  $E+A$  is the intrinsic viscosity and  $cn1$  is the concentration required for a stable nematic phase. Studies of chain conformation are emphasized at infinite dilution, and rheological behavior is emphasized for more concentrated isotropic and nematic solutions. Both theoretical and experimental considerations are included. The physical chemistry of solutions of rodlike chains has received renewed attention since the discovery that synthetic polymers may be designed to adopt a rodlike configuration and form rematic liquid crystalline solutions. Some of the salient features of this work will be summarized in the following, with examples from the literature on theoretical and experimental studies. The concluding section will present a discussion of some unsolved problems. We will emphasize work on rodlike chains designed to exhibit a nematic mesophase in solution and high strength and modulus in the ordered solid processed from the mesophase. Keywords: Mesodomain; Nonlinear optics; Light scattering; Reprints; (aw)

AD-A210 601 CONTINUED

DESCRIPTORS: (U) \*DILUENTS, \*LIQUID CRYSTALS, \*POLYMERS, \*SOLUTIONS(MIXTURES), CHAINS, CONFORMITY, DILUTION, EXPERIMENTAL DATA, HIGH STRENGTH, ISOTROPISM, LIGHT SCATTERING, LIQUID PHASES, NONLINEAR SYSTEMS, OPTICS, PHASE, PHYSICAL CHEMISTRY, REPRINTS, RHEOLOGY, STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Rodlike Polymers, Nematic Phase, Mesophase, Mesodomain, Nonlinear Optics.

AD-A210 601

AD-A210 601

UNCLASSIFIED

PAGE 12

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 574 AD-A210 574 CONTINUED

AD-A210 574 12/5 23/3 5/8

NEW YORK UNIV MEDICAL CENTER NY COMPUTATIONAL  
NEUROSCIENCE LABS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A5.

(U) Cepstral Filtering on a Columnar Image Architecture: A  
Fast Algorithm for Binocular Stereo Segmentation.

DESCRIPTIVE NOTE: Final rept. 15 Sep 85-14 Sep 88.

MAY 89 21P

PERSONAL AUTHORS: Yeshurun, Yehezkel; Schwartz, Eric L.

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0966

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on Pattern  
Analysis and Machine Intelligence, 14p Jun 89.

ABSTRACT: (U) Preprints and reprints of journal articles  
comprise this report. Articles describe and implement  
novel techniques in Neurobiology, Differential Geometry,  
and Computer Vision. Some articles describe  
Neurobiological work on the use of metabolic markers to  
indicate coarse structural organization of visual cortex  
in mammals. Other articles describe algorithms for  
processing data from brain sections to obtain accurate 2D  
and 3D reconstruction of intact tissue. Another article  
presents a novel algorithm for projecting convoluted  
surfaces onto the plane (a solution to the map-makers  
problem). Other articles describe algorithms for visual  
stereo (determination of depth map) and scanning  
(redirection of optic axis) consistent with the  
neurobiology and psychophysics. Reprints. (RH).

DESCRIPTORS: (U) \*ALGORITHMS, \*COMPUTER GRAPHICS,  
\*NEUROBIOLOGY, \*PSYCHOPHYSICS, \*VISUAL CORTEX,  
ARCHITECTURE, BINOCULARS, BRAIN, DEPTH, DETERMINATION,  
DIFFERENTIAL GEOMETRY, IMAGES, MAMMALS, MAPS, MARKERS,  
METABOLISM, OPTICS, ORGANIZATIONS, PROCESSING, PRINTS,  
SEGMENTED, STRUCTURAL PROPERTIES.

AD-A210 574

AD-A210 574

UNCLASSIFIED

PAGE 113

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 549 AD-A210 549 CONTINUED

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF ELECTRICAL  
ENGINEERING AND COMPUTE R SCIENCES

AD-A210 549 9/1 20/12 20/6

(U) Studies of High Power Density, Pico-Second Rise-Time  
Light Activated Semiconductor Switch.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Dec 88.

DEC 88 107P

PERSONAL AUTHORS: Yu, Paul L.

CONTRACT NO. AFOSR-87-0351

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0993

IDENTIFIERS: (U) WUAFOSR2301A7, PE61102F.

DESCRIPTORS: (U) \*AVALANCHE EFFECT(ELECTRONICS), \*CHARGE  
CARRIERS, \*CURRENT DENSITY, \*ELECTRIC FIELDS, \*ELECTRIC  
SWITCHES, \*ELECTRICAL IMPEDANCE, \*OPTICAL PROPERTIES,  
\*PHOTODIODES, \*PIN DIODES, \*TRANSMISSION LINES, BEHAVIOR,  
BIAS, CIRCUITS, CONFIGURATIONS, CONSISTENCY, DIODES,  
DYNAMICS, ELECTRIC POWER, ENERGY, ENERGY LEVELS,  
EXCITATION, HIGH DENSITY, HIGH POWER, INPUT, INTERNAL,  
LOW LEVEL, MAXWELLS EQUATIONS, MULTIPLICATION, PROFILES,  
SWITCHES, THEORY, TRANSIENTS, TRANSPORT PROPERTIES.

UNCLASSIFIED REPORT

ABSTRACT: (U) The carrier dynamics of the diode which is related to its electrical power switching behaviors is investigated in this program. A model is developed where the carrier transport and Maxwell equations are incorporated and self-consistent electrical field profiles, current density and carrier are obtained in the PIN diode. Both low and high level optical excitations as well as low and high applied bias situations can be described by this model. The transient behavior of the diode switch at different optical energy levels is now well understood, while conventional theory for photodiodes at low level excitation and at low bias cannot be applied to cases for high level excitation and high bias. As a circuit element, the rise time of the switch under these circumstances depends on the time the internal field is cancelled out by mobile carriers generated. The predicted input energy dependence and the transmission line impedance dependence of the rise time compare well with experimental results. The model also suggests the experimental configuration for obtaining power in the GW range. Finally, a preliminary investigation is made on the effects of avalanche multiplication on the performance of the diode switch. (rh)

AD-A210 549

AD-A210 549

UNCLASSIFIED

PAGE 114

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 546 CONTINUED

AD-A210 546 7/6 11/9 20/11

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Picosecond Laser-Induced Transient Grating Probe of the Mechanical Properties of High-Modulus Poly(p-phenylenebenzobisoxazole-2,6-diyl),  
IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, Laser Induced Transient Grating Technique, Rigid Rod Polymers, Polybenzobisoxazole, Polyphenylenebenzobisoxazoles, Poly(p-Phenylenebenzobisoxazole-2-6-Diyl), Christoffel Equation.

89 6P

PERSONAL AUTHORS: Rao, D. N.; Pang, Yang; Burzynski, Ryszard; Prasad, Paras N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR TR-89-0823

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v22 n2 p985-989 1989.

ABSTRACT: (U) The picosecond laser-induced transient grating technique was used to determine the elastic constants of a predominantly uniaxial film of a rigid-rod polymer, poly(benzobisoxazole). By adjusting the grating angle, ultrasonic phonons in the frequency range 0.4-2 GHz were generated and their in-plane speed in various directions was measured. The speed was found to be independent of the phonon frequency in the range of frequency studied. The general Christoffel equation was used to fit the observed anisotropy of the acoustic velocity. This fit conveniently yielded various elastic moduli demonstrating the application of picosecond laser-induced transient grating methods for obtaining both longitudinal and shear components of elastic constants for an anisotropic medium. Reprints. (aw)

DESCRIPTORS: (U) \*GRATINGS(SPECTRA), \*MODULUS OF ELASTICITY, \*POLYMERIC FILMS, \*POLYPHENYLENES, \*BENZOXAZOLES, ACOUSTIC VELOCITY, ANGLES, ANISOTROPY, AXES, CONSTANTS, ELASTIC PROPERTIES, EQUATIONS, FILMS, FREQUENCY, FREQUENCY BANDS, LASERS, MECHANICAL PROPERTIES, METHODOLOGY, PHONONS, PROBES, REPRINTS, SHEAR PROPERTIES, TRANSIENTS, ULTRASONICS.

AD-A210 546

AD-A210 546

UNCLASSIFIED

PAGE 115

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 509 CONTINUED

CINCINNATI UNIV OHIO DEPT OF MICROBIOLOGY

(U) Surface Electrochemistry of Amino Acids; Voltammetry Assisted by EELS (Electron Energy-Loss Spectra), Auger and LEED.

88 10P

PERSONAL AUTHORS: Hubbard, Arthur T.; Frank, Douglas G.; Tarlov, Michael J.; Batina, Nicholas; Walton, Nicholas

CONTRACT NO. AFOSR-86-0200

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0998

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Redox Chemistry and Interfacial Behavior of Biological Molecules, p229-245 1988.

ABSTRACT: (U) Recent studies by means of thin-layer electrochemistry of the chemisorption at polycrystalline Pt of hydroquinone, catechol and more than 50 related compounds have revealed that a layer of oriented molecules is formed in virtually all instances. Variables affecting adsorbate orientation include: adsorbate molecular structure, adsorbate concentration, electrode potential, nature of the electrolyte anion, temperature, solvent and structure of the Pt surface. Adsorbate orientation strongly influences the course of electrocatalytic oxidation and reduction. The present work brings some advances in technique to bear on such studies: well-defined Pt(111) and Pt(100) surface were employed as substrates; surface molecular packing densities were measured by means of Auger spectroscopy (rather than by thin-layer voltammetry), thus extending the range of experimentation to include non-electroactive compounds and concentrations outside the range of adsorption measurements with thin-layer electrodes; much useful insight into the nature of the adsorbed species was obtained from electron energy-loss spectra (EELS) of the adsorbed layers. Reprints. (KT)

DESCRIPTORS: (U) \*AMINO ACIDS, \*ELECTROCHEMISTRY, \*SURFACE REACTIONS, ADSORPTION, ANIONS, AUGER ELECTRON SPECTROSCOPY, AUGERS, CHEMISORPTION, ELECTRODES, ELECTROLYTES, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, LAYERS, LOSSES, MEASUREMENT, MOLECULES, PACKING DENSITY, PHENOLS, REPRINTS, SUBSTRATES, SURFACES, THIN FILMS, VOLTAMMETRY.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A1, EELS(Electron Energy Loss Spectra).

AD-A210 509

AD-A210 509

UNCLASSIFIED

PAGE 116

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 493 5/8 5/7

AD-A210 493 CONTINUED

CHICAGO UNIV IL SPEECH RESEARCH LAB

(U) Attention and Vigilance in Speech Perception.

DESCRIPTIVE NOTE: Final rept. 1 Jul 87-31 Dec 88.

JUN 89 72P

PERSONAL AUTHORS: Nusbaum, Howard C.

CONTRACT NO. AFOSR-97-0272

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0963

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes research carried out in three related projects investigating the function and limitations of attention in speech perception. The projects were directed at investigating the distribution of attention in time during phoneme recognition, perceptual normalization of talker differences, and perceptual learning of synthetic speech. The first project demonstrates that in recognizing phonemes listeners attend to earlier and later phonetic context, even when that context is in another syllable. The second project demonstrated that there are two mechanisms underlying the ability of listeners to recognize speech across talkers. The first, structural estimation, is based on computing a talker-independent representation of each utterance on its own; the second, contextual tuning, is based on learning the vocal characteristics of the talker. Structural estimation requires more attention and effort than contextual tuning. The final project examined the attentional demands of synthetic speech and how they change with perceptual learning. The results demonstrated that the locus of attentional demands in perception of synthetic speech is in recognition rather than storage or recall of synthetic speech. Moreover, perceptual learning increases the efficiency with which listeners can use spare capacity in recognizing synthetic speech and this effect is not just due to increased intelligibility. Our results suggest that perceptual learning allows listeners

to focus on the relevant acoustic-phonetic properties of a particular, synthetic talker. (sdw)

DESCRIPTORS: (U) \*ATTENTION, \*PERCEPTION(PSYCHOLOGY), \*SPEECH RECOGNITION, \*VIGILANCE, AUDITORY PERCEPTION, CAPACITY(QUANTITY), DISTRIBUTION, ESTIMATES, HUMANS, INTELLIGIBILITY, LEARNING, LIMITATIONS, LOCUS, NORMALIZING(STATISTICS), PHONEMES, PHONETICS, RECALL, SPARE PARTS, SPEECH, STORAGE, STRUCTURAL PROPERTIES, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 456 5/8

AD-A210 400 20/5 7/4

CASE WESTERN RESERVE UNIV CLEVELAND OH DEPT OF PSYCHOLOGY

OHIO STATE UNIV COLUMBUS DEPT OF PHYSICS

(U) Models of Mental Functioning.

(U) International Symposium (43rd) on Molecular Spectroscopy Held in Ohio State University on 13-17 June 1988.

DESCRIPTIVE NOTE: Final rept. 15 Jun 87-14 Dec 88.

MAY 89 15P

DESCRIPTIVE NOTE: Final rept..

PERSONAL AUTHORS: Netterman, Douglas K.

JUN 88 213P

CONTRACT NO. AFOSR-87-0227

PERSONAL AUTHORS: Rao, K. N.

PROJECT NO. 2313

CONTRACT NO. AFOSR-86-0065

TASK NO. A7

PROJECT NO. 2310

MONITOR: AFOSR  
TR-9-0813

MONITOR: AFOSR  
TR-89-1009

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this research was to develop models of basic cognitive tasks developed in previous research. A model of choice reaction time was written in Simsript II.5 but development of this model made it clear that additional information was required before good models of basic cognitive tasks could be devised. Therefore, a number of experiments were conducted which were designed to provide the basic information needed. The experiments focused on several questions important to the construction of explicit models. Some of these questions were: How do subjects build mental models of instructions and to what extent do the goodness of these models affect subsequent performance? What aspects of stimulus structure are important in the encoding of the stimuli used in these tasks? Seven experiments addressing these issues were conducted. In general, results suggest that basic cognitive tasks are far more complex than had previously been thought. Keywords: Individual differences, Mental models, Cognition. (SDW)

DESCRIPTORS: (U) \*COGNITION, \*MENTAL ABILITY, ADDRESSING, CODING, INFORMATION SYSTEMS, INSTRUCTIONS, MODELS, REACTION TIME, STIMULI.

IDENTIFIERS: (U) WUAFOSR2313A7, PE61102F, Individual differences.

AD-A210 456

UNCLASSIFIED

AD-A210 400

PAGE 118

EV109K

UNCLASSIFIED REPORT

ABSTRACT: (U) The 43rd Symposium on Molecular Spectroscopy was convened at Ohio State University during the period 13-17 June 1988. Over 300 scientists attended, representing research organizations from the US and fourteen foreign countries. Topical areas included electronic characteristics of molecules, energy transfer, infrared and microwave spectra, molecular beams, vibrational analysis, and experimental techniques. (aw)

DESCRIPTORS: (U) \*ELECTRONIC STATES, \*ENERGY TRANSFER, \*MOLECULAR BEAMS, \*MOLECULAR SPECTROSCOPY, \*SYMPOMIA, \*MOLECULAR VIBRATION, EXPERIMENTAL DESIGN, FOREIGN, INTERNATIONAL, METHODOLOGY, MICROWAVES, MOLECULES, NATIONALS, SCIENTIFIC ORGANIZATIONS, SPECTRA, ELECTRON TRANSITIONS, INFRARED SPECTRA.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 366 9/1 10/4 20/3 20/13

AD-A210 364 7/3

CERAMPHYSICS INC WESTERVILLE OH

CORNELL UNIV ITHACA NY DEPT OF CHEMISTRY

(U) Capacitive Energy Storage at Cryogenic Temperatures. Phase 2.

(U) Methane and Benzene Activation via Transient (t-Bu<sub>3</sub>SiNH)Zr-NSi-t-Bu<sub>3</sub>.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 88.

88 4P

FEB 89 148P

PERSONAL AUTHORS: Cummins, Christopher G.; Baxter, Steven M.; Wolczanski, Peter T.

PERSONAL AUTHORS: Clark, C. F.

CONTRACT NO. F49620-86-C-0029

CONTRACT NO. AFOSR-87-0103

PROJECT NO. 3005

PROJECT NO. 2303

TASK NO. A1

TASK NO. B2

MONITOR: AFOSR TR-89-0995

MONITOR: AFOSR TR-89-0828

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary goal of this Phase II program was to improve the dielectric breakdown strength of ceramic multilayer capacitors (MLC's) in order to improve capacitive energy storage at liquid-nitrogen temperatures. A secondary goal was to explore the reproducibility of a field-enforced state-switching effect discovered in the Phase I program. The ceramic composition involved in these programs is designated as CPN17 and has a dielectric constant in the range 8,000-10,000 at 77 K. Several variations in conventional ceramic-processing parameters were studied, leading to systematic improvements in the breakdown strength at 77 K (180 to 250 to 400 kV/cm). (RH)

DESCRIPTORS: (U) \*BREAKDOWN(ELECTRONIC THRESHOLD), \*CERAMIC CAPACITORS, \*CERAMIC MATERIALS, \*CRYOGENICS, \*DIELECTRIC PROPERTIES, \*DIELECTRIC STRENGTH, \*ENERGY STORAGE, CONSTANTS, LAYERS, LIQUID NITROGEN, LOW TEMPERATURE, REPRODUCIBILITY, TEMPERATURE.

IDENTIFIERS: (U) WUAFOSR3005A1, PEB1102F.

AD-A210 366

UNCLASSIFIED

PAGE 119 EVI09K

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v110 p8731-8733 1988.

ABSTRACT: (U) Over the past decade, the activation of carbon-hydrogen bonds by transition-metal complexes has undergone intense investigation. Alkane dehydrogenations, discrete RH oxidative additions, free-radical processes, and Sigma-bond metatheses comprise most of the reactivity investigated. Reactions of alkanes with multiply bonded functionalities are rare yet constitute an important class of transformations related to the partial oxidation or functionalization of unactivated C-H bonds. During the course of assessing the utility of t-Bu<sub>3</sub>SiNH- as an ancillary ligand related to t-Bu<sub>3</sub>SiO- (Silox), a mode of intermolecular C-H activation involving addition across a transient zirconium imide was discovered. Treatment of Zirconium tetrachloride with 3 equiv of t-Bi<sub>3</sub>SiNHLi, prepared from n-BuLi and t-Bu<sub>3</sub>SiNH<sub>2</sub>, resulted in the formation of (t-Bu<sub>3</sub>SiNH)ZrCl (1, eq 1) in 88% yield. Alkylation of 1 with appropriate Grignard reagents yielded white crystals of the methyl, phenyl, and cyclohexyl (Cy) derivatives, (t-Bu<sub>3</sub>SiNH)ZrR (R = Me Reprints. (aw)

DESCRIPTORS: (U) \*BENZENE, \*METHANE, \*ZIRCONIUM COMPOUNDS, \*METAL COMPLEXES, \*CHEMICAL REACTIONS, ACTIVATION, ALKANES, CARBON, CHEMICAL BONDS, FREE

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 364 CONTINUED

AD-A210 363 7/6 7/4 7/5 20/3  
20/6

RADICALS, GRIGNARD REAGENTS, HYDROGEN, IMIDES, INTENSITY, OXIDATION, REACTIVITIES, REPRINTS, TRANSFORMATIONS, TRANSIENTS, TRANSITION METAL COMPOUNDS, BUTYL RADICALS, SILICON COMPOUNDS.

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Picosecond Degenerate Four-Wave Mixing Study of Nonlinear Optical Properties of the Poly-N-Vinyl Carbazole; 2,4,7-Trinitrofluorenone Composite Polymer Photoconductor.

IDENTIFIERS: (U) PE6110ZF, WUAFOSR2303B2, Carbon Hydrogen Bonds, Dehydrogenation, Zirconium Tetrachloride, Alkylation.

MAY 89 5P

PERSONAL AUTHORS: Ghoshal, Sunil K.; Chopra, Pratibha; Singh, Bhanu P.; Swiatkiewicz, Jacek; Prasad, Paras N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0822

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90 n9 p5078-5081, 1 May 89.

ABSTRACT: (U) The role of charge carriers in determining optical nonlinearities in inorganic semiconductors and photoconductors has been widely investigated. An evaluation of optical nonlinearities derived from charge carriers in organic semiconductors and photoconductors is lacking. Our initial motivation for the present work was to assess the contributions to  $\chi^{(3)}$  derived from charge carrier dynamics in organic systems. For our study of third-order optical nonlinearity in an organic photoconductor, we have chosen poly-N-vinyl carbazole (PVK) as the photosystem which has been widely studied. Resonant third-order nonlinear optical susceptibility  $\chi^{(3)}$  of poly-vinyl-n-carbazole; 2,4,7-trinitrofluorenone composite polymer photoconductor has been measured at 602 nm for various compositions by a picosecond degenerate four-wave mixing. The origin of effective third order nonlinearity of this system is attributed to the charge-transfer excitation which creates thermalized correlated electron-hole pairs. The optical nonlinearity of this polymeric system is characterized by a long relaxation time of hundreds of picoseconds. A progressive

AD-A210 364

AD-A210 363

UNCLASSIFIED

PAGE 120

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 363 CONTINUED

AD-A210 355 20/4 20/13

enhancement of the signal intensity and hence effective X(3) accompanied by an increase in the decay rate of the degenerate four-wave mixing signal has been observed with an increase in the mole fraction of trinitrofluorenone. Reprints. (AW)

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Separated Flows, Turbulence Production Mechanisms and Free Shear Layers.

DESCRIPTIVE NOTE: Final rept. 1 Dec 73-30 Nov 78.

DESCRIPTORS: (U) \*PHOTOCONDUCTORS, \*FLUOROPOLYMERS, CHARGE CARRIERS, DECAY, DYNAMICS, ELECTRONS, HOLES(ELECTRON DEFICIENCIES), INORGANIC MATERIALS, INTENSITY, LONG RANGE(TIME), MOTIVATION, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, ORGANIC MATERIALS, RATES, RELAXATION TIME, REPRINTS, SEMICONDUCTORS, SIGNALS, VINYL RADICALS, HOLES(ELECTRON DEFICIENCIES), COMPOSITE MATERIALS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3, \*Trinitrofluorenones, Fluorenone/2-4-7-Trinitro, Polyvinyl Carbazoles, Poly-N-Vinyl Carbazole, \*Nonlinear Optical Properties, Four Wave Mixing.

JAN 79 38P

PERSONAL AUTHORS: Kline, S. J.; Ferziger, J. H.

CONTRACT NO. F44620-74-C-0016

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR TR-89-0986

UNCLASSIFIED REPORT

ABSTRACT: (U) The work forms part of an integrated, long-term program in complex turbulent flows and related convection heat transfer. A very large fraction of all difficulties in complex turbulent flow fields arises from lack of the ability to predict the behavior of two phenomena: turbulence and flow separation. Ongoing research included work on the following topics: experimental studies of fundamental flow physics; development of computational models and programs at several levels of complexity; Development of design data and design procedures for some technologically critical applications; production of data and computational methods for flow over curved surfaces with blowing and suction; development of instruments and instrument procedures pertinent to these tasks. Usually, several phases of research on each topic have been progress. Applied problems of special interest to DOD include diffusers for both combustors and after-turbine sections in jet engines, flight vehicle inlets, cooling of high-temperature turbine blades, and coordination of an international effort to confront computational procedures in complex turbulent flows with carefully screened data of a wide variety. Many commercial applications also exist. (jhd)

DESCRIPTORS: (U) FLOW SEPARATION, JET ENGINE INLETS.

AD-A210 363

AD-A210 355

UNCLASSIFIED

PAGE 121 EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 355 CONTINUED

AD-A210 346 12/7

\*TURBULENT FLOW, COMBUSTORS, COMPUTATIONS, CONVECTION(HEAT TRANSFER), COOLING, CURVATURE, DIFFUSERS, EXPERIMENTAL DATA, FLOW FIELDS, HIGH TEMPERATURE, INSTRUMENTATION, JET ENGINES, LAYERS, LONG RANGE(TIME), MATHEMATICAL MODELS, NUMERICAL METHODS AND PROCEDURES, SHEAR PROPERTIES, SURFACES, TURBINE BLADES, TURBULENCE.

KESTREL INST PALO ALTO CA

(U) Finding Efficient Pipelining in Concurrent Structures.

DESCRIPTIVE NOTE: Final rept. 15 Jan-14 Dec 86.

JAN 88 54P

IDENTIFIERS: (U) WUAFOSR2307A4, PE61102F.

PERSONAL AUTHORS: King, Richard M.

REPORT NO. KES-U-88-2

CONTRACT NO. F49620-85-C-0015

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR, AFOSR  
TR-89-0212, FR-87-1

UNCLASSIFIED REPORT

ABSTRACT: (U) The focus of our research is the production of concurrent systems from First Order Logic specifications. As we have seen in past years, first order logic is a natural means of specification, especially if we intend to synthesize concurrent computing systems; from these specifications, because it describes the relationship between input and output precisely without making any commitment as to how a satisfying output is to be achieved given an input. In our conception of the synthesis process, the user is asked to specify only that information that allows a system satisfying the user's needs to be distinguished from one that does not by a formal specification of its behavior. From this information, a system that satisfies the specification may be generated using our synthesis techniques. Keywords: Concurrency; Pipelining; Multiprocessors; Multi-processor synthesis; Communication networks. (JES)

DESCRIPTORS: (U) \*COMMUNICATIONS NETWORKS, COMPUTATIONS, DUAL MODE, LOGIC, MULTIPROCESSORS, PRODUCTION, SPECIFICATIONS, STRUCTURES, SYNTHESIS, USER NEEDS.

IDENTIFIERS: (U) WUAFOSR2304A5, PE61102F.

AD-A210 355

AD A210 346

UNCLASSIFIED

PAGE 122

EV109K

UNCLASSIFIED

AD-A210 341 9/1 20/12 12/1 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

POLYTECHNIC UNIV FARMINGDALE NY WEBER RESEARCH INST

(U) Physics of High Energy Photoconductive Switches.  
DESCRIPTIVE NOTE: Final technical rept. 1 Aug 85-30 Sep 88.

JUN 89 25P

PERSONAL AUTHORS: Kunhardt, Erich E.

CONTRACT NO. AFOSR-85-0249

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0994

UNCLASSIFIED REPORT

ABSTRACT: (U) During this funding period, a semi-classical macro-kinetic theory that describes the dynamic behavior of carriers in a semiconductor under the influence of space-time varying fields has been formulated. The macro-kinetic model is considerably easier to implement numerically than Monte Carlo methods or those based on the Boltzmann Transport Equation (BTE). Moreover, the macro-kinetic model requires orders of magnitude less computer time to run. A Monte Carlo method has been developed for obtaining the electron energy distribution, transport parameters, and rate coefficients in multi-valley semiconductors. The procedure requires an order of magnitude less time than conventional Monte Carlo techniques. (rh)

DESCRIPTORS: (U) \*BOLTZMANN EQUATION, \*ELECTRIC SWITCHES, \*ELECTRON ENERGY, \*PHOTOCONDUCTIVITY, \*TRANSPORT PROPERTIES, COEFFICIENTS, COMPUTERS, DISTRIBUTION, ELECTRONS, HIGH ENERGY, MONTE CARLO METHOD, PARAMETERS, PHYSICS, RATES, SPACE PERCEPTION TIME, TRANSPORT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

AD A210 341

UNCLASSIFIED

PAGE 123

EV1091

AD-A210 340 7/3

BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 86.  
Alkylidyne(Carborane)Molybdenum-Gold, -Rhodium and Iron Complexes; Crystal Structure of (NEt4)(MoFe2(mu3-CC6H4Me-4) (mu-Sigma: Sigma: Eta 5 - C2B9H7Me2)(CO)8).

89 13P

PERSONAL AUTHORS: Devore, David D.; Emmerich, Christiane; Howard, Judith A.; Stone, F. G.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0791

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society. p797-807 1989.

ABSTRACT: (U) The alkylidyne-molybdenum complex (NEt4)(Mo triple bonded CC6H4M3-4) (CO) (P(OMe)3) eta 5-C2B9HgMe2)) has been prepared, and used to prepare compounds with bonds between molybdenum and gold, rhodium, and iron: (MoAu(mu-CC6H4Me-4) (CO) (P(OMe)3) (PPh3) (eta 5-C2B9HgMe2)), (MoRh(mu-CC6H4Me-4) (mu-CO) - (P(OMe)3) (PPh3)2 (eta 5-C2B9HgMe2)), and (NEt4) (MoFe2(mu3-CC6H4Me-4) (mu-sigma: sigma' :eta 5-C2B9H7Me2) (CO)8). The structure of the latter has been established by x-ray diffraction. In the anion a triangle of metal atoms is symmetrically capped on one side by the alkylidyne ligand. On the other side of the triangle the molybdenum atom is eta 5-ligated by the C2B9 cage, but two boron atoms in the pentagonal face are sigma bonded to the two iron atoms. The molybdenum carries two carbonyl groups and each of the iron atoms is bonded by three ligands. The reaction between (Fe2(CO)9) and (NEt4) (Mo(triple bonded CC6H4Me-4) (CO) (P(OMe)3) (eta 5-C2B9HgMe2)) also affords the novel mononuclear molybdenum compound (NEt) (Mo(sigma: eta 5-CH(C64Me-4)C2B9H8Me2)(CO)3). Reprints (av)

AD A210 340

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 340 CONTINUED

AD-A210 336 9/5 11/9 7/6 7/3  
20/6

DESCRIPTORS: (U) \*CARBENES, \*CRYSTAL STRUCTURE, \*GOLD  
COMPOUNDS, \*IRON COMPOUNDS, \*METAL COMPLEXES, \*MOLYBDENUM  
COMPOUNDS, \*RHODIUM COMPOUNDS, ATOMS, CHEMISTRY, LIGANDS,  
METALS, REPRINTS, SIDES, TRIANGLES, X RAY DIFFRACTION,  
ORGANOMETALLIC COMPOUNDS, CHEMICAL BONDS.

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Ultrafast Third-Order Non-Linear Optical Processes in  
Polymeric Films.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, \*Carbynes,  
Alkylidyne Carboranes.

89 15P

PERSONAL AUTHORS: Prasad, Paras M.

CONTRACT NO. F49620-87-C-0042, NSF-DMR87-15688

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0824

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Nonlinear Optical Effects in  
Organic Polymers, p351-363 1989.

ABSTRACT: (U) This paper includes selective results from  
our comprehensive program in nonlinear optical effects in  
organic molecules and polymers. The focus of our study  
has been on the third order effect. We have calculated  
microscopic nonlinearities of organic molecules in  
several series of conjugated structures using ab-initio  
SCF approach coupled with the finite field method. The  
effects of increase in the pi-electron conjugation length  
and molecular conformation, as well as the heavy atom  
effect and the role of substituents have been  
investigated in order to derive an understanding of  
molecular structure-property relation so that structural  
parameters associated with enhanced optical  
nonlinearities can be identified. This theoretical study  
has been complemented with the measurements of optical  
nonlinearities in subsequently built and systemically  
derivatized structures. (Reprint)

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*POLYMERIC FILMS,  
\*ORGANIC COMPOUNDS, ATOMS, MICROSCOPY, MOLECULAR  
STRUCTURE, MOLECULES, NONLINEAR SYSTEMS, ORGANIC  
COMPOUNDS, PARAMETERS, POLYMERS, REPRINTS, STRUCTURAL  
PROPERTIES, MOLECULAR PROPERTIES, HIGH VELOCITY.

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AD-A210 336

UNCLASSIFIED

PAGE 124

LVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 336 CONTINUED

AD-A210 334 20/5 7/4

IDENTIFIERS: (U) PEG1102F, WUAF0SR2303A3, \*Nonlinear  
Optical Processes, Ultrafast, Third Order Effect,  
Electron Conjugation, Molecular Conformation.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY  
(U) Dynamics of Flexible Triplet Biradicals.

DESCRIPTIVE NOTE: Rept. for 1987-1988.

JUN 89 8P

PERSONAL AUTHORS: Doubleday, Charles, Jr.; Turro,  
Nicholas J.; Wang, Jin Feng

CONTRACT NO. AFOSR-88-0043, NSF-CHE84-21140

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0922

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Accounts of Chemical Research,  
v22 n6 p199-205 Jun 89. Sponsored in part by Grant NSF-  
CHE87-22164.

ABSTRACT: (U) Through a combination of product studies,  
isotope effects, and transient absorption kinetics  
including the effect of biradical chain length and  
substituent, solvent, temperature, and magnetic field, we  
have made progress in elucidating the relation of the  
rates and product distributions to the spin interactions  
in the biradicals. Probably the most surprising result is  
the profound effect exerted by extremely small  
interactions such as the S-T gap, SOC, and HFC upon the  
dynamics and product distribution of triplet biradicals  
Keywords: Electron spin; Magnetic field; Magnetic isotope  
effects. Reprints.

DESCRIPTORS: (U) \*SPIN STATES, \*ATOMIC SPECTROSCOPY,  
\*EMISSION SPECTRA, \*ISOTOPE EFFECT, RADIATION ABSORPTION,  
DYNAMICS, ELECTRONS, INTERACTIONS, KINETICS, MAGNETIC  
FIELDS, MAGNETIC PROPERTIES, REPRINTS, TRANSIENTS

IDENTIFIERS: (U) Triplet Spectra, PEG1102F,  
WUAF0SR2303B2

AD A210 336

AD A210 334

UNCLASSIFIED

PAGE 125

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 333 CONTINUED

AD-A210 333 6/4 12/5

NEW YORK UNIV N Y

(U) Computer-Aided Neuroanatomy: Differential Geometry of Cortical surfaces and an Optimal Flattening Algorithm.

MAR 86 11P

PERSONAL AUTHORS: Schwartz, Eric L.; Merker, Bjorn

CONTRACT NO. AFCSR-85-0341, F49620-83-C-0108

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0967

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Computer Graphics and Applications, p38-40 Mar 86. Sponsored in part by Grant NSF-DCR82-03979. Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) In this article we review several computer graphics and image processing applications that help us understand the architecture of monkey and human visual cortex. Two general areas are covered. First, computer graphics methods can be used to simulate the patterns of activity that would occur at various levels of the nervous system as a result of the presence of a particular image on the retina. Current understanding of brain architecture is sufficiently advanced to make this a useful exercise. Simulations of several aspects of visual cortex architecture, using real images, are presented. Second, the technical aspects of studying brain architecture involve the reconstruction of patterns of architecture from serial sections. Computer graphics and image processing techniques can make a major contribution to this area by providing methods of reconstructing the three-dimensional surfaces derived from large numbers of serial sections, and also by providing flattened versions of these surfaces. We have termed this area of application computer aided anatomy. We illustrate this methodology by demonstrating an algorithm we have developed that flattens a 3D reconstruction of the opercular surface of monkey striate

cortex while optimally preserving the metric structure of the original neural surface. As a first step in this work, we have measured the mean and Gaussian curvature at each point of the opercular surface of macaque striate cortex. Reprints. (aw)

DESCRIPTORS: (U) \*ALGORITHMS, \*ANATOMY, \*COMPUTER GRAPHICS, \*IMAGE PROCESSING, \*VISUAL CORTEX, \*COMPUTERIZED SIMULATION, ARCHITECTURE, BRAIN, COMPUTER AIDED DESIGN, COMPUTER APPLICATIONS, DIFFERENTIAL GEOMETRY, HUMANS, IMAGES, MACAQUE MONKEYS, MONKEYS, NERVOUS SYSTEM, NEUROLOGY, PATTERNS, REPRINTS, RETINA, SURFACES, THREE DIMENSIONAL, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, \*Neuroanatomy, Optimal Flattening Algorithm, Striate Cortex, Gaussian Curvature, Reconstruction, Flat models.

AD A210 333

AD-A210 333

UNCLASSIFIED

PAGE 126

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 326 CONTINUED

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Comparison of the Voltammetric Behavior of Adsorbed or Dissolved Unsaturated Alcohols at Vacuum-Annealed and Electrochemically Cycled Pt(111) and Pt(Polycrystalline) Electrodes,

89 11P

PERSONAL AUTHORS: Batina, Nikola; Kahn, Bruce E.; Lin, Chiu-Hsun; McCargar, James W.; Salaita, Ghaleb N.

CONTRACT NO. AFOSR-86-0200

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0997

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Electroanalysis, v1 p213-221  
1989

ABSTRACT: (U) Recent investigations of unsaturated alcohols have focused upon the characterization of molecular layers adsorbed from both aqueous solutions and the neat liquids at Pt(111). The mode of surface attachment was deduced by surface vibrational studies (electron energy-loss spectroscopy, EELS), molecular packing density and elemental composition data (Auger spectroscopy), and electrochemical reactivity (cyclic voltammetry and chronocoulometry). The subject unsaturated alcohols were found to form chemisorbed layers by attachment through the unsaturated moiety. Comparison of the reaction energetics, kinetics, and stoichiometry of the adsorbed layers with the behavior of the same compounds in aqueous solution provides an immediate indication of the extent to which the electrochemical reactivity of dissolved unsaturated alcohols resembles the reactivity of the adsorbed intermediates. The present studies compare the voltammetric behavior of dissolved and adsorbed unsaturated alcohols (alkenes, alkynes, and aromatics) on electrochemically cycled and UHV-annealed Pt(111) surfaces. Also included are voltammetric scans of the

adsorbed alcohol; at Pt(polycrystalline) (Pt(poly)). Adsorption of the subject unsaturated aliphatic alcohols in this study from dilute aqueous solutions indicates the adsorption of a substantial amount of CO. Keywords: Electrochemistry; Reprints. (KT)

DESCRIPTORS: (U) \*ELECTRODES, \*SURFACE REACTIONS, \*ELECTROCHEMISTRY, ADSORPTION, ALKENES, ALKYNES, AROMATIC COMPOUNDS, ATTACHMENT, PLATINUM, ALCOHOLS, AUGER ELECTRON SPECTROSCOPY, CHRONOMETERS, COULOMETERS, CYCLES, DILUENTS, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, ENERGETIC PROPERTIES, LAYERS, LOSSES, MOLECULAR PROPERTIES, MOLECULES, PACKING DENSITY, REACTIVITIES, REPRINTS, RESPONSE, SOLUTIONS(MIXTURES), STOICHIOMETRY, SURFACES, VIBRATION, VOLTAMMETRY, WATER.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1 Pt 111.

AD A210 326

AD A210 326

UNCLASSIFIED

PAGE 127

LVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

AD-A210 325 9/1

AD-A210 325 CONTINUED

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Structure and Composition of Pt(111) and Pt(100) Surfaces as a Function of Electrode Potential in Aqueous Sulfide Solutions.

89

7P

DESCRIPTORS: (U) \*ELECTRODES, \*ELECTRON DIFFRACTION, \*ELECTRON ENERGY, \*VIBRATIONAL SPECTRA, ADSORPTION, AUGER ELECTRON SPECTROSCOPY, AUGERS, COULOMETERS, DESORPTION, DIFFUSION, ELECTRON SPECTROSCOPY, INTENSITY, LAYERS, LINE SCANNING, LOSSES, LOW ENERGY OXIDATION, PEAK VALUES, REACTIVITIES, SOLUTIONS(MIXTURES), STRUCTURAL PROPERTIES, SULFIDES, SURFACE ANALYSIS, SURFACES, VOLTAMMETRY, WATER.

PERSONAL AUTHORS: Batina, Nikola; McCargar, James W.; Salaita, Ghaleb N.; Lu, Frank; Laguren-Davidson, Laarni

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1.

CONTRACT NO. AFOSR-86-0200

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0996

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Langmuir, v5 n1 p123-128 1989.

ABSTRACT: (U) Studies are reported in which surface layers formed by immersion of well-defined Pt(111) and Pt(100) electrode surfaces into aqueous Na<sub>2</sub>S solutions were characterized with regard to structure, composition, and reactivity by means of low-energy electron diffraction (LEED), Auger electron spectroscopy, electron energy-loss spectroscopy (EELS), linear scan voltammetry, and coulometry. Voltammetry reveals that only oxidative desorption of S occurs on the Pt surfaces; no S reductive desorption is observed over the useful potential range. Combined surface analysis data (Auger), vibrational spectra (EELS), and structural data (LEED) permit identification of adsorbed layer composition and structure on Pt(111) and Pt(100) surfaces as a function of potential. The best clarity of the LEED patterns is found at pH 9. Potentials more positive than 0.0 V give rise to increasingly diffuse intensity related to oxidative desorption of S. Voltammograms for oxidative adsorption of S from both surfaces are markedly different, indicating different mechanisms of S oxidation at the two surfaces: at pH 9, four voltammetric peaks are present for S at the Pt(111) surface, compared with only one peak for the Pt(100) surface. (jes)

AD-A210 325

AD-A210 325

UNCLASSIFIED

PAGE 128

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 317 CONTINUED

STANFORD UNIV CA DEPT OF AERONAUTICS AND ASTRONAUTICS

SYSTEMS, CURVATURE, FLIGHT, FLUTTER, HARMONICS,  
AERODYNAMIC LIFT, LIGHTWEIGHT, LINEARITY, MOTION,  
NONLINEAR SYSTEMS, OPTIMIZATION, OSCILLATION  
SOLUTIONS(GENERAL), STABILITY, STRUCTURAL PROPERTIES,  
THEORY, TRANSIENTS, TRANSONIC FLOW, VEHICLES, VELOCITY,  
VIBRATION, WINGS.

(U) Unsteady Gas Dynamics Problems Related to Flight  
Vehicles.

DESCRIPTIVE NOTE: Final rept. 1 Apr 74-31 Mar 79,

MAY 79 18P

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A1.

PERSONAL AUTHORS: Ashley, Holt

CONTRACT NO. AFOSR-74-2712

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-89-0890

UNCLASSIFIED REPORT

ABSTRACT: (U) Report summarizes the findings of a five-year program devoted to improving fundamental knowledge on unsteady aerodynamic phenomena related to flight vehicles and on associated aeroelastic problems. With regard to minimum-weight structural optimization with aeroelastic constraints, both new results and new methods of solution for free and forced motion were published. The effect of chordwise-force components on flutter of large aspect ratio wings proved often to be unfavorable. Improved steady and unsteady theories were published for the loading of vertical-axis wind turbines, and discoveries were made regarding free vibration of their curved blades. It was learned how to adapt linear theory for simple harmonic oscillation to cover arbitrary small motion, with applications to automatic control. A nonlinear approach was published for transient lifting airloads at low speeds. A study was undertaken on aerodynamics useful for the analysis of variable-geometry propulsive devices. An approximate scheme was devised for highlighting the importance of partial-chord shocks for transonic aeroelastic stability, their influence proving often large and unfavorable. (jhd)

DESCRIPTORS: (U) +AERODYNAMIC LOADING, +AERODYNAMIC STABILITY, +AEROELASTICITY, +UNSTEADY FLOW, AERODYNAMICS, ASPECT RATIO, AUTOMATIC, TURBINE BLADES, FLIGHT CONTROL

AD-A210 317

AD-A210 317

UNCLASSIFIED

PAGE 129

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

AD-A210 313 7/1

AD-A210 307 11/6

GEORGETOWN UNIV WASHINGTON DC DEPT OF CHEMISTRY

SRI INTERNATIONAL MENLO PARK CA

(U) Evaluation of Chemical Research Relevant to Current and Projected U.S. Air Force Interests.

(U) Influence of Microstructure and Microdamage Processes on Fracture at High Loading Rates.

DESCRIPTIVE NOTE: Final rept. 1 Jul 75-1 Jul 79,

DESCRIPTIVE NOTE: Final rept. 1 Feb 86-30 Sep 88,

JUL 79 2P

JUN 89 48P

PERSONAL AUTHORS: Earley, Joseph E.

PERSONAL AUTHORS: Giovanola, J. H.; Kloop, R. W.; Simons, J. W.; Kobayashi, T.; Shockey, D. A.

CONTRACT NO. F44620-75-C-0001

PROJECT NO. 2303

REPORT NO. TR-90

TASK NO. A1

CONTRACT NO. F49620-86-K-0010

MONITOR: AFOSR TR-89-0883

PROJECT NO. 2306

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-89-0992

ABSTRACT: (U) The main activity carried out under this contract has been to evaluate research proposals submitted to the Directorate of Chemical Sciences, AFOSR. This has been carried out by expert scientists, both from Georgetown University faculty and from other university, industry and government laboratories. Eleven main meetings have been held to discuss evaluations of research proposals and also other portions of the AFOSR program. About sixteen university and industrial scientists and ten or more Air Force scientists attended each meeting (see table below). Detailed evaluations of all proposals were provided in written form. (JES)

DESCRIPTORS: (U) \*CHEMISTRY, \*SCIENTISTS, AIR FORCE, INDUSTRIES, INSTRUCTORS, LABORATORIES, SYMPOSIA, UNIVERSITIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1.

AD-A210 313

UNCLASSIFIED

UNCLASSIFIED REPORT

ABSTRACT: (U) The objectives of this three-year program were to establish how microstructure and loading rate influence the fracture behavior of Ti-10V-2Fe-3Al, a promising advanced titanium alloy increasingly used in aircraft structural components, and to relate the macroscopic fracture toughness results to microdeformation and microdamage processes with a view toward developing microstructurally based fracture models. Such models are desirable to develop compositions and processing conditions resulting in optimum mechanical properties. Titanium alloy; Loading rate; Microdeformation; Microstructures; Microdamage; Microstructure models; Fracture behavior. (JES)

DESCRIPTORS: (U) \*AIRCRAFT EQUIPMENT, \*AIRFRAMES, \*ALLOYS, \*MICROSTRUCTURE, \*TITANIUM ALLOYS, FRACTURE(MECHANICS), MECHANICAL PROPERTIES, MODELS, OPTIMIZATION, PROCESSING, RATES.

IDENTIFIERS: (U) WUAFOSR2306A1, LPN-SRI-PYU-1750, PE61102F.

AD-A210 307

PAGE 130

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 302 12/5

AD-A210 302 CONTINUED

QUALCOMM INC SAN DIEGO CA

(U) Research in Mathematics and Computer Science:  
Calculation of the Probability of Undetected Error for  
Certain Error Detection Codes. Phase 1.

All possible generator polynomial corresponding to 8 and  
16 parity bits and some of the generator polynomials  
corresponding to 24 and 32 parity bits were tested. (KR)

DESCRIPTORS: (U) \*ERROR DETECTION CODES, ALGORITHMS,  
CHANNELS, COMMUNICATION AND RADIO SYSTEMS, COMPUTATIONS,  
COMPUTERS, EFFICIENCY, ERROR CORRECTION CODES,  
OPERATIONAL EFFECTIVENESS, ERRORS, GENERATORS, LENGTH,  
MATHEMATICS, POLYNOMIALS, PROBABILITY, REDUCTION,  
TRANSMITTANCE, VALUE.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 88-31 Jan  
89.

MAR 89 60P

PERSONAL AUTHORS: Wolf, Jack K.; Fredrickson, Lyle J.;  
Viterbi, Andrew J.

IDENTIFIERS: (U) PE61102F, WUAFOSR3005A1.

CONTRACT NO. F49620-88-C-0088

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0841

UNCLASSIFIED REPORT

ABSTRACT: (U) Cyclic redundancy check codes (or CRC codes) have become the standard means for insuring the integrity of messages that have been transmitted over a noisy communications channel. The sole purpose of these codes is to detect transmission errors (in contrast to error correction codes (or ECC codes) which attempt to correct transmissions in errors). Sometimes both CRC and ECC codes are utilized and in that case the burden is on the CRC code to detect errors that were not correctly decoded by the ECC code. Unfortunately, even the very best CRC codes cannot detect all transmission errors. The probability of CRC failure is called the probability of undetected error. The thrust of this study was concerned with finding an efficient method of calculating this probability of undetected error and then to use this method to find good (or even the best) CRC codes. A new algorithm was implemented to find good choices for the generator polynomial of CRC codes, that is, generator polynomials for which the probability of undetected error was less than a given bound for all shortened block lengths and for all values of the binary symmetric channel error rate. Results are given for generator polynomials corresponding to 8, 16, 24 and 32 parity bits.

AD-A210 302

AD-A210 302

UNCLASSIFIED

PAGE 131

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 298 9/5

AD-A210 290 7/4 7/3

MINNESOTA MINING AND MFG CO ST PAUL SCIENCE RESEARCH LAB

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Applications Requirements for Nonlinear-Optical Devices and the Status of Organic Materials.

(U) Intramolecular Energy Transfer and Mode-Specific Effects in Unimolecular Reactions of 1,2-Difluoroethane,

APR 89 9P

PERSONAL AUTHORS: Boyd, G. T.

JUN 89 10P

CONTRACT NO. F49620-88-C-0008

PERSONAL AUTHORS: Raff, Lionel M.

CONTRACT NO. AFOSR-89-0085

PROJECT NO. 0812

PROJECT NO. 2303

TASK NO. J1

TASK NO. B3

MONITOR: AFOSR  
TR-89-0802

MONITOR: AFOSR  
TR-89-1002

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society of America B, v6 n4 p685-692 Apr 89.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90 n11 p6313-6319, 1 Jun 89.

ABSTRACT: (U) The materials requirements for nonlinear optical applications, including electrooptics, second harmonic generation, and all optical signal processing, are discussed. The status of organic materials is reviewed in light of these requirements, along with the needs for future research. Keywords: Nonlinear optics; Electrooptics; Second harmonic generation; All optical signal processing; Reprints. (JHD)

ABSTRACT: (U) The unimolecular decomposition reactions of 1,2-difluoroethane upon mode-specific excitation to a total internal energy of 7.5 eV are investigated using classical trajectory methods and a previously formulated empirical potential-energy surface. The decomposition channels for 1,2-difluoroethane are, in order of importance, four-center HF elimination, C-C bond rupture, and hydrogen-atom dissociation. This order is found to be independent of the particular vibrational mode excited. Neither fluorine-atom nor F2 elimination reactions are ever observed even though these dissociation channels are energetically open. For four-center HF elimination, the average fraction of the total energy partitioned into internal HF motion varies between 0.115-0.181 depending upon the particular vibrational mode initially excited. The internal energy of the fluoroethylene product lies in the range 0.716-0.776. Comparison of the present results with those previously obtained for a random distribution of the initial 1,2-difluoroethane internal energy shows that numerous mode-specific effects are present in these reactions in spite of the fact that intramolecular energy transfer rates for this system are 5.88-25.5 times faster than any of the unimolecular reaction rates. Mode-specific excitation always leads to a total decomposition

DESCRIPTORS: (U) \*OPTICAL CIRCUITS, \*ELECTROOPTICS, HARMONIC GENERATORS, NONLINEAR SYSTEMS, OPTICAL PROCESSING, OPTICAL PROPERTIES, REPRINTS, REQUIREMENTS, SIGNAL PROCESSING.

IDENTIFIERS: (U) Second Harmonic Generation, PE61102F, WUAFOSRD812J1.

AD-A210 298

AD-A210 290

UNCLASSIFIED

PAGE 132

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 270 CONTINUED

AD-A210 252 20/4 1/1

rate significantly larger than that obtained for a random distribution of the internal energy. Excitation of different 1,2-difluoroethane vibrational modes is found to produce as much as a 51% change in the total decomposition rate. Reprints. (aw)

DESCRIPTORS: (U) \*ENERGY TRANSFER, \*FLUORINATED HYDROCARBONS, \*ETHANES, \*CHEMICAL REACTIONS, CHANNELS, DECOMPOSITION, CHEMICAL DISSOCIATION, DISTRIBUTION, ENERGY, ETHYLENES, FLUORINE COMPOUNDS, INTERNAL, MOLECULAR PROPERTIES, MOLECULES, RATES, REACTION KINETICS, REACTION TIME, REPRINTS, TRAJECTORIES, MOLECULAR VIBRATION, VIBRATIONAL SPECTRA.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303B3,  
\*Difluoroethanes, Ethane/1-2-Difluoro, Fluoroethylene.

FLORIDA AGRICULTURAL AND MECHANICAL UNIV TALLAHASSEE  
FLUID MECHANICS RESEARC H LAB

(U) Basic Studies of the Unsteady Flow Past High Angle of Attack Airfoils.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Oct 88,

MAY 89 132P

PERSONAL AUTHORS: Krothapalli, Anjaneyulu; Lourenco, Luiz;  
Van Dommelen, Leon

CONTRACT NO. AFOSR-86-0243

PROJECT NO. 2307

TASK NO. A3

MONITOR: AFOSR  
TR-89-0780

UNCLASSIFIED REPORT

ABSTRACT: (U) An experimental and numerical simulations have been carried out to study the unsteady flow past an impulsively started NACA 0012 airfoil at different angles of attack ( $0 < \alpha < 45$  deg.). A novel experimental technique, commonly referred to as Particle Image Displacement Velocimetry (PIDV), is successfully implemented to measure the instantaneous velocity fields. The velocity field is measured with sufficient accuracy so that the distribution of vorticity can be calculated. The unsteady separated flow fields generated by these airfoils contain large scale vortical structures such as; a primary vortex generated at the leading edge of the airfoil with secondary vortices upstream of it; a trailing vortex, and a vortex sheet type structure. The origins and time evolution of these structures are clearly depicted by the instantaneous velocity and vorticity fields. A random-walk vortex simulations of the full Navier-Stokes equations were performed as comparison. Keywords: Unsteady flows; High angle of attack airfoils; Particle image velocimetry; Vortex calculations. (jhd)

DESCRIPTORS: (U) \*AIRFOILS, \*ANGLE OF ATTACK, \*HIGH ANGLES, \*UNSTEADY FLOW, ACCURACY, COMPUTATIONS, DISPLACEMENT, DISTRIBUTION, EVOLUTION(GENERAL), FLOW

AD-A210 290

AD-A210 252

UNCLASSIFIED

PAGE 133

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 252 CONTINUED

FIELDS, FLOW SEPARATION, IMAGES, LABORATORY PROCEDURES,  
LEADING EDGES, NAVIER STOKES EQUATIONS, NUMERICAL  
ANALYSIS, PARTICLES, SECONDARY FLOW, SHEETS, TIME  
TRAILING VORTICES, VELOCIMETERS, VELOCITY, VORTICES.

IDENTIFIERS: (U) NACA 0012 Airfoils, WJAFOSR2307A3,  
PE61102F.

AD-A210 250 20/5

NATIONAL INST OF STANDARDS AND TECHNOLOGY GAITHERSBURG  
MD MOLECULAR SPECTROSCOPY DIV

(U) Energetics and Spin- and Lambda-Doublet Selectivity in  
the Infrared Multiphoton Dissociation DN3 Yields DN(X  
3 Sigma(-), a 1 Delta) + N2(X 1 Sigma g (+)):  
Experiment.

AUG 88 12P

PERSONAL AUTHORS: Stephenson, John C.; Casassa, Michael P.  
; King, David S.

CONTRACT NO. AFOSR-ISSA-89-0022

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0431

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89  
n3 p1378-1387, 1 Aug 88.

ABSTRACT: (U) Multiphoton vibrational excitation of  
deuterated hydrazoic acid, DN3, by a CO2 laser (1=10 GW/  
sq.cm.) leads to dissociation forming DN in both X 3  
Sigma(-) (spin forbidden) and a 1 Delta (spin allowed)  
electronic states. Under collisionless conditions, the  
nascent DN fragments were probed via laser induced  
fluorescence, to determine initial product state  
distributions. The DN(X 3 Sigma(-)) molecules are formed  
predominantly in the symmetric F1 and F3 spin-rotation  
states with little population (< or = 6%) in the  
antisymmetric F2 levels. There is no significant  
population (< 3%) in excited DN 3-Sigma(-) vibrational  
levels. The distribution of rotational states is  
Boltzmann-like, characterized by a rotational temperature  
of about 920 K for the F1, F3 states and 500 K for F2  
levels. Doppler profiles showed a large kinetic energy  
release of about 10 100 cm total in the triplet channel.  
The DN(1 Delta) products are formed preferentially in the  
symmetric Delta(A'), e-labeled lambda doublet levels:  
Delta(A')/Delta(A) = 1.44. The DN(1 Delta) is formed with  
no vibrational excitation (<2%); the rotational states

AD-A210 252

AD-A210 250

UNCLASSIFIED

PAGE 134

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 250 CONTINUED

AD-A210 242 20/4

are populated Boltzmann-like with a rotational temperature of 425 K. Doppler profiles give a total kinetic energy of about 1500/cm in this channel. The observed DN(3 Sigma(-) spin- and DN(1 Delta) Lambda-doublet selectivities reflect the symmetry properties of a planar transition state and that the low degree of DN(3 Sigma(-) rotational and vibrational excitation is also expected from the transition state geometry. Reprints. (jhd)

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF MECHANICS AND MATERIALS SCIENCE

(U) Complex Turbulent Flows.

DESCRIPTIVE NOTE: Final rept. 1 May 78-29 Feb 79.

FEB 79 4P

PERSONAL AUTHORS: Kovaszny, Leslie S.

DESCRIPTORS: (U) +HYDRAZOIC ACID, +PHOTODISSOCIATION, DISTRIBUTION, DOPPLER SYSTEMS, ELECTRONIC STATES, ENERGETIC PROPERTIES, ENERGY TRANSFER, EXCITATION, DEUTERIUM COMPOUNDS, KINETIC ENERGY, LASER INDUCED FLUORESCENCE, PHOTONS, POPULATION, PROFILES, REPRINTS, MOLECULAR ROTATION, SYMMETRY, TEMPERATURE, LASER PUMPING, MOLECULAR VIBRATION.

CONTRACT NO. AFOSR-78-3610

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-89-0889

IDENTIFIERS: (U) +Deuterated Hydrazoic Acid,  
+Multiphoton Dissociation, Multiphoton Excitation,  
Deuterated Compounds, WUAFOSR2303B1, PE61102F.

UNCLASSIFIED REPORT

DESCRIPTORS: (U) +TURBULENT FLOW, +TRANSITIONS, COUETTE FLOW, EXPERIMENTAL DESIGN, TEST FACILITIES, JET FLOW HOI WIRE ANEMOMETERS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2307A2.

AD-A210 250

AD-A210 242

UNCLASSIFIED

PAGE 135

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 234 20/9

AD-A210 225 5/8 6/4

AVCO RESEARCH LAB INC EVERETT MA

OREGON STATE UNIV NEWPORT OR HATFIELD MARINE SCIENCE CENTER

(U) Optical Production of Negative Ions.

DESCRIPTIVE NOTE: Final rept. for 15 Jul 87-14 Dec 88,

(U) Parallel Processing and Learning in Simple Systems.

FEB 89 31P

DESCRIPTIVE NOTE: Final rept. 10 Jan 86-14 Jan 89.

PERSONAL AUTHORS: McGeoch, M. W.

MAR 89 6P

CONTRACT NO. F49620-87-C-0080

PERSONAL AUTHORS: Mpitsos, George J.

PROJECT NO. 2301

CONTRACT NO. AFOSR-86-0076

TASK NO. A7

PROJECT NO. 2312

MONITOR: AFOSR TR-89-0812

MONITOR: AFOSR TR-89-0809

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A kinetic model of an optically pumped lithium plasma is discussed. Observations of ionization processes at high Rydberg atom density are analyzed, and the role of an electron avalanche process is identified. The optical pump intensity requirements for continuous plasma formation are derived, and Li production is modeled. Keywords: Negative Ions; Lithium; Optical plasma. (jhd)

DESCRIPTORS: (U) \*ANIONS, \*OPTICAL PUMPING, \*PLASMAS(PHYSICS), AVALANCHE EFFECT(ELECTRONICS), INTENSITY, IONIZATION, KINETICS, LITHIUM, MODELS, OPTICAL PROPERTIES, PRODUCTION, REQUIREMENTS.

IDENTIFIERS: (U) \*Optical Plasmas, Rydberg Atoms, PE61102F, WUAFOSR2301A7.

AD-A210 234

UNCLASSIFIED

PAGE 136

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 225 CONTINUED

AD-A210 191 20/5

MICHIGAN UNIV ANN ARBOR DEPT OF PHYSICS

DESCRIPTORS: (U) +DISTRIBUTED DATA PROCESSING, +LEARNING,  
+PARALLEL PROCESSING, ADAPTIVE SYSTEMS, ANNEALING,  
ASSOCIATIVE PROCESSING, BIOCHEMISTRY, BIOLOGY,  
COMPUTERIZED SIMULATION, DISTRIBUTION, GROUP DYNAMICS,  
INVERTEBRATES, MOTORS, NERVE CELLS, NETWORKS, NEURAL NETS,  
NEUROLOGY, NEUTRAL OUTPUT, BEHAVIOR, PATTERNS,  
PHARMACOLOGY, PREPARATION, PRODUCTION, SENSE ORGANS,  
SIMULATION, TOOLS, VARIABLES.

(U) Resonant and Non-Resonant Optical Frequency Mixing in  
Simple Molecular Systems.

DESCRIPTIVE NOTE: Final rept.,

NOV 80 6P

PERSONAL AUTHORS: Ward, J. F.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A1.

CONTRACT NO. AFOSR-77-3225

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0777

UNCLASSIFIED REPORT

DESCRIPTORS: (U) +MOLECULAR SPECTROSCOPY, MIXING,  
MOLECULAR VIBRATION, ELECTRONIC STATES, QUANTUM CHEMISTRY.

IDENTIFIERS: (U) Nonlinear Optics, Ab Initio  
Calculations, PEG1102F, WUAFOSR2301A1.

AD-A210 225

AD-A210 191

UNCLASSIFIED

PAGE 137

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 190 20/2

AD-A210 180 11/1

ARIZONA STATE UNIV TEMPE SEMICONDUCTOR MATERIALS RESEARCH LAB

MARTIN MARIETTA LABS BALTIMORE MD

(U) Autonomous Control System for Czochralski Growth of LEC GaAs.

(U) High-Strain-Rate Behavior of Hydrated Cement Paste.

DESCRIPTIVE NOTE: Final technical rept.,

DESCRIPTIVE NOTE: Final technical rept.,

MAY 89

DESCRIPTIVE NOTE: Final rept. Jan 86-May 89.

89 29P

PERSONAL AUTHORS: Ritter, A.; Childs, G.; Bridger, K.; Winzer, S.; Barker, D.

PERSONAL AUTHORS: Schwuttke, G. H.

REPORT NO. MML-TR-89-56C

CONTRACT NO. F49620-86-C-0012

CONTRACT NO. F49629-86-C-0021

MONITOR: AFOSR TR-89-0801

PROJECT NO. 2302

UNCLASSIFIED REPORT

TASK NO. C2

MONITOR: AFOSR

TR-89-0927

UNCLASSIFIED REPORT

ABSTRACT: (U) The consolidation of the Czochralski Growth Control System(CGCS) is a revision of the hardware and software within the constraints of the first generation. The consolidation consists of: a cabinet that is physically more compatible with the Cambridge console; a more modular hardware arrangement that facilitates calibration, servicing, and expansion; increased accuracy and stability of the system variable measurements; and many software enhancements, including increased controller flexibility and improved diameter estimation and control. The hardware and software installation has been completed and crystal growth with complete digital control has been demonstrated. Keywords: Liquid encapsulated crystal; Single crystal; Crystal growth; Gallium arsenide. (Jhd)

DESCRIPTORS: (U) \*CRYSTAL GROWTH, \*CZOCHEALSKI CRYSTALS, ACCURACY, CALIBRATION, COMPUTER PROGRAMS, CONTROL, CONTROL SYSTEMS, DIGITAL SYSTEMS, ENCAPSULATION, GALLIUM ARSENIDES, INSTALLATION, MEASUREMENT, SINGLE CRYSTALS, VARIABLES.

IDENTIFIERS: (U) \*Liquid Encapsulated Crystals, PE61102F.

AD A210 190

AD-A210 180

UNCLASSIFIED

PAGE 138

EVI09K

ABSTRACT: (U) Concrete paste and mortar were studied at intermediate to high strain-rates and peak pressures up to 150 kbar, to determine how the microstructure responded to dynamic loading. Intermediate response was primarily brittle failure, while high strain-rate (shock) loads induced micro cracking, particle size reduction, lattice distortion and alteration and/or elimination of porosity. Effects were isolated by comparing explosively-loaded specimens with unshocked reference materials, using X-ray diffraction, scanning electron microscopy, and mercury porosimetry. Cement microstructure; Dynamic loading; Shock effects; Concrete. (Jes)

DESCRIPTORS: (U) \*CEMENTS, CONCRETE, DISTORTION, DYNAMIC LOADS, ELECTRON MICROSCOPY, ELECTRONIC SCANNERS, ELIMINATION, HYDRATES, LATTICE DYNAMICS, MATERIALS, MICROSTRUCTURE, PARTICLE SIZE, PEAK VALUES, POROSITY, PRESSURE, REDUCTION, RESPONSE, SHOCK, X RAY DIFFRACTION

IDENTIFIERS: (U) PE61102F, WUAFOSR2302C2, \*Cement paste

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A210 147 12/3

AD-A210 143 20/2 20/3

KENTUCKY UNIV LEXINGTON DEPT OF STATISTICS

GEORGIA UNIV ATHENS DEPT OF PHYSICS AND ASTRONOMY

(U) Life Testing, Reliability, and Multivariate Nonparametric Methods.

(U) Band Calculations on Ferroelectric and Piezoelectric Solids.

DESCRIPTIVE NOTE: Final scientific rept..

DESCRIPTIVE NOTE: Final rept. 1 Jun 77-1 Oct 78.

FEB 79

JAN 79

PERSONAL AUTHORS: Blumenthal, Saul; Bhapkar, V. P.

PERSONAL AUTHORS: Henkel, J. H.; Uzes, C. A.; Lee, M. H.

CONTRACT NO. AFOSR-75-2841

CONTRACT NO. AFOSR-76-3045

PROJECT NO. 2304

PROJECT NO. 2305

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0874

TR-89-0875

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Since the grant involves two distinct projects, this report is divided into two sections, number I dealing with the work of the principal investigator, and number II dealing with the co-investigator's research. Contents: I) Screening and Estimation Procedures for the Unknown Number of Defective Items in a Life Test, and Estimation of the Size of a Finite Population; and Multivariate Nonparametric Methods for Several Samples. (KR)

DESCRIPTORS: (U) \*MULTIVARIATE ANALYSIS, \*NONPARAMETRIC STATISTICS, ESTIMATES, LIFE TESTS, POPULATION, RELIABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

ABSTRACT: (U) The main objectives of the original proposal were to calculate spontaneous and other polarization properties of polar and piezoelectric crystals. The purpose of the work was to aid in selecting the best piezoelectric materials to be used in piezoelectric image tubes. The crystals for which the main work effort was directed were: NaN02, BN, LiNb03 and KNb03. Using charge densities obtained from band calculations with this program, the following piezoelectric coefficients d21, d22, and d23 for sodium nitrite have been calculated. This was accomplished by calculating the changes in the electric polarization of sodium nitride for three different strains. The plain wave-Gaussian mixed basis method has been employed to calculate crystalline energy bands for cubic boron nitride (zinc-blende structure). These calculations agree favorably with experiment. The spontaneous polarization of LiNb03 has been calculated and the value differs by 20 percent from the experimental value. Because Lithium Niobate contains so many electrons in a unit cell we were not able to do a thorough calculation on LiNb03 as was done on NaN02. (JHD)

DESCRIPTORS: (U) \*FERROELECTRIC MATERIALS, \*PIEZOELECTRIC CRYSTALS, \*PIEZOELECTRIC MATERIALS, \*SODIUM NITRIDE, \*BAND THEORY OF SOLIDS, CELLS, CHARGE

AD A210 147

AD A210 143

UNCLASSIFIED

PAGE 139

LVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A210 143 CONTINUED

AD-A210 134 11/6

DENSITY, CRYSTALS, ELECTRICITY, ENERGY BANDS, IMAGE TUBES,  
LITHIUM NIOBATES, NITRIDES, PHYSICAL PROPERTIES,  
POLARIZATION, PYROELECTRICITY, SODIUM COMPOUNDS.

ILLINOIS UNIV AT URBANA LASER AIDED MATERIALS PROCESSING  
LAB

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B2.

(U) Laser Cladding of Ni, Nb, and Mg Alloys for Improved  
Environmental Resistance at High Temperature.

DESCRIPTIVE NOTE: Final rept. Nov 85-Oct 88.

JAN 89

PERSONAL AUTHORS: Mazumder, J.; Sircar, S.; Kar, A.;  
Ribaudo, C.; Lober, R.

CONTRACT NO. AFOSR-85-0333

MONITOR: AFOSR  
TR-89-0778

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes experimental and theoretical studies carried out during the period of November 1985 to October 1988 on laser surface modification of Nickel, Niobium, and Magnesium alloys for improved environmental resistance at high temperature. Major emphasis has been on Ni-Cr-Al-Hf system. Microstructural evolution and oxidation properties of Ni and Nb alloys were examined. For Mo alloys microstructural characterization and potentiodynamic corrosion testing were carried out. One-dimensional diffusion model for finite domain to examine the extended solid solubility in laser cladding was also developed. (JES)

DESCRIPTORS: (U) \*ALLOYS, \*CLADDING, DIFFUSION, ENVIRONMENTS, EVOLUTION(GENERAL), EXPERIMENTAL DATA, HIGH TEMPERATURE, LASERS, MAGNESIUM ALLOYS, MICROSTRUCTURE, MODELS, MODIFICATION, NICKEL, NIOBIUM, ONE DIMENSIONAL, OXIDATION, RESISTANCE, SOLIDS, SOLUBILITY, SURFACES, THEORY.

IDENTIFIERS: (U) WUAFOSR2306A1, PE61102F, \*Laser cladding.

AD A210 143

AD A210 134

UNCLASSIFIED

PAGE 140

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 130 CONTINUED

TEXAS UNIV AT AUSTIN GEOTECHNICAL ENGINEERING CENTER

(U) High-Amplitude Mobile Vibrator for Exciting Body and Surface Waves in Soil, Pavement And Structural Systems.

DESCRIPTIVE NOTE: Final technical rept. Oct 86-Dec 88.

JUN 89

PERSONAL AUTHORS: Stokoe, Kenneth H., II

CONTRACT NO. AFOSR-87-0056

PROJECT NO. 2917

TASK NO. A1

MONITOR: AFOSR  
TR-89-0833

UNCLASSIFIED REPORT

ABSTRACT: (U) A servo-hydraulic vibrator mounted on a transport vehicle was purchased from Teledyne Exploration, Corp. of Houston, TX. The vibrator was modified by Heaviquip, Inc. of Newkirk, OK to improve its performance in the low frequency range, 0.5 to 10 Hz. The resulting system has: 1) a gross vehicle weight of approximately 44,000 lb; 2) a useable frequency range of about 0.5 to 250 Hz; and 3) a peak vertical force (estimated) of about 34,500 lb at frequencies above 5 Hz. The general function of the vibrator is the application of vertical steady-state, multiple-pulse or swept-sine loads to surface or embedded platens in geotechnical, pavement and structural systems. This equipment will form a key component in conducting field studies involving wave propagation in geotechnical materials to investigate: 1) the effect of stress state on the velocity of small-strain body waves; 2) nonlinear body wave propagation; and 3) the dispersive characteristics of surface waves. Keywords: Mechanical vibrators; Pulse generators; Field instrumentation; Seismic source; Mobile vibratory system; Servo-hydraulic vibrator; Field seismic testing; Surface seismic waves; body seismic waves. (EDC)

DESCRIPTORS: (U) \*SEISMIC WAVES, \*VIBRATORS(MECHANICAL), DISPERSING, FIELD EQUIPMENT, FIELD TESTS, FREQUENCY, FUNCTIONS, HYDRAULIC SERVOMECHANISMS, INSTRUMENTATION,

AD A210 130

UNCLASSIFIED

AD-A210 130

PAGE 141

EVI09K

LOW FREQUENCY, MATERIALS, MOBILE, NONLINEAR PROPAGATION ANALYSIS, PAVEMENTS, PEAK VALUES, RANGE(EXTREMES), SEISMOLOGY, SOURCES, STEADY STATE, STRAIN(MECHANICS), STRESSES, STRUCTURES, SURFACE WAVES, TRUCKS, VERTICAL ORIENTATION, VIBRATION, WAVE PROPAGATION, PULSE GENERATORS, WEIGHT.

IDENTIFIERS: (U) Geotechnical materials, PEG1102F, WUAFOSR2917A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 084 CONTINUED

AD-A210 084 11/6

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MECHANICAL  
ENGINEERING

LOADS(FORCES), NUMERICAL ANALYSIS, PATHS, STRESS  
CONCENTRATION, STRESSES, THERMAL CYCLING TESTS, THERMAL  
FATIGUE, THERMAL PROPERTIES, THERMAL STRESSES,  
THERMOMECHANICS, TIME, TRANSIENTS.

(U) The Effect of Transients on Crack Tip Stress Fields  
during Thermal Fatigue Loading.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382.

DESCRIPTIVE NOTE: Final rept. 1 Apr 86-31 Mar 89.

APR 89

PERSONAL AUTHORS: Griffin, J. H.; Cunningham, S. E.

CONTRACT NO. AFOSR-88-0113

PROJECT NO. 2302

TASK NO. 82

MONITOR: AFOSR  
TR-89-0684

UNCLASSIFIED REPORT

ABSTRACT: (U) A method is developed for evaluating the effect of cyclic thermal loading on crack tip stress fields. In its development, advantage is taken of the periodic nature of fatigue loading and only harmonic loadings are considered. Formulating the problem in this way permits the extraction of time as an explicit variable and replaces its role with a dependence on the frequency of the thermal loading. The means for evaluating the effect of thermal transients on crack tip stress fields is the stress intensity factor which is calculated from numerically defined stress and displacement fields using a path independent integral. Results obtained indicate that stress intensity factors of cracked components exposed to thermal fatigue conditions have a significant dependence on the frequency of the thermal cycle and the crack geometry. Numerical estimates for Mode I thermal stress intensity have been obtained for the case of a titanium alloy that was heated using intense light sources. Thermal mechanical fatigue, Fracture mechanics, Thermal stress, Thermal transients. (jes)

DESCRIPTORS: (U) \*ALLOYS, \*TITANIUM ALLOYS, CRACKS,  
DISPLACEMENT, ESTIMATES, EXTRACTION, FATIGUE(MECHANICS),  
FRACTURE(MECHANICS), GEOMETRY, INTENSITY, LIGHT SOURCES.

AD-A210 084

AD-A210 084

UNCLASSIFIED

PAGE 142

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 065 7/2 7/3 7/4 7/5 AD-A210 084 6/4  
CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

SMITH-KETTLEWELL EYE RESEARCH FOUNDATION SAN FRANCISCO CA

(U) Sigma Bond Metathesis Reactions of Si-H and M-Si Bonds. New Routes to d(O) Metal Silyl Complexes.

89

PERSONAL AUTHORS: Woo, Hee-Gyeon; Tilley, T. D.

CONTRACT NO. AFOSR-88-0273

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0817

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of The American Chemical Society, v111 p3757-3758 1989.

ABSTRACT: (U) The D metal silyl complexes CpCp\*MSi(SiMe3)3 Cl(1,Zr); 4, M= Hf; Cp= eta 5 -C5H5; Cp\* = eta 5-C5Me5) react with PhSiH3 via a Sigma bond metathesis process to give CpCp \*M(SiH2Ph)Cl(2, M=Zr; 5, M=Hf) and HS(SiMe3)3. These reactions occur via both thermal and photochemical (normal fluorescent room light) pathways. The new silyl complexes 2 and 5 decompose thermally to the hydrides CpCp\* MHC1n and polysilanes SiHPhm, but 5 was isolated and completely characterized. These q-bond metathesis reactions have been shown to provide general routes to a range of stable hafnium silyl complexes of the type CpCp\*HfSiHRRc1, where - SiHRR is a primary or secondary silyl group. Keywords: Silicon Compounds, Methyl radicals, hafnium compounds, metal Complexes, Silanes, Reprints. (aw)

DESCRIPTORS: (U) \*METAL COMPLEXES, \*SILANES, \*SYNTHESIS(CHEMISTRY), \*THERMOCHEMISTRY, \*PHOTOCHEMICAL REACTIONS, CHEMICAL BONDS, CHEMICAL REACTIONS, FLUORESCENCE, HAFNIUM COMPOUNDS, HEAT, HYDRIDES, LIGHT, METHYL RADICALS, POLYSILANES, REPRINTS, SILICON COMPOUNDS, SPACE(ROOM).

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B2, Metal Silyl Complexes, Silyl Radicals, Sigma Bonds, Metathesis.

AD-A210 065

UNCLASSIFIED

UNCLASSIFIED

SEARCH CONTROL NO. EVI09K

AD-A210 084 6/4

SMITH-KETTLEWELL EYE RESEARCH FOUNDATION SAN FRANCISCO CA

(U) The Perception of Moving Plaids Reveals Two Motion-Processing Stages.

FEB 89

PERSONAL AUTHORS: Welch, Leslie

CONTRACT NO. AFOSR-89-0035

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0811

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In Nature v337 n6209, 23 Feb 89.

ABSTRACT: (U) The human visual system views the world through an aperture array-the neural receptive fields. Therefore a moving object is viewed through many small apertures and the motion within many of those apertures is ambiguous. This ambiguity may be resolved by monitoring the motion of a distinctive feature, such as a line-end or corner, and attributing to the larger object the motion of the feature. Alternatively, Adelson and Movshon have suggested that moving images are processed in two stages, that is, they are first decomposed into one-dimensional components which are later recombined to generate perceived object motion. For a moving plaid, defined as the sum of two drifting gratings, these alternative models generate different predictions concerning the resolution of the plaid's motion ambiguity. A feature monitor would respond to the motion of the intersections between gratings, whereas the two-stage motion processor would first decompose the plaid into its constituent gratings and subsequently recombine them to generate the perception of a moving plaid. Using speed discrimination to distinguish between the two models, I find that discrimination thresholds reflect the speed of a plaid's component gratings, rather than the speed of the plaid itself. This result supports the two stage model. Reprints. (jhd)

AD-A210 064

PAGE 143

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 064 CONTINUED

AD-A210 057 8/11 17/10

DESCRIPTORS: (U) \*MOTION, \*VISUAL PERCEPTION, AMBIGUITY, APERTURES, DISCRIMINATION, DRIFT, GRATINGS(SPECTRA), HUMANS, IMAGES, MODELS, ONE DIMENSIONAL, REPRINTS, STAGING, SUPPORTS, VELOCITY, VISION.

SOUTHERN METHODIST UNIV DALLAS TX DEPT OF GEOLOGICAL SCIENCES

(U) Deterministic and Stochastic Wavefields in the Near-Field from Explosive Sources.

IDENTIFIERS: (U) PE61102F, WUAF0SR2313A5.

DESCRIPTIVE NOTE: Final technical rept. 15 Oct 87-14 Apr 89.

MAY 89

PERSONAL AUTHORS: Stump, Brian W.; Grant, L.; Bogaards, M.; Flynn, E.; Reinke, R.

REPORT NO. SMUG-5

CONTRACT NO. AFOSR-84-0016

PROJECT NO. 2309

TASK NO. A2

MONITOR: AFOSR TR-89-0845

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Master's thesis.

ABSTRACT: (U) An experimental technique for characterizing the seismic source from chemical explosions in different geological material is presented. The specific example of an explosion in alluvium is given. The importance of a complete seismic site characterization prior to the experiment is emphasized. This characterization must include determination of both compressional and shear properties at the test site. Keywords: Seismology; Explosion source; Moment tensors; Inversion; Seismic modeling. (jhd)

DESCRIPTORS: (U) \*ALLUVIUM, \*EXPLOSIONS, \*SEISMIC WAVES, CHEMICAL REACTIONS, COMPRESSIVE PROPERTIES, GEOLOGY, MATERIALS, MODELS, MOMENTS, SEISMOLOGY, SHEAR PROPERTIES, SITES, SOURCES, TENSORS, TEST FACILITIES.

IDENTIFIERS: (U) PE61102F, WUAF0SR2309A2.

AD-A210 064

AD-A210 057

UNCLASSIFIED

PAGE 144

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 056 CONTINUED

AD-A210 056 12/3 5/2

GEORGE MASON UNIV FAIRFAX VA CENTER FOR COMPUTATIONAL STATISTICS

(U) Hyperdimensional Data Analysis and Structural Inference.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 87-31 Mar 89.

MAY 89

PERSONAL AUTHORS: Weaman, Edward J.

CONTRACT NO. AFOSR-87-0179

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0914

UNCLASSIFIED REPORT

ABSTRACT: (U) This research project was based on belief that modern technology has substantially changed the flavor of problems being presented to the statistician. Electronic instrumentation implies an ability to acquire a large amount of high dimensional data very rapidly. While such capabilities have existed for some time, the emergence of cheap RAM in the 1980's has given us the ability to store and access that data in an active computer memory. This represents a challenge for statisticians which is substantially different in kind. The majority of existing methodology is focused on the univariate, iid random variable model. Even in the circumstance that a multivariate model is allowed, it is usually assumed to be multivariate normal. While arbitrary sample size is frequently assumed, the truth of the matter is that these techniques implicitly assume small to moderate sample sizes. For example, a regression problem with 5 design variables and 1000 observations would represent no problem for traditional techniques. By contrast, a regression problem with 40,000 design variables and 8 million observations would. The reason is clear. In the former case the emphasis is on statistical efficiency which is the operational goal for most current statistical technology. By contrast, in the latter case,

emphasis must be clearly on computational efficiency. The emphasis on parsimony in many contemporary books and papers is a further reflection of the mind-set that implicitly focuses on small to moderate sample sizes since few parameters do not make sense in the context of very large sample sizes. Finally, we note that the very fact of largeness in sample size implies that it is unlikely we would see iid homogeneity. (jhd)

DESCRIPTORS: (U) \*COMPUTER APPLICATIONS, \*STATISTICAL SAMPLES, \*MULTIVARIATE ANALYSIS, \*STATISTICAL INFERENCE, COMPUTATIONS, EFFICIENCY, ELECTRONIC EQUIPMENT, INSTRUMENTATION, MATHEMATICAL MODELS, MEMORY DEVICES, MODELS, RANDOM ACCESS COMPUTER STORAGE, REGRESSION ANALYSIS, STATISTICS, VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

AD-A210 056

AD-A210 056

UNCLASSIFIED

PAGE 145

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A210 054 12/3 12/5 AD-A210 .054 CONTINUED

STANFORD UNIV CA INFORMATION SYSTEMS LAB IDENTIFIERS: (U) PEG1102F, WJAFOSR2004A6.

(U) Studies in Statistical Signal Processing.

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 83-30 Jun 88.

JUN 88

PERSONAL AUTHORS: Kallath, Thomas

CONTRACT NO. AFOSR-83-0228

PROJECT NO. 2304

TASK NO. A6

MONITOR: AFOSR  
TR-89-0916

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary objective of our research is to develop efficient and numerically stable algorithms for nonstationary signal processing problems by understanding and exploiting special structures, both deterministic and stochastic, in the problems. We also strive to establish and broaden links with related disciplines, such as cascade filter synthesis, scattering theory, numerical linear algebra, and mathematical operator theory for the purpose of cross fertilization of ideas and techniques. These explorations have led to new results both in estimation theory and in these other fields, e.g., to new algorithms for triangular and QR factorization of structured matrices, new techniques for root location and stability testing, new recursions for orthogonal polynomials on the unit circle and the real line as well as on other curves, and new approaches to overcome singularities and ill-conditioning in the recursions. (RH)

DESCRIPTORS: (U) \*ALGORITHMS, \*ESTIMATES, \*LINEAR ALGEBRA, \*NUMERICAL ANALYSIS, \*POLYNOMIALS, \*SIGNAL PROCESSING, \*STABILITY, \*STATISTICAL PROCESSES, CIRCLES, FILTERS, MATHEMATICS, OPERATORS(MATHEMATICS), ORTHOGONALITY, POSITION(LOCATION), SCATTERING, STRUCTURES, SYNTHESIS, TEST AND EVALUATION, THEORY.

AD-A210 054

AD-A210 054

UNCLASSIFIED

PAGE 146

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 053

1/2

AD-A210 052

12/3

13/8

MICHIGAN UNIV ANN ARBOR DEPT OF AEROSPACE ENGINEERING

NORTHWESTERN UNIV EVANSTON IL DEPT OF MECHANICAL ENGINEERING

(U) Study of the Design and Performance Characteristics of Aircraft Simulators.

(U) Monte Carlo Reliability Analysis.

DESCRIPTIVE NOTE: Final rept. 5 Jan 77-4 Sep 78.

DESCRIPTIVE NOTE: Final rept. 1 Jul 84-31 Dec 88.

FEB 79

APR 89

PERSONAL AUTHORS: Cyrus, Michael L.; Fogarty, Laurence

PERSONAL AUTHORS: Lewis, Elmir E.

CONTRACT NO. AFOSR-77-3245

CONTRACT NO. AFOSR-84-0340

MONITOR: AFOSR  
TR-89-0887

PROJECT NO. 2304

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFJSR  
TR-89-0915

ABSTRACT: (U) Hardware components of the Advanced Simulator for Pilot Training (ASPT) were studied during this period and an interim technical report was issued. An examination of the ASPT platform motion system was accomplished and reported to an Advisory Board convened to study the procurement of motion bases for upcoming training simulators. This work was additionally beneficial to the AFHRL/FT conversion of one ASPT-37 cockpit to an A-10 configuration. A paper entitled 'Advance Simulation for New Aircraft', presented at the 11th NTEC/Industry Conference on 15 November 1978, is included. Keywords: Flight simulators; Air Force training. (edc)

UNCLASSIFIED REPORT

ABSTRACT: (U) The research resulted in major improvements in Markov models to be used in Monte Carlo modeling of reliability problems. These include a number of component dependency models and modeling of unrevealed failures. A new sampling technique, the method of self-transitions, is developed for treating time dependent failure rates, and non Markovian generalizations are made to model replacement of ageing parts and as-good-as-new repair. Keywords: Reliability; Monte Carlo simulation. (jhd)

DESCRIPTORS: (U) \*FLIGHT SIMULATORS, AIR FORCE TRAINING, FLIGHT TRAINING, MOTION, PILOTS, PLATFORMS, SIMULATION, TRAINING DEVICES.

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*MONTE CARLO METHOD, \*RELIABILITY, FAILURE, MARKOV PROCESSES, RATES, REPLACEMENT, SAMPLING, SIMULATION, TIME DEPENDENCE.

IDENTIFIERS: (U) ASPT(Advanced Simulators for Pilot Training), PE61102F.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5.

AD-A210 053

AD-A210 052

UNCLASSIFIED

PAGE 147

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 018 12/9

AD-A210 016 23/3 12/9 11/5

NEW YORK UNIV N Y

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

(U) Psychophysical Studies of Shape with Fourier Descriptor Stimuli.

88

PERSONAL AUTHORS: Schwartz, Eric

PERSONAL AUTHORS: Schwartz, Eric

CONTRACT NO. AFOSR-85-0341

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

PROJECT NO. 2313

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-89-0974

MONITOR: AFOSR  
TR-89-0973

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Perception, v17 p191-202 1988.

ABSTRACT: (U) The Fourier descriptor (FD) method of shape representation provides a convenient description for the outlines of shapes. It can also be used to generate orthogonal patterns (FD stimuli) which are uniquely characterized by their frequency, amplitude, and phase. Psycho-physical studies were conducted to assess threshold tuning properties and frequency specificity during adaptation to FD stimuli. The results suggest the operation of filters which are characterized by the parameter curvature frequency. Reprints, Visual perception. (JHD)

DESCRIPTORS: (U) \*FOURIER ANALYSIS, \*VISUAL PERCEPTION, CURVATURE, FILTERS, OPERATION, ORTHOGONALITY, PATTERNS, PSYCHOPHYSICS, REPRINTS, SHAPE, STIMULI, THRESHOLD EFFECTS, TUNING.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2313A5.

(U) Conformal Image Warping.

DESCRIPTIVE NOTE: Technical rept..

OCT 88

ABSTRACT: (U) This report describes numerical and computer graphic methods for conformal image mapping between two simply connected regions. The immediate motivation for this application is that the visual field is represented in the brain by mappings which are, at least approximately, conformal. Thus, in order to simulate the imaging properties of the human visual system (and perhaps other sensory systems), conformal image mapping is a necessary technique. There are two distinct aspects to this problem: first, one must implement a numerical or analytic method which allows for the computation of a given conformal mapping, constrained by the shape of the two simply connected regions (hereafter known simply as regions) to be mapped, and by a single point and orientation correspondence between them; second, it is necessary to apply a space variant texture mapping algorithm to warp the image, once the mapping itself has been specified. These algorithms are illustrated with examples of conformal mappings constructed analytically from elementary mappings such as the linear fractional map, the complex logarithm, etc. Applications are shown of numerically generated maps between highly irregular regions, and also are shown of the visual field mapping which motivates this work. (JHD)

DESCRIPTORS: (U) \*COMPUTER GRAPHICS, \*CONFORMAL MAPPING, ALGORITHMS, COMPUTER APPLICATIONS, CONFORMAL STRUCTURES,

AD-A210 018

AD-A210 016

UNCLASSIFIED

PAGE 148

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 016 CONTINUED

AD-A210 015 12/9 12/2

GRAPHICS, HUMANS, IMAGES, LOGARITHM FUNCTIONS, MAPPING, MAPS, MATHEMATICAL ANALYSIS, MOTIVATION, NUMERICAL METHODS AND PROCEDURES, ORIENTATION(DIRECTION), REGIONS, SENSES(PHYSIOLOGY), SHAPE, VISION.

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES  
(U) Computing Minimal Distances on Arbitrary Polyhedral Surfaces.

IDENTIFIERS: (U) Symm Algorithm, Texture, PE61102F, WUAFOSR2313A5.

DESCRIPTIVE NOTE: Technical rept..

JAN 87

PERSONAL AUTHORS: Schwartz, Eric

REPORT NO. TR-274, RR-96

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0971

UNCLASSIFIED REPORT

ABSTRACT: (U) We have implemented an algorithm that makes iterative use of the law of cosines to find all the minimal (geodesic) distances in an arbitrary (that is, non-convex) three-dimensional polyhedral surface. The algorithm is intrinsically parallel, inasmuch as it deals with all nodes simultaneously. It has let us obtain very satisfactory flattening of biological (monkey visual cortex) surfaces consisting of several thousand triangular faces, by providing a full characterization of the distance geometry of these surfaces. (KR)

DESCRIPTORS: (U) \*ALGORITHMS, \*COMPUTATIONS, \*RANGE(DISTANCE), GEOMETRY, ITERATIONS, MONKEYS, NODES, VISUAL CORTEX, THREE DIMENSIONAL.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, \*Polyhedral Surfaces.

AD-A210 016

AD-A210 015

UNCLASSIFIED

PAGE 149

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 013 12/9 12/2 6/4 AD-A210 011 7/4 7/3

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) The Generalized Map Makers Problem: Optimal Flattening of Polyhedral Surfaces.

(U) Comparison of Vacuum-Annealed and Electrochemically Cycled Electrodes in Adsorption and Electrocatalysis: Aromatic Compounds at Platinum(111) and Polycrystalline Platinum.

JAN 87

PERSONAL AUTHORS: Schwartz, Eric

89

REPORT NO. TR-273, RR-95

PERSONAL AUTHORS: Gui, John Y.; Kahn, Bruce E.; Laguren-Davidson, Laarni; Lin, Chiu-Hsun; Lu, Frank

CONTRACT NO. AFOSR-85-0341

CONTRACT NO. AFOSR-86-0200

PROJECT NO. 2313

PROJECT NO. 2303

TASK NO. A5

TASK NO. A1

MONITOR: AFOSR

TR-89-0980

MONITOR: AFOSR

TR-89-0925

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The authors' concern is to 'unfold' and flatten the curved, convoluted surfaces of the brain in order to study the functional architectures and neural maps embedded in them. In order to do this, it is necessary to solve the general map makers problem for representing curved surfaces by quasi-isometric planar models. This algorithm has applications in areas other than computer aided neuroanatomy, such as robotics motion planning and geophysics. The algorithm the author has written maximizes the goodness of fit of distances in these surfaces, to those in a planar configuration of points. He illustrates this algorithm with a flattening of monkey visual cortex, which is an extremely complex, folded surface. Found are distance errors in the range of several percent, with isolated regions of larger error, for the class of cortical surfaces so far studied. (kr)

DESCRIPTORS: (U) \*ALGORITHMS, \*BRAIN, \*MAPPING, ANATOMY, ARCHITECTURE, COMPUTER AIDED DESIGN, CURVATURE, ERRORS, GEOPHYSICS, ISOLATION, MAPS, MONKEYS, MOTION, PROBLEM SOLVING, NERVOUS SYSTEM, NEUROLOGY, PLANNING, RANGE(DISTANCE), REGIONS, ROBOTICS, SURFACES, VISUAL CORTEX.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A5.

AD-A210 013

AD-A210 011

UNCLASSIFIED

PAGE 150

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 011 CONTINUED

AD-A210 010 7/4

the IR spectra of the pure compounds. Substrate surfaces were characterized by LEED. Cycling the Pt(111) surface affects the adsorbate packing density by up to 50%, while smaller effects are observed for Pt(poly). Cycling causes the LEED pattern of the Pt(111) substrate to become diffuse. Reprints. (AW)

DESCRIPTORS: (U) \*ADSORPTION, \*AROMATIC COMPOUNDS, \*CATALYSIS, \*ELECTRODES, \*PACKING DENSITY, \*VIBRATIONAL SPECTRA, ABSORBERS(MATERIALS), ANNEALING, ATOMS, ATTACHMENT, AUGER ELECTRON SPECTROSCOPY, CYCLES, DILUTION, ELECTROCHEMISTRY, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, HORIZONTAL ORIENTATION, LAYERS, LOSSES, NICOTINIC ACID, ORIENTATION(DIRECTION), OXIDATION REDUCTION REACTIONS, PHENOLS, PLATINUM, PURITY, SOLUTIONS(MIXTURES), MOLECULAR STRUCTURE, SUBSTRATES, SULFUR, SURFACES, TILT, VERTICAL ORIENTATION, WATER, ELECTROCATALYSTS, SURFACE REACTIONS, POLYCRYSTALLINE.

IDENTIFIERS: (U) \*Electrocatalysis, Biphenyl/2-2-5-5-Tetrahydroxy, Carboxylic Acid/3-Thiophene, Hydroquinone/3-Pyridyl, Sigma Bonds, Benzyl Mercaptan, Mercaptan/2-5-Dihydroxy-4-Methylbenzyl.

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Ab Initio Computation of Silicon-29 Nuclear Magnetic Resonance Chemical Shifts for a Range of Representative Compounds.

89

PERSONAL AUTHORS: Van Wazer, John R.; Ewig, Carl S.; Ditchfield, Robert

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-0926

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in The Jnl. of Physical Chemistry, v93 n6 p2222-2230 1989.

ABSTRACT: (U) Silicon 29 Nuclear Magnetic Resonance shielding tensors (and the chemical shifts derived therefrom) were calculated for 28 representative silicon compounds, employing optimized molecular structures and a split-valence contracted basis set in a gauge-invariant representation. The following substituted-substitutions series of compounds were investigated: SiH4/SiF4, SiH4/Si(CH3)4, Si(CH3)4/SiF4, and part of two series involving the SiC14 molecule. Within these series and within a group of silyl derivatives, the calculated and experimental chemical-shift data agreed quite well a group of disilicon compounds H3Si-X-SiH3 were also studied, as well as the SiF8 (2-) anion. The paramagnetic and diamagnetic contributions to the magnetic shielding were analyzed, and a relationship between the paramagnetic term and the electron-withdrawing power of the substituents on the silicon was found. Keywords: Silanes, Fluorosilanes, Methyl silane, Reprints. (AW)

DESCRIPTORS: (U) \*CHEMICAL SHIFTS, \*SILANES, \*NUCLEAR MAGNETIC RESONANCE, MAGNETIC FIELDS, METHYL RADICALS, MOLECULAR STRUCTURE, OPTIMIZATION, REPRINTS, SHIELDING, SILICON, SILICON COMPOUNDS, FLUORINE COMPOUNDS, CHLORINE

AD-A210 011

AD-A210 010

UNCLASSIFIED

PAGE 151

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 010 CONTINUED

AD-A210 009 12/9

COMPOUNDS.

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

IDENTIFIERS: (U) PEG1102F, WUAFOSR230383, Fluorosilanes,  
Chlorosilanes, Silyl Radicals.

(U) Automatic Construction of Polyhedral Surfaces from  
Voxel Representations.

DESCRIPTIVE NOTE: Technical rept..

JUN 89

PERSONAL AUTHORS: Schwartz, Eric L.; Shaw, Alan

REPORT NO. TR-381, RR-158

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0978

UNCLASSIFIED REPORT

ABSTRACT: (U) Various applications require triangulations, or polyhedral representations, of surfaces which are represented as serial sections. Heuristic methods are in common use to triangulate such data. These methods work well on segments of generalized cylinder, i.e., runs of sections containing single loops, but they often fail when attempting to process highly convoluted surfaces. This is because the topology of the sections changes when a critical point of the surface is encountered. This paper uses the equivalent of the full adjacency graph of the surface, provided by a voxel model, to classify the changes in topology of the sections of the surface, and thereby guide the triangulation process. For a voxel surface which is a discrete sampling of a smooth manifold in general position, we are able to exhaustively classify the small set of possible topological changes in the sections of the surface, we then deal with these cases exhaustively. To the best of our knowledge, this is the first description of an algorithm which can in theory and practice triangulate surfaces as complex as that of a brain, from serial sections, without human interaction. Keywords: Computer graphs; Computer aided design; Numerical analysis; Biomedical applications. (KR)

AD A210 010

AD-A210 009

UNCLASSIFIED

PAGE 152

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 009 CONTINUED

AD-A210 008 6/4 12/5

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

DESCRIPTORS: (U) \*ALGORITHMS, \*TRIANGULATION, AUTOMATIC, BIOMEDICINE, BRAIN, COMPUTER AIDED DESIGN, COMPUTERS, CONSTRUCTION, GRAPHS, HEURISTIC METHODS, HUMANS, INTERACTIONS, LOOPS, NUMERICAL ANALYSIS, POSITION(LOCATION), SAMPLING, SURFACES, TOPOLOGY.

(U) A New Method for Measuring the Visuotopic Map Function of Striate Cortex: Validation with Macaque Data and Possible Extension to Measurement of the Human Map.

DESCRIPTIVE NOTE: Technical rept.,

87

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A5, \*Polyhedral Surfaces.

PERSONAL AUTHORS: Schwartz, Eric

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0977

UNCLASSIFIED REPORT

ABSTRACT: (U) The observation and measurement of the visuotopic map of primate visual cortex is a classical experimental activity. A number of psychophysical (e.g. vernier acuity, visual acuity, Panum's area stereo acuity, motion thresholds) and anatomical (e.g. retinal cell densities) measurements bear at least a qualitative relationship to the presumed curve of cortical magnification. However, there is no accurate and direct method for estimating human magnification factor; and even for the case of monkeys, where micro-electrode and 2DG experiments have been performed, there is still uncertainty in this area. What is the correct functional form for the primate map? What is the variance of this estimate across a population? In order to address these issues, we have constructed a computer generated planar approximation to the surface of Macaque striate cortex (median flattening error = 5%). Other topics in this report include: Flattening Visual Cortex at Image Resolution; Quantitative Computer Reconstruction of the Macaque Ocular Dominance Column Pattern; Image Simulation of the Macaque Ocular Dominance Column System; Three Dimensional Computer Reconstruction of the Ocular Dominance Column Pattern of Macaque Striate Cortex. Demonstrating a Digital Tangential Microtone Frequency Specificity and Inhibitory Interactions for Fourier

AD-A210 009

AD-A210 008

UNCLASSIFIED

PAGE 153

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 008 CONTINUED

AD-A210 007 6/11

Descriptors of Boundary Curvature; Image Processing Simulations of the Functional Architecture of Primate Striate Cortex. (AM)

WISCONSIN UNIV-MADISON SCHOOL OF PHARMACY

(U) Perfluorodecanoic Acid and Lipid Metabolism in the Rat

DESCRIPTORS: (U) \*IMAGE PROCESSING, \*VISUAL CORTEX, \*COMPUTER APPLICATIONS, \*MAPPING, \*COMPUTER GRAPHICS, ACCURACY, ACUITY, ARCHITECTURE, BOUNDARIES, CELL(S)BIOLOGY, COMPUTERS, CURVATURE, DENSITY, EYE, FOURIER ANALYSIS, FUNCTIONS, HUMAN FACTORS ENGINEERING, HUMANS, IMAGES, INDEX TERMS, INHIBITION, INTERACTIONS, MACAQUE MONKEYS, MAGNIFICATION, MAPS, MONKEYS, PATTERNS, POPULATION, PRIMATES, RESOLUTION, RETINA, COMPUTERIZED SIMULATION, VALIDATION, VISUAL ACUITY, PSYCHOPHYSICS.

DESCRIPTIVE NOTE: Annual rept. Jun 88-Jun 89.

MAY 89

PERSONAL AUTHORS: Van Rafeelghem, Marc J.; Heuvel, John P.; Menahan, Lawrence A.; Peterson, Richard E.

CONTRACT NO. AFOSR-85-0207

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR TR-89-0923

IDENTIFIERS: (U) \*Striate Cortex, \*Visuotopic Maps, Computer Generated Planar Approximation, Flattening, Computer Reconstruction, Ocular Dominance, Brain Architecture.

UNCLASSIFIED REPORT

ABSTRACT: (U) Derivatives of perfluorosulfonic and perfluorocarboxylic acids have been used in a number of industrial applications as lubricants, plasticizers, writing agents and corrosion inhibitors. Aqueous film-forming foams, used as fire extinguishants, contain mixtures of hydrocarbon and fluorocarbon surfactants (derivatized fatty acids) due to their superior surface-active properties. Studies on the effects of perfluorodecanoic acid (PFDA) on lipid metabolism in the rat after a single intraperitoneal dose (20, 40, 80 mg/kg) were completed. Because PFDA treatment causes a dose-related reduction in feed intake, the response of vehicle treated rats pair-fed to those receiving PFDA was monitored to distinguish direct effects of the perfluorinated fatty acid from those secondary to hypophagia. A reduction in the carcass content of lipid phosphorus (phospholipid) and free cholesterol in rats treated with PFDA appeared to be consequent to hypophagia, as the pair fed animals exhibited the same attenuation PFDA-treated rats were found to have a higher concentrations of triacylglycerols than their vehicle treated, pair-fed counterparts. It appears PFDA treatment results in the diversion of fatty acids from oxidations towards esterification in the liver. Reprints. (kt)

DESCRIPTORS: (U) \*SULFONIC ACIDS, \*LIPID METABOLISM.

AD A210 008

AD-A210 007

UNCLASSIFIED

PAGE 154 EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 007 CONTINUED

AD-A210 005 6/4

ACIDS. ATTENUATION. CHEMICAL REACTIONS. CHOLESTEROL. CARBOXYLIC ACIDS. PHYSIOLOGICAL EFFECTS. RESPONSE(BIOLOGY). GLYCEROLS. ESTERS. FATTY ACIDS. FILMS. FIRE EXTINGUISHING AGENTS. FLUORINATED HYDROCARBONS. FLUORINATION. FOAM. HYDROCARBONS. INDUSTRIES. LIPIDS. LIQUIDS. LIVER. LUBRICANTS. MIXTURES. PHOSPHOLIPIDS. PHOSPHORUS. PLASTICIZERS. RATS. REPRINTS. SURFACE ACTIVE SUBSTANCES. WRITING.

NEW YORK UNIV N Y

(U) Visualizing and Rhyming Cause Differences in Alpha Suppression.

DESCRIPTIVE NOTE: Rept. for 1 Mar 88-28 Feb 89.

MAY 89

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A5, \*Perfluorodecanoic Acids, Triaxylglycerols.

PERSONAL AUTHORS: Kaufman, Lloyd

CONTRACT NO. F49620-88-K-0004

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR TR-89-0962

UNCLASSIFIED REPORT

ABSTRACT: (U) Alpha rhythms of the EEG are strongest at the occipital regions of the head, and the visual cortex is apparently a major contributor. It has been suggested that visual cortex is involved in forming and processing mental images. The purpose of this experiment is to determine if a task that involves visualizing objects represented by words produces changes in alpha rhythms of the MEG that differ from changes associated with finding rhymes of the same or related verbal stimuli. By hypothesis, the visual areas of the cortex play a less prominent role in the latter task than they do in the visualizing task. This inference is consistent with the finding that visual imagery is accompanied by attenuation of the alpha rhythm over the occipital scalp, in the proximity of visual cortex cognitive factors, such as memorization and classification of words, affects the pattern of alpha blockage across the occipital and parietal area, but this does not establish that visual cortex per se is involved. Subjects responded by forming mental images of the objects represented by the words. The event related potentials associated with presentation of the words were larger in amplitude than they were when the subjects silently pronounced words that rhymed with the stimuli instead of forming mental images. This effect was more evident at occipital electrodes than it was at other locations. There may well be differential

AD A210 007

AD-A210 005

UNCLASSIFIED

PAGE 155

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 005 CONTINUED

AD-A210 004 5/1 6/3

suppression of alpha activity depending on the degree to which visual resources are engaged in various mental tasks, such as imaging. Keywords: Brain; Brain function; Neurochemistry. Reprints. (kt)

NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL WASHINGTON DC

DESCRIPTORS: (U) \*BIOLOGICAL RHYTHMS, \*COGNITION, \*NEUROCHEMISTRY, \*VISUAL CORTEX, ATTENUATION, BRAIN, CLASSIFICATION, ELECTROENCEPHALOGRAPHY, FUNCTIONS, HYPOTHESES, IMAGES, MENTAL ABILITY, OPTICAL IMAGES, PROCESSING, REPRINTS, RESOURCES, STIMULI, SUPPRESSION, VERBAL BEHAVIOR, WORDS(LANGUAGE).

(U) Support of Travel for U.S. Participants in 5th International Biophysics Congress (5th) Held in Copenhagen, Denmark 4-9 August 1975.

DESCRIPTIVE NOTE: Final rept.,

JAN 76

PERSONAL AUTHORS: Sheppard, Harvey E.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4, \*Alpha Rhythms, Brain Function, Brain Waves.

CONTRACT NO. AFOSR-75-2838

PROJECT NO. 9777

MONITOR: AFOSR TR-89-0864

UNCLASSIFIED REPORT

ABSTRACT: (U) This document consist of partial support of travel by five scientists to the 5th International Biophysics Congress, Copenhagen, which was covered under this grant in addition to administrative costs. Applications were screened by a Committee of the Assembly of Life Sciences, National Research Council. Report by the official U.S. delegation to the congress and informal reports by the attendees are attached. (kt)

DESCRIPTORS: (U) \*MANAGEMENT, \*TRAVEL, ADDITION, COSTS, LIFE SCIENCES, INTERNATIONAL, BIOPHYSICS.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A210 001 7/4 7/5

AD-A209 998 9/3 20/5

NATIONAL BUREAU OF STANDARDS WASHINGTON DC MOLECULAR SPECTROSCOPY DIV

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES CENTER FOR LASER STUDIES

(U) Unimolecular Dynamics Following Vibrational Overtone Excitation of  $\text{HN}_3$   $\nu_1=5$  and  $\nu_1=6$ :  $\text{HN}_3(\text{X}, \text{V}, \text{J}, \text{K})$  Yields  $\text{HN}_1(\text{X}(3)\text{Sigma}^-(\text{VJ}\Omega\text{mega})+\text{N}_2(\text{X}(1)\text{Sigma}^+\text{g}))$ .

(U) New, Efficient Optically Pumped Solid State Lasers.

DESCRIPTIVE NOTE: Final rept. 15 Aug 84-14 Nov 88.

JUL 88

FEB 89

PERSONAL AUTHORS: Foy, B. R.; Casassa, M. P.; Stephenson, J. C.; King, D. S.

PERSONAL AUTHORS: Bass, Michael; Birnbaum, Milton

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0378

TASK NO. B1

PROJECT NO. 2301

MONITOR: AFOSR TR-89-0429

TASK NO. A1

MONITOR: AFOSR TR-89-0919

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89 n1 p608-609, 1 Jul 88.

ABSTRACT: (U) We report measurements of the unimolecular vibrational predissociation lifetimes and  $\text{NH}(\text{X } 3 \text{ sigma } -)$  product state distributions following excitation of the fourth and fifth  $\text{NH}$ -stretching overtone transitions of  $\text{HN}_3$ . These state-to-state photodissociation experiments provide an exceptionally detailed view of the dynamics of vibrationally excited  $\text{HN}_3$  and complement high resolution spectra and linewidth data for assigned rovibrational levels of  $\nu_1 = 4, 5, \text{ and } 6$ . Reprints. (AW)

DESCRIPTORS: (U) \*PHOTODISSOCIATION, \*MOLECULAR VIBRATION, \*HYDRAZOIC ACID, DYNAMICS, MEASUREMENT, REPORTS, REPRINTS, ELECTRON TRANSITIONS, MOLECULAR ROTATION, MOLECULAR ENERGY LEVELS, EXCITATION, VIBRATIONAL SPECTRA.

ABSTRACT: (U) This effort explored the effects on laser operation of ion-ion interactions in crystalline solids. Our work on the doubly-doubly Nd, Er: YAG and Nd, Ho: YAG lasers has demonstrated not only simultaneous lasing of both ionic species but also drastic lifetime productions in the lower laser states of both Er and Ho. This work has enabled us to predict crystals in which 4 level operations at 2.9 microns can be achieved and initial verification was obtained with Er,Nd: YALO. Keywords: Solid state lasers; Laser spectroscopy; Ion-ion interactions. (jhd)

DESCRIPTORS: (U) \*SOLID STATE LASERS, CRYSTALS, ION ION INTERACTION, EFFICIENCY, OPTICAL PUMPING, DOPING, OPERATION, SOLIDS, SPECTROSCOPY, ERBIUM, HOLMIUM, YAG LASERS, YTTRIUM ALUMINUM GARNET, NEODYMIUM.

IDENTIFIERS: (U) Laser Spectroscopy, WUAFOSR2301A1, PEG1102F.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 997 11/6

AD-A209 996 12/9 12/3 25/5

CALIFORNIA UNIV DAVIS DEPT OF MECHANICAL ENGINEERING

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Superplasticity - A Fundamental Investigation on Deformation Mechanism and Cavitation Phenomena.

(U) Statistical Communication Theory and Robust Estimation.

DESCRIPTIVE NOTE: Final rept. 1 Feb 86-31 Jan 89,

DESCRIPTIVE NOTE: Final rept.,

JUN 80

JAN 80

PERSONAL AUTHORS: Mukherjee, A. K.; Bieler, T. R.

PERSONAL AUTHORS: Cambanis, S.; Carroll, R. J.

CONTRACT NO. AFOSR-88-0091

CONTRACT NO. AFOSR-75-2796

PROJECT NO. 2306

PROJECT NO. 2304

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0912

TR-89-0853

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Superplasticity at high strain rates was obtained in mechanically alloyed aluminum IN90211. The high rate was due to the fine grain size. A threshold stress analysis, combined with SEM and TEM observations permitted the deformation mechanisms to be determined. Very little cavitation was observed, due to the grain morphology, and the deformation mechanisms that are operative. Superplasticity, Mechanical behavior, Deformation mechanisms, Cavitation phenomenon, Adiabatic heating, Threshold stresses, Dispersion strengthening. (jes)

ABSTRACT: (U) Research completed includes consistent estimation of (nonrandom) signals from nonlinear transformations of noisy samples; approximations of non-bandlimited signals using a finite number of samples and their rate of convergence; (infinite) sampling approximations for non-bandlimited signals, and sampling representations for bounded linear operations on bandlimited signals, and for generalized bandlimited signals; the evaluation of linear estimates and regression estimates in stable processes, including regression and linear filtering of signals in noise; and certain probability and expectation inequalities. Research completed includes work in the following areas: trimming least squares estimators in the linear model by using a preliminary estimator; tests for heteroscedasticity in the linear model; estimation of regression coefficients in a heteroscedastic linear model; almost sure properties of robust regression estimates with applications to sequential clinical trials; robust methods in factorial experiments; studying sequential procedures for estimating the largest of three normal means; nonparametric estimation of regression functions. (RH)

DESCRIPTORS: (U) \*CAVITATION, \*SUPERPLASTICITY, ADIABATIC CONDITIONS, DEFORMATION, DISPERSION HARDENING, FINE GRAINED MATERIALS, GRAIN SIZE, GRAIN STRUCTURES(METALLURGY), HEATING, HIGH RATE, MECHANICAL PROPERTIES, MORPHOLOGY, STRAIN RATE, STRENGTH(MECHANICS), STRESS ANALYSIS, STRESSES, THRESHOLD EFFECTS.

IDENTIFIERS: (U) WUAFOSR2306A1, PE61102F.

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), \*COMBINATORIAL ANALYSIS, \*ESTIMATES, \*INFORMATION THEORY, \*LINEAR FILTERING, \*MATHEMATICAL MODELS, \*NONLINEAR

AD-A209 997

AD-A209 996

UNCLASSIFIED

PAGE 158

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 996 CONTINUED

AD-A209 991 12/2

SYSTEMS, \*SEQUENTIAL ANALYSIS, BANDWIDTH, COEFFICIENTS, CONSISTENCY, CONVERGENCE, FUNCTIONS, LIMITATIONS, LINEAR SYSTEMS, LINEARITY, NONPARAMETRIC STATISTICS, OPERATION, RATES, REGRESSION ANALYSIS, SAMPLING, SIGNALS, STABILITY, STATISTICS, TRANSFORMATIONS.

WISCONSIN UNIV-MADISON

(U) Some Problems in Nonlinear Analysis.

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-31 Jan 89.

IDENTIFIERS: (U) WUAFOSR2304A5, PE61102F.

89

PERSONAL AUTHORS: Crandall, Michael G.

CONTRACT NO. AFOSR-87-0202

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0918

UNCLASSIFIED REPORT

ABSTRACT: (U) A program for obtaining the basic results of Kato's theory of quasilinear evolution equations was obtained by the simpler methods of nonlinear semigroup theory (implicit differencing in time). Certain classes of parabolic and Hamilton-Jacobi equations show the existence and uniqueness of solutions if initial boundary value problems with singular (e.g., identically infinite) initial data and the continuous dependence of these singular solutions as the diffusion coefficient tends to zero. This work shows how certain pde questions motivated by the theory of large deviations can be treated in greater generality and provides a certain abstract framework for this as well as concrete estimates. (jhd)

DESCRIPTORS: (U) \*GROUPS(MATHEMATICS), \*NONLINEAR ANALYSIS, BOUNDARY VALUE PROBLEMS, DIFFUSION COEFFICIENT, EQUATIONS, ESTIMATES, EVOLUTION(GENERAL), SOLUTIONS(GENERAL).

IDENTIFIERS: (U) Kato Theory, Quasilinear Evolution Equations, WUAFOSR2304A9, PE61102F.

AD-A209 996

AD-A209 991

UNCLASSIFIED

PAGE 159

PAGE EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 989 9/1

AD-A209 989 CONTINUED

TEXAS UNIV AT AUSTIN ELECTRONICS RESEARCH CENTER

(U) Electronics Research at the University of Texas at Austin.

DESCRIPTIVE NOTE: Final rept. 1 Apr 86-31 Mar 89.

MAY 89

PERSONAL AUTHORS: Powers, Edward J.

REPORT NO. TR-39

CONTRACT NO. F49620-86-C-0045

PROJECT NO. 2305

TASK NO. A9

MONITOR: AFOSR  
TR-89-0800

IDENTIFIERS: (U) WUAFOSR2305A9, PE61102F.

EQUIPMENT, \*ELECTRONICS, \*MONOLITHIC STRUCTURES\*(ELECTRONICS), \*SOLID STATE ELECTRONICS, ANNEALING, ARRAYS, COMPUTERS, DETECTION, ENGINEERING, EPITAXIAL GROWTH, ESTIMATES, IMPLANTATION, INSTRUCTORS, INTERACTIONS, LIGHT SCATTERING, MILLIMETER WAVES, MOLECULAR BEAMS, MOLECULAR IONS, NONLINEAR ANALYSIS, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, PHYSICS, PROCESSING, QUANTUM ELECTRONICS, RAMAN SPECTRA, SIGNAL PROCESSING, SILICIDES, SILICON, STUDENTS, SURFACES, TEXAS, WAVES.

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report covers the period from April 1, 1986 through March 31, 1989. The progress reported concerns research conducted by ten faculty members and approximately thirty graduate students from the Department of Electrical and Computer Engineering and the Department of Physics. The University of Texas DOD JSEP program is a broad-based program with four research units in Solid State Electronics, two in Electromagnetics, two in Quantum Electronics, and two in Information Electronics. Solid State Electronics includes work on implantation and annealing of InP and related compounds; molecular beam epitaxy with high-speed device applications; epitaxial growth, structure and electronic properties of silicides on silicon surfaces; and femtosecond processes in condensed matter. In Quantum Electronics, nonlinear optical interactions and nonlinear Raman scattering from molecular ions have been investigated. Work in Electromagnetics includes millimeter-wave monolithic array components and nonlinear wave phenomena, while electronic signal processing and nonlinear estimation and detection have been studied in Information Electronics. (rh)

DESCRIPTORS: (U) \*ELECTRICAL EQUIPMENT, \*ELECTRONIC

AD-A209 989

AD-A209 989

UNCLASSIFIED

PAGE 160

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 985 6/4 12/5 AD-A209 985 CONTINUED

NEW YORK UNIV N Y

(AW)

(U) Applications of Computer Graphics and Image Processing to 2D and 3D Modeling of the Functional Architecture of Visual Cortex.

D DESCRIPTORS: (U) \*COMPUTER GRAPHICS, \*IMAGE PROCESSING, \*VISUAL CORTEX, ARCHITECTURE, BRAIN, COMPUTATIONS, ERRORS, GEOMETRY, IMAGES, MONKEYS, NUMERICAL METHODS AND PROCEDURES, PRIMATES, RANGE (EXTREMES), REPRINTS, COMPUTERIZED SIMULATION, STEREOSCOPIC DISPLAY SYSTEMS, VISUAL PERCEPTION, MATHEMATICAL MODELS, ANATOMICAL MODELS, TWJ DIMENSIONAL, THREE DIMENSIONAL.

DESCRIPTIVE NOTE: Technical rept..

JUL 88

PERSONAL AUTHORS: Schwartz, Eric L.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A5, \*Computational Neuroscience, Brain Architecture.

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0976

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Computer Graphics and Applications, Computational Neuroscience 13, p12-23 Jul 88.

ABSTRACT: (U) The visual cortex of monkeys is one of the most extensive studied areas of the primate brain. Nearly half of monkey cortex is devoted to visual processing, and the twenty-odd functional areas that make up visual cortex represent, arguably, one of the most complex mechanisms in nature. Attempts at understanding visual cortex pose a wide range of problems in computer graphics, image processing, computational geometry, and numerical methods. The term computational neuroscience has recently come into use to describe this area of study. In this article we describe a series of studies in this area of work which illustrate a number of applications of computer graphics and image processing to the reconstruction and representation of the complex architectures that make up primate visual cortex. We demonstrate techniques for reconstructing brains in three dimensions, peeling them apart, and flattening the brain with minimal metric error. Finally, we show simulations of natural images as they are mapped in the brain by these architectures, including a simulation of a stereo image at the level of primary visual cortex. Reprints.

AD-A209 985

AD-A209 985

UNCLASSIFIED

PAGE 161

EVI09K

UNCLASSIFIED

UTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 984 23/3

AD-A209 984 CONTINUED

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

\*HUMANS, \*SCANNING, \*VISION, BIOLOGY, BOUNDARIES,  
CURVATURE, SHAPE, SPACE ENVIRONMENTS, VARIATIONS.

(U) Shape Description with a Space Variant Sensor:  
Algorithms for Scan-Path, Fusion and Convergence Over  
Multiple Scans.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

DESCRIPTIVE NOTE: Technical rept..

APR 87

PERSONAL AUTHORS: Yeshurun, Yehezkel; Schwartz, Eric L.

REPORT NO. TR-295, RR-109

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0975

UNCLASSIFIED REPORT

ABSTRACT: (U) One of the ways by which early human vision is sharply distinguished from machine vision is by the fact that the human visual representation is strongly space variant and that the human system builds up a representation of a scene through multiple fixations during scanning. In this paper, we discuss three algorithms related to the 'blending' of a single scene from multiple frames acquired from a space variant sensor. 1) Given a series of space-variant contour based scenes, with different 'fixation points', we show how to fuse these into a single, multi-scan view, which incorporates the information present in the individual scans. 2) We demonstrate an (attentional) algorithm which recursively examines the current knowledge of the scene, in order to best choose the next fixation point, based on focusing attention in regions of maximum boundary curvature. 3) We discuss a simple metric for evaluating 'convergence' over scan-path. This may be used to quantify the performance of (2) above, i.e. to compare the performance of various 'attentional' algorithms. Finally, we discuss this work in the light of both machine and biological vision. (RH)

DESCRIPTORS: (U) \*ALGORITHMS, \*DETECTORS, \*FRAMES,

AD-A209 984

AD-A209 984

UNCLASSIFIED

PAGE 162

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K  
AD-A209 983 AD-A209 983 CONTINUED

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) He<sub>2</sub>-(4II sub g) Yields He<sub>2</sub>(X1 Sigma+) Autodetachment Energy Spectrum: Assessment of the He<sub>2</sub> - and He<sub>2</sub> Ground-State Potentials.

DR 88

PERSONAL AUTHORS: Bae, Y. K.; Peterson, J. R.; Michels, H. H.; Hobbs, R. H.

CONTRACT NO. F49620-85-C-0095

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0814

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v37 n8 p2778-2784, 15 Apr 88.

ABSTRACT: (U) The energy from the spin-forbidden electronic autodetachment from the metastable He<sub>2</sub>-4 Pi<sub>g</sub> ion has been measured. The single-peaked continuum, resulting from a vertical transition to the repulsive well of the He<sub>2</sub> 1sigma + ground state, has a maximum at 15.70 + or - 0.15 eV. For a rotationally cool beam, the spectrum is inconsistent with the existing potentials of He<sub>2</sub>- and He<sub>2</sub>X sigma +. A suitable fit, neglecting rotational effects, would require an increase of 0.06 A<sub>2</sub> in the calculated Re of He<sub>2</sub>-. However a very good fit can also be obtained from the existing potentials by assuming a rotationally hot (15 000 K) distribution. Surprisingly, both fits require contributions from levels v > 0, which are known to undergo vibrational autodetachment to He<sub>2</sub>A 3 SIGMA U +. For such contributions, the latter process must be exceptionally slow (10 to the 6th power/s). Reprints. (AW)

DESCRIPTORS: (U) \*HELIUM, \*MOLECULAR ROTATION, \*MOLECULAR VIBRATION, \*GROUND STATE, COOLING, ENERGY, REPRINTS, ROTATION, SPECTRA, TRANSITIONS, VERTICAL ORIENTATION, ELECTRONIC STATES, METASTABLE STATE, IONS, POTENTIAL ENERGY.

AD-A209 983

AD-A209 983

UNCLASSIFIED

PAGE 163

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 982 CONTINUED

AD-A209 982 12/9 6/4

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

decades may have computational significance, and may represent an alternative approach to the theory of neural computation which stresses the aspect of data structure over the details of network implementation. (KR)

(U) Towards a Non-Network Approach to Neural Modeling:  
Some Basic Issues of Measurement, Simulation and  
Computational Significance of Brain Maps.

DESCRIPTORS: (U) \*BRAIN, \*MAPS, \*ANATOMICAL MODELS,  
ARCHITECTURE, ASSOCIATIVE PROCESSING, BIOLOGY,  
COMPUTATIONS, DATA BASES, IMAGE PROCESSING, METHODOLOGY,  
NERVE CELLS, NERVOUS SYSTEM, NETWORKS, NEURAL NETS,  
OPTICAL IMAGES, POWER, PROCESSING, SCALE, SCHEMATIC  
DIAGRAMS, SEGMENTED, SIMULATION, STRESSES, VISION.

JUN 87

PERSONAL AUTHORS: Schwartz, Eric L.; Yeshurun, Yehezkel

CONTRACT NO. AFOSR-85-0341

PROJECT NO. 2313

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A5.

TASK NO. A5

MONITOR: AFOSR  
TR-89-0968

UNCLASSIFIED REPORT

Pub. in IEEE Annual International Conference on Neural  
Networks (1st) pIV-225-IV-233 Jun 87.

ABSTRACT: (U) The term neural network is often associated with the construction of networks of schematic neurons to implement functions such as associative memory, classification, visual segmentation, etc. One advantage of this approach to modeling the nervous system is its explicit computational power: neural models are set up with the exclusive goal of solving a particular computational problem. One disadvantage of this approach is its remoteness from the actual data of the nervous system. The details of complex neural networks are very difficult to observe. The experimental likelihood of such observation, or even of experimental constraint on current network models, is not favorable in the near future. This work provides a non-network approach to neural modeling in the following sense: we model brain architecture and computation at a continuum, rather than a discrete, or neuronal, level of scale. From a practical point of view, this allows us to simulate biological processing of early vision using conventional image processing techniques (e.g. convolution), avoiding the largely unknown details of network level implementation. In doing so, a concept of the cortical component of the brain as a map machine emerges. This is, novel architectures which have been observed over the past few

AD A209 982

AD-A209 982

UNCLASSIFIED

PAGE 164

LV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 942 20/9 9/1

AD-A209 942 CONTINUED

APPLIED MICROWAVE PLASMA CONCEPTS CARLSBAD CA

(U) A Two-Stream Plasma Electron Microwave Source for High-Power Millimeter Wave Generation. Phase 1.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

MAR 89

PERSONAL AUTHORS: Guest, Gareth E.; Dandl, Raphael A.

REPORT NO. AMPC-033-038

CONTRACT NO. F49620-88-C-0101

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-89-0840

UNCLASSIFIED REPORT

ABSTRACT: (U) A novel high power millimeter/microwave source is proposed in which one or more pairs of interpenetrating streams of electrons flowing through a background plasma in a static magnetic field are used to generate a hot-electron plasma that is confined in a mirror-like magnetic field. Energy stored in the anisotropic, hot-electron plasma is then used to amplify pulses of unstable plasma waves to large amplitude by selective deactivation of mechanisms that stabilize the hot-electron plasma during the energy accumulation phase when the density of hot electrons is rapidly increased through the beam-plasma interaction. The Phase I program has yielded a design for an experimental arrangement capable of verifying the key aspects of this novel source concept, as well as a theoretical framework for interpreting the empirical Phase II results produced by the experimental device and extrapolating those results to evaluate the suitability of the proposed source to meet the requirements of various high power microwave and millimeter wave defense and industrial applications. The experiments will be carried out in a timely and cost-effective way by employing the AMPHED experimental facility at AMPC. (UJID)

DESCRIPTORS: (U) \*RADIOFREQUENCY GENERATORS, \*MICROWAVE EQUIPMENT, \*MILLIMETER WAVES, ACCUMULATION, AMPLITUDE, BEAMS(RADIATION), COST EFFECTIVENESS, DEFENSE SYSTEMS, ELECTRON DENSITY, ENERGY, HIGH POWER, INTERACTIONS, RADIOFREQUENCY AMPLIFIERS, MAGNETIC FIELDS, PLASMA WAVES, PLASMA DEVICES, PLASMAS(PHYSICS), RADIOFREQUENCY POWER, SOURCES, TIMELINESS, WAVE PROPAGATION.

IDENTIFIERS: (U) High Power Microwaves, PE61102F, WUAFOSR2301A8.

UNCLASSIFIED

AD-A209 936 20/6 12/6 9/5  
DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES  
AD-A209 935 12/3

(U) Integrated Opto-Electronic Computing.  
NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS  
DESCRIPTIVE NOTE: Final technical rept. 1 Jul 88-31 Jan 89.  
(U) Research in Stochastic Processes.

APR 89  
DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Aug 88.

PERSONAL AUTHORS: Steier, W. H.; Savchuk, A. A.  
REPORT NO. 53-4502-0337

CONTRACT NO. AFOSR-88-0211

PROJECT NO. 2305

TASK NO. 84

MONITOR: AFOSR  
TR-89-0910

UNCLASSIFIED REPORT

ABSTRACT: (U) Research assistants supported by this grant have worked in a variety of optical computing projects. These projects are summarized briefly in this report. Keywords: Optical interconnection networks; Integrated optoelectronic transceivers; Laser arrays; Array receivers; Optical processors image understanding. (RH)

DESCRIPTORS: (U) \*CIRCUIT INTERCONNECTIONS, \*COMPUTATIONS, \*ELECTROOPTICS, \*INTEGRATED SYSTEMS, \*OPTICAL PROCESSING, \*TRANSMITTER RECEIVERS, ARRAYS, LASERS, NETWORKS, OPTICAL IMAGES, OPTICAL PROPERTIES, RECEIVERS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2305B4.

PERSONAL AUTHORS: Cambanis, Stamatis; Carroll, Raymond J.; Kallianpur, Gopinath; Leadbetter, M. R.

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0913

UNCLASSIFIED REPORT

ABSTRACT: (U) Research was conducted and directed in the area of stochastic processes by three of the principal investigators, S. Cambanis, G. Kallianpur and M. R. Leadbetter, and their associates, and in statistical inference by R. J. Carroll. A summary of the main areas of research activity follows for each principal investigator and co-workers. More detailed descriptions of the work of all participants is given in the main body of the report. Keywords: Signal processing, Nonlinear filters, Stationary, Weighted least square. (KR)

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, FILTERS, LEAST SQUARES METHOD, NONLINEAR SYSTEMS \*LOCAL PROCESSING, STATIONARY, STATISTICAL INFERENCE, WEIGHTING FUNCTIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K  
AD-A209 934 CONTINUED

AD-A209 934 11/6.2 11/6.1

LOCKHEED MISSILES AND SPACE CO INC PALO ALTO CA RESEARCH  
AND DEVELOPMENT DIV

(U) Effect of Alloying, Rapid Solidification, and Surface  
Kinetics on the High Temperature Environmental  
Resistance of Niobium.

DESCRIPTIVE NOTE: Technical rept. Nov 85-Jan 89.

JUN 89

PERSONAL AUTHORS: Perkins, R. A.; Chiang, K. T.; Meier, G.  
H.; Miller, R. A.

REPORT NO. LMSC-F352227

CONTRACT NO. F49620-86-C-0018

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR  
TR-89-0909

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with  
Pittsburgh Univ., PA.

ABSTRACT: (U) Factors affecting the formation of  
protective alumina scales on niobium-base alloys by  
selective oxidation have been investigated. Alumina  
cannot be formed in air at 1 atm. on binary Nb-Al alloys  
at any NiAl). Theoretical knowledge of selective  
oxidation has been applied to Nb-Al alloys to alter  
behavior. The effects of Al-content, temperature,  
atmosphere, third element additions, and microstructure  
on the transition from internal to external oxidation of  
aluminum has been evaluated and conditions under which  
protective alumina scales can form on Nb-Al alloys have  
been defined. Third element additions are required to  
form protective alumina. The most effective additions are  
those which can reduce the solubility and diffusivity of  
oxygen, enhance diffusion of Al, and limit transient  
oxidation. Additions of Ti, Cr, V and Si were identified  
as most promising for providing oxidation resistance in  
Nb-Al alloys. The feasibility of forming compact.

AD A209 934

AD A209 934

UNCLASSIFIED

PAGE 167

EVI09K

adherent alumina scales on Nb alloys at a minimum N(A1)=0.  
32 in air at 1100-1600 C has been demonstrated. Alumina  
scale could not be formed below 1100 C. Preoxidation  
above 1100 C can be used to preform alumina scales that  
will protect at lower temperatures but is effective only  
if the alloy is not cooled to room temperature prior to  
exposure at lower temperatures. Rapid solidification  
processing does not appear to offer any significant  
benefit. (AW)

DESCRIPTORS: (U) \*ALUMINUM OXIDES, \*NIOBIUM ALLOYS,  
\*OXIDATION RESISTANCE, \*SOLIDIFICATION, \*HEAT RESISTANT  
ALLOYS, \*REACTION KINETICS, ADDITION, ALUMINUM, COOLING,  
DIFFUSIVITY, ENVIRONMENTS, EXPOSURE(GENERAL), EXTERNAL,  
FEASIBILITY STUDIES, HIGH TEMPERATURE, KINETICS, LOW  
TEMPERATURE, MICROSTRUCTURE, NIOBIUM, OXIDATION, OXYGEN,  
QUICK REACTION, THERMAL RESISTANCE, ROOM TEMPERATURE,  
SCALE, SOLUBILITY, SURFACES, TRANSIENTS, TRANSITIONS,  
TITANIUM, CHROMIUM, VANADIUM, SILICON.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD A205 921 12/5

AD-A209 920 20/1

STANFORD UNIV CA STANFORD ELECTRONICS LABS

TORONTO UNIV DOWNSVIEW (ONTARIO) INST FOR AEROSPACE STUDIES

(U) Data Compression Algorithms.

DESCRIPTIVE NOTE. Final rept. 1 May 78-30 Apr 79.

APR 79

DESCRIPTIVE NOTE: Final scientific rept.

PERSONAL AUTHORS: Gray, Robert M.

JAN 79

CONTRACT NO. F49620-78-C-0087

PERSONAL AUTHORS: Ribner, H. S.

PROJECT NO. 2304

CONTRACT NO. AFOSR-75-2808

TASK NO. A6

PROJECT NO. 2307

MONITOR: AFOSR  
TR-89-0880

TASK NO. A2

MONITOR: AFOSR  
TR-89-0873

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The principal accomplishment of the year was the completion of an experimental and theoretical study of an algorithm for the design of block (or vector) quantizers that are locally optimum in the sense of minimizing average distortion as measured by quite general distortion measures. The algorithm is based either on a probabilistic model of the source to be compressed or on a long sequence of training data produced by the source. Keywords: Data compression; Data processing. (kt)

DESCRIPTORS: (U) \*ALGORITHMS, \*DATA COMPRESSION, DATA PROCESSING, DISTORTION, MATHEMATICAL MODELS, PROBABILITY, SEQUENCES

IDENTIFIERS: (U) PE61102F, WUAFOSR23046

ABSTRACT: (U) Jet noise diagnostics were performed by cross-correlating the suspected source terms (e.g., rates of turbulent momentum flux) with the effect they produce. To eliminate the possibility of spurious noise, the source terms were measured with a laser doppler velocimeter and correlated with the far field jet noise (microphone signal). Source distribution over slices of jet inferred therefrom are, unexpectedly, somewhat pear-shaped. Spectra predicted from measured cross-spectral densities are compatible with corresponding spectra extracted from far field intensities and with theory. Experimental studies of unorthodox concepts for shielding jet noise were carried out. Only modes attenuation of the park jet noise was found with a family of half round 'sugar scoop' shields (e.g., 5-6 PNdB when scaled to a full size engine), owing largely to edge noise from jet interference. Another shielding concept involved extending the effective length of the 'sugar scoops' by means of a hot refractive layer (array of flames). Marginal increases in shielding were found. Keywords: Jet aircraft noise; Sonic boom; Aeroacoustics; Thunder; Blast waves; Noise reduction; Canada. (EDC)

DESCRIPTORS: (U) \*AERODYNAMIC NOISE, \*JET AIRCRAFT NOISE, ACOUSTIC MEASUREMENT, ACOUSTICS, AERODYNAMICS.

AD A209 921

AD A209 920

UNCLASSIFIED

PAGE 158

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 920 CONTINUED

AD-A209 919 6/3 1/2

ATTENUATION, BLAST WAVES, CANADA, CROSS CORRELATION, DENSITY, DIAGNOSIS(GENERAL), DISTRIBUTION, DOPPLER SYSTEMS, EDGES, ENGINES, EXPERIMENTAL DATA, FAR FIELD, FLAMES, FLUX(RATE), HIGH TEMPERATURE, INTENSIFY, JET ENGINE NOISE, LASER VELOCIMETERS, LAYERS, MICROPHONES, MOMENTUM, NOISE, NOISE REDUCTION, REFRACTION, SCOOPS, SHIELDING, ACOUSTIC SIGNALS, SONIC BOOM, SOUND, SOURCES, SPECTRA, SUBSONIC CHARACTERISTICS, TURBULENCE.

CLEMSON UNIV S C DEPT OF ZOOLOGY

(U) Radar Techniques for Air Force Applications in Avoidance of Bird-Aircraft Collisions and Improvement of Flight Safety.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun-31 Dec 78.

FEB 79

IDENTIFIERS: (U) Thunder, Aeroacoustics, PE61102F, WUAFOSR2307A2.

PERSONAL AUTHORS: Gauthreaux, Sidney A., Jr

CONTRACT NO. AFOSR-75-2782

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR TR-89-0868

UNCLASSIFIED REPORT

ABSTRACT: (U) Evaluation of the influence of aircraft landing lights on flight behavior of migrating birds at night has been completed. Birds do not make evasive maneuvers to avoid approaching aircrafts with their landing lights on. Evaluation of the AN/TVS-5 image intensifier shows that it is an ideal instrument to use in quantifying and monitoring bird migrations. The correlation between migration traffic rate and the density of bird echoes on the radar screen is identical on different nights when the magnitude of migration is the same. An automatic system composed of an image intensifier in combination with a closed circuit television video tape system has been developed to gather more accurate data on nocturnal migration. Keywords: Bird strikes; Collision avoidance; Radar; Nocturnal bird migration; Animal migration. (KT)

DESCRIPTORS: (U) \*BIRD STRIKES, \*COLLISION AVOIDANCE, ACCURACY, AIR FORCE OPERATIONS, AIRCRAFT LANDINGS, ANIMAL MIGRATION, AUTOMATIC, AVIATION SAFETY, BIRDS, CATHODE RAY TUBE SCREENS, AVIATION SAFETY, ECHOES, FLIGHT ENVELOPE, IMAGE INTENSIFIERS(ELECTRONICS), INSTRUMENTATION, LANDING LIGHTS, MIGRATION, MILITARY APPLICATIONS, MONITORING, NIGHT, RADAR, RADAR EQUIPMENT, RATES, TRAFFIC.

AD-A209 920

AD-A209 919

UNCLASSIFIED

PAGE 169

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD A209 919 CONTINUED

AD-A209 918 6/4

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A4, AN/TVS-5.

NEW YORK UNIV N Y

(U) Modulation of Spontaneous Brain Activity During Mental Imagery.

DESCRIPTIVE NOTE: Rep. for 1 Mar 88-28 Feb 89.

MAY 89

PERSONAL AUTHORS: Kaufman, Lloyd

CONTRACT NO. F49620-88-K-0004

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0961

UNCLASSIFIED REPORT

ABSTRACT: (U) Magnetic measurements of average power of human alpha activity over the occipital and parietal areas of the scalp reveal spatially selective suppression when abstract figures are briefly presented visually. The duration of suppression increases along with reaction time during a search of visual memory. This implies that the visual system is involved in mental imagery. Keywords: Brain function; Neural activity. (KT)

DESCRIPTORS: (U) \*BRAIN, \*NEUROPHYSIOLOGY, \*NERVE IMPULSES, \*NEURAL NETS, ABSTRACTS, FUNCTIONS, HEAD(ANATOMY), HUMANS, MAGNETIC FIELDS, MEASUREMENT, MEMORY(PSYCHOLOGY), MODULATION, OPTICAL IMAGES, REACTION TIME, SEARCHING, SKIN(ANATOMY), SUPPRESSION, TIME, VISION

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4, \*Brain Activity, \*Brain function.

AD A209 919

AD A209 918

UNCLASSIFIED

PAGE 170

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 917 CONTINUED

AD-A209 917 5/8 6/4

NEW YORK UNIV N Y

(U) Attention, Imagery and Memory: A Neuromagnetic Investigation.

produced a profound change in activity cortex during imaging. Acoustically presented words were also found to produce changes in MEG activity arising in the visual areas when they were used as cues to forming a mental image. (AW)

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 88-28 Feb 89.

MAY 89

DESCRIPTORS: (U) \*MEMORY(PSYCHOLOGY), \*OPTICAL IMAGES, \*VISION, \*VISUAL CORTEX, \*ATTENTION, ALPHA SPECTRA, BRAIN, IMAGES, MAGNETOENCEPHALOGRAMS, MEAN, MENTAL ABILITY, POWER, REACTION TIME, REDUCTION, SEARCHING, TIME, CUES(STIMULI).

PERSONAL AUTHQR: Kaufman, Lloyd

CONTRACT NO. F49620-88-K-0004

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4, Mental Images.

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0960

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes a number of experiments related to the effects of mental imagery and other high-level cognitive tasks on the spontaneous activity of the brain. The basic procedure involves narrowly bandpassing the magnetoencephalogram (MEG), computing the average response to a stimulus or event within that bandpass, and computing the variance around the average. The variance at any point in time subsequent to the stimulus is a measure of mean square field (power). Power in the alpha band (8-12 Hz) was found to show a prominent change in level subsequent to presentation of form. Simply watching the form results in a dip in alpha power, but when subjects attempt to determine if the form had been seen previously, the duration of the reduction in alpha power increases significantly, and is correlated with reaction time (RT). The distribution of alpha across the occipital and parietal areas shows remarkable individual differences in both symmetry and magnitude. The changes in this distribution during the course of performing a search of visual memory suggests that the effects are localized to visual cortex. In another experiment subjects either tried and form an image of an object represented by a visually presented word, or to find a rhyming word. The latter task did not produce a change in activity of visual cortex, while the same words

AD-A209 917

AD-A209 917

UNCLASSIFIED

PAGE 171

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 916 20/4 12/5

AD-A209 904 7/3

STANFORD UNIV CA DEPT OF AERONAUTICS AND ASTRONAUTICS

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Development of Analytical and Semi-Numerical Methods of Flow Calculation.

(U) Three-, Four-, and Five-Membered Rings from Disilenes, 89

DESCRIPTIVE NOTE: Final scientific rept. 1 Dec 73-30 Nov 78.

PERSONAL AUTHORS: West, Robert; Gillette, Gregory R.; Yokelson, H. B.; Millevolte, A. J.

JAN 79

PERSONAL AUTHORS: Van Dyke, Milton

CONTRACT NO. F49620-86-C-0010

CONTRACT NO. AFOSR-74-2649

PROJECT NO. 2303

PROJECT NO. 2307

TASK NO. B2

TASK NO. A4

MONITOR: AFOSR TR-89-0795

MONITOR: AFOSR TR-89-0872

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Phosphorus, Sulfur and Silica, v41 p3-14 1989.

DESCRIPTORS: (U) \*FLUID DYNAMICS, \*COMPUTER APPLICATIONS, FLOW FIELDS, COMPUTATIONS, VORTICES, BOUNDARY LAYER FLOW, FLOW PIPES, LAMINAR FLOW, VISCOUS FLOW, SHOCK WAVES, TRANSONIC FLOW.

ABSTRACT: (U) Disilenes, R2Si=SiR2, react with many substances to produce cyclic compounds containing two silicon atoms and one or more heteroatoms. Most of these products are new ring systems, and some show abnormal structures with short Si-Si bonds, suggesting unusual chemical bonding. Keywords: Disiloxanes; Siloxanes; Dioxigen; Chalcogens; Azides; Diazomethanes; Isocyanides; Disilacyclopropanimine; Chemical reactions; Reprints. (aw)

DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, \*MOLECULAR STRUCTURE, \*SILICON COMPOUNDS, ABNORMALITIES, ATOMS, AZIDES, CHALCOGENS, CHEMICAL BONDS, CHEMICAL REACTIONS, REPRINTS, RINGS, SILICON, SILOXANES.

IDENTIFIERS: (U) PE61102F. WUAFOSR2307A4.

IDENTIFIERS: (U) PEG61102F, WUAFOSR2303B2, \*Disilenes, Heteroatoms, Dioxigen, Diazomethanes, Isocyanides, Disilacyclopropanimine, Rings(Cyclic Compounds).

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 903 12/1

AD-A209 899 7/6 7/3

FLORIDA UNIV GAINESVILLE

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

(U) Probabilistic Analysis of Semilinear Partial  
Differential Equations.

(U) Reaction of E-1,4-Poly(2-Triethylsilyl)-1,3-Butadiene)  
with Iodine Monochloride,

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-29 Mar 89.

89

MAY 89

PERSONAL AUTHORS: Glover, Joseph; Chung, Kai L.

PERSONAL AUTHORS: Wan, Jjiang; Weber, William P.

CONTRACT NO. AFOSR-85-0330

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR  
TR-89-0806

MONITOR: AFOSR  
TR-89-0837

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A major thrust of the original proposal was to find new probabilistic methods for dealing with semilinear partial differential equations. Mathematicians are currently devoting more of their attention to studying nonlinear partial differential equations since they recognize that descriptions of physical phenomena must incorporate nonlinear behavior. The author succeeded in finding a method for solving systems of semilinear elliptic equations by a new procedure which does not need the old hypotheses of quasi-monotone systems. It combines probability, analysis and a transfinite induction scheme to solve equations of a certain on a domain  $E$  in  $R$  sub  $d$  subject to boundary conditions  $u$  sub  $1$  =  $u$  sub  $2$  = ...  $u$  sub  $n$  0 on the boundary of  $E$ . (kr)

DESCRIPTORS: (U) \*PARTIAL DIFFERENTIAL EQUATIONS, \*PROBABILITY, BEHAVIOR, ELLIPSES, EQUATIONS, HYPOTHESES, INDUCTION SYSTEMS, MATHEMATICS, METHODOLOGY, NONLINEAR DIFFERENTIAL EQUATIONS, NONLINEAR SYSTEMS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

SUPPLEMENTARY NOTE: Pub. in Polymer Bulletin, v21 p427-432 1989.

ABSTRACT: (U) Addition of iodine monochloride to E-1,4-poly(2-triethylsilyl-1,3-butadiene) (I) followed by treatment with potassium fluoride dihydrate yields a copolymer comprised of E and Z-1,4(2-iodo-1,3-butadiene) (E and Z-II) units and Z-1,4-(2-chloro-1,3-butadiene) (Z-III) units. The mechanism of this reaction is discussed. The product copolymer has been characterized by <sup>1</sup>H and <sup>13</sup>C NMR, IR, UV, GPC, TGA and elemental analysis. Keywords: Electrophilic substitution; Reprints. (AW)

DESCRIPTORS: (U) \*CHLORIDES, \*IODINE COMPOUNDS, \*POLYBUTADIENE, \*CHEMICAL REACTIONS, COPOLYMERS, REPRINTS, SUBSTITUTION REACTIONS, POTASSIUM COMPOUNDS, FLUORIDES, SILICON, ETHYL RADICALS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Butadiene/E-1-4-Poly(2-Triethylsilyl-1-3), Electrophilic Substitution Reactions, Iodine Monochloride.

AD A209 903

AD-A209 899

UNCLASSIFIED

PAGE 173

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 897 CONTINUED

AD-A209 897 8/11 17/10 19/9

SOUTHERN METHODIST UNIV DALLAS TX DEPT OF GEOLOGICAL SCIENCES

AMPLITUDE COMPUTATIONS, CONTAINMENT(GENERAL), COUPLING(INTERACTION), CRATERING, DEPTH, EFFICIENCY, ENERGY, EXPLOSIONS, FUNCTIONS(MATHEMATICS), GRADIENTS, GREENS FUNCTION, HIGH FREQUENCY, NEAR FIELD, NUCLEAR EXPLOSION SIMULATION, OPTIMIZATION, PRIMARY WAVES(SEISMIC WAVES), WAVE PROPAGATION, RATIOS, REPRINTS, SCALING FACTOR, SEISMIC DATA, SITES, SOURCES, SURFACES, VELOCITY.

(U) Effects of Source Depth on Near-Source Seismograms.

MAY 88

PERSONAL AUTHORS: Flynn, Elizabeth C.; Stump, Brian W.

CONTRACT NO. AFOSR-84-0018

IDENTIFIERS: (U) Source depth, PE61102F, WUAFOSR2309A2.

PROJECT NO. 2309

TASK NO. A2

MONITOR: AFOSR TR-89-0842

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research, v93 n85 p4820-4834, 10 May 88.

ABSTRACT: (U) Source depth effects are examined for five 115-kg explosions buried at depths ranging from the optimum cratering depth of 1.8 m to the fully contained depth of 11.5 m. Data were recovered at near source ranges from 17 to 228 m. The waveforms are dominated by P and SV-Rayleigh energy. Depth effects are evident in the increase of P to SV-Rayleigh amplitude ratios and in the twofold increase of high-frequency energy for the deeper sources. Theoretical propagation depth effects are modeled by Green's functions calculated for a velocity gradient which approximates the velocity structure of the experimental site. The effects of depth on the explosion source function are predicted using the scaling laws of Mueller and Murphy (1971). These models did not reproduce the observed twofold increase of high-frequency energy. The discrepancy between the model and observations is attributed to increased coupling of high frequency P wave energy for fully contained sources. Energy calculations confirm that the shallowest event coupled 40% and the fully contained event 80% of the total seismic energy into the P wave. Source coupling efficiencies ranged from 0.7-1.0% for the near surface source to 1.5-2.9% for the fully contained explosion. Reprints. (EDC)

DESCRIPTORS: (U) \*EXPLOSION EFFECTS. \*SEISMIC WAVES.

AD A209 897

AD-A209 897

UNCLASSIFIED

PAGE 174

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 896

7/4

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

AD-A209 896

CONTINUED

(U) Emission Properties of Dioxorhenium(V) Complexes in Aqueous Solutions of Anionic and Nonionic Surfactants: A Sensitive Probe of Hydrophobic Binding Regions.

DESCRIPTORS: (U) \*HYDROPHOBIC PROPERTIES, \*RHENIUM COMPOUNDS, \*OXIDES, \*SURFACE ACTIVE SUBSTANCES, \*EMISSION SPECTRA, ABSORPTION, COLLOIDS, EMISSION, ISOTOPE EFFECT, KINETICS, MODELS, MOISTURE CONTENT, OPTICAL PROPERTIES, PROBES, REGIONS, REPRINTS, SENSITIVITY, SODIUM, SOLUTIONS(MIXTURES), WATER, METAL COMPLEXES, CHEMICAL BONDS, PYRIDINES, SULFATES.

DESCRIPTIVE NOTE: Rept. for 1987-1988.

89

PERSONAL AUTHORS: Thorp, H. H.; Kumar, Challa V.; Turro, Nicholas J.; Gray, Harry B.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, Dioxorhenium Complexes, Hydrophillic, Phenylpyridines, Sulfate/Sodium Dodecyl.

REPORT NO.: CONTRIB-7725

CONTRACT NO.: AFOSR-88-0043, NSF-CHE85-18793

PROJECT NO.: 2303

TASK NO.: 82

MONITOR: AFOSR  
TR-89-0836

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemical Society, v111 n12 p4364-4368 1989.

ABSTRACT: (U) The emission properties of ReO<sub>2</sub>(py)<sub>4</sub>(+) (ReO<sub>2</sub>(+)) in aqueous solutions of anionic and nonionic surfactants have been investigated. The optical properties of this complex are extremely sensitive to water and therefore, it is an excellent probe of hydrophobic as well as hydrophilic regions. The emission and absorption maxima of ReO<sub>2</sub>(+) are dependent on the water content of its environment. Emission lifetimes vary over four orders of magnitude upon shifting from aqueous to nonaqueous environments. The emission lifetime has a large (8.6) isotope effect (k(H<sub>2</sub>O)/k(D<sub>2</sub>O)) that reflects its sensitivity toward the environment. These properties have been used to develop a structural and kinetic model for the interactions of ReO<sub>2</sub>(+) with sodium dodecyl sulfate (SDS). A hydrophobic ReO<sub>2</sub> + derivative, ReO<sub>2</sub>(3-Ph-py)<sub>4</sub>(+) (3-Ph-py=3phenylpyridine), has been used to probe micelles of nonionic surfactants and these results are consistent with those obtained with SDS. Reprints. (aw)

AD-A209 896

AD-A209 896

UNCLASSIFIED

PAGE 175

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 895 CONTINUED

AD-A209 895 7/4 20/5

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY AND  
BIOCHEMISTRY

(U) The Dipole Moment Function and Vibrational Transition  
Intensities of OH,

MAY 89

PERSONAL AUTHORS: Nelson, David D., Jr.; Schiffman, Aram;  
Nesbitt, David J.

CONTRACT NO. F49620-86-C-0056

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0838

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90  
n10 p5455-5465, 15 May 89.

ABSTRACT: (U) The relative intensities of nine pairs of  
rovibrational transitions of OH in the  $v=0$  to 1  
transition fundamental have been measured by flash  
kinetic infrared absorption spectroscopy. Each pair of  
transitions originates from a common rotational and spin-  
orbit state, so that relative intensities are independent  
of the OH number density and quantum state distribution.  
The relative intensities are strongly J dependent and  
this dependence provides detailed information about the  
shape of the OH dipole moment function,  $\mu(r)$ , and hence  
the absolute infrared transition strengths. In an  
accompanying paper we present the theoretical basis for  
extracting  $\mu(r)$ , for an open shell diatomic like OH,  
from relative infrared intensities and permanent dipole  
moment measurements. In this work we implement those  
ideas and determine the OH dipole moment function. The  
accuracy of  $\mu(r)$  is excellent since the data used to  
derive it are from low vibrational states. The useful  
range of this function extends from approximately 0.75 to  
1.35 Å. The rotationless Einstein A coefficient for the  
OH fundamental is determined from  $\mu(r)$  to be 16.7 (19)  
Hz. Keywords: Flash kinetic spectroscopy; HNO photolysis;  
Vibrational emission, Reprints. (aw)

DESCRIPTORS: (U) \*DIPOLE MOMENTS, \*HYDROXYL RADICALS,  
\*VIBRATIONAL SPECTRA, ACCURACY, COEFFICIENTS, DENSITY,  
DISTRIBUTION, EMISSION, FLASHES, FUNCTIONS, INFRARED  
SPECTRA, INTENSITY, KINETICS, MEASUREMENT, PHOTOLYSIS,  
QUANTUM THEORY, REPRINTS, SPECTROSCOPY, SPINNING(MOTION),  
STRENGTH(GENERAL), ELECTRON TRANSITIONS, MOLECULAR  
VIBRATION, MOLECULAR ORBITALS, MOLECULAR ROTATION, SPIN  
STATES, DIATOMIC MOLECULES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230381.

AD A209 895

AD-A209 895

UNCLASSIFIED

PAGE 176

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 894 CONTINUED

AD-A209 894 7/4 20/5

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY AND  
BIOCHEMISTRY

(U) Absolute Infrared Transition Moments for Open Shell  
Diatomics from J Dependence of Transition Intensities:  
Application to OH.

MAY 89

PERSONAL AUTHORS: Nelson, David D., Jr.; Schiffman, Aram;  
Nesbitt, David J.; Yaron, David J.

CONTRACT NO. F49620-86-C-0058

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0839

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90  
n10 p5443-5454, 15 May 89.

ABSTRACT: (U) A general approach to the determination of  
the dipole moment function and of the absolute  
vibrational transition moments for diatomic molecules is  
presented. This method utilizes the variation of  
intensity with J within a vibrational transition,  
together with permanent dipole moment information, to  
extract the absolute transition moments. An essential  
feature of the model is its use of algebraic expressions  
for calculating vibration-rotation line intensities.  
These expressions can be rapidly evaluated in a least  
squares fit which determines the dipole moment function.  
This approach is general in that it is not limited to  $\sigma$   
sigma state molecules, nor to the simplest of Hund's case  
couplings of spin, orbital and mechanical angular  
momentum. It is successfully applied to the OH molecule  
which violates each of these restrictions. In the  
accompanying work we report experimental measurements of  
relative infrared absorption intensity measurements for  
OH v=0 to 1 transitions and the extraction of an  
experimental (r) using the approach presented here.  
Keywords: Absorption spectra, Herman Wallis effect;  
Reprints. (aw)

DESCRIPTORS: (U) \*ABSORPTION SPECTRA, \*DIATOMIC  
MOLECULES, \*DIPOLE MOMENTS, \*ELECTRON TRANSITIONS,  
\*HYDROXYL RADICALS, \*VIBRATIONAL SPECTRA, ALGEBRAIC  
FUNCTIONS, ANGULAR MOMENTUM, COUPLINGS, EXPERIMENTAL DATA,  
FUNCTIONS, INFRARED SPECTRA, INTENSITY, MEASUREMENT,  
MOLECULAR ORBITALS, REPORTS, REPRINTS, SPINNING(MOTION),  
VARIATIONS, MOLECULAR VIBRATION, MOLECULAR ROTATION,  
MOLECULAR ENERGY LEVELS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, Herman Wallis  
Effect, Shells(Energy Levels).

AD-A209 894

AD-A209 894

UNCLASSIFIED

PAGE 177

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 888 7/6 7/3

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

(U) Reduction Silylation of Chloroprene.

83

PERSONAL AUTHORS: JIANG, Wan; WEBER, William

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0798

UNCLASSIFIED REPORT

ABSTRACT: (U) Copolymers made up of 1,4-(2-trimethylsilyl)-1,3-butadiene (I) and 1,4-(2-chloro-1,3-butadiene) (II) units have been prepared by reaction of chloroprene with trimethylchlorosilane and sodium dispersion in THF. The ratio of I:II units in the copolymers have been determined by IR, <sup>1</sup>H NMR and elemental analysis. The E:Z ratio of these units has been determined by <sup>1</sup>H NMR, <sup>13</sup>C and <sup>29</sup>Si NMR of these copolymers is discussed. Keywords: Reductive silylation; Reprints. (aw)

DESCRIPTORS: (U) \*CHLOROSILANES, \*POLYBUTADIENE, \*CHLOROPRENES, \*REDUCTION(CHEMISTRY), COPOLYMERS, DISPERSING, METHYL RADICALS, RATIOS, REPRINTS, SODIUM.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, \*Silylation, Butadiene/1-4-(2-Trimethylsilyl-1-3), Butadiene/1-4-(2-Chloro-1-3).

AD-A209 887 7/3

CORNELL UNIV ITHACA NY DEPT OF CHEMISTRY

(U) ETA(2)-(N,C)-Pyridine Micrometers-ETA(2)(1,2):ETA(2):4,5-Benzene Complexes of (Silox)3Ta (Silox = t-Bu3SiO ).

83

PERSONAL AUTHORS: NEITHAMER, David R.; PARKANYI, Laszlo; MITCHELL, John F.; WOLCZANSKI, Peter T.

CONTRACT NO. AFOSR-87-0103

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0827

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v110 n13 p4421-4423 1988.

ABSTRACT: (U) The unusual capability of transition metals to coordinate to pi-systems of organic molecules is recognized as playing a historic and important role in the growth of organometallic chemistry. This development is manifested in the widespread usage of aromatic hydrocarbons, such as cyclopentadienyl anion and arenes, as ancillary ligands bound with maximum hapticity to various metals. Less common, but inherently interesting, are modes of binding which disturb the aromaticity of the fragment, yet fall short of utilizing the hydrocarbon's full complement of pi-electrons. Presented herein are pyridine (eta 2)7 and benzene mu (eta 2) (1,2)(eta 2(4,5) adducts of (silox)3Ta (1,silox = t-Bu3SiO-18 which exhibit intriguing coordination geometries. Reprints. (AW)

DESCRIPTORS: (U) \*BENZENE, \*ORGANOMETALLIC COMPOUNDS, \*PYRIDINES, \*SILOXANES, AROMATIC HYDROCARBONS, CHEMISTRY, GROWTH(GENERAL), LIGANDS, METALS, MOLECULES, ORGANIC COMPOUNDS, REPRINTS, TRANSITION METALS.

IDENTIFIERS: (U) Cyclopentadienyl Anions, Arenes, Hapticity.

AD A209 888

AD-A209 887

UNCLASSIFIED

PAGE 178

EVI09K

UNCLASSIFIED

AD-A209 886 7/3 7/4 7/5 AD-A209 886 CONTINUED  
OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

DANISH ATOMIC ENERGY COMMISSION ROSKILDE ACCELERATOR SECTION

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2,  
\*Diphenylalkanes, Alkane/N-Diphenyl-1, Mean Life,  
Lifetime, Triplet State, Biradicals,  
\*Diphenylcycloalkanes, Alkanones, Intersystem Crossing

(U) Negative Temperature Dependence in the Decay of Triplet Biradicals.

88

PERSONAL AUTHORS: Wang, Jinfeng; Doubleday, Charles E., Jr.; Turro, Nicholas J.

CONTRACT NO. AFOSR-88-0043

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR TR-89-0799

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 p3962-3965 1988.

ABSTRACT: (U) The lifetimes of the 1, n-diphenylalkane-1, n-diyl triplet biradicals 3n derived from type I photolyses of alpha, alpha-diphenylcycloalkarones were studied by nanosecond transient absorption as a function of biradical chain length n and temperature. Intermediate-length biradicals 3(5,8,9) have no longer lifetimes than smaller 3(3,4) or larger 3(11,14) biradicals. The temperature dependence of the biradical lifetimes was measured in methanol and nonane solvents for biradicals 3(5,9,11). For 3(5) the Arrhenius activation energy for decay is normal. However, for 3(9,11) a novel negative activation energy has been observed in the range 0-100 C. The results are interpreted in terms of an intrinsic relation between the sign of the high-temperature Arrhenius slope and the mechanism of intersystem crossing in the biradical. Keywords: Temperature dependence; Intersystem crossing. Reprints. (aw)

DESCRIPTORS: (U) \*ALKANES, \*CHEMICAL RADICALS, \*DECAY, ABSORPTION, ACTIVATION ENERGY, CARBINOLS, NONANE, REPRINTS, SOLVENTS, THERMAL PROPERTIES, TRANSIENTS, PHENYL RADICALS

AD A209 886

AD-A209 886

UNCLASSIFIED

PAGE 179

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 884 6/4 AD-A209 880 14/2 12/3 12/4 12/9  
JOHNS HOPKINS UNIV BALTIMORE MD  
ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF MATHEMATICS  
STATISTICS AND COMPUTER SCIENCE

(U) Pre-Attentive and Attentive Visual Information Processing.

(U) Design of Experiments and Reliability Models.

DESCRIPTIVE NOTE: Annual rept. 2 Apr 88-3 Mar 89.

DESCRIPTIVE NOTE: Final rept. 1 Aug 85-31 Oct 88.

JUN 89

MAY 89

PERSONAL AUTHORS: Egeth, H. E.

PERSONAL AUTHORS: Hedayat, A. S.; El-Newehi, E.

CONTRACT NO. AFOSR-87-0180

CONTRACT NO. AFOSR-85-0320

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. A4

TASK NO. A5

MONITOR: AFOSR  
TR-89-0815

MONITOR: AFOSR  
TR-89-0772

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on several interrelated topics is described in this report. These projects are focused on the analysis of feature and conjunction detection, models of selective attention, and curve tracing. One project examines the effects of a heterogeneous background on feature search. Another assesses spatial factors (such as target-distractor separation) in the detection of targets defined in terms of simple features. A third project has the goal of developing methods for determining the extent to which processing is serial or parallel. A fourth represents initial efforts to determine whether conjoined features are represented in retinotopic or spatiotopic 'maps'. A fifth explores top-down and bottom-up factors in visual search. A sixth makes use of an inhibitory priming method to test early- and late-selection models of selective attention. Finally, a project is reported in which the operation of visual curve tracing is studied. Keywords: Visual perception; Attention; Perception; Information processing; Vision; Visual search; Curve tracing. (kt)

DESCRIPTORS: (U) \*DETECTION, \*INFORMATION PROCESSING, \*OPTICAL IMAGES, \*SEARCHING, \*TARGETS, \*VISION, \*VISUAL PERCEPTION, BACKGROUND, CURVE FITTING, HETEROGENEITY, INHIBITION, PERCEPTION, PRIMERS, SPATIAL DISTRIBUTION.

ABSTRACT: (U) Our research in design of experiments included the following areas: 1) Efficient designs for experiments involving several factors; 2) Efficient designs for repeated measurements models; 3) Trade off in designs; 4) Flexible orthogonal arrays; 5) Efficient designs for comparing test treatments with controls; and 6) Designs for collecting data through sampling. Our research in reliability has been mainly directed to the following areas: 1) Multistate reliability models; 2) Optimal assembly of coherent systems (both in the binary and multistate cases); 3) Redundancy importance and allocation of spares in coherent systems; 4) Closure properties of classes of life distributions; and 5) Optimal inspection policies. (EDC)

DESCRIPTORS: (U) \*EXPERIMENTAL DESIGN, \*RELIABILITY, ALLOCATIONS, ARRAYS, ASSEMBLY, CLOSURES, COHERENCE, DATA ACQUISITION, FLEXIBLE STRUCTURES, INSPECTION, LIFE EXPECTANCY(SERVICE LIFE), MODELS, OPTIMIZATION, ORTHOGONALITY, POLICIES, REDUNDANCY, SAMPLING, TEST AND EVALUATION, TRADE OFF ANALYSIS, SPARE PARTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5.

AD A209 884

AD A209 880

UNCLASSIFIED

PAGE 180

PAGE 180

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 875 CONTINUED

CREATE INC HANOVER NH

AD-A209 875 20/3 13/9 13/7

\*CRYOGENICS, \*MINIATURIZATION, \*SUPERCONDUCTORS,  
\*TURBINES, \*TURBOMACHINERY, COOLING AND VENTILATING  
EQUIPMENT, CYCLES, DETECTORS, EFFICIENCY, EXPANSION, GAS  
BEARINGS, HEAT, HIGH RELIABILITY, HIGH TEMPERATURE, INPUT,  
LAUNCHING, LOW TEMPERATURE, MATERIALS, POWER, ROOM  
TEMPERATURE, SELF OPERATION, SPACEBORNE, STIFFNESS,  
WEIGHT.

(U) Superconducting Meissner Effect Bearings for Cryogenic  
Turbomachines. Phase 1.

DESCRIPTIVE NOTE: Final rept. Sep 88-Mar 89.

MAY 89

IDENTIFIERS: (U) Meissner Effect, PE61102F,  
WUAFOSRK822F1.

PERSONAL AUTHORS: Iannello, Victor; Marshall, Jeffrey S.;  
Stacy, W. D.

REPORT NO. CREATE-TM-1352

CONTRACT NO. F49620-88-C-0137

PROJECT NO. K822

TASK NO. F1

MONITOR: AFOSR  
TR-89-0825

UNCLASSIFIED REPORT

ABSTRACT: (U) State of the art miniature expansion  
turbines and centrifugal compressors used in spaceborne  
sensor cryocoolers employ self-acting gas bearings to  
achieve high reliability and long operating life. Because  
these bearings must run at room temperature to achieve  
adequate stiffness and stability, they result in an  
avoidable source of heat leak to the process gas, thereby  
lowering overall cycle efficiency and increasing the  
system launch weight. This report shows that the gas  
bearings can be replaced by Meissner effect bearings  
fabricated from high temperature superconducting  
materials. Analyses are presented to predict Meissner  
bearing performance, and a preliminary design of a  
miniature expansion incorporating Meissner bearings is  
conceptualized. Because these bearings operate at a  
cryogenic temperatures, a substantial reduction in heat  
leak to the process gas can be achieved. For a typical  
cryocooler providing 1 watt of cooling at 10 K, a 40%  
reduction in input cycle power can be achieved by  
replacing the self-acting gas bearings by Meissner  
bearings in the cold expansion turbine.

DESCRIPTORS: (U) \*BEARINGS, \*CENTRIFUGAL COMPRESSORS.

AD A209 875

AD A209 875

UNCLASSIFIED

PAGE 181

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD A209 870 9.3 20/4

AD-A209 870 CONTINUED

WASHINGTON UNIV SEATTLE COLL OF ENGINEERING

DESCRIPTORS: (U) \*CHEMICAL LASERS, \*GAS DYNAMIC LASERS, CAVITIES, CHEMICAL REACTIONS, COMBUSTION, DIFFUSION, ENERGY, EXPANSION, FLOW, FLUID DYNAMICS, FLUID FLOW, HEAT, HEAT TRANSFER, HIGH ENERGY, HIGH RATE, HIGH VELOCITY, ISOLATION, LASER BEAMS, LAYERS, MASS FLOW, MIXING, MOLECULES, NONEQUILIBRIUM FLOW, NOZZLES, PLENUM CHAMBERS, QUALITY, RECOVERY, SUPERSONIC DIFFUSERS, TEMPERATURE, TURBULENCE, WAKE, WALLS.

(U) Laser Mixing Processes.

DESCRIPTIVE NOTE: Final rept. 1 Jul 77-31 Oct 78.

79

PERSONAL AUTHORS: Russell, David A.

CONTRACT NO AFOSR-77-3450

IDENTIFIERS: (U) \*Supersonic Diffusion Lasers, High Energy Lasers, PEG1102F, WUAFOSR2307A1.

PROJECT NO 2307

TASK NO A1

MONITOR AFOSR  
TR-89-0886

UNCLASSIFIED REPORT

ABSTRACT. (U) The high energy laser was made possible by the application of high speed fluid flow to basic molecular processes. The flow is used to remove waste heat, to provide a high mass flow for compactness and a high total pressure for gas recovery, to enhance lasing through reduced cavity temperatures, and to drop the density and thus the flow uniformity necessary for beam quality. Further, it is the rapid expansion of the plenum gas that provides non-equilibrium energy for the supersonic laser (SDL), and provides fast mixing and upstream isolation for the chemical supersonic diffusion laser (SDL). Thus, the 20-50 kw/kgm/sec output of modern high energy lasers is integrally tied to the development of a new class of fluid flows involving non-equilibrium/ reacting gases in a radiation-extraction cavity. High flow quality is essential if the laser beam is not to be degraded, and the wave systems, wakes, mixing layers, turbulence levels, and wall layers must be controlled. Consideration must be given to combustion processes in plenums and mixing layers, heat transfer in the expansion nozzles, aerodynamic beam-extraction windows, and downstream recovery of the working fluid to ambient conditions. In addition to the obvious concerns of efficiency and size, there are thus many reasons why laser possibilities are often paced by fluid dynamics. (U) (U) (U)

AD A209 870

AD-A209 870

UNCLASSIFIED

PAGE 182

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 869 CONTINUED

AD A209 869 20.6

WASHINGTON UNIV SEATTLE COLL OF ENGINEERING

(U) Phase Compensation for High Power Lasers Using  
Refracting Gas Prisms.

DESCRIPTIVE NO. E: Final rept. 1 May 77-31 Oct 78.

JAN 79

PERSONAL AUTHORS: Christjansen, W.; Bogdanoff, D.;  
Wasserstrom, F.

CONTRACT NO AFOSR-77-331a

PROJECT NO 2307

TASK NO A1

MONITOR AFOSR  
TR-89-0885

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser beams propagating through the atmosphere are subject to considerable phase distortion due to variations of the air density. The beams emitted by high-power lasers can also be distorted due to density variations inside the laser cavity. One of the main applications of active optics is the compensation of these wavefront distortions in order to enhance the intensity of a laser beam on a distant target. A new method of phase compensation using the refractive properties of gas jets is being investigated as an alternative method for phase front control. Gases of sufficient optical properties (index of refraction) with laser so that passage through the gas elements produces phase shifts in the beam itself. Actively changing the gas index of refraction using flow will permit the control necessary to achieve phase compensation. The geometry required to bring about localized phase compensation in the laser beam is possible by using independent jets of gas each with its own dither and feedback circuiting as is done with conventional COAT technology. By replacing the solid array elements by jets of gas of varying refractive index, the power handling capacity of the COAT system can be raised to very high levels while maintaining a frequency response in the

kilocycle range. This is the essence of the fluid COAT idea. Coherent Adaptive Optical Techniques. (JHD)

DESCRIPTORS: (U) \*COMPENSATION, \*DISTORTION, \*PHASE DISTORTION, \*PHASE SHIFT, ADAPTIVE SYSTEMS, COHERENCE, ATMOSPHERIC DENSITY, DEPTH, FREQUENCY RESPONSE, GASES, HIGH POWER, JET FLOW, LASER BEAMS, LASER CAVITIES, LASERS, OPTICAL PROPERTIES, OPTICS, PATHS, POWER, PRISMS(OPTICS), REFRACTION, REFRACTIVE INDEX, WAVEFRONTS.

IDENTIFIERS: (U) \*High Energy Lasers, Adaptive Optics, PE61102F, WUAFOSR2307A1, COAT(Coherent Adaptive Optical Technique).

AD A209 869

AD-A209 869

UNCLASSIFIED

PAGE 183

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 868 AD-A209 868 CONTINUED

MONTEFIORE HOSPITAL AND MEDICAL CENTER BRONX NY

YIELD.

(U) 24-Hour Mean Plasma Hormone Levels in Men with Coronary Heart Disease.

IDENTIFIERS: (U) PEG1102F, WUAF0SR2312A3, Androestrogene, Glucuronide, Estrone, Dehydroisandroesterone, Triiodothyronine.

DESCRIPTIVE NOTE: Final rept. 1 May 78-30 Apr 79.

JUL 79

PERSONAL AUTHORS: Zumoff, Barnett

CONTRACT NO F49620-78-C-0078

PROJECT NO. 2312

TASK NO. A3

MONITOR: AF03R  
TR-89-0881

UNCLASSIFIED REPORT

ABSTRACT: (U) Effort has involved the plasma concentrations of 14 hormones in 10 rigorously selected younger men who have recovered well from a myocardial infarction, and in 34 suitable controls. Concentrations of 11 hormones were normal. Concentrations of 3 abnormal: estrone was elevated from the normal average, dehydroisandrosterone was elevated from normal, triiodothyronine was decreased from normal. All three of these abnormalities are in the direction of femaleness, i.e. women normally have higher levels of estrone and dehydroisandrosterone and lower levels of triiodothyronine than men. Two of the abnormalities, those of estrone and dehydroisandrosterone are also found in obese men. A 'discriminant' composed of all 3 of the individually abnormal hormones yields nearly total separation of the post-infarct group from normal controls; there is only 1 overlap. 24 Hour urine analyses were accomplished on 6 men with abnormal and 21 men with normal coronary arteriograms. Total androgen metabolites excretion was lower in the abnormal than in the normals, and the excretion of androsterone glucuronide was markedly lower. Keywords: Hormones; Cardiac patients. (KT)

DESCRIPTORS: (U) \*CARDIAC PATIENTS, \*BLOOD PLASMA, \*HORMONES, \*MYOCARDIAL INFARCTION, \*ABNORMALITIES, \*CONTROL, \*ESTROGENS, \*MALES, \*CORONARY DISEASE, \*HEART, \*LOW LEVEL.

AD A209 868

AD-A209 868

UNCLASSIFIED

PAGE 184

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 867 12/3

MISSOURI UNIV-COLUMBIA DEPT OF STATISTICS

(U) Nonparametric and Sequential Analysis of Life Testing and Reliability Problems.

DESCRIPTIVE NOTE: Final rept.,

79

PERSONAL AUTHORS: Basu, Asit P.

CONTRACT NO. AFOSR-75-2795

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0882

UNCLASSIFIED REPORT

ABSTRACT: (U) Contents: Classification and selection rules for the exponential populations; Nonparametric analysis of some reliability problems; Bayesian test for increasing failure rate; Estimation of the restricted scale parameter of the exponential distribution; Nonparametric tests for independence; Estimation of reliability in the stress-strength model; Estimates of reliability for k-out-of-m systems; Identifiability of the multinomial and other distributions under competing risks model. (kr)

DESCRIPTORS: (U) \*LIFE TESTS, \*NONPARAMETRIC STATISTICS, \*SEQUENTIAL ANALYSIS, BAYES THEOREM, DISTRIBUTION FUNCTIONS, ESTIMATES, EXPONENTIAL FUNCTIONS, FAILURE, PROBLEM SOLVING, LIMITATIONS, PARAMETERS, RATES RELIABILITY, SCALE, SELECTION, TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

AD A209 867

UNCLASSIFIED

AD-A209 866 11/6

MICHIGAN TECHNOLOGICAL UNIV HOUGHTON DEPT OF METALLURGICAL ENGINEERING

(U) Fundamental Studies of B Phase Decomposition Modes in Titanium Alloys.

DESCRIPTIVE NOTE: Final rept. 1 Oct 78-30 Sep 79.

AUG 79

PERSONAL AUTHORS: Aaronson, H. I.; Scarr, G. K.; Plichta, M. R.; Moore, J. P.

CONTRACT NO. AFOSR-78-3728

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR  
TR-89-0884

UNCLASSIFIED REPORT

ABSTRACT: (U) A technique has been developed for preparing thin foils of Ti-X specimens containing alpha, beta and intermetallic compound based upon ion milling performed in a cold stage without any intermediate electrothinning. Application of this technique to a Ti-6 W/O Cr alloy reacted at 625 C yielded the following orientation relationships among the three phases. This result is in accord with a prediction of our theory of precipitation at interphase boundaries. A selected area electron channeling pattern study has been made of orientation relationships developed during the massive transformation in a Ag-26 A/O Al alloy. (jes)

DESCRIPTORS: (U) \*INTERMETALLIC COMPOUNDS, BOUNDARIES, CHEMICAL MILLING, FOILS(MATERIALS), ION BEAMS, LOW TEMPERATURE, ORIENTATION(DIRECTION), PHASE STUDIES, PRECIPITATION, THINNESS, TITANIUM ALLOYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1.

AD-A209 866

PAGE 185

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 856 CONTINUED

AD-A209 856 25/5

CITY COLL NEW YORK COMMUNICATIONS SYSTEMS LAB

TIME

(U) Communications Using Channels Formed by Meteor Bursts. IDENTIFIERS: (U) PE61102F, WUAFUSR2305B3.

DESCRIPTIVE NOTE: Final rept. 1 Jul 85-30 Nov 88.

NOV 88

PERSONAL AUTHORS: Schilling, Donald L.; Hibshoosh, Eliphaz

CONTRACT NO. AFOSR-85-0234

PROJECT NO. 2305

TASK NO. 83

MONITOR: AFOSR  
TR-89-0821

UNCLASSIFIED REPORT

ABSTRACT: (U) We propose to study the use of the meteor burst channel in communication systems by investigating the following important aspects: 1) The development and enhancement of an accurate and reliable channel model based on recently available empirical data. Analysis of this model results in analytical expressions for communication parameters such as channel duration and throughput to be used as design and analysis tools. 2) The optimization of throughput for fixed transmission rate under the constraint of a given maximum bit error rate. This will demonstrate the room for improvement in existing systems using constant transmission rate. 3) The feasibility of efficiently communicating over the MBC using variable bit rate and employing a feedback protocol to monitor the channel. This approach will dramatically improve the throughput in comparison with constant transmission rate systems. 4) Analysis of Automata Repeat-Request (ARQ) Transmission over MBC by studying performance measures such as duty cycle, throughput and waiting time as a function of packet length, coding, data rate and modulation technique. (rh)

DESCRIPTORS: (U) \*CHANNELS, \*COMMUNICATION AND RADIO SYSTEMS, \*DATA RATE, \*DATA TRANSMISSION SYSTEMS, ACCURACY, CODING, ERRORS, MATHEMATICAL ANALYSIS, MODELS, MODULATION, OPTIMIZATION, PARAMETERS, RATES, RELIABILITY, THROUGHPUT,

AD A209 856

AD-A209 856

UNCLASSIFIED

PAGE 186

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K  
AD-A209 855 12/9 23/3 6/4 5/8 AD-A209 855 CONTINUED

CALIFORNIA UNIV SAN DIEGO LA JOLLA INST FOR COGNITIVE  
SCIENCE

ALGORITHMS, COMPUTERIZED SIMULATION, NETWORKS, NEURAL  
NETS, OPTICAL IMAGES, PROPAGATION, CEREBRAL CORTEX,  
VISUAL CORTEX.

(U) The Back Propagation Technique for Modeling Cortical  
Computation.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, Parietal Lobe,  
Back Propagation Technique.

DESCRIPTIVE NOTE: Final rept. 1 Feb 88-1 Jan 89.

JAN 89

PERSONAL AUTHORS: Zipser, David

CONTRACT NO. AFOSR-86-0062

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TF 89-0911

UNCLASSIFIED REPORT

ABSTRACT: (U) Over the past several years powerful learning procedures have been developed that can program simulated neural networks to compute a wide variety of functions. This has made it possible to use learning procedures to train model networks to do computations that occur in the brain. While there was so a priori reason to suppose that the individual neuro-like units in these model networks would resemble the brain in any way, the empirical observations is that they do. Good results have been achieved applying this paradigm to modeling monkey parietal area 7a. Various aspects of the primary visual area have also been successfully modeled using this approach. The results of this work raise the interesting possibility that learning procedures and particularly the back propagation algorithm used in these studies, can serve as a general technique to account for how the brain implements computations. While these observations do not imply that back propagation is actually used in the brain, they do raise the possibility that some analogous learning procedure is used there. Keywords: Mathematical models, Computerized simulation. (aw)

DESCRIPTORS: (U) \*BRAIN, \*COMPUTATIONS, \*LEARNING,  
\*MATHEMATICAL MODELS, \*ARTIFICIAL INTELLIGENCE.

AD A209 855

AD-A209 855

UNCLASSIFIED

PAGE 187

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 847 20/5

AD-A209 847 CONTINUED

OPTICAL SOCIETY OF AMERICA WASHINGTON D C

IDENTIFIERS: (U) Four Wave Mixing, Multiphoton Spectroscopy, PE61102F, WUAFOSR2301A1.

(U) Organization of the Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications (4th) Held in North Falmouth, Massachusetts

DESCRIPTIVE NOTE: Final rept. 1 Jun 88-1 Mar 89.

MAR 89

PERSONAL AUTHORS: Quinn, Jarus W.

CONTRACT NO. AFOSR-88-0192

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0788

UNCLASSIFIED REPORT

ABSTRACT: (U) The meeting dealt with the development and application of sources of coherent radiation from the extreme ultraviolet to the x-ray spectral region. Closely related areas of interest are multiphoton phenomena, soft x-ray optics, and laser produced plasmas. Topics covered included: short-wavelength lasers, free electron lasers and undulators, harmonic generation and frequency conversion, short wavelength optics and novel instrumentation, laser plasma radiation sources, multiphoton phenomena, ultrafast short-wavelength sources, applications in spectroscopy, and microfabrication, phase coherent applications: holography and interferometry, and unique applications of short-wavelength sources. Keywords: Symposia; Abstracts. (JHD)

DESCRIPTORS: (U) \*COHERENT RADIATION, \*ULTRAVIOLET SPECTROSCOPY, \*X RAY SPECTROSCOPY, COHERENCE, FABRICATION, FREE ELECTRON LASERS, FREQUENCY CONVERSION, HARMONIC GENERATORS, HOLOGRAPHY, INTERFEROMETRY, LASER BEAMS, LASERS, MICROMINIATURIZATION, OPTICS, PHOTONS, PLASMAS (PHYSICS), RANGE (EXTRIMES), ABSTRACTS, SHORT PULSES, SHORT WAVELENGTHS, SOFT X RAYS, SOURCES, SPECTROSCOPY, SYMPOSIA, X RAY SPECTRA.

AD A209 847

AD-A209 847

UNCLASSIFIED

PAGE 188

EV109K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A209 838

6/4 5/8

AD-A209 837

1/1

NEW YORK UNIV N Y DEPT OF PSYCHOLOGY

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF AEROSPACE ENGINEERING

(U) Higher Order Mechanisms of Color Vision.

(U) Studies of Unsteady Vortex Flap Aerodynamics.

DESCRIPTIVE NOTE: Progress rept. no. 1, 15 Sep 86-14 Mar 89.

DESCRIPTIVE NOTE: Final rept. 1 Aug 85-31 Jan 89.

MAY 89

JUN 89

PERSONAL AUTHORS: Krauskopf, John

PERSONAL AUTHORS: Maxworthy, T.; Cheng, H. K.

CONTRACT NO. AFOSR-86-0334

CONTRACT NO. AFOSR-85-0318

PROJECT NO. 2313

PROJECT NO. 2307

TASK NO. A5

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR TR-89-0933

TR-89-0931

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The main accomplishments have been: 1) a comprehensive study of the effects of chromatic content, blur and contrast of targets on vernier acuity and on stereo acuity; 2) the use of a new method of measuring chromatic discrimination under conditions of constant adaptation; 3) continuation of the study of the chromatic properties of single cells in the monkey cortex; and 4) experiments on the significance of color in the perception of motion. keywords: Color Vision; Visual cortex; Visual acuity; Thresholds physiology; Adaptation physiology; Psychophysiology; Psychophysics; Color discrimination; Isoluminance. (edc)

DESCRIPTORS: (U) \*ADAPTATION(PHYSIOLOGY), \*COLOR VISION, CELLS(BIOLOGY), CHROMATICITY, COLORS, CONTRAST, DEPTH, DISCRIMINATION, LUMINANCE, MEASUREMENT, MONKEYS, MOTION, VISUAL PERCEPTION, PSYCHOPHYSICS, PSYCHOPHYSIOLOGY, SPACE PERCEPTION, THRESHOLDS(PHYSIOLOGY), VISUAL ACUITY, VISUAL CORTEX.

IDENTIFIERS: (U) Isoluminance. PEG1102F. WUAFOSR2313A5.

AD A209 838

AD-A209 837

UNCLASSIFIED

PAGE 189

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 836 20/12

AD-A209 835 6/4 6/1

PRINCETON UNIV NJ DEPT OF ELECTRICAL ENGINEERING AND  
COMPUTER SCIENCE

BAYLOR COLL OF MEDICINE HOUSTON TX

(U) Transport and Submillimeter Wave Spectroscopy of GaAs/  
Al sub xGa sub 1-x and In sub x Ga 5.. 1-x As  
Heterostructures.

(U) Heterosynaptic Modulation of Long-Term Potentiation at  
Mossy Fiber Synapses in Hippocampus.

DESCRIPTIVE NOTE: Final rept. Jul 85-Sep 88.

DESCRIPTIVE NOTE: Annual technical rept. 1 Apr 88-31 Mar  
89.

JUN 89

MAY 89

PERSONAL AUTHORS: Tsui, D. C.

PERSONAL AUTHORS: Johnson, Daniel

CONTRACT NO. AFOSR-85-0204

CONTRACT NO. AFOSR-88-0142

PROJECT NO. 2305

MONITOR: AFOSR  
TR-89-0935

TASK NO. C1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-0934

UNCLASSIFIED REPORT

ABSTRACT: (U) The research emphasizes the physics of the  
electronic processes in GaAs/Al(x)Ga(1-x)As and In(x)Ga(1-  
x)As/InP heterojunction thin film structures and focuses  
in two directions: one in superlattice materials and the  
other in submillimeter wave spectroscopy. After a brief  
description is given of the accomplishments in both  
directions, together with a list of the publications of  
work supported by the contract, a detailed account is  
made of the systematic investigation of transport through  
In(x)Ga(1-x)As/InP superlattices grown by Chemical Beam  
Epitaxy. Keywords: Gallium arsenides; Aluminum gallium  
arsenides; Indium compounds; Indium phosphides. (AW)

DESCRIPTORS: (U) \*ALUMINUM GALLIUM ARSENIDES, \*GALLIUM  
ARSENIDES, \*HETEROJUNCTIONS, \*INDIUM COMPOUNDS, \*THIN  
FILMS, CHEMICALS, CRYSTAL LATTICES, ELECTRONIC STATES,  
EPITAXIAL GROWTH, INDIUM PHOSPHIDES, PHYSICS,  
SPECTROSCOPY, SUBMILLIMETER WAVES, SUPERLATTICES,  
TRANSPORT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C1.

AD A209 836

UNCLASSIFIED

AD A209 835

PAGE 190

EVI09K

ABSTRACT: (U) The overall goal of this research project  
is to investigate the cellular mechanisms associated with  
the heterosynaptic modulation of long-term synaptic  
potentiation (LTP) at mossy fiber synapses in hippocampus.  
It was previously shown that norepinephrine, through Beta-  
adrenoceptors, enhances the magnitude, duration, and  
probability of induction of mossy fiber LTP, while  
acetylcholine, through muscarinic receptors, depresses  
the magnitude and probability of induction of mossy fiber  
LTP. The goal for the first year of this research project  
was to test several specific hypotheses for the  
cholinergic and entry through voltage-gated calcium  
channels for the induction of LTP. We have also been  
investigating the properties of voltage-ated calcium  
channels in hippocampal CA3 neurons and the modulation of  
these calcium channels by noradrenergic and cholinergic  
agonists. These studies have used acutely exposed  
hippocampal neurons and a new preparation of isolated  
mossy fiber presynaptic terminals. In a collaborative  
project with Dr. David Terrian at the USAFSAM, San  
Antonio, the mechanisms of neurotransmitter release from  
a homogeneous fraction of mossy fiber synaptosomes have  
been investigated. (AW)

DESCRIPTORS: (U) \*HIPPOCAMPUS, \*NERVE TRANSMISSION,  
\*NERVE FIBERS, \*SYNAPSE, ACETYLCHOLINE, CALCIUM CHANNELS,  
CYTOLOGY, EXPOSURE(GENERAL), HYPOTHESES, LONG RANGE(TIME),  
MODULATION, MUSCARINE, NERVE CELLS, NOREPINEPHRINE,  
PREPARATION, RECEPTION, RELEASE, IONIC CURRENT.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 835 CONTINUED

AD-A209 834 6/10

CHOLINERGIC NERVES.

COLORADO STATE UNIV FORT COLLINS

IDENTIFIERS: (U) \*Long Term Synaptic Potentiation, LTP(Long Term Potentiation), \*Mossy Fiber Synapses, Calcium Channels, Noradrenergic Agonists, Cholinergic Agonists.

(U) The Phototoxicity of Blue Light on the Functional Properties of the Retinal Pigment Epithelium.

DESCRIPTIVE NOTE: Annual rept. 1 May 88-30 Apr 89.

MAY 89

PERSONAL AUTHORS: Paulter,

CONTRACT NO. AFOSR-87-0189

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0930

UNCLASSIFIED REPORT

ABSTRACT: (U) The phototoxic effect of blue light on isolated pigment epithelium will be investigated. The emphasis will be on functional changes rather than a description of pathology. The pigment epithelium is analogous to the blood-brain barrier; therefore, the principal functions to be investigated are the integrity of the barrier system and the transport system and the transport systems known to operate in the pigment epithelium. The effects of blue light on leucine transport across the isolated bovine retinal pigment epithelium (RPE) have been continued to determine if Vitamin E and malatonin provided any protective action. Similar studies on the transport of glutamate in the retina to choroid direction were also completed. Keywords: Exposure physiology; Radiation effects; Response biology. (Kt)

DESCRIPTORS: (U) \*EPITHELIUM, \*LIGHT, \*PIGMENTS, \*TOXICITY, BARRIERS, BLOOD, BLUE(COLOR), BRAIN, CHOROID PLEXUS, EXPOSURE(PHYSIOLOGY), FUNCTIONAL ANALYSIS, PHYSIOLOGICAL EFFECTS, GLUTAMIC ACID, ISOLATION, LEUCINE, PATHOLOGY, RADIATION EFFECTS, RESPONSE(BIOLOGY), RETINA, SALTS, TRANSPORT, VITAMIN E.

IDENTIFIERS: (U) PE6110?F, WUAFOSR2312A5, \*Phototoxicity

AD A209 835

AD-A209 834

UNCLASSIFIED

PAGE 191

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A209 833

20/2

AD-A209 827

11/4

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

STANFORD UNIV CA DIV OF APPLIED MECHANICS

(U) The Orientation of Chemical Bonds at Surfaces: A Key to Understanding the Structure and Bonding of Surface Species.

(U) Mechanical Response of Structural Elements to Dynamic Loads.

DESCRIPTIVE NOTE: Final rept. 15 Apr 86-14 Apr 89.

DESCRIPTIVE NOTE: Final rept. 1 Sep 77-31 Dec 78.

JUN 89

JAN 89

PERSONAL AUTHORS: Yates, John T., Jr

PERSONAL AUTHORS: Herrmann, George

CONTRACT NO. AFOSR-86-0107

CONTRACT NO AFOSR-77-3403

PROJECT NO. 2303

PROJECT NO. 2307

TASK NO. A2

TASK NO. B1

MONITOR: AFOSR  
TR-89-0928

MONITOR: AFOSR  
TR-89-0956

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This work has been concerned with the development and use of the digital ESDIAD method for studying the molecular structure and the dynamics of adsorbates on metal single crystal surfaces. A number of new findings have been made involving the following phenomena: (A) First direct observation of the hindered rotation of a chemisorbed molecule; (B) Observation of hydrogen bonding forces between adsorbates causing hindrance of molecular rotation; (C) Structural determination of bonding site for coordinatively unsaturated radical species, PF<sub>2</sub> and PF on Ni(111). (D) Discovery of alkali metal sensitization of H<sub>2</sub> ESD yield on metals; (E) Discovery of copious metastable CO yield in ESD from CO on Pt(111). (jes)

DESCRIPTORS: (U) \*SINGLE CRYSTALS, ALKALI METALS, BONDING, CHEMICAL BONDS, DETERMINATION, DYNAMICS, METAL CRYSTALS, METALS, MOLECULAR ROTATION, MOLECULAR STRUCTURE, OBSERVATION, SENSITIZING, SITES, STRUCTURAL PROPERTIES, SURFACES, YIELD.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A2.

AD A209 833

UNCLASSIFIED

PAGE 192

EVI09K

ABSTRACT: (U) The general objectives of the activities under this grant consisted of acquiring more detailed and complete knowledge of dynamic response of laminated composites. Specifically, wave propagation in a periodically layered elastic body in plane strain was studied and a considerable amount of numerical results were worked out. Both real and complex branches of the dispersion spectrum were considered. The spectrum was shown to be multivalued and quite intricate in detail. Some analytical properties of the Floquet surface were also established. An analytical study of a plane wave in plane strain is exceedingly involved due to the coupling between longitudinal and shear waves. (jes)

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, DISPERSING, DYNAMIC LOADS, DYNAMIC RESPONSE, ELASTIC PROPERTIES, ELASTIC WAVES, LAMINATES, LAYERS, MECHANICAL PROPERTIES, NUMERICAL ANALYSIS, PLANE WAVES, RESPONSE, SHEAR PROPERTIES, SPECTRA, STRUCTURAL COMPONENTS, WAVE PROPAGATION.

IDENTIFIERS: (U) PE61102F, WJAFOSR2307B1.

AD A209 827

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 817 CONTINUED

AD-A209 817 5/8

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J DEPT OF  
PSYCHOLOGY

IDENTIFIERS. (U) PE61102F, WUAFOSR2313A5.

(U) Eye Movements and Visual Information Processing.

DESCRIPTIVE NOTE: Interim rept. 1 Apr 88-31 Mar 89.

APR 89

PERSONAL AUTHORS: Kowler, Eileen

CONTRACT NO. AFOSR-88-0171

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0808

UNCLASSIFIED REPORT

ABSTRACT: (U) Eye movements place a limit on the processing of visual information because they determine the location and the velocity of the retinal image. Thus, to understand how we see it is necessary to understand how eye moments are controlled. Work this year in my laboratory has concentrated on the roles of expectations and selective attention in the programming of smooth and saccadic eye movements. We have: 1) demonstrated distinct roles for past experience and expectations in the control of smooth eye movement and found that expectation will predominate in the presence of cues about the direction of future motion; 2) found that brisk initial pursuit requires that expectation that target motion will continue; 3) showed that saccadic eye movements are not attracted to visual backgrounds (as had been claimed) unless subjects pay attention to the background. These studies show that central representations of visual scenes, containing information about the position, motion and future motion of selected objects, are the natural effective stimulus for human eye movement. Psychomotor tests. Psychology; Communication; Eye movement. (JES)

DESCRIPTORS: (U) \*EYE MOVEMENTS, \*PSYCHOMOTOR TESTS, ATTENTION, EYE, HUMANS, IMAGES, INFORMATION PROCESSING, MOVING TARGETS, OPTICAL IMAGES, PSYCHOLOGY, RETINA, SALARIES, VISUAL SIGNALS.

AD A209 817

AD-A209 817

UNCLASSIFIED

PAGE 193

EVI09K

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD A209 729 5/1 6/5 23/2 6/11  
23/3 5/2 15/6.3 6/7

UNIVERSAL ENERGY SYSTEMS INC DAYTON OH

(U) United States Air Force Research Initiation Program  
for 1987. Volume 4.

AD-A209 729 CONTINUED

the Detection of the Protozoan Parasite Giardia Lamblia  
in Drinking Water; Limitations to Heavy Work of Personnel  
Wearing at 21 C: U.S. Military Chemical Defense Ensemble.  
(JHD)

DESCRIPTIVE NOTE: Interim rept..

DESCRIPTORS: (U) \*AIR FORCE RESEARCH, ADAPTIVE FILTERS,  
ASSAYING, BEHAVIOR, BIAS, BONES, BRAIN, CHEMICAL WARFARE,  
COMPARISON, CONTRAST, DATA BASES, AVIATION FUELS, DEFENSE  
SYSTEMS, DETECTION, DRINKING WATER, FOURIER ANALYSIS,  
GROWTH(GENERAL), HYDROCARBONS, IMPACT, IMPLANTATION,  
INFORMATION SYSTEMS, INTEGRATED SYSTEMS, LEARNING,  
MACROMOLECULES, MAINTENANCE, MATHEMATICAL MODELS,  
MEASUREMENT, METALS, MULTIPURPOSE, MUTAGENS, PERCEPTION,  
PHYTOXICITY, POTENTIAL THEORY, RATS, RESIDUES,  
SENSITIVITY, SOILS, STRUCTURAL PROPERTIES, SUPERVISORS,  
SYNTHESIS, VOLATILITY.

APR 89

PERSONAL AUTHORS: Darrah, Rodney C.

CONTRACT NO. F49620-85-C-0013

PROJECT NO. 3396

TASK NO. D5

MONITOR: AFOSR  
TR-89-0832

IDENTIFIERS: (U) PEG1102F, WUAFOSR3396D5, Bonn Growth,  
JP-4 Fuel, Gasproff clothing.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 1, AD-A209 726.

ABSTRACT: (U) Contents: Development of Implantable  
Devices for Sustained Delivery of Volatile Hydrocarbons  
in Rats; In Situ Detection of Osteoprogenitor Cells in an  
Actively Growing Bone System; Trauma-Activated Periosteum  
Derived Osteogenic Cells; Response to Selected Growth  
Factors; Assessing the Attributes of Expert Judgement;  
Measuring Bias in Subjective Uncertainty Estimates;  
Mathematical Modeling; Learning Behavior of Adaptive  
Filters for Evoked Brain Potentials; The Rhetoric of  
Hypertext; An Examination of Document Database Concepts  
and The Integrated Maintenance Information System;  
Structural Representations of Multi-Dimensional Criterion  
Construct Space; Comparison of Supervisor's and  
Incumbent's Estimates of SDy; The Role of Fourier  
Descriptions for Shape in Visual Form Perception;  
Comprehensibility of Technical Text; Mechanisms of  
Contrast and Lightness Constancy; Phytotoxicity of Soil  
Residues of JP-4 Aviation Fuel; An Impact Study for the  
Contracting Out of In-House Analytical Services at the  
Usaf Occupational & Environmental Health Laboratory-  
Brooks AFB, San Antonio, Texas; Effects of Metal Mutagens  
on the Synthesis and Accumulation of Macromolecules;  
Development of a Rapid and Sensitive Assay Procedure for

AD A209 729

AD-A209 729

UNCLASSIFIED

PAGE 194

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K  
AD-A209 728 AD-A209 728 CONTINUED

Intramolecular Cyclization - Aromatization Reactions;  
Leaky Rayleigh and Lamb Waves on Composites; and  
Performance Improvement in Knowledge-Based Process  
Control Systems. (JHD)

UNIVERSAL ENERGY SYSTEMS INC DAYTON OH

(U) United States Air Force Research Initiation Program  
for 1987. Volume 3.

DESCRIPTIVE NOTE: Interim rept.

APR 89

PERSONAL AUTHORS: Darrah, Rodney C.

CONTRACT NO. F49620-85-C-0013

PROJECT NO. 3396

TASK NO. 05

MONITOR. AFOSR  
TR-89-0831

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also volume 4, AD-A209 729.

ABSTRACT: (U) Contents: A Numerical Study of the Flow  
Field and Heat Transfer in a Rectangular Passage with a  
Turbulator; Analysis of an Algorithm for Multiple  
Frequency Resolution; Signal Processing in EW Environment;  
Implementation of Blackboard Systems in Ada; Surface  
States and Electron Transport Properties in Semi-  
Insulating Gallium Arsenide; Investigate Feasibility of  
Implementing Associative Memories Using Luminescent  
Rebroadcasting Devices; Automated Translation of Digital  
Logic Equation into Optimized VHDL Code; Analytical Model  
and Computer Program of F-16 Nos; Gear and F-16 ALGS;  
Development of a Technique for Prediction of Internal  
Heat Transfer in Actively Cooled Structures; Radiation  
Hypersonic Aerodynamics; A Chemical Kinetics Model for  
Mach 5 - 14 Hypersonic Flow; Development of a  
Microcomputer Lateral Resupply Simulation System;  
Development of Expert System Control of a Carbon Fiber  
Production Process; Influence of Microstructural  
Variations on the Thermomechanical Processing in Dynamic  
Material Modeling of Titanium Aluminides; Studies on the  
Compatibility of Potential Matrix and Reinforcement  
Materials in Ceramic Composites for High Temperature  
Aerospace Applications; Synthesis of Compounds Capable of

DESCRIPTORS: (U) \*AIR FORCE RESEARCH, AERODYNAMICS,  
AEROSPACE SYSTEMS, ALGORITHMS, CARBON FIBERS, CERAMIC  
MATERIALS, COMPOSITE MATERIALS, COMPUTER PROGRAMS,  
CONTROL, CONTROL SYSTEMS, COOLING, DIGITAL SYSTEMS,  
DYNAMICS, ELECTRON TRANSPORT, EQUATIONS, FLOW FIELDS,  
FREQUENCY, GALLIUM ARSENIDES, HEAT TRANSFER, HYPERSONIC  
FLOW, INSULATION, INTERNAL, LOGIC, MACHINE TRANSLATION,  
MATERIALS, MATHEMATICAL MODELS, MICROSTRUCTURE, MODELS,  
NUMERICAL ANALYSIS, PRODUCTION, REACTION KINETICS,  
REINFORCING MATERIALS, RESOLUTION, SIGNAL PROCESSING,  
STRUCTURES, SURFACE PROPERTIES, SYNTHESIS,  
THERMOMECHANICS, TITANIUM ALUMINIDE, TRANSPORT PROPERTIES,  
VARIATIONS.

IDENTIFIERS: (U) Expert Systems, Lamb Waves, Rayleigh  
Waves, PEG1102F, WUAFOSR3396D5.

AD A209 728

AD A209 728

UNCLASSIFIED

PAGE 195

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIO9K

AD-A209 727 5/1 4/2 12/3 20/3 20/14 12/9 13/9 20/4

AD-A209 727 CONTINUED

UNIVERSAL ENERGY SYSTEMS INC DAYTON OH

Superconductors; and Three Dimensional Thermal Conduction Effects in High Power CW Laser Target Plates. (JHD)

(U) United States Air Force Research Initiation Program for 1987. Volume 2.

DESCRIPTORS: (U) AIR FORCE RESEARCH, ADAPTIVE SYSTEMS, ALGORITHMS, ATOMS, BAYES THEOREM, CROSS SECTIONS, CRYSTALS, ELECTRONS, ELECTROOPTICS, EXCITATION, GROUND LEVEL, INTERACTIONS, ITERATIONS, CONTINUOUS WAVE LASERS, MAINTAINABILITY, MODELS, NEAR INFRARED RADIATION, NONLINEAR SYSTEMS, OMNIDIRECTIONAL, OPTICAL PROCESSING, CARBON DIOXIDE, OPTICAL PROPERTIES, NORTH PACIFIC OCEAN, PHASED ARRAYS, PLANAR STRUCTURES, PROTOTYPES, REASONING, RELIABILITY, SIGNAL PROCESSING, SILICON, SLOT ANTENNAS, SUPERCONDUCTORS, TEMPERATURE, TEST AND EVALUATION, TORQUE, TURBULENCE, TYPHOONS, MOLECULAR VIBRATION, WAVEGUIDES, WIND.

DESCRIPTIVE NOTE: Interim rept..

APR 89

PERSONAL AUTHORS: Darrah, Rodney C.

CONTRACT NO. F49620-85-C-0013

PROJECT NO. 3396

TASK NO. D5

MONITOR: AFOSR  
TR-89-0830

IDENTIFIERS: (U) PE61102F, WUAFOSR3396D5.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 3, AD-A209 728.

ABSTRACT: (U) Contents: The Omnidirectional Torquer - Experimental Prototype Model I; Calculation of Nonlinear Optical Properties; Modelling and Prediction in a Nonlocal Turbulence Model; CD2 (001) Vibrational Temperatures and Limb-View Infrared Radiance Under Terminator Conditions in the 60-100 Altitude Range; Comparison of SSM/I Rainrates and Surface Winds with the Corresponding Conventional Data in the North West Pacific Typhoons; Development of a System for the Measurement of Electron Excitation Cross Sections of Atoms and Molecules in the Near Infrared; Superconductor Testing; A Form and Function Knowledge Representation for Reasoning about Classes and Instances of Objects; Development and Evaluation of a Bayesian Test for System Testability; Crystalline Silicon Electro-Optic Waveguides; Measurements of a Slot Antenna Fed by Coplanar Waveguide and Solution of an Infinite Phased Array of Slots Fed by Coplanar Waveguide Over a Dielectric Half-Space; A New Measure of Maintainability/Reliability and Its Estimation; Signed-Digit Number System for Optical Adaptive Processing; Implementation of Iterative Algorithms for an Optical Signal Processor; Experimental Evaluation of Imaging Correlography; Interaction of Lasers with

AD-A209 727

AD-A209 727

UNCLASSIFIED

PAGE 196

EVIO9K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K  
AD-A209 726 AD-A209 726 CONTINUED

AD-A209 726 5/1 19/10 21/2 20/11  
19/10 19/1 7/3 12/3

UNIVERSAL ENERGY SYSTEMS INC DAYTON OH

(U) United States Air Force Research Initiation Program  
for 1987. Volume 1.

DESCRIPTIVE NOTE: Interim rept..

APR 89

PERSONAL AUTHORS: Darrah, Rodney C.

CONTRACT NO. F49620-85-C-0013

PROJECT NO. 3396

TASK NO. D5

MONITOR: AFOSR  
TR-89-0329

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 2, AD-A209 727.

ABSTRACT: (U) Contents: Effects of Bending Flexibility on the Aerodynamic Characteristics of Slender Cylinders Determined from Free-Flight Ballistic Data; Image Complexity Measures and Edge Detection; Advanced Gun Gas Diversion; A Physical and Numerical Study of Pressure Attenuation in Solids; Pyroelectric Sensing for Potential Multi-Mode Use; Gaseous Fuel Injection and Mixing in a Supersonic Combustor; systems Effectiveness for Targets with Repair or Replacement; A Pattern Recognition Application in Elastic-Plastic Boundary Element, Hybrid Stress Analysis; Vectorized Perturbed Functional Iterative Scheme (VPFIS); A Large-Scale Nonlinear System Solver; Liquid Film Cooling in Rocket Engines; Estimation of Autocorrelation and Power Spectral Density for Randomly Sampled Systems; Fracture in Solid Propellant; Damage Effects upon Crack Propagation; Novel Conversion of Organometallics to Energetic Nitro Compounds; Correlations of Spontaneous Ignition Temperatures with Molecular Structures of Flammable with Molecular Structures of Flammable Compounds; The Estimation of Stature from Fragments of the Femur; A Revision of the Steele Method; Effects of Water Solubility and Functional Group Content on the Interactions of Organic Solutes with

AD-A209 726

UNCLASSIFIED

PAGE 197

EVI09K

Soil Organic Matter; A Study of Semihardened Concrete Arch Structure Response Under Protective Layers; and Stress Wave Propagation in Layered Media. (JHD)

DESCRIPTORS: (U) \*AIR FORCE RESEARCH, AERODYNAMIC CHARACTERISTICS, ATTENUATION, AUTOCORRELATION, BONES, BOUNDARIES, COMBUSTORS, CRACK PROPAGATION, CYLINDRICAL BODIES, DAMAGE, DETECTION, EDGES, ELASTIC PROPERTIES, ENERGETIC PROPERTIES, ESTIMATES, FILM COOLING, FLAMMABILITY, FRAGMENTS, FREE FLIGHT, FUEL INJECTION, GAS GUNS, HYBRID SYSTEMS, IGNITION, IMAGES, LEGS, LIQUID COOLING, MEDIA, MOLECULAR STRUCTURE, MULTIMODE, NITROGEN COMPOUNDS, NONLINEAR SYSTEMS, NUMERICAL ANALYSIS, ORGANIC MATERIALS, ORGANIC SOLUTES, ORGANOMETALLIC COMPOUNDS, PATTERN RECOGNITION, PHYSICAL PROPERTIES, PLASTIC PROPERTIES, POWER SPECTRA, PRESSURE, PROTECTIVE COATINGS, PYROELECTRICITY, REPAIR, ROCKET ENGINES, SAMPLING, SLENDER BODIES, SOILS, SOLID PROPELLANTS, SOLUBILITY, STRESS ANALYSIS, STRESS WAVES, TEMPERATURE, SUPERSONIC COMBUSTION.

IDENTIFIERS: (U) Aqueous Solutions, PE61102F,  
WUAFOSR339605.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 665 20/5

AD-A209 665 CONTINUED

FLORIDA AGRICULTURAL AND MECHANICAL UNIV TALLAHASSEE  
DEPT OF PHYSICS

DESCRIPTORS: (U) +DIATOMIC MOLECULES, ACCURACY,  
CANCELLATION, COMPUTATIONS, COMPUTER APPLICATIONS, CROSS  
SECTIONS, ELECTROSTATICS, ERRORS, EXPONENTIAL FUNCTIONS,  
HYDROGEN, INTEGRALS, MATHEMATICAL ANALYSIS, MOLECULES,  
NUMERICAL ANALYSIS, REPRINTS, TAYLORS SERIES, TEST AND  
EVALUATION, WAVES.

(U) Analytical Evaluation of the Electrostatic Potential  
for Diatomic Molecules.

88

PERSONAL AUTHORS: Jones, H. W.; Etemad, B.; Weatherford,  
C. A.

IDENTIFIERS: (U) WUAFDSR230383, PE61102F.

CONTRACT NO. AFOSR-86-0149

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-0785

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Quantum  
Chemistry: Quantum Chemistry Symposium (22nd) p497-502  
1988.

ABSTRACT: (U) The technique of expanding Lowdin alpha-  
functions in a Taylor series has been further developed  
and applied to the problem of the electrostatic potential  
due to H2 with given 1s, 2s, 2p Slater-type orbitals. In  
contrast to other methods, our approach is completely  
analytic and capable of arbitrary precision. The  
ultimate accuracy of our method is dependent upon the  
number of partial waves used; here by use of only 13  
harmonics excellent results are achieved. Our methods are  
readily generalized to larger molecules. The electron-  
molecule static interaction potentials is of central  
importance to calculations of cross sections for electron-  
molecule collisions. In this paper, using the diatomic  
hydrogen molecule of Fraga and Ransil, we introduce a  
fully analytic method and make a few comparisons with  
computer runs using the codes of Morrison and Schmid et  
al. They, as well as others, need numerical integrals for  
the potential. Our analytical methods avoid cancellations  
errors and singularities by expanding the exponentials in  
the Lowdin alpha-functions, which are used to represent  
displaced orbitals in a spherical harmonic series.  
Reprints. (jes)

AD-A209 665

AD-A209 665

UNCLASSIFIED

PAGE 198

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 657 9/3 20/4 20/9 20/8 20/5 AD-A209 657 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) Coupling between Radiation and Gas Dynamics.

DESCRIPTIVE NOTE: Final rept. 1 Feb 88-1 Feb 89.

MAY 89

PERSONAL AUTHORS: Merkle, Charles L.; Micci, Michael M.

CONTRACT NO. AFOSR-84-0048

PROJECT NO. 2308

TASK NO A1

MONITOR: AFOSR  
TR-89-0784

UNCLASSIFIED REPORT

ABSTRACT: (U) Heat addition in flowing gases by electromagnetic wave absorption is being considered for propulsive purposes. The research includes both microwave and solar radiation. In the microwave studies, an experimental investigation of helium and nitrogen discharges has shown that free-floating plasmas can be established in either medium for a range of input powers and gas flow rates, although helium gives the broader range of stable limits. The discharges are being set up in a 10.2 cm quartz sphere. For pressure ranges from 0.5 to 5.0 atm and input powers to 3 kW, maximum coupling efficiencies are measured to be between 40 and 65% with higher efficiencies for cases with larger flow rates. Spectroscopic techniques are being introduced to provide detailed local measurements of conditions inside the discharge. In companion analytical efforts, computational techniques are being used to model the experimental flowfields to provide improved understanding of the absorption process and to enable us to extend the experimental findings to broader conditions. In the solar radiation studies, the feasibility of direct absorption of solar energy in flowing conditions is studied. Similar computational studies are also being used to study the absorption of solar radiation in hydrogen with alkali seedants. Results show peak gas temperatures of about

3500-4000 K can be reached with reasonable solar concentration ratios. (rh)

DESCRIPTORS: (U) \*COUPLING(INTERACTION), \*ELECTROMAGNETIC RADIATION, \*FLOW FIELDS, \*GAS DYNAMICS, \*HELIUM, \*HYDROGEN, \*NITROGEN, \*PLASMAS(PHYSICS), \*RADIATION ABSORPTION, \*SOLAR ENERGY, \*SOLAR RADIATION, \*SPECTROSCOPY, ABSORPTION, ADDITION, COMPUTATIONS, EFFICIENCY, FLOATING BODIES, FLOW RATE, GAS FLOW, GASES, HEAT, LIMITATIONS, MEASUREMENT, MICROWAVES, PEAK VALUES, STABILITY, TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1.

AD-A209 657

AD-A209 657

UNCLASSIFIED

PAGE 189

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 656 AD-A209 656 CONTINUED

AD-A209 656 11/2.1 11/10

CINCINNATI UNIV OH DEPT OF CHEMISTRY

U) Generate Reinforcing Particles in Place. IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A3.

89

PERSONAL AUTHORS: Mark, James E.

CONTRACT NO. AFOSR-83-0027, DAAL03-86-K-0032

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR, ARO  
TR-89-0789, 23255.24-MS

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In Chemtech, v19 p230-233 Apr 89.

ABSTRACT: (U) When the hydrolysis reactions used in the sol-gel process are carried out within a polymeric matrix, the silica is generated in the form of small, well-dispersed particles. When the matrix is an elastomer, these particles provide the same highly desirable reinforcing effects obtained by the usual blending of a filler (such as carbon black) into polymers (such as natural rubber) prior to their being cross-linked or cured into tough elastomers of commercial importance. Previous studies have concentrated on the elastomer reinforcement that the particles provide, but the focus can easily be switched to the particles themselves. Thus the elastomeric matrix can be viewed as acting in the same way as the frozen low molecular weight matrices that are used to immobilize and stabilize molecular fragments and thus permit their spectroscopic characterization. Characterization of the dispersed ceramic particles could provide information that would complement that obtained from the possibly more complicated monolithic ceramic objects of primary interest in the sol-gel technology. Reprints. (AW)

DESCRIPTORS: (U) \*ELASTOMERS, \*REINFORCING MATERIALS, \*SILICON DIOXIDE, \*CERAMIC FIBERS, CARBON BLACK, CERAMIC MATERIALS, DISPERSING, FRAGMENTS, HYDROLYSIS, MOLECULES, NATURAL RUBBER, PARTICLES, POLYMERS, REPRINTS, SWITCHING, TOUGHNESS, FIBER REINFORCEMENT.

AD-A209 656

AD-A209 656

UNCLASSIFIED

PAGE 200

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 653 CONTINUED

AD-A209 653 9/3

MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

90 dB/m and a saturated power output of 10 MW. The corresponding electronic efficiency is 3%. Computer simulations are also presented. (jhd)

(U) Microwave Emission from Relativistic Electron Beams.

DESCRIPTORS: (U) \*MICROWAVE AMPLIFIERS, \*MASERS, \*FREE ELECTRON LASERS, COMPUTERIZED SIMULATION, EFFICIENCY, ELECTRIC FIELDS, ELECTROMAGNETIC RADIATION, ELECTRON BEAMS, ELECTRON GUNS, ELECTRONICS, EMISSION, ENERGY, CYCLOTRON RESONANCE, FIELD EMISSION, GAIN, INTENSITY, INTERACTIONS, LASER AMPLIFIERS, MEASUREMENT, MICROWAVE FREQUENCY, MICROWAVES, MODIFICATION, OUTPUT, POWER, RAMAN SPECTROSCOPY, RELATIVITY THEORY, REPORTS, SATURATION, SIGNALS, SPACE CHARGE, SPATIAL DISTRIBUTION, SPIN FLIP LASERS.

DESCRIPTIVE NOTE: Final rept. 1 Nov 83-31 Oct 88,

MAR 89

PERSONAL AUTHORS: Bekefi, George

CONTRACT NO. AFOSR-84-0026

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-89-0787

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A8.

UNCLASSIFIED REPORT

ABSTRACT: (U) Profile modification by optical guiding in a Raman free electron laser operating at microwave frequencies was studied experimentally. A cyclotron autoresonance maser (CARM) amplifier was designed, built, and tested. This CARM operates at 35 GHz with a power output of 10 MW and an efficiency of three percent. Observations of Field Profile Modifications in a Raman Free Electron Laser Amplifier: We report measurements of the spatial distribution of the RF electric field intensities and phases induced in a free electron laser amplifier operating in the collective (Raman) regime. The studies are carried out at a microwave frequency of about 10 GHz in a FEL using a mildly relativistic electron beam of about 200 keV energy and 1 - 4 A current. The probing of the ponderomotive (space charge) and the electromagnetic waves is accomplished by means of small movable electric dipole antennas inserted into the interaction region. A 35 GHz Cyclotron Autoresonance Maser Amplifier: Studies of a cyclotron autoresonance maser are presented. The measurements are carried out at a frequency of 35 GHz using a mildly relativistic electron beam (1.5 MeV, 260 A) generated by a field emission electron gun followed by an emittance selector that removes the outer, hot electrons. Perpendicular energy is imparted to the electrons by means of a bifilar helical wiggler. Measurements give a small signal gain of

AD-A209 653

AD-A209 653

UNCLASSIFIED

PAGE 201

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 649 CONTINUED

AD-A209 649 12/7 12/3

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF ELECTRICAL ENGINEERING

DESCRIPTORS: (U) \*NETWORK ANALYSIS(MANAGEMENT), \*SYSTEMS ANALYSIS, \*STATISTICAL ANALYSIS, ALGORITHMS, AVAILABILITY, COMPUTATIONS, DEGRADATION, EFFICIENCY, FAILURE, MAINTAINABILITY, \*MANAGEMENT, MODELS, MULTIMODE, RELIABILITY, TEST AND EVALUATION, RESEARCH MANAGEMENT.

(U) Basic Research in Reliability for Real Systems.

DESCRIPTIVE NOTE: Final technical rept. 15 Jul 86-14 Jul 88.

AUG 88

IDENTIFIERS: (U) PE61102F, WUAFOSR2304K3, E3RM(Event Based Reliability Model).

PERSONAL AUTHORS: Li, Victor O.

CONTRACT NO. AFOSR-84-0269

PROJECT NO. 2304

TASK NO. K3

MONITOR: AFOSR TR-89-0783

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this research is to develop practical models and efficient algorithms to analyze the reliability/availability/maintainability of complex systems in which component failures are statistically dependent and each component is subject to degradations before complete failure. The Event-Based Reliability Model (EBRM) was developed to model and analyze the reliability of a network in which component failures are statistically dependent. In EBRM, the events that could cause component failures were modeled explicitly. This approach required much less parameters than the traditional model employing conditional probabilities. The EBRM was also proved to be a completely general model which could be applied to various types of failure dependencies. For reliability evaluations, many existing algorithms for computing network reliability could be used with minor modifications and no significant increase in computational complexity. An improved algorithm for the approximate evaluation of network performance was also developed. For multi-state systems, ordered enumeration was used to approximate and bound system reliabilities and other performance measures, and an efficient algorithm was developed for this purpose. The author has been studying network management algorithms which are resilient to network failures. (kr)

AD-A209 649

AD-A209 649

UNCLASSIFIED

PAGE 202

PAGE 202 EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 633 CONTINUED

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Molecular Theories of Rubberlike Elasticity and Some Recent Results on Model Networks and Unusual Fillers.

89

PERSONAL AUTHORS: Mark, J. E.

CONTRACT NO. AFOSR-83-0027

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0790

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Kautschuk and Gummi, v42 n3  
p191-193 1989.

ABSTRACT: (U) The molecular theories of rubberlike elasticity are reviewed briefly; they are based on two assumptions, viz. that intermolecular interactions are independent of deformation and that the Helmholtz free energy of a network is separable into a non-elastic and an elastic part, with only the latter depending on deformation. With regard to two important examples, the phantom theory predicts moduli that are lower than those of the affine theories; in both cases the modulus should be a constant independent of deformation which is generally not found to be the case. Novel reinforcing techniques use in-situ formation of reinforcing particles and orientation of filler particles by a magnetic field. In the former case, elastomers are allowed to swell in organometallic compounds which can be hydrolyzed (silicates, titanates), thermolyzed (metal carbonyls) or photolyzed. Other techniques generate glassy particles by in-situ polymerization or use polymers with functional groups reacting with the filler surface. West Germany; Translation. (JES)

DESCRIPTORS: (U) \*POLYMERIZATION, DEFORMATION, ELASTIC PROPERTIES, ELASTOMERS, FILLERS, GLASS, INTERACTIONS, MAGNETIC FIELDS, METAL CARBONYLS, MODELS, MOLECULE MOLECULE INTERACTIONS, MOLECULES, NETWORKS.

AD-A209 633

UNCLASSIFIED

PAGE 203

EVI09K

ORGANOMETALLIC COMPOUNDS, ORIENTATION(DIRECTION), PARTICLES, POLYMERS, REINFORCING MATERIALS, SILICATES, SURFACES, SYNTHETIC RUBBER, THEORY, TITANATES, WEST GERMANY.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV109K

AD-A209 632 12/7

AD-A209 631 7/3

SYRACUSE UNIV NY SCHOOL OF COMPUTER AND INFORMATION  
SCIENCE

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Testbeds for Logic Programming and Very Large  
Databases.

(U) Lewis Base Adducts to Diorganosilylenes.

DESCRIPTIVE NOTE: Final rept..

PERSONAL AUTHORS: Gillette, Gregory R.; Noren, George H.;  
West, Robert

SEP 87

89

PERSONAL AUTHORS: Bowen, Kenneth A.

CONTRACT NO. F49620-86-C-0010

CONTRACT NO. AFOSR-87-0065

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B2

TASK NO. A5

MONITOR: AFOSR  
TR-89-0794

MONITOR: AFOSR  
TR-89-0781

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v8 n2 p487-  
491 1989.

ABSTRACT: (U) This grant was funded under the Syracuse  
University Research Instrumentation program to purchase  
equipment in support of research in advanced logic  
programming and its application to artificial  
intelligence, especially extensions and enhancements to  
logic programming which include metal level programming to  
capabilities and concurrent execution. Equipment obtained  
under this grant included two Sun workstations, one  
Motorola C31 workstation tested, and three Xenologic  
Prolog Accelerator boards. This equipment has led  
completion of research in theoretical capabilities of  
metaProlog and enabled the design and implementation of  
metaProlog and to carry out moderate scale knowledge base  
maintenance experiments. Keywords: Interfaces, Expert  
systems. (kr)

DESCRIPTORS: (U) ARTIFICIAL INTELLIGENCE, COMPUTER  
LOGIC, COMPUTER PROGRAMMING, DATA BASES, INSTRUMENTATION,  
MAINTENANCE, MILITARY FACILITIES, PARTICLE ACCELERATORS,  
PROCUREMENT, TEST BEDS, UNIVERSITIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

AD A209 632

AD-A209 631

UNCLASSIFIED

PAGE 204

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A209 630 12/4 1/2

AD-A209 579 12/6 9/1

STATE UNIV OF NEW YORK AT BINGHAMTON DEPT OF MATHEMATICAL SCIENCES

MASSACHUSETTS UNIV AMHERST

(U) Discrete Time Analysis of a Shut Down Queueing Systems.

(U) Fault Tolerant Multiprocessors and VLSI-Based Systems

DESCRIPTIVE NOTE: Final rept..

DESCRIPTIVE NOTE: Final rept. 15 Feb 87-15 Feb 88.

77

MAR 88

PERSONAL AUTHORS: Klimko, Eugene M.

PERSONAL AUTHORS: Pradhan, Dhiraaj

CONTRACT NO. AFOSR-75-2813

CONTRACT NO. AFOSR-87-0161

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0775

TR-89-0782

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this study is to analyze a special type of job shop queueing system which has the following features: 1) A finite number of customers is present initially and no new customers arrive; 2) there are two service stations, each with its own input and each serving the output of the other; and 3) as soon as a customer is served by both stations, he leaves the system. A queueing system with these features is called a shutdown queueing system and it may also be called a clearance problem. Queueing problems of this type arise in connection with fuel and supply facilities for aircraft. A fixed number of aircraft are scheduled for fueling and supply loading. Keywords: Computations; Exponential distributions. (kr)

DESCRIPTORS: (U) \*REFUELING, \*QUEUEING THEORY, \*SHUTDOWNS, \*SYSTEMS ANALYSIS, AIRCRAFT, COMPUTATIONS, EXPONENTIAL FUNCTIONS, FUELS, JOBS, REFUELING, SHOPS(WORK AREAS), STATIONS, STATISTICAL DISTRIBUTIONS, SUPPLIES, SUPPLY DEPOTS, TIME STUDIES.

ABSTRACT: (U) Two significant aspects of fault-tolerant computing were the focus of this project. Concurrent research was carried out as well in the areas of fault tolerant testable VLSI system design and fault-tolerant multiprocessor design. A novel concept for testable RAM designs was developed, too, allowing for the design of large RAMs with built-in test capabilities. Such a testability feature is, in fact, an integral part of the design, not added on adhoc, and as such, is the subject of a patent application filed by the U.S. Air Force. The second major focus of research concentrated on the development of fault-tolerant multiprocessor topologies. It was demonstrated that DeBruijn multiprocessor networks provide a naturally fault-tolerant robust interconnection network. The attractive feature of these networks includes their ability to provide fault-tolerance in a wide variety of applications. Also developed was a new topology, termed Flip Trees, which provides certain optimal fault-tolerant properties. Finally, a practical perspective on distributed agreement algorithms was formulated, which can admit a large variety of faults (rh)

DESCRIPTORS: (U) \*FAULTS, \*MULTIPROCESSORS, \*TOLERANCE, AGREEMENTS, AIR FORCE, ALGORITHMS, DISTRIBUTION, NETWORK FLOWS, NETWORKS, PATENT APPLICATIONS, SELF CONTAINED, TEST AND EVALUATION, TEST METHODS, TOPOLOGY

AD-A209 630

AD A209 579

UNCLASSIFIED

PAGE 202

LV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 576 13/8 20/12 20/6

AD-A209 579 CONTINUED

DEACON RESEARCH PALO ALTO CA

IDENTIFIERS: (U) PE61102F, WJAF0SR2304A2.

(U) Development of Photodeposited Diamond Films.

DESCRIPTIVE NOTE: Final rept. Aug 88-Feb 89.

MAR 89

PERSONAL AUTHORS: O'Keefe, Anthony

CONTRACT NO. F49620-88-C-0099

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0779

UNCLASSIFIED REPORT

ABSTRACT: (U) This document details a study of the fundamental physical and chemical processes occurring in hot filament and laser assisted synthetic diamond CVD processes. The chemical model developed in this program permits a detailed analysis of previous investigations. This model suggests that several factors will limit the attainable purity and utility of synthetic diamonds grown by plasma or hot filament CVD techniques. A diamond deposition process based upon selective laser production of the chemical species which give rise to the films is described. This technique holds the promise of growing essentially pure diamond at rates comparable to existing schemes, and should permit co-deposition of selected dopant species to make novel new optic and electro optic devices. An experimental diamond CVD reactor has been designed, developed and tested to provide experimental verification of the model. The reactor has been run in two modes of operation; a hot filament CVD mode, and a laser-assisted hot filament mode. Films deposited in the hot filament mode of operation exhibit the physical characteristics and growth behavior expected for synthetic diamond films. The observed growth kinetics agree with predictions based upon the chemical model developed here. A study based upon a laser-assisted hot filament diamond CVD process suggests that the laser process results in an enhancement of the rate of film growth, although the extent of this enhancement was

AD-A209 579

AD-A209 576

UNCLASSIFIED

PAGE 206

EV109K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTRO. NO. EVI09K

AD-A209 576 CONTINUED

AD-A209 343 7/5 20/8 20/5

limited by the available laser power. Further investigation using greater laser powers will be required to confirm this result and expand upon the results. (AW)

SAN DIEGO STATE UNIV CA DEPT OF ELECTRICAL AND COMPUTER ENGINEERING

(U) Photodetachment Cross Sections of Negative Halogen Ions in Discharge Media.

DESCRIPTORS: (U) \*VAPOR DEPOSITION, \*DIAMONDS, \*FILMS, \*SYNTHETIC STONES, CHEMICAL REACTIONS, CHEMICALS, ELECTROOPTICS, GROWTH(GENERAL), HCT WIRE, KINETICS, LASERS, MODELS, OPERATION, OPTICAL EQUIPMENT, PHYSICAL PROPERTIES, POWER, PURITY, RATES, LASER APPLICATIONS, DOPING.

88

PERSONAL AUTHORS: Wang, W. C.; Lee, L. C.

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0695

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A1,  
\*Photodeposition.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Phys. D: Applied Phys. v21 p675-682 1988.

ABSTRACT: (U) Photodetachment of negative halogen ions occurs in the atmosphere and in discharge systems. The photodetachment cross section of negative halogen ions are generally of interest for the studies of laser and plasma physics. Laser-induced increases of discharge current were observed in the discharge media containing various halogen compounds (F<sub>2</sub>, HF, HCl, HBr, CH<sub>3</sub>Br, CH<sub>3</sub>I and CH<sub>2</sub>I<sub>2</sub>) in N<sub>2</sub>. The increase of transient current were attributed to the photodetachment of negative ions in the discharge media. On the basis of general considerations, the negative ions present in the discharge are assumed to be the atomic halogen negative ions. Photodetachment cross sections were determined from the current increases as a function of laser flux. Photodetachment cross sections of F<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup> and I<sup>-</sup> are 193 nm and (0.6, 1.0, 1.5 and 3.0) x 10 to the -17th power sq cm at (0.75, 2.5, 3.3 and 7.0) x 10 to the -17th power sq cm at 248 nm, respectively. These data are compared with the earlier results of negative ion beam experiments and theoretical calculations. Keywords: Methyl bromide; Methyl iodide; Methylene iodide; Nitrogen; Fluorine; Hydrogen fluoride; Hydrochloric acid; Chlorine; Hydrogen bromide; Bromine; Iodine; Reprints. (AW)

DESCRIPTORS: (U) \*ANIONS, \*CROSS SECTIONS, \*HALOGENS, \*PHOTODISSOCIATION, BROMIDES, BROMINE, CHEMICAL

AD A209 576

AD-A209 343

UNCLASSIFIED

PAGE 207

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A209 343 CONTINUED

AD-A209 261 7/6 7/3

DISSOCIATION, CHLORINE, COMPUTATIONS, ELECTRIC CURRENT, ELECTRIC DISCHARGES, FLUORINE, FLUX(RATE), HALOGEN COMPOUNDS, HYDROCHLORIC ACID, HYDROGEN COMPOUNDS, HYDROGEN FLUORIDE, IODIDES, IODINE, ION BEAMS, LASERS, MEDIA, METHYL RADICALS, METHYLENES, NITROGEN, PHOTOCHEMICAL REACTIONS, PLASMAS(PHYSICS), REPRINTS, THEORY, TRANSIENTS.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Synthesis of Polyphosphazenes Bearing Geminal (Trimethylsilyl)methylene and Alkyl or Phenyl Side Groups.

MAY 89

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

PERSONAL AUTHORS: Allcock, Harry R.; Brennan, David J.; Dunn, Beverly S.

CONTRACT NO. AFOSR-84-0147

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0690

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In The Macromolecules, V22 n4  
P1534-1539 1989.

ABSTRACT: (U) The ring-opening polymerization of a series of organosilylcyclophosphazenes of formula  $gem-N3P3Cl4(CH2SiMe3)(R)$ , where  $R = C2H5, i-C3H7, n-C4H9, neo-C5H11,$  and  $C6H5$ , is described and is compared with the polymerization behavior of the non-silylated counterparts,  $gem-N3P3Cl4(CH3)(R)$ . Polymerization is markedly favored by the presence of the organosilicon group. In the organosilyl derivatives, geminal  $t-C4H9$  or  $neo-C5H11$  co-substituent groups retard polymerization compared to  $CH3, C2H5, n-C4H9,$  or  $C6H5$  groups. The  $i-C3H7$  group has an intermediate effect. It is speculated that the  $t-C4H9, neo-C5H11,$  and  $i-C3H7$  groups give rise to polymerization-inhibiting side reactions. The polymers prepared by the polymerization of  $gem-N3P3Cl4(CH2SiMe3)(R)$  were subjected to chlorine replacement reactions by treatment with sodium trifluoroethoxide. Reactions carried out in toluene solution allowed replacement of chlorine without concurrent attack on the organosilyl groups. In THF solvent,  $CH2-Si$  bond cleavage occurred to replace the (trimethylsilyl) methylene units by methyl groups. Reprints. (AW)

AD A209 343

AD-A209 261

UNCLASSIFIED

PAGE 208

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 261 CONTINUED

AD-A209 217 7/6 11/2 7/4

DESCRIPTORS: (U) \*POLYMERIZATION, \*PHOSPHAZENE, CHLORINE, METHYL RADICALS, METHYLENES, ORGANIC COMPOUNDS, PHENOLS, POLYMERS, REPLACEMENT, REPRINTS, SIDES, SILICON COMPOUNDS, SODIUM, SOLUTIONS(MIXTURES), SYNTHESIS(CHEMISTRY), TOLUENES, SILICON, ALKYL RADICALS, PHENYL RADICALS, CYCLIC COMPOUNDS.

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY  
(U) The Effect of Fluoride on the Sol-Gel Process.

88

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2,  
\*Polyphosphazenes, Side Groups, Ring Opening  
Polymerization, Rings(Chemistry)..

PERSONAL AUTHORS: Winter, R.; Chan, J. B.; Frattini, R.;  
Jonas, J.

CONTRACT NO. AFOSR-85-0345, NSF-DMR86-12860

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0254

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Non-Crystalline  
Solids, v105 p214-222 1988.

ABSTRACT: (U) In view of its well-recognized technological importance, the sol-gel process for glass preparation continues to receive major experimental attention. For the silica-based process, the gelation occurs in two stages, the hydrolysis stage and the condensation stage. Depending on the experimental conditions used, these two stages of gelatin can be highly interlocked thus leading to condensation between partially hydrolyzed species. Natural abundance  $^{29}\text{Si}$  NMR spectroscopy and laser Raman scattering experiments were employed to investigate the effects of fluoride ion on the gelation process in tetramethylorthosilicate at pH = 6.4. In addition, the BET method was used to carry out a pore analysis of the dried gels. Both the NMR and Raman data show that the presence of fluoride anions not only accelerates the gelation process but leads to a different polymerization process. The condensation proceeds via the formation of higher branched polymers, and the dimers and trimers do not play a significant role in the polymerization process. A high percentage of organic OCH<sub>3</sub> groups is present in the silicon network at the gelation point. The pore analysis of dried gels shows that the fluoride ion leads to the formation of a loose and relatively open silica network with a large fraction of mesopores. Reprints. (AW)

AD-A209 261

AD-A209 217

UNCLASSIFIED

PAGE 209

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 217 CONTINUED

AD-A209 202 20/1 20/3

DESCRIPTORS: (U) \*ANIONS, \*FLUORIDES, \*GELATION, \*SILICA  
GLASS, \*POLYMERIZATION, CONDENSATION, DRY MATERIALS, GELS,  
HYDROLYSIS, IONS, LIGHT SCATTERING, NETWORKS, POLYMERS,  
PREPARATION, RAMAN SPECTRA, REPRINTS, SILICON, SILICON  
DIOXIDE, SPECTROSCOPY.

DELAWARE UNIV NEWARK DEPT OF MATHEMATICAL SCIENCES

(U) The Inverse Scattering Problem for Acoustic and  
Electromagnetic Waves.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-31 May 89.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, Sol Gel  
Process, Tetramethylorthosilicate, Silicate/  
Tetramethylortho.

MAY 89

PERSONAL AUTHORS: Colton, David; Monk, Peter; Ochs, R. L.

CONTRACT NO. AFOSR-86-0087

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0608

UNCLASSIFIED REPORT

ABSTRACT: (U) This research project was concerned with  
the problem of determining the physical and geometric  
properties of an obstacle by probing with time harmonic  
acoustic or electromagnetic waves. A new method has been  
developed to solve problems of this type based on the  
theory of Herglotz wave functions and complete sets of  
solutions to the Helmholtz and Maxwell equations.  
Numerical examples have been given for the case of  
acoustic waves. (jhd)

DESCRIPTORS: (U) \*ACOUSTIC SCATTERING, \*INVERSE  
SCATTERING, ELECTROMAGNETIC SCATTERING, ACOUSTIC WAVES,  
ELECTROMAGNETIC RADIATION, GEOMETRY, MAXWELLS EQUATIONS,  
PHYSICAL PROPERTIES, WAVE FUNCTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9

AD-A209 217

AD-A209 202

UNCLASSIFIED

PAGE 210

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 082 AD-A209 082 CONTINUED

OREGON UNIV EUGENE DEPT OF PHYSICS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A4, \*Multiphoton Ionization, High Intensity Fields, Dirac Equation.

(U) Quantum Electrodynamical Approach to Multiphoton Ionization in the High-Intensity Field.

DEC 88

PERSONAL AUTHORS: Guo, D-S; Aberg, T.

CONTRACT NO. AFOSR-87-0026, NSF-PHY85-16788

PROJECT NO. 2302

TASK NO. A4

MONITOR: AFOSR  
TR-89-0416

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physics A, v21 p4577-4591 1988.

ABSTRACT: (U) The development of high-power lasers has made it possible to achieve light intensities which are of the order of one atomic unit. At these field strengths relativistic effects become important. It is thus of interest to study multiphoton ionization from the point of view of quantum electrodynamics (QED). In recent work Filipowicz (1985) obtained the solution of the Dirac equation for an electron interacting with a quantized electromagnetic plane wave. He also discussed the non-quantum limit of this solution. We solve the Dirac equation for an electron interacting with a quantized and elliptically polarized electromagnetic field. We use the solution to obtain a relativistic S-matrix amplitude for multiphoton ionization in the high-intensity limit. Its non-relativistic limit is also derived and is used to construct a multiphoton transition-rate formula which is compared with previous results. Reprints. (AW)

DESCRIPTORS: (U) \*PHOTOIONIZATION, \*QUANTUM ELECTRODYNAMICS, AMPLITUDE, ELECTROMAGNETIC FIELDS, ELECTROMAGNETIC RADIATION, ELECTRONS, EQUATIONS, FIELD INTENSITY, HIGH POWER, INTENSITY, LASERS, LIGHT LIMITATIONS, PLANE WAVES, POLARIZATION, QUANTIZATION, REPRINTS.

AD-A209 082

AD-A209 082

UNCLASSIFIED

PAGE 211

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI09K

AD-A209 063 4/1 20/14

AD-A209 062 20/3 9/3

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF PHYSICS

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Inverse Scattering: Ionospheric Structure Determination.

(U) Tunable Microwigglers for Free-Electron Lasers,

APR 89

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 79-30 Jun 80.

PERSONAL AUTHORS: Chen, S. C.; Bekefi, G.; DiCecca, S.; Tenkhn, R.

AUG 80

PERSONAL AUTHORS: Cohen, Jeffrey M.

CONTRACT NO. AFOSR-89-0082

CONTRACT NO. F49620-79-C-0127

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. A8

TASK NO. A4

MONITOR: AFOSR TR-89-0721

MONITOR: AFOSR TR-89-0742

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A paper entitled 'Curved Space Scattering' has already been sent to AFOSR. The abstracts of the paper and report contain statements of the research accomplished. In addition we have looked into the following problems: a. We have employed the Kanal-Moses variational principle to treat the synthetic data discussed in the report listed in 1.1. It was found that if the initial trial function is within 10% of the actual result, then the K-M variational principle gives the result to better than 1%. We have generalized the results of Kay for n-poles in such a way that practical applications are possible, e.g. to the ionosphere. To test the method we are in the process of studying the 4- and 10-pole cases before treating the 100-pole case. (RH)

DESCRIPTORS: (U) \*INVERSE SCATTERING, \*IONOSPHERE, ABSTRACTS, DETERMINATION, PAPER.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4.

AD-A209 063

UNCLASSIFIED

AD-A209 062

PAGE 212

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SUPPLEMENTARY NOTE: Pub. in Applied Physics Letters, v54 n14 p1299-1301, 3 Apr 89.

ABSTRACT: (U) The design, construction, and test results of a novel microwiggler structure with a periodicity of 2.4 mm are presented for free-electron laser applications. The experimentally demonstrated tunability of field amplitude provides versatile means for field tapering. optical klystron configurations, improving field uniformity, and electron beam matching at the wiggler entrance. Reprints. (jhd)

DESCRIPTORS: (U) \*FREE ELECTRON LASERS, \*WIGGLER MAGNETS, AMPLITUDE, CONFIGURATIONS, ELECTRON BEAMS, KLYSTRONS, LASER APPLICATIONS, MATCHING, OPTICAL PROPERTIES, REPRINTS, TEST AND EVALUATION, TUNING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A8.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A209 039

20/5

AD-A208 989

7/5

7/4

OREGON UNIV EUGENE DEPT OF PHYSICS

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Photon-Energy-Sensitive Si L(2,3) VV Auger Satellite,

(U) Photochemical Probes for Structure of Zeolites and for Dynamics of Reactions of Molecules Adsorbed on Porous Solids.

89

PERSONAL AUTHORS: Wojcik, J. C.; Pianetta, P.; Sorensen, S. L.; Crasemann, B.

DESCRIPTIVE NOTE: Rept. for 1986-1988,

89

CONTRACT NO. AFOSR-87-0026

PROJECT NO. 2301

PERSONAL AUTHORS: Turro, Nicholas J.

TASK NO. A4

PROJECT NO. 2303

MONITOR: AFOSR TR-89-0734

TASK NO. B2

MONITOR: AFOSR TR-89-0722

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v39 p6048-6051 1989.

SUPPLEMENTARY NOTE: Pub. in Molecular Dynamics in Restricted Geometries, ch14 p387-404 1989.

ABSTRACT: (U) The high-energy satellite structure which appears at 103 eV kinetic energy in the Si L sub 2,3 VV Auger spectrum has been studied with synchrotron radiation. We find the intensity of the satellite to be sensitive to the photon energy in the vicinity of the Si K edge ( $\nu=1840$  eV). The results of an atomic Hartree-Fock Delta SCF (self-consistent field) calculation are presented which account for the energy position of the satellite, and an atomic model is described which accounts for its dependence on the excitation photon energy. Keywords: Silicon electronic structure; Auger satellites; Reprints. (jhd)

DESCRIPTORS: (U) \*AUGER ELECTRON SPECTROSCOPY, \*ELECTRONIC STATES, \*SILICON, \*SYNCHROTRON RADIATION, CONSISTENCY, ENERGY, EXCITATION, HIGH ENERGY, INTENSITY, KINETIC ENERGY, PHOTONS, POSITION(LOCATION), REPRINTS.

IDENTIFIERS: (U) WUAFOSR2301A4, PE61102F, Auger satellites.

DESCRIPTORS: (U) \*PHOTOLYSIS, \*SILICATES, \*ALUMINUM COMPOUNDS, \*ION EXCHANGE RESINS, \*MOLECULAR STRUCTURE, \*SURFACE REACTIONS, ADSORPTION, CATALYSIS, CATIONS, DENSITY, DYNAMICS, ELECTROSTATIC FIELDS, GEOMETRY, KETONES, MOBILITY, MOLECULES, PHOTOCHEMICAL REACTIONS, POROUS MATERIALS, PROBES, REPRINTS, SHAPE, REPRINTS. (aw)

AD-A209 039

AD-A208 989

UNCLASSIFIED

PAGE 213

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A208 989 CONTINUED

AD-A208 932 7/5

SIZES(DIMENSIONS), SOLIDS, SUBSTRATES, TOPOLOGY, CHEMICAL RADICALS.

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Zeolites, Pentasil Topology, Faujasite Topology, Radical Pairs.

(U) Dimethylsilyl Derivatives of Zirconium, 89

PERSONAL AUTHORS: Roddick, Dean M.; Heyn, Richard H.; Tilley, T. D.

CONTRACT NO. AFOSK-95-0228

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR TR-89-0394

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics. v8 n2 p325-330 1989.

ABSTRACT: (U) The development of early-transition-metal silicon chemistry has been hampered by a lack of general synthetic methods. To date most metal silyl complexes have been prepared by displacement of halide ion from the metal by a silyl anion. However, application of this procedure is somewhat restricted by the availability of suitable silyl anion sources. In particular, there is a limited range of reagents for preparation of primary and secondary metal silyl complexes, since stable silyl anion reagents with Si-H bonds are quite rare. Chemical reactions. Reprints. (jes)

DESCRIPTORS: (U) \*DISPLACEMENT, \*PHOTOCHEMICAL REACTIONS, AVAILABILITY, CHEMICAL AGENTS, CHEMICAL REACTIONS, HALIDES, IONS, LIMITATIONS, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

AD-A208 989

AD-A208 932

UNCLASSIFIED

PAGE 214

EVI09K

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI09K

AD-A208 930 20/10

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Use of Quantum Mechanical Models in Studies of Reaction Mechanisms.

88

PERSONAL AUTHORS: Dewar, Michael J.

CONTRACT NO. AFOSR-86-0022

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0348

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Quantum Chemistry: Quantum Chemistry Symposium, V22 p557-566 1988.

ABSTRACT: (U) The problems involved in determining the mechanisms of reactions by quantum mechanical calculations are discussed. Various precautions must be taken if the results of any calculation are to be chemically meaningful. Ab initio studies of reactions must also be carried out at a high level, using large basis sets and allowing for electron correlation. Such calculations are usually restricted to the simplest example of a reaction. More information can usually be obtained at far less cost through AM1 calculations for a number of examples of a reaction for which experimental data are available. These points are illustrated by recent studies of the Cope rearrangement. Keywords: Quantum mechanical models, Reaction mechanisms, Reprints. (jhd)

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*QUANTUM CHEMISTRY, \*QUANTUM THEORY, CORRELATION, COSTS, ELECTRONS, EXPERIMENTAL DATA, MODELS, REPRINTS, RESPONSE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Ab initio calculations.

AD-A208 930

UNCLASSIFIED

PAGE 215

EVI09K