

610859



# FACT BOOK

NAVAL RESEARCH LABORATORY

Washington, D.C. 20375

DECEMBER 1972

APPROVED FOR PUBLIC  
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*1923—Fifty Years of Science for the Navy and the Nation—1973*

# Report Documentation Page

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This document has been prepared as  
a reference source of factual information  
about the Naval Research Laboratory.

December 1972

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Aerial view of the Naval Research Laboratory main site

# The Naval Research Laboratory

## MISSION

The mission of the Naval Research Laboratory is to conduct scientific research and development in the physical sciences and related fields directed toward new and improved materials, equipment, techniques, and systems for the Navy. In fulfillment of this mission, the Naval Research Laboratory:

1. Initiates and conducts scientific research and development of a basic and long-range nature in scientific areas of special interest to the Navy.
2. Performs scientific research and development for the Systems Commands and offices of the Navy and, where specially qualified, for the Defense Department and, in defense related efforts, for other government agencies.
3. Provides to the Navy and its contractors standardized techniques and procedures for measurements and for the accurate calibration of standard instruments in areas of special Navy needs.
4. Furnishes scientific consultative services for the Navy and, where specially qualified, for the Defense Department and, in defense related efforts, for other government agencies.
5. Provides to the Navy unbiased determination of performance characteristics of developmental and prototype devices through limited engineering test and evaluation services.

## THE NAVY'S CORPORATE LABORATORY

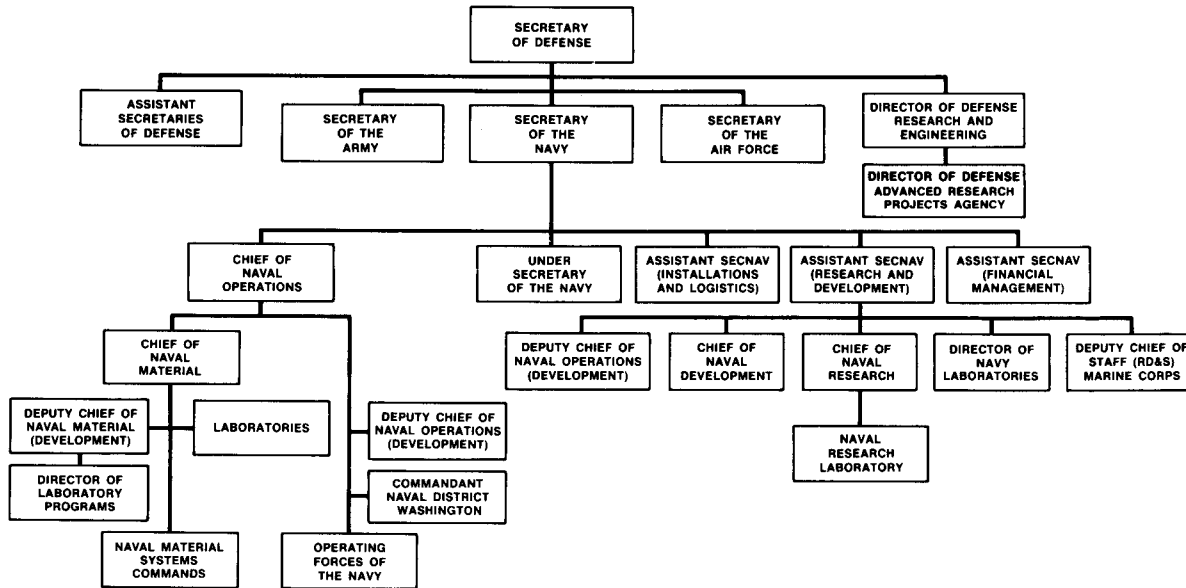
The Naval Research Laboratory is one of the principal in-house research and development institutions of the U.S. Government. It was established in 1923 to ensure that advancements in science and engineering could be readily applied to the Navy's needs. Directed always toward this end, the NRL research program has developed to its present status as a broadly based and coordinated effort in the physical, mathematical, and environmental sciences, in advanced engineering, and in naval analysis. The work of the Laboratory is conducted at the main establishment in the District of Columbia and at various field sites that provide unique environment and facilities not available at the main site.

Some principal elements of the research program include fundamental and applied work in radio wave propagation, oceanography, deep-sea instrumentation, submarine air purification, structural design theory, fracture mechanics, surface chemistry, optical physics, radar, underwater sound propagation, acoustic signal processing, sonar transducers, nuclear physics, radio astronomy, high-temperature lubricant, high-energy fuels, plasma physics, refractory metals, exotic materials for high-performance structures, x-ray astronomy, high-power lasers, solid-state physics, and stress-corrosion cracking of high-strength titanium steels and aluminum alloys.

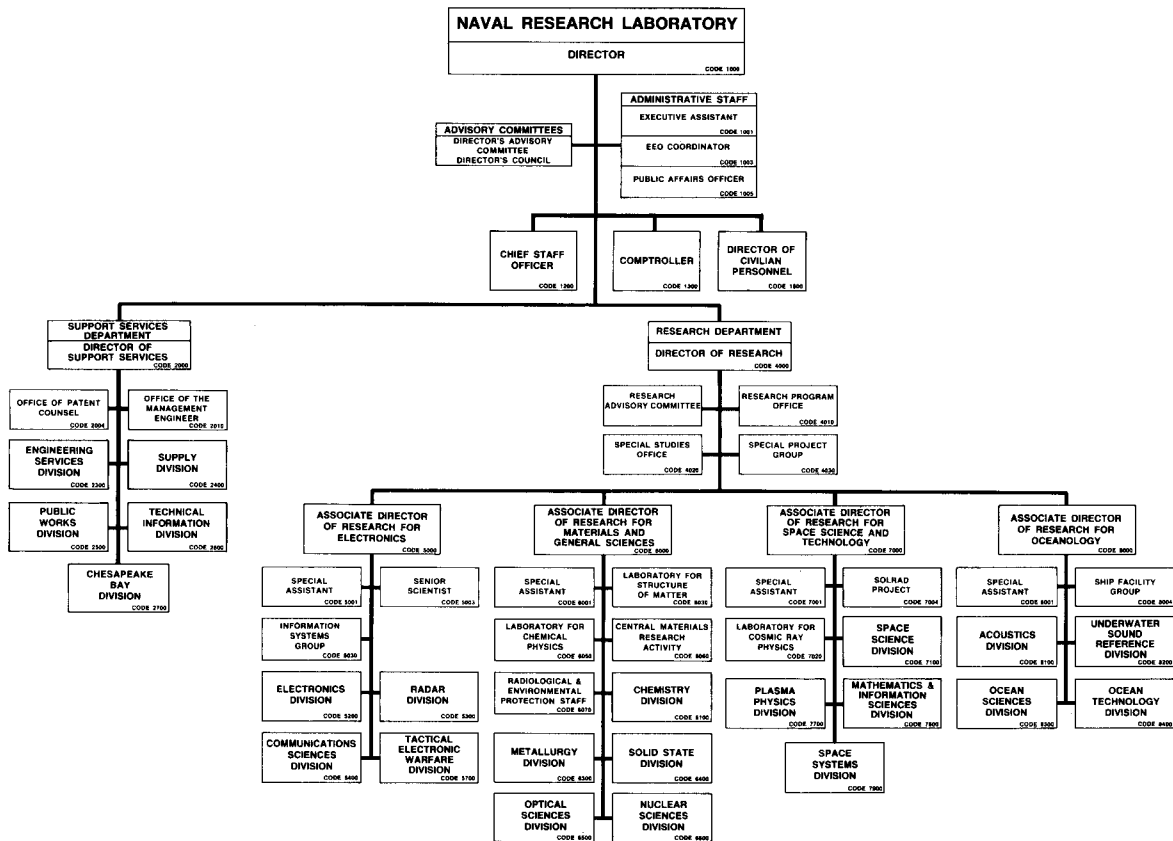
Over 1700 scientific and technical papers were produced in 1971 as a consequence of the research and development effort of the Laboratory staff. The figure includes 155 formal reports, 170 memorandum reports, 520 articles published in professional society journals, and over 800 papers presented at scientific and technical meetings in the United States and in foreign countries.

In addition, 76 U.S. patents were issued in 1971 on inventions made by present and former employees of the Naval Research Laboratory. This figure brings the grand total of NRL patents, through the calendar year 1971, to 2293.

In its investigations of broad scientific areas, in considering its findings for potential military applications, and in furnishing to the Naval Systems Commands and Secretariat expert consultative services relating to science and military systems, NRL functions as the corporate laboratory of the Navy. Thus it provides a central focus of research and development activity that supports the Navy. When NRL findings and capabilities have borne fruit in particular areas, the results are made known to and used by not only the Navy but also the Army, the Air Force, the Defense Advanced Research Projects Agency, the Atomic Energy Commission, and other agencies of the government.



Position of NRL in the Department of Defense structure



Organization chart of NRL

## MILITARY AND CIVILIAN PERSONNEL

Military Personnel Attached to NRL as of June 1, 1972

<i>Officers</i>	<i>Authorized</i>	<i>On Board</i>
Captain	3	2
Commander	8	9
Lieutenant Commander	11	3
Lieutenant	8	10
Lieutenant (Junior Grade)	0	3
Ensign	0	1
Warrant Officer	1	0
<b>Total</b>	<b>31</b>	<b>28</b>
 <i>Enlisted</i>	 81	 79

Civilian Employees on Rolls as of June 1, 1972

10 USC 1581 (formerly Public Law 313)	24
Classification Act (GS)	2793
Scientific & Professional	1387
Technical Supporting	629
General Administrative & Clerical	777
Wage Board	798
General Wage Service (WG)	632
Apprentices, Planning, Estimating, etc.(WD)	83
Printing & Lithographic Service (WI)	19
Supervisory General Wage Service (WS)	56
Inspection Service (WX)	6
Leader (WL)	2
<b>Total</b>	<b>3615</b>

Annual Civilian Turnover Rate (percent)

	<u>1970</u>	<u>1971</u>	<u>1972</u>
Research Department	4.9	4.5	5.4
Nonresearch Areas	11.6	11.3	8.7
Entire Laboratory	7.8	7.1	6.8

Highest Academic Degrees Held by Permanent Employees  
(as of June 1, 1972)

Bachelors	686
Masters	344
Doctorates	461

FISCAL INFORMATION  
 NRL FUNDING BY MAJOR SPONSOR  
 FISCAL YEARS 1971 AND 1972

Sponsor	FY 1971 (Act)		FY 1972 (Est)	
	Millions of Dollars	Percent	Millions of Dollars	Percent
R&D PROGRAM				
ONR	31.6	28.2	36.1	26.6
SHIP	14.2	12.7	16.0	11.8
ELEX	7.8	6.9	12.3	9.1
AIR	17.2	15.3	24.3	17.9
ORD	3.9	3.5	4.8	3.5
OTHER NAVY	<u>4.6</u>	<u>4.1</u>	<u>6.2</u>	<u>4.5</u>
TOTAL NAVY	79.3	70.7	99.7	73.4
OTHER DOD	18.3	16.3	20.2	14.9
NON-DOD	<u>11.2</u>	<u>10.0</u>	<u>12.1</u>	<u>8.9</u>
TOTAL R&D	108.8	97.0	132.0	97.2
NON R&D	<u>2.2</u>	<u>2.0</u>	<u>2.3</u>	<u>1.7</u>
TOTAL NIF	111.0	99.0	134.3	98.9
CAPITAL IMPROVEMENT	<u>1.2</u>	<u>1.0</u>	<u>1.5</u>	<u>1.1</u>
TOTAL FUNDS	112.2	100.0	135.8	100.0

EXPENDITURES  
 (Excluding Plant Account Funds)  
 FY 1971-1972

<u>Purpose</u>	During FY 1971	During FY 1972
Materials, supplies and parts	\$ 15,000,000	\$ 15,500,000
Salaries and wages	56,500,000	63,900,000
Contractural services and other costs	39,500,000	54,900,000
TOTAL	<u>\$111,600,000</u>	<u>\$134,300,000</u>

CAPITAL PROPERTY

As of May 1972

Class 1 (Land)	\$ 451,839
Class 2 (Buildings and improvements)	76,660,816
Class 3 (Equipment)	15,280,807
Class 4 (Industrial production equipment)	<u>15,698,078</u>
TOTAL CAPITAL PROPERTY	\$108,091,540

# Office of the Director

The Director of the Naval Research Laboratory is a Navy Captain with appropriate educational background and experience. He is responsible for the overall operation and management of the Laboratory and its programs, and he executes the usual functions of command of a naval shore activity. The Directors of the Laboratory's two Departments, Research and Support Services, report to the Director. In carrying out the functions of his office, the Director is assisted by the Chief Staff Officer, the Comptroller, the Director of Civilian Personnel, an Executive Assistant, an EEO Coordinator, and a Public Affairs Officer.

## Director, Naval Research Laboratory



Captain Earle W. Sapp, USN

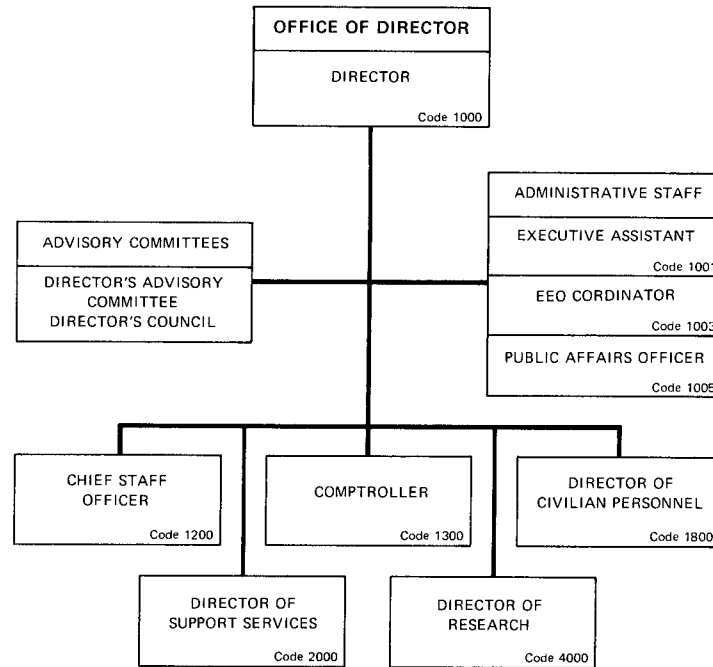
Captain Sapp [REDACTED], [REDACTED]. He attended Duke University from 1944 to 1947, where he majored in physics while in the Naval Reservè Officers Training Corps. He graduated in March 1947 and was commissioned Ensign, USN, at that time. He is a graduate of the Naval War College and has attended several Naval schools in the areas of antisubmarine warfare equipment and tactics, combat information center operations, and naval electronics. Captain Sapp also has attended special oceanographic courses, and his Navy technical subspecialty is oceanography.

Captain Sapp's R&D experience includes project assignments in fleet evaluation activities, in the Office of Naval Research, and in experimental ships assigned to Navy laboratories and the operational test and evaluation force. Prior to assuming the position of Director of the Laboratory on June 30, 1970, he was on the staff of the Director of Defense Research and Engineering, where he served as Deputy to the Assistant Director for Ocean Control.

Captain Sapp is a line officer and is qualified to command destroyers. During his naval career, Captain Sapp acquired broad operational and command experience in destroyer-type ships and in fleet staffs. He has commanded the experimental destroyer escort USS MALOY (EDE 791) and the fleet destroyer USS EUGENE A. GREENE (DD 711). His fleet experience includes deployments to both the European and Southeast Asia theaters, as well as experimental antisubmarine warfare operations.

He is a member of the Research Society of America, the Acoustical Society of America and the American Society of Naval Engineers.

# OFFICE OF THE DIRECTOR



## Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT E.W. Sapp, USN	Director	1000
Mr. S.L. Cohen	Executive Assistant	1001
Mr. W.H. Webster	EEO Coordinator	1003
Mr. E.L. Smith	Public Affairs Officer	1005
CAPT J. Brozena, USN	Chief Staff Officer	1200
Mr. J.P. Donovan	Comptroller	1300
Mr. F.D. Wallace	Director of Civilian Personnel (Acting)	1800
CAPT J.A. Bortner	Director of Support Services	2000
Dr. A. Berman	Director of Research	4000

## EXECUTIVE ASSISTANT

### Basic Responsibilities

The Executive Assistant provides the Director with executive level staff and managerial support in connection with the duties, interests, and activities of the the Director.



Mr. S. L. Cohen

## EQUAL EMPLOYMENT OPPORTUNITY COORDINATOR

### Basic Responsibilities

The Equal Employment Opportunity Coordinator serves as an advisor to the Director on EEO matters; conducts surveys and studies relating to NRL's Affirmative Action Plan and recommends methods for achieving its goals of a fully integrated work force; acts as ex officio member of the EEO Committee; and assists the EEO counselors in settling initial complaints of alleged discrimination.

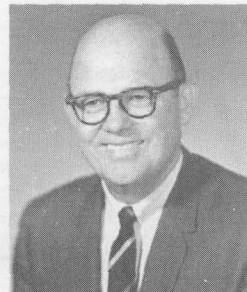


Mr. W. H. Webster

## PUBLIC AFFAIRS OFFICER

### Basic Responsibilities

As a collateral duty, the Head of the Technical Information Division (Code 2600) serves as Public Affairs Officer (Code 1005), and advisor to the Director of the Laboratory on all matters relating to public affairs. He is also responsible for the overall planning and guidance of the Laboratory's public affairs program implemented through the Public Affairs Branch (Code 2650).



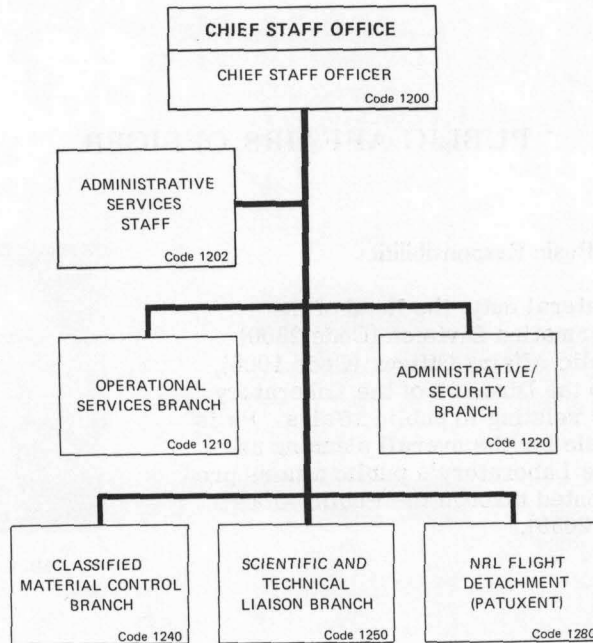
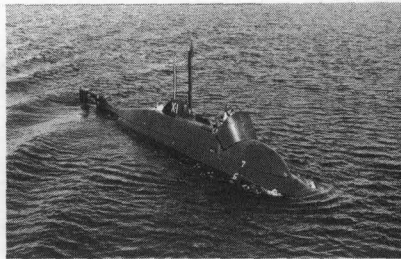
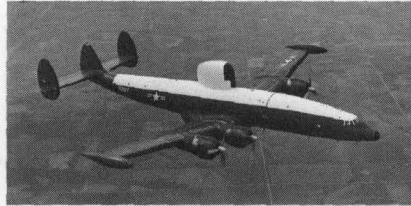
Mr. E. L. Smith



CAPT J. Brozena, USN

# Chief Staff Office

- OPERATIONAL SERVICES
- SECURITY
- CLASSIFIED MATERIAL CONTROL
- SCIENTIFIC AND TECHNICAL LIAISON



### Basic Responsibilities

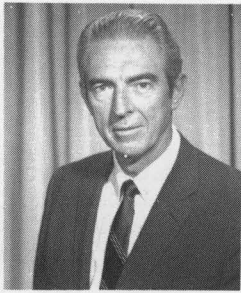
The Chief Staff Officer provides a military staff to the Director, Naval Research Laboratory, for the purpose of assisting the Director in the military aspects of the management of the Laboratory. He conducts liaison with DOD and Navy Commands and activities and the operating forces of the Navy in support of NRL research and development operations and the coordination of the military application of the scientific work of the Laboratory. The Staff supports four multi-engine Laboratory aircraft and obtains and coordinates such additional air, surface, and subsurface services as are required. The Military Staff is also responsible for personnel and plant security, communications, and control of classified material.

### Key Personnel

<u>Name</u>	<u>Title</u>
CAPT J. Brozena, USN	Chief Staff Officer
Mr. J.R. Gallagher	Administrative Services Officer
LTJG T.R. Coccozza, USN	Communications/Military Personnel Officer
CDR D.F. Moxley, USN	Operational Services Officer
CDR L.R. Marshall	Administrative/Security Officer
Mr. W.C. Bryan	Head, Special Activities Office
Mr. J.M. Manser	Head, Security Section
Mr. J.J. Bagley	Classified Material Control Officer
CDR W. Glickman, USN	Scientific and Technical Liaison Officer
CDR G. Janulis, USN	OIC, NRL Flight Detachment (Patuxent)

### Personnel Complement

On Board: 160  
(81 Civilian, 79 Military)



# Office of the Comptroller

Mr. J. P. Donovan



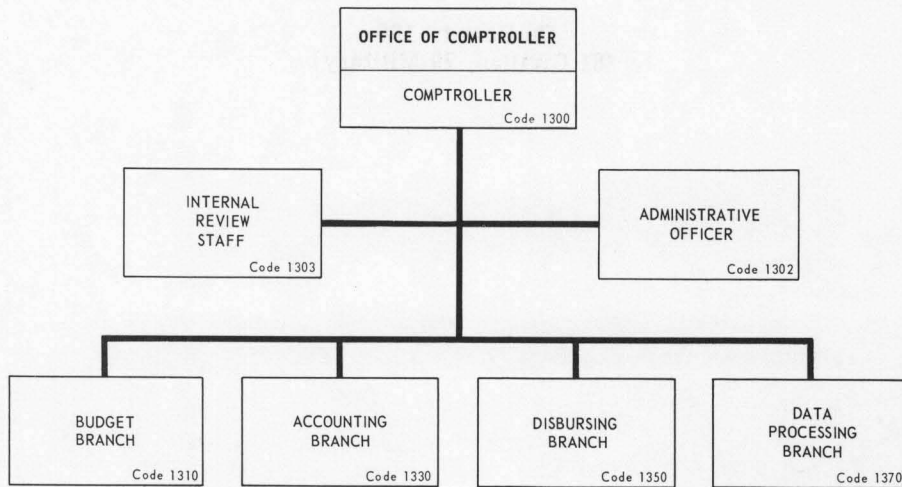
INTERNAL REVIEW

BUDGET OFFICE



COMPUTER

- BUDGET
- ACCOUNTING
- DISBURSING
- DATA PROCESSING



### Basic Responsibilities

The Comptroller is the financial adviser to the Director and other officials of the Laboratory. He administers the financial program of the Laboratory.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. J.P. Donovan	Comptroller
Mr. D.M. Johnson	Budget Officer
Mr. D.K. Jones	Accounting Officer
WO1 Lydia C. Gelardi, USN	Disbursing Officer
Mr. R.L. Guest	Data Processing Officer
Mr. R.A. Showman	Head, Internal Review Staff

### Personnel Complement

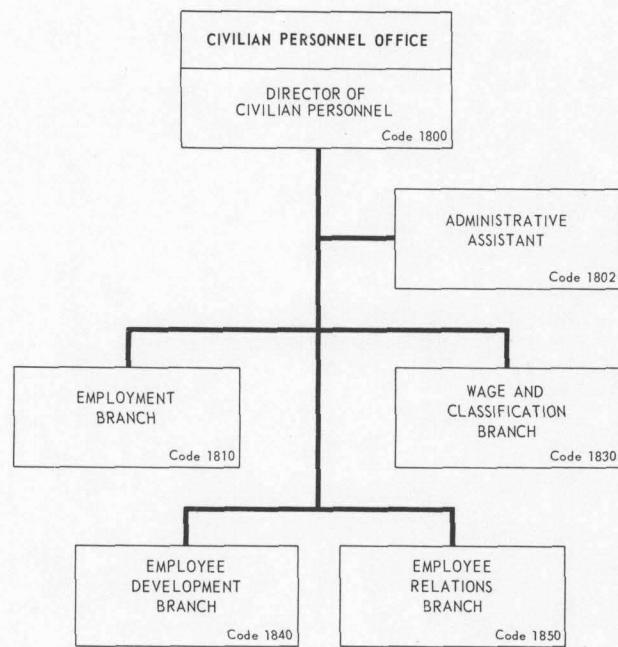
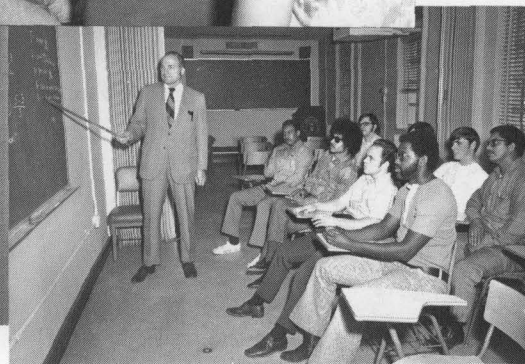
On Board: 84



Mr. F. D. Wallace

# Civilian Personnel Office

- EMPLOYMENT
- WAGE AND CLASSIFICATION
- EMPLOYEE DEVELOPMENT
- EMPLOYEE RELATIONS



### Basic Responsibilities

The Civilian Personnel Office administers the Laboratory's personnel program, which includes selection, development, promotion, utilization, appropriate recognition, and employee counseling and services for all civilian personnel.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. F.D. Wallace	Director of Civilian Personnel
Mr. J.E. Goss	Head, Employment Branch
Miss D.A. Myers	Head, Wage and Classification Branch
Mr. E.C. Reinhardt, Jr.	Head, Employee Development Branch (Acting)
Mr. H.H. Kay	Head, Employee Relations Branch

### Personnel Complement

On Board: 48

# The Research Department

The Research Department is headed by a civilian Director of Research who reports to the Director of NRL. The Department is comprised of four organizational areas of research— Electronics, Materials and General Sciences, Space Science and Technology, and Oceanology—each of which is headed by an Associate Director of Research. Encompassed by these four broad areas of research, which correspond to the principal areas of the Navy's interest in the physical and engineering sciences, are 17 divisions and additional special groups. Each division is headed by a civilian scientist and is comprised of an average of about 110 scientific, technical, and administrative personnel. The special groups average about 13 persons each. Three of the special groups (Laboratory for the Structure of Matter, Laboratory for Chemical Physics, and Laboratory for Cosmic Ray Physics) are headed by Chief Scientists who occupy corresponding "Chairs of Science."

The Director of Research is the Chief Scientist for the Laboratory; in this capacity he is responsible for:

- the conduct and effectiveness of the research program with direct authority and accountability for the technical work.
- long range and broad overall planning and programming.
- evaluating and accepting, modifying, or rejecting R&D proposals from NRL's scientific divisions; and for evaluating and recommending to the Director of NRL the acceptance or rejection of new problems from other activities.
- Research Department administration and the budgeting of funds.
- hiring, promoting, and effecting other personnel actions for Research Department personnel.

The Director of Research keeps the Director of Support Services informed at all times of the service needs of the scientific divisions and of any obstacles which may be impeding technical work of the Laboratory; he advises the Comptroller relative to requirements and control of funds; he also is encouraged to advise the Chief of Naval Research directly of the progress of the research program and of the overall climate for research at the Laboratory.

## Director of Research



Dr. Alan Berman

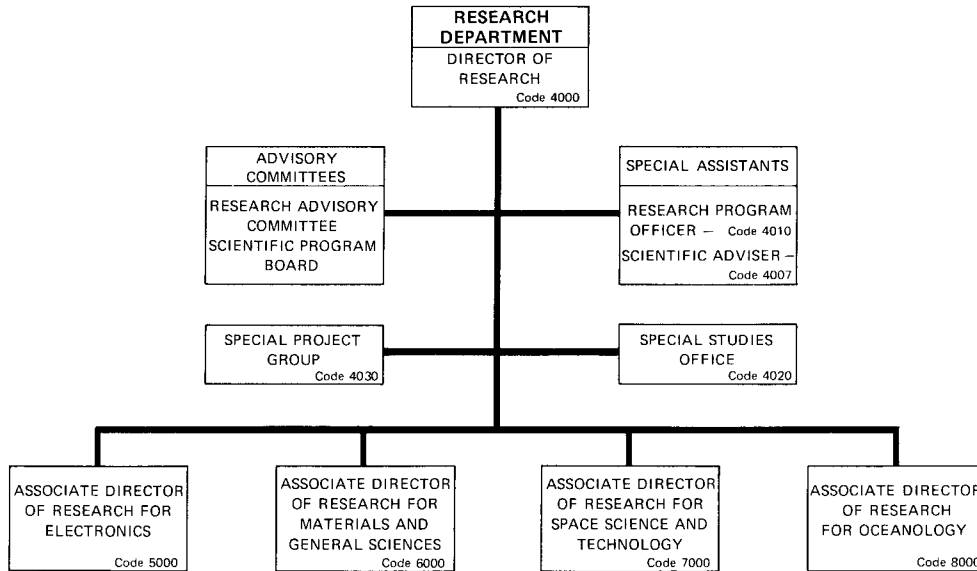
Dr. Berman [REDACTED]

[REDACTED] He received the A.B. degree in physics from Columbia College in 1947 and the Ph.D. degree in physics from Columbia University in 1952.

From 1952 to 1955 he was a research scientist at the Hudson Laboratories of Columbia University. He became Assistant Director of Hudson Laboratories in 1955, Associate Director in 1957, and Director in 1963. On May 29, 1967, Dr. Berman became Director of Research for the Naval Research Laboratory.

Dr. Berman's research specialties include the areas of underwater acoustics, oceanography, and signal processing. He has published numerous papers on these and related subjects. At present he is a member or chairman of a wide variety of Navy and oceanographic advisory groups. He also provides advisory services for a number of Department of Defense and other Government agencies.

Dr. Berman has on three occasions been visiting scientist to the Admiralty Research Laboratory, Teddington, England (1955, 1957, 1960), and once at the SACLANT ASW Research Center, La Spezia, Italy (1960).



### Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
Dr. A. Berman	Director of Research	4000
Mr. H.P. Gates	Consultant	4003
Mr. E.L. Brancato	Consultant	4004
Mr. A. Hollings	Head, Research Program Office	4010
Mr. C.L. Tipton	Head, Special Studies Office	4020
CAPT T.H. Sherman, USN	Head, Special Projects Group	4030
Dr. J.L. Allen	Associate Director of Research for Electronics	5000
Dr. J.H. Schulman	Associate Director of Research for Materials and General Sciences	6000
Dr. H. Rabin	Associate Director of Research for Space Science and Technology	7000
Dr. R.R. Goodman	Associate Director of Research for Oceanology	8000

## RESEARCH PROGRAM OFFICE

### Basic Responsibilities

The Research Program Office serves as staff to the research directorate of the Laboratory. It provides an orderly plan for coordinating NRL research programs with those of ONR and other sponsors or potential sponsors throughout the Departments of the Navy, the Army, and the Air Force, the Defense Advanced Research Projects Agency, and other agencies of the government. It also serves as a focal point for program information for project managers and other key personnel of sponsoring activities on work in progress or in various stages of planning. The Research Program Office maintains a management information center which serves as a working tool for the Laboratory directorate, and it maintains appropriate records of the Laboratory's research programs.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.J. Hollings	Head, Research Program Office
Mr. R.E. Seebold	Deputy Head, Research Program Office
Mr. R.C. Spragg	Head, Management Information Center Section
Mr. R.E. Seebold	Head, Short-Range Program Planning and Appraisal Section
Mr. N. Moglen	Staff Assistant—ADP



Mr. A. J. Hollings

### Personnel Complement

On Board: 13

## SPECIAL STUDIES OFFICE

### Basic Responsibilities

The Special Studies Office provides analytical staff support to the Director of Research in the fields of strategic, tactical, and special naval warfare. Programs of operation research and system analysis are undertaken to provide substantive analytical bases for (a) the orientation of naval research and development, and (b) the general delineation of advanced naval weapon systems and force structures requirements for the mid- to long-range time period. Broad scope analyses of projected threats, operations, tactics, equipments, and forces are conducted by four study sections—Operations Analysis; Systems Analysis; Systems Applications; and Amphibious Warfare, respectively.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. C.L. Tipton	Head, Special Studies Office
Mr. J. Reynolds	NRL Special Warfare Assistant



Mr. C. L. Tipton

### Personnel Complement

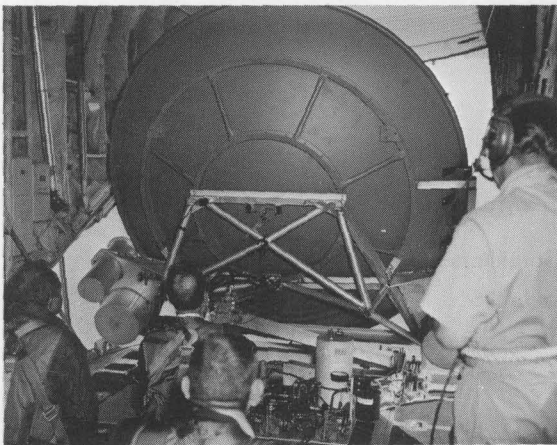
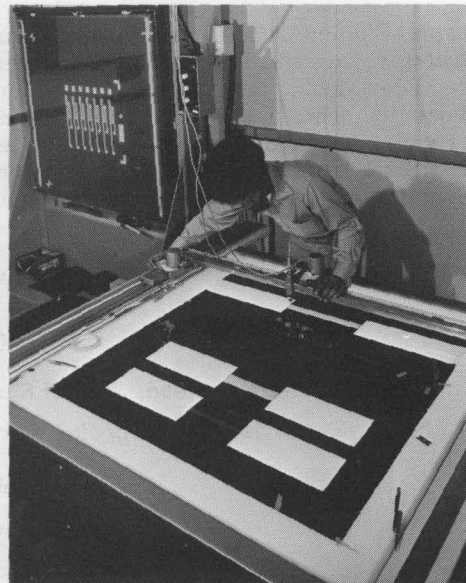
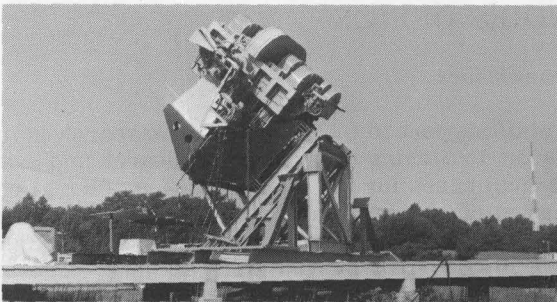
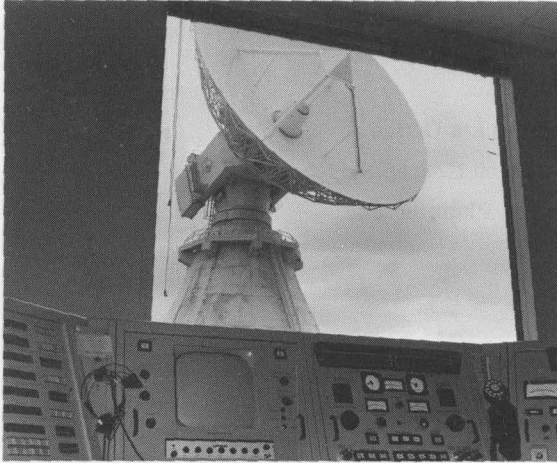
On Board: 15

### Total Estimated R&D Funding

Fiscal Year 1972: \$950,000 (Projected)

## Electronics Area

The Navy's operational effectiveness depends greatly on its ability to make optimum use of the electromagnetic spectrum ranging from the very low to the extremely high frequencies. Accordingly, most of this Area's work is directed toward extending both the knowledge and the technological applications of the electromagnetic spectrum. The effort includes investigations of electronic devices, the phenomenology and advanced instrumentation associated with radio communications, radar, and related sensors, and digital computation and information-processing. NRL also serves as the lead laboratory for the Navy's exploratory development program in electronic warfare.



## Associate Director of Research for Electronics

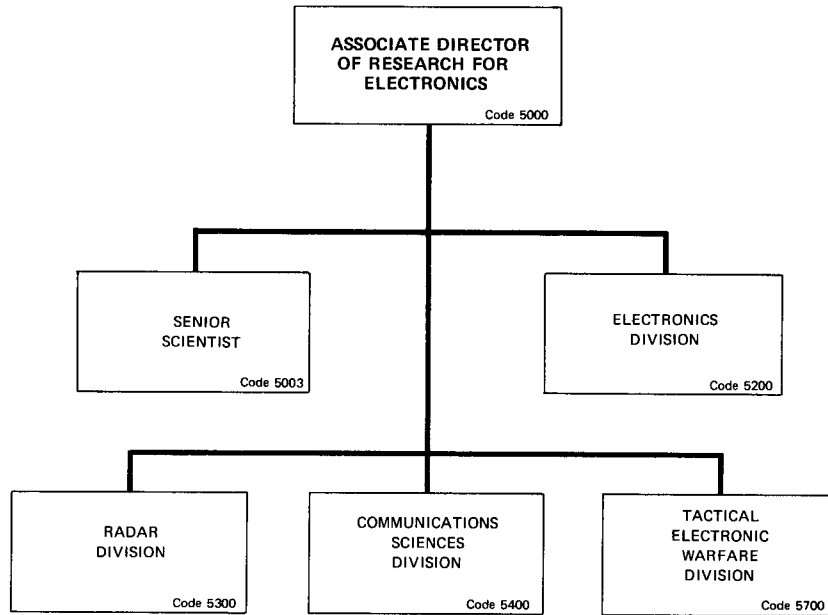


Dr. John L. Allen

Dr. Allen [REDACTED]. He graduated from Pennsylvania State University in 1958 with a B.S. degree in engineering science and from Massachusetts Institute of Technology with an M.S. in electrical engineering in 1962 and a Ph.D. in communications biophysics in 1968.

Dr. Allen joined the Research Department of NRL as the Associate Director of Research for Electronics on March 1, 1971. Prior to coming to NRL, he spent 4 years in the U.S. Air Force (1950-1954)—2 years as a student and an instructor at the Air Force Radar School and 2 years at Lincoln Laboratories, M.I.T. While attending Pennsylvania State University, he was employed as an engineer by HRB Singer, Inc. After graduating, he returned to Lincoln Laboratories as a member of the engineering staff and advanced to the position of Associate Head of the Radar Measurement Division.

Dr. Allen is a member of the Institute of Electrical and Electronic Engineers and the Tau Beta Pi Engineering Honor Society. He has served on several studies and committees for professional societies and for the Department of Defense; he is presently a member of the Defense Science Board Avionics Panel.



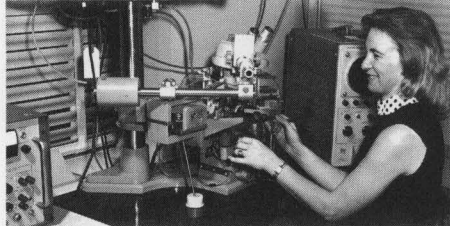
**Key Personnel**

<u>Name</u>	<u>Title</u>
Dr. J.L. Allen	Associate Director of Research for Electronics
Mr. P.L. Lester	Special Assistant
Dr. L.B. Wetzel	Senior Scientist
Mr. L.A. Gebhard	Consultant
Mr. H. Bress	Consultant
Mr. A. Brodzinsky	Superintendent, Electronics Division
Dr. M.I. Skolnik	Superintendent, Radar Division
Dr. B. Wald	Superintendent, Communications Sciences Division (Acting)
Mr. L.A. Cosby	Superintendent, Tactical Electronic Warfare Division

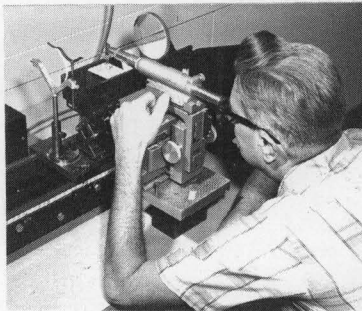


# Electronics Division

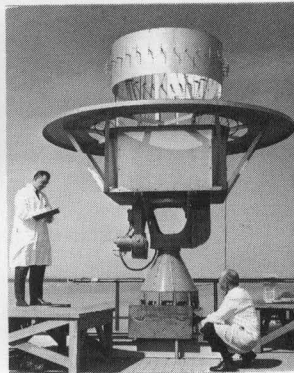
Mr. A. Brodzinsky



MICROELECTRONICS

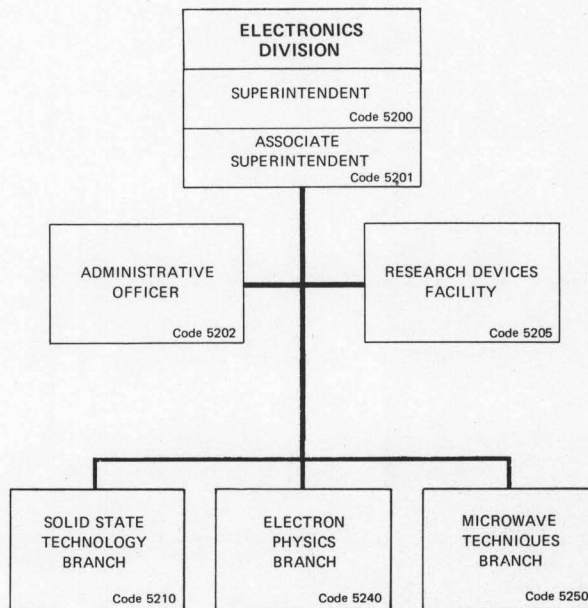


ELECTRO-OPTICAL SYSTEMS



ANTENNA RESEARCH

- SOLID STATE TECHNOLOGY
- ELECTRON PHYSICS
- MICROWAVE TECHNIQUES



## Basic Responsibilities

The Electronics Division carries out programs of basic and applied research and development in the fields of electronic properties of solid materials, microwave antennas and components, micro-electronic technology, properties of ground and sea surface radar returns, and high power microwave electron devices.

### Branches

#### Solid State Technology

Microwave device theory, fabrication,  
and reliability  
Ion implantation technology  
High and low power devices for energy  
conversion  
Functional devices (thin film, MIS, CCD)  
MIS failure physics; radiation hardening

#### Microwave Techniques

Millimeter wave device research  
Adaptive array studies  
Advanced microwave antenna research  
Microwave integrated circuits  
Microwave ferrimagnetic components  
Surface wave acoustics

#### Electron Physics

Microwave tubes  
Surface physics research  
Microwave components  
Beam semiconductor devices

### Key Personnel

<i>Name</i>	<i>Title</i>
Mr. A. Brodzinsky	Superintendent
Dr. R.W. Wright	Associate Superintendent
Mr. T.E. Hanley	Head, Research Devices Facility
Dr. J.E. Davey	Head, Solid State Technology Branch
Dr. S.T. Smith	Head, Electron Physics Branch
Dr. L.R. Whicker	Head, Microwave Techniques Branch

### Personnel Complement

On Board: 90

Total Estimated R&D Funding

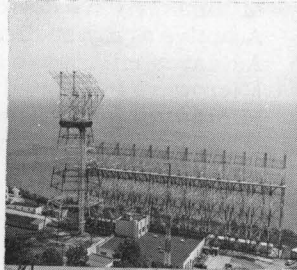
Fiscal Year 1972: \$4,100,000



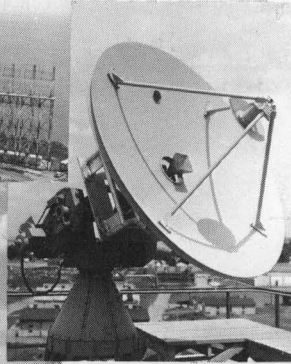
Dr. M. I. Skolnik

# Radar Division

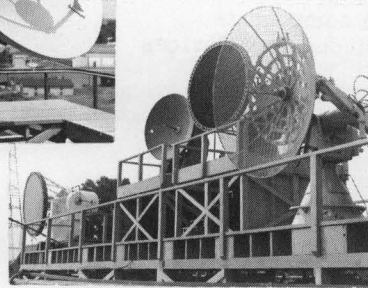
HF ADVANCED RESEARCH RADAR



MARK 50  
MONOPULSE RADAR

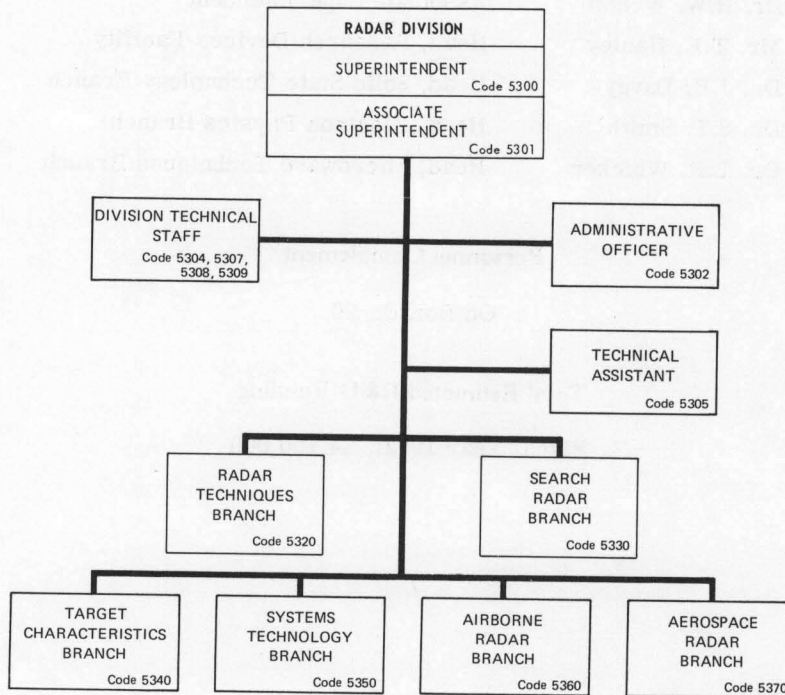


HF SURFACE WAVE ANTENNA



MULTI-BAND EXPERIMENTAL  
RADAR COMPLEX

- RADAR TECHNIQUES
- SEARCH RADAR
- TARGET CHARACTERISTICS
- SYSTEMS TECHNOLOGY
- AIRBORNE RADAR
- AEROSPACE RADAR



## Basic Responsibilities

The Radar Division conducts research on basic physical phenomena of importance to radar and related sensors, investigates new engineering techniques applicable to radar, demonstrates the feasibility of new radar concepts and systems, performs related systems analysis and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors which are applicable to enhancing the Navy's ability to fulfill its mission.

### Staff Activity

#### Division Technical Staff

Radar Analysis	Mechanical Design
Systems Research	Systems Analysis

### Branches

#### Radar Techniques

High-frequency radar  
Signal Processing

#### Search Radar

Phased array techniques  
Precision tracking radar techniques  
Radar evaluation  
Range instrumentation  
Signal processing

#### Target Characteristics

Target signature analysis  
Target radar-spectra studies  
Laser sensor systems  
ECCM

#### Aerospace Radar

Ocean surveillance  
Sea clutter  
Sea spectral analysis  
Wave tank simulations

#### Airborne Radar

Airborne radar  
Weapons analysis  
Airborne early warning radar  
Moving target indication

#### Systems Technology

Radar systems

### Key Personnel

<i>Name</i>	<i>Title</i>
Dr. M.I. Skolnik	Superintendent
Mr. J.H. Dunn	Associate Superintendent
Mr. W.N. Shaddix	Technical Assistant
Mr. F.M. Gager	Head, Radar Techniques Branch
Dr. R.J. Adams	Head, Search Radar Branch
Mr. I.D. Olin	Head, Target Characteristics Branch
Mr. R.E. Ellis	Head, Systems Technology Branch
Mr. D.L. Ringwalt	Head, Airborne Radar Branch
Mr. N.W. Guinard	Head, Aerospace Radar Branch

### Personnel Complement

On Board: 185

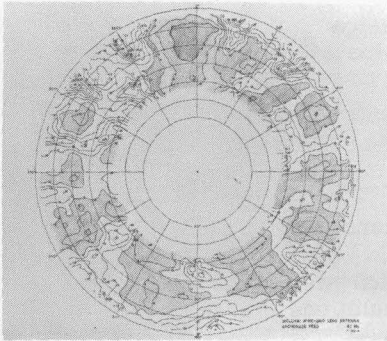
Total Estimated R&D Funding

Fiscal Year 1972: \$14,000,000



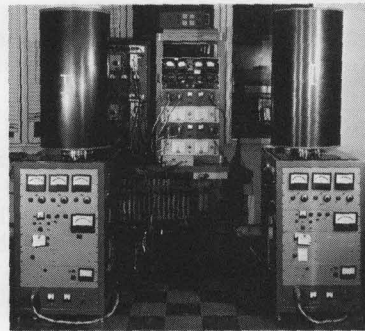
Dr. B. Wald

# Communications Sciences Division

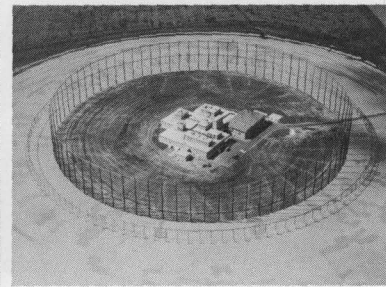


ANTENNA  
PATTERN  
MEASUREMENT

MICROWAVE SPACE  
RESEARCH FACILITY

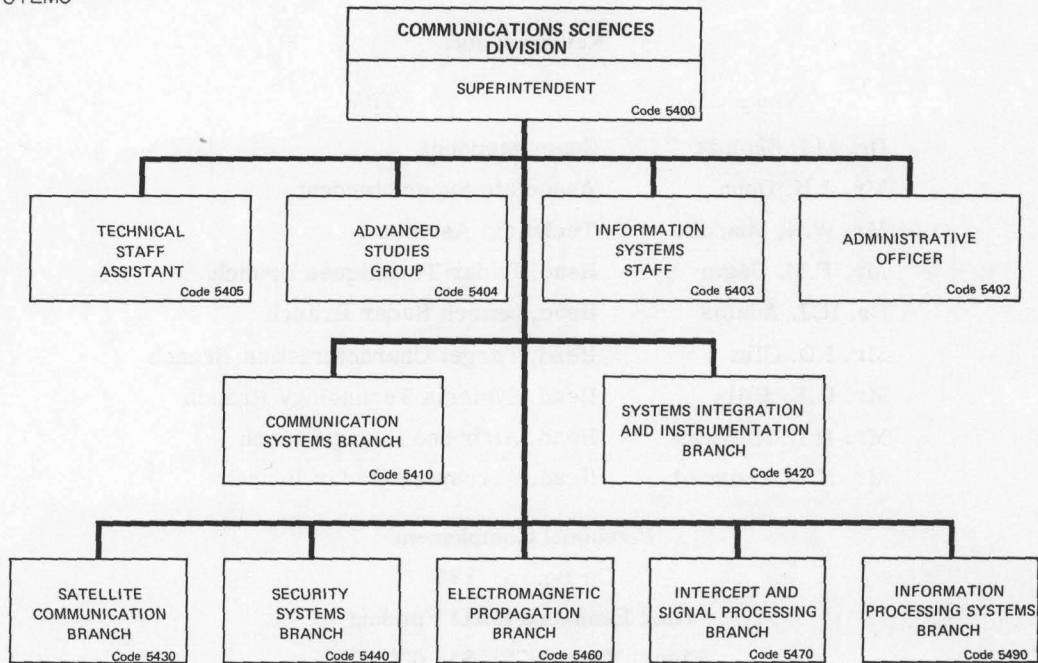


HYDROGEN MASER TIME  
STANDARDS



HF ANTENNA

- COMMUNICATION SYSTEMS
- SYSTEMS INTEGRATION AND INSTRUMENTATION
- SATELLITE COMMUNICATION
- SECURITY SYSTEMS
- ELECTROMAGNETIC PROPAGATION
- INTERCEPT AND SIGNAL PROCESSING
- INFORMATION PROCESSING SYSTEMS



## Basic Responsibilities

The Communications Sciences Division conducts research and development in the systems, sensors, techniques, instrumentation and phenomenology of radio communications in aspects of navigation and identification, and in problems of emitter intercept and signal processing. The major emphasis is placed on those new concepts and techniques which will specifically enhance the Navy's operational capabilities in these areas.

### Staff Activity

#### Information Systems Staff

Systems agriculture  
Information management  
Computer science

### Branches

#### Communication Systems

Submarine communication systems  
Crypto-logic systems  
Communication antenna studies  
Antenna circuitry  
Underwater reception

#### Systems Integration and Instrumentation

Precise frequency and time  
Centralized electronic control  
Integrated communication, navigation  
and identification systems  
Advanced monitoring and testing  
techniques

#### Intercept and Signal Processing

Radio frequency intercept  
Direction finding  
Signal processing  
Data storage  
Data processing  
Recording and display

#### Satellite Communication

Satellite communication systems  
Precision satellite communication experiments  
Modem studies

#### Electromagnetic Propagation

ELF/VLF and LF propagation studies  
Noise measurements and predictions  
Effects of propagation on navigational accuracy

#### Security Systems

Experimental systems  
Security systems  
Advanced development

#### Information Processing Systems

Signal processing element  
Towed array processor  
Emulation studies

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. B. Wald	Superintendent (Acting)
Mr. M.L. Musselman	Technical Staff Assistant
Dr. B. Wald	Head, Information Systems Staff (Acting)
Dr. W.S. Ament	Advanced Studies Group
Mr. H.D. Cabbage	Head, Communication Systems Branch
Mr. D.I. Himes	Head, Systems Integration and Instrumentation Branch
Mr. J.P. Leiphart	Head, Satellite Communication Branch
Mr. C.V. Parker	Head, Security Systems Branch
Mr. W.E. Garner	Head, Electromagnetic Propagation Branch
Mr. R.D. Misner	Head, Intercept and Signal Processing Branch
Dr. B. Wald	Head, Information Processing Systems Branch

### Personnel Complement

On Board: 190

### Total Estimated R&D Funding

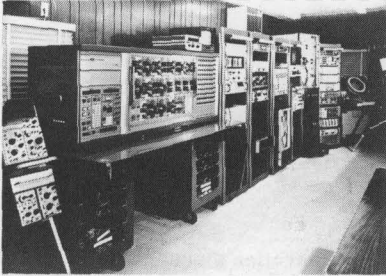
Fiscal Year 1972: \$16,600,000



# Tactical Electronic Warfare Division

Mr. L. A. Cosby

*ANALOG SIMULATION OF EW SYSTEMS*

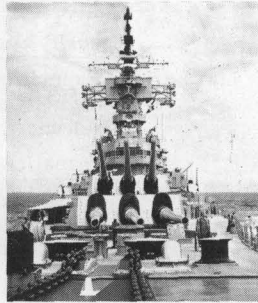
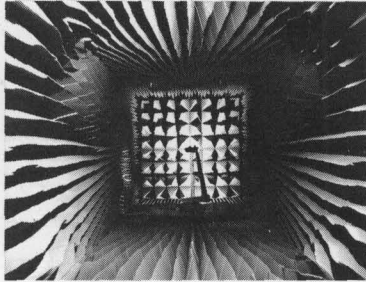


*EXPENDABLES AND OFF-BOARD EW*

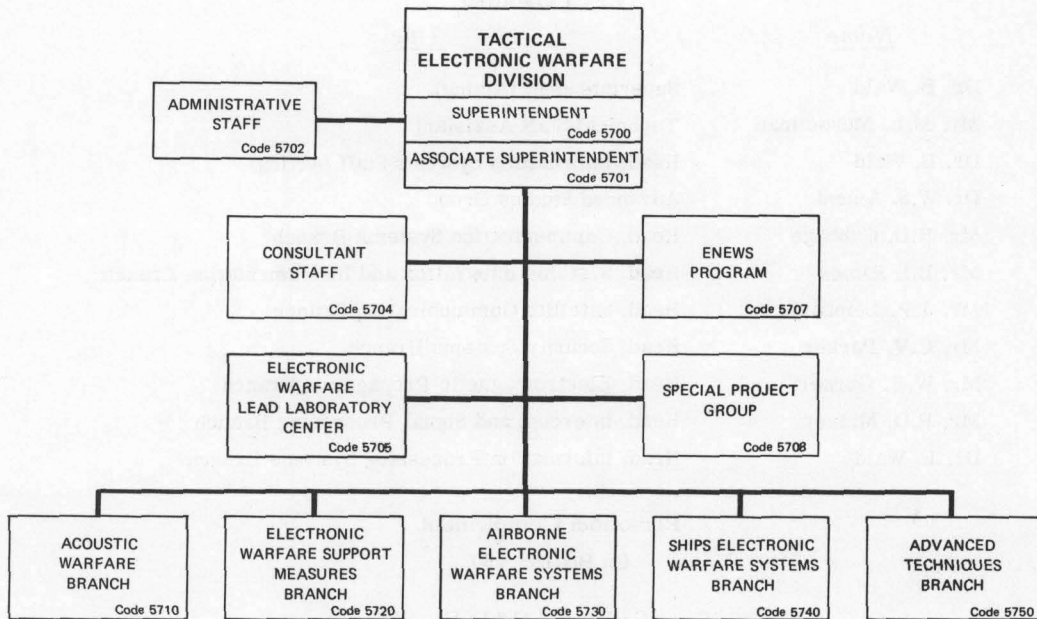


- LEAD LABORATORY CENTER
- EFFECTIVENESS OF NAVAL EW SYSTEM (ENEWS)
- SPECIAL PROJECT
- ACOUSTIC WARFARE
- ELECTRONIC WARFARE SUPPORT MEASURES
- AIRBORNE ELECTRONIC WARFARE SYSTEMS
- SHIPS ELECTRONIC WARFARE SYSTEMS
- ADVANCED TECHNIQUES

*ANECHOIC CHAMBER MEASUREMENTS*



*SHIPBOARD & AIRCRAFT EW SYSTEMS*



## Basic Responsibilities

The Tactical Electronic Warfare Division is responsible for research and development in support of the Navy's tactical electronic and certain acoustic warfare requirements and missions. These include electronic warfare support measures, electronic and acoustic countermeasures, supporting counter-countermeasures, as well as study, analyses, and simulations for the determination and improvement of the effectiveness of these systems.

### Staff Activities

#### Lead Laboratory Coordinating Staff

Navy in-house exploratory development  
Program reference center  
Advanced technical objectives working group  
Analyses and liaison

#### ENEWS

EW effectiveness

#### Special Project Group

Vulnerability analysis  
Special countermeasures

### Branches

#### Acoustic Warfare

Intelligence and analysis  
AW techniques and components research  
AW systems  
Operations research

#### Electronic Warfare Support Measures

Intercept receivers and signal processors  
Direction finding  
Systems integration  
Command and control interfaces

#### Airborne Electronic Warfare Systems

Air systems development  
Penetration aids  
Transmitters  
Expendables components

#### Advanced Techniques

Analysis and simulation  
Expendables technology  
New components  
Experimental systems

#### Ships Electronic Warfare Systems

Jamming technology  
Deception techniques  
Ships systems development  
Passive ECM

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. L.A. Cosby	Superintendent
Dr. G.P. Ohman	Associate Superintendent (Acting)
Mr. E.W. Piety	Lead Laboratory Coordinator and Head, Electronic Warfare Lead Laboratory Center (Acting)
Mr. D.F. Grady	Manager, ENEWS Program
Mr. L.A. Cosby	Program Manager, Special Project
Mr. N.J. Lesko	Deputy Program Manager, Special Project (Acting)
Mr. R.H. Mathes	Head, Acoustic Warfare Branch
Mr. M.J. Sheets	Head, Electronic Warfare Support Measures Branch
Mr. R.L. Brandenburg	Head, Airborne Electronic Warfare Systems Branch (Acting)
Mr. A.J. Jesswein	Head, Ships Electronic Warfare Systems Branch
Dr. G.P. Ohman	Head, Advanced Techniques Branch (Acting)

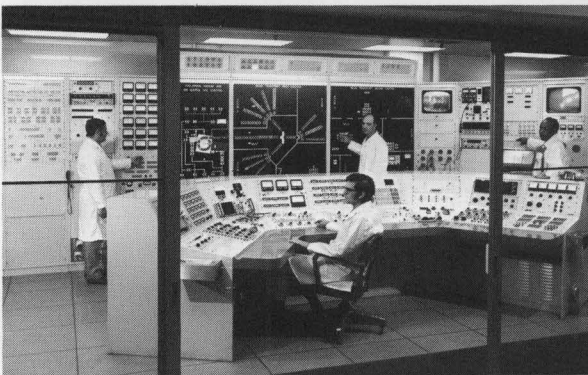
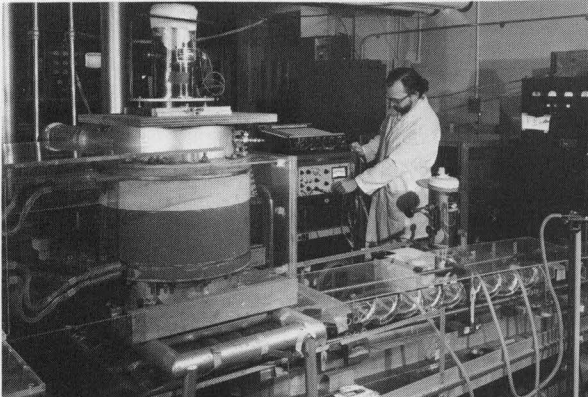
### Personnel Complement

On Board: 145

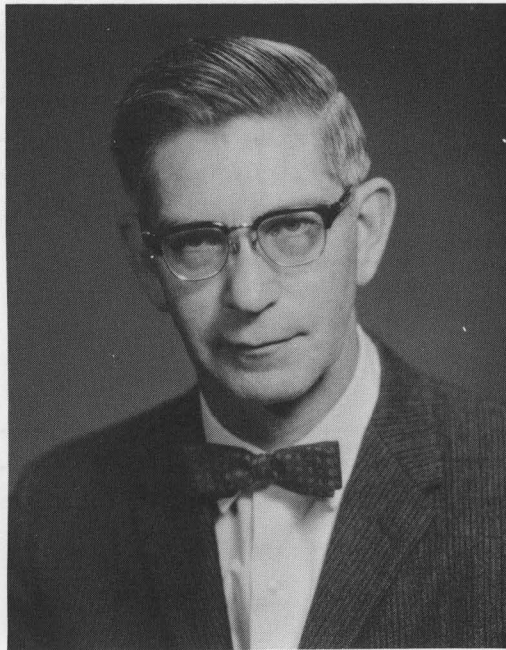
Total Estimated R&D Funding  
Fiscal Year 1973: \$10,000,000

# Materials and General Sciences Area

The Materials and General Sciences Area is an administrative grouping of chemists, metallurgists, and solid-state, optical, and nuclear scientists who (a) carry on interdisciplinary basic and applied research on the mechanical, electrical, thermal, magnetic, optical, and nuclear properties of matter, and (b) develop components, devices, and systems based on the phenomena and principles of the several disciplines involved.



## Associate Director of Research for Materials and General Sciences



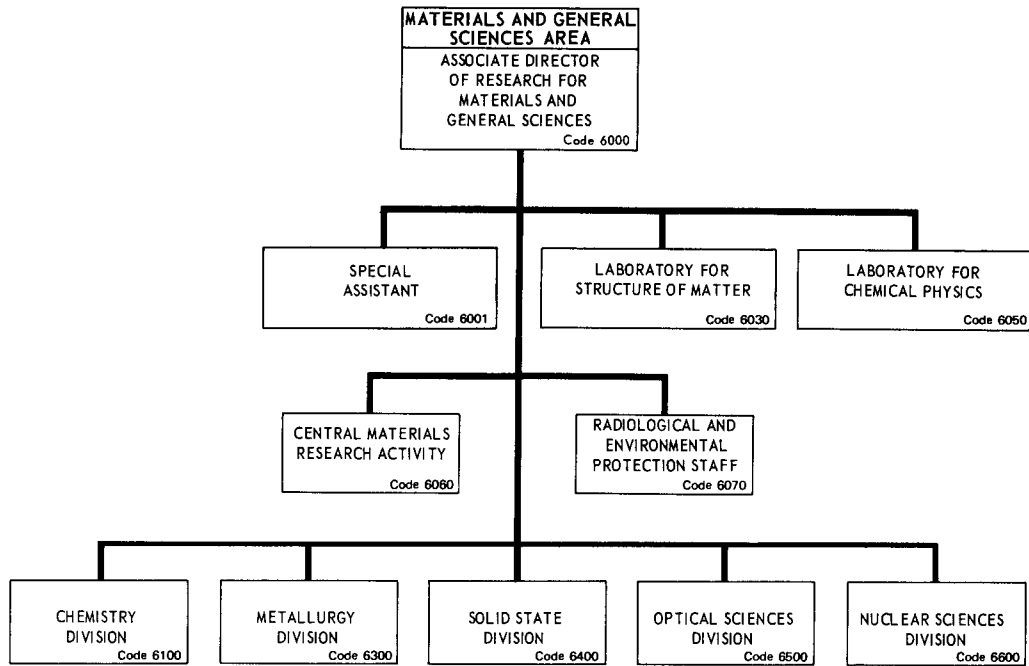
Dr. James H. Schulman

Dr. Schulman [REDACTED]. He received the degrees of B.S. (1939) and Ph.D. (1942), both in chemistry, from the Massachusetts Institute of Technology. He has held teaching positions at Suffolk University and M.I.T. and research positions at the M.I.T. Laboratory for Insulation Research and Sylvania Electric Products.

Since coming to NRL in 1946 to initiate research on luminescence in solids, he has served as Head of Branches in the Metallurgy and Solid State Divisions and as Superintendent of the Optical Physics Division. From August 1960 until December 1961, he was Deputy Scientific Director of the London Branch of the Office of Naval Research. In November 1964, Dr. Schulman was appointed to the Chair of Materials Sciences in recognition of his distinguished research accomplishments. In September 1967, he was appointed Associate Director of Research for Materials. In February 1971 the Materials Area was broadened to include the Optical Science and Nuclear Science Divisions and was renamed the Materials and General Sciences Area.

Dr. Schulman received the Applied Science Award of the NRL Branch of the Research Society of America (1957) and the Navy Superior Civilian Service Award (1965), both in recognition of his many contributions to the science of luminescent materials and phenomena, radiation-induced optical effects in solids, and the application of these effects to radiation dosimetry. He is author or co-author of over 90 papers and a book on these subjects, and he holds numerous patents.

Dr. Schulman is a Fellow of the American Physical Society, the Optical Society of America, and the American Association for the Advancement of Science, as well as an Associate Editor of two scientific journals. He has served on several panels and committees of the National Academy of Sciences and of various scientific societies.



### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.H. Schulman	Associate Director of Research for Materials and General Sciences
Dr. D.A. Patterson	Special Assistant
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter
Dr. W.A. Zisman	Chief Scientist, Laboratory for Chemical Physics
Mr. R.J. Ginther	Head, Central Materials Research Activity
Mr. L.A. Brauch	Head, Radiological and Environmental Protection Staff (Acting)
Dr. R.E. Kagarise	Superintendent, Chemistry Division
Mr. W.S. Pellini	Superintendent, Metallurgy Division
Dr. C.C. Klick	Superintendent, Solid State Division
Dr. W.R. Sooy	Superintendent, Optical Sciences Division
Dr. J. McElhinney	Superintendent, Nuclear Sciences Division

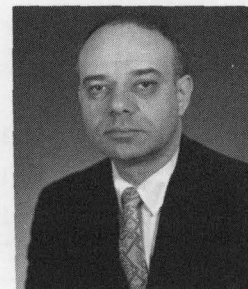
## LABORATORY FOR STRUCTURE OF MATTER

### Basic Responsibilities

The Laboratory for Structure of Matter carries out experimental and theoretical investigations of the atomic, molecular, glassy, and crystalline structures of materials. The methods of x-ray, electron, and neutron diffraction are used in a broad program of structure studies which can form the basis for understanding and interpreting the results of research investigations in a wide variety of scientific disciplines.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter



Dr. J. Karle

### Personnel Complement

On Board: 14

Total Estimated R&D Funding

Fiscal Year 1972: \$650,000

## LABORATORY FOR CHEMICAL PHYSICS

### Basic Responsibilities

The Laboratory for Chemical Physics carries out an interdisciplinary program of fundamental and applied research with especial emphasis on phenomena occurring at phase boundaries, i.e., the interfaces between solids and solids, solids and liquids, solids and gases, liquids and liquids, and liquids and gases. Currently, attention is being given to adhesion and adhesion promoters, wetting and spreading of liquids on solids including liquid metals and ceramics, surface electric properties of metals and plastics, interfacial phenomena in composite materials, the quantitative relation of dry film lubricants to shear strength and its pressure coefficient, the ability of insoluble monolayers to dampen capillary waves on liquids, the relation of interfacial properties to various aspects of blood clotting and bioadhesion.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. W.A. Zisman	Chief Scientist, Laboratory for Chemical Physics



Dr. W. A. Zisman

### Personnel Complement

On Board: 9

Total Estimated R&D Funding

Fiscal Year 1972: \$300,000

## CENTRAL MATERIALS RESEARCH ACTIVITY

### Basic Responsibilities

The responsibilities of the Central Materials Research Activity are twofold: (1) to perform basic and applied research in the preparation and characterization of materials, and (2) to provide consultation or assistance for all laboratory research personnel in the above matters. Special research areas investigated by the staff include glasses, luminescent materials, and single-crystal high-purity and rare earth materials. The primary means involved in characterization are wet chemical analysis, x-ray fluorescent and electron beam microprobe analysis, emission and solid state spark source spectrometry, electron microscopy, and x-ray diffraction techniques.

### Key Personnel

<i>Name</i>	<i>Title</i>
Mr. R.J. Ginther	Head, Central Materials Research Activity
Mr. D.I. Walter	Head, Analytical Chemistry Branch
Mr. R.J. Ginther	Head, Structure and Composition Branch



Mr. R. J. Ginther

### Personnel Complement

On Board: 26

### Total Estimated R&D Funding

Fiscal Year 1972: \$650,000

# RADIOLOGICAL AND ENVIRONMENTAL PROTECTION STAFF

## Basic Responsibilities

The Radiological & Environmental Protection Staff is assigned the responsibility for radiological safety and the overall minimization of pollution from all sources at NRL and its field stations. The NRL radiological protection program has three primary purposes: (1) to assure that all operations using ionizing radiation are safe and in compliance with Federal Regulations; (2) to provide employees with instruments, instructions, and assistance to assure radiological safety in the performance of their duties; and (3) to conduct research in radiation dosimetry, instrumentation, and methodology. The environmental control responsibilities are to: (1) review programs to identify sources of pollution at NRL; (2) recommend preventative or corrective measures necessary to reduce or eliminate pollution; and (3) conduct research in the field.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. L.A. Brauch	Head, Radiological & Environmental Protection Staff (Acting)
Mr. T.L. Johnson	Head, Research Section
Mr. R.B. Luersen	Head, Accelerators & Analysis Section
Mr. J.N. Stone	Head, Operations Section
Mr. V.R. Piatt	Head, Environmental Control Section



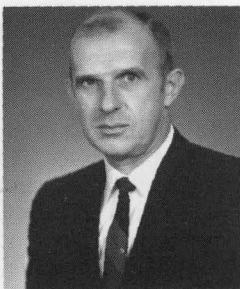
Mr. L. A. Brauch

## Personnel Complement

On Board: 21

## Total Estimated R&D Funding

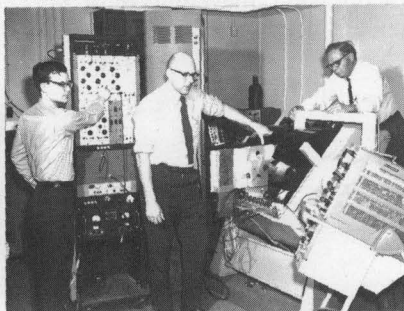
Fiscal Year 1972: \$418,000



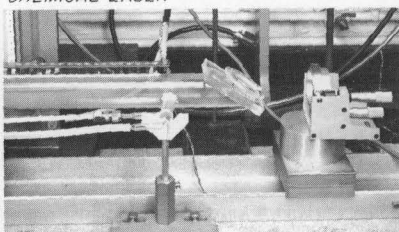
# Chemistry Division

Dr. R. E. Kagarise

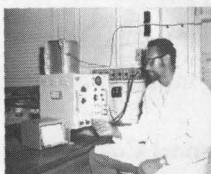
PULSED-NMR APPARATUS



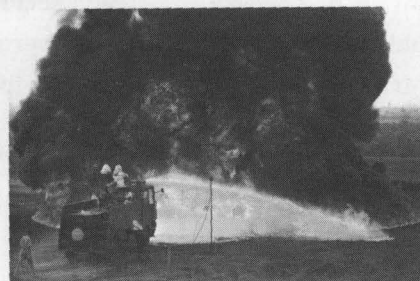
CHEMICAL LASER



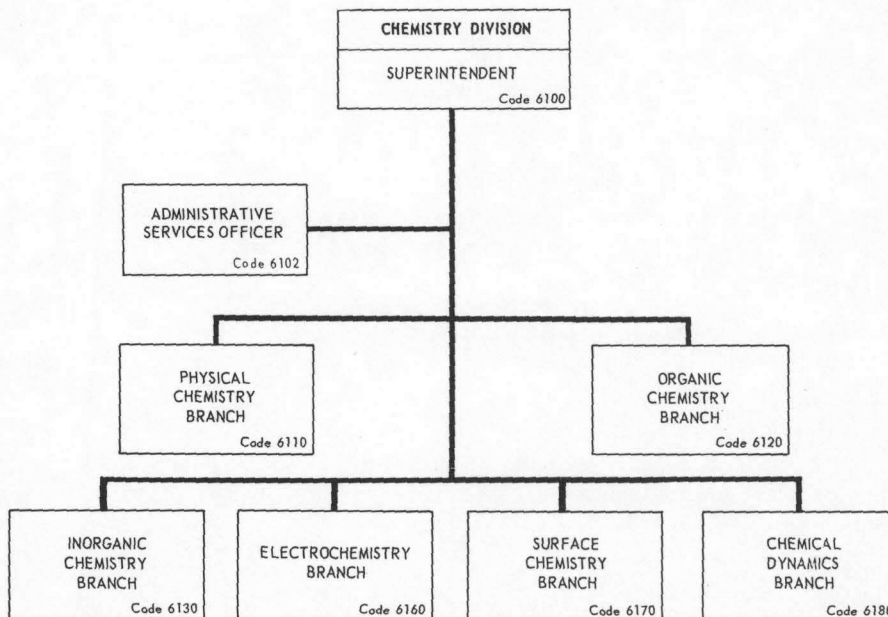
- PHYSICAL CHEMISTRY
- ORGANIC CHEMISTRY
- INORGANIC CHEMISTRY
- ELECTROCHEMISTRY
- SURFACE CHEMISTRY
- CHEMICAL DYNAMICS



TOTAL HYDROCARBON ANALYZER



AQUEOUS FILM-FORMING FOAM



## Basic Responsibilities

The Chemistry Division conducts a diversified program of basic and applied research and development in physical, organic, inorganic, and analytical chemistry. Specialized programs within these fields include fuels, lubricants, surface chemistry, fire suppression, protective coatings, polymers, electrochemistry, molecular structure, chemical lasers, submarine atmosphere purification, and BW/CW personnel protection. Consultative services form an important element in the division effort.

### Branches

#### Physical Chemistry

Infrared and ultraviolet spectroscopy  
Analytical mass spectrometry  
Nuclear magnetic resonance spectroscopy  
Chemical lasers  
Thermal and oxidative degradation

#### Organic Chemistry

Synthesis and properties of polymers  
Functional organic coatings  
Properties of resins under high compressive loads

#### Inorganic Chemistry

Submarine air purification  
Ceramic materials  
Synthesis of novel inorganic fluids  
Corrosion prevention

#### Electrochemistry

Fuel cells  
Fundamental electrode reactions  
Electrochemical power sources

#### Surface Chemistry

Lubricants  
Surface properties of fibers  
Drag reduction  
Adsorbents  
Surface and solid kinetics

#### Chemical Dynamics

Organic contaminants in submarine atmosphere  
Distillate fuels research  
Autoxidation and combustion dynamic  
Fire suppression  
CW/BW ship defense

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. R.E. Kagarise	Superintendent
Dr. L.B. Lockhart, Jr.	Head, Physical Chemistry Branch
Dr. R.E. Kagarise	Head, Organic Chemistry Branch (Acting)
Dr. W.D. Fox	Head, Inorganic Chemistry Branch
Mr. S. Schuldiner	Head, Electrochemistry Branch
Dr. N.L. Jarvis	Head, Surface Chemistry Branch
Dr. H.W. Carhart	Head, Chemical Dynamics Branch

### Personnel Complement

On Board: 117

Total Estimated R&D Funding

Fiscal Year 1972: \$5,500,000

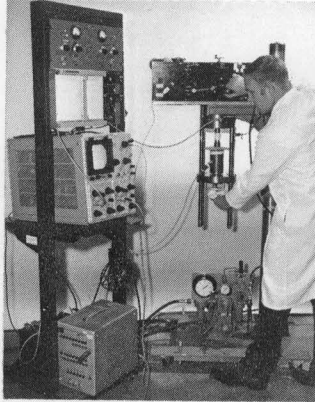


# Metallurgy Division

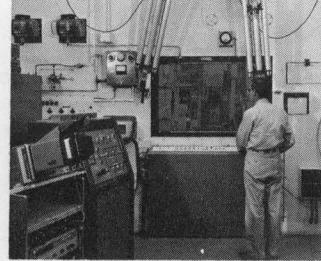
Mr. W. S. Pellini

- PHYSICAL METALLURGY
- METAL PHYSICS
- TRANSFORMATIONS AND KINETICS
- STRENGTH OF METALS
- REACTOR MATERIALS

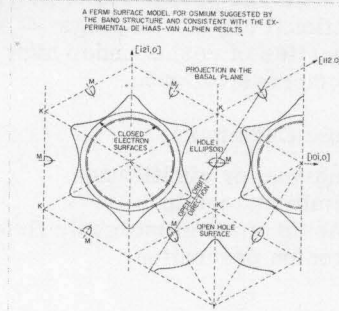
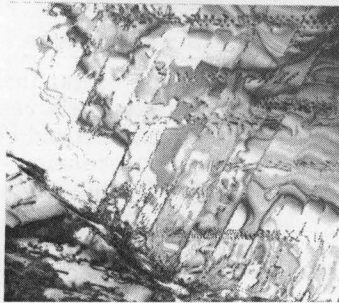
FRACTURE MECHANICS



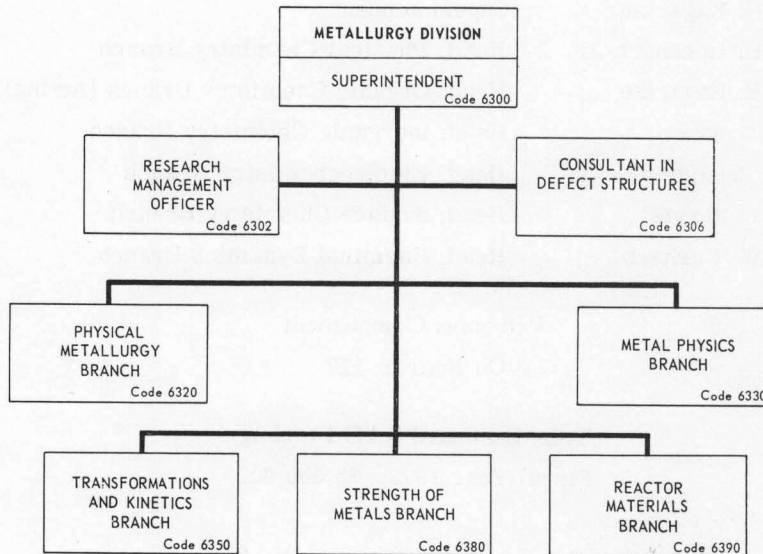
REMOTE HANDLING ROOM



COPLANAR SLIP:  
S.C.C. IN Ti ALLOYS



FERMI SURFACE MODEL FOR OSMIUM



## Basic Responsibilities

The Metallurgy Division is concerned with basic and applied research in physical, mechanical, chemical, and structural aspects of metals. Metal physics activities center in the investigation of electronic transport properties in terms of quantum-mechanical principles. The mechanical studies are largely related to the attainment of quantitative analytical capabilities in the definition of plastic flow and fracture properties. The chemical interests involve electrochemical aspects of various forms of catastrophic corrosion, particularly the complex phenomenon of stress corrosion cracking. The metal structure studies cover a broad range of topics including strengthening mechanisms, role of defect structures, microscale separation events in fracture, transformation processes, and mechanisms of environmental effects. This broad range of activity evolves from a balance staff which includes materials scientists, physical metallurgists, physicists, chemists, and mechanical engineers. Important consultative services on subjects ranging from concept formulation to system development are provided to the Navy and other DOD activities.

### Branches

#### Physical Metallurgy

Micromechanical metallurgy  
Corrosion science related to advanced alloys  
Marine corrosion and cathodic protection

#### Metal Physics

Fermi surface studies of pure metals and alloys  
Electronic, magnetic, and optical properties of metallic materials  
Charged particle irradiation effects  
Electronic, thermal and optical properties of liquid metals  
Response of metallic systems to high rates of energy deposition

#### Transformations and Kinetics

Phase transformations, solidification, metallic crystal growth  
Thermodynamics of lattice defects, crystal plasticity  
Applications of holography to metallurgical studies  
Preparation and processing of electronically active alloys

#### Strength of Metals

Characterization criteria  
Fracture-safe design parameters  
Role of processing for high strength metals  
Macroscale and microscale aspects of metal separation processes

#### Reactor Materials

Environmental factors in neutron irradiation  
Basic mechanisms of radiation damage  
Spectral analyses and dosimetry  
Characterization criteria for mechanical damage

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. W.S. Pellini	Superintendent
Dr. M.R. Achter	Consultant
Mr. W.S. Pellini	Head, Physical Metallurgy Branch (Acting)
Dr. A.I. Schindler	Head, Metal Physics Branch
Dr. M.E. Glicksman	Head, Transformations and Kinetics Branch
Mr. R.J. Goode	Head, Strength of Metals Branch
Mr. L.E. Steele	Head, Reactor Materials Branch

### Personnel Complement

On Board: 94

Total Estimated R&D Funding

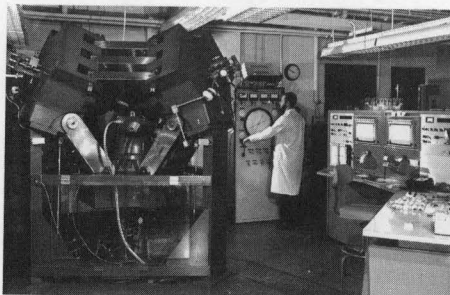
Fiscal Year 1972: \$4,300,000



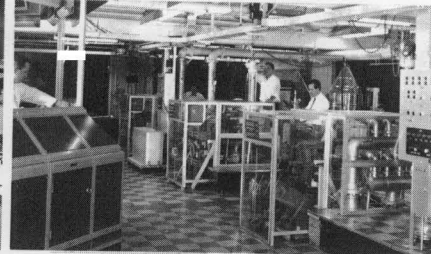
Dr. C. C. Klick

# Solid State Division

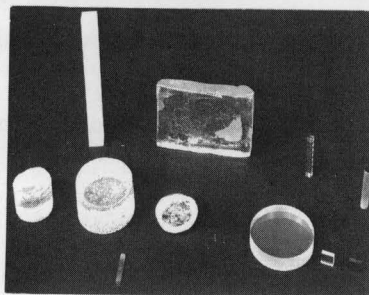
TETRAHEDRAL  
PRESS AND  
X-RAY EQUIPMENT



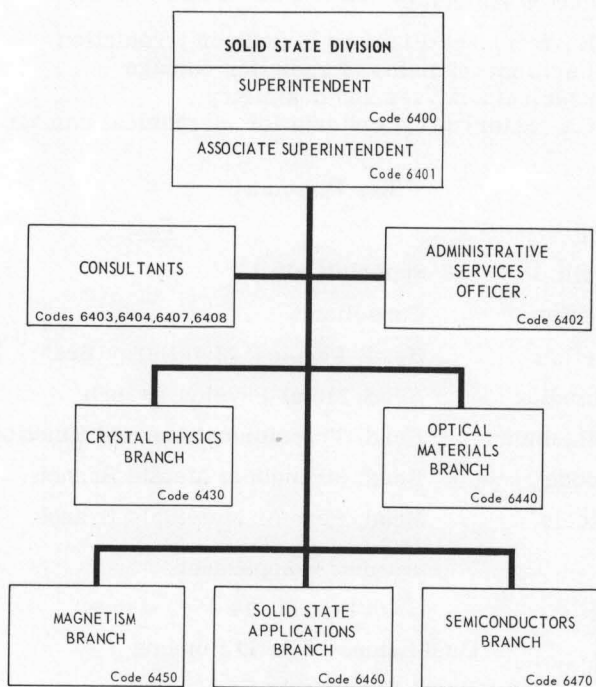
HIGH MAGNETIC FIELD FACILITY



LUMINESCENT  
PROPERTIES  
OF GLASS



- CRYSTAL PHYSICS
- OPTICAL MATERIALS
- MAGNETISM
- SOLID STATE APPLICATIONS
- SEMICONDUCTORS



## Basic Responsibilities

The Solid State Division is concerned with basic and applied research in the physics of materials, principally solids, and with the interaction of matter with radiation. Its purposes are to increase understanding of the physical principles involved, to pursue applications related to military and industrial problems, and to serve as a corps of experts in solids for the Laboratory specifically and the Navy generally. The research work of the Division is fairly comprehensive in magnetism, semiconductors, and alkali halides. Important work is also carried on in surface physics, structure, and optical properties of glass, properties of metals at low temperatures and high magnetic fields, the effects of high pressures on solids, and radiation damage. Applications in solid state dosimeters, superconducting electronics, information storage systems, and infrared detectors are being pursued actively.

### Branches

#### Crystal Physics

High-pressure effects  
Superconducting materials  
Superconducting electronics

#### Optical Materials

Electronic properties of nonmetal crystals  
and glasses  
Radiation induced defects, color centers  
Lattice dynamics

#### Magnetism

Electronic and nuclear paramagnetism  
Spin-ordered magnetic phenomena  
Rare earth magnetic materials

#### Solid State Applications

Environmental effects on semiconductor and  
dielectric materials and devices  
Applications of magnetic materials  
Semiconductor applications  
IR light sources such as semiconductor lasers

#### Semiconductors

Electronic energy levels and band structure  
Physical properties of semiconductors  
Infrared magneto optics  
Infrared detector physics  
Raman spectroscopy

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. C.C. Klick	Superintendent
Mr. J.R. Clement	Associate Superintendent (Acting)
Dr. P.L. Smith	Consultant
Mr. J.R. Clement	Consultant
Dr. H.B. Rosenstock	Consultant
Dr. M. Hass	Consultant
Dr. R.A. Hein	Head, Crystal Physics Branch
Dr. M.N. Kabler	Head, Optical Materials Branch
Dr. G.T. Rado	Head, Magnetism Branch
Dr. D.L. Mitchell	Head, Solid State Applications Branch
Dr. S. Teitler	Head, Semiconductors Branch

### Personnel Complement

On Board: 97

### Total Estimated R&D Funding

Fiscal Year 1972: \$4,000,000

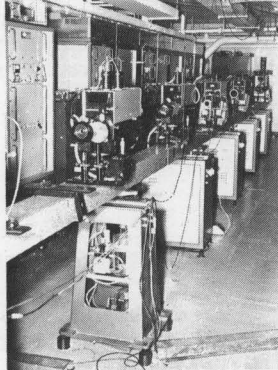


Dr. W. R. Sooy

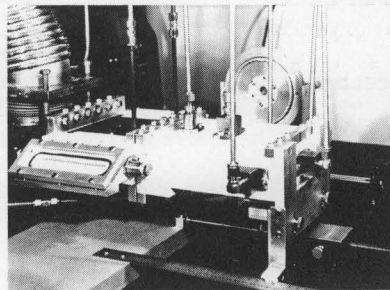
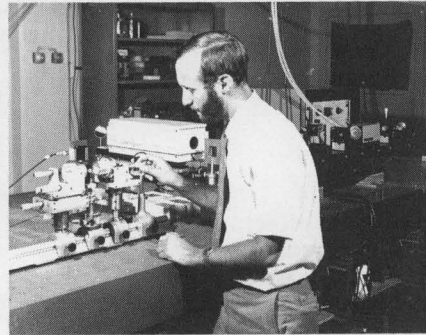
# Optical Sciences Division

- OPTICAL PHYSICS
- INTERACTION PHYSICS
- APPLIED OPTICS
- LASER PHYSICS
- OPTICAL WARFARE
- OPTICAL ENGINEERING

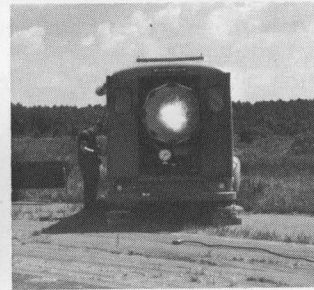
GLASS LASER



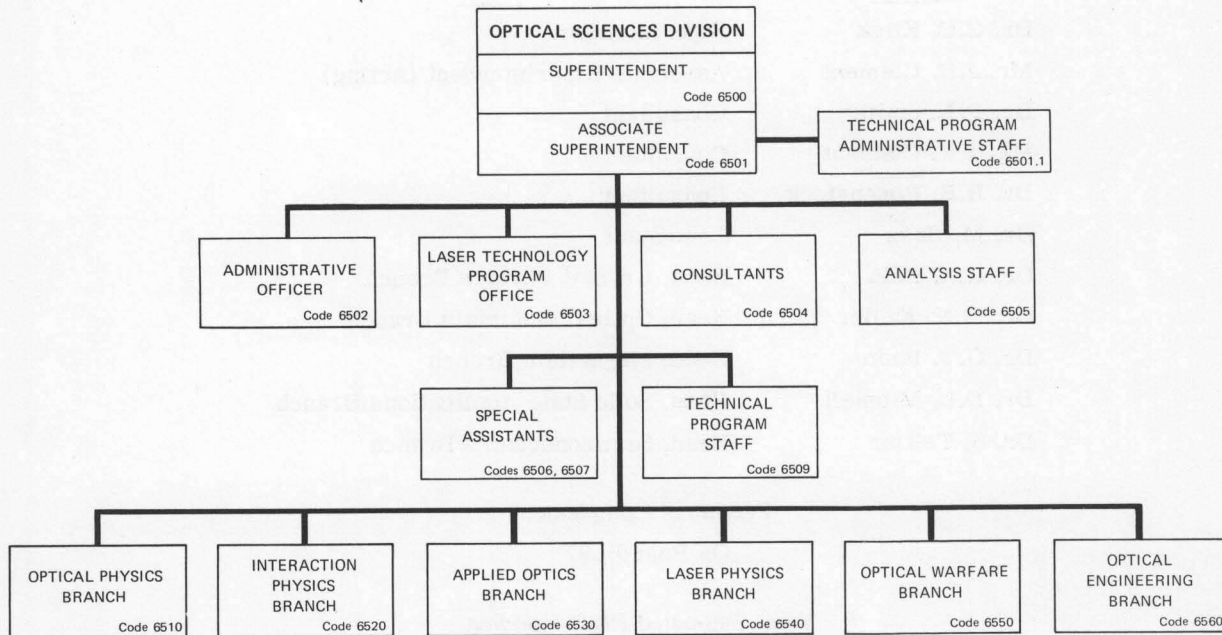
OPTICAL PARAMETRIC OSCILLATOR



DF-CO<sub>2</sub> TRANSFER LASER



LINEAR PROPAGATION EXPERIMENTS



## Basic Responsibilities

The Optical Sciences Division carries out a variety of research, development, and application-oriented activities in the generation, propagation, detection, and use of radiation in the wavelength region between near ultraviolet and far infrared. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis and prototype system development and exploitation of research and development for the solution of optically related military problems. In addition to its internal program activities, the Division serves the Laboratory specifically and the Navy generally as a consulting body of experts in optical sciences and focuses some of this effort through the Laser Technology Program Office. The work in the Division includes studies in quantum optics, laser physics, laser-matter interactions, infrared physics, atmospheric propagation, optical technology, holography, optical warfare, optical radar, and optical systems. A variety of field measurement programs on optical problems of specific interest are also conducted.

## Staff Activities

### Laser Technology Program Office

Laser program assessment and advisory support

### Analysis Staff

Systems analysis  
Operations analysis  
Special studies  
Consultative service

## Branches

### Optical Physics

Nonlinear optical phenomena  
Optical parametric oscillators  
Optical up-conversion  
Picosecond light pulses  
Light scattering in solids  
Nonlinear effects in materials  
Optical waveguides  
Liquid crystals

### Interaction Physics

Laser controlled fusion  
Laser x-ray generation  
X-ray lasers  
Laser-matter interactions

### Optical Warfare

Optical and IR countermeasures  
Optical intelligence  
Optical and electro-optical techniques  
Optical radar

### Optical Engineering

Laser system engineering  
High energy mirror technology  
Electro-optic applications  
Modulation/demodulation  
Optical instrumentation  
Interferometry  
Systems operation

### Laser Physics

Molecular laser physics  
Chemical laser physics  
High power solid state lasers  
Plasma light source development

### Applied Optics

Optical information processing  
Optical characteristics of military targets  
Atmospheric optics  
Optical technology

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. W.R. Sooy	Superintendent
Dr. L. F. Drummeter, Jr.	Associate Superintendent
Dr. W.R. Sooy	Head, Laser Technology Program Office
Dr. J. M. MacCallum, Jr.	Deputy Head, Laser Technology Program Office
Dr. H.W. Gandy	Special Assistant
Dr. H. Shenker	Special Assistant
Dr. J.L. Walsh	Head, Analysis Staff
Dr. R.A. Patten	Technical Program Manager
Dr. L.F. Drummeter, Jr.	Head, Optical Physics Branch (Acting)
Dr. R.A. Andrews	Head, Interaction Physics Branch (Acting)
Dr. P. Livingston	Head, Applied Optics Branch (Acting)
Dr. R. Airey	Head, Laser Physics Branch (Acting)
Mr. J.R. Anderson	Head, Optical Warfare Branch
Mr. D.J. McLaughlin	Head, Optical Engineering Branch (Acting)

## Personnel Complement

On Board: 114

## Total Estimated R&D Funding

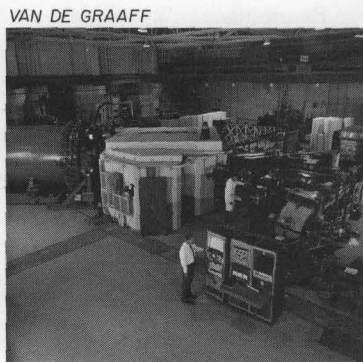
Fiscal Year 1972: \$9,000,000



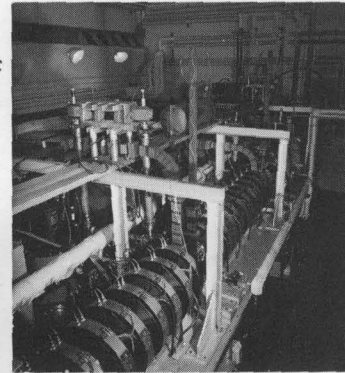
Dr. J. McElhinney

# Nuclear Sciences Division

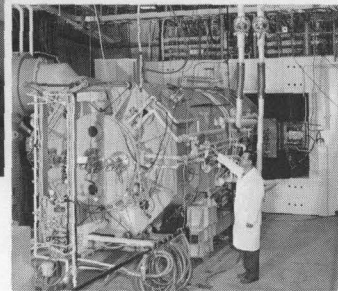
- CYCLOTRON
- LINAC
- THEORY
- VAN DE GRAAFF
- X-RAY OPTICS



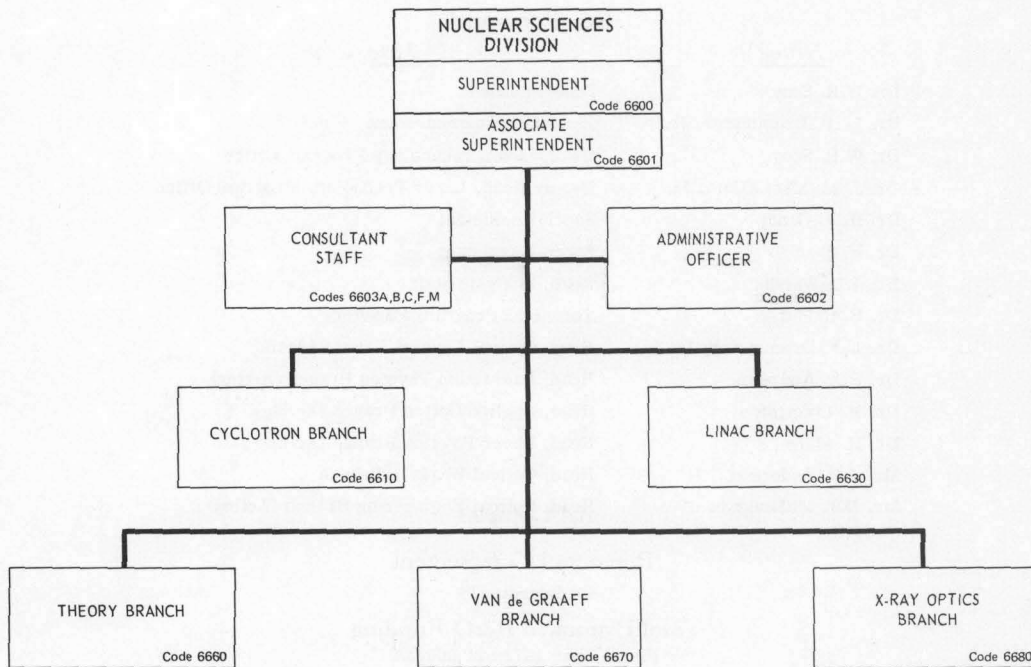
VAN DE GRAAFF



LINAC



CYCLOTRON



## Basic Responsibilities

The Nuclear Sciences Division is engaged in a broad program of basic and applied research in nuclear physics and related areas. Included are theoretical and experimental programs in properties of nuclei, nuclear forces, nuclear reactions, shielding studies, x-ray and electron optics, materials analysis, transient radiation effects on electronics, measurements of pulsed x-rays and neutrons, and nuclear-weapon-related research. The Division operates a 75-MeV sector focussing cyclotron, 60-MeV Linac, 5-MeV Van de Graaff, and other particle accelerators and radiation sources.

### Branches

#### Cyclotron

Charged particle nuclear reactions  
Nuclear structure  
Charged particle scattering  
Neutron beams  
Radioactivation analysis  
Ion-induced x-rays  
Production of radioactive sources  
Radiation damage

#### Theory

Nuclear reactions  
Nuclear structure  
Nucleon-nucleon interactions  
Coherent bremsstrahlung  
Electron scattering by nuclei  
Fundamental quantum-mechanical scattering theory  
High-intensity laser beam propagation  
Deposition of energy by charged particles

#### Linac

Electron scattering  
Nuclear excitation

#### Linac (continued)

Neutron capture reactions  
Transient radiation effects on electronics  
Radioactivation analysis  
Service irradiations  
Measurement of neutrons from pulsed sources

#### Van de Graaff

Materials analysis by means of charged particle beams  
Implantation of ions into solids  
Radiation effects caused by high energy charged particle beams  
Crystal studies by means of particle channeling techniques  
Ion-induced x-rays

#### X-Ray Optics

X-ray spectral measurements  
X-ray fluorescence analysis  
Electron probe micro-analysis  
X-ray production by charged particles  
X-ray shielding

<u>Name</u>	Key Personnel	<u>Title</u>
Dr. J. McElhinney	Superintendent	
Dr. E.A. Wolicki	Consultant and Associate Superintendent (Acting)	
Mr. F.H. Attix	Consultant	
Dr. J.W. Butler	Consultant	
Mr. D.C. Cook	Consultant	
Dr. B.J. Faraday	Consultant	
Dr. K.W. Marlow	Consultant	
Dr. R.O. Bondelid	Head, Cyclotron Branch	
Dr. T.F. Godlove	Head, Linac Branch	
Dr. A.W. Saénz	Head, Theory Branch	
Dr. K.L. Dunning	Head, Van de Graaff Branch	
Mr. L.S. Birks	Head, X-Ray Optics Branch	

#### Personnel Complement

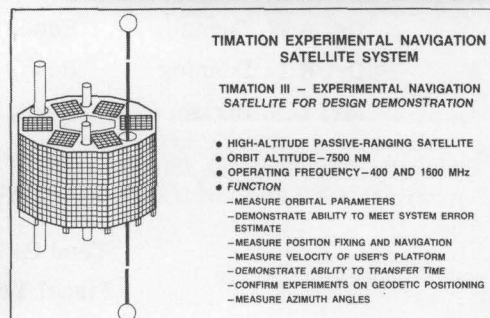
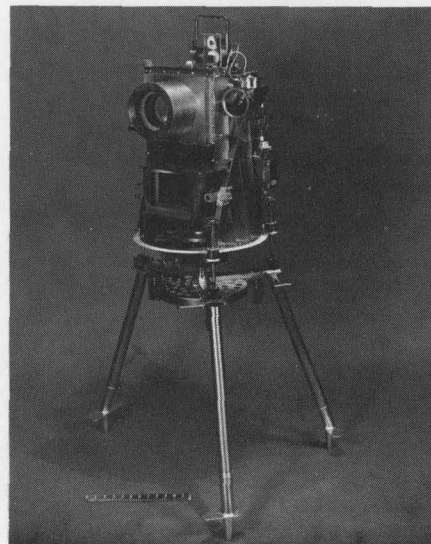
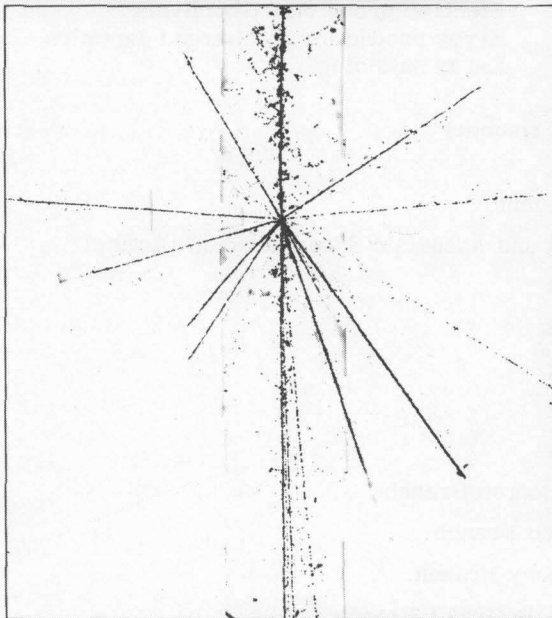
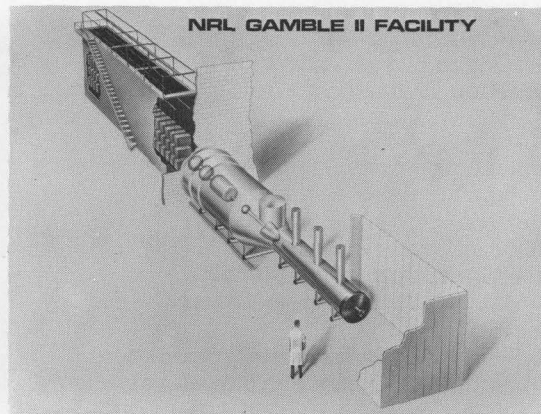
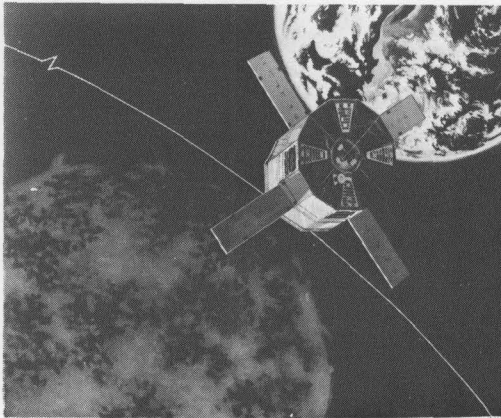
On Board: 100

Total Estimated R&D Funding

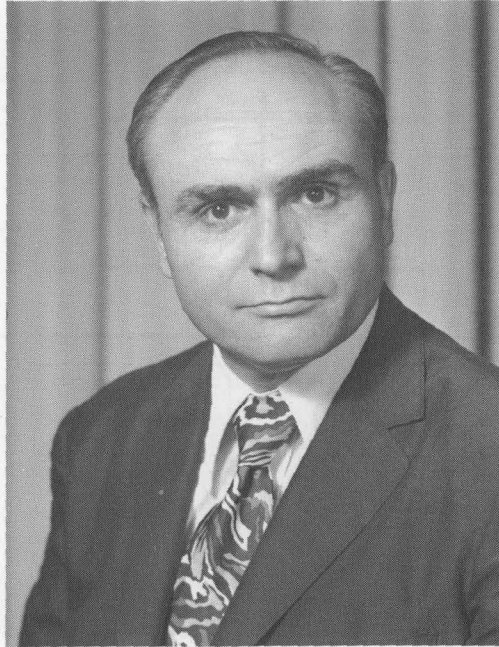
Fiscal Year 1972: \$3,900,000

# Space Science and Technology Area

The Naval Research Laboratory conducts basic and applied research in upper air physics, astronomy, and astrophysics to improve naval capabilities in communications, navigation, detection, surveillance, and other fields; the investigations are made by means of several radio telescopes and a wide variety of space probes. Both experimental and theoretical techniques are used to conduct plasma research, to understand more fully natural and man-made plasma phenomena, and to develop controlled thermonuclear power sources. The area is involved also in the study and application of advanced mathematical techniques and in the many approaches afforded by the computer sciences.



## Associate Director for Space Science and Technology



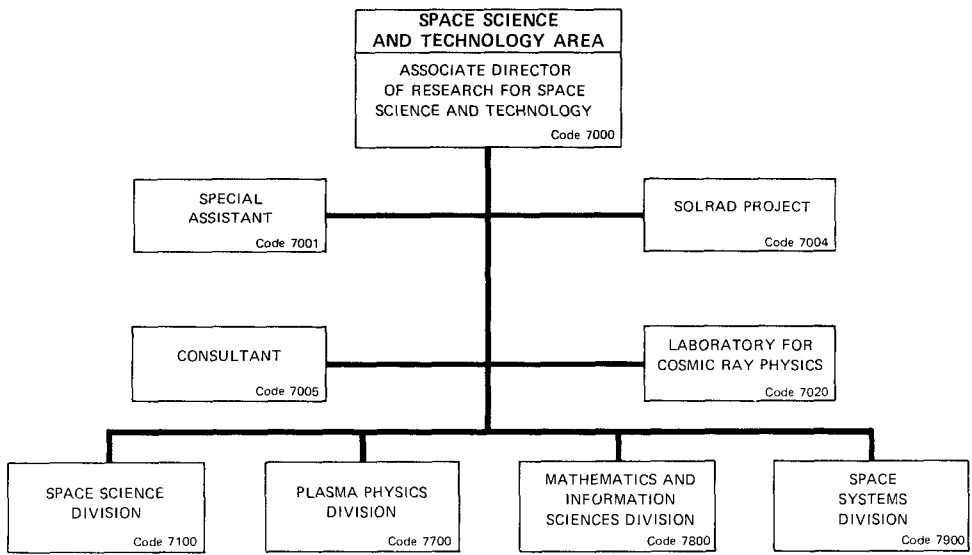
Dr. Herbert Rabin

Dr. Rabin [REDACTED]. He received a B.S. degree in physics from the University of Wisconsin in 1950, an M.S. degree in physics from the University of Illinois in 1951, and a Ph.D. degree in physics from the University of Maryland in 1959.

He has been employed at the Naval Research Laboratory since 1952, working in the fields of high-energy gamma ray and electron facilities, radiation dosimetry, solid state studies of lattice defects, and nonlinear optics and laser physics. In these research areas Dr. Rabin has authored or coauthored well over a hundred papers and conference presentations. In addition, Dr. Rabin holds five patents.

Prior to his present appointment Dr. Rabin held several supervisory positions at NRL, the most recent being Head, Quantum Optics Branch, Optical Sciences Division. He has taught courses in the Physics Department at George Washington University; he was a visiting scientist at the Technische Hochschule in Stuttgart, Germany; and he was a consultant to the school of Engineering of the University of Sao Paulo, Sao Carlos, Brazil, under sponsorship of the Pan American Union.

Dr. Rabin is a Fellow of the American Physical Society and holds membership in the Optical Society of America, the Philosophical Society of Washington, the American Association for the Advancement of Science, the American Institute of Aeronautics and Astronautics, and several honorary societies. He is also a corresponding member of the Brazilian Academy of Sciences. Dr. Rabin received the Navy Meritorious Civilian Service Award in 1969 and the E.O. Hulburt Annual Science Award for 1970.



**Key Personnel**

<u>Name</u>	<u>Title</u>
Dr. H. Rabin	Associate Director of Research for Space Science and Technology
Mr. J.M. Shaw, Jr.	Special Assistant
Mr. E.W. Peterkin	Technical Project Manager
Dr. J.W. Schwartz	Consultant
Dr. M.M. Shapiro	Head, Laboratory for Cosmic Ray Physics
Dr. H. Friedman	Superintendent, Space Science Division
Dr. R.A. Shanny	Superintendent, Plasma Physics Division
Dr. P.B. Richards	Superintendent, Mathematics & Information Sciences Division
Mr. H.O. Lorenzen	Superintendent, Space Systems Division

## LABORATORY FOR COSMIC RAY PHYSICS

### Basic Responsibilities

The Laboratory for Cosmic Ray Physics conducts a program of fundamental investigations of cosmic radiation – its composition and spectra, its origin, its “age,” its propagation through space, its interactions with particles and fields in the regions of space that it traverses, and its role in various astrophysical phenomena including those of gamma ray astronomy. The program is framed so as to be broadly responsive to the anticipated technical requirements of the Navy and the general research and development program of the Department of Defense.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. M.M. Shapiro	Chief Scientist, Laboratory for Cosmic Ray Physics
Mr. N. Seeman	Head, Gamma Rays
Dr. R. Silberberg	Senior Scientist
Mr. F.W. O'Dell	Senior Scientist



Dr. M. M. Shapiro

### Personnel Complement

On Board: 20

Total Estimated R&D Funding

Fiscal Year 1972: \$820,000

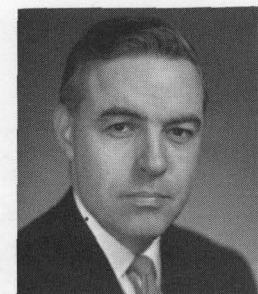
## SOLRAD PROJECT

### Basic Responsibilities

The SOLRAD Project was established to support NAVAIR exploratory development tasks in solar x-ray monitoring, and specifically to (1) develop, construct, test, evaluate, and provide launch support of SOLRAD satellites, (2) track, command, and acquire satellite telemetry, and (3) reduce, analyze, and transmit solar emission data for scientific and application purposes.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. E.W. Peterkin	Technical Project Manager
Mr. R.W. Kreplin	Scientific Program Manager
Mr. C.H. Chrisman	Assistant Manager for Data Processing
Mr. P.W. Wilhelm	Assistant Manager for Space Craft
Mr. G.E. Leavitt	Technical Assistant for Experiments Electronics

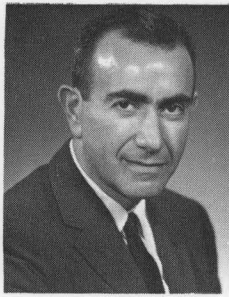


Mr. E. W. Peterkin

Manpower Support: 40 man-years

Total Estimated R&D Funding

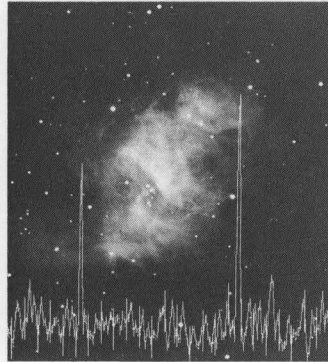
Fiscal Year 1972: \$2,500,000



# Space Science Division

Dr. H. Friedman

UPPER AIR PHYSICS  
 RADIO ASTRONOMY  
 ROCKET SPECTROSCOPY  
 •••••  
 E. O. HULBURT CENTER  
 FOR SPACE RESEARCH



X-RAY PULSAR IN THE CRAB NEBULA

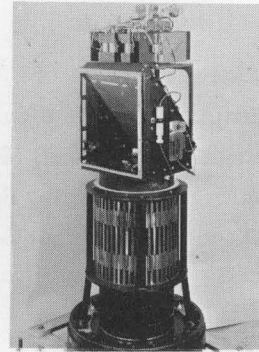
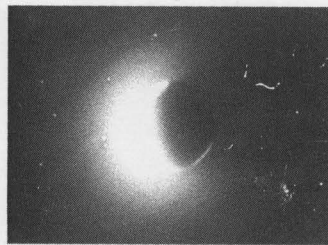


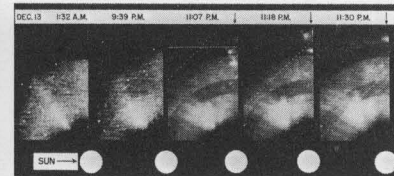
IMAGE-CONVERTER SPECTROGRAPH FOR FAR-UV ROCKET ASTRONOMY



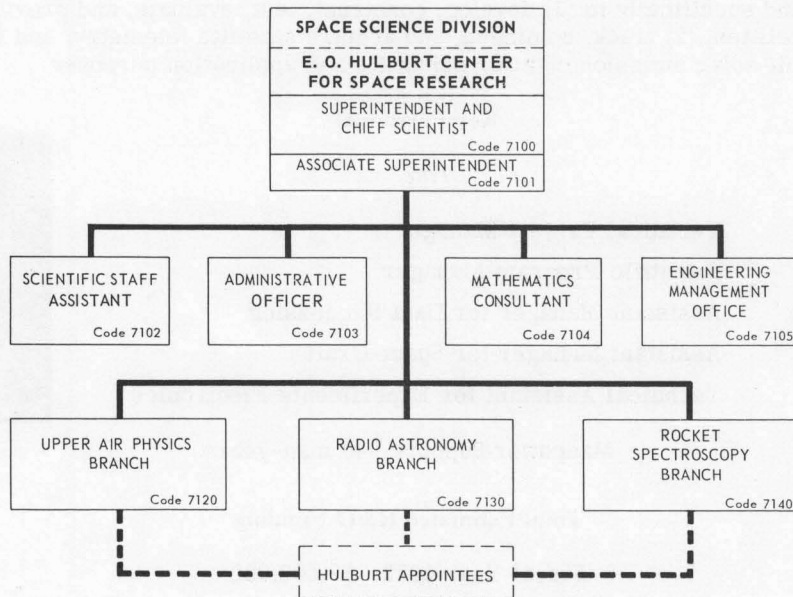
RADIO TELESCOPE MARYLAND POINT



FAR-ULTRAVIOLET PHOTOGRAPH OF EARTH



OSO-7 WHITE LIGHT CORONAGRAPH



## Basic Responsibilities

The Space Science Division conducts research, development, and tests in the fields of upper air physics, astronomy, and astrophysics. Satellites and rockets are used to obtain information on radiation from the sun and celestial sources, and to study the composition and behavior of the ionosphere. Radio telescopes are used for astronomical observations. Results are of importance to radio communications, to utilization of the space environment, and to the fundamental understanding of natural radiation phenomena.

### Branches

#### Upper Air Physics

Gamma-ray, x-ray, ultraviolet, and infrared astronomy  
Aeronomy  
Solar x-ray monitoring satellites  
Electronic imaging studies  
Meteor astronomy

#### Rocket Spectroscopy

X-ray and ultraviolet solar spectroscopy  
Spectroheliographic and coronagraphic research  
Laboratory astrophysics  
XUV spectroradiometry  
Apollo telescope mission solar research

#### Radio Astronomy

Galactic and extragalactic radio astronomy  
Radar measurements of earth-moon distance and topography of moon  
Radar and microwave applications to oceanography  
VLBI (very long base interferometry)  
Intergalactic gases

#### E.O. Hulburt Center for Space Research

The program is that of the combined Upper Air Physics, Rocket Spectroscopy, and Radio Astronomy Branches. It allows graduate and postgraduate students and visiting faculty members to cooperate with NRL in space research.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. H. Friedman	Superintendent
Dr. P. Mange	Associate Superintendent
Dr. B. Lepson	Mathematics Consultant
Dr. T.A. Chubb	Head, Upper Air Physics Branch
Mr. C.H. Mayer	Head, Radio Astronomy Branch
Dr. R. Tousey	Head, Rocket Spectroscopy Branch
Dr. H. Friedman	Chief Scientist, Hulburt Center

### Personnel Complement

On Board: 132

### Total Estimated R&D Funding

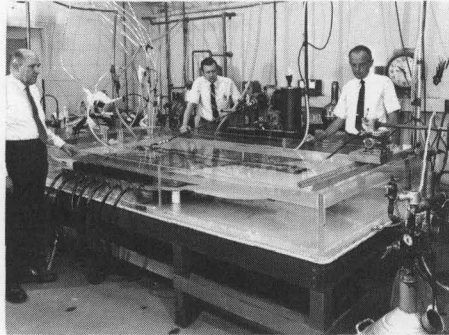
Fiscal Year 1972: \$16,500,000



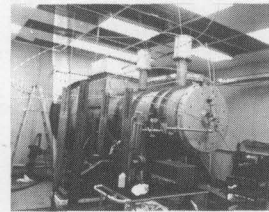
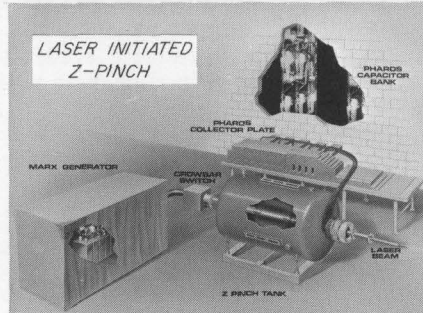
Dr. R. A. Shanny

# Plasma Physics Division

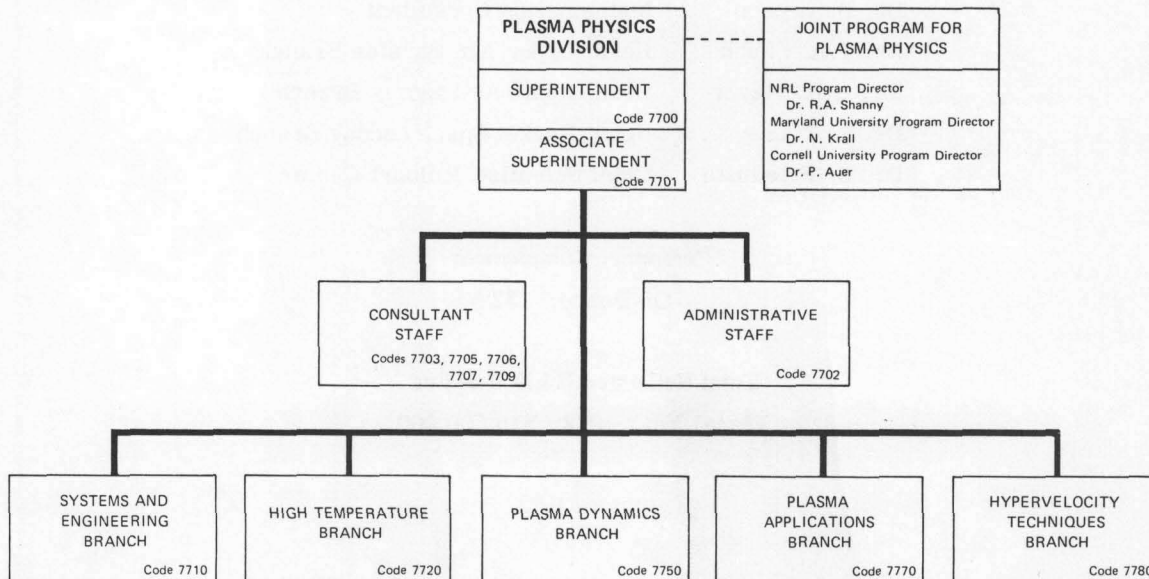
VACUUM ULTRAVIOLET LASER



- HIGH TEMPERATURE PHYSICS
- PLASMA DYNAMICS
- PLASMA APPLICATIONS
- SYSTEMS & ENGINEERING
- HYPERVELOCITY TECHNIQUES



GAMBLE I ELECTRON BEAM GENERATOR



## Basic Responsibilities

The Plasma Physics Division conducts both basic and applied experimental and theoretical research. Examples of effort underway include: fusion physics and the generation and containment of high temperature plasmas, directed toward eventual power sources, laser produced plasmas, laboratory astrophysics, collision-free shock waves, the behavior of the ionosphere as a partial plasma, electron beam experiments, and the production and effects of hypervelocity particles.

### Branches

#### High Temperature Physics

Generation and diagnostics of high temperature plasmas  
Experimental study of the physics of plasma shock waves, instabilities, and turbulence  
Experimental study of plasma chemistry

#### Plasma Dynamics

Theoretical and numerical simulation studies of problems in nonlinear plasma dynamics  
Global ionospheric modeling

#### Plasma Applications

Production of intense relativistic electron beams  
Electron beam propagation  
Interaction of intense electron beams with target materials  
Acceleration of heavy ions by electron beams

#### Hypervelocity Techniques

Vulnerability mechanics  
Hypervelocity kill mechanisms  
Hypervelocity impact mechanics

#### Systems and Engineering

Physics and chemistry of flame plasmas  
Technical support of major division experiments

### Key Personnel

<i>Name</i>	<i>Title</i>
Dr. R.A. Shanny	Superintendent
Mr. J.D. Brown	Associate Superintendent
Mr. J.D. Shipman	Consultant
Dr. K. Hain	Consultant
Mr. D.C. dePackh	Consultant
Dr. J.P. Boris	Consultant
Dr. W.C. Lupton	Consultant
Mr. W. Balwanz	Consultant
Dr. R.C. Elton	Head, High Temperature Physics Branch
Dr. T.C. Coffey	Head, Plasma Dynamics Branch
Dr. L.S. Levine	Head, Plasma Applications Branch
Mr. J.D. Brown	Head, Systems and Engineering Branch (Acting)
Mr. W.W. Atkins	Head, Hypervelocity Techniques Branch

### Personnel Complement

On Board: 115

Total Estimated R&D Funding

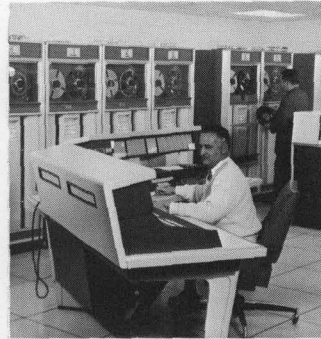
Fiscal Year 1972: \$6,500,000



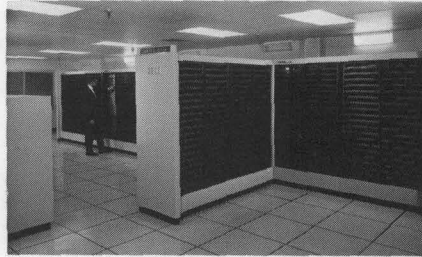
# Mathematics and Information Sciences Division

Dr. P. B. Richards

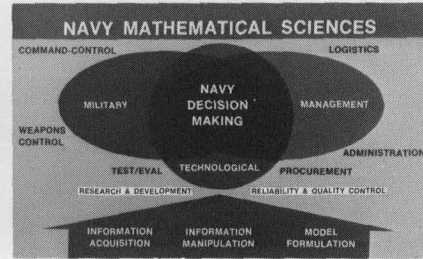
- RESEARCH COMPUTATION CENTER
- MATHEMATICS RESEARCH CENTER
- OPERATIONS RESEARCH BRANCH



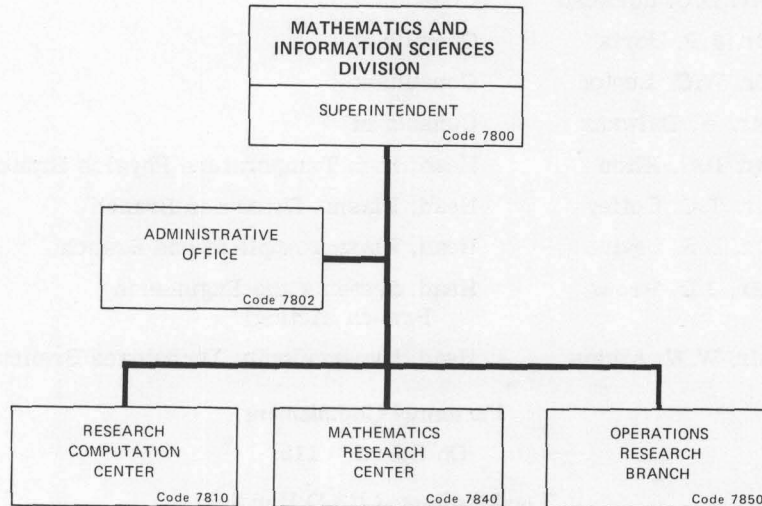
RESEARCH COMPUTATION CENTER



CDC 3800 COMPUTER



MATHEMATICS SCIENCE COORDINATION



## Basic Responsibilities

The Mathematics and Information Sciences Division conducts basic and applied research in the mathematical sciences; determines present and future Navy needs with reference to mathematics and the computer-oriented sciences; creates and maintains the competence required to formulate and to meet these needs; and operates large-scale computers to meet overall NRL needs.

### Branches

#### Research Computation

Data engineering and operations  
Programming  
Programming systems  
Information retrieval

#### Operations Research

Mission analysis  
Pursuit-evasion problems  
Weapons system evaluation  
Surveillance  
Celestial mechanics  
Networks and combinatorics  
Resource allocation  
Computer sciences  
Pollution research

#### Mathematics Research Center

Functional analysis  
Ordinary differential equations  
Special functions  
Approximation theory  
Functions of a complex variable  
Diophantine approximations  
Approximation theory  
Control theory  
Numerical methods  
Celestial mechanics

### Key Personnel

<i>Name</i>	<i>Title</i>
Dr. P.B. Richards	Superintendent
Dr. A.F. Petty	Head, Operations Research Branch
Mr. A.B. Bligh	Head, Research Computation Center
Dr. P. Lanzano	Head, Mathematics Research Center

### Personnel Complement

On Board: 65

### Total Estimated R&D Funding

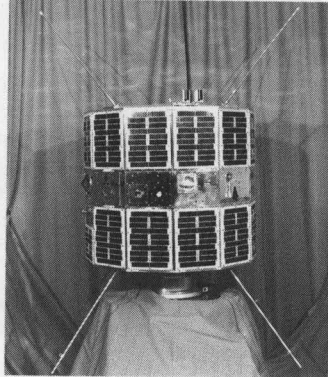
Fiscal Year 1972: \$650,000



Mr. H. O. Lorenzen

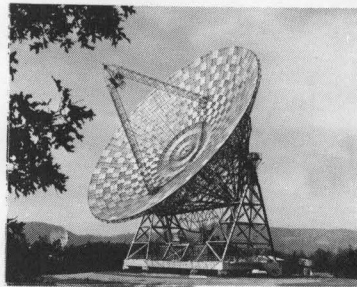
# Space Systems Division

SOLRAD  
SATELLITE

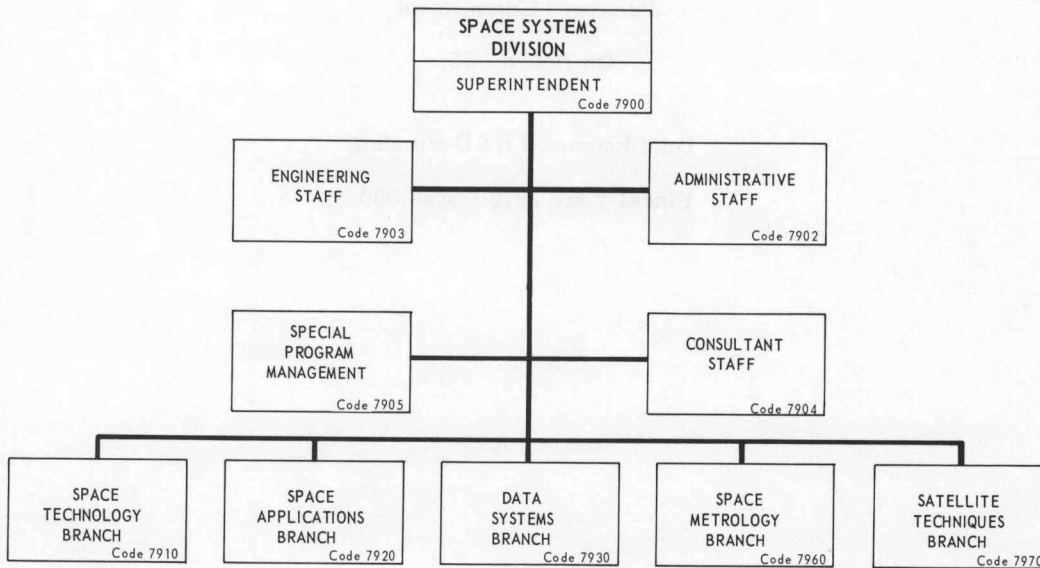
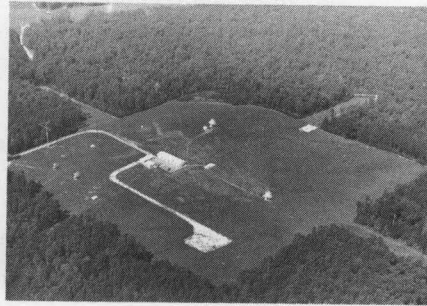


- SPACE TECHNOLOGY
- SPACE APPLICATIONS
- DATA SYSTEMS
- SPACE METROLOGY
- SATELLITE TECHNIQUES

150-FOOT  
ANTENNA  
SUGAR GROVE



BLOSSOM POINT



## Basic Responsibilities

The Space Systems Division is responsible for research and development leading to the design, fabrication, launch, operation, and support of space systems for the Navy. The application of space technology to the naval mission extends through all of the R&D spectrum, from concept formulation to launch techniques of the completed spacecraft and interface with boosters. The Division is also responsible for R&D in environmental problem areas which affect the operation and performance of these space vehicles and for sharing the results with other related activities.

### Branches

#### Space Technology

Large parabolic antenna systems  
Electromagnetic radiation observations  
Special media propagation  
Electromagnetic exosphere phenomena  
National radio quiet zone

#### Space Metrology

Navigation systems  
Geodesy systems  
Time synchronization  
System analysis

#### Space Applications

Space systems concepts  
Space systems research  
Ground support systems  
Spacecraft RF components development

#### Satellite Techniques

Spacecraft structure design  
Fabrication and environmental testing  
Ground station maintenance  
Telemetry analysis

#### Data Systems

Operational data systems  
Automatic processing instrumentation  
Satellite telemetry  
Orbital data analysis

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. H.O. Lorenzen	Superintendent
Mr. F. Welden	Consultant
Mr. J. Jackson	Consultant
Mr. C.W. Price	Engineering Staff
Mr. E.L. Dix	Special Program Management
Mr. J.H. Trexler	Space Technology Branch
Mr. R.D. Mayo	Space Applications Branch
Mr. C.H. Chrisman	Data Systems Branch
Mr. R.L. Easton	Space Metrology Branch
Mr. P.G. Wilhelm	Space Techniques Branch

### Personnel Complement

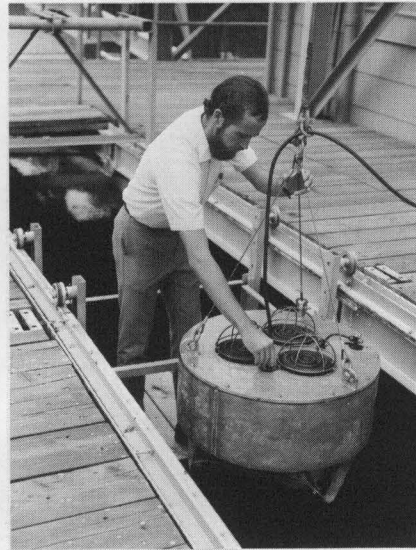
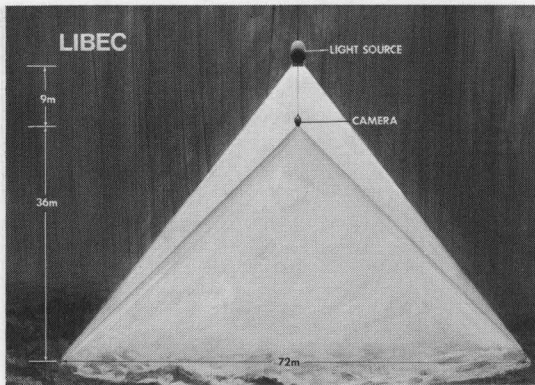
On Board: 160

### Total Estimated R&D Funding

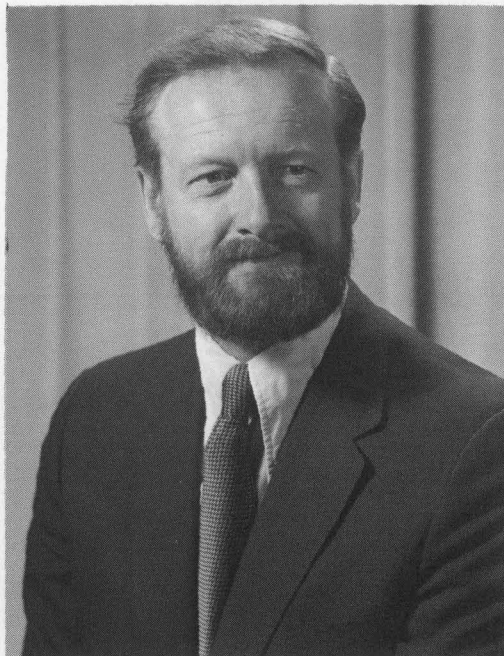
Fiscal Year 1972: \$22,000,000

## Oceanology Area

The Naval Research Laboratory conducts research at sea and in the laboratory in the fields of underwater acoustics, oceanography marine geophysics, atmospheric physics, and ocean engineering and technology. Subjects of investigation include antisubmarine warfare, acoustic propagation and scattering, ambient noise in the ocean, signal processing, marine and atmospheric pollution, instrumentation systems for deep ocean search and inspection, and methods of design and installation of structures and apparatus for use in the ocean. NRL also serves as a focal point in the Navy for standardization of underwater sound measurements, and it holds a major responsibility for research and development in undersea acoustic surveillance.



## Associate Director of Research for Oceanology



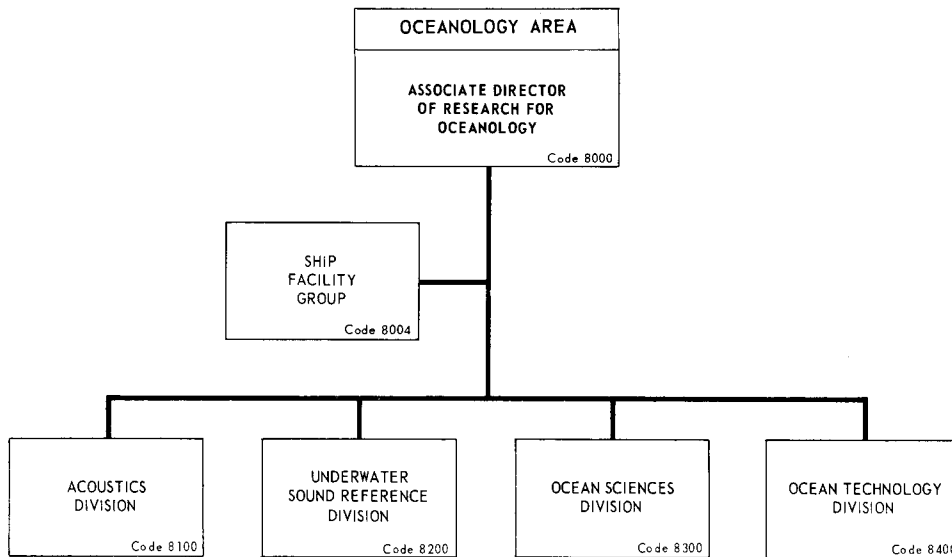
Dr. Ralph R. Goodman

Dr. Goodman was born in Detroit, Michigan, on March 18, 1927. He attended the University of Michigan, Ann Arbor, where in 1950 he received a B.S. degree in mathematics, in 1951 a B.S. in physics, in 1952 an M.S. in physics, and in 1958 a Ph.D. in physics.

He began his scientific career at the Navy Electronics Laboratory in 1958, joined the staff of Colorado State University in 1959 as Assistant Professor, and served as a consultant to the Applied Physics Group at the SACLANT ASW Research Center, La Spezia, Italy, from 1961 to 1963. He then returned to Colorado State University, where from 1963 to 1968 he served as Associate Professor and Professor of Physics and, during his last year there, as Acting Chairman of the Department of Physics. He came to NRL with the appointment of Associate Director of Research in September 1968.

Dr. Goodman's research interests are centered on acoustic propagation, scattering, and physical acoustics. He also maintains an active interest in solid state physics.

Dr. Goodman is a member of the American Physical Society, the Acoustical Society of America, the American Geophysical Union, the American Institute of Physics, Sigma Xi, Phi Kappa Phi, and Tau Beta Pi. He was also a member of the Board of Trustees of the Colorado State University Research Foundation and the NAS/NRC Committee on Undersea Warfare.



#### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. R.R. Goodman	Associate Director of Research for Oceanology
Mr. W.L. Brundage	Special Assistant
Mr. A.L. Gotthardt	Ship Facility Group
Dr. J.C. Munson	Superintendent, Acoustics Division
Mr. R.J. Bobber	Superintendent, Underwater Sound Reference Division
Dr. J.O. Elliott	Superintendent, Ocean Sciences Division (Acting)
Dr. J.P. Walsh	Superintendent, Ocean Technology Division

# SHIP FACILITY GROUP

## Basic Responsibilities

The Ship Facility Group is responsible for coordinating and providing ship services, sea-going facilities, and specialized expertise common to and required by the at-sea experiments of Research Divisions under the Associate Director of Research for Oceanology.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.L. Gotthardt	Head, Ship Facility Group



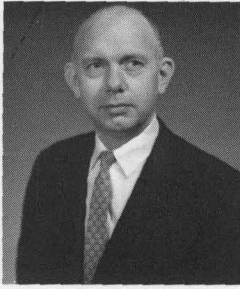
Mr. A. L. Gotthardt

## Personnel Complement

On Board: 16

## Total Estimated R&D Funding

Fiscal Year 1972: \$3,300,000



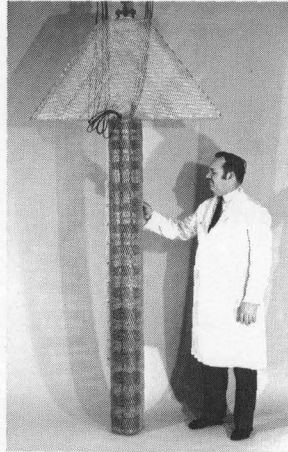
Dr. J. C. Munson

# Acoustics Division

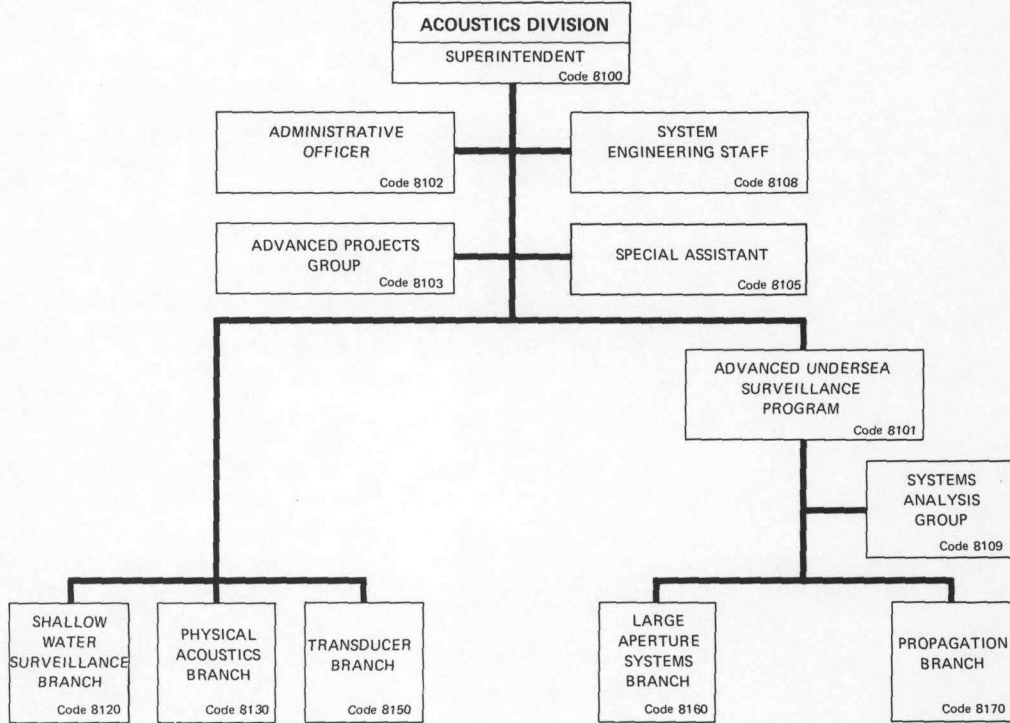
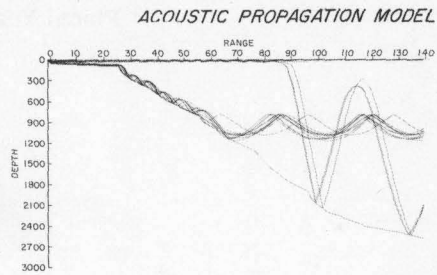
- LARGE APERTURE SYSTEMS
- PHYSICAL ACOUSTICS
- TRANSDUCER
- PROPAGATION
- SHALLOW WATER SURVEILLANCE



AMBIENT NOISE BUOY



RING TRANSDUCER ARRAY



## Basic Responsibilities

The Acoustics Division has major responsibilities for basic and applied research and development in the Navy's undersea warfare programs. The spectrum of work covered in the program includes acoustic radiation and transduction, propagation and scattering, environmental prediction, surveillance system concepts, and system analysis. The Division conducts theoretical and experimental research programs in physical acoustics and ocean acoustics; it develops models of the interaction of acoustic energy with the ocean environment and with structures; it conducts experiments in the deep ocean, in acoustically shallow water and in the Arctic. The Division program is heavily oriented toward research and development in support of the undersea surveillance mission but also includes other missions. The Division is supported by an Engineering Staff in the conduct of at sea experiments aboard the USNS HAYES and often uses other ships and aircraft in multiplatform experiments. The Division interacts with research programs outside the Division in areas such as oceanography, deep ocean technology, systems analysis and Fleet operations.

### Staff Activities

#### System Engineering

Support and ship facility  
Acoustic sources  
Engineering research

#### Systems Analysis

Systems studies  
Surveillance systems  
planning and evaluation

#### Advanced Projects

Advanced surveillance systems  
Information processes for  
underwater acoustics

### Branches

#### Shallow Water Surveillance

Mode analysis  
Model the signal, noise and reverberation  
fields  
Source and receiving array configurations  
Signal design and processing requirements

#### Physical Acoustics

Ultrasonic investigation of liquids and  
amorphous solids  
Reflection, diffraction, scattering by bodies  
Target strength modeling  
Light-sound interaction  
Bulk and interface wave properties

#### Transducer

Basic radiation theory  
Electroacoustic modeling  
Transducer physical models  
Transducer mathematical models  
Calibration of large transducer arrays  
Acoustic array calculations

#### Large Aperture Systems

Active target detection and classification  
Propagation, coherency, and wave front  
behavior  
Low frequency monostatic and bistatic  
reverberation studies  
Propagation models  
Natural and man-made noise

#### Propagation

Long-range propagation models  
Application of long-range low-frequency  
propagation  
Scattering from ocean bottom, surface,  
and volume  
Arctic underwater acoustics  
Very low frequency propagation

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.C. Munson	Superintendent
Mr. R.R. Rojas	Head, Advanced Undersea Surveillance Program
Mr. W.J. Finney	Head, Advanced Projects Group
Mr. A.T. McClinton	Head, System Engineering Staff
Dr. J.C. Knight	Head, Systems Analysis Group
Mr. R.H. Ferris	Head, Shallow Water Surveillance Branch
Dr. C.M. Davis, Jr.	Head, Physical Acoustics Branch
Mr. S. Hanish	Head, Transducer Branch
Dr. B.B. Adams	Head, Large Aperture Systems Branch
Mr. B.G. Hurdle	Head, Propagation Branch

### Personnel Complement

On Board: 140

### Total Estimated R&D Funding

Fiscal Year 1972: \$8,500,000

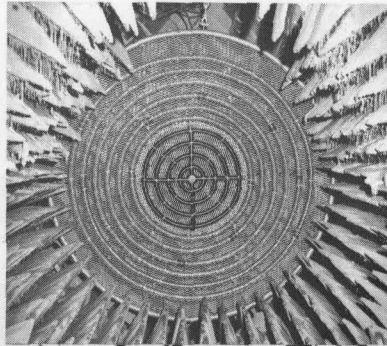
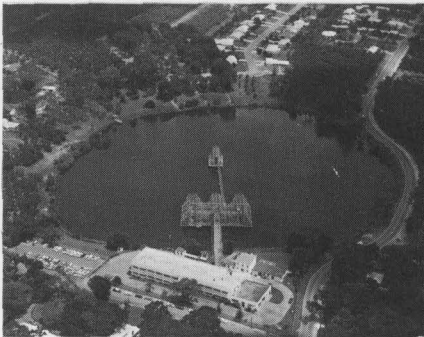


# Underwater Sound Reference Division

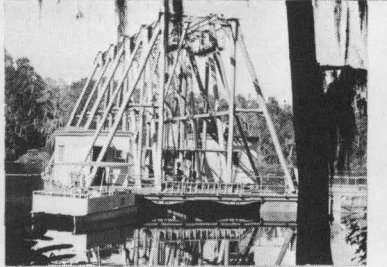
Mr. R. J. Bobber

- UNDERWATER ELECTROACOUSTIC MEASUREMENT METHODS
- UNDERWATER ELECTROACOUSTIC STANDARDS
- UNDERWATER ELECTROACOUSTIC MEASUREMENT SERVICES

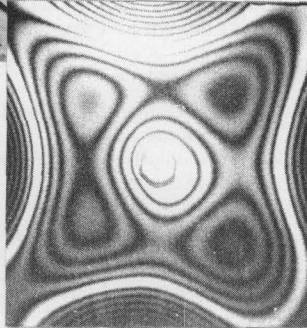
UNDERWATER SOUND REFERENCE DIVISION,  
ORLANDO, FLORIDA



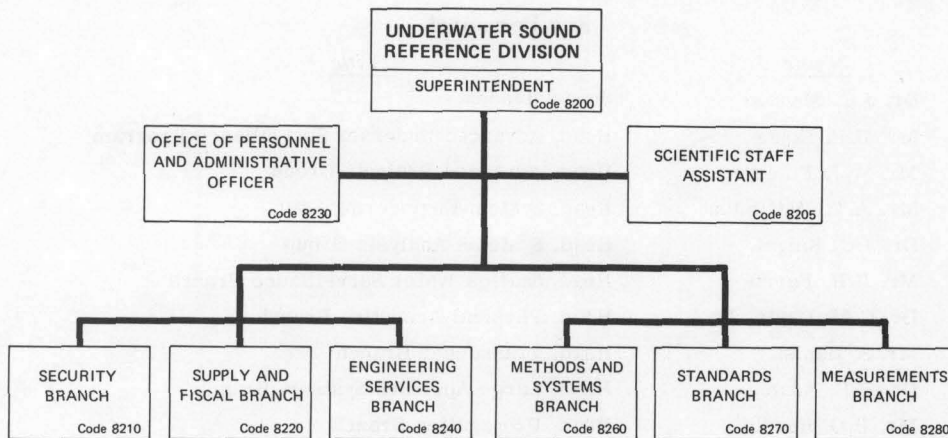
NEAR-FIELD TRANSDUCER  
ARRAY IN ANECHOIC  
TANK FACILITY



LEESBURG FACILITY-  
CALIBRATION BARGE



HOLOGRAM OF VIBRATING  
TRANSDUCER DIAPHRAGM



## Basic Responsibilities

The Underwater Sound Reference Division is a focal point in the Navy for standardization in the science and technology of underwater sound measurements. Its research and development program is aimed at expanding the state of the art and providing Navy in-house expertise. Reference calibration measurements in a large complex of specialized facilities and calibrated standard transducers are available to all naval activities and contractors in support of undersea warfare programs.

### Research and Development Branches

#### Methods and Systems

Calibration theory and accuracy  
Measurement methods  
Digital and analog systems  
Acoustic absorption  
Signal analysis

#### Standards

Transducer materials  
Electroacoustic standards  
Acoustic sources  
Specialized electroacoustic transducers  
Vibration analysis techniques  
Standard loan services

#### Measurements

Standard calibration services  
Sonar transducer test and evaluation  
Measurements on acoustic materials  
Simulated deep-submergence measurements  
Measurement facility development

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.J. Bobber	Superintendent
Mr. J.M. Taylor	Scientific Staff Assistant
Mr. J.C. Michael	Supply and Fiscal Officer
Mrs. W.M. Scott	Personnel and Administrative Officer
Mr. W.W. Carlson	Head, Engineering Services Branch
Mr. A.Z. Robinson	Head, Methods and Systems Branch
Mr. I.D. Groves	Head, Standards Branch
Dr. W.L. Paine	Head, Measurements Branch

### Personnel Complement

On Board: 100  
(Graded 84, Ungraded 16)

### Total Estimated R&D Funding

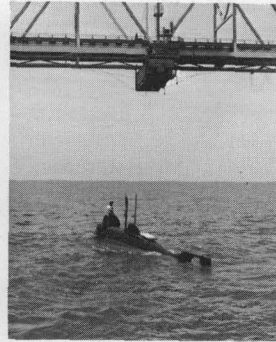
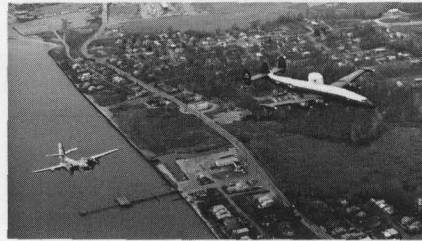
Fiscal Year 1972: \$1,700,000



Dr. J. O. Elliot

# Ocean Sciences Division

CLOUD PHYSICS STUDIES

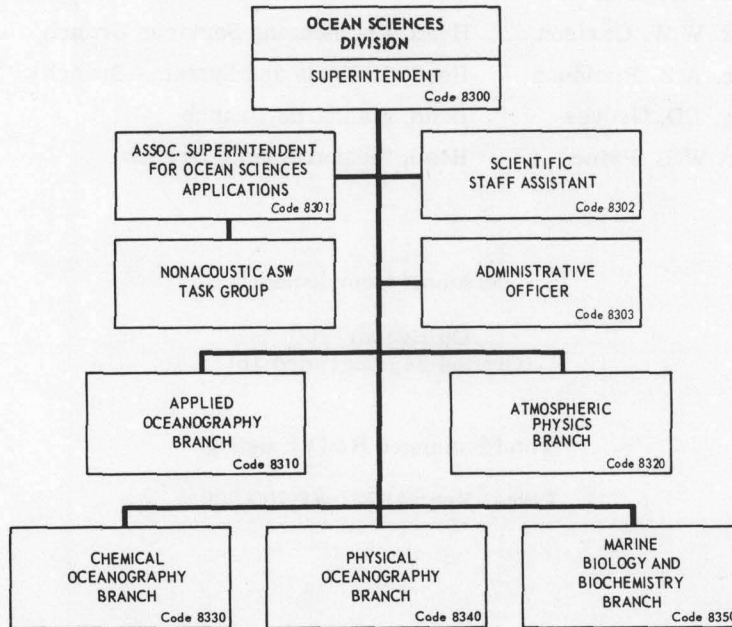


SURFACE EFFECTS

- APPLIED OCEANOGRAPHY
- ATMOSPHERIC PHYSICS
- CHEMICAL OCEANOGRAPHY
- PHYSICAL OCEANOGRAPHY
- MARINE BIOLOGY & BIOCHEMISTRY
- NONACOUSTIC ASW



NANSEN BOTTLE PREPARATION



## Basic Responsibilities

The Ocean Sciences Division conducts basic and applied research and development in the ocean sciences. Included are studies of the physics, chemistry, geology, and biology of the oceans directed toward an improved understanding and use of the oceans as the major operating environment of the Navy. Practical results lead ultimately to improvement in the design and effectiveness of naval equipment, materials, and systems.

### Staff Activity

#### Nonacoustic ASW (R&D) Task Group

#### Branches

##### Applied Oceanography

Nonacoustic detection of submarines  
Hydrodynamics of submerged bodies  
Infrared characteristics of the ocean

##### Atmospheric Physics

Air-sea interactions  
Atmospheric dynamics  
Cloud physics  
Weather instrumentation

##### Chemical Oceanography

Physical and analytical chemistry of seawater, dissolved gases, and marine sediments

##### Physical Oceanography

Hydrodynamics and turbulence of the oceans  
Marine geophysics

##### Marine Biology & Biochemistry

Biodegradation of materials in the marine environment  
Organic chemistry of seawater  
Biochemistry of marine organisms

### Key Personnel

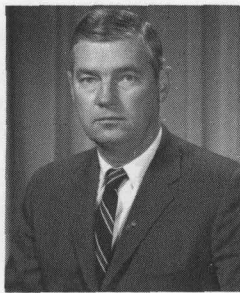
<u>Name</u>	<u>Title</u>
Dr. J.O. Elliot	Superintendent (Acting)
Dr. J.O. Elliot	Associate Superintendent for Ocean Science Applications
Dr. A.H. Schooley	Senior Research Scientist
Mr. J.I. Hoover	Consultant
Mr. H.L. Clark	Head, Applied Oceanography Branch
Dr. L. Ruhnke	Head, Atmospheric Physics Branch
Dr. P.E. Wilkniss	Head, Chemical Oceanography Branch (Acting)
Mr. K.G. Williams	Head, Physical Oceanography Branch
Dr. D.W. Strasburg	Head, Marine Biology and Biochemistry Branch

### Personnel Complement

On Board: 85

### Total Estimated R&D Funding

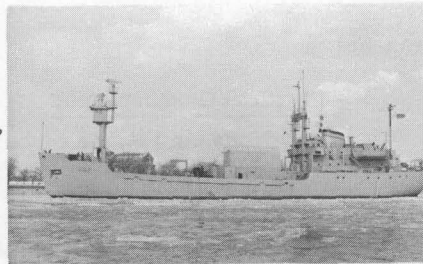
Fiscal Year 1972: \$4,500,000



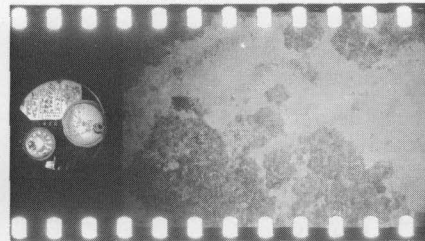
Dr. J. P. Walsh

# Ocean Technology Division

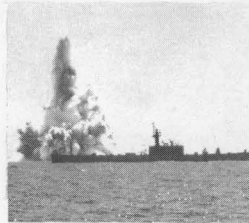
MIZAR



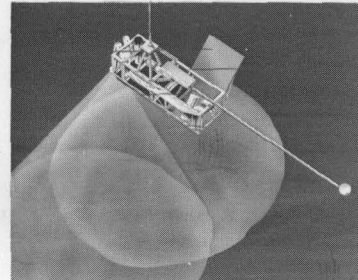
BOTTOM STUDIES



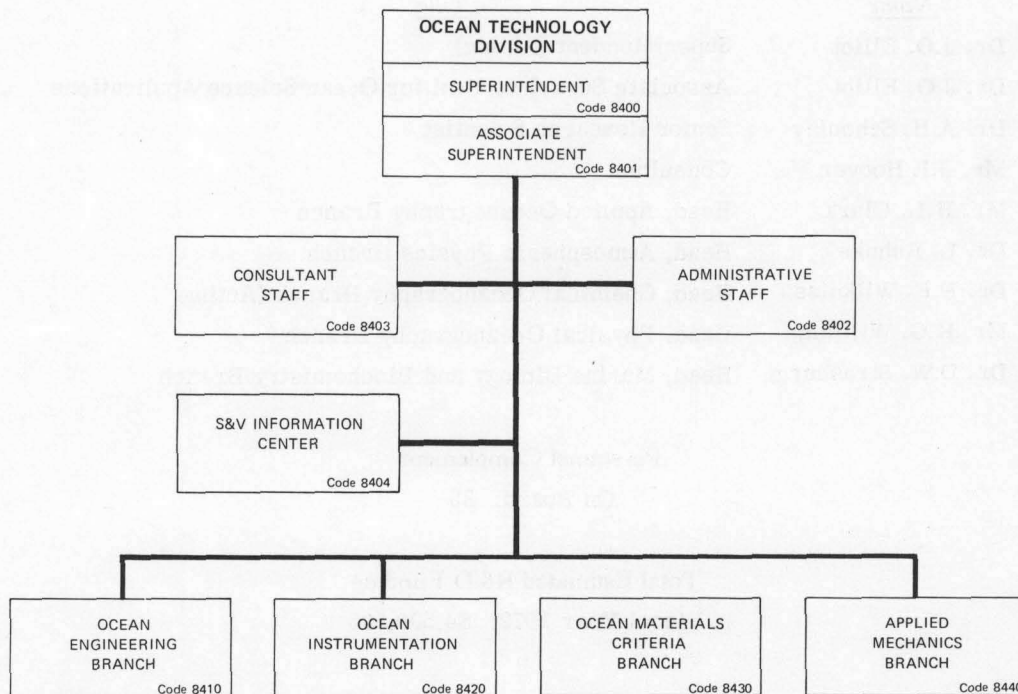
- OCEAN ENGINEERING
- OCEAN MATERIALS CRITERIA
- OCEAN STRUCTURES



UNDERWATER SHOCK STUDIES



UNDERWATER CAMERA



## Basic Responsibilities

The Ocean Technology Division researches, develops, and applies specialized equipment, instrumentation, and techniques for conducting ocean and ocean-floor operations, and it evolves operational technology for advanced systems. The Division utilizes advanced materials and design technology for engineering optimization of required equipment. It also conducts research activities in select areas of ocean technology with coupling and support activities related to other ongoing research and development in these and other fields of interest. The DoD Shock and Vibration Information Center is included in the Division; this Center provides a single source for up-to-date information on shock and vibration for scientists and engineers. This Division, in conjunction with other Divisions of NRL and out-of-house agencies, brings the collective expertise to bear on crucial problems.

### Staff Activity

#### S&V Information Center

##### Branches

##### Ocean Engineering

Research and development on ocean systems, subsystems, and components  
Systems engineering  
Design  
Conduct at-sea operations

##### Ocean Materials Criteria

Fracture mechanics and fracture strength  
Plastic flowing  
Compression failure mechanisms  
Armor research and development  
Deep submergence materials-structures  
Missile component failure  
Nondestructive testing

##### Applied Mechanics

Shipboard shock fundamentals  
Shock protection for weapons systems  
Methods for design against shock  
Fracture mechanics design studies  
Developmental studies of prototypes  
Shock strength of materials  
Hydromechanic studies

##### Ocean Instrumentation

Instrumentation analysis, research and development  
Sensors, detectors  
Data and signal processing  
Stress and kinematic quantities measurements

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.P. Walsh	Superintendent
Mr. C.L. Buchanan	Associate Superintendent
Dr. R.O. Belsheim	Consultant
Dr. R.O. Belsheim	Head, S&V Information Center
Mr. J.J. Gennari	Head, Ocean Engineering Branch (Acting)
Mr. C.L. Buchanan	Head, Ocean Instrumentation Branch (Acting)
Dr. J.M. Krafft	Head, Ocean Materials Criteria Branch
Dr. F. Rosenthal	Head, Applied Mechanics Branch

### Personnel Complement

On Board: 70

### Total Estimated R&D Funding

Fiscal Year 1972: \$4,430,000

# The Support Services Department

The Director of Support Services is a Navy Captain with appropriate training and experience; he reports to the Director of NRL. His primary responsibility is the supervision, coordination, and control of the administrative and service operations required in support of the work of the Research Department. Usually, he is the next senior officer to the Director and assumes the responsibilities of and acts for the Director in his absence.

The Director of Support Services is responsible for:

- guiding and coordinating the service Divisions of the Laboratory (Engineering Services, Supply, Public Works, Technical Information, and Chesapeake Bay) and also his staff functions (Management Engineer and Patent Counsel) so that services rendered are adequate, prompt, accurate, and economical in the use of men and money.
- implementing, for the Director of NRL, the orders and instructions of higher authority in a manner appropriate to the research environment as manifested in the policies and the organization of the Laboratory.
- being familiar with the scientific program and for following the progress of the scientific efforts of the Laboratory in sufficient detail to ensure that administrative decisions are made which support the scientific program.
- assisting the Director of NRL in maintaining an overall plan of organization for the best direction and control of the Laboratory.
- keeping the Director of NRL advised of matters requiring his attention, decision, or other action; acting for the Director of NRL in the approval of usual or routine matters; for assisting the Director of NRL generally with administrative detail, correspondence, reports, and similar matters.
- formulating, amending, and issuing instructions, policy statements, and procedures approved by the Director of NRL.

The Director of Support Services keeps in constant touch with the Director of Research to ensure that the service units of the Laboratory are providing complete support to the scientific divisions. He coordinates with the Director of Research in the planning and carrying out of administrative actions affecting Research Department organization and personnel; and he maintains a close working relationship with the Chief Staff Officer and officers assigned to him to assure provision of support services in operations conducted by the Chief Staff Officer. He also has direct "line" authority over the heads of special staff and service divisions.

## Director, Support Services



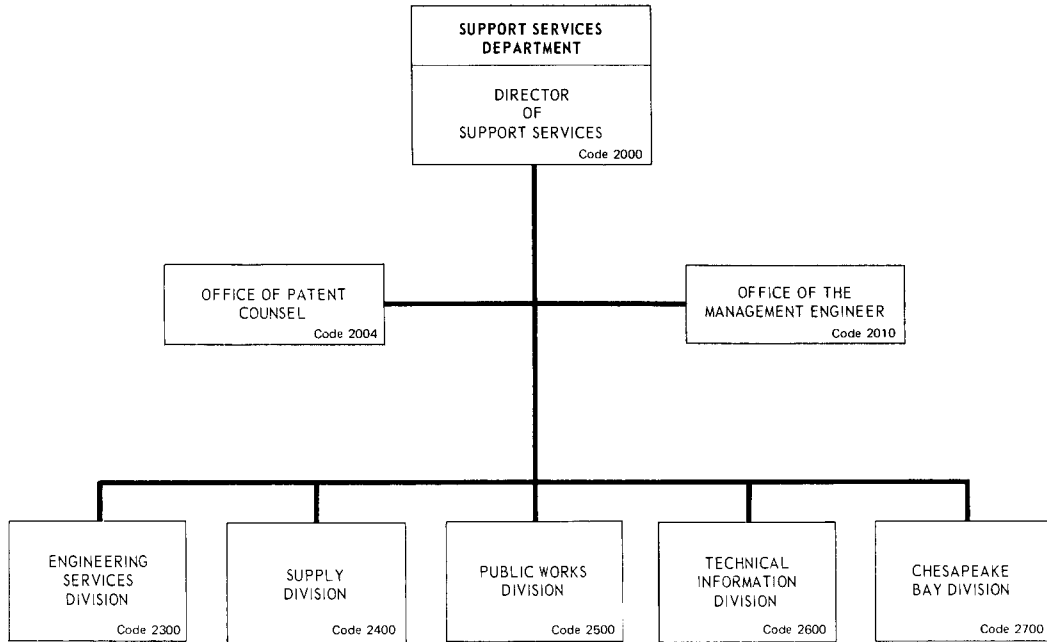
Captain James A. Bortner, USN

Captain Bortner [REDACTED] He has had formal education and Navy experience, both as an enlisted man and as a commissioned officer, in physics, mathematics, electronics, naval engineering, and management. He served four years of active enlisted duty with the Naval Reserve, including assignment to the Radio Material School at NRL during World War II.

He remained active with the Naval Reserve while a student at York Junior College and later at Bucknell University in Lewisburg, Pennsylvania. In 1949, he received a B.S. in physics and an M.S. in mathematics from Bucknell and was appointed to its mathematics faculty. He returned to active duty during the Korean conflict and was commissioned as an Engineering Duty Officer (LT/JG) upon graduation from the Officer Candidate School at Newport, Rhode Island, where he stood first in his class. Later he completed a postgraduate course in Naval Construction and Engineering at the Massachusetts Institute of Technology and two postgraduate courses in Management—one at the Naval Postgraduate School and one at the Defense Weapons Systems Management Center, Wright-Patterson AFB, Dayton, Ohio.

As an officer, he has served in key assignments with the Atlantic Reserve Fleet, the Boston Naval Shipyard, the Ship Repair Facility on Guam, M.I., the Pacific Fleet, and the U.S. Naval Academy. In the latter assignment he was Chairman of the Department of Electrical Engineering. Since 1968 he has been with the Naval Ship Systems Command serving in succession as Head of the Ship Communications Branch; Director of the Warfare Systems Division; and Deputy Project Manager, Tactical Electromagnetic Programs.

Captain Bortner is a member of Pi Mu Epsilon, Sigma Pi Sigma, the Society of Naval Architects and Marine Engineers, the American Society of Naval Engineers, and the Armed Forces Communications and Electronics Association.



#### Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT J.A. Bortner, USN	Director of Support Services	2000
Dr. A.L. Branning	Patent Counsel	2004
Mr. S.L. Cohen	Management Engineer	2010
CDR C.M. Kunstmann, USN	Engineering Services Officer	2300
CDR J.R. Webb, SC, USN	Supply Officer	2400
CDR C. Geoly, CEC, USN	Public Works Officer	2500
Mr. E.L. Smith	Head, Technical Information Division	2600
CDR J.M. Fitts, USN	Chesapeake Bay Division Officer	2700

## OFFICE OF THE MANAGEMENT ENGINEER

### Basic Responsibilities

The Office of the Management Engineer provides staff support to management officials of the Laboratory in matters of administrative operations, management control, and facilities planning. In addition, the Office conducts the Laboratory's Safety Program (except in the fields of microwave, radiological, and nuclear safety, which are the responsibility of the Radiological and Environmental Protection Staff.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. S.L. Cohen	Management Engineer
Mr. A.M. Toscano	Deputy Management Engineer and Head, Management Engineering Branch
Mr. H. Kennedy	Head, Safety Branch



Mr. S. L. Cohen

### Personnel Complement

On Board: 16

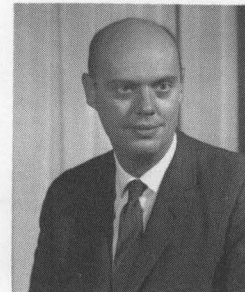
## OFFICE OF PATENT COUNSEL

### Basic Responsibilities

The Office of Patent Counsel provides services concerning inventions, patents, trademarks, copyrights, and other related matters. Patent applications are prepared, filed, and prosecuted on NRL inventions of significance to the Government. The Patent Counsel serves as consultant and adviser on patent and data clauses in R&D and procurement contracts. Assistance is provided the Research Department through state-of-the-art searches in the patent literature pertinent to particular research problems.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. A.L. Branning	Patent Counsel
Dr. P. Schneider	Deputy Patent Counsel



Dr. A. L. Branning

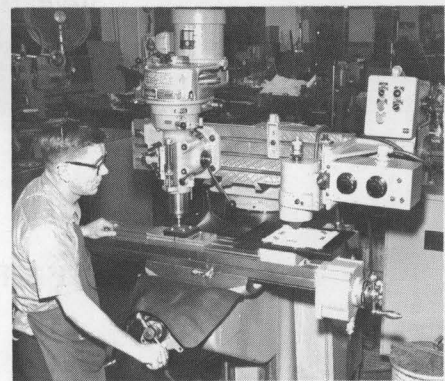
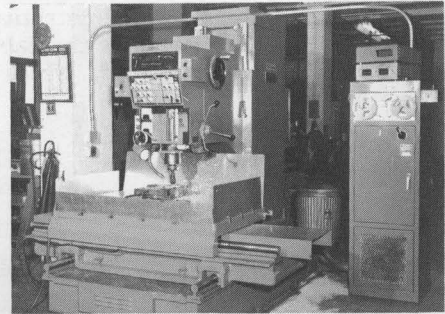
### Personnel Complement

On Board: 22  
(Includes NRL and ONR)

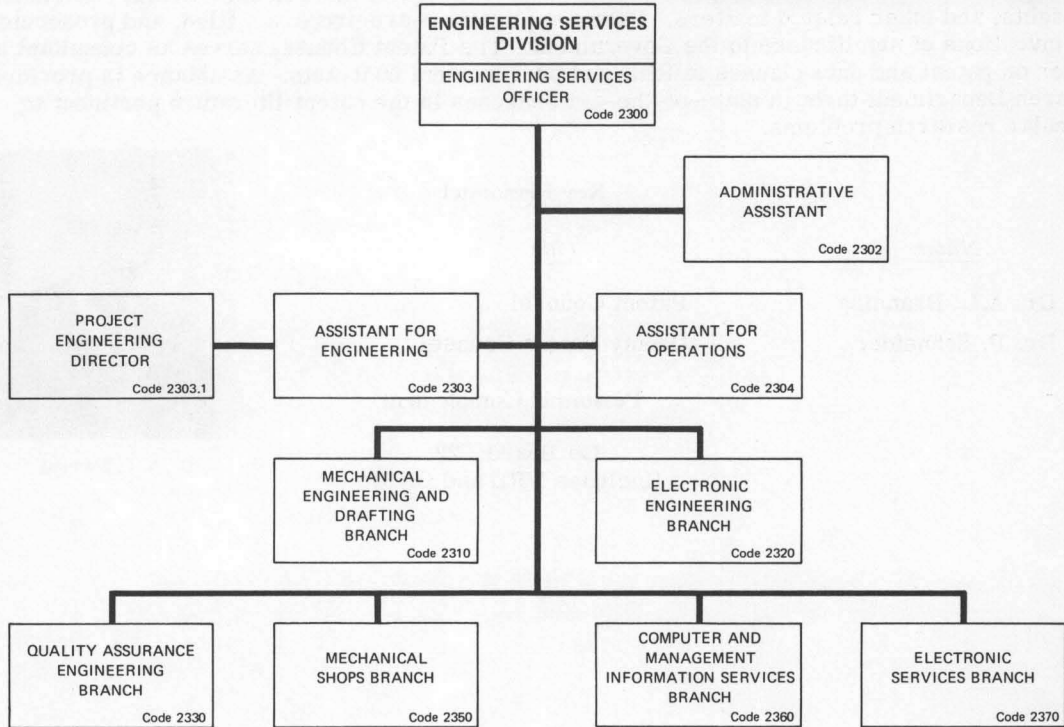


CDR C. M. Kunstmann, USN

# Engineering Services Division



- MECHANICAL ENGINEERING AND DRAFTING
- ELECTRONIC ENGINEERING
- QUALITY ASSURANCE ENGINEERING
- MECHANICAL SHOPS
- COMPUTER AND MANAGEMENT INFORMATION SERVICES
- ELECTRONIC SERVICES



### Basic Responsibilities

The Engineering Services Division provides the engineering, design, fabrication, assembly, and test of experimental research equipment in support of the Laboratory's research efforts.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR C.M. Kunstmann, USN	Engineering Services Officer
Mr. P.R. Shifflett	Assistant for Engineering
Mr. J.P. Manning	Assistant for Operations
Mr. M. Shimkus	Head, Mechanical Engineering and Drafting Branch (Acting)
Mr. J. Brotzman	Head, Electronic Engineering Branch
Mr. P.C. Buck	Head, Quality Assurance Engineering Branch
Mr. I.F. Long	Head, Mechanical Shops Branch
Mr. L.G. Murphy	Head, Computer and Management Information Services Branch
Mr. J.L. Leizear	Head, Electronic Services Branch

### Personnel Complement

On Board: 488

(Graded 162, Ungraded 325, Military 1)

Management & Staff	56
Engineers	37
Technicians	107
Journeymen	204
Machine Operators & Helpers	33
Apprentices	51

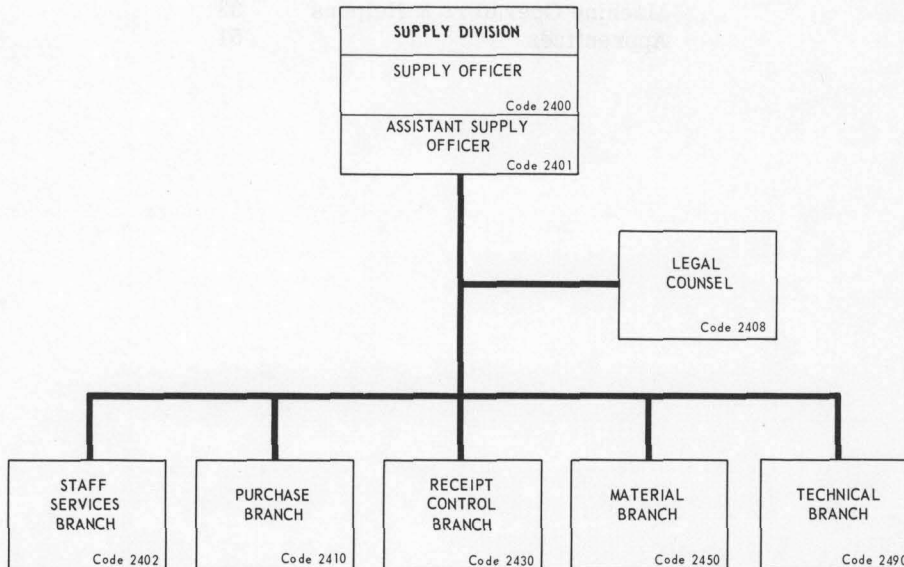


# Supply Division

CDR J. R. Webb, USN



- STAFF SERVICES
- PURCHASE
- RECEIPT CONTROL
- MATERIAL
- TECHNICAL



### Basic Responsibilities

The Supply Division provides service functions to the Laboratory, including the operation of supply issue stores, procurement of equipment, material, and contractual services; receipt, inspection, and delivery of material and equipment; storage of inactive laboratory equipment; packing, shipping, and traffic management; and survey and disposal of excess and unusable property.

In addition, Supply offers technical and counseling services to the Research departments in the development of specifications for a complete procurement package; consultation as needed in the handling of claims against the Laboratory and guidance in the performance stages of contractual services. Maintains a technical library of hard-copy commercial catalogs for over 7,000 firms.

During FY 1972, the Supply Division occupied 204,531 sq ft of building space; its stores (six retail and one bulk warehouse) inventory averaged \$648,941.00; procurements totalled \$52,798,104.00; stores issues totalled \$2,168,044.00; and disposals totalled \$4,116,124.00.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR J.R. Webb, SC, USN	Supply Officer
LT R.W. Zeiler, III, SC, USN	Assistant Supply Officer
Mr. A.S. Horton	Legal Counsel
Mr. A.W. Medley, Sr.	Head, Staff Services Branch
Mr. H.E. Senasack	Head, Purchase Branch
Mrs. V.S. Thomas	Head, Receipt Control Branch
Mr. H.W. Dickinson	Head, Material Branch
Mr. R.R. Black	Head, Technical Branch

### Personnel Complement

On Board: 139

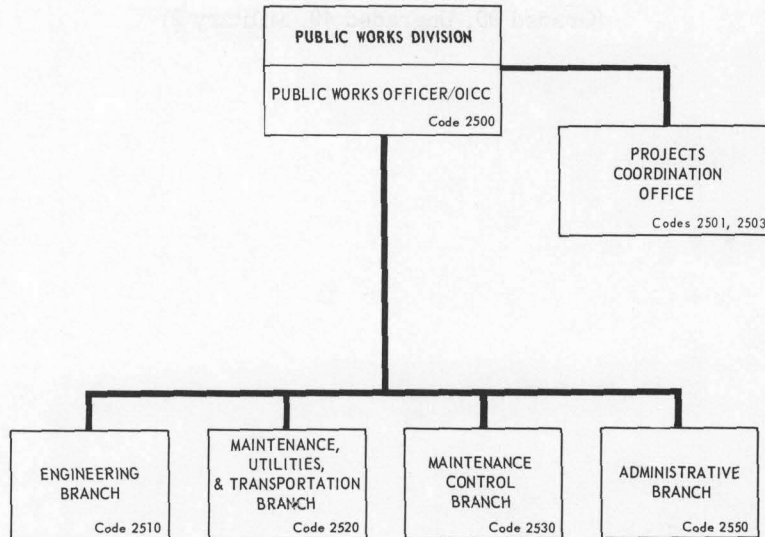
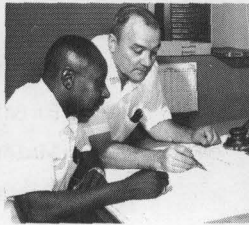
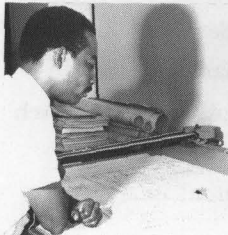
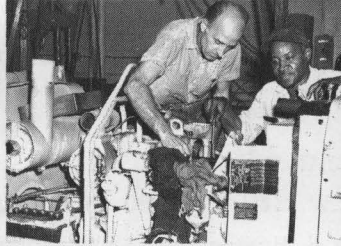
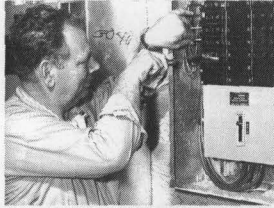
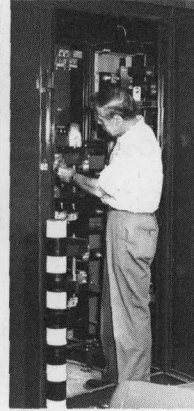
(Graded 90, Ungraded 49, Military 2)



CDR C. Geoly, CEC, USN

# Public Works Division

- ENGINEERING
- ADMINISTRATION
- MAINTENANCE, UTILITIES, & TRANSPORTATION
- MAINTENANCE CONTROL
- CONSTRUCTION
- PROJECTS PROGRAMMING



### Basic Responsibilities

The Public Works Division is responsible for the physical plant of NRL. This includes responsibility for the design, construction, operation, maintenance, and repair of all buildings, grounds, roads, utilities, and other structures and activities. Also included are transportation; weight-handling and heavy-construction equipment; heating and refrigeration plants; electric, water, steam, air, and gas supply distribution; telephone communication systems; and sewage disposal.

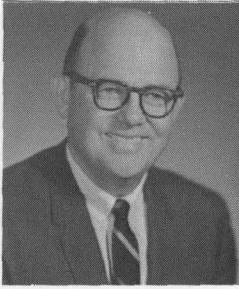
The Public Works Division provides professional consulting services to the scientific divisions on facilities planning and engineering.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR C. Geoly, CEC, USN	Public Works Officer/Officer in Charge of Construction
ENS E. Weatherby, III, CEC, USNR	Staff Assistant
Mr. G. Ridings	Projects Coordination
Mr. G.H. Seaver, Jr.	Projects Coordination
Mr. J.R. Lescault	Head, Administrative Branch
Mr. C.R. Parsons	Head, Engineering Branch
Mr. L.P. Carpenter	Head, Maintenance, Utilities, & Transportation Branch
Mr. R.O. Weidman	Head, Maintenance Control Branch

### Personnel Complement

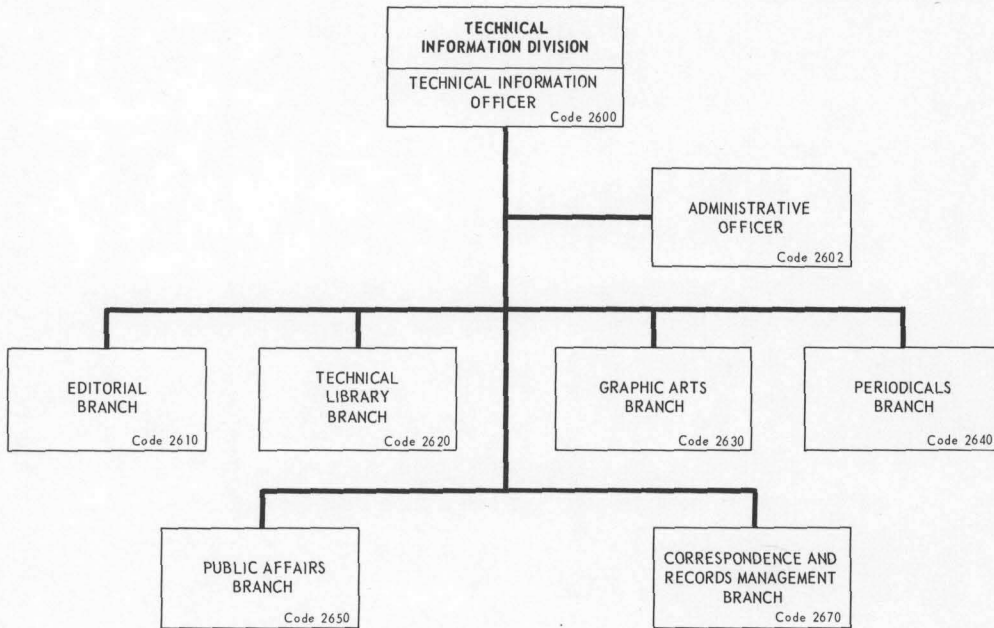
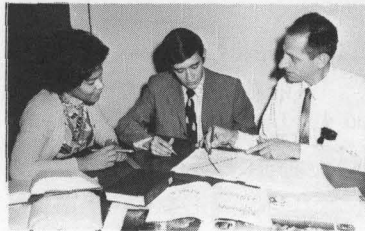
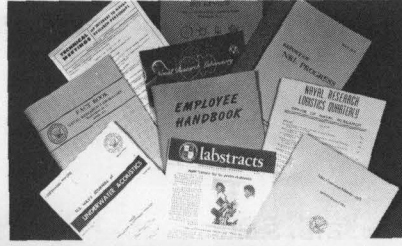
On Board: 373  
(Graded 46, Ungraded 325, Military 2)



Mr. E. L. Smith

# Technical Information Division

- EDITORIAL
- LIBRARY
- GRAPHIC ARTS
- PERIODICALS
- PUBLIC AFFAIRS
- CORRESPONDENCE AND RECORDS MANAGEMENT



### Basic Responsibilities

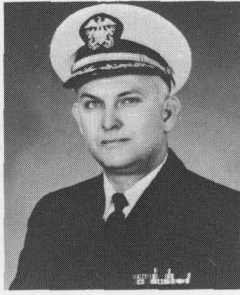
The Technical Information Division plans and administers the Laboratory's program of preparing and disseminating the results of scientific research through official publications, scientific journals, presentations, films, exhibits, and news media. It provides centralized professional services to both NRL and ONR in writing, editing, printing, exhibits, photography, graphic arts, public affairs, documentation, language-translations, and mail-records services. It operates one of the Navy's largest integrated technical libraries with holdings of 200,000 bound volumes and 350,000 technical reports.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. E.L. Smith	Head, Technical Information Division
Mrs. D.E. Cameron	Administrative Officer
Mrs. D.P. Baster	Librarian
Mr. W.H. Ramey	Head, Graphic Arts Branch
Mr. W.M. Leak	Head, Periodicals Branch
Mr. I.S. Rudin	Head, Editorial Branch
Mr. J.E. Sullivan	Head, Public Affairs Branch
Mrs. L.V. Dabney	Head, Correspondence and Records Management Branch (Acting)

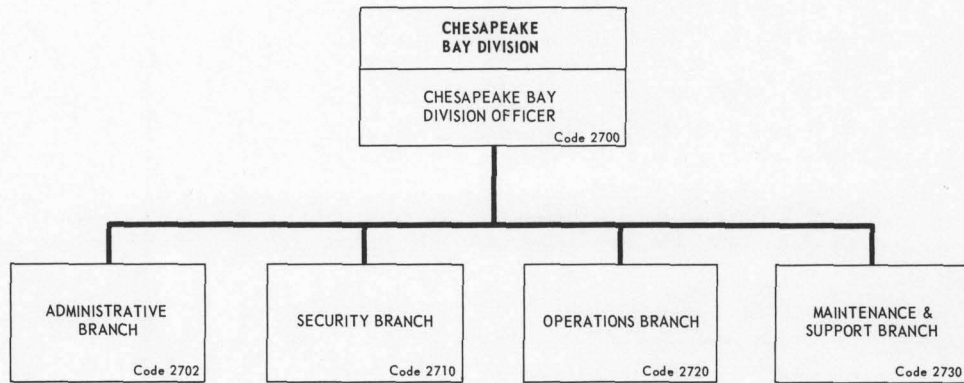
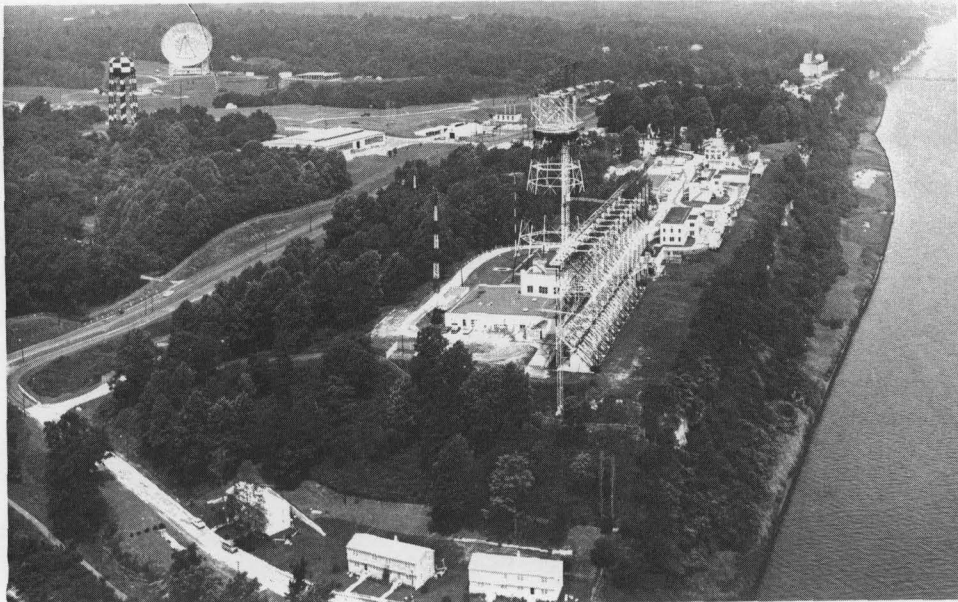
### Personnel Complement

On Board: 163  
(Graded 144, Ungraded 19)



# Chesapeake Bay Division

CDR J. M. Fitts, USN



### Basic Responsibilities

The Chesapeake Bay Division provides and maintains facilities and services for test, development and evaluation of radar, radio, and fire control equipment. It also services and supports all research projects conducted at the Chesapeake Beach and Tilghman Island complexes of NRL.

### The Physical Plant

Located in a relatively clear area away from any congestion or industrial interference, the main site, at Chesapeake Beach, covers 174.9 acres containing 197 structures of various size and construction, six of which are major laboratory buildings. There is over 200 ft of usable dock space with a water depth of 4 to 7 ft, located 2 mi north of the main site. Off-site facilities include the Tilghman Island Facility, located directly across the Bay from CBD at a distance of about 10 mi; the Theodolite House, at North Beach; and the Off-Shore Platform, approximately 2 mi southeast of CBD in the Bay.

Research watercraft available at CBD include one 60-ft catamaran, one 45-ft modified aviation rescue boat, and one 36-ft motor boat. These are used in support of research projects and for transportation between off-site facilities. Housing includes 24 public quarters.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR J.M. Fitts, USN	Division Officer
Mr. F.R. Theodore	Administrative Officer
Mr. K.V. Davis	Security Officer
BMCM F. McGinnis, USN	Operations Officer
Mr. R.M. Conlyn	Station Engineer

### Research Division Representatives

#### Optical Sciences Division

Mr. A.C. Grosvenor, High Energy Laser Facility Group  
Mr. T.H. Cosden, Applied Optics Branch

#### Radar Division

Mr. M.W. Lehman, Radar Geophysics Branch  
and Division Representative  
Mr. W.K. Fliss, ECCM Staff Representative  
Mr. P.W. Ward, Target Characteristics Branch

#### Plasma Physics Division

Mr. C.D. Porter, Hypervelocity Techniques Branch

### Personnel Complement

On Board: 92  
(Graded 39, Ungraded 51, Military 2)

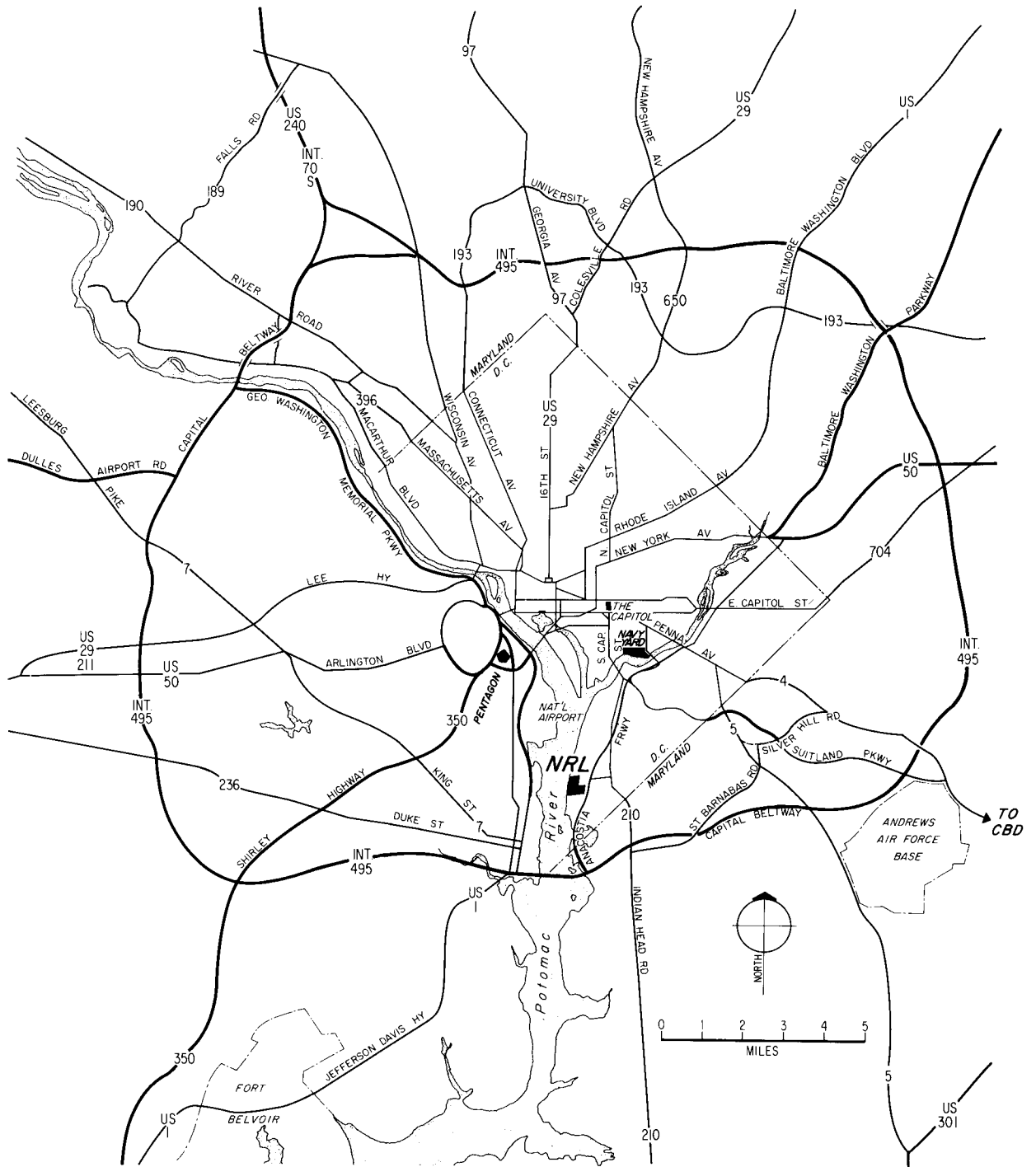
# Awards Received by Civilian Employees

As of June 1, 1972

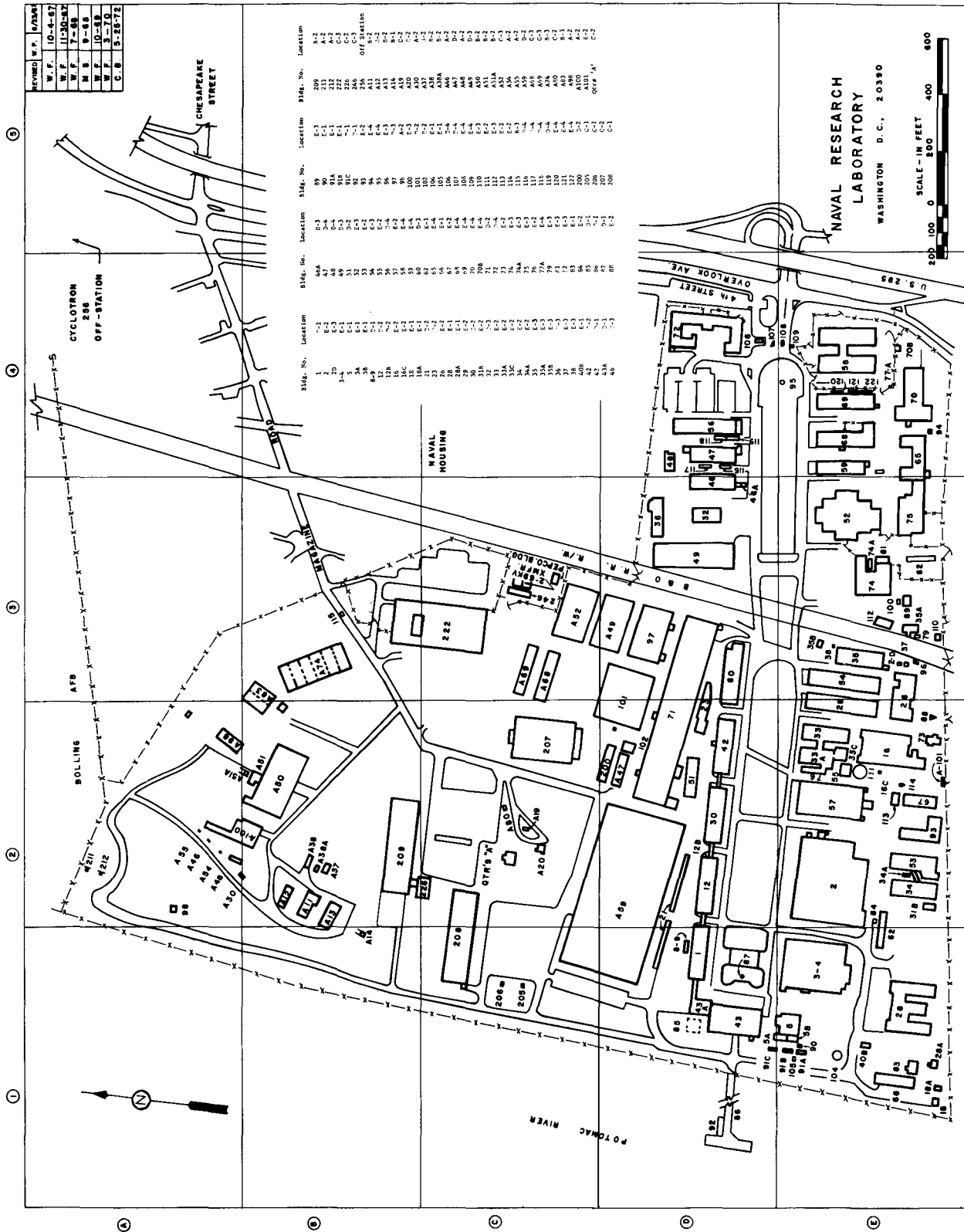
<u>Government Awards</u>	Number
The Medal of Merit from the President of the United States	1
The Certificate of Merit from the President of the United States	11
National Medal of Science from the President of the United States	1
The President's Award for Distinguished Federal Civilian Service	2
Department of Defense Distinguished Civilian Service Award	4
Department of Defense Certificate of Merit	1
Department of the Navy Award for Distinguished Achievement in Science	3
Navy Distinguished Civilian Service Award	59
Navy Captain Robert Dexter Conrad Award	4
Navy Superior Civilian Service Award (established 1959)	37
Navy Meritorious Civilian Service Award	195
E. O. Hulburt Annual Science Award (local NRL award)	17
<u>Non-Government Awards</u>	
Rockefeller Public Service Award	1
Henry Draper Medal of the National Academy of Sciences	1
Engineering Science Award of the Washington Academy of Sciences	2
Physical Sciences Award of the Washington Academy of Sciences	4
Mathematical Sciences Award of the Washington Academy of Sciences	1
Morris Liebmann Memorial Prize of the Institute of Electrical and Electronics Engineers	1
Medal of Merit Award of the Institute of Electrical and Electronics Engineers	2
Harry Diamond Award of the Institute of Electrical and Electronics Engineers	4
John Scott Medal of the City of Philadelphia	1
Patrons Award of the Institute of Electrical and Electronics Engineers (Washington section)	1
Reliability and Quality Control Award of the Radio Engineers Professional Group	1
Frederic Ives Award of the Optical Society of America	2
A. G. Bissell Memorial Award of the American Welding Society	1
Joseph S. Seaman Gold Medal Award of the American Foundrymen's Society	1
John A. Penton Gold Medal Award of the American Foundrymen's Society	1
Eisenman Medal of the American Society for Metals (Philadelphia Chapter)	1
Burgess Prize Award of the American Society for Metals	2
Burgess Memorial Lecture of the American Society for Metals (Washington Section)	1
Charles B. Dudley Medal of the American Society for Testing Materials	1
Sam Tour Award of the American Society for Testing Materials	1
Gold Medal Award of the American Society of Naval Engineers	2
Trent-Crede Award of the Acoustical Society of America	1
Society of Technical Writers and Publishers (Washington, D.C. Chapter)	1

<u>Non-Government Awards (Continued)</u>	Number
District Meritorious Certificate Award of the American Welding Society	1
Stuart Ballantine Medal of the Franklin Institute of Pennsylvania	1
A. K. Doolittle Award of the National American Chemical Society	1
Kendall Company Award of the American Chemical Society	1
Hillebrand Prize of the American Chemical Society	2
William Blum Award of the Washington-Baltimore Electrochemical Society	2
National Award of the American Society of Lubrication Engineers	1
Annual Award of the Society for Applied Spectroscopy	2
E. Edward Pendray Award of the American Rocket Society	1
James H. Wyld Memorial Award of the American Rocket Society	1
Space Science Award of the American Institute of Aeronautics and Astronautics	1
Eddington Medal of the Royal Astronomical Society (Great Britain)	1
Janssen Medal of the French Photographic Society	1
Ancel Prize of the French Photographic Society	1
Progress Award of the Photographic Society of America	1
Professional Achievement Award of the D. C. Council of Engineers and Architectural Studies	1
National Capital Award of the D. C. Council of Engineers and Architectural Studies	3
Award for Technical Achievement of the American Society of Mechanical Engineers	1
Mayo D. Hersey Award of the American Society of Mechanical Engineers	1
Service to Mankind Award of the Washington Sertoma Club	1
Pittsburgh Spectroscopy Award of the Spectroscopy Society of Pittsburgh	1
Pure Science Award of the Scientific Research Society of America (NRL Branch)	20
Applied Science Award of the Scientific Research Society of America (NRL Branch)	19
Arthur S. Fleming Award of the Washington Chamber of Commerce	3
Society of Women Engineers Achievement Award	1
Notre Dame Centennial of Science Award	2
M. Barry Carlton Award - Institute of Electrical and Electronics Engineers	1
National Civil Service League Merit Citation	1
Brazilian Ordem do Merito Naval (Legion of Naval Merit) Cavaleiro	1
Outstanding Americans Foundation	1
Frank Booth Award - International Power Sources Symposium	1
Kratel Award of the Eurocontamination Foundation	1
Burgess Memorial Award of the American Society for Metals	1
Award of Merit of the American Society for Testing and Materials	1
John Adam Fleming Award by the American Geophysical Union of the National Academy of Science—National Research Council	1
Marcus A. Grossmann Award of the American Society of Metals	1
Victor K. LaMer Award for Outstanding Graduate Research in Colloid and Surface Chemistry	1

# Location of NRL

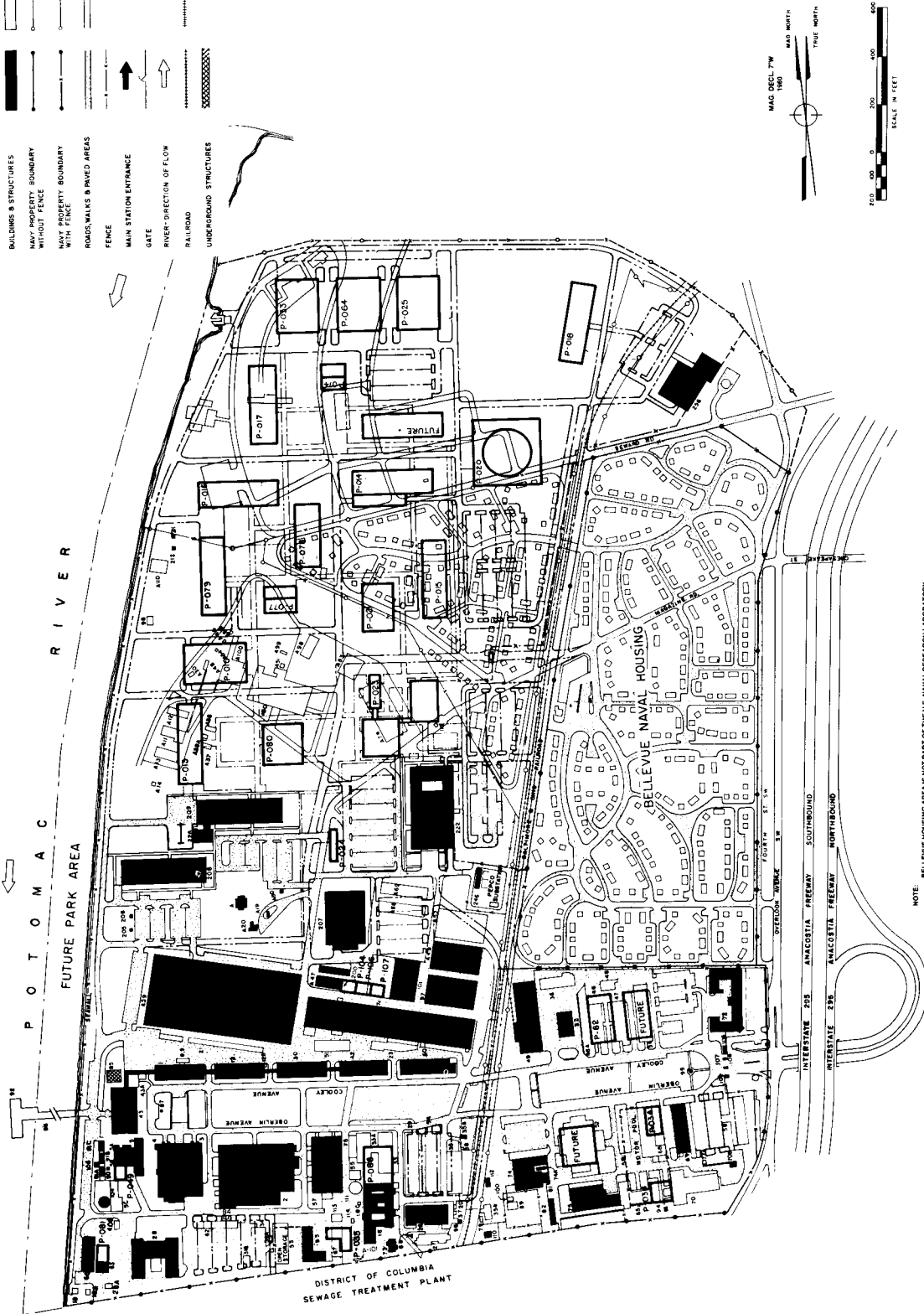


# Location of Buildings at Main Site



# General Development Plan

LEGEND	EXISTING TO REMAIN	EXISTING TO BE REMOVED	PLANNED
BUILDINGS & STRUCTURES			
NAVY PROPERTY BOUNDARY WITHOUT FENCE			
NAVY PROPERTY BOUNDARY WITH FENCE			
ROADS, WALKS & PARKED AREAS			
FENCE			
MAIN STATION ENTRANCE			
GATE			
RIVER-DIRECTION OF FLOW			
RAILROAD			
UNDERGROUND STRUCTURES			



NOTE:  
 BELLEVUE HOUSING AREA IS NOT PART OF THE U.S. NAVAL RESEARCH LABORATORY  
 DISTRICT OF COLUMBIA SEWAGE TREATMENT PLANT IS NOT PART OF THE RESEARCH  
 LONG 77°03' 00" W. LAT. 38°48' 30" N. AT THOMAS EDISON MONUMENT. STRUCTURE #45  
 MAP GRID IS BASED ON TRUE NORTH.

# Listing of NRL Sites and Facilities

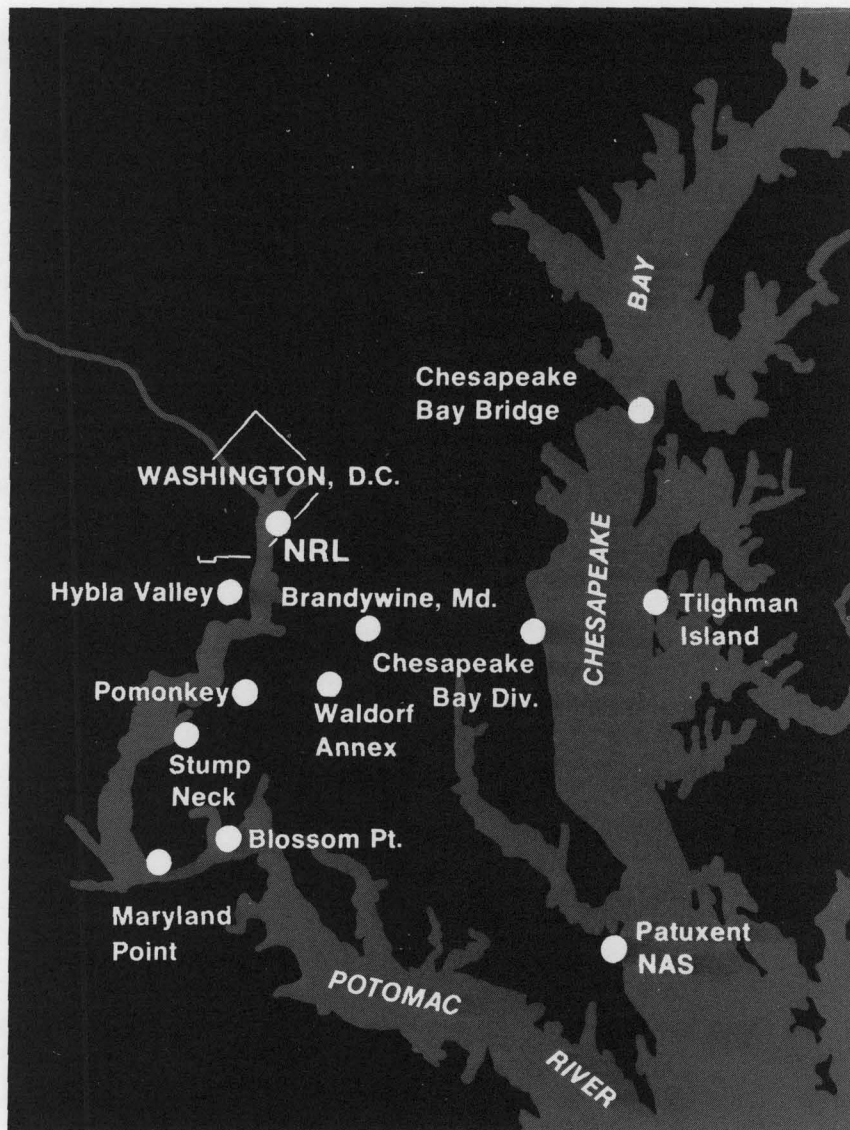
September 30, 1972

<u>Station and Location</u>	<u>Acreage</u>			<u>Class I &amp; II Plant Account</u>	
	<u>Fee Title</u>	<u>Easement or Purchase</u>	<u>Permit or Lease</u>	<u>Value</u>	<u>No. of Buildings and Structures</u>
Naval Research Laboratory, Washington, D.C.	129.23		1.29	57,619,841	153
Radio Research Site, Blue Plains, D.C.			0.30		
Cyclotron Building Site Bolling Air Force Base, D.C.			5.24	3,606,621	1
Radio Research Site Coast Guard Radio Station, Alexandria, Va.			55.40		
Radio Test Area, Hybla Valley, Va.	1,262.46			60,000	
A&A Test Site, Shenandoah National Park Luray, Va.			NA		
Coast Guard Station, Va. Beach			NA		
NRL Flight Support Detachment, Naval Air Station, Patuxent River, Md.			NA		
Chesapeake Bay Division, Chesapeake Beach, Md.	174.90			10,375,430	184
Multiple Research Site, Tilghman Island, Md.	2.00			110,662	9
Dock Facility, Chesapeake Bay, Md.			0.60	18,533	5
Theodolite Station, North Beach, Md.			0.29	800	1
Tunnel under Maryland State Road 261			NA		
Optics Research Platform in the Chesapeake Bay, Md.			0.23	1,500	2
Research Platform, Chesapeake Bay Bridge, Md.				21,400	1
2 Foghorn Platforms, Chesapeake Bay Bridge, Md.			NA		
Research Gondola, Chesapeake Bay Bridge, Md.			NA		
NRL Waldorf Annex, Md.	23.94	35.16		1,217,707	35
Radio Astronomy Observatory, Maryland Point, Md.	24.30		197.88	247,002	12
Radio Antenna Range, USAF Receiver Site, Brandywine, Md.			22.98		
Radio Research Site, Stump Neck Annex, Naval Ordnance Station, Indian Head, Md.			5.90		
Free Space Antenna Range, Pomonkey, Md.	14.12	28.40		736,508	12
Navy Radio Research Station Sugar Grove, West Va.				74,091	2
Satellite Tracking Facility, Blossom Point, Md.			23.00		
Edgewood Arsenal, Md.			NA		
Coast Guard Station, Cove Light Station, Md.			NA		
*Satellite Tracking Station, Roma, Texas	27.84	1.00		725,239	5
*Satellite Tracking Station, Raymondville, Texas	171.55	2.85		1,206,770	16
Underwater Sound Reference Division, Orlando, Fla.	10.46			1,242,389	32
USRD, Leesburg Facility, Bugg Spring, Fla.			6.92	167,067	7
Marine Corrosion Laboratory, Key West, Fla.			NA		
*Underwater Track Facility Argus Island (near Bermuda)			NA		
<b>Totals:</b>	<u>1,840.80</u>	<u>67.41</u>	<u>320.03</u>	<u>77,431,560</u>	

\*Now being screened for disposal

## Location of Principal Field Stations

Another station is located at Sugar Grove, W. Va. The Underwater Sound Reference Division is located at Orlando, Fla.



## Research Platforms

### Aircraft

1. The S2D (BUNO 149240) contains specially installed equipment and wing mounted pods for cloud physics research. It is also used in chaff research and for short-term experiments compatible with space limitations of the aircraft.
2. The EC-121K (BUNO 128324) is used for wave propagation studies in the four-frequency radar system.
3. The EC-121K (BUNO 135753) is used for research in cloud physics, ECM, low-frequency radar, and various projects requiring minimal aircraft conversion.
4. The EC-121K (BUNO 141297) is used mainly by the Tactical Electronic Warfare Division to experiment, evaluate, and improve Fleet electronic warfare capabilities.
5. The P3A (BUNO 149670) is primarily used for airborne radiometric studies and to a lesser degree for cloud physics and acoustic research.

### Available Ships

1. USNS MIZAR (T-AGOR-11) Under operational control of MSC LANT. Scheduled by NRL.
2. USNS HAYES (T-AGOR-16)  
(Will use the inherent catamaran design to accomplish oceanographic and acoustics research at sea)
3. USS X-1 (SSX-1) is a one-sixth scale research submarine used mainly for oceanographic research. It is under operational control of COMSUBLANT, but is scheduled by NRL.
4. Fleet units are regularly scheduled for NRL in support of CNO assigned projects by OPTEVFOR.

The Naval Research Laboratory has a continuing need for physical scientists, mathematicians, engineers, and supporting personnel. Vacancies are filled without regard to race, creed, color, sex, or national origin. Information concerning current vacancies will be gladly furnished upon request. Address all such inquiries to the Personnel Office (Code 1800), Naval Research Laboratory, Washington, D. C. 20375.

