The NRL Fact Book is a reference source for information about the Naval Research Laboratory (NRL). It is updated and placed on NRL’s Web site (http://www.nrl.navy.mil) annually. It is printed every other year. To provide additional information to the reader, a point of contact is listed for each activity.

NRL has a continuing need for physical scientists, mathematicians, engineers, and support personnel. Vacancies are filled without regard to age, race, creed, sex, or national origin. Information concerning current vacancies is furnished on request. Address all such inquiries to:

Human Resources Office
Personnel Operations Branch (Code 1810)
Naval Research Laboratory
Washington, DC 20375-5320

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Quick Reference Telephone Numbers

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<tr>
<th>Service</th>
<th>NRL Washington</th>
<th>NRL-SSC</th>
<th>NRL-Monterey</th>
<th>NRL-CBD</th>
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Introduction to the Naval Research Laboratory

Mission

To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems, and ocean, atmospheric, and space sciences and related technologies.

The Naval Research Laboratory

• Provides primary in-house research for the physical, engineering, space, and environmental sciences;

• Provides broadly based exploratory and advanced development programs in response to identified and anticipated DON needs;

• Provides broad multidisciplinary support to the Naval Warfare Centers;

• Provides space and space systems technology development and support; and

• Assumes responsibility as the Navy’s corporate laboratory.
The Naval Research Laboratory in the Department of the Navy

The Naval Research Laboratory is the Department of the Navy’s corporate laboratory, and it reports to the Chief of Naval Research. As the corporate laboratory of the Navy, NRL is the principal in-house component in the Office of Naval Research’s (ONR) effort to meet its science and technology responsibilities.

NRL has had a long and fruitful relationship with industry as a collaborator, contractor, and through Cooperative Research and Development Agreements (CRADAs). NRL values this linkage and continues to develop it.

NRL is an important link in the Navy Research, Development, and Acquisition (RD&A) chain. Through NRL, the Navy has direct ties with sources of fundamental ideas in industry and the academic community throughout the world and provides an effective coupling point to the R&D chain for ONR.
Current Research

The following areas represent broad fields of NRL research. Under each, more specific topics that are being investigated for the benefit of the Navy and other sponsoring organizations are listed. Some details of this work are given in the NRL Review, published annually. More specific details are published in reports on individual projects provided to sponsors and/or presented as papers for professional societies or their journals.

**Advanced Radio, Optical, and IR Sensors**
- Advanced optical sensors
- EM/EO/meteorological/oceanographic sensors
- Satellite meteorology
- Precise space tracking
- Radio/infrared astronomy
- Infrared sensors and phenomenology
- UV sensors and middle atmosphere research
- Image processing
- VLBI/astrometry
- Optical interferometry
- Imaging spectrometry
- Liquid crystal technology

**Autonomous Systems**
- Algorithms for control of autonomous systems
- Cognitive robotics
- Human-robot interaction
- Perception hardware and algorithms
- High-level reasoning algorithms
- Machine learning and adaptive algorithms
- Sensors for autonomous systems
- Power and energy for autonomous systems
- Networking and communications for mobile systems
- Swarm behaviors
- Test and evaluation of autonomous systems

**Computer Science and Artificial Intelligence**
- Standard computer hardware, development environments, operating systems, and run-time support software
- Methods of specifying, developing, documenting, and maintaining software
- Human-computer interaction
- Intelligent systems for resource allocation, signal identification, operational planning, target classification, and robotics
- Parallel scientific libraries
- Algorithms for massively parallel systems
- Digital progressive HDTV for scientific visualization
- Adaptive systems: software and devices
- Advanced computer networking
- Simulation management software for networked high performance computers
- Interactive 3D visualization tools and applications
- Real-time parallel processing
- Scalable, parallel computing
- Petaflop computing, globally distributed file systems, terabit-per-second networking

**Directed Energy Technology**
- High-energy lasers
- Laser propagation
- Solid-state and fiber lasers
- High-power microwave sources
- RAM accelerators
- Pulse detonation engines
- Charged-particle devices
- Pulse power
- DE effects

**Electronic Electro-optical Device Technology**
- Integrated optics
- Radiation-hardened electronics
- Nanotechnology
- Microelectronics
- Microwave and millimeter-wave technology
- Hydrogen masers for GPS
- Aperture syntheses
- Electric field coupling
- Vacuum electronics
- Focal plane arrays
- Infrared sensors
- Radiation effects and satellite survivability
- Molecular engineering

**Electronic Warfare**
- EW/C2W/IW systems and technology
- COMINT/SIGINT technology
- EW decision aids and planning/control systems
- Intercept receivers, signal processing, and identification systems
- Passive direction finders
- Decoys and offboard countermeasures (RF and IR)
- Expendable autonomous vehicles/UAVs
- Repeaters/jammers and EO/IR active countermeasures and techniques
- Platform signature measurement and management
- Threat and EW systems computer modeling and simulations
- Visualization
- Hardware-in-the-loop and flyable ASM simulators
- Missile warning infrared countermeasures
- RF environment simulators
- EO/IR multispectral/hyperspectral surveillance

**Enhanced Maintainability, Reliability, and Survivability Technology**
- Coatings
- Friction/wear reduction
- Water additives and cleaners
Fire safety
Laser hardening
Satellite survivability
Corrosion control
Automation for reduced manning
Radiation effects
Mobility fuels
Chemical and biological sensors
Environmental compliance

Environmental Effects on Naval Systems
Meteorological effects on communications
Meteorological effects on weapons, sensors, and platform performance
Air quality in confined spaces
Electromagnetic background in space
Solar and geomagnetic activity
Magnetospheric and space plasma effects
Nonlinear science
Ionospheric behavior
Oceanographic effects on weapons, sensors, and platforms
EM, EO, and acoustic system performance/optimization
Environmental hazard assessment
Contaminant transport
Biosensors
Microbially induced corrosion

Imaging Research/Systems
Remotely sensed signatures analysis
Real-time signal and image processing algorithms/systems
Image data compression methodology
Image fusion
Automatic target recognition
Scene/sensor noise characterization
Image enhancement/noise reduction
Scene classification techniques
Radar and laser imaging systems studies
Coherent/incoherent imaging sensor exploitation
Remote sensing simulation
Hyperspectral imaging
Microwave polarimetry

Information Technology
High-performance, all-optical networking
Antijam communication links
Next-generation, signaled optical network architectures
Integrated voice and data
Information security (INFOSEC)
Voice processing
High performance computing
High performance communications
Requirements specification and analysis
Real-time computing
Wireless mobile networking
Behavior detection
Machine learning

Information filtering and fusion
Integrated internet protocol (IP) and asynchronous transfer mode (ATM) multicasting
Reliable multicasting
Wireless networking with directional antennas
Sensor networking
Communication network simulation
Bandwidth management (quality of service)
High assurance software
Distributed network-based battle management
High performance computing supporting uniform and nonuniform memory access with single and multithreaded architectures
Distributed, secure, and mobile information infrastructures
Simulation-based virtual reality
High-end, progressive HDTV imagery processing and distribution
Defense information warfare
Virtual reality/mobile augmented reality
3D multimodal interaction
Model integration (physical, environmental, biological, psychological) for simulation
Command decision support
Data fusion

Marine Geosciences
Marine seismology, including propagation and noise measurement
Geoacoustic modeling in support of acoustic performance prediction
Geomagnetic modeling in support of nonacoustic system performance prediction
Static potential field measurement and analysis (gravity and magnetic) in support of navigation and geodesy
Geotechnology/sediment dynamics affecting mine warfare and mine countermeasures
Foreshore sediment transport
Geospatial information, including advanced seafloor mapping, imaging systems, and innovative object-oriented digital mapping models, techniques, and databases

Materials
Superconductivity
Magnetism
Biological materials
Materials processing
Advanced alloy systems
Solid free-form fabrication
Environmental effects
Energetic materials/explosives
Aerogels and underdense materials
Nanoscale materials
Nondestructive evaluation
Ceramics and composite materials
Thin film synthesis and processing
Electronic and piezoelectric ceramics
Thermoelectric materials
Active materials and smart structures
Computational material science
Paints and coatings
Flammability
Chemical/biological materials
Spintronic materials and half metals
Biomimetic materials
Multifunctional materials
Power and energy
Synthetic biology

**Meteorology**

Global, theater, tactical-scale, and on-scene numerical weather prediction
Data assimilation and physical initialization
Atmospheric predictability and adaptive observations
Adjoint applications
Marine boundary layer characterization
Air/sea interaction; process studies
Coupled air/ocean/land model development
Tropical cyclone forecasting aids
Satellite data interpretation and application
Aerosol transport modeling
Meteorological applications of artificial intelligence and expert systems
On-scene environmental support system development/nowcasting
Tactical database development and applications
Meteorological tactical decision aids
Meteorological simulation and visualization

**Ocean Acoustics**

Underwater acoustics, including propagation, noise, and reverberation
Fiber-optic acoustic sensor development
Deep ocean and shallow water environmental acoustic characterization
Undersea warfare system performance modeling, unifying the environment, acoustics, and signal processing
Target reflection, diffraction, and scattering
Acoustic simulations
Tactical decision aids
Sonar transducers
Dynamic ocean acoustic modeling
Underwater acoustic communications

**Oceanography**

Oceanographic instrumentation
Open ocean, littoral, polar, and nearshore oceanographic forecasting
Shallow water oceanographic effects on operations
Modeling, sensors, and data fusion
Bio-optical and fine-scale physical processes
Oceanographic simulation and visualization
Coastal scene generation
Waves, tides, and surf prediction
Coupled model development

**Space Systems and Technology**

Space systems architectures and requirements
Advanced payloads and optical communications
Controllers, processors, signal processing, and VLSI
Precision orbit estimation
Onboard autonomous navigation
Satellite ground station engineering and implementation
Tactical communication systems
Spacecraft antenna systems
Launch and on-orbit support
Precise Time and Time Interval (PTTI) technology
Atomic time/frequency standards/instrumentation
Passive and active ranging techniques
Design, fabrication, and testing of spacecraft and hardware
Structural and thermal analysis
Attitude determination and control systems
Reaction control
Propulsion systems
Navigation, tracking, and orbit dynamics
Spaceborne robotics applications

**Surveillance and Sensor Technology**

Point defense technology
Imaging radars
Surveillance radars
Multifunction RF systems
High-power millimeter-wave radar
Target classification/identification
Airborne geophysical studies
Fiber-optic sensor technology
Undersea target detection/classification
EO/IR multispectral/hyperspectral detection and classification
Sonar transducers
Electromagnetic sensors, gamma ray to RF wavelengths
SQUID for magnetic field detection
Low observables technology
Ultrawideband technology
Interferometric imagery
Microsensor system
Digital framing reconnaissance canvas
Biologically based sensors
Digital radars and processors

**Undersea Technology**

Autonomous vehicles
Bathymetric technology
Anechoic coatings
Acoustic holography
Unmanned undersea vehicle dynamics
Weapons launch
Major Research Capabilities and Facilities

Institute for Nanoscience (Code 1100)

- **Clean room (5000 sq ft), quiet (4000 sq ft), and ultra-quiet (1000 sq ft) laboratories**
- **35 dB and 25 dB acoustically isolated zones**
- **20°C ± 0.5°C and 0.1°C controlled temperature zones**
- **Vibration isolation**
  - Vertical (mm, pp) <0.1 @ 70–500 Hz
  - Horizontal (mm, pp) <0.1 @ 70–500 Hz
- Clean electrical power, free from SCR spikes and other interferences, and < ±10% voltage change
- **<0.5 mG at 60 Hz EMI**
- 45 ± 5% relative humidity
- **Class 100 clean room**
- Source of water meeting ASTM D5127 spec. Type E1.2

Clean Room Major Equipment

- Monitoring system (toxic gas, hazmat, temperature)
- Laminar flow wet benches for localized Class 1/10 ambient in clean room
- Air purification unit to remove local organic contamination
- DI water system
- Wire bonder
- Two electron-beam writers
- Two scanning electron microscopes
- Atomic force microscope
- Metallurgical optical microscopes
- 3D optical profiler
- Mask aligners (2, 1, and 0.2 μm)
- Electron beam evaporation systems
- Low pressure chemical vapor deposition (LPCVD) system
- Magnetron sputter deposition system
- Reactive ion etching systems
- Dual-beam focused ion beam workstation
- Optical pattern generating system
- Laser micromachining system
- Plasma-enhanced chemical vapor deposition (PECVD) system
- Plasma-enhanced atomic layer deposition system
- Chlorine reactive ion etching system
- Other Major Equipment
- Transmission electron microscope
- UHV multi-tip scanning tunneling microscope/nanomanipulator

Desert High Bay with a 40 ft by 14 ft area of sand 2.5 ft deep, and 18 ft high rock walls; high speed fans and variable lighting

Tropical High Bay, a 60 ft by 40 ft greenhouse, contains a re-creation of a southeast Asian rain forest with native plants; nominal 80 degrees temperature and 80% humidity; can generate rain events up to 6 in. per hour; Rainforest contains waterfall, stream, and pond

Outdoor test range is a 1/3 acre highland forest with a waterfall, stream and pond, and terrain of differing difficulty including large boulder structures and earthen berms

Sensor lab contains environmental chambers (small and walk-in) with maximum temperature range of −50°F to 375°F, relative humidity from 10% to 95% and for smaller chamber, barometric pressure of −9000 feet to 100,000 feet; lab also contains various fume hoods, biosafety cabinet, anechoic chamber, vapor generators, and other specialized equipment

Power and energy lab contains specialized equipment including a battery dry room, glove box, isolation room, and fume hoods

Research and Development Services Division (Code 3500)

- Military construction
- Research support engineering
- Planning
  - Full range of facility contracting, including construction, architect/engineering services, facilities support, and reserved parking
- Transportation
- Telephone services
- Maintenance and repair of buildings, grounds, and communication and alarm systems
- Shops for machining, sheet metal, carpentry, and welding
- Safety and Occupational Health/Industrial Hygiene
  - Explosives safety
- Environmental Program

Radar Division (Code 5300)

Shipboard radar research and development test beds:

- FlexDAR demonstration system (every element digital beamforming)
- AN/SPS-49-A(V)1
- S-Band radar waveform development testbed
- Airborne research radar facility, AN/APS-137D(V)5
- High Power 94 GHz radar system
- Ultra-high resolution radar (Microwave Microscope)
- Radar signature calculation facility
- Electromagnetic numerical computational facility
- Compact range and nearfield antenna measurement laboratory

Laboratory for Autonomous Systems Research (Code 1700)

Prototyping High Bay: (150 ft by 75 ft by 30 ft), contains real-time motion capture system, directional environmental sounds, GPS repeater and simulator

Four human-systems interaction labs contain eye trackers and mult大户, multitouch monitors

Littoral High Bay with 45 ft by 25 ft by 5.5 ft deep pool with 16-channel wave generator and slope that allows simulation of littoral environments; multiple sediment tanks (from 5 ft to 16 ft); GPS repeater and simulator; portable tank 4 ft by 36 ft
Electronic Protection (EP) and adaptive pulse compression (APC) testbed
Electronics and mechanical computer aided design facility
High Frequency (HF) Multiple-Input Multiple-Output (MIMO) testbed
HF Surface Wave Radar Testbed
Microwave and RF instrumentation laboratories

Information Technology Division
(Code 5500)
Extended Spectrum Experimentation Laboratory
Robotics and Autonomous Systems Laboratory
Immersive Simulation Laboratory
Warfighter Human-Systems Integration Laboratory
Audio Laboratory
Mobile and Dynamic Network Laboratory
Integrated Communications Technology Test Lab
General Electronics Environmental Test Facility
Key Management Laboratory
Crypto Technology Laboratory
Navy Cyber Defense Research Laboratory
Communications Security (COMSEC) Laboratory
Navy Shipboard Communications Testbed
Behavior Detection Laboratory
Virtual Reality Laboratory
Service Oriented Architecture Laboratory
Distributed Simulation Laboratory
Motion Imagery Laboratory
Laboratory for Large Data Research
Affiliated Resource Center for High Performance Computing
Ruth H. Hooker Research Library

Optical Sciences Division (Code 5600)
Optical probes laboratory to study viscoelastic, structural, and transport properties of molecular systems
Short-pulse excitation apparatus for kinetic mechanisms investigations
IR laser facility for optical characterization of semiconductors
Facilities for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers
Silica and IR fluoride/chalcogenide fiber fabrication facilities
Environmental testing of fiber sensors (acoustic, magnetic, electric field, etc.)
Laser diode pumped solid-state lasers
Mid-IR, low-phonon crystal growth facility
Infrared countermeasure techniques laboratory
Mobile, high-precision optical tracker
EO/IR technology/systems modeling and simulation capabilities
Field-qualified EO/IR measurement devices
Focal plane array evaluation facility
Facilities for fabricating and testing integrated optical devices
Panchromatic and multi- and hyperspectral digital imaging processing facilities
NRL P-3 aircraft sensor pallet
Airborne EO/IR and radar sensors
VNIR through SWIR hyperspectral systems
VNIR, MWIR, and LWIR high-resolution systems
Wideband SAR systems
RF and laser data links
High-speed, high-power photodetector characterization
Communication link characterization to >100 Gbps
RF phase noise, noise figure, and network analysis
Ultrahigh-speed A/O converters

Tactical Electronic Warfare Division
(Code 5700)
Visualization display room
Transportable step frequency radar
Vehicle development laboratory
Offboard test platform
Compact antenna range facility
Millimeter-Wave Antenna Range Facility
TEWD Mechanical Fabrication Shop
RFCM techniques development chamber facility
Low-power anechoic chamber
High-power microwave research facility
Electro-optics mobile laboratory
Infrared-electro-optical calibration and characterization laboratory
Infrared missile simulator and simulator development laboratory
Secure supercomputing facility
CBD/Tilghman Island IR field evaluation facility
Ultrashort pulse laser effects research and analysis laboratory
Central Target Simulator facility
Flying Electronic Warfare laboratory
High-power RF explosive laboratory
Classified material lay-up facility
Classified computing facilities
RF measurement laboratory
Wet chemistry laboratory
Ultra-near-field test facility
RF and millimeter-wave laboratory
Optical laboratory
Paint room
Secure laboratories for classified projects

Laboratories for Computational Physics and Fluid Dynamics (Code 6040)
1120-core x86 cluster
(3) 64-core SGI Altix systems
184-core x86 cluster
256-core SGI ICE
256-processor Opteron cluster
More than sixty SGI, Apple, and Intel workstations
Three-quarter-terabyte RAID disk storage systems
All computers and workstations have network connections to NICENET and ATDnet allowing access
to the NRL CCS facilities (including the DoD HPC resources) and many other computer resources both internal and external to NRL

**Chemistry Division (Code 6100)**

Synthesis/processing facilities
- Paint formulation and coating
- Functional polymers/elastomers/composites
- Nanotubes/Nanofibers
- Surface modification
- Thin film deposition/etching with in situ control
Marine Corrosion Facility (at Key West, FL)
Fire/Damage Control Test Facility (at Mobile, AL)
Wave pool (at Mobile, AL)
Large and small boat test platforms (at Mobile, AL)
Characterization facilities
- General-purpose chemical analysis/trace analysis
- Surface diagnostics
- Nanometer scale composition/structure/properties
- Magnetic resonance NDI
- Tribology
- Polymer structure/function/dynamics
Special-purpose capability
- Environmental monitoring/remediation
- Combustion and fire research
- Alternate and petroleum-derived fuels
- Trace explosive detection test beds
- Trace vapor generation and detection test beds
- Simulation/modeling
- Synchrotron radiation beam lines (at NSLS, Brookhaven, NY)
Pressurized test chambers (small, medium, large)

**Materials Science and Technology Division (Code 6300)**

Synthesis and Processing
- Hot and cold isostatic presses
- Isothermal heat treating facility
- Vacuum arc melting facility
- Rapid Solidification System
- Composites processing autoclave
- 200 keV ion-implantation facility
- Class 1000 clean room
- Metallic film deposition systems
- Laser direct write system
- Excimer laser film deposition facility
- Dip pen lithography
- 3D-printing of polymers
- Polymer synthesis and characterization
- Polymer extruder
- Channel reactors for fuels synthesis
- Tape caster
- Laser cutting facility
- Biomechanical surrogate fabrication facility
Physical Property Characterization
- Conductive AFM
- Magnetometry
- Cryogenic facilities
- High-field magnets

**Plasma Physics Division (Code 6700)**

Mercury, 6 MV, 360 kA, magnetically insulated inductive voltage adder
Gamble II, 1 MV, 1 MA pulsed power generator
HAWK, 1 MA inductive storage facility
Table-Top Terawatt (T³) laser system
Table-Top Ti: Sapphire Femtosecond Laser (TFL) systems (10 Hz and 1 kHz)
NIKE krypton fluoride laser facility
Space Physics Simulation Chamber
Plasma Applications Laboratory
Microwave facility for processing of advanced materials (2.45, 35, 83, and 60–120 GHz)
ELECTRA, test bed for high-rep 5 Hz KrF laser
Railgun Materials Testing Facility
Directed Energy Physics Facility
SWOrRD laser facility

**Electronics Science and Technology Division (Code 6800)**

Solar Cell Characterization Laboratory
Optoelectronic Scanning Electron Characterization Facility
Infrared Sensor Characterization Laboratory
Ultrafast Laser Facility
Millimeter-Wave Vacuum Electronics Fabrication Facility
Ultraviolet Photolithography Laboratory for Sub-millimeter-Wave Devices
Compound Semiconductor Processing Facility
Atomic Layer Deposition System
Epicenter
Laboratory for Advanced Materials Synthesis
Advanced Silicon Carbide Epitaxial Research Laboratory
High Pressure Laboratory

**Center for Bio/Molecular Science and Engineering (Code 6900)**

- Optical equipment
  - Confocal microscope
  - Raman microscope
  - UV-visible absorption spectrophotometers
  - Transmission electron microscope
  - Scanning electron microscope
  - Microscope/atomic force microscope
  - Nanosight (nanoparticle tracking analysis)
- Analytical instruments
  - Gas chromatography mass spectrometer
  - HPLC
  - LC/MS/MS system
  - FluoroMax-3 spectrofluorometer
  - Titration workstation
- General facilities
  - X-ray scattering
  - Cold room for storage and preparation
  - High-speed and microanalytical ultracentrifuges
  - Inert atmosphere dry box
  - NMR
  - FTIR
  - Ellipsometer
  - Dynamic mechanical analyzer
  - Differential scanning calorimeter
  - Circular dichroism
  - Minimill injection mold machine
  - Multi RF centrifuge
  - Perkin Elmer BioChip Arrayer I
  - Freeze-dry system
  - Affymetrix Gene Chip system
  - Surface plasmon resonance (SPR)
  - Isothermal calorimeter
  - High-resolution 3D Printer

**Acoustics Division (Code 7100)**

- Laboratory Measurements
  - One-million-gallon, vibration-isolated underwater acoustic holographic/3D laser vibrometer facility for studying structural acoustic phenomena
  - Large, sandy-bottom, acoustic holographic pool facility for investigating echo characteristics of underwater acoustic phenomena
  - In-air structural acoustics facility with high spatial density near-field acoustic holography and 3D laser vibrometry for diagnosing large structures, including aircraft interiors and rocket payload fairings
  - Salt water acoustic tank (20 ft by 20 ft by 10 ft deep) with environmental control and substantial optical access for studying the acoustics of bubbly media, acoustic metamaterials, and laser induced sound
  - Micro-Nanostructure Dynamics Laboratory to study the structural dynamics and performance of high Q oscillators and other micromechanical systems using laser Doppler vibrometers, super resolution nearfield scanning optical microscope, and low temperature calorimeter
  - Model Fabrication Laboratory to fabricate rough topographical surfaces in various materials for acoustic scattering and propagation studies and measurements.
  - Sonomagnetic Laboratory with doubly insulated Faraday cage for conducting experiments to measure weak electromagnetic fields generated by mechanical/acoustic vibrations of a conducting medium in an arbitrary magnetic field
- Seagoing Assets
  - Acoustic arrays (towed/moored/suspended)
  - 64-channel broadband source–receiver array with time-reversal mirror functionality over a frequency band of 500 to 3500 Hz
  - High-powered sound sources and source arrays
  - Autonomous acoustic sources
  - Acoustic communications array and data acquisition buoy
  - Portable, ocean-deployable synthetic aperture acoustic measurement system (100-meter rail with precise positioning)
  - Containerized, seagoing multichannel data acquisition system
  - High-speed, maneuverable towed body with MK-50 and synthetic aperture sonars to measure high frequency scattering and coherence

**Remote Sensing Division (Code 7200)**

- WindSAT satellite instrument (joint with Code 8000)
- WindSat processing facility
- Hyperspectral Imager for the Coastal Ocean (HICO) International Space Station (ISS) instrument
- Ground-based water vapor millimeter-wave spectrometer (WVMS)
- SAR processing facility
- SCI processing facility
- SEALAB
- SAP facility
- Hyperspectral imaging, sensors, and processing
- Optical remote sensing calibration lab/facility
- Navy Precision Optical Interferometer (NPOI)
NRL/NRAO 74 MHz Very Large Array long-wave radio receiver system
Free surface hydrodynamics laboratory (including a 10 m wave tank)
In-water lidar facility
Aerosol and field measurement facility
NRL RP-3A aircraft sensors
   Airborne polarimetric microwave imaging radiometer (APMIR)
Millimeter-wave imager
   Interferometric synthetic aperture radar (InSAR)
   Flight-level meteorological sensors
Visible/near infrared (VNIR) hyperspectral imaging systems
VNIR polarimetric multispectral imager
Short-wave IR (SWIR) hyperspectral imaging systems
Midwave infrared (MWIR) indium antimonide (InSb) imaging system
Long-wave infrared (LWIR) quantum well IR photodetector (QWIP) imaging system

Oceanography Division (Code 7300)
Towed sensor and advanced microstructure profiler systems for studying upper ocean fine and microstructure
Integrated absorption cavity and optical profiler systems for studying ocean optical characteristics
Self-contained bottom-mounted upward-looking acoustic profilers for measuring ocean variability
Acoustic Doppler profiler for determining ocean currents while under way
Remotely operated underwater vehicle (ROV)
Bottom-mounted acoustic Doppler profilers
Towed hyperspectral optical array
SCI processing facility
Satellite receiving stations for AVHRR, MODIS, DMSP, and JPASS ocean color processing facility
Environmental scanning electron microscope, confocal laser scanning microscope, and Inspect S low vacuum scanning electron microscope for detailed studies of biocorrosion in naval materials
Real-time Ocean Observations and Forecast Facility for monitoring and tracking of ocean physical and bio-optical conditions
Slocum Electric Gliders for performing wide-area ocean surveys of temperature, salinity, and optical characteristics
SCANFISH MKII, a towed undulating vehicle system, designed for collecting 3D TS profile data of the water column
Bottom-mounted Shallow water Environmental Profiler in Trawl-safe Real-time configuration (SEPTR) for measuring temperature, salinity, and optical parameters in addition to current profiles and pressure
Bio-optical Physical Pop-up Environmental Reconnaissance System to measure bio-optical and physical properties of the water column

Cytosense Scanning Flow Cytometer to identify individual phytoplankton and zooplankton for ecological model development and validation
Shipboard Lidar Optical Profiler to measure optical properties of the water
Raleigh Bernard Convective Tank and a Hybrid Underwater Camera for providing object detection and identification in extremely turbid underwater environments
Collaborative system for propagating environment error distributions through disparate dynamical systems

Marine Geosciences Division (Code 7400)
Airborne gravimetry, magnetics, and topographic measurements suite coupled with differential GPS yielding position accuracies of <1.0 meter
100 and 500 kHz sidescan sonar with 2–12 kHz chirp profiler and Cs magnetometer for seafloor characterization/imaging and shallow subbottom profiling
Deep-towed acoustic geophysical system operating at 220–1000 Hz characterizes subseaflor structure including gas clathrate accumulations and dissociation of methane hydrates
Acoustic seafloor classification system operating at 8–50 kHz provides underway, real-time prediction of sediment type and physical properties
Seafloor probes for measuring sediment pore water pressures, permeability, electrical resistivity, acoustic compressional and shear wave velocities and attenuations, and dynamic penetration resistance
300 kV transmission electron microscope with environmental cell for study of sediment fabric, especially impact of organic matter
Map data formatting facility compresses map information onto CD-ROM media for masters for use in aircraft digital moving map systems
Comprehensive geotechnical and geoacoustics laboratory capability
Airborne electromagnetic (AEM) bathymetry system
Ocean bottom magnetometer system
3D, multispectral, subbottom swath imaging system
Ocean bottom seismographs (OBS)
In situ sediment acoustic measurement system (IS-SAMS)
Instrumented mine shapes to measure hydrodynamics of free-fall in the water column, dynamics of deceleration in seafloor sediments, and rates and depths of scour burial
Hydrothermal plume imaging data acquisition and analysis system
Integrated digital databases analysis and display system for bathymetric, meteorological, oceanographic, geoacoustic, and acoustic data
Stereometric video image processing system for use in foreshore morphology measurement
Sediment gas-content sampler
Acoustic tomographic probes for surf zone sands and gassy muds
Computed tomography (CT) system and real-time radiography unit with a 0–225 keV @ 0–1 mA micro-focus X-ray tube and a 225 mm image intensifier
Patented Geospatial Information Data Base (GIDB™) for rapidly accessing disparate geospatial content on the Internet. http://dmap.nrlssc.navy.mil
Human-centered display design through the application of human factors principles in the design of geospatial displays (e.g., analysis of clutter in electronic displays)
GPS-based survey vehicles and equipment to measure foreshore and nearshore bathymetry (camera towers, jet ski, and push cart)
Geospatial lab for rapid 2D and 3D visualization, analysis, and prototyping
Small oscillatory flow tunnel to observe sediment dynamics under forcing from waves and currents
Tomographic particle image velocimetry system for three-dimensional volumetric velocity measurements of fluid flow

**Marine Meteorology Division (Code 7500)**
The USGODAE Data Server (Global Ocean Data Assimilation Experiment) for collection and broad distribution of near-real-time METOC data and higher-level products from Navy, DoD, and other providers to the global ocean and atmospheric research community
A Cray Xe-6 Supercomputer for numerical weather prediction systems development provided by the DoD High Speed Computing Modernization Program (HPCMP) through a Dedicated HPC Project Investment (DHPI) grant
Bergen Data Center with an extensive disk file storage capacity and research data tape backup/archival capability
Data visualization center for developing shipboard briefing tools, displaying individual and merged observations and model output, and integrating meteorological parameters into tactical simulations
Classified and unclassified radar and satellite data processing facility
Two Mobile Atmospheric Aerosol and Radiation Characterization Observatories (MAARCO) used to collect atmospheric data around the world
Technical research library
New Marine Meteorology Center for the Meteorological Applications Development Branch, Secure IT Facility, Division Administrative support, and Front Office Management Team

**Space Science Division (Code 7600)**
Development and test facilities for satellite, sounding rocket, and balloon instruments, to perform solar terrestrial, astrophysical, astronomical, solar, upper/middle atmospheric, and space environment sensing
Solar Coronagraph Optical Test Chamber (SCOTCH)
Vacuum Ultraviolet Calibration Facility (VUCF)
Gamma Ray Imaging Laboratory (GRIL)
Rocket Assembly and Checkout Facility
Neutron Characterization Laboratory
Semiautomatic Probe Station
Solar Irradiance Calibration Facility
Suborbital Instrument Assembly and Test Facility
SuperMISTI reconfigurable and adaptable standoff gamma ray and neutron radiation detection systems for detection of special nuclear material and other radiological/nuclear Weapons of Mass Destruction
Very high angular Resolution Imaging Spectrometer (VERIS) sounding rocket instrument
Helium Resonance Scattering in the Corona and Heliospheric (HERSCHEL) sounding rocket instrument
Remote Atmospheric and Ionospheric Detection System (RAIDS) International Space Station instrument
Michelson Interferometer for Global High-resolution Thermospheric Imaging (MIGHTI) satellite instrument
Extreme Ultraviolet Imaging Spectrometer (EIS) satellite instrument
Large Angle Spectrometric Coronagraph (LASCO) satellite instrument
Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI) satellite instrument suite
Solar Orbiter Heliospheric Imager (SoloHI) satellite instrument
Wide-field Imager (WISPR) satellite instrument
Compact Coronagraph (CCOR) satellite instrument
Special Sensor Ultraviolet Limb Imager (SSULI) satellite instrument
Winds Ions Neutrals Composition Suite (WINCS) small satellite instrument suite
Extensive computer-assisted data manipulation, interpretive, and theoretical capabilities for space science instrumentation operations, data imaging, and modeling
SECCHI Payload Operations Center (POC)
Fermi Gamma-ray Space Telescope (formerly GLAST) Science Analysis Center (SAC)
SoftWare for Optimization of Radiation Detectors (SWORD)
Mountain Wave Forecast Model (MWFM)
Mass Spectrometer and Incoherent Scatter Radar empirical atmospheric model (NRLMSISE)
Horizontal Wind Model (HWM)
Ground to Space empirical atmospheric model (G2S)
Navy Global Environmental Model (NAVGEM)
Integrating the Sun-Earth System for the Operational Environment (ISES-OE)

**Space Systems Development Department (Code 8100)**
Payload test facility and processor development laboratory
Laser communications and electro-optics laboratories
Tactical Technology Development Laboratory (TTDL)
Precision oscillator (clock) test facility
RF payload development laboratory with anechoic chamber
Precision high-frequency RF compact range anechoic chamber facility
Transportable ground station development, assembly, and test facility
Multiplatform FPGA/ASIC/VLSI development laboratory
Satellite telemetry, tracking, and satellite control at Blossom Point, MD
L/C/S/X-band fixed antenna resources
Connectivity to the Air Force Satellite Control Network (AFSCN)
Pomonkey field site: large antenna, space communications, and research facility
Midway Research Center space communications and research facility
Optical telescope facility

**Spacecraft Engineering Department (Code 8200)**

Chambers:
- Thermal-vacuum
- Acoustic reverberation
- Large, tapered horn, RF anechoic chamber
- EMI/EMC testing chamber

Facilities:
- Spacecraft high-reliability electronic and electrical rework facility
- Spacecraft electronic systems integration and test facility
- Radio frequency (RF) system development facility
- RF microcircuit fabrication clean room facility
- Large tapered horn RF anechoic chamber facility
- Frequency sources laboratory
- Shock and vibration test
- Clean rooms (multiple classes and sizes)
- Spacecraft fabrication and assembly
- Fuels testing
- Autoclave
- Space robotics laboratory
- Proximity operations testbed
- CAD/CAM
- Propulsion system welding
- Static loads test
- Star tracker characterization
- Spacecraft spin balance
- Modal analysis
- Computational astrodynamical simulation and visualization
### NRL Sites and Facilities

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<tr>
<th>SITE</th>
<th>ACREAGE</th>
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<td>NRL Scientific Development Squadron One (VXS-1), NAS Patuxent River*</td>
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<td>Chesapeake Bay Section and Dock Facility</td>
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<td>Chesapeake Beach*</td>
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<td>Mississippi</td>
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<td>Ex-USS Shadwell (LSD-15) Mobile Bay</td>
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<td>Decommissioned 457-ft vessel used for fire research</td>
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¹Per DON Facilities Asset Data System standard cost factors.
²NRL Accountable Property Acquisition Costs
*See maps in the General Information section (page 131).
**Key Personnel**

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<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Code</th>
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<tbody>
<tr>
<td>CAPT A.J Ferrari, USN</td>
<td>Commanding Officer</td>
<td>1000</td>
</tr>
<tr>
<td>Dr. J.A. Montgomery</td>
<td>Director of Research</td>
<td>1001</td>
</tr>
<tr>
<td>Mr. D.J. DeYoung</td>
<td>Executive Assistant to the Director of Research</td>
<td>1001.1</td>
</tr>
<tr>
<td>Ms. C.L. Downing</td>
<td>Head, Strategic Workforce Planning</td>
<td>1001.2</td>
</tr>
<tr>
<td>Dr. G. Sandhoo</td>
<td>Executive Assistant for Technology Deployment/STILO</td>
<td>1001.3</td>
</tr>
<tr>
<td>Dr. L. Slater</td>
<td>NRL Historian</td>
<td>1001.15</td>
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<tr>
<td>CAPT K. Szczublewski, USN</td>
<td>Chief Staff Officer / Inspector General</td>
<td>1002/1000.1</td>
</tr>
<tr>
<td>Ms. B.L. Gibson*</td>
<td>Command Management Review</td>
<td>1000.12</td>
</tr>
<tr>
<td>Dr. R.C. Manak</td>
<td>Head, Office of Technology Transfer</td>
<td>1004</td>
</tr>
<tr>
<td>Ms. M.E. Dixon</td>
<td>Head, Office of Program Administration and Policy Development</td>
<td>1006</td>
</tr>
<tr>
<td>Mr. J.N. McCutcheon</td>
<td>Head, Office of Counsel</td>
<td>1008</td>
</tr>
<tr>
<td>Mr. R.L. Thompson</td>
<td>Head, Public Affairs Office</td>
<td>1030</td>
</tr>
<tr>
<td>Dr. E.S. Snow*</td>
<td>Director, Institute for Nanoscience</td>
<td>1100</td>
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<tr>
<td>Mr. T. Brewer</td>
<td>Head, Command Support Division</td>
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<tr>
<td>CDR D.A. Ursini, USN*</td>
<td>Head, Military Support Division</td>
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<tr>
<td>CDR J. Plaisance, USN</td>
<td>Commanding Officer, Scientific Development,</td>
<td>1600</td>
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<tr>
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<td>Squadron One (VXS-1)</td>
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<tr>
<td>Mr. A.C. Schultz*</td>
<td>Director, Laboratory for Autonomous Systems Research</td>
<td>1700</td>
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<tr>
<td>Ms. C.L. Downing*</td>
<td>Director, Human Resources Office</td>
<td>1800</td>
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<tr>
<td>Ms. L.L. Hill</td>
<td>Deputy Equal Employment Opportunity Officer</td>
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<tr>
<td>Vacant</td>
<td>Deputy for Small Business</td>
<td>3005</td>
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<tr>
<td>Mr. K.J. Pawlovich</td>
<td>Head, Safety Branch</td>
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</tr>
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</table>

*Acting

*Additional Duty
EXECUTIVE DIRECTORATE

Code 1000 and Code 1001

The Commanding Officer (Code 1000) and the Director of Research (Code 1001) share executive responsibility for the management of the Naval Research Laboratory. In accordance with Navy requirements, the Commanding Officer is responsible for the overall management of the Laboratory and exercises the usual functions of command including compliance with legal and regulatory requirements, liaison with other military activities, and the general supervision of the quality, timeliness, and effectiveness of the technical work and of the support services.

The Commanding Officer delegates line authority and assigns responsibility to the Director of Research for the Laboratory’s technical program, its planning, conduct, and staffing; evaluation of the technical competence of personnel; liaison with the scientific community; selection of subordinate technical personnel; exchange of technical information; and the effective execution of the NRL mission.

Within the limits of Navy regulations, the Commanding Officer and the Director of Research share authority and responsibility for the internal management of the Laboratory. The Commanding Officer retains all authority and responsibility specifically assigned to him by higher authority.

The mission of the Laboratory is carried out by three science and technology directorates and the Naval Center for Space Technology, supported by the Business Operations Directorate and the Executive Directorate. In addition, the Laboratory’s operating staffs provide assistance in their special fields to the Commanding Officer and to the Director of Research. The operating staffs are listed on the following pages of this publication.
Captain Mark Bruington is the 38th Commanding Officer of the Naval Research Laboratory, assuming command on August 1, 2014. As NRL’s Commanding Officer, he directs the activities of more than 2,500 scientists, engineers, and support personnel in their mission to conduct leading-edge research and provide new technological capabilities to the Navy and Marine Corps. Prior to his assumption of command of NRL, he was the Principal Director, Programs at the Defense Security Cooperation Agency where he led a team charged with DoD humanitarian assistance, building partnership capacity and Foreign Military Training and Equipping U.S. partner nations.

Captain Bruington, a native of California, received his commission through the Aviation Officer Candidate School program after graduating from San Francisco State University with a B.S. in physics. He received his Wings of Gold at NAS Beeville, Texas, in 1992 and is a graduate of the United States Naval Test Pilot School, Class 117, in 2000. He also holds an M.S. in systems engineering from Johns Hopkins University and an M.S. in national resource strategy from the Industrial College of the Armed Forces (ICAF).

His sea tours include an assignment in the A-6 Intruders with VA-165, “The Boomers,” aboard USS Nimitz (CVN 68) in support of Operation Southern Watch. Following the decommissioning of the A-6E, Captain Bruington transitioned to the F-14 Tomcat. He next reported to VF-11, “The Red Rippers,” aboard the USS John C. Stennis (CVN 74) for its maiden, around-the-world cruise, again in support of Operation Southern Watch. Following the events of September 11th, Captain Bruington joined VF-211, “The Fighting Checkmates,” again aboard USS John C. Stennis, in the initial phases of Operation Enduring Freedom, where he led numerous strikes in support of coalition troops in Afghanistan. Following his Department Head tour in VF-211, Captain Bruington transitioned to the Aerospace Engineering Duty Officer community.

His shore tours include attendance at United States Naval Test Pilot School (USNTPS), and upon graduation, he reported to Air Test and Evaluation Squadron 23 (VX-23) as the squadron’s Safety Officer and F-14 project officer. At VX-23 he worked on numerous F-14 and F/A-18 A-F projects including F-14 digital flight controls systems, envelope expansion and LANTIRN pod integration. His next shore assignment was as the senior fixed wing instructor at USNTPS where he led curriculum development and was integral in the introduction of the F/A-18 Hornet out-of-control flight syllabus implemented at all F/A-18 Fleet Replacement Squadrons. He next spent three years in the F-35 Lightning II Joint Strike Fighter program office as the Vehicle Systems Integrated Product Team (IPT) lead. He was responsible for developing the F-35 A/B/C flight controls, propulsion integration, aircraft subsystems and all aircrew systems. He led his IPT through three F-35 Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs), directly leading to the flight clearances and first flights of the F-35A Conventional Take-Off and Landing (CTOL) and F-35B Short Take-Off and Vertical Landing (STOVL) variants. Following this tour, he attended ICAF where he earned distinguished graduate honors. Following his tour at ICAF, he was assigned as the “Deputy CAG,” as part of the OPNAV N88 staff, responsible for development of requirements and budget submissions for all Naval tactical aircraft, E-2/C-2, unmanned combat air systems and weapons programs across the Naval Aviation Enterprise. Following his tour on the Navy staff, Captain Bruington next served as the Deputy Program Manager for the F/A-18 E/F and EA-18G air vehicle and Royal Australian Air Force (RAAF) F/A-18F programs as part of Program Manager AIR (PMA) 265 in NAS Patuxent River, Maryland. He led a diverse team of over 1,000 government and industry professionals to execute a $2.7B annual budget, delivering 40-plus Super Hornets and Growlers to the fleet each year. He was also instrumental in the final delivery of all 24 F/A-18F aircraft to the RAAF.

Captain Bruington has flown more than 70 combat missions above Iraq and Afghanistan, flown 41 different types of aircraft while amassing 3,200 flight hours and over 500 carrier-arrested landings. His decorations include the Defense Meritorious Service Medal, Meritorious Service Medal, four Air Medals (Strike/Flight), and numerous personal, campaign, and unit level awards.
Dr. John A. Montgomery joined the Naval Research Laboratory in 1968 as a research physicist in the Advanced Techniques Branch of the Electronic Warfare Division, where he conducted research on a wide range of Electronic Warfare (EW) topics. In 1980, he was selected to head the Off-Board Countermeasures Branch. In May 1985, he was appointed to the Senior Executive Service and was selected as Superintendent of the Tactical Electronic Warfare Division. He has been responsible for numerous systems that have been developed/approved for operational use by the Navy and other services. He has had great impact through the application of advanced technologies to solve unusual or severe operational deficiencies noted during world crises, most recently in Afghanistan, Iraq, and for Homeland Defense and in the Pacific theater. Dr. Montgomery has accumulated 45 years of civilian service to-date at the Naval Research Laboratory.

Dr. Montgomery received the Department of Defense Distinguished Civilian Service Award in 2001. He was recognized by the Department of the Navy Distinguished Civilian Service Award in 1999 and by the Department of the Navy Meritorious Civilian Service Award in 1986. As a member of the Senior Executive Service, he received the Presidential Rank Award of Distinguished Executive in 1991 and again in 2002, and the Presidential Rank Award of Meritorious Executive in 1988, 1999 and again in 2007. He also received the 1997 Dr. Arthur E. Bisson Prize for Naval Technology Achievement, awarded by the Chief of Naval Research in 1998. Further, he has received the Association of Old Crows (Electronic Defense Association) Joint Services Award in 1993. He was an NRL Edison Scholar, and is a member of Sigma Xi. He served as the U.S. National Leader of The Technical Cooperation Program’s multinational Group on Electronic Warfare from 1987 to 2002, and served as its Executive Chairman. In 2006, Dr. Montgomery received the Laboratory Director of the Year award from the Federal Laboratory Consortium for Technology Transfer, and in 2011, he received the Roger W. Jones Award for Executive Leadership from American University’s School of Public Affairs. In 2013, he was elected to membership in the National Academy of Engineering.

Dr. Montgomery received his bachelor’s of science degree in physics from North Texas State University in 1967 and his master’s degree, also in physics, in 1969. He received his PhD in physics from the Catholic University of America in 1982. As Director of Research at the Naval Research Laboratory, Dr. Montgomery oversees research and development programs with expenditures of approximately $1.2 billion per year.
The Executive Council consists of executive, management, and administrative personnel. Executive Council members include the following:

- Commanding Officer, Chairperson
- Director of Research
- Executive Assistant to the Director of Research
- Associate Directors of Research
- Chief Staff Officer
- Director, Naval Center for Space Technology
- Associate Director, Naval Center for Space Technology
- Heads of Divisions
- Director, Laboratories for Computational Physics and Fluid Dynamics
- Director, Center for Bio/Molecular Science and Engineering
- Director, Human Resources Office
- Public Affairs Officer
- Deputy Equal Employment Opportunity Officer
- Administrative Resources Manager
- Head, Office of Program Administration and Policy Development
- Safety Officer
- Head, Office of Counsel
- Head, Office of Technology Transfer
- Head, Management Information Systems Staff
- Head, Office of Research Support Services
- Representative, Administrative Advisory Council
- Director, Institute for Nanoscience
- Director, Laboratory for Autonomous Systems Research
The Research Advisory Committee advises the Commanding Officer and the Director of Research on scientific programs and the administration of the Laboratory. The committee assists in planning the long-range scientific program, coordinating the scientific work, reviewing the budget, accepting or modifying problems, considering personnel actions, and initiating such studies as may be necessary or desirable. The membership consists of the following:

Director of Research, Chairperson
Commanding Officer
Associate Directors of Research
Director, Naval Center for Space Technology
Chief Staff Officer (Observer)
Chief Staff Officer/Inspector General  
Code 1002/1000.1  
The Chief Staff Officer serves as the Deputy to the Commanding Officer and acts for the Commanding Officer in his absence. The Command Support Division (Code 1200), the Military Support Division (Code 1400), and the Scientific Development Squadron One (VXS-1) (NAS Patuxent River, MD, Code 1600) report directly to the Chief Staff Officer. When directed, the Laboratory’s Inspector General investigates, inspects, and/or inquires into matters that affect the operation and efficiency of NRL. These matters include but are not limited to: effectiveness, efficiency, and economy; management practices; and fraud, waste, and abuse. He serves as principal advisor to the Commanding Officer on all inspection matters and audits and is the principal point of contact and liaison with all agencies outside NRL.

Public Affairs Officer  
Code 1030  
The Public Affairs Officer (PAO) advises the Commanding Officer and Director of Research on public affairs matters, including external and internal relations and community outreach, and serves as the Commanding Officer’s principal assistant in the area of public affairs. To do this, the PAO plans and directs a program of public information dissemination on official NRL activities. The PAO coordinates responses to requests from the news media and the public for unclassified information or materials dealing with the Laboratory, coordinates participation in community relations activities, and directs the internal information programs. The PAO is also responsible for coordinating all actions within the Laboratory that respond to requirements of the Freedom of Information Act (FOIA).

Deputy Equal Employment Opportunity Officer  
Code 1830  
The Deputy Equal Employment Opportunity Officer (DEEOO) is the EEO program manager and the advisor to the Commanding Officer on all EEO matters. The DEEOO manages the discrimination complaint and reasonable accommodation processes and directs the Laboratory’s affirmative action plans and special emphasis programs (Federal Women’s, Hispanic Employment, African American Employment, Asian-Pacific Islanders, American Indian Employment, Individuals with Disabilities, including Disabled Veterans). The DEEOO recruits quality candidates for those areas when underrepresentation exists. Duties also include reviewing, coordinating, and monitoring implementation of EEO policies and developing local guidance, directives, and implementation procedures for the EEO programs.
Basic Responsibilities

The Technology Transfer Office (TTO) is responsible for NRL’s implementation of the Federal Technology Transfer Act of 1986 (Public Law 99-502). The law requires the transfer of Government innovative technologies to industry for commercialization as products and services for public benefit. TTO negotiates Cooperative Research and Development Agreements (CRADAs) under which NRL investigators collaborate with investigators from industry, academia, state or local governments, or other Federal agencies to develop NRL technologies for government and/or commercial use. It markets NRL’s patented inventions, negotiates patent license agreements under which the Navy grants a licensee the right to make, use, and sell NRL inventions (in exchange for receiving licensing fees and a percentage of sales), and enforces licenses to assure diligence in commercialization efforts.

Personnel: 5 full-time civilian; 1 SCEP student

Key Personnel

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<tr>
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<tr>
<td>Sr. Licensing Associate</td>
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<td>Sr. Licensing Associate</td>
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<td>Management Analyst</td>
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<tr>
<td>Administrative Assistant (SCEP)</td>
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Point of contact: Code 1004, (202) 767-7229
Basic Responsibilities

The Office of Program Administration and Policy Development provides managerial, technical, and administrative support to the Director of Research (DOR) in such areas as program and policy development, intra-Navy and inter-Service Science and Technology (S&T) program coordination; liaison with other Navy, DoD, and government activities on matters of mutual concern; and support to the Executive Directorate in planning and directing NRL’s S&T (6.1, 6.2) program. Specific functions include: monitoring and providing background information on technical and policy matters that come under the purview of the DOR; representing NRL, ONR, and/or the Navy on tri-Service or DoD-wide coordination matters; performing special studies or chairing ad hoc study groups regarding program decisions or policy positions; performing special studies involving major NRL programs and resource issues; providing administrative support in the areas of personnel, budget, facilities, equipment, and security; providing executive management information and analyses for various aspects of the S&T program effort; coordinating VIP visits to NRL; managing the NRL directives system; administering the NRL response to Congressional requests; maintaining the NRL R&D achievements file; developing the S&T guidance for monitoring and reporting the NRL S&T program; administering NRL’s various postdoctoral fellowship programs; and managing the Facility Modernization Program.

Personnel: 16 full-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head, Office of Program Administration and Policy Development</td>
<td>1006</td>
</tr>
<tr>
<td>Head, Program Administration Staff</td>
<td>1006.1</td>
</tr>
<tr>
<td>VIP Coordinator / Protocol Officer / Administrative Officer</td>
<td>1006.2</td>
</tr>
<tr>
<td>Head, Executive Management &amp; Policy Development Staff</td>
<td>1006.3</td>
</tr>
<tr>
<td>Directives</td>
<td>1006.31</td>
</tr>
<tr>
<td>Head, NRL Facilities Staff</td>
<td>1006.4</td>
</tr>
<tr>
<td>Special Assistant</td>
<td>1006.6</td>
</tr>
</tbody>
</table>

Point of contact: Code 1006.2, (202) 767-3370

*Acting
Basic Responsibilities

The Office of Counsel is responsible for providing legal services to NRL’s management in all areas of general, administrative, intellectual property, and technology transfer law. The Office reviews all procurement-related actions; reviews NRL scientific papers prior to publication; prepares patent applications and prosecutes the applications through the Patent and Trademark Office; defends against contract protests, other contract litigation, and personnel cases; and advises on other legal matters relating to technology transfer, personnel, fiscal, and environmental law.

NRL Counsel also serves as legal advisor to the Commanding Officer and Director of Research.

Personnel: 30 full-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Head, Office of Counsel</td>
<td>1008</td>
</tr>
<tr>
<td>Associate Counsel / General Law</td>
<td>1008.1</td>
</tr>
<tr>
<td>Associate Counsel / Intellectual Property</td>
<td>1008.2</td>
</tr>
<tr>
<td>Associate Counsel / SSC Legal Matters</td>
<td>1008.3</td>
</tr>
</tbody>
</table>

Point of contact: Code 1008.1, (202) 767-7605
Code 1100
Staff Activity Areas

- Interdisciplinary nanoscience that enables:
  - Low-power, high-speed electronics
  - Lightweight, high-strength materials
  - Highly sensitive molecular sensors
  - Efficient energy generation and storage

NRL researchers working in the Class 100 clean room in the Institute for Nanoscience.

Transmission electron microscope located in one of the Institute for Nanoscience’s environmentally controlled laboratories.

Wafer on graphene transistors.
The Institute for Nanoscience has two primary responsibilities: to administer an interdisciplinary research program in nanoscience and to provide NRL scientists with high-quality laboratory space and state-of-the-art nanofabrication facilities.

The mission of the research program is to conduct highly innovative, interdisciplinary research at the intersections of the fields of materials, electronics, and biology in the nanometer size domain. The Institute exploits the broad multidisciplinary character of NRL to bring together scientists and engineers with disparate training and backgrounds to attack common goals at the intersection of their respective fields at this length scale. The Institute’s S&T programs provide the Navy and DoD with scientific leadership in this complex, emerging area and help to identify opportunities for advances in future defense technology.

The Institute also operates a nanoscience research building containing nanofabrication facilities and environmentally controlled measurement laboratories. The central core of the building, a 5000 sq ft Class 100 clean room, has been outfitted with the newest tools to permit nanofabrication, measurement, and testing of devices. In addition to the clean room facility, the building also contains 5000 square feet of controlled-environment laboratory space, which is available to NRL researchers whose experiments are sufficiently demanding to require this space. There are 12 of these laboratories within the building. They provide shielding from electromagnetic interference, and very low floor vibration and acoustic levels. Eight of the laboratories control the temperature to within ± 0.5 °C and four to within ± 0.1 °C.

**Personnel:** 3.5 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>Director, Institute for Nanoscience</td>
<td>1100</td>
</tr>
<tr>
<td>Position Assistant</td>
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<tr>
<td>Facilities Manager</td>
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<tr>
<td>Facilities Manager</td>
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</table>

**Point of Contact:** Code 1100, (202) 767-1804

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*Additional Duty*
Command Support Division

Code 1200
Staff Activity Areas

- Security

Incoming visitor reception area

Security monitoring
The Command Support Division is responsible for NRL security policy, management, and enforcement. The Division Head is the NRL Security Manager. The primary areas of security are: information assurance, information security, personnel security, industrial security, classification management, public release, foreign disclosure, physical security, force protection, antiterrorism, operations security, special security programs, and communications security. Provides security education across all security disciplines. Conducts local inspections for compliance with current internal and external policies. Provides advice and guidance to senior NRL management concerning the security posture of the Command. Provides administrative budget support to the Military Support Division (Code 1400) and Scientific Development Squadron One (VXS-1, Code 1600).

**Personnel:** 66 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Head, Command Support Division</td>
<td>1200</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>1202</td>
</tr>
<tr>
<td>Head, Stennis Space Center Security Staff</td>
<td>1203</td>
</tr>
<tr>
<td>Head, Force Protection and Physical Security Branch</td>
<td>1210</td>
</tr>
<tr>
<td>Head, Information Assurance and Communications Security Branch</td>
<td>1220</td>
</tr>
<tr>
<td>Head, Information Security and Special Programs Branch</td>
<td>1230</td>
</tr>
<tr>
<td>Head, Personnel Security and Visitor Control Branch</td>
<td>1240</td>
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**Point of contact:** Code 1202, (202) 767-6987
Military Support Division

Code 1400
Staff Activity Areas

- Operations
- Administrative Operations

P-3 airborne research platform

Administration
Basic Responsibilities

The Military Support Division provides military operational and administrative services to NRL. The Operations Branch assists NRL research directorates in planning and executing project flight missions, develops deployment schedules and military operational and training objectives, and coordinates the Research Reserve Program within NRL.

The Military Administration Branch is responsible for the coordination and efficient functioning of all military administrative operations for NRL (including site detachments). These duties specifically include: personnel actions, maintenance of personnel records, performance evaluations, awards and training; advising the Chief Staff Officer on manpower matters and organization issues; and preparing and administering the military operational budget.

**Personnel:** 1 full-time contractor; 7 military

**Key Personnel**

<table>
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<tbody>
<tr>
<td>Head, Military Support Division</td>
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<tr>
<td>Project Officer</td>
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<tr>
<td>Administrative Officer</td>
<td>1420</td>
</tr>
<tr>
<td>Administrative Yeoman</td>
<td>1420</td>
</tr>
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</table>

**Point of contact:** Code 1420, (202) 767-2103
VXS-1 maintains two RC-12 aircraft dedicated to airborne research. They are smaller, more cost-efficient alternatives to the P-3 Orion. Each aircraft is outfitted with a research electrical load center and has a roll-on roll-off capability, which enables it to be equipped with project stations. The RC-12s can support a broad spectrum of project configurations.

P-3 airborne research platform

Aircraft maintenance

Scientific Development Squadron One hangar

VXS-1 maintains two RC-12 aircraft dedicated to airborne research. They are smaller, more cost-efficient alternatives to the P-3 Orion. Each aircraft is outfitted with a research electrical load center and has a roll-on roll-off capability, which enables it to be equipped with project stations. The RC-12s can support a broad spectrum of project configurations.

P-3 airborne research platform

Aircraft maintenance

Scientific Development Squadron One hangar

Scientific Development Squadron ONE (VXS-1)

Code 1600
Staff Activity Areas

• Projects
  – Operations
  – Safety/NATOPS/Training
• Administration
• Maintenance
  – Quality assurance
• Configurations
  – Project Liaison Officer
Basic Responsibilities

The Scientific Development Squadron ONE (VXS-1) located at NAS Patuxent River, Maryland, operates and maintains three uniquely configured P-3 Orion aircraft and one C-12 aircraft. The men and women of the squadron provide the Naval Research Laboratory with airborne research platforms, conducting flights worldwide in support of a broad spectrum of projects and experiments. These include magnetic variation mapping, electro-optic infrared research, hydroacoustic research, bathymetry, electronic countermeasures, gravity mapping, data link, and radar research. The squadron annually logs approximately 1000 flight hours, and in its 51 years, Scientific Development Squadron ONE (VXS-1) has amassed 72,000 hours of mishap-free flying.

Personnel: 1 full-time civilian; 63 military; 7 full-time contractors

Key Personnel

<table>
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<tbody>
<tr>
<td>Commanding Officer, VXS-1</td>
<td>1600</td>
</tr>
<tr>
<td>Executive Officer</td>
<td>1601</td>
</tr>
<tr>
<td>Senior Enlisted Leader</td>
<td>1600.2</td>
</tr>
<tr>
<td>Executive Secretary</td>
<td>1600.4</td>
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<tr>
<td>Projects Director</td>
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<tr>
<td>Operations Officer</td>
<td>1630.1</td>
</tr>
<tr>
<td>Safety / Quality Insurance Officer</td>
<td>1630.2</td>
</tr>
<tr>
<td>NATOPS / Training Officer</td>
<td>1630.2</td>
</tr>
<tr>
<td>Administrative Officer / Public Affairs Officer</td>
<td>1640</td>
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<tr>
<td>Maintenance Officer</td>
<td>1650</td>
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<tr>
<td>Assistant Maintenance Officer</td>
<td>1650.1</td>
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<tr>
<td>Maintenance / Material Control Officer</td>
<td>1650.2</td>
</tr>
<tr>
<td>Projects Liaison Officer</td>
<td>1660</td>
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Point of contact: Code 1640, (301) 995-4122
Multidisciplinary research, development, and integration in autonomous systems, including:

- Software for intelligent autonomy
- Novel human-systems interaction technology
- Mobility and platforms
- Sensor systems
- Power and energy systems
- Networking and communications
- Trust and assurance

The Laboratory for Autonomous Systems Research integrates S&T components into research prototype systems.

The Prototyping High Bay can be used for small autonomous air vehicles, autonomous ground vehicles, and of course the people who interact with them.

The Littoral High Bay features a 45 ft by 25 ft by 5.5 ft deep pool. This pool has a 16-channel wave generator, allowing us to create directional waves. The Littoral High Bay has a variety of sediment tanks for testing sensors and energy-harvesting devices.

The Tropical High Bay provides a simulated jungle terrain and rain forest including a flowing water feature in an enclosed greenhouse. Rain up to 6” per hour can be generated.

The Desert High Bay contains a 40 ft by 14 ft area of sand 2 feet deep, and contains 18-foot-high rock walls that allow testing of robots and sensors in a desert-like environment. We can introduce blowing sand, and can control the lighting in that environment.
Basic Responsibilities

The Laboratory for Autonomous Systems Research provides specialized facilities to support highly innovative, interdisciplinary research in autonomous systems, including software for intelligent autonomy, sensor systems, power and energy systems, human-systems interaction, networking and communications, and platforms and mobility. The Laboratory capitalizes on the broad multidisciplinary character of NRL, bringing together scientists and engineers with disparate training and backgrounds to advance the state of the art in autonomous systems at the intersection of their respective fields. The Laboratory provides unique facilities and simulated environments (littoral, desert, tropical) and instrumented reconfigurable high bay spaces to support integration of science and technology components into research prototype systems. The objective of the laboratory is to enable Naval and DoD scientific leadership in this complex, emerging area and to identify opportunities for advances in future defense technology.

The facility includes a Reconfigurable Prototyping High Bay that allows real-time, accurate tracking of many entities (vehicles and humans) for experimental ground truth. Small UAVs and ground vehicles can simultaneously operate within the large high bay, which is viewable from four adjacent Human-System Interaction labs. The Tropical High Bay emulates a rainforest with appropriate terrain and plants, and includes flowing water features. An outdoor Highland Forest provides an additional forest environment, and also includes interesting water and terrain features. The Desert High Bay provides a simulated desert environment featuring as sand pit, natural rock walls, and appropriate lighting and wind. The Littoral High Bay provides a simulated coastal environment featuring sediment tanks, large pool with a sloping floor, and small flow tanks. In addition to the environmental high bays, the facility also has a Power and Energy Laboratory, a Sensor Laboratory, and a mechanical and electrical shop.

The facility is open to use by all NRL scientists contributing to the science and technology of autonomous systems and will host many NRL scientists as needed.

**Personnel:** 3.5 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Director, Laboratory for Autonomous Systems Research</td>
<td>1700</td>
</tr>
<tr>
<td>Facilities Manager</td>
<td>1700</td>
</tr>
<tr>
<td>Secretary</td>
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</table>

**Point of contact:** Code 1700, (202) 767-0792

*Additional Duty*
Code 1800
Staff Activity Areas

- Personnel Operations (Staffing and Classification)
- Employee Relations
- Employee Development
- Equal Employment Opportunity and Manpower
- Compensation, Reports, and Demonstration Project
- Information Technology and Reports
Basic Responsibilities

The Human Resources Office (HRO) provides civilian personnel, manpower, and Equal Employment Opportunity (EEO) services to the Naval Research Laboratory. The Human Resources Program provides the full range of operating civilian personnel management in the staffing and placement, position classification, employee relations, labor relations, employee development, EEO functional areas, manpower management, and morale, welfare, and recreation programs.

The HRO at NRL’s main site in Washington, DC, services approximately 2,500 employees and provides a centralized capability to perform managerial, service, and advisory functions in support of field office operations. These include issuing policy and procedural directives; developing, designing, and maintaining automated systems; and monitoring and evaluating product effectiveness to develop and maintain efficient, cost-effective, service-oriented methods.

Personnel: 30 full-time civilian

Key Personnel

<table>
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<tbody>
<tr>
<td>Director, Human Resources Office</td>
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<tr>
<td>Administrative Officer</td>
<td>1802</td>
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<tr>
<td>Head, Information Technology and Reports Office</td>
<td>1804</td>
</tr>
<tr>
<td>Head, Personnel Operations Branch</td>
<td>1810</td>
</tr>
<tr>
<td>Head, EEO, Diversity, and Employee Recognition Branch</td>
<td>1830</td>
</tr>
<tr>
<td>Head, Employee Development and Management Branch</td>
<td>1840</td>
</tr>
<tr>
<td>Head, Employee Relations Branch</td>
<td>1850</td>
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</tbody>
</table>

Point of contact: Code 1802, (202) 404-2797
Ms. S.M. Ryder

Basic Responsibilities

NRL’s Ruth H. Hooker Research Library supports NRL and ONR scientists in conducting their research by making a comprehensive collection of the most relevant scholarly information available and useable; by providing direct reference and research support; by capturing and organizing the NRL research portfolio; and by creating, customizing, and deploying a state-of-the-art digital library. Traditional library resources include extensive technical report, book, and journal collections dating back to the 1800s housed within a centrally located research facility that is staffed by subject specialists and information professionals. The collections include 44,000 books; 80,000 digital books; 80,000 bound historical journal volumes; more than 3,500 current journal subscriptions; and approximately 2 million technical reports in paper, microfiche, or digital format (classified and unclassified). Research Library staff members provide advanced information consulting; literature searches against all major online databases including classified databases; circulation of materials from the collection including classified literature up to the Secret level; and retrieval of articles, reports, proceedings, or documents through our interlibrary loan and document delivery network. The digital library provides desktop access to thousands of journals, books, proceedings, reports, databases, and reference sources.

Personnel: 21 full-time civilian

Key Personnel

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<tr>
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<tbody>
<tr>
<td>Chief Librarian</td>
<td>5596</td>
</tr>
<tr>
<td>Head, Research Reports and Bibliography</td>
<td>5596.3</td>
</tr>
<tr>
<td>Library IT Director</td>
<td>5596.2</td>
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</table>

Point of contact: Code 5596, (202) 767-2357
BUSINESS OPERATIONS DIRECTORATE
BUSINESS OPERATIONS DIRECTORATE

Code 3000

The Business Operations Directorate provides executive management, policy development, and program administration for business programs needed to support the activities of the scientific directorates. This support is in the areas of financial management, supply management, technical information services, contracting, research and development services, and management information systems support.
Mr. D.K. Therning was born in Modesto, California. He graduated from Washington State University with a bachelor’s degree in finance in 1983 and earned a master’s degree in business administration from George Mason University in 1993. Mr. Therning has accumulated extensive experience in the financial business management of research, development, test, and evaluation (RDT&E) activities within the Department of the Navy (DON) beginning at the Naval Weapons Center, China Lake, California, where he served as a budget analyst in the Public Works Department and then in the Weapons Department. In 1984, he became the Financial Management Advisor to the Ordnance Systems Department. In 1985, under the auspices of the Naval Scientist Training and Exchange Program, he was selected for a one-year assignment in the Office of the Director of Naval Laboratories (DNL), Washington, DC. He remained on the DNL staff as a budget analyst until 1987, when he was appointed Budget Officer of the DNL’s seven Navy Industrial Fund R&D laboratories.

As the DON reorganized the R&D laboratories and T&E activities, Mr. Therning oversaw the financial reorganization of the DNL labs with other activities into the Naval warfare centers. Upon the disestablishment of DNL, Mr. Therning remained in the Space and Naval Warfare Systems Command as the Director of the Defense Business Operations Fund (DBOF) Resources Management Division, with collateral duty as the Financial Manager of the Naval Command, Control, and Ocean Surveillance Center (NCCOSC). During this time, he managed the conversion of nine appropriated fund engineering activities to DBOF and the financial consolidation of these activities with NCCOSC.

In 1995, Mr. Therning served as Head of the Revolving Funds Branch of the Office of the Assistant Secretary of the Navy (Financial Management and Controller), where he was responsible for the budget formulation and execution processes of all DON DBOF activities, which includes the RDT&E activities, shipyards, aviation depots, ordnance centers, and supply centers.

Mr. Therning was appointed Head, Financial Management Division/Comptroller of NRL in July 1996. In October 1996, in addition to leading the Financial Management Division, he assumed responsibilities for the Management Information Systems office. In January 1999, as an additional duty to his role as Comptroller, Mr. Therning was appointed to the newly established position of Deputy Associate Director of Research for Business Operations to assist in the management and administration of the Business Operations Directorate.

Mr. Therning was Acting Associate Director of Research for Business Operations from April 1999 until March 2000, when he was appointed the Associate Director of Research for Business Operations.
### Key Personnel

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Associate Director of Research for Business Operations</td>
<td>3000</td>
</tr>
<tr>
<td>Special Assistant</td>
<td>3001</td>
</tr>
<tr>
<td>Deputy Associate Director of Research for Business Operations</td>
<td>3002</td>
</tr>
<tr>
<td>Deputy for Small Business</td>
<td>3005</td>
</tr>
<tr>
<td>Head, Management Information Systems Office</td>
<td>3030</td>
</tr>
<tr>
<td>Head, Contracting Division</td>
<td>3200</td>
</tr>
<tr>
<td>Head, Financial Management Division</td>
<td>3300</td>
</tr>
<tr>
<td>Head, Supply and Information Services Division</td>
<td>3400</td>
</tr>
<tr>
<td>Director, Research and Development Services Division</td>
<td>3500</td>
</tr>
</tbody>
</table>

**Point of contact:** Code 3000A, (202) 404-7461

*Acting
Code 3200
Staff Activity Areas

- Advance Acquisition Planning
- Acquisition Strategies
- Acquisition Training
- Contract Negotiations
- Contractual Execution
- Contract Administration
- Acquisition Policy Interpretation and Implementation
Basic Responsibilities

The Contracting Division is responsible for the acquisition of major research and development materials, services, and facilities where the value is in excess of $150,000. It also maintains liaison with the ONR Procurement Directorate on procurement matters involving NRL. Specific functions include: providing consultant and advisory services to NRL division personnel on acquisition strategy, contractual adequacy of specifications, and potential sources; reviewing procurement requests for accuracy and completeness; initiating and processing solicitations for procurement; awarding contracts; performing contract administration and post-award monitoring of contract terms and conditions, delivery, contract changes, patents, etc., and taking corrective actions as required; providing acquisition-related training to division personnel; and interpreting and implementing acquisition-related Federal, Department of Defense, and Navy regulations.

Personnel: 40 full-time civilian

Key Personnel

<table>
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<tr>
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<tbody>
<tr>
<td>Head, Contracting Division</td>
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</tr>
<tr>
<td>Deputy Head</td>
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<tr>
<td>Administrative Officer</td>
<td>3202</td>
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<tr>
<td>Contracts Support Branch</td>
<td>3210</td>
</tr>
<tr>
<td>Head, Contracts Branch 1</td>
<td>3220</td>
</tr>
<tr>
<td>Head, Contracts Branch 2</td>
<td>3230</td>
</tr>
<tr>
<td>Team Lead, Contracts Section, SSC</td>
<td>3235</td>
</tr>
</tbody>
</table>

Point of contact: Code 3202, (202) 767-3749

*Acting
The Budget Branch prepares various financial analyses, reports, and studies in response to external data calls and/or management requests.

The Financial Systems, Reports, and Accounting Branch ensures that NRL’s financial system satisfies user requirements and is in compliance with applicable rules and regulations, maintains official accounting records, and coordinates efforts with DFAS to complete payment transactions related to NRL business.

The Financial Improvement and Audit Readiness team ensures that NRL is ready for an independent financial audit in accordance with Secretary of Defense and congressional mandates. They perform independent audit readiness testing, develop corrective action recommendations, and serve as NRL’s liaison with the Navy’s Financial Management Operations office.

The Financial Management Division

Code 3300
Staff Activity Areas

• Budget
• Reports and Statistics
• Accounting
• Travel Services
• Payroll Liaison
• Audit Readiness

The Financial Systems, Reports, and Accounting Branch ensures that NRL’s financial system satisfies user requirements and is in compliance with applicable rules and regulations, maintains official accounting records, and coordinates efforts with DFAS to complete payment transactions related to NRL business.
Basic Responsibilities

The Financial Management Division (FMD) develops, coordinates, and maintains an integrated system of financial management that provides the Comptroller, Commanding Officer, Director of Research, and other officials of NRL the information and support needed to fulfill the financial and resource management aspects of their responsibilities. FMD translates the NRL program requirements into the financial plan, formulates the NRL budget, monitors and evaluates performance with the budget plan, and provides recommendations and advice to NRL management for corrective actions or strategic program adjustments. FMD maintains the accounting records of NRL’s financial and related resources transactions and prepares reports, financial statements, and other documents in support of NRL management needs and/or to comply with external reporting requirements. FMD provides financial management guidance, policies, advice, and documented procedures to ensure that NRL operates in compliance with Navy and DoD regulations and with economy and efficiency. FMD coordinates efforts with the Defense Finance and Accounting Service (DFAS) to complete payment transactions related to NRL business (e.g., the payment of NRL personnel for payroll and travel expenses and the payment to NRL’s contractors and vendors for goods and services purchased by NRL). FMD coordinates Financial Improvement and Audit Readiness efforts to ensure NRL is ready for an independent financial audit. Additionally, FMD develops, operates, and maintains automated business and management information systems supporting the lab-wide administrative and business processes, including financial management, procurement and contracting, stores and inventory, asset management, human resources, facilities, and security.

Personnel: 68 full-time civilian

Key Personnel

<table>
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<tbody>
<tr>
<td>Head, Financial Management Division</td>
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</tr>
<tr>
<td>Administrative Officer</td>
<td>3302</td>
</tr>
<tr>
<td>Financial Improvement and Audit Readiness Coordinator</td>
<td>3305</td>
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<tr>
<td>Head, Budget and Funds Management Branch</td>
<td>3310</td>
</tr>
<tr>
<td>Head, Funding Section</td>
<td>3311</td>
</tr>
<tr>
<td>Head, Internal Budget Section</td>
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<td>Head, Corporate Budget Section</td>
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</tr>
<tr>
<td>Head, Financial Systems, Reports, and Accounting Branch</td>
<td>3350</td>
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<tr>
<td>Head, Cost Accounting Section</td>
<td>3351</td>
</tr>
<tr>
<td>Cost and Analysis Unit</td>
<td>3351.1</td>
</tr>
<tr>
<td>Head, Vendor Pay Unit</td>
<td>3351.2</td>
</tr>
<tr>
<td>Head, Financial Services Section</td>
<td>3352</td>
</tr>
<tr>
<td>Head, Payroll Services Unit</td>
<td>3352.1</td>
</tr>
<tr>
<td>Head, Travel Services Unit</td>
<td>3352.2</td>
</tr>
<tr>
<td>Head, Accounting Systems and Reports Section</td>
<td>3353</td>
</tr>
<tr>
<td>Head, Asset Management and Accounting Section</td>
<td>3354</td>
</tr>
</tbody>
</table>

Point of contact: Code 3302, (202) 767-2950
Supply and Information Services Division

Code 3400
Staff Activity Areas

- Purchasing
- Technical Information Services
- Customer Support and Program Management
- Material Control
- Administrative Services
- Automated Inventory Management System
- Disposal and Storage

Customers and employee at the Supply store.

Disposal and storage in Building 49.

Photographer and videographer capture footage for a technical presentation.

Woodworkers prepare boxes for shipping.

Employees of the Administrative Services Branch discuss NRL electronic forms.
Basic Responsibilities

The Supply and Information Services Division provides the Laboratory and its field activities with contracting, supply management, logistics, administrative, and technical information services. Specific functions include: procuring required equipment, material, and services; receiving, inspecting, storing, and delivering material and equipment; packing, shipping, and traffic management; surveying and disposing of excess and unusable property; operating various supply issue stores and performing stock inventories; providing technical and counseling services for the research directorates in the development of specifications for a complete procurement package; and obtaining and providing guidance in the performance stages of contractual services. Services also include publications, visual information, exhibits, photography, editing, and mailroom services and correspondence management.

Personnel: 81 full-time civilian; 1 part-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Officer</td>
<td>3400</td>
</tr>
<tr>
<td>Deputy Supply Officer</td>
<td>3401</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>3402</td>
</tr>
<tr>
<td>Head, Customer Support Staff</td>
<td>3403</td>
</tr>
<tr>
<td>Head, Purchasing Branch</td>
<td>3410</td>
</tr>
<tr>
<td>Head, Technical Information Services Branch</td>
<td>3430</td>
</tr>
<tr>
<td>Head, Material Control Branch</td>
<td>3450</td>
</tr>
<tr>
<td>Head, Administrative Services Branch</td>
<td>3460</td>
</tr>
</tbody>
</table>

Point of contact: Code 3402, (202) 404-1701
Code 3500
Staff Activity Areas

- Engineering
- Production Control and Transportation
- Shop Services
- Chesapeake Bay Facilities Management
- Customer Liaison
- Safety and Occupational Health/Industrial Hygiene
- Explosives Safety
- Health Physics
- Environmental
- Utilities
- Telephones
- Facilities Planning and Operations

Safety and Occupational Health — respirator fit testing for research support personnel.

Health physics — analyzing samples for radioactive material.
Basic Responsibilities

The Research and Development Services Division is responsible for the physical plant of the Naval Research Laboratory and subordinate field sites. The responsibilities include military construction, engineering, and coordination of construction; facility support services, planning, maintenance/repair/operation of all infrastructure systems; transportation; and occupational safety, health and industrial hygiene, and environmental safety.

The Division provides engineering and technical assistance to research divisions in the installation and operation of critical equipment in support of the research mission.

Personnel: 154 full-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director, Research and Development Services Division</td>
<td>3500</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>3502</td>
</tr>
<tr>
<td>Customer Liaison</td>
<td>3505</td>
</tr>
<tr>
<td>Head, Technical/Support Services Branch</td>
<td>3520</td>
</tr>
<tr>
<td>Head, Engineering Section</td>
<td>3521</td>
</tr>
<tr>
<td>Head, Chesapeake Bay Section</td>
<td>3522</td>
</tr>
<tr>
<td>Head, Shop Services Section</td>
<td>3523</td>
</tr>
<tr>
<td>Head, Production Control Section</td>
<td>3524</td>
</tr>
<tr>
<td>Head, Facilities, Planning and Operations Section</td>
<td>3525</td>
</tr>
<tr>
<td>Head, Safety Branch</td>
<td>3540</td>
</tr>
<tr>
<td>Occupational Safety and Health/Industrial Hygiene Section</td>
<td>3541</td>
</tr>
<tr>
<td>Explosives Safety</td>
<td>3542</td>
</tr>
<tr>
<td>Health Physics Section</td>
<td>3544</td>
</tr>
<tr>
<td>Environmental Section</td>
<td>3546</td>
</tr>
<tr>
<td>Environmental Response Unit</td>
<td>3546.1</td>
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</table>

Point of contact: Code 3502, (202) 404-4312

*Acting
The Systems Directorate applies the tools of basic research, concept exploration, and engineering development to expand operational capabilities and to provide materiel support to Fleet and Marine Corps missions. Emphasis is on technology, devices, systems, and know-how to acquire and move warfighting information and to deny these capabilities to the enemy. Current activities include:

- New and improved radar systems to detect and identify ever smaller targets in the cluttered littoral environment;
- Optical sensors and related materials to extract elusive objects in complex scenes when both processing time and communications bandwidth are limited;
- Unique optics-based sensors for detection of biochemical warfare agents and pollutants, for monitoring structures, and for alternative sensors;
- Advanced electronic support measures techniques for signal detection and identification;
- Electronic warfare systems, techniques, and devices including quick-reaction capabilities;
- Innovative concepts and designs for reduced observables;
- Techniques and devices to disable and/or confuse enemy sensors and information systems;
- Small “intelligent”/autonomous land, sea, or air vehicles to carry sensors, communications relays, or jammers; and
- High performance/high assurance computers with right-the-first-time software and known security characteristics despite commercial off-the-shelf components and connections to public communications media.

Many of these efforts extend from investigations at the frontiers of science to the support of deployed systems in the field, which themselves provide direct feedback and inspiration for applied research and product improvement and/or for quests for new knowledge to expand the available alternatives.

In addition to its wide-ranging multidisciplinary research program, the Directorate provides support to the corporate laboratory in shared resources for high performance computing and networking, technical information collection and distribution, and in coordination of Laboratory-wide efforts in signature technology, counter-signature technology, Theater Missile Defense, and the Naval Science Assistance Program.
Dr. G.M. Borsuk is the Associate Director of Research for Systems at the Naval Research Laboratory (NRL) in Washington, DC. In this position he provides executive direction and leadership to four major NRL research divisions that conduct a broad multidisciplinary program of scientific research and advanced technological development in the areas of optics, electromagnetics, information technology, and radar. He is responsible for the conduct and effectiveness of research programs conducted within these divisions and for the overall administration of activities throughout the Systems Directorate. He is also the Focus Area Coordinator for all NRL base programs in electronics science and technology. Prior to this appointment, Dr. Borsuk served for 23 years as the Superintendent of the Electronics Science and Technology Division at NRL where he was responsible for the in-house execution of a multidisciplinary program of basic and applied research in electronic materials and structures, solid state devices, vacuum electronics, and circuits. Dr. Borsuk also serves as the Technical Chair of the DDR&E’s Electronic Warfare Technology Task Force (EWTTF). He was the Navy Deputy Program Manager and Technical Director for the now completed DARPA/Tri-Service MIMIC and MAFET Programs. He was the Department of Defense (DoD) technical representative for Electronics to the Wassenaar Arrangement dealing with export control. He has also served as the DoD representative to the President’s National Science and Technology Council’s Electronic Materials Working Group.

Dr. Borsuk joined the ITT Electro-Physics Laboratory in Columbia, Maryland, as a staff physicist in 1973, where he worked on the application of charge-coupled devices (CCDs) for imaging and signal processing. In 1976 he joined the Westinghouse Advanced Technology Laboratory in Baltimore, Maryland, developing advanced silicon VLSI integrated circuits and performing device physics research. He performed original work in the design and fabrication of CCDs for signal processing and photodetectors for use with acousto-optic signal processors. He headed the Westinghouse VHSIC effort in advanced sub-micron VLSI device technology. Dr. Borsuk was department manager of Solid State Sciences at the Advanced Technology Laboratory when he left Westinghouse in 1983 to join the Naval Research Laboratory as the Superintendent of the Electronics Science and Technology Division.

Dr. Borsuk received a Ph.D. in physics from Georgetown University in Washington, DC, in 1973. He is a Fellow of the IEEE, a member of the American Physical Society, a member of the AVS, and is a member of Sigma Xi. He has 37 technical publications, four patents, and eleven invention disclosures. He is the recipient of four Presidential Rank Senior Executive Awards, the Distinguished, the most recent awarded in 2010. He is also the recipient of the IEEE Frederik Philips Award, the IEEE Harry Diamond Memorial Award, the IEEE Millennium Medal, and an IR-100 Award for his work on high-speed CCDs. Dr. Borsuk also served on the editorial board of the IEEE Proceedings.
Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Associate Director of Research for Systems</td>
<td>5000</td>
</tr>
<tr>
<td>Special Assistant</td>
<td>5001</td>
</tr>
<tr>
<td>Special Consultant</td>
<td>5007</td>
</tr>
<tr>
<td>Head, InTop Program Office</td>
<td>5008</td>
</tr>
<tr>
<td>Superintendent, Radar Division</td>
<td>5300</td>
</tr>
<tr>
<td>Superintendent, Information Technology Division</td>
<td>5500</td>
</tr>
<tr>
<td>Superintendent, Optical Sciences Division</td>
<td>5600</td>
</tr>
<tr>
<td>Superintendent, Tactical Electronic Warfare Division</td>
<td>5700</td>
</tr>
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</table>

Point of contact: Code 5000A, (202) 767-3324
Radar Division

Code 5300
Staff Activity Areas

Shipboard radar systems
Small target detection
Maritime Domain Awareness
Networked Radar Concepts (FlexDAR)
High-power millimeter-wave radar

Radar Analysis
Target signature prediction
Electromagnetics and antennas
Airborne early-warning radar (AEW)
Inverse synthetic aperture radar (ISAR)
Sea clutter modeling
Periscope detection
Wideband array simulation and fabrication

Advanced Radar Systems
High-frequency over-the-horizon radar systems
HF Radar Technology
Signal analysis
Real-time signal processing and equipment
Computer-aided engineering (CAE)
Optimization techniques
FPGA-based digital processing

Surveillance Technology
Shipboard surveillance radar
Ship self-defense
Electronic counter-countermeasures and electronic protection (EP)
Target signature and information extraction
T/R module technologies
Asymmetric and expeditionary warfare spectrum management
Ultrawideband technology
Dynamic waveform diversity
Multistatic radar network information
Ballistic missile defense
Mine detection

Wavelength scaled array: an ultrawideband array concept providing constant beamwidth across 8:1 bandwidth; designed using NRL-developed Domain Decomposition Algorithm.

The Advanced Multifunction RF Concept (AMRFC) test bed is a proof-of-principle demonstration system capable of simultaneously transmitting and receiving multiple beams from common transmit and receive array antennas for radar, electronic warfare, and communications. This testbed will be expanded to support the FlexDAR program.
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 analyses and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors that are applicable to enhancing the Navy’s ability to fulfill its mission.

**Personnel:** 80 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Radar Division</td>
<td>5300</td>
</tr>
<tr>
<td>Chief Scientist</td>
<td>5300.1</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>5301</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>5302</td>
</tr>
<tr>
<td>AEGIS Coordinator</td>
<td>5306</td>
</tr>
<tr>
<td>Head, Advanced Concepts Group</td>
<td>5307</td>
</tr>
<tr>
<td>Head, Radar Analysis Branch</td>
<td>5310</td>
</tr>
<tr>
<td>Head, Advanced Radar Systems Branch</td>
<td>5320</td>
</tr>
<tr>
<td>Head, Surveillance Technology Branch</td>
<td>5340</td>
</tr>
</tbody>
</table>

**Point of contact:** Code 5300, (202) 404-2700
Information Technology Division

Code 5500
Research Activity Areas

**Freespace Photonics Communications Office**
- Extended spectrum communications
- Atmospheric channel effects on photonic transfer
- Studies in marine miraging
- Analog modulation techniques on freespace optical carriers
- Modulating retroreflector based communications
- Signature studies for ISR
- Adaptive optics for freespace optical communications

**Adversarial Modeling and Exploitation Office**
- Behavioral indicators of hostile intent
- Suspicious behavior detection research
- Behavioral modeling, analysis, and metrics
- Deception detection research
- Geospatial modeling and simulation
- Spatially integrated social science
- Automated video analysis and retrieval

**Navy Center for Applied Research in Artificial Intelligence**
- Intelligent decision aids
- Natural language and multimodal interfaces
- Intelligent software agents
- Machine learning and adaptive systems
- Robotics software and computer vision
- Neural networks
- Novel devices/techniques for HCI
- Spatial audio
- Immersive simulation
- Autonomous and intelligent systems
- Case-based reasoning and problem-solving methods
- Machine translation technology evaluation
- Cognitive architectures
- Human-robot interaction

**Transmission Technology**
- Communication system architecture
- Communication antenna/propagation technology
- Communications intercept systems
- Virtual engineering
- Secure voice technology
- Satellite and tactical networking
- Satellite communications research
- Satellite architecture analysis
- RF systems analysis

**Center for High Assurance Computer Systems**
- Secure Enterprise Architectures (SEA)
- Formal specification/verification of system security
- COMSEC application technology
- Technology and solutions to secure networks and databases
- Software engineering for secure systems
- Key management and distribution solutions
- Information systems security (INFOSEC) engineering
- Formal methods for requirements specification and verification
- Security product development
- Secure wireless network and wireless sensor technology
- Network security protocol modeling, simulation, and verification
- Cross-domain solution technology development
- Computer Network Defense (CND) technology
- Hardware/software co-design
- Malicious code analysis
- Information hiding (watermarking, covert channel analysis, etc.)
- Anonymizing systems
- Quantum information science
- Logical foundations of security

**Networks and Communication Systems**
- Communication system engineering
- Mobile, wireless networking technology
- Bandwidth management (quality of service)
- Joint service tactical networking
- Integration of communication and C2 applications
- Automated testing of highly mobile tactical networks
- Reliable multicast protocols and applications
- Communication network simulation
- Networking protocols for directional antennas
- Policy-based network management
- Tactical voice-over IP
- Sensor networks
- Advanced tactical data links
- Cognitive radio technology

**Information Management and Decision Architectures**
- Virtual reality / mobile augmented reality
- Visual analytics
- Scientific visualization
- Computer graphics
- Human-computer interaction
- Service oriented architecture
- Service orchestration
- Data and information management
- Human-centered design
- Parallel and distributed computation
- Distributed modeling and simulation
- Natural environments for distributed simulation
- Intelligent decision support
- Information sharing
- Semantic web technology
- Data mining
- Software agents for data fusion

**Center for Computational Science**
- Transparent optical network research and design
- Parallel computing
- Scalable high performance computing and networking for Navy and DoD
- Large data in distributed computing
- Scientific visualization
- High-performance file systems
- High-definition video technology
- NRL labwide computer network and related services
- Labwide support for web, email, and other information services
- ATDnet and leading-edge WAN research networks

**Ruth H. Hooker Research Library**
- Desktop/workbench access to relevant scientific resources
- NRL scientific digital archive (TORPEDO)
- Authoritative database of NRL-produced publications (NRL Online Bibliography)
- Comprehensive literature/citation/classified searches
- Extensive collection of print and digital books, journals, and technical reports
Basic Responsibilities

The Information Technology Division conducts basic research, exploratory development, and advanced technology demonstrations in the collection, transmission, processing, presentation, and distribution of information to provide information superiority and distributed networked force capabilities that improve Naval operations across all mission areas. The Division provides immediate solutions to current operational needs as required while developing those technologies necessary to implement the Navy after next.

**Personnel:** 204 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superintendent/NRL Chief Information Officer*</td>
<td>5500</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>5501</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>5502</td>
</tr>
<tr>
<td>Head, Freespace Photonic Communications Office</td>
<td>5505</td>
</tr>
<tr>
<td>Head, Adversarial Modeling and Exploitation Office</td>
<td>5508</td>
</tr>
<tr>
<td>Director, Navy Center for Applied Research in Artificial Intelligence</td>
<td>5510</td>
</tr>
<tr>
<td>Head, Networks and Communication Systems Branch</td>
<td>5520</td>
</tr>
<tr>
<td>Director, Center for High Assurance Computer Systems</td>
<td>5540</td>
</tr>
<tr>
<td>Head, Transmission Technology Branch</td>
<td>5550</td>
</tr>
<tr>
<td>Head, Information Management and Decision Architectures Branch</td>
<td>5580</td>
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<tr>
<td>Director, Center for Computational Science</td>
<td>5590</td>
</tr>
<tr>
<td>Chief Librarian, Ruth H. Hooker Research Library</td>
<td>5596</td>
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**Point of contact:** Code 5501, (202) 767-2954

*Additional Duty*
Optical Sciences Division

Code 5600
Staff Activity Areas

Program analysis and development
Special systems analysis
Technical study groups

Technical contract monitoring
Theoretical studies

Research Activity Areas

Optical Materials and Devices
Advanced infrared optical materials
IR fiber-optic materials and devices
IR fiber chemical and environmental sensors
IR transmitting windows and domes
Transparent ceramic armor materials
Planar waveguide devices
IR nonlinear materials and devices
Ceramic laser gain materials
Advanced solar cell materials
Fiber lasers/sources and amplifiers
Radiation effects

Optical Physics
Laser materials diagnostics
Nonlinear frequency conversion
Optical instrumentation and probes
Optical interactions in semiconductor superlattices and organic solids
Laser-induced reactions
Organic light-emitting devices
Nanoscale electro-optical research
Aerosol optics

Applied Optics
UV, optical, and IR countermeasures
Ultraviolet component development
Missile warning sensor technology
UV, visible, and IR imager development
Multispectral/hyperspectral sensors
Multispectral/hyperspectral/detection algorithms
Framing reconnaissance sensors
Novel optical components
Sensor control and exploitation system development
IR low observables
EO/IR systems analysis
Atmospheric IR measurements
Airborne IR search and track technology

Advanced Optical Materials Fabrication Laboratory, a state-of-the-art high vacuum cluster system, consists of a series of interconnected chambers allowing vacuum deposition of complex, multilayer films to be deposited and patterned without breaking vacuum during processing.

Photronics Technology
Fiber and solid-state laser/sources
High-speed (<100 fs) optical probing
High-power fiber amplifiers
High-speed fiber-optic communications
Antenna remoting
Free space communication
Photonic control of phased arrays
Micro-electro-optical-mechanical systems
Optical clocks
Microwave photonics

Optical Techniques
Fiber-optic materials and fabrication
Fiber Bragg grating sensors/systems
Fiber-optic sensors/systems (acoustic, magnetic, gyroscopes)
Integrated optics

The Optical Fiber Preform Fabrication Facility includes computer control of the glass composition and standard fiber-optic dopants as well as rare earths, aluminum, and other components for specialty fibers.
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 wavelengths. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices, materials, 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, prototype system development, and exploitation of R&D results 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. The work in the Division includes studies in quantum optics, laser physics, optical waveguide technologies, laser-matter interactions, atmospheric propagation, holography, optical data processing, fiber-optic sensor systems, optical systems, optical materials, radiation damage studies, IR surveillance and missile seeker technologies, IR signature measurements, and optical diagnostic techniques. A portion of the effort is devoted to developing, analyzing, and using special optical materials.

Personnel: 132 full-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
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<tbody>
<tr>
<td>Superintendent, Optical Sciences Division</td>
<td>5600</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>5601</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>5602</td>
</tr>
<tr>
<td>Head, Senior Scientific Staff</td>
<td>5604</td>
</tr>
<tr>
<td>Head, Optical Physics Branch</td>
<td>5610</td>
</tr>
<tr>
<td>Head, Optical Materials and Devices Branch</td>
<td>5620</td>
</tr>
<tr>
<td>Head, Photonics Technology Branch</td>
<td>5650</td>
</tr>
<tr>
<td>Head, Applied Optics Branch</td>
<td>5660</td>
</tr>
<tr>
<td>Head, Optical Techniques Branch</td>
<td>5670</td>
</tr>
</tbody>
</table>

Point of contact: Code 5602, (202) 767-9306

*Acting
Code 5700
Staff Activity Areas

EW Strategic Planning
Signature Technology Office
Effectiveness of Naval EW Systems (ENews)

Research Activity Areas

Offboard Countermeasures
- Expendable technology and devices
- Unmanned air vehicles
- Offboard payloads
- Decoys

Airborne Electronic Warfare Systems
- Counter ISR
- Wireless network analysis
- Jamming technology and deception
- Communications CM

Ships Electronic Warfare Systems
- Ships systems development
- Jamming technology and deception
- EW antennas
- High power microwaves (HPM) research

Electronic Warfare Support Measures
- Intercept systems and direction finders
- RF signal simulators
- Systems integration
- Command and control interfaces
- Signal processing

Advanced Techniques
- Analysis and modeling simulation
- Experimental systems
- EW concepts
- Infrared technology

Integrated EW Simulation
- Hardware-in-the-loop simulation
- Data management technology
- Flyable ASM seeker simulators
- Foreign materiel exploitation (FME)

EW Modeling and Simulation
- High-fidelity threat models and simulations
- Advanced system visualization
- EW tactical decision aids
- RF environmental and propagation modeling

Using the latest composite, MMIC, and processing technologies, the Tactical Electronic Warfare Division has developed a small, lightweight, and inexpensive ESM receiving system for use on frigates, Coast Guard vessels, and various patrol aircraft.

The Central Target Simulator (CTS) Programmable Array is part of a large hardware-in-the-loop simulation facility whose purpose is to test and evaluate electronic warfare systems and techniques used to counter radar-guided missile threats to Navy forces.
Basic Responsibilities

The Tactical Electronic Warfare Division (TEWD) is responsible for research and development in support of the Navy’s tactical electronic warfare requirements and missions. These include electronic warfare support measures, electronic countermeasures, and supporting counter-countermeasures, as well as studies, analyses, and simulations for determining and improving the effectiveness of these systems.

**Personnel:** 269 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Tactical Electronic Warfare Division</td>
<td>5700</td>
</tr>
<tr>
<td>Head, Electronic Warfare Strategic Planning Organization</td>
<td>5700.1</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>5701</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>5702</td>
</tr>
<tr>
<td>Senior Scientist for Expendable Vehicles</td>
<td>5704</td>
</tr>
<tr>
<td>Head, Electronic Warfare Lead Laboratory Staff</td>
<td>5705</td>
</tr>
<tr>
<td>Head, Signature Technology Office</td>
<td>5708</td>
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<tr>
<td>Head, Offboard Countermeasures Branch</td>
<td>5710</td>
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<tr>
<td>Head, Electronic Warfare Support Measures Branch</td>
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<tr>
<td>Head, Aerospace Electronic Warfare Systems Branch</td>
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<tr>
<td>Head, Surface Electronic Warfare Systems Branch</td>
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<tr>
<td>Head, Advanced Techniques Branch</td>
<td>5750</td>
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<tr>
<td>Head, Integrated Electronic Warfare Simulation Branch</td>
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</tr>
<tr>
<td>Head, Electronic Warfare Modeling and Simulation Branch</td>
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</table>

**Point of contact:** Code 5701, (202) 767-5974

*Acting*
The Materials Science and Component Technology Directorate carries out a multidisciplinary research program whose objectives are the discovery, invention, and exploitation of new improved materials, the generation of new concepts associated with materials behavior, and the development of advanced components based on these new and improved materials and concepts. Theoretical and experimental research is carried out to determine the scientific origins of materials behavior and to develop procedures for modifying these materials to meet important naval needs for advanced platforms, electronics, sensors, and photonics.

The program includes investigations of a broad spectrum of materials including insulators, semiconductors, superconductors, metals and alloys, optical materials, polymers, plastics, artificially structured bio/molecular materials and composites, and energetic materials, which are used in important naval devices, components, and systems. New techniques are developed for producing, processing, and fabricating these materials for crucial naval applications.

The synthesis, processing, properties, and limits of performance of these new and improved materials in natural or radiation environments, and under deleterious conditions such as those associated with the marine environment, neutron or directed energy beam irradiation, or extreme temperatures and pressures, are established. For new materials design, emphasis is placed on protection of the environment.

Additionally, major thrusts are directed in advanced sensing, detection, reactive flow physics, computational physics, and plasma sciences. Areas of particular emphasis include nanoscience and technology, fluid mechanics and hydrodynamics, nuclear weapon effects simulations, high energy density materials including fuels, propellants, explosives, and storage devices, interactions of various types of radiation with matter, survivability of materials and components, and directed energy devices.
Dr. B.B. Rath was born in Banki, India. He received a B.S. degree in physics and mathematics from Utkal University, an M.S. in metallurgical engineering from Michigan Technological University, and a Ph.D. from the Illinois Institute of Technology.

Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961 to 1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research Group of the McDonnell Douglas Research Laboratories in St. Louis, Missouri, until he came to NRL as Head of the Physical Metallurgy Branch. During this period, he was adjunct professor at Carnegie-Mellon University, the University of Maryland, and the Colorado School of Mines. Dr. Rath served as Superintendent of the Materials Science and Technology Division from 1982 to 1986, when he was appointed to his present position.

Dr. Rath is recognized in the fields of solid-state transformations, grain boundary migrations, and structure-property relationships in metallic systems. He has published over 140 papers in these fields and edited several books and conference proceedings.

Dr. Rath serves on several planning, review, and advisory boards for both the Navy and the Department of Defense, as well as for the National Materials Advisory Board of the National Academy of Sciences, National Science Foundation, University of Virginia, Colorado School of Mines, and the University of Florida. He is currently the Navy representative to the DOE Deputy Assistant Secretary’s advisory and planning committee on methane hydrates, and the Navy representative to the Indo-U.S. Joint Commission on Science and Technology. He has previously served as the Navy representative to the panel of The Technical Cooperation Program (TTCP) countries.

Dr. Rath is a member of the National Academy of Engineering. He is a fellow of the Minerals, Metals and Materials Society (TMS), American Society for Materials-International (ASM), Washington Academy of Sciences, Materials Research Society of India, the Institute of Materials of the United Kingdom, and the American Association for the Advancement of Science (AAAS). In 2007, Dr. Rath received an honorary doctorate in engineering from the Michigan Technological University and was elected to deliver the commencement address to the 2007 graduating class. In 2008, he received the Illinois Institute of Technology Mechanical Materials & Aerospace Engineering Department 2008 Alumni Recognition Award. In 2010, he received an honorary doctorate from Ravenshaw University and Indian Institute of Technology.

Dr. Rath has received a number of honors and awards, most recently the Michigan Technological University Distinguished Alumni Award, the Padma Bhushan Award of Honors and Excellence bestowed by the President of India, and the Acta Materialia J. Herbert Hollomon Award. His other awards include the DoD Distinguished Civilian Service Award which is presented by the Secretary of Defense for distinguished accomplishments and sustained superior service, the 2005 Fred Saalfeld Award for Outstanding Lifetime Achievement in Science, the Presidential Rank Award for Distinguished Executive (2005), the NRL Lifetime Achievement Award (2004), National Materials Advancement Award from the Federation of Materials Societies (2001), the Presidential Rank of Meritorious Executive Award (1999 and 2004), the S. Chandrasekhar Award and Medal, and the Award of Merit for Group Achievement from the Chief of Naval Research. He received the 1991 George Kimball Burgess Memorial Award, the Charles S. Barrett Medal, and the prestigious TMS Leadership Award for his contributions to materials research. The American Society for Materials-International and The Metals, Minerals, and Materials Society have jointly recognized him with the TMS/ASM Joint Distinguished Lectureship in Materials & Society Award and the 2001 ASM Distinguished Life Membership Award. He has served as the 2004–2005 President of the American Society for Materials. He also has served as a member of the Boards of Directors/Trustees of TMS, ASM-International, and the Federation of Materials Society (FMS), as a member of the editorial boards of several international materials research journals, and as chairman of many committees of TMS, ASM, FMS, and American Association of Engineering Societies.
Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>Associate Director of Research for Materials Science and Component Technology</td>
<td>6000</td>
</tr>
<tr>
<td>Special Assistant</td>
<td>6001</td>
</tr>
<tr>
<td>Chief Scientist for Computational Physics and Fluid Dynamics</td>
<td>6003</td>
</tr>
<tr>
<td>Director, Laboratories for Computational Physics and Fluid Dynamics</td>
<td>6040</td>
</tr>
<tr>
<td>Superintendent, Chemistry Division</td>
<td>6100</td>
</tr>
<tr>
<td>Superintendent, Materials Science and Technology Division</td>
<td>6300</td>
</tr>
<tr>
<td>Superintendent, Plasma Physics Division</td>
<td>6700</td>
</tr>
<tr>
<td>Superintendent, Electronics Science and Technology Division</td>
<td>6800</td>
</tr>
<tr>
<td>Director, Center for Bio/Molecular Science and Engineering</td>
<td>6900</td>
</tr>
</tbody>
</table>

Point of contact: Code 6000, (202) 767-2538
Laboratories for Computational Physics and Fluid Dynamics

Code 6040
Research Activity Areas

**Reactive Flows**
- Fluid dynamics in combustion
- Turbulence in compressible flows
- Multiphase flows
- Turbulent jets and wakes
- Jet noise S&T
- Detonation engines
- Propulsion systems analysis
- Contaminant transport modelling
- Fuel cells
- Fire and explosion mitigation

**Computational Physics Developments**
- Laser-plasma interactions
- Inertial confinement fusion
- Space debris elimination
- Solar physics modeling
- Dynamical gridding algorithms
- Advanced graphical and parallel processing systems
- Solar & Heliospheric Modeling
- Microfluidics
- Fluid structure interaction
- Shock and blast containment

CT-Analyst plumes displayed in Google Earth, showing the same colors and density information as in the CT-Analyst program.

Unstructured grid technology has been used to design and develop a flying unmanned underwater vehicle (UUV) for long range deployment.

Detailed simulations have led to new understanding of high-intensity, nonequilibrium, inhomogeneous, anisotropic reactive turbulent flows.

Rotating Detonation Engine research for reducing fuel consumption and improving performance.
Basic Responsibilities

The Laboratories for Computational Physics and Fluid Dynamics (LCP&FD) are responsible for the research leading to and the application of advanced analytical and numerical capabilities that are relevant to NRL, Navy, DoD, and other Government agencies. This research is pursued in the fields of compressible and incompressible fluid dynamics, reactive flows, fluid/structure interactions including submarine and aerospace applications, atmospheric and solar geophysics, magnetoplasma dynamics, application of parallel processing to large-scale problems such as unsteady flows of contaminants in and around cities, advanced propulsion concepts, flame dynamics for shipboard fire safety, jet noise reduction, and other disciplines of continuum computational physics as required to further the overall mission of NRL. The specific objectives of the LCP&FD are to develop and maintain state-of-the-art analytical and computational capabilities in fluid dynamics and related fields of physics; to establish in-house expertise in parallel processing for large-scale scientific computing; to perform analyses and computational experiments on specific relevant problems using these capabilities; and to transfer this technology to new and ongoing projects through cooperative programs with the research Divisions at NRL and elsewhere.

**Personnel:** 22 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Director, Laboratories for Computational Physics and Fluid Dynamics</td>
<td>6040</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>6040.2</td>
</tr>
<tr>
<td>Chief Scientist for Computational Physics and Fluid Dynamics</td>
<td>6003</td>
</tr>
<tr>
<td>Head, Laboratory for Propulsion, Energetic, and Dynamic Systems</td>
<td>6041</td>
</tr>
<tr>
<td>Head, Laboratory for Advanced Computational Physics</td>
<td>6042</td>
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<tr>
<td>Head, Laboratory for Multiscale Reactive Flow Physics</td>
<td>6043</td>
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</table>

**Point of contact:** Code 6040, (202) 404-1064
Chemical Diagnostics
- Alternate energy sources
- Atmosphere analysis and control
- Environmental chemistry / microbiology
- Ion / molecule processes
- Kinetics of gas phase reactions
- Laboratory on a chip
- Methane hydrates
- Optical diagnostics of chemical reactions
- Trace analysis

Materials Chemistry
- Bio-inspired materials
- Degradation and stabilization mechanisms
- Functional organic coatings
- High-temperature resins
- Magnetic resonance
- Novel nanotubes and nanofibers
- Polymer characterization
- Reactive nanometals
- Synthesis and evaluation of innovative polymers and composites

Center for Corrosion Science and Engineering
- Aquatic invasive organism control
- Biofouling control
- Cathodic protection

Corrosion control engineering
- Corrosion science
- Environmental fracture and fatigue
- Marine coatings
- Materials failure analysis

Surface/Interface Chemistry
- Adhesion
- Bio / organic interfaces
- Chemical / biological sensors
- Diamond films
- Electrochemistry
- Plasmonics
- Energy storage materials
- Nanostructured materials and interfaces
- Surface / interface analysis
- Surface properties of materials
- Surface reaction dynamics
- Synchrotron radiation applications
- Tribology

Safety and Survivability
- Chemometrics / data fusion
- Combustion dynamics
- Fire protection and suppression
- Mobility fuels
- Modeling and scaling of combustion systems
- Personnel protection
- System automation
- Trace analysis

The ex-USS Shadwell (LSD 15), moored in Mobile Bay, Alabama, is NRL’s full-scale, advanced research and full-scale demonstration vessel operated by the Chemistry Division.

The Key West site of the NRL Center for Corrosion Science and Engineering specializes in understanding and modeling the marine environment’s impact on naval materials. A complete laboratory for the study of corrosion control technologies provides sponsors with prototypical seawater exposure of their systems.
Basic Responsibilities

The Chemistry Division conducts basic research, applied research, and development studies in the broad fields of chemical/structural diagnostics, reaction rate control, materials chemistry, surface and interface chemistry, corrosion passivation, environmental chemistry, and ship safety/survivability. Specialized programs within these fields include coatings, functional polymers/elastomers, clusters, controlled release of energy, physical and chemical characterization of surfaces, electrochemistry, assembly and properties of nanometer structures, tribology, chemical vapor deposition/etching, atmosphere analysis and control, environmental protection/reclamation, prevention/control of fires, mobility fuels, modeling/simulation, and miniaturized sensors for chemical, biological, trace analysis and data fusion, and explosives.

To enhance protection of Navy personnel and platforms from damage and injury in peace and wartime, the Navy Technology Center for Safety and Survivability performs RDT&E on fire and personnel protection, fuels, chemical defense, submarine atmospheres, and damage control aspects of ship and aircraft survivability; supports Navy and Marine Corps requirements in these areas; and acts as a focus for technology transfer in safety and survivability.

To address problems in corrosion and marine fouling, a Marine Corrosion Facility is located in Key West, Florida. This laboratory resides in an unparalleled site for natural seawater exposure testing and marine related materials evaluation. The tropical climate is ideal for marine exposure testing. Along with the high quality seawater, the location provides small climatic variation and a stable biomass throughout the year.

Personnel: 113 full-time civilian; 1 military; 5 intermittent; 3 part-time

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Chemistry Division</td>
<td>6100</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>6101</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>6102</td>
</tr>
<tr>
<td>Senior Scientific Staff</td>
<td>6104</td>
</tr>
<tr>
<td>Senior Scientific Staff</td>
<td>6104</td>
</tr>
<tr>
<td>Biotechnology Program Manager</td>
<td>6106</td>
</tr>
<tr>
<td>Head, Chemical Dynamics and Diagnostics Branch</td>
<td>6110</td>
</tr>
<tr>
<td>Head, Materials Chemistry Branch</td>
<td>6120</td>
</tr>
<tr>
<td>Head, Center for Corrosion Science and Engineering</td>
<td>6130</td>
</tr>
<tr>
<td>Head, Surface Chemistry Branch</td>
<td>6170</td>
</tr>
<tr>
<td>Head, Navy Technology Center for Safety and Survivability</td>
<td>6180</td>
</tr>
<tr>
<td>Senior Scientist for Theoretical Chemistry</td>
<td>6189</td>
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</table>

Point of contact: Code 6102, (202) 767-2460

*Acting
Materials and Sensors
- Laser direct write
- THz sources, devices, and sensors
- Spintronic materials and devices
- Magnetic materials
- Superconducting materials
- Optoelectronic materials
- Electroceramic materials
- Multiferroic materials
- Radar absorbing materials
- Analysis of extrasolar materials
- Chemical sensors
- Nonlinear dynamics and chaos theory
- Nanoplasmonic biosensors
- Thin film deposition for devices
- Ion implantation
- Glass fiber processing and characterization
- Polymer synthesis and characterization
- Personal protective equipment
- Remote explosives detection
- Automated learning

Multifunctional Materials
- 3D Materials Science
  - Image-based microstructural modeling
  - Materials by design
  - Nano-, micro-, mesoscale material characterization
  - Grain boundary engineering
  - Atom probe tomography
- Physical metallurgy
  - Ferrous, nonferrous, and intermetallic alloys
  - Powder metallurgy
  - Microwave sintering
  - Rapid solidification
  - Rail gun materials

Friction stir welding and joining technologies
- Heat treating and phase transformations
- Biomechanical surrogate development for warfighter protection
- Biomechanical simulation
- Personal protective equipment
- Composite material systems
  - Multifunctional structures
- Armor
- Porovascular structures
- Corrosion simulation and control
  - Modeling of electrochemical corrosion systems
  - Evaluation of cathodic protection performance
- Advanced ceramics
  - High energy density dielectrics
  - High temperature ceramics
  - Thermal barrier coatings

Computational Materials Science
- Condensed matter theory
- Electronic structure of solids and clusters
- Molecular dynamics
- Quantum many-body theory
- Theory of magnetic materials
- Theory of alloys
- Materials for power and energy
- Semiconductor and surface physics
- Theoretical studies of phase transitions
- Atomic physics theory
- Protein modeling
- Continuum multiphysics modeling
- Reduced order modeling
- Multiphysics simulation of materials behavior
- Development of high-performance computational methods

The Secondary Ion Mass Spectrometer/Single-Stage Accelerator Mass Spectrometer performs spatially resolved composition analysis using secondary ion mass spectrometer (SIMS) to sputter atoms, and single stage accelerator mass spectrometer (SSAMS) to reduce background interferences from commonly present molecular ions. Provides high-sensitivity and high-precision measurements.
Basic Responsibilities

The Materials Science and Technology Division conducts basic and applied research and engages in exploratory and advanced development of materials having substantive value to the Navy. The Division is composed of multidisciplinary teams of materials scientists, metallurgists, ceramists, physicists, chemists, and engineers using the most advanced testing facilities and diagnostic techniques. R&D programs encompass the intrinsic behavior of metals, semiconductors, insulators, composites, and ceramics, including efforts in ferrous alloys, intermetallic compounds, superconducting, dielectric, and magnetic materials, films and coatings, and multifunctional materials systems. The programs encompass advanced synthesis and processing techniques, as well as postprocessing techniques to fabricate sensors, devices, structures, and components. A variety of state-of-the-art characterization tools are used to probe the atomic, grain, and defect structure (composition and microstructure) of the materials as well as to delineate the fundamental properties of the material or material system. Response of materials and material systems to a variety of external influences (mechanical, chemical, optical, electromagnetic radiation, high-power lasers, temperature, etc.) is integral to the Division’s programs, as are performance and reliability projections for military service lifetime. The program includes strong theoretical, experimental, computational, and simulation efforts to predict, guide, and explain the behavior of materials and materials systems. Studies conducted in the Division provide guidance for the selection, design, certification, and life-cycle management of material in Naval vehicles and systems.

Personnel: 100 full-time civilian

Key Personnel

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Materials Science and Technology Division</td>
<td>6300</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>6301</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>6302</td>
</tr>
<tr>
<td>Senior Scientist</td>
<td>6300.1</td>
</tr>
<tr>
<td>Head, Special Projects Group</td>
<td>6300.2</td>
</tr>
<tr>
<td>Head, Multifunctional Materials Branch</td>
<td>6350</td>
</tr>
<tr>
<td>Head, Materials and Sensors Branch</td>
<td>6360</td>
</tr>
<tr>
<td>Head, Center for Computational Materials Science</td>
<td>6390</td>
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</tbody>
</table>

Point of contact: Code 6302, (202) 767-2458

*Acting
Plasma Physics Division

Code 6700
Research Activity Areas

Radiation Hydrodynamics
- Radiation hydrodynamics of Z-pinches and laser-produced plasmas
- X-ray source development
- Cluster dynamics in intense laser fields
- Plasma kinetics for directed energy and fusion
- Plasma discharge physics
- Dense plasma atomic physics, equation of state
- Numerical simulation of high-density plasma
- Laser driven ion/neutron sources

Laser Plasma
- Nuclear weapons stockpile stewardship
- Laser fusion, inertial confinement
- Megabar high-pressure physics
- Rep-rate KrF laser development
- High power electron beam applications
- Laser fusion technology
- Laser fusion energy
- Detection of chemical/biological/nuclear materials

Charged Particle Physics
- Applications of modulated electron beams
- Rocket, satellite, and ISS natural and active experiments
- Laboratory simulation of space plasmas
- Large-area plasma processing sources

Surface modification of energy sensitive materials
- Atmospheric and ionospheric GPS sensing
- Ionospheric effects on communications
- Electromagnetic launchers
- Radiation belt remediation

Pulsed Power Physics
- Production, focusing, and propagation of intense electron and ion beams
- High-power, pulsed radiography
- Plasma and bremsstrahlung radiation sources
- Capacitive, inductive, and battery energy storage
- Nuclear weapons effects simulation
- Electromagnetic launchers
- Detection of Special Nuclear Materials
- Advanced energetics via stimulated nuclear decay

Beam Physics
- Directed energy and laser propagation in the atmosphere
- Advanced accelerators and radiation sources
- Microwave, plasma, and laser processing of materials
- Microwave sources: magnicons and gyrotrons
- Nonlinear stochastic dynamical systems
- Ultrahigh-intensity laser-matter interactions
- Free electron lasers and laser synchrotrons
- Theory and simulation of space and solar plasmas
- Global ionospheric and space weather modeling
- Underwater laser interactions

Nike is the world’s largest krypton fluoride (KrF) laser and is used to explore physics issues for laser fusion. Shown is the propagation bay where 56 short-duration (4-5 ns) beams are directed by mirrors first to the electron-beam-pumped amplifiers and then to the target facility. The Nike KrF system achieves extremely uniform high-intensity illumination of planar targets by overlapping numerous smoothed laser beams. Typical experiments include studies of the ablative acceleration of matter to high velocities (up to 1000 km/s) and studies of the reaction of materials to very high pressures (10 million atmospheres) produced by the laser light.

The NRL Ti:Sapphire Femtosecond Laser (TFL) currently operates at 40 fs, 15 TW and provides a facility to conduct research in intense laser-plasma interactions, ultrashort intense laser propagation in the atmosphere, remote sensing of chem/bio agents, and laser-induced electrical discharges.
The Plasma Physics Division conducts a broad theoretical and experimental program of basic and applied research in plasma physics, laboratory discharge, and space plasmas, intense electron and ion beams and photon sources, atomic physics, pulsed power sources, laser physics, advanced spectral diagnostics, and nonlinear systems. The effort of the Division is concentrated on a few closely coordinated theoretical and experimental programs. Considerable emphasis is placed on large-scale numerical simulations related to plasma dynamics; ionospheric, magnetospheric, and atmospheric dynamics; nuclear weapons effects; inertial confinement fusion; atomic physics; plasma processing; nonlinear dynamics and chaos; free electron lasers and other advanced radiation sources; advanced accelerator concepts; and atmospheric laser propagation. Areas of experimental interest include laser-plasma, laser-electron beam, and laser-matter interactions, high-energy laser weapons, laser shock hydrodynamics, thermonuclear fusion, electromagnetic wave generation, the generation of intense electron and ion beams, large-area plasma processing sources, electromagnetic launchers, high-frequency microwave processing of ceramic and metallic materials, advanced accelerator development, inductive energy storage, laboratory simulation of space plasma phenomena, high-altitude chemical releases, and in situ and remote sensing space plasma measurements.

**Personnel:** 85 full-time civilian

**Key Personnel**

<table>
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<tbody>
<tr>
<td>Superintendent, Plasma Physics Division</td>
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<tr>
<td>Associate Superintendent</td>
<td>6701</td>
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<tr>
<td>Administrative Officer</td>
<td>6702</td>
</tr>
<tr>
<td>Senior Scientist, Directed Energy Physics</td>
<td>6703</td>
</tr>
<tr>
<td>Senior Scientist, Radiation Physics and High Energy Density Materials</td>
<td>6705</td>
</tr>
<tr>
<td>Senior Scientist, Intense Particle Beams and Plasma Processes</td>
<td>6709</td>
</tr>
<tr>
<td>Head, Radiation Hydrodynamics Branch</td>
<td>6720</td>
</tr>
<tr>
<td>Head, Laser Plasma Branch</td>
<td>6730</td>
</tr>
<tr>
<td>Head, Charged Particle Physics Branch</td>
<td>6750</td>
</tr>
<tr>
<td>Head, Pulsed Power Physics Branch</td>
<td>6770</td>
</tr>
<tr>
<td>Head, Beam Physics Branch</td>
<td>6790</td>
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</table>

**Point of contact:** Code 6700, (202) 767-2723
Electronics Science and Technology Division

Code 6800
Research Activity Areas

Nanoscience and Nanotechnology
Nanoelectronics
Plasmonics
Energy harvesting
Quantum information
Sensing

Surface and Interface Sciences
Epitaxial growth of graphene
Growth of hyper-abrupt junctions
Atomic layer deposition of dielectrics

Electronic Materials
Advanced elemental and compound semiconductors, high-k dielectrics, and second-order materials
Unique materials characterization
Fabrication of electronic devices with high degree of complexity and precision

Computational Modeling and Simulation
Fast principles atomistic calculations
Device modeling activities
Modeling coherent interaction of electromagnetic fields with electron beams

Power Electronics
SiC and GaN epitaxial growth research
Characterization of defects in SiC and GaN
Development of advanced SiC and GaN power device processes
Reliability of SiC and GaN power devices

Microwave, Millimeter, and Sub-Millimeter Technology
Millimeter-wave, sub-millimeter-wave and terahertz technology
Vacuum electronics
Solid-state electronics
Filters and control components

Optoelectronics
Design and synthesis of new materials in the IR spectrum region

Photovoltaics
High-efficiency technologies for portable photovoltaic power systems

Radiation Effects
Particle irradiation
Photons irradiation
Displacement damage dose effects in materials and devices

The EPICENTER specializes in molecular beam epitaxial growth of nanostructures created by alternating layers of narrow bandgap materials made available from four ultrahigh-vacuum chambers. These structures are expected to improve the performance of far-infrared detectors, midwave lasers, and superhigh frequency transistors and resonant tunneling diodes.
Basic Responsibilities

The Electronics Science and Technology Division conducts programs of basic science and applied research and development in nanoscience and nanotechnology, surface and interface sciences, electronic materials, computational modeling and simulation, power electronics, microwave, millimeter, and sub-millimeter technology, optoelectronics, photovoltaic and radiation effects. The activities of the Division integrate device research with basic materials investigations and with systems research and development needs.

**Personnel:** 107 full-time civilian

**Key Personnel**

<table>
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<tr>
<td>Superintendent, Electronics Science and Technology Division</td>
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</tr>
<tr>
<td>Associate Superintendent</td>
<td>6801</td>
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<tr>
<td>Administrative Officer</td>
<td>6802</td>
</tr>
<tr>
<td>Senior Scientist for Nanoelectronics</td>
<td>6877</td>
</tr>
<tr>
<td>Head, Optoelectronics and Radiation Effects Branch</td>
<td>6810</td>
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<tr>
<td>Head, Electromagnetics Technology Branch</td>
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<tr>
<td>Head, Physics of Electronic Materials Branch</td>
<td>6870</td>
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<tr>
<td>Head, High Power Electronics Branch</td>
<td>6880</td>
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</table>

**Point of contact:** Code 6802, (202) 767-3416
Biologically Derived Microstructures
Self-assembly, molecular machining
Synthetic membranes
Nanocomposites
Tailored electronic materials
Molecular engineering, biomimetic materials
Molecular imprinting
Viral scaffolds
Multifunctional decontamination coatings

Biosensors
Binding polypeptides and proteins
Cell-based biosensors
DNA biosensors
Fiber-optic biosensors
Flow immunosensors
Array-based sensors
Optical biosensors
Microfluidics and Microarrays

Novel Materials
Soil/groundwater explosives detection
Single chain and single domain antibodies
Nanoparticles and quantum dots
Nano- and mesoporous materials
Quantum dot and protein conjugates
Biomimetic materials

Molecular Biology
Genomics and proteomics of marine bacteria
Tissue engineering
Gene arrays, biomarkers
System and synthetic biology

Energy Harvesting
Biomaterials for charge storage
Ocean floor biofuel cell
Photo-induced electron transfer

Porphyrin-functionalized organosilicate sorbents provide capture and neutralization of vapor phase TIC/TIM targets. These materials offer the potential for new approaches to air filtration applicable to personal and facility protection.

5-color quantum dot immunohistochemical labeling of mouse splenic tissue and an image of live HEK cells microinjected with quantum dots. Center: 3-color quantum dot immunoassay results along with a schematic showing quantum dot potential to function as both a donor or as an acceptor in different types of energy transfer biosensing configurations. Bottom: Quantum dot solutions highlighting their size-tunable photoluminescence.
Basic Responsibilities

The Center for Bio/Molecular Science and Engineering is using the tools of modern biology, physics, chemistry, and engineering to develop advanced materials and sensors. The long-term research goal is first to gain a fundamental understanding of the relationship between molecular architecture and the function of materials, then apply this knowledge to solve problems for the Navy and DoD community. The key theme is the study of complex bio/molecular systems with the aim of understanding how “nature” has approached the solution of difficult structural and sensing problems. Technological areas currently being studied include molecular and microstructure design, molecular biology, imaging of cells using nanoparticles, sensor design and prototype development for biosurveillance or underwater chemical detection, and energy harvesting. Much of the research deals with the engineering of peptides, proteins, and nanoparticles into complex microstructures for use in advanced material applications, and the harnessing of the recognition functions of proteins and cells for the development of advanced sensors. A highly multidisciplinary staff is required to pursue these research and development programs. The Center provides a stimulating environment for cross-disciplinary programs in the areas of immunology, biochemistry, systems biology, electrochemistry, synthetic chemistry, microbiology, microlithography, photochemistry, biophysics, spectroscopy, advanced diagnostics, organic synthesis, and electro-optical engineering.

Personnel: 57 full-time civilian

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
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<tbody>
<tr>
<td>Director, Center for Bio/Molecular Science and Engineering</td>
<td>6900</td>
</tr>
<tr>
<td>Assistant Director</td>
<td>6901</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>6902</td>
</tr>
<tr>
<td>Senior Scientist for Biosurveillance</td>
<td>6905</td>
</tr>
<tr>
<td>Head, Laboratory for Biosensors and Biomaterials</td>
<td>6910</td>
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<tr>
<td>Head, Laboratory for Biomolecular Dynamics</td>
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<tr>
<td>Head, Laboratory for the Study of Molecular Interfacial Interactions</td>
<td>6930</td>
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Point of contact: Code 6902, (202) 404-6012

*Acting
The Ocean and Atmospheric Science and Technology Directorate performs research and development in the fields of acoustics, remote sensing, oceanography, marine geosciences, marine meteorology, and space science. Areas of emphasis in acoustics include advanced acoustic concepts and computation, acoustic signal processing, physical acoustics, acoustic systems, ocean acoustics, and acoustic simulation and tactics. Areas of emphasis in remote sensing include radio, infrared, and optical sensors, remote sensing physics and hydrodynamics, remote sensing simulation, and imaging systems. Areas of emphasis in oceanography include coastal and open ocean dynamics, ocean modeling and prediction, coastal and open ocean processes, remote sensing applications to oceanography, and marine biocorrosion processes. Areas of emphasis in marine geosciences include marine physics, seafloor sciences, geospatial information science and technology, and mapping, charting, and geodesy. Areas of emphasis in marine meteorology include atmospheric dynamics for theater-wide, tactical-scale prediction systems and forecast support, and meteorological applications development. Areas of emphasis in space science include middle and upper atmosphere physics, solar terrestrial relationships, solar physics, and higher energy astronomy. Senior naval officers are assigned as military advisors to help maintain the directorate focus on operational Navy and other DoD requirements in these areas of emphasis. The directorate is responsible for administrative and technical support to major activities in Washington, DC; Stennis Space Center, Mississippi; and Monterey, California.
Dr. E.R. Franchi was born in Huntington, New York. He graduated from Clarkson University in 1968 with a bachelor of science degree in mathematics. He received his master of science (1970) and Ph.D. (1973) degrees, both in applied mathematics, from Rensselaer Polytechnic Institute. After completing his graduate studies, Dr. Franchi accepted a research position with Bolt, Beranek, and Newman where he performed validation studies of underwater acoustic propagation and noise models.

Dr. Franchi joined the Naval Research Laboratory in 1975 as a research mathematician in the Acoustics Division. In this position, he conducted and directed research in low frequency acoustic reverberation and scattering, including design and conduct of field experiments, development of signal processing techniques, data analysis and interpretation, computer prediction models, and active sonar performance studies. In 1986, he was named Head of the Acoustic Systems Branch where he was responsible for programs that emphasized theoretical, experimental, and computational research to understand the physical mechanisms of acoustic propagation, scattering, and ambient noise that control the design and performance of large-aperture passive sonar systems, low frequency active sonar systems, and shallow water sonar systems.

In July 1988, Dr. Franchi was appointed to the Senior Executive Service and selected as the Associate Technical Director of the Naval Ocean Research and Development Activity (NORDA) and its Director of Ocean Acoustics and Technology. The Directorate conducted basic, exploratory, and advanced research and development and program management in the areas of acoustic model development and simulation, ocean acoustics measurements, and ocean engineering in support of all undersea warfare missions. In October 1992, the Directorate became the Center for Environmental Acoustics in the Acoustics Division of the Naval Research Laboratory, with Dr. Franchi as Director. Dr. Franchi was selected to the position of Superintendent of the Acoustics Division in October 1993. The Acoustics Division conducts basic, exploratory, and applied research and development in areas of acoustic modeling and simulation, ocean acoustics measurements, acoustic systems development, acoustic signal processing, and physical acoustics. He was responsible for the technical/scientific management, direction, and administration of programs with a total budget in excess of $25M, and for efficient management of division resources including the activities of approximately 110 civilian personnel. He served as Acting Associate Director of Research for the Ocean and Atmospheric Science and Technology Directorate from October 2001 to May 2002 and from June 2007 to April 2008. In April 2008, he was selected as the Associate Director of Research.

Dr. Franchi received the Presidential Rank Award of Meritorious Executive in 2003. He has over 35 years experience in underwater acoustics research and is the author/co-author of over 35 publications. He is recognized as an authority on underwater acoustic scattering and reverberation and has played major roles in Navy low frequency active sonar programs as both performer and advisor/consultant. He served as the U.S. National Leader of The Technical Cooperation Program’s multinational Panel on ASW Systems and Technology from 1996 to 2002, and served as its Panel Chairman from 2002 to 2009. In 2011, Dr. Franchi received the TTCP Personal Achievement Award in recognition of his significant contributions and strategic vision in leading the ASW Panel. He represents the United States to the NATO Maritime Science and Technology Experts Committee and served as its Committee Chairman from 2010 to the present. In 2011, he was appointed to the NATO Science and Technology Reform Implementation Team. He was elected to Pi Mu Epsilon, the Honorary National Mathematics Society, while an undergraduate at Clarkson University. Dr. Franchi is a member of the Acoustical Society of America and past member of the Mathematical Association of America. From 2004 to 2013, he volunteered his time to serve on the Board of Directors of the NRL Federal Credit Union.
ASSOCIATE DIRECTOR OF RESEARCH FOR OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY 7000

STAFF
7001 SPECIAL ASSISTANT
7005 MILITARY DEPUTY
7030 OFFICE OF RESEARCH SUPPORT SERVICES

ACOUSTICS DIVISION 7100
OCEANOGRAPHY DIVISION 7300
MARINE GEOSCIENCES DIVISION 7400
MARINE METEOROLOGY DIVISION 7500
SPACE SCIENCE DIVISION 7600
REMOTE SENSING DIVISION 7200

Key Personnel

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<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Associate Director of Research for Ocean and Atmospheric Science and Technology</td>
<td>7000</td>
</tr>
<tr>
<td>Special Assistant</td>
<td>7001</td>
</tr>
<tr>
<td>Military Deputy</td>
<td>7005</td>
</tr>
<tr>
<td>Head, Office of Research Support Services</td>
<td>7030</td>
</tr>
<tr>
<td>Superintendent, Acoustics Division</td>
<td>7100</td>
</tr>
<tr>
<td>Superintendent, Remote Sensing Division</td>
<td>7200</td>
</tr>
<tr>
<td>Superintendent, Oceanography Division</td>
<td>7300</td>
</tr>
<tr>
<td>Superintendent, Marine Geosciences Division</td>
<td>7400</td>
</tr>
<tr>
<td>Superintendent, Marine Meteorology Division</td>
<td>7500</td>
</tr>
<tr>
<td>Superintendent, Space Science Division</td>
<td>7600</td>
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</table>

Point of contact: Code 7000A, (202) 404-8174
Office of Research Support Services (NRL-SSC)

Code 7030
Staff Activity Areas

Office of Research Support
Conference coordination, video teleconferencing
Directives, reports, forms

Facilities Office
Facilities planning and maintenance
Vehicles

HPC Management Office
Supercomputing interface management

Safety/Environmental Office
Industrial/laboratory safety
Specialized safety training
Hazard abatement
Mishap prevention
Hazardous materials program
Hazardous waste disposal

Public Affairs Office
Community relations
News releases
Exhibits
Information
Freedom of Information Act

NRL-SSC Network Management Office
Data communications
Data networking
Computer network maintenance
Basic Responsibilities

The Office of Research Support Services is responsible for the operational and management support necessary for the day-to-day operations at NRL Stennis Space Center, Mississippi (NRL-SSC). The Head of NRL-SSC acts for the Commanding Officer in dealing with local Navy, Federal, and civil activities and personnel on matters relating to NRL-SSC support activities and facilities, community and multicommand issues, and safety and disaster control measures.

Support functions include public affairs, network support, safety, high performance computer management, and support services to include management, administration, and facilities.

**Personnel:** 8 full-time civilian

**Key Personnel**

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Head, Office of Research Support Services</td>
<td>7030</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>7030.2</td>
</tr>
<tr>
<td>Head, Facilities Office</td>
<td>7030.3</td>
</tr>
<tr>
<td>Public Affairs Officer</td>
<td>7030.4</td>
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<tr>
<td>Safety/Environmental Officer</td>
<td>7030.5</td>
</tr>
<tr>
<td>HPC Management Office</td>
<td>7030.6</td>
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<tr>
<td>NRL-SSC Network Management Office</td>
<td>7030.8</td>
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</table>

**Point of contact:** Code 7030, (228) 688-4010; DSN 828-4010

*Acting
Physical Acoustics
- Structural acoustics
- Quantum effects in phononic crystals
- Nanomechanical devices
- Fiber-optic acoustic sensors
- Acoustic transduction
- Inverse scattering
- Target strength / radiation modeling
- Flow-induced noise and vibration
- Active sonar classification
- Underwater distributed, networked sensing
- AUV-based sensing

Acoustic Signal Processing and Systems
- Underwater acoustic communications and networking
- Limits of array performance
- Waveguide invariant processing
- Acoustic field uncertainty
- Acoustic interactions with transonic/supersonic flows
- Acoustic noise forecasting
- Long-range underwater communications
- Underwater distributed sensing networks
- Ocean boundary scattering
- Acoustic propagation
- Acoustic inversion
- Characterization of reverberation
- Acoustic metamaterials
- Acoustics of microfluidic bubbly emulsions
- Active sonar performance modeling
- Compressive sensing
- Acoustic classification
- Nonlinear propagation
- Underwater acoustic network warfare

Acoustic Simulation, Measurements, and Tactics
- Ocean acoustic propagation and scattering models
- Fleet application acoustic models
- High-frequency seafloor and ocean acoustic measurements
- Riverine acoustics
- Distributed sensing networks
- Incorporating uncertainty in predictive models
- Tactical acoustic simulations and databases
- Warfare effectiveness studies and optimization
- Environmental assessment and planning tools
Basic Responsibilities

The Acoustics Division conducts basic and applied research addressing the physics of acoustic signal generation, propagation, scatter, and detection with the objective of improving the strategic and tactical capabilities of the Navy and Marine Corps in the ocean and land operational environment. The Division’s scientists and engineers perform collaborative research with scientists affiliated with national and international academic, private, and governmental research organizations. The Division’s research spans classical and quantum physics, signal processing, the impact of fluid dynamics on the oceans sound speed field, the propagation and scatter of acoustic signals in the ocean and land environments, structural and physical acoustics including the development of MEMS and nanotechnology based sensors, and the application of networked unmanned underwater vehicles and associated sensors to the Navy’s ASW, MCM, and ISR missions.

**Personnel:** 61 full-time civilian

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Acoustics Division</td>
<td>7100</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>7101</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>7102</td>
</tr>
<tr>
<td>Naval Science (Acoustics) Research Coordinator</td>
<td>7105</td>
</tr>
<tr>
<td>Senior Scientist for Structural Acoustics</td>
<td>7106</td>
</tr>
<tr>
<td>Head, Physical Acoustics Branch</td>
<td>7130</td>
</tr>
<tr>
<td>Head, Acoustic Signal Processing and Systems Branch</td>
<td>7160</td>
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<tr>
<td>Head, Acoustic Simulation, Measurements, and Tactics Branch</td>
<td>7180</td>
</tr>
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</table>

**Point of contact:** Code 7100, (202) 767-3482
Remote Sensing Division

**Code 7200**  
**Research Activity Areas**

**Remote Sensing**
- Sensors  
- SAR  
- Imaging radar  
- Passive microwave imagers  
- CCDs and focal plane arrays  
- Thermal IR cameras  
- Fabry-Perot spectrometers  
- Imaging spectrometers  
- Radio interferometers  
- Optical interferometers  
- Adaptive optics  
- Lidar  
- Spaceborne and airborne systems  

**Research Areas**
- Radiative transfer modeling  
- Coastal oceans  
- Marine ocean boundary layer  
- Polar ice  
- Middle atmosphere  
- Global ocean phenomenology  
- Environmental change  
- Ocean surface wind vector  
- Soil moisture  
- Ionosphere  
- Data assimilation  

**Astrophysics**
- Optical interferometry  
- Radio interferometry  
- Fundamental astrometry and reference frames  
- Fundamental astrophysics  
- Star formation  
- Stellar atmospheres and envelopes  
- Interstellar medium, interstellar scattering pulsars  
- Low-frequency astronomy  

**Physics of Atmospheric/Ocean Interaction**
- Mesoscale, fine-structure, and microstructure  
- Aerosol and cloud physics  
- Mixed layer and thermocline applications  
- Sea-truth towed instrumentation techniques  
- Turbulent jets and wakes  
- Nonlinear and breaking ocean waves  
- Stratified and rotating flows  
- Turbulence modeling  
- Boundary layer hydrodynamics  
- Marine hydrodynamics  
- Computational hydrodynamics  

**Imaging Research/Systems**
- Remotely sensed signatures analysis/simulation  
- Real-time signal and image processing  
- algorithm/systems  
- Image data compression methodology  
- Image fusion  
- Automatic target recognition  
- Scene/sensor noise characterization  
- Image enhancement/noise reduction  
- Scene classification techniques  
- Radar and laser imaging systems studies  
- Coherent/incoherent imaging sensor exploitation  
- Numerical modeling simulation  
- Environmental imagery analysis

The Hyperspectral Imager for the Coastal Ocean, or HICO, is optimized to image the coastal ocean and adjacent land in 128 contiguous color bands. This spectral data is used to develop maps of water depth, water optical properties, land vegetation, and soil bearing strength. HICO was deployed to the International Space Station in September 2009, providing scientific imagery of varied coastal types worldwide.
Basic Responsibilities

The Remote Sensing Division is the Navy’s center of excellence for remote sensing research and development, conducting a program of basic research, science, and applications aimed at the development of new concepts for sensors and imaging systems for objects and targets on the Earth, in the near-Earth environment, and in deep space. The research, both theoretical and experimental, deals with discovering and understanding the basic physical principles and mechanisms that give rise to target and background emission and to absorption and emission by the intervening medium. The accomplishment of this research requires the development of sensor systems technology. This development effort includes active and passive sensor systems to be used for the study and analysis of the physical characteristics of phenomena that give rise to naturally occurring background radiation, such as that caused by the Earth’s atmosphere and oceans, as well as man-made or induced phenomena, such as ship/submarine hydrodynamic effects. The research also includes theory, laboratory, and field experiments leading to ground-based, airborne, and space-based systems for use in such areas as environmental remote sensing (including improved meteorological support systems for the operational Navy), astrometry, astrophysics, surveillance, and nonacoustic ASW. Special emphasis is given to developing space-based platforms and exploiting existing space systems.

Personnel: 97 full-time civilian

Key Personnel

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Remote Sensing Division</td>
<td>7200</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>7201</td>
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<tr>
<td>Administrative Officer</td>
<td>7202</td>
</tr>
<tr>
<td>Military Deputy</td>
<td>7205</td>
</tr>
<tr>
<td>Head, Radio/Infrared/Optical Sensors Branch</td>
<td>7210</td>
</tr>
<tr>
<td>Head, Remote Sensing Physics Branch</td>
<td>7220</td>
</tr>
<tr>
<td>Head, Coastal and Ocean Remote Sensing Branch</td>
<td>7230</td>
</tr>
<tr>
<td>Head, Image Science and Applications Branch</td>
<td>7260</td>
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</table>

Point of contact: Code 7200, (202) 767-3391
Ocean Dynamics and Prediction

Circulation
- Global resolution of circulation and meso-scale fields
- Littoral circulation at the coast, bays, and estuaries
- Satellite observation processing and assimilation
- UUV adaptive sampling
- Observation system simulation experiments
- Ice volume and ice drift
- Tidal currents and heights

Surface effects
- Surface wave effects globally and into bays
- Wave breaking
- Mixed layer dynamics
- Swell propagation and dynamics
- Phase averaged wave evolution
- Phase resolved wave dynamics

Nearshore
- Wave breaking at the shore
- Rip currents at the shore
- Tidal currents and heights into rivers
- Nonlinear wave interaction
- Sensor deployment optimization

Acoustic effects
- Sound speed variation for acoustic propagation
- Internal waves, solitons, and bores for beam focusing
- Wave bubble entrainment and noise generation

Ocean Sciences

Dynamical processes
- Optical turbulence
- Biological sensing and modeling
- Optical thin layers
- Coastal current systems
- Waves and bubbles

Coupled systems
- Air/ocean/acoustic coupling
- Coupled bio/optical/physical processes
- Coupled physical/sediment processes

Remote sensing applications
- 3D optical profiling
- Color/hyperspectral signatures
- Ocean optics
- Sea surface salinity
- Microbiologically influenced corrosion
- Metal-microbe interaction

Sea surface height from the 1/25° Global Hybrid Coordinate Ocean Model (HYCOM) for the Northern Pacific Ocean.
Basic Responsibilities

The Oceanography Division conducts basic and applied research in description and modeling of biological, physical, and dynamical processes in open ocean, regional, and littoral areas; in exploitation of satellite, airborne, and in situ sensors for environmental characterization; and in investigation and application of microbial processes to Navy problems. The oceanographic research is both theoretical and experimental in nature and is focused on understanding and modeling ocean, coastal, and littoral area hydro/thermodynamics, circulation, waves, ice dynamics, air-sea exchange, optics, and small and microscale processes. Analytical methods and algorithms are developed to provide quantitative retrieval of geophysical parameters of Navy interest from state-of-the-art sensor systems. The Division work includes analysis of biological processes that mediate and control optical properties of the oceans, coastal, and littoral regions, and microbially induced corrosion/metal-microbe interaction. The Division programs are designed to be responsive to and to anticipate Naval needs. Transition of Division products to the DoD, Navy systems developers, operational Navy, and civilian (dual use) programs is a primary goal. The Division’s programs are coordinated and interactive with other NRL programs and activities, ONR’s research programs, and other government agencies involved in oceanographic activities. The Division also collaborates and cooperates with scientists from the academic community and other U.S. and foreign laboratories.

Personnel: 78 full-time civilian; 1 military

Key Personnel

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Oceanography Division</td>
<td>7300</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>7301</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>7302</td>
</tr>
<tr>
<td>Office of the Senior Scientist for Marine Molecular Processes</td>
<td>7303</td>
</tr>
<tr>
<td>Military Deputy</td>
<td>7305</td>
</tr>
<tr>
<td>Head, Ocean Dynamics and Prediction Branch</td>
<td>7320</td>
</tr>
<tr>
<td>Head, Ocean Sciences Branch</td>
<td>7330</td>
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</table>

Point of contact: Code 7301, (228) 688-4704; DSN 828-4704
Marine Geology
- Sedimentary processes
- Sediment microstructure
- Pore fluid flow
- Diapirism, volcanism, faulting, mass movement
- Biogenic and thermogenic methane
- Hydrate distribution, formation, and dissociation
- Small-scale granular/fluid dynamics

Marine Geophysics
- Seismic wave propagation
- Physics of low-frequency acoustic propagation
- Acoustic energy interaction with topography and inhomogeneities
- Gravimetry and geodesy
- Geomagnetic modeling

Marine Geotechnique
- Acoustic seafloor characterization
- Geoaoustic modeling
- Geotechnical properties and behavior of sediments
- Measurement and modeling of high-frequency acoustic propagation and scattering
- Mine burial processes
- Marine biogeochemistry
  - Animal-microbe-sediment interactions
  - Early sediment diagenesis
- Biomineralization of palladium species
- Physics-based and numerical modeling of sediment strength

Geospatial Sciences and Technology
- Digital database design
- Digital product analysis and standardization
- Data compression techniques and exploitation
- Hydrographic survey techniques
- Bathymetry extraction techniques from remote and acoustic imagery
- Modeling of nearshore morphodynamics
- Geospatial portal design with 2D and 3D interfaces
- Characterization of the littoral from airborne platforms

In Situ and Laboratory Sensors
- High-resolution subseafloor 2D and 3D seismic imaging
- Laser/hyperspectral bathymetry/topography
- Swath acoustic backscatter imaging
- Sediment pore water pressure, permeability, and undrained shear strength
- Compressional and shear wave velocity and attenuation
- Airborne geophysics, gravity, and magnetics
- Seafloor magnetic fluctuation
- Sediment microfabric change with pore fluid and/or gas change
- Instrumented mine shapes
- Bottom currents and pressure fluctuations

In the Marine Geosciences Division, scientists perform laboratory experiments with a small oscillatory flow tunnel (S-OFT) to study the formation and migration of sand ripples. Rippled sand beds are ubiquitous on the seafloor in shallow water. Understanding the complex response of the seafloor to forcing from surface waves and currents is important for Naval operations from amphibious landings to mine warfare. Shown in the image is the S-OFT including a mounted laser and four high-speed video cameras to perform tomographic particle image velocimetry (Tomo-PIV) measurements, which estimate the three-dimensional fluid velocity in a volume up to 10 cm³. The upper inset is a picture of a sand ripple formed using a bimodal distribution of sand where the smaller sand particles are darker and the larger sand particles are lighter in color. The lower inset is a profile image of a sand ripple from the same experiment where the sorting processes between large and small grains have formed visible strata. Ripple migration is from right to left in both inset images.
Basic Responsibilities

The Marine Geosciences Division conducts a broadly based, multidisciplinary program of scientific research, advanced technology development, and applied research in marine geosciences, geodesy, geospatial information, and related technologies. This includes investigations of basic processes within ocean basins, littoral regions and adjacent land areas, and arctic regions; development of models, sensors, and techniques; and the exploitation of this knowledge and technology to enhance Navy and Marine Corps systems, plans, and operations, and to meet national needs.

As the Navy’s subject matter expert in the areas of Geospatial Information and Services (GI&S), the Division provides vital technical support to the Oceanographer/Navigator of the Navy, CNO, N2/N6E, the National Geospatial-Intelligence Agency (NGA) and the Tri-Service Community. NRL also contributes to the development of leading-edge geospatial technology by reviewing emerging GI&S standards and products.

Close coordination and interactions with the Commander, Naval Meteorology and Oceanography Command, Naval Oceanographic Office, CNO, Office of Naval Research (ONR), Systems Commands, Warfare Centers, NGA, and the other DoD and national organizations are essential to the success of Division programs, with transition of Division technology to systems developers and to the operational Navy a primary goal. The Division program is coordinated and interactive with other NRL programs and activities, ONR’s Research Program Department, NOAA, USGS, NSF, and other government agencies involved in seafloor activities. The Division collaborates and cooperates with scientists from the academic community, other U.S. and foreign laboratories, and industry.

Personnel: 62 full-time civilian; 2 military

Key Personnel

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Marine Geosciences Division</td>
<td>7400</td>
</tr>
<tr>
<td>Associate Superintendent</td>
<td>7401</td>
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<tr>
<td>Administrative Officer</td>
<td>7402</td>
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<tr>
<td>Head, Office of Geospatial Science and Technology Innovation</td>
<td>7403</td>
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<tr>
<td>Military Deputy</td>
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<tr>
<td>Head, Marine Physics Branch</td>
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<tr>
<td>Head, Seafloor Sciences Branch</td>
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<tr>
<td>Head, Geospatial Sciences and Technology Branch</td>
<td>7440</td>
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</table>

Point of contact: Code 7402, (228) 688-4660; DSN 828-4660

*Acting
Marine Meteorology Division

Code 7500
Research Activity Areas

Atmospheric Dynamics and Prediction
- Global to tactical scale
- Deterministic and probabilistic forecasting
- Large eddy simulation
- Boundary layer processes
- Land surface processes and modeling
- Cloud microphysics and radiative processes
- Coastal processes and modeling
- Arctic processes and modeling
- Urban effects
- Coupled ocean/atmosphere phenomena
- Madden Julian oscillation
- Atmospheric waves and scale interactions
- Coupled littoral prediction
- Hydrology and hydrological cycle
- Tropical cyclones
- Aerosol particles
- Gravity waves
- Predictability
- Ensembles design
- Advanced numerical methods
- GPU-based computing

Data Assimilation
- Hybrid ensemble-variational techniques
- 3D and 4D variational analysis
- Ensemble Kalman Filter (EnKF)
- Quality control and bias correction
- Tropical cyclone initialization
- Remotely sensed data assimilation
- Adjoint technique and applications
- Radar data assimilation
- Targeted observing strategies
- Data selection techniques
- Aerosol and trace gas assimilation
- UAV/UAS data assimilation
- Observing system assimilation experiment

Tactical Environmental Support
- Rapid environmental assessment
- Through-the-sensor measurements
- Atmospheric impact on weapons systems
- Data fusion
- Nowcasting
- Visualization
- Verification and Validation
- Information Assurance
- Expert systems
- Aviation risk assessment

Atmospheric Physics
- Air-sea interaction
- Cloud and aerosol microphysics
- Radiative transfer
- Cloud and aerosol radiative properties
- Aerosol characterization
- Tropical cyclone structure
- Gravity wave drag

Measurement Capabilities Atmospheric Physics
- Mobile Atmospheric Aerosol and Radiation Laboratory
- Platform Coastal Facility for Atmospheric Research
- Aircraft Aerosol and Radiation Instrumentation Packages
- Aerosol and Radiation Instrumentation Calibration Facilities

Satellite Data/Imagery
- Automated cloud properties
- Sensor calibration/validation
- Nighttime environmental analysis
- Multisensor data fusion
- Tropical cyclone characterization
- Dust/aerosols monitoring
- Satellite imagery analysis and enhancement
- Rain rate and snow cover
- Precipitation and cloud climatology
- Future satellite/constellation assessment
- Tactical meteorology
- Training and public outreach

Decision Aids
- Probabilistic Decision aids
- Refractivity/ducting
- Ceiling/visibility
- Fog/turbulence/icing
- Atmospheric acoustics
- EM/EO propagation
- Tropical cyclones/consensus forecasts
- Port studies
- Typhoon havens
- Forecaster handbooks
- Quantification of uncertainty
- Counter-piracy guidance
- Tropical cyclone sortie guidance
- Forecast difficulty guidance
- Ship wind and wave limits
- Optimal ship routing – fuel savings
Basic Responsibilities

The Marine Meteorology Division conducts a basic and applied research and development program designed to improve scientific understanding of atmospheric processes that impact Fleet operations and to develop automated systems that analyze, simulate, predict, and interpret the structure and behavior of these processes and their effect on naval weapons systems. Basic and applied research includes work in air-sea interaction, aerosol and cloud physics, atmospheric turbulence, orographically forced flow, atmospheric predictability, scale interactions observation impact, advanced data assimilation, ensemble prediction, tropical dynamics, and numerical methods. Research and development ranges from development of atmospheric analysis/forecast systems and satellite data products to the development of tactical decision aids for operations support. Interdisciplinary research supports the development of coupled analysis/forecast systems, including components for ocean, wave, land surface, aerosol, chemistry, and middle atmosphere prediction. NRL-Monterey (NRL-MRY) is co-located with the Fleet Numerical Meteorology and Oceanography Center (FNMOC) and has developed and transitioned to FNMOC and other operational centers the data assimilation, global, and mesoscale weather forecast models, aerosol prediction systems, and satellite applications products that form the backbone of the Navy’s worldwide environmental forecasting capability. Specialties of the Division include numerical weather prediction, data assimilation, tropical cyclones, marine boundary layer processes, aerosols, rapid environmental assessment, environmental decision aids, and satellite data analysis, interpretation, and application.

**Personnel:** 74 full-time civilian; 1 military

**Key Personnel**

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<td>Superintendent, Marine Meteorology Division</td>
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<tr>
<td>Associate Superintendent</td>
<td>7501</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>7502</td>
</tr>
<tr>
<td>Lead Scientist, Probabilistic Prediction Research Office</td>
<td>7504</td>
</tr>
<tr>
<td>Military Deputy</td>
<td>7505</td>
</tr>
<tr>
<td>Head, Atmospheric Dynamics and Prediction Branch</td>
<td>7530</td>
</tr>
<tr>
<td>Head, Meteorological Applications Development Branch</td>
<td>7540</td>
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</table>

**Point of contact:** Code 7500, (831) 656-4721; DSN 878-4721
Code 7600
Research Activity Areas

Geospace Science and Technology
Conduct research to observe, understand, model, and forecast the Earth’s geospace environment and its connections to its lower and upper boundaries, to facilitate and create functional capabilities.

With SuperMISTI (Mobile Imaging & Spectroscopic Threat Identification) in two 20-ft ISO shipping containers, SSD demonstrates detection and identification of radiological/nuclear materials at relevant operational standoff distances.

High-Energy Space Environment
Advance the understanding of the high-energy environment through development and deployment of advanced detectors, simulation of the environments and operations concepts, and interpretation and theoretical modeling of the observed phenomena, to address priority S&T goals.

Solar and Heliospheric Physics
Develop improved heliospace environment understanding, awareness, sensors, forecast capabilities, and monitoring tools that predict operational impacts and enable real-time threat warning, and transition these developments as needed.

Research in solar and heliophysics space-based sensors — notably in-house coronagraphs, heliospheric imagers, solar spectrometers — and a stream of insights and discoveries driven by resulting data, provide timely knowledge about solar geoeffective storms for defense and civilian readiness.
The Space Science Division conducts a broad-spectrum RDT&E program in solar-terrestrial physics, astrophysics, upper/middle atmospheric science, and astronomy. Instruments to be flown on satellites, sounding rockets and balloons, and ground-based facilities and mathematical models are conceived and developed. Researchers apply these and other capabilities to the study of the atmospheres of the Sun and Earth, including solar activity and its effects on the Earth’s ionosphere, upper atmosphere, and middle atmosphere; laboratory astrophysics; and the unique physics and properties of celestial sources. The science is important to orbital tracking, radio communications, and navigation that affect the operation of ships and aircraft, utilitization of the near-space and space environment of the Earth, and the fundamental understanding of natural radiation and geophysical phenomena.

**Personnel:** 77 full-time civilian; 1 military

**Key Personnel**

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Superintendent, Space Science Division</td>
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<tr>
<td>Associate Superintendent</td>
<td>7601</td>
</tr>
<tr>
<td>Administrative Officer</td>
<td>7602</td>
</tr>
<tr>
<td>Space Test Program Officer, Kirtland AFB, NM</td>
<td>7603</td>
</tr>
<tr>
<td>Senior Scientist for Sun-Earth Systems Research</td>
<td>7605</td>
</tr>
<tr>
<td>Head, Geospace Science and Technology Branch</td>
<td>7630</td>
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<tr>
<td>Head, High-Energy Space Environment Branch</td>
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<tr>
<td>Head, Solar and Heliospheric Physics Branch</td>
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**Point of contact:** Code 7602, (202) 767-3248
NAVAL CENTER FOR SPACE TECHNOLOGY

Code 8000

In its role to preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems that support naval missions, the Naval Center for Space Technology performs basic and applied research through advanced development in all areas of interest to the Navy space program. The Center develops spacecraft, systems using these spacecraft, and ground command and control stations. Principal functions of the Center include understanding and clarifying requirements, recognizing and prosecuting promising research and development, analyzing and testing systems to quantify their capabilities, developing operational concepts that exploit new technical capabilities, performing system engineering to allocate design requirements to subsystems, and performing engineering development and initial operation to test and evaluate selected spacecraft subsystems and systems. The Center is a focal point and integrator for those divisions at NRL whose technologies are used in space systems. The Center also provides systems engineering and technical direction assistance to system acquisition managers of major space systems. In this role, technology transfer is a major goal and motivates a continuous search for new technologies and capabilities and the development of prototypes that demonstrate the integration of such technologies.
Mr. P.G. Wilhelm was born in New York City. He attended Purdue University, where he received a B.S.E.E. degree in 1957. By 1961, he had completed all the course work for an M.S.E. degree from George Washington University.

From 1957 to 1959, Mr. Wilhelm served as an electrical engineer with Stewart Warner Electronics where he was assigned to a project to redesign the UPM-70, a Navy radar test set. In March 1959, he joined the Naval Research Laboratory as an electrical scientist in the Electronics Division. In December 1959, he joined the Satellite Techniques Branch. In 1961, he became Head of the Satellite Instrument Section; in 1965, he became Head of the Satellite Techniques Branch; and in 1974, Head of the Spacecraft Technology Center. In these positions, he performed satellite system design, equipment development, environmental testing, launch operations, and orbital data handling. In 1981, he was named Superintendent of the Space Systems and Technology Division, the Navy’s principal organization, or lead laboratory, for space. He is credited with contributions in the design, development, and operation of more than 100 scientific and Fleet-support satellites. He has been awarded five patents. In October 1986, he was appointed Director of the newly established Naval Center for Space Technology. The Center’s mission is to “preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems which support naval missions.”

Mr. Wilhelm has been recognized with numerous awards including the Navy’s Meritorious Civilian Service Award, the DoD Distinguished Civilian Service Award, the Presidential Meritorious Executive Award, the Presidential Distinguished Rank Award, the Institute of Electrical and Electronics Engineers Aerospace and Electronic Systems Group Man of the Year Award, the NRL E.O. Hulburt Annual Science and Engineering Award, the Dexter Conrad Award, the Rotary National Stellar Award, the NRL Lifetime Achievement Award, and in May 1999, Mr. Wilhelm received the American Institute of Aeronautics and Astronautics (AIAA) Goddard Astronautics Award. He also has been elected a Fellow of the Washington Academy of Sciences and a Fellow of the American Institute of Aeronautics and Astronautics, and was elected to the National Academy of Engineering. Mr. Wilhelm is also the first recipient of the R.L. Easton Award for excellence in engineering.
Key Personnel

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<tr>
<td>Director, Naval Center for Space Technology</td>
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<td>Associate Director</td>
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<td>Technical Staff</td>
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<tr>
<td>Head, Administrative/Financial Management Office</td>
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<tr>
<td>Military Deputy</td>
<td>8020</td>
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<tr>
<td>Superintendent, Space Systems Development Department</td>
<td>8100</td>
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<tr>
<td>Superintendent, Spacecraft Engineering Department</td>
<td>8200</td>
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</table>

**Point of contact:** Code 8010, (202) 767-6551
Advanced Space/Airborne/Ground Systems Technologies
- Space systems architectures and requirements
- Advanced payloads and optical communications
- Controllers, processors, signal processing, and VLSI data management systems and equipment
- Embedded algorithms and software
- Satellite laser ranging

Astrodynamics
- Precision orbit estimation
- Onboard autonomous navigation
- Onboard orbit propagation
- GPS space navigation
- Satellite coverage and mission analysis
- Geolocation systems
- Orbit dynamics
- Interplanetary navigation

Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
- Communications theory and systems
- Satellite ground station engineering and implementation
- Transportable and fixed ground antenna systems
- High-speed fixed and mobile ground data collection, processing, and dissemination systems
- Tactical communication systems

Space and Airborne Payload Development
- Space and airborne system payload concept definition, design, and implementation including hardware and software
- Detailed electrical/electronic design of electronic and electromechanical payload and systems and components
- Design and verification of real-time embedded multiprocessor software
- Payload antenna systems
- Space and airborne payload fabrication, test, and integration
- Launch and on-orbit payload support

Laser Communications Research
- Ship-to-ship laser communications
- Space-to-ground laser communications
- Satellite laser ranging for precise orbit determination

Space and Airborne Mission Development
- Mission development and requirements definition
- Systems engineering and analysis
- Concepts of operations and mission simulations
- Mission evaluation and performance assessments

Precision Navigation and Time
- Advanced navigation satellite technology
- Precise Time and Time Interval (PTTI) technology
- Atomic time/frequency standards/instrumentation
- Passive and active ranging techniques
- Precision tracking of orbiting objects from space/ground
- National and International standards for time keeping/Universal Coordinated Time/UTC (NRL)

The Space Systems Development Department, operates extensive laser communication test bed facilities at Quantico, Virginia; Tilghman Island, Maryland; and NRL’s Chesapeake Bay Detachment (CBD). Optical communications equipment at CBD and Tilghman Island are separated by 16 km across the Chesapeake Bay, creating a fully instrumented laboratory in a maritime environment. Measurements made at this facility may be applied directly to ship-to-ship laser communications applications. The optical test facility at Quantico, Virginia, hosts a 1-m telescope and satellite laser ranging equipment that is used for both precise orbit determination and space-to-ground laser communications research. Together, these facilities provide researchers the full spectrum of operating environments relevant to naval communications needs.

One-meter SLR and Optical Test Facility in Quantico, Virginia.
Basic Responsibilities

The Space Systems Development Department (SSDD) is the space and ground support systems research and development organization of the Naval Center for Space Technology. The primary objective of the SSDD is to develop command, control, communications, computers, and intelligence, surveillance, and reconnaissance (C4ISR) hardware and software solutions to space, airborne, and ground applications to respond to Navy, DoD, and national mission requirements with improved performance, capacity, reliability, efficiency, and/or life cycle cost. The Department must derive system requirements from the mission, develop architectures in response to these requirements, and design and develop systems, subsystems, equipment, and implementation technologies to achieve the optimized, integrated operational space, airborne, and ground system. These development responsibilities extend across the entire space/airborne/ground spectrum of hardware, software, and advanced technologies, including digital processing and control, analog systems, power, communications, payload command and telemetry, radio frequency, optical, payload, and electromechanical systems, as well as systems engineering.

**Personnel:** 126 full-time civilian; 1 part-time civilian; 23 student civilian; 1 intermittent civilian

**Key Personnel**

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<tr>
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<td>Associate Superintendent</td>
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<td>Administrative Officer</td>
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<td>Head, Mission Management Office</td>
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<td>Head, National Programs Support Office</td>
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<tr>
<td>Head, Mission Development Branch</td>
<td>8110</td>
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<tr>
<td>Head, Advanced Systems Technology Branch</td>
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<td>Head, Command, Control, Communications, Computers, and Intelligence Branch</td>
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<tr>
<td>Head, Advanced Space Precision Navigation and Timing Branch</td>
<td>8150</td>
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**Point of contact:** Code 8102, (202) 767-0432
Design, Test, and Processing
Preliminary and detailed design of spacecraft mechanical components, structures, and mechanisms
Fabrication, assembly, integration, and testing of spacecraft and payloads
Vibration, shock, acoustic, and thermal vacuum testing of components, systems, payloads, and spacecraft
Integration of spacecraft onto launch vehicles
Systems engineering for new spacecraft proposals

Space Mechanical Systems Development
Development, integration, and transition of prototype spacecraft systems and experimental payloads
Structural design and analysis
Large space structures
Thermal design, analysis, fabrication, integration, test, and flight operation
Pumped and advanced multiphase heat transfer devices
Computational Fluid Dynamics (CFD) technique for space systems
Integrated structural/thermal/optical or RF design and analysis
Mission integration and development
Mission assurance, configuration control, and safety
Systems engineering and management

Control Systems
Attitude determination and control systems
Precision pointing
Optical line-of-sight stabilization
Propulsion systems
Precision cleaning and component testing
Propellant and pressurization systems
Hydraulic and pneumatics control
Test systems and services
Analytical design and mission planning
Navigation, tracking, and orbit dynamics
Expert systems
Flight operations support
Computer simulation and animation
Computer animation
Robotics systems engineering
Proximity operations
Autonomous servicing and inspection
Autonomous inspection
End effector design

Compliance control
Trajectory planning
Machine vision
Fault detection, isolation, and recovery
Electrodynamic tethers
Robotic control algorithms and software
Robotic actuation and sensing

Space Electronic Systems Development
Space system concept definition, design, and implementation including hardware and software
Detailed electrical design of electronic and electromechanical systems and components
Implementation of real-time flight software and embedded command, control, and telemetry software
Implementation of Spacecraft Ground system software, including integration and test as well as operations (Neptune/CGA)
Mission Tasking Software (VMOC)
Spacecraft antenna systems, receivers, transmitters, and radiometers
Space hardware design, fabrication, test, and integration
Launch and on-orbit support
Space test systems and electronic launch support equipment
Spacecraft power systems—collection, storage, conversion, and distribution
Spacecraft TT&C and control systems
Space communications

Against the backdrop of a glowing morning sky, the TacSat-4 tactical satellite, carrying an experimental communications payload developed by NRL, successfully launched September 27, 2011, aboard an Orbital Sciences Minotaur-IV+ launch vehicle from the Alaska Aerospace Corporation’s Kodiak Launch Complex, Kodiak Island, Alaska.
The Spacecraft Engineering Department (SED) is the focal point for the Navy’s capability to design and build spacecraft. Activities range from concept and feasibility planning to on-orbit IOC for NRL’s space systems.

The SED provides spacecraft bus expertise for the Navy and maintains an active in-house capability to develop satellites; manages Navy space programs through engineering support and technical direction; in concert with the Space Systems Development Department, designs, assembles, and tests spacecraft and space experiments, including all aspects of space, launch, and ground support; analyzes and designs structures, mechanisms, and a variety of control systems, including attitude, propulsion, reaction, and thermal; integrates satellite designs, launch vehicles, and satellite-to-boost stages; functions as a prototype laboratory to ensure that designs can be transferred to industry and incorporated into subsequent satellite hardware builds; and consults with the Navy Program Office on technical issues involving spacecraft architecture, acquisition, and operation.

**Personnel:** 128 full-time civilian; 2 part-time civilian; 26 student civilian

### Key Personnel

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<tr>
<th>Title</th>
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<tr>
<td>Superintendent, Spacecraft Engineering Department</td>
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<td>Associate Superintendent</td>
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<td>Administrative Officer</td>
<td>8202</td>
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<td>Head, Programs Support Office</td>
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<td>Head, Design, Test, and Processing Branch</td>
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<tr>
<td>Head, Space Mechanical Systems Development Branch</td>
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<td>Head, Control Systems Branch</td>
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<tr>
<td>Head, Space Electronics Systems Development Branch</td>
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**Point of contact:** Code 8202, (202) 767-6412

*Acting*
TECHNICAL OUTPUT, FISCAL, AND PERSONNEL INFORMATION
Publications, Presentations, and Patents

The Navy continues to be a pioneer in science and engineering developments and a leader in applying these advancements to military requirements. The primary means of informing the scientific and engineering community of the advances made at NRL is through the Laboratory’s technical output—reports, articles in scientific journals, contributions to books, papers presented to scientific societies and topical conferences, patents, and inventions.

The figures for calendar years 2012 and 2013 presented below represent the output of NRL facilities in Washington, DC; Bay St. Louis, Mississippi; and Monterey, California.

In 1986, Congress enacted the Federal Technology Transfer Act in an effort to encourage the commercial use of technology developed in Federal laboratories. The Act allows Government inventors and the laboratories where they work to share the royalties generated by commercial licensing of their inventions. Also, the Act encourages the establishment of Cooperative Research and Development Agreements (CRADAs) between laboratories such as NRL and non-Federal entities such as state and local governments, universities, and business corporations. Such cooperative R&D agreements can include the allocation in advance of patent rights on any inventions made under the joint research effort.

The 1986 Act has given additional impetus to the Laboratory’s efforts to patent important inventions arising out of its various research programs.

### Calendar Year 2012

<table>
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<th>Type of Contribution</th>
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<td>Oral Presentations</td>
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<td>NRL Memorandum Reports</td>
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<td>Books</td>
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### Calendar Year 2013

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*This is a provisional total based on information available to the Ruth H. Hooker Research Library on January 28, 2014. Total includes refereed and non-refereed publications.
FY 2012/2013 Sources of New Funds (Actual)

**FY 2012**

**Source of Funds**

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>FY 2012 Reimbursable</th>
<th>$M Direct Cite</th>
<th>Total</th>
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<td>Office of Naval Research (ONR)</td>
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<tr>
<td>Naval Sea Systems Command (NAVSEA)</td>
<td>48.1</td>
<td>44.3</td>
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<tr>
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<tr>
<td>Naval Air Systems Command (NAVAIR)</td>
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<tr>
<td>Other Navy</td>
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<tr>
<td>All Other</td>
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<td><strong>Total Funds</strong></td>
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**FY 2013**

**Source of Funds**

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<th>Source of Funds</th>
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FY 2012
Distribution of Funds

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<td>Direct Material, Travel, and Other</td>
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<td>Direct Contracts</td>
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<td><strong>Total Costs</strong></td>
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*Costs based on CFO statements; direct contracts include costs for reimbursable-funded contracts and obligations for direct cite-funded contracts.

FY 2013
Distribution of Funds

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<tr>
<td>Direct Labor</td>
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<tr>
<td>General Overhead</td>
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<td>Indirect Overhead</td>
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<td><strong>Total Costs</strong></td>
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*Costs based on CFO statements; direct contracts include costs for reimbursable-funded contracts and obligations for direct cite-funded contracts.
FY 2012 Total New Funds by Category

<table>
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<tr>
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<th>Non-Navy</th>
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<td>BA1 Basic Research</td>
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<td>BA2 Applied Research</td>
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<td>BA3 Advanced Technology Development</td>
<td>92.3</td>
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<td>BA4 Advanced Component Development Prototypes</td>
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<td>BA5 System Development and Demonstration</td>
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<td>BA7 Operational System Development</td>
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FY 2013 Total New Funds by Category

### FY 2013

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<td>125.8</td>
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<td>BA2 Applied Research</td>
<td>148.2</td>
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<td>BA4 Advanced Component Development Prototypes</td>
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<td>BA5 System Development and Demonstration</td>
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<td>BA7 Operational System Development</td>
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<td>Subtotal RDT&amp;E</td>
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<td>Other</td>
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<td>81.9</td>
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<td><strong>552.9</strong></td>
<td><strong>361.4</strong></td>
<td><strong>914.2</strong></td>
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</table>
### Personnel Information*

#### Civilian On-Board
- **Full-Time, Permanent (FTP)**
  - Graded: 2,298
  - Ungraded: 88
  - Total: 2,386

- **Temporary, Part-Time, Intermittent (TPTI)**
  - TPTI: 168
  - Total Civilian: 2,554

**FTP Breakdown**
- Scientific/Engineering Professional: 1,561
- Scientific/Engineering Technical: 83
- Administrative Specialist/Professional: 386
- Administrative Support: 232
- Senior Executive Service: 22
- Scientific or Professional: 14
- General Schedule: 0
- Total: 2,298

#### Military On-Board
- Officers: 31
- Enlisted: 52
- Total Military On-Board: 83
- (Military Allowance): 106

#### Annual Civilian Turnover Rate (%) (permanent employees only)

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<thead>
<tr>
<th>Year</th>
<th>Research divisions</th>
<th>Nonresearch areas</th>
<th>Entire Laboratory</th>
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<tr>
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<td>7.4</td>
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<td>6.2</td>
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<td>2011</td>
<td>5.3</td>
<td>13.5</td>
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<td>2012</td>
<td>6.0</td>
<td>11.1</td>
<td>7.0</td>
</tr>
</tbody>
</table>

#### Highest Academic Degrees Held by Civilian Permanent Employees
- Bachelors: 557
- Masters: 389
- Doctorates: 868

*All data is as of 31 December 2013 unless otherwise noted.*
Professional Development

Programs for NRL Employees

The Human Resources Office supports and provides traditional and alternative methods of training for employees. NRL employees are encouraged to develop their skills and enhance their job performance so they can meet the future needs of NRL and achieve their own goals for growth.

One common study procedure is for employees to work full time at the Laboratory while taking job-related courses at universities and schools local to their job site. The training ranges from a single course to undergraduate, graduate, and postgraduate course work. Tuition for training is paid by NRL. The formal programs offered by NRL are described here.

Graduate Programs

The Advanced Graduate Research Program (formerly the Sabbatical Study Program, which began in 1964) enables selected professional employees to devote full time to research or pursue work in their own or a related field for up to one year at an institution or research facility of their choice without the loss of regular salary, leave, or fringe benefits. NRL pays all travel and moving expenses for the employee. Criteria for eligibility include professional stature consistent with the applicant's opportunities and experience, a satisfactory program of study, and acceptance by the facility selected by the applicant. The program is open to employees who have completed six years of Federal service, four of which have been at NRL.

The Edison Memorial Graduate Training Program enables employees to pursue graduate studies in their fields at local universities. Participants in this program work 24 hours each workweek and pursue their studies during the other 16 hours. The criteria for eligibility include a minimum of one year of service at NRL, a bachelor's or master's degree in an appropriate field, and professional standing in keeping with the candidate's opportunities and experience.

To be eligible for the Select Graduate Training Program, employees must have a bachelor's degree in an appropriate field and must have demonstrated ability and aptitude for advanced training. Students accepted into this program receive one-half of their salary and benefits and NRL pays for tuition and travel expenses.

The Naval Postgraduate School (NPS), located in Monterey, California, provides graduate programs to enhance the technical preparation of Naval officers and civilian employees who serve the Navy in the fields of science, engineering, operations analysis, and management. NRL employees desiring to pursue graduate studies at NPS may apply; thesis work is accomplished at NRL. Participants continue to receive full pay and benefits during the period of study. NRL also pays for tuition and travel expenses.

In addition to NRL and university offerings, application may be made to a number of noteworthy programs and fellowships. Examples of such opportunities are the Capitol Hill Workshops, the Legislative Fellowship (LEGIS) program, the Federal Executive Institute (FEI), and the Executive Leadership Program for Mid-Level Employees. These and other programs are announced from time to time, as schedules are published.

Continuing Education

Undergraduate and graduate courses offered at local colleges and universities may be subsidized by NRL for employees interested in improving their skills and keeping abreast of current developments in their fields.

NRL offers short courses to all employees in a number of fields of interest including administrative subjects, and supervisory and management techniques. Laboratory employees may also attend these courses at nongovernment facilities. HRO advertises training opportunities on the online Billboard, HRO website, and in the email newsletter, HRO Highlights.

For further information on any of the above Graduate and Continuing Education programs, contact the Employee Development and Management Branch (Code 1840) at (202) 767-8306 or via email at Training@hro.nrl.navy.mil.

The Scientist-to-Sea Program (STSP) provides opportunities for Navy R&D laboratory/center personnel to go to sea to gain first-hand insight into operational factors affecting system design, performance, and operations on a variety of ships. NRL is a participant of this Office of Naval Research (ONR) program. Contact (202) 404-2701.

Professional Development

NRL has several programs, professional society chapters, and informal clubs that enhance the professional growth of employees. Some of these are listed below.

The Department of the Navy Civilian Employee Assistance Program (DONCEAP) provides confiden-
tal assessment, referral, and short-term counseling for employees (or their eligible family members) regarding personal concerns to help avoid adversely affecting job performance. Types of personal concerns may include challenging relationships (at work or at home); dealing with stress, anxiety, or depression; grief and loss; or substance abuse. The DONCEAP also provides work/life referral services such as live or on-demand webinars; discussion groups; and advice on parenting, wellness, financial and legal issues, education, and much more. Contact (844)-366-2327 or visit http://donceap.foh.hhs.gov/.

The NRL chapter of Women In Science and Engineering (WISE) was established to address current issues concerning the scientific community of women at the NRL such as networking, funding, work-life satisfaction, and effective use of our resources. We address these issues by empowering members through the establishment of a supportive and constructive network that serves as a sounding board to develop solutions that address said issues, and then serve as a platform in which members work together to implement these solutions. The NRL chapter of WISE has started several new initiatives for the 2013-2014 year, including a seminar series entitled “Working Smarter Not Harder at NRL — Effective Use of Our Resources” and a Science as Art competition, which is open to all NRL sites. Membership is open to all employees. For more information, contact (202) 404-3355.

Sigma Xi. The Scientific Research Society, encourages and acknowledges original investigation in pure and applied science. It is an honor society for research scientists. Individuals who have demonstrated the ability to perform original research are elected to membership in local chapters. The NRL Edison Chapter, comprising approximately 200 members, recognizes original research by presenting annual awards in pure and applied science to two outstanding NRL staff members per year. In addition, an award seeking to reward rising stars at NRL is presented annually through the Young Investigator Award. The chapter also sponsors several lectures per year at NRL on a wide range of topics of general interest to the scientific and DoD community. These lectures are delivered by scientists from all over the world. The highlight of the Sigma Xi Lecture Series is the Edison Memorial Lecture, which traditionally is given by an internationally distinguished scientist. Contact (202) 767-5528.

The NRL Mentor Program was established to provide an innovative approach to professional and career training and an environment for personal and professional growth. It is open to permanent NRL employees in all job series and at all sites. Mentees are matched with successful, experienced colleagues having more technical and/or managerial experience who can provide them with the knowledge and skills needed to maximize their contribution to the success of their immediate organization, to NRL, to the Navy, and to their chosen career fields. The ultimate goal of the program is to increase job productivity, creativity, and satisfaction through better communication, understanding, and training. NRL Instruction 12400.1B provides policy and procedures for the program. For more information, please contact mentor@hro.nrl.navy.mil or (202) 767-6736.

Employees interested in developing effective self-expression, listening, thinking, and leadership potential are invited to join the NRL Forum Toastmasters Club, a chapter of Toastmasters International. Members of this club possess diverse career backgrounds and talents and learn to communicate not by rules but by practice in an atmosphere of understanding and helpful fellowship. NRL’s Commanding Officer and Director of Research endorse Toastmasters. Contact (202) 404-4670.

Equal Employment Opportunity (EEO) Programs

Equal employment opportunity (EEO) is a fundamental NRL policy for all employees regardless of race, color, national origin, sex, religion, age, sexual orientation, or disability. The NRL EEO Office is a service organization whose major functions include counseling employees in an effort to resolve employee/management conflicts, processing formal discrimination complaints, and requests for reasonable accommodation, providing EEO training, and managing NRL’s MD-715 and affirmative employment recruitment programs. The NRL EEO Office is also responsible for sponsoring special-emphasis programs to promote awareness and increase sensitivity and appreciation of the issues or the history relating to females, individuals with disabilities, and minorities. Contact the NRL Deputy EEO Officer at (202) 767-2486 for additional information on any of their programs or services.

Other Activities

The award-winning Community Outreach Program directed by the NRL Public Affairs Office fosters programs that benefit students and other community citizens. Volunteer employees assist with and judge science fairs, give lectures, provide science demonstrations and student tours of NRL, and serve as tutors, mentors, coaches, and classroom resource teachers. The program sponsors student tours of NRL and an annual holiday party for neighborhood children in December. Through the program, NRL has active partnerships with three District of Columbia public schools. Contact (202) 767-2541.

Other programs that enhance the development of NRL employees include sports groups and the Amateur Radio Club. The NRL Fitness Center at NRL-DC, managed by Naval Support Activity Washington Morale, Welfare and Recreation (NSAW-MWR), houses a fitness room with treadmills, bikes, ellipticals, step mills, and a full strength circuit; a gymnasium for basketball, volleyball, and other activities; and full locker rooms. The Fitness Center is free to NRL employees and contractors. Various exercise classes
are offered for a nominal fee. NRL employees are also eligible to participate in all NSA-W-MWR activities held on Joint Base Anacostia–Bolling and Washington Navy Yard, less than five miles away.

Programs for Non-NRL Employees

Several programs have been established for non-NRL professionals. These programs encourage and support the participation of visiting scientists and engineers in research of interest to the Laboratory. Some of the programs may serve as stepping-stones to Federal careers in science and technology. Their objective is to enhance the quality of the Laboratory's research activities through working associations and interchanges with highly capable scientists and engineers and to provide opportunities for outside scientists and engineers to work in the Navy laboratory environment. Along with enhancing the Laboratory's research, these programs acquaint participants with Navy capabilities and concerns and may provide a path to full-time employment.

Postdoctoral Research Associateships

Every year, NRL hosts several postdoctoral research associates through the National Research Council (NRC) and American Society for Engineering Education (ASEE) postdoctoral associateship and fellowship programs. These competitive positions provide postdoctoral scientists and engineers the opportunity to pursue research at NRL in collaboration with NRL scientists and engineers. Research associates are guest investigators, not employees of NRL.

NRL/NRC Cooperative Research Associateship Program: The National Research Council conducts a national competition to recommend and make awards to outstanding scientists and engineers at recent postdoctoral levels for tenure as guest researchers at participating laboratories. The objectives of the NRC program are (1) to provide postdoctoral scientists and engineers of unusual promise and ability opportunities for research on problems, largely of their own choice, that are compatible with the interests of the sponsoring laboratories and (2) to contribute thereby to the overall efforts of the Federal laboratories. The program provides an opportunity for concentrated research in association with selected members of the permanent professional laboratory staff, often as a climax to formal career preparation.

NRL/NRC Postdoctoral Associateships are awarded to persons who have held a doctorate less than five years at the time of application and are made initially for one year, renewable for a second and possible third year. Information and applications may be found at http://www.national-academies.org/rap. To contact NRL's program coordinator, call (202) 404-7450 or email nrc@hro.nrl.navy.mil.

NRL/ASEE Postdoctoral Fellowship Program: The ASEE program is designed to significantly increase the involvement of creative and highly trained scientists and engineers from academia and industry in scientific and technical areas of interest and relevance to the Navy. Fellowship awards are based upon the technical quality and relevance of the proposed research, recommendations by the Navy laboratory, academic qualifications, reference reports, and availability of funds.

NRL/ASEE Fellowship awards are made to persons who have held a doctorate for less than seven years at the time of application and are made for one year, renewable for a second and possible third year. Information and applications may be found at http://www.asee.org/nrl/. To contact NRL's program coordinator, call (202) 404-7450 or email asee@hro.nrl.navy.mil.

Faculty Member Programs

The Office of Naval Research Summer Faculty Research and Sabbatical Leave Program provides for university faculty members to work for ten weeks (or longer, for those eligible for sabbatical leave) with professional peers in participating Navy laboratories on research of mutual interest. Applicants must hold a teaching or research position at a U.S. college or university. Contact NRL's program coordinator at sfrp@hro.nrl.navy.mil.

The NRL/United States Naval Academy Cooperative Program for Scientific Interchange allows faculty members of the U.S. Naval Academy to participate in NRL research. This collaboration benefits the Academy by providing the opportunity for USNA faculty members to work on research of a more practical or applied nature. In turn, NRL's research program is strengthened by the available scientific and engineering expertise of the USNA faculty. Contact NRL's program coordinator at usna@hro.nrl.navy.mil.

Professional Appointments

Faculty Member Appointments use the special skills and abilities of faculty members for short periods to fill positions of a scientific, engineering, professional, or analytical nature at NRL.

Consultants and experts are employed because they are outstanding in their fields of specialization or because they possess ability of a rare nature and could not normally be employed as regular civil servants.

Intergovernmental Personnel Act Appointments temporarily assign personnel from state or local governments or educational institutions to the Federal Government (or vice versa) to improve public services rendered by all levels of government.
Student Programs

The student programs are tailored to high school, undergraduate, and graduate students to provide employment opportunities and work experience in naval research.

The Naval Research Enterprise Intern Program (NREIP) is a ten-week summer research opportunity for undergraduate sophomores, juniors, and seniors, and graduate students. The Office of Naval Research (ONR) offers summer appointments at Navy laboratories to current college sophomores, juniors, seniors, and graduate students from participating schools. Application is online at www.asee.org/nreip through the American Society for Engineering Education. Electronic applications are sent for evaluation to the point of contact at the Navy laboratory identified by the applicant. Contact NRL's program coordinator at nreip@nrl.navy.mil.

The National Defense Science and Engineering Graduate Fellowship Program helps U.S. citizens obtain advanced training in disciplines of science and engineering critical to the U.S. Navy. The three-year program awards fellowships to recent outstanding graduates to support their study and research leading to doctoral degrees in specified disciplines such as electrical engineering, computer sciences, material sciences, applied physics, and ocean engineering. Award recipients are encouraged to continue their study and research in a Navy laboratory during the summer. Contact NRL's program coordinator at (202) 404-7450 or ndseg@hro.nrl.navy.mil.

The Pathways Intern Program (formerly STEP and SCEP) provides students enrolled in a wide variety of educational institutions, from high school to graduate level, with opportunities to work at NRL and explore Federal careers while still in school and while getting paid for the work performed. Students can work full-time or part-time on a temporary or non-temporary appointment. Students must be continuously enrolled on at least a half-time basis at a qualifying educational institution and be at least 16 years of age. The primary focus of our Non-temporary intern appointment is to attract students enrolled in undergraduate and graduate programs in engineering, computer science, or the physical sciences. Students on non-temporary appointments are eligible to remain on their appointment until graduation and may be noncompetitively converted to a permanent appointment within 120 days after completion of degree requirements. Conversion is not guaranteed. Conversion is dependent on work performance, completion of at least 640 hours of work under the intern appointment before completion of degree requirements, and meeting the qualifications for the position. The Temporary intern appointment is initially a one year appointment. This program enables students to earn a salary while continuing their studies and offers them valuable work experience. NRL's Pathways Intern Program opportunities are announced on USAJOBS four times per year. Visit USAJOBS at https://www.usajobs.gov/ to create an account, search for jobs, set up an e-mail notification alert of when positions of interest are posted (see “Saved Searches”) and apply for our intern opportunities when posted. For additional information on NRL's Intern Program, contact (202) 767-8313.

The Department of Defense Science and Engineering Apprenticeship Program (SEAP) provides an opportunity for high school students who have completed at least Grade 9, and are at least 15 years of age, to serve as junior research associates. Under the direction of a mentor, for eight weeks in the summer, students gain a better understanding of research, its challenges, and its opportunities through participation in scientific, engineering, and mathematics programs. Criteria for eligibility are based on science and mathematics courses completed and grades achieved; scientific motivation, curiosity, the capacity for sustained hard work; a desire for a technical career; teacher recommendations; and exceptional test scores. The NRL program is the largest in the Department of Defense. For detailed information visit http://seap.asee.org/, or call (202) 767-8324, or email seap@hro.nrl.navy.mil.

Volunteer Opportunities

The Student Volunteer Program helps students gain valuable experience by allowing them to voluntarily perform educationally related work at NRL. It provides exposure to the work environment and also provides an opportunity for students to make realistic decisions regarding their future careers. Applications are accepted year-round. For additional information, contact (202) 767-8313.

The Voluntary Emeritus Program (VEP) uses the services of highly skilled and uniquely qualified individuals who are retired from the Federal Service. Participants will work under the program without compensation.
Follow Route 1 South for approximately 3 miles to the Beltway I-95/I-495.

2 Exit right to the Beltway. This exit curves to the right and then divides. Take the left fork to I-95 (Baltimore). Stay in local lanes.

3 Stay in the right lane on the Woodrow Wilson Bridge. After crossing the Woodrow Wilson Bridge, take the first exit (I-295). This exit divides. Take the left fork to I-295 North.

4 NRL is the first exit off of I-295 (approximately 2 miles) after crossing the Woodrow Wilson Bridge.

5 Make a right at the traffic light in front of the main gate (Overlook Avenue). Then make an immediate left into the parking lot. The Visitor Control Center (Building 72) is located on the corner in the brick building next to the main gate.
Location of Field Sites in the NRL Washington Area

<table>
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<th>Location</th>
<th>Approximate Mileage from NRL Washington</th>
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<tbody>
<tr>
<td>A – Chesapeake Bay Section, Chesapeake Beach, MD</td>
<td>40</td>
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<tr>
<td>B – Tilghman Island, MD</td>
<td>110</td>
<td>3522</td>
</tr>
<tr>
<td>C – Patuxent River (MD) Naval Air Station</td>
<td>64</td>
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</tr>
<tr>
<td>D – Pomonkey, MD</td>
<td>20</td>
<td>8124</td>
</tr>
<tr>
<td>E – Midway Research Center, Quantico, VA</td>
<td>38</td>
<td>8140</td>
</tr>
<tr>
<td>F – Blossom Point, MD</td>
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</tr>
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Chesapeake Bay Section
(Chesapeake Beach, Maryland)

Access Routes to Chesapeake Bay Section

Naval Research Laboratory
Chesapeake Bay Section
5813 Bayside Road
Chesapeake Beach, MD 20732
(301) 257-4002
Location of Buildings
at the Chesapeake Bay Section
NOTE: Use Interstate 610 to by-pass downtown New Orleans district.
Naval Research Laboratory Monterey
(Monterey, California)

Naval Research Laboratory
Marine Meteorology Division
7 Grace Hopper Avenue
Monterey, CA 93943-5502
(831) 656-4721
<table>
<thead>
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<th>Code</th>
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<tbody>
<tr>
<td>1000</td>
<td>Commanding Officer</td>
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<td>Director of Research</td>
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<tr>
<td>1001.1</td>
<td>Executive Assistant to the Director of Research</td>
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<tr>
<td>1001.2</td>
<td>Head, Strategic Workforce Planning</td>
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<tr>
<td>1001.3</td>
<td>Executive Assistant for Technology Deployment</td>
</tr>
<tr>
<td>1002</td>
<td>Chief Staff Officer</td>
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<tr>
<td>1004</td>
<td>Head, Office of Technology Transfer</td>
</tr>
<tr>
<td>1006</td>
<td>Head, Office of Program Administration and Policy Development</td>
</tr>
<tr>
<td>1008</td>
<td>Head, Office of Counsel</td>
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<tr>
<td>1030</td>
<td>Head, Public Affairs Office</td>
</tr>
<tr>
<td>1100</td>
<td>Director, Institute for Nanoscience</td>
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<tr>
<td>1200</td>
<td>Head, Command Support Division</td>
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<td>1400</td>
<td>Head, Military Support Division</td>
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<tr>
<td>1600</td>
<td>Commanding Officer, Scientific Development Squadron One (PAX River NAS)</td>
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<tr>
<td>1700</td>
<td>Director, Laboratory for Autonomous Systems Research</td>
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<tr>
<td>1800</td>
<td>Director, Human Resources Office</td>
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<tr>
<td>1830</td>
<td>Deputy Equal Employment Opportunity Officer</td>
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<tr>
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<td>Head, Management Information Systems Office</td>
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<tr>
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<td>Head, Contracting Division</td>
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<tr>
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<td>Head, Financial Management Division</td>
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<td>Head, Supply and Information Services Division</td>
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<td>Director, Research and Development Services Division</td>
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<tr>
<td>5000</td>
<td>Associate Director of Research for Systems</td>
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<tr>
<td>5300</td>
<td>Superintendent, Radar Division</td>
</tr>
<tr>
<td>5500</td>
<td>Superintendent, Information Technology Division/NRL Chief Information Officer*</td>
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<td>5600</td>
<td>Superintendent, Optical Sciences Division</td>
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<tr>
<td>5700</td>
<td>Superintendent, Tactical Electronic Warfare Division</td>
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<tr>
<td>6000</td>
<td>Associate Director of Research for Materials Science and Component Technology</td>
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<tr>
<td>6040</td>
<td>Director, Laboratories for Computational Physics and Fluid Dynamics</td>
</tr>
<tr>
<td>6100</td>
<td>Superintendent, Chemistry Division</td>
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<td>Superintendent, Materials Science and Technology Division</td>
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<td>Superintendent, Plasma Physics Division</td>
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<td>6800</td>
<td>Superintendent, Electronics Science and Technology Division</td>
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<tr>
<td>6900</td>
<td>Director, Center for Bio/Molecular Science and Engineering</td>
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*Additional duty
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<tbody>
<tr>
<td>7000</td>
<td></td>
<td>Associate Director of Research for Ocean and Atmospheric Science and Technology</td>
<td>(202) 404-8690</td>
</tr>
<tr>
<td>7030</td>
<td></td>
<td>Head, Office of Research Support Services</td>
<td>(228) 688-4010</td>
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<tr>
<td>7100</td>
<td></td>
<td>Superintendent, Acoustics Division</td>
<td>(202) 767-3482</td>
</tr>
<tr>
<td>7200</td>
<td></td>
<td>Superintendent, Remote Sensing Division</td>
<td>(202) 767-3391</td>
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<tr>
<td>7300</td>
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<td>Superintendent, Oceanography Division</td>
<td>(228) 688-4670</td>
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<td>Superintendent, Marine Geosciences Division</td>
<td>(228) 688-4650</td>
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<td>Superintendent, Marine Meteorology Division</td>
<td>(831) 656-4721</td>
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<tr>
<td>7600</td>
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<td>Superintendent, Space Science Division</td>
<td>(202) 767-6343</td>
</tr>
<tr>
<td>8000</td>
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<td>Director, Naval Center for Space Technology</td>
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</tr>
<tr>
<td>8100</td>
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<td>Superintendent, Space Systems Development Department</td>
<td>(202) 767-4593</td>
</tr>
<tr>
<td>8200</td>
<td></td>
<td>Superintendent, Spacecraft Engineering Department</td>
<td>(202) 404-3727</td>
</tr>
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The cooperation and assistance of others on the staffs of the Technical Information Services Branch and the Central Mail Processing Unit are also acknowledged and appreciated.