Current Research and Development Efforts

Research in NRL's DIVISIONS/DEPARTMENTS

For technical questions or to submit a resumé, simply use the e-mail link found in the heading for each research division/department in this guide.

EXECUTIVE DIRECTORATE

INSTITUTE FOR NANOSCIENCE

LABORATORY FOR AUTONOMOUS SYSTEMS RESEARCH

SYSTEMS DIRECTORATE

RADAR DIVISION

INFORMATION TECHNOLOGY DIVISION

OPTICAL SCIENCES DIVISION

TACTICAL ELECTRONIC WARFARE DIVISION

MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE

LABORATORIES FOR COMPUTATIONAL PHYSICS AND FLUID DYNAMICS

CHEMISTRY DIVISION

MATERIALS SCIENCE AND TECHNOLOGY DIVISION

PLASMA PHYSICS DIVISION

ELECTRONICS SCIENCE AND TECHNOLOGY DIVISION

CENTER FOR BIO/MOLECULAR SCIENCE AND ENGINEERING

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

ACOUSTICS DIVISION

REMOTE SENSING DIVISION

OCEANOGRAPHY DIVISION

MARINE GEOSCIENCES DIVISION

MARINE METEOROLOGY DIVISION

SPACE SCIENCE DIVISION

NAVAL CENTER FOR SPACE TECHNOLOGY

SPACE SYSTEMS DEVELOPMENT DEPARTMENT

SPACECRAFT ENGINEERING DEPARTMENT
Current Research and Development Efforts

Advanced Radio, Optical, and IR Sensors
Advanced optical sensors
EM/OO/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 finds
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
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
Defensive 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

**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
Coastal ocean characterization
Oceanographic decision aids
Global, theater, and tactical-scale modeling
Remote sensing of oceanographic parameters
Satellite image analysis

**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
Research in NRL’s
DIVISIONS/DEPARTMENTS
EXECUTIVE DIRECTORATE

INSTITUTE FOR NANOSCIENCE, CODE 1100
NANOINFO@NRL.NAVY.MIL

NANOSCIENCE AND NANOTECHNOLOGY
Low-power, high-speed electronics
Lightweight, high-strength materials
Highly sensitive molecular sensors
Efficient energy generation and storage

LABORATORY FOR AUTONOMOUS SYSTEMS
RESEARCH, CODE 1700
LASRINFO@NRL.NAVY.MIL

AUTONOMOUS SYSTEMS RESEARCH
Multidisciplinary research, development, and integration in autonomous systems
Software for intelligent autonomy
Novel human-systems interaction technology
Mobility and platforms
Sensor systems
Power and energy systems
Networking and communications
Trust and assurance

SYSTEMS DIRECTORATE

RADAR DIVISION, CODE 5300
RADARINFO@NRL.NAVY.MIL

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
Signal analysis
Real-time signal processing and equipment
Computer-aided engineering (CAE)
Array architecture optimization
FPGA-based digital processing
Future identification technology

**SURVEILLANCE TECHNOLOGY**
Shipboard surveillance radar
Ship self-defense
Electronic counter-countermeasures and
electronic protection (EP)
Target signature recognition
Digital T/R modules
Asymmetric and expeditionary warfare
  spectrum management
Ultrawideband technology
Dynamic waveform diversity
Multistatic radar network
Information extraction
Ballistic missile defense
Mine detection

**INFORMATION TECHNOLOGY DIVISION, CODE 5500**
ITDINFO@NRL.NAVY.MIL

**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**
Hostile intent and deception detection
Behavior detection research
Geospatial modeling and simulation
Dynamic semantic networks
Behavioral modeling, analysis, and metrics
Spatially integrated social science
Integrated intelligence, surveillance, and reconnaissance
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 service oriented architectures (SOA) and 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, e-mail, 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

OPTICAL SCIENCES DIVISION, CODE 5600
OPTINFO@NRL.NAVY.MIL

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

PHOTONICS 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

TACTICAL ELECTRONIC WARFARE DIVISION,
CODE 5700
EWINFO@NRL.NAVY.MIL

OFFBOARD COUNTERMEASURES
Expendable technology and devices
Unmanned air vehicles
Offboard payloads
Decoys

AIRBORNE ELECTRONIC WARFARE SYSTEMS
Air systems development
Penetration aids
Power source development
Jamming and deception
Millimeter-wave technology
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

MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE

LABORATORIES FOR COMPUTATIONAL PHYSICS AND FLUID DYNAMICS, CODE 6040

REACTIVE FLOWS
Fluid dynamics in combustion
Turbulence in compressible flows
Multiphase flows
Turbulent jets and wakes
Turbulence modeling
Computational hydrodynamics
Propulsion systems analysis
Contaminant transport modeling
Fire and explosion mitigation
COMPUTATIONAL PHYSICS DEVELOPMENTS
Laser-plasma interactions
Inertial confinement fusion
Solar physics modeling
Dynamical gridding algorithms
Advanced graphical and parallel processing systems
Electromagnetic and acoustic scattering
Microfluidics
Fluid structure interaction
Shock and blast containment

CHEMISTRY DIVISION, CODE 6100
CHEMINFO@NRL.NAVY.MIL

CHEMICAL DIAGNOSTICS
Optical diagnostics of chemical reactions
Kinetics of gas phase reactions
Trace analysis
Atmosphere analysis and control
Ion/molecule processes
Environmental chemistry/microbiology
Methane hydrates
Laboratory on a chip
Alternate energy sources

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

CENTER FOR CORROSION SCIENCE AND ENGINEERING
Materials failure analysis
Marine coatings
Cathodic protection
Corrosion science
Environmental fracture and fatigue
Corrosion control engineering
SURFACE INTERFACE CHEMISTRY
Tribology
Surface properties of materials
Surface/interface analysis
Chemical/biological sensors
Surface reaction dynamics
Adhesion
Bio/organic interfaces
Diamond films
Energy storage materials
Nanostructured materials and interfaces
Electrochemistry
Plasmonics
Synchrotron radiation applications

SAFETY AND SURVIVABILITY
Combustion dynamics
Fire protection and suppression
Personnel protection
Modeling and scaling of combustion systems
Mobility fuels
Chemometrics/data fusion
Trace analysis

MATERIALS SCIENCE AND TECHNOLOGY DIVISION,
CODE 6300
MATERIALINFO@NRL.NAVY.MIL

MATERIALS AND SENSORS
Superconducting materials
Magnetic materials
Optoelectronic materials
Electroceramic materials
Radar absorbing materials
THz sources and detectors
Bioelectronics
Remote video surveillance
Chemical sensors
Chaos theory
Thin film deposition
Pulsed laser deposition
Ion-beam-assisted deposition
Variable balance magnetron sputtering
Laser direct write
Ion implantation
Glass fiber draw tower
Polymer synthesis and characterization
Precision calorimetry
Analysis of extrasolar materials
Ballistic materials
Personal protective equipment
Explosives detection

**MULTIFUNCTIONAL MATERIALS**

Biomechanical surrogate development for threat response characterization
Biomechanical simulation
Composite material systems
  - Multifunctional structure + other (e.g., power, etc.)
  - Hierarchical and tiled architectures
  - Armor protection
Corrosion simulation and control
  - Modeling of electrochemical corrosion systems
  - Evaluation of cathodic protection performance
Image-based modeling
Materials by design
Mesoscale material characterization and simulation
Physical metallurgy
  - Ferrous, nonferrous, and intermetallic alloys
  - Hot/cold isostatic pressing
  - Micro/nanostructure characterization
  - Three-dimensional microstructure characterization
Synthesis and processing of metal
Rapid solidification
Welding/joining technology
Heat treating and phase transformations
Synthesis and processing of advanced ceramics
  - High energy density dielectrics
  - Piezoelectrics

**COMPUTATIONAL MATERIALS**

Condensed matter theory
Electronic structure of solids and clusters
Molecular dynamics
Quantum many-body theory
Theory of magnetic materials
Theory of alloys
Semiconductor and surface physics
Theoretical studies of phase transitions
Atomic physics theory
Protein modeling
Continuum multiphysics modeling
PLASMA PHYSICS DIVISION, CODE 6700
PLASMAINFO@NRL.NAVY.MIL

RADIATION HYDRODYNAMICS
Radiation hydrodynamics of Z-pinchess and laser-produced plasmas
X-ray source development
Cluster dynamics in intense laser fields
X-ray channeling and propagation
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
Impact fusion
Laser fusion technology
Laser fusion energy
Detection of chemical/biological/nuclear materials

CHARGED PARTICLE PHYSICS
Applications of modulated electron beams
Rocket, satellite, and shuttle-borne natural and active experiments
Laboratory simulation of space plasma processes
Large-area plasma processing sources
Plasma processing 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 radiator and bremsstrahlung diode sources
Capacitive and inductive energy storage
Nuclear weapons effects simulation
Electromagnetic launchers
Detection of Special Nuclear Materials
Advanced energetics via stimulated nuclear decay
BEAM PHYSICS
Advanced accelerators and radiation sources
Microwave, plasma, and laser processing of materials
Microwave sources: magnicons and gyrotrons
Nonlinear dynamics of coupled lasers
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
Laser propagation in the atmosphere
Underwater laser interactions

ELECTRONICS SCIENCE AND TECHNOLOGY
DIVISION, CODE 6800
ELECINFO@NRL.NAVY.MIL

ELECTRONIC MATERIALS
Preparation and development of magnetic, dielectric, optical, and semiconductor materials including micro- and nanostructures
Electrical, optical, and magneto-optical studies of semiconductor microstructures and nanostructures, superlattices, surfaces, and interfaces
Impurity and defect studies
Surface research and interface physics
Theoretical solid-state physics

MICROWAVE TECHNOLOGY
Microwave and millimeter-wave integrated circuits and components research
High-frequency device design, simulation, and fabrication
Reliability and failure physics of electronic devices and circuits
Oxide- and carbon-based electronics for high-frequency devices

POWER ELECTRONICS
Power device design, simulation, and fabrication
High-voltage/high-temperature power device and components research
Growth and characterization of wide bandgap and thin film materials for power devices
Wafer bonding for power devices and novel substrates
Reliability and failure physics of power devices
NANOELECTRONICS
Characterization of nanosurfaces and interfaces
Nanoelectronic device research and fabrication
Processing research for nanometric devices

RADIATION EFFECTS
Space experiments and satellite survivability
Single event and total ionizing dose effects
Radiation hardening of electronics devices, circuits, and optoelectronic sensors
Ultrafast charge collection
Environmental hazard remediation
Advanced photovoltaic technologies
Femtosecond laser research
Radiation effects in microelectronics and photonics

SOLID-STATE DEVICES
Solid-state optical sensors
Photovoltaic research and development
Mid- and far-infrared photodiodes/arrays
Microelectronics device research and fabrication
Solid-state circuits research
Signal processing research

VACUUM ELECTRONICS
Compact millimeter-wave power amplifier research and development
Cathode research and electron emission science
Materials development for microwave and millimeter-wave applications
Development of microfabrication techniques for upper millimeter-wave devices
Theory and numerical techniques for modeling of fast-wave and slow-wave devices
Techniques for broadband, complex waveform generation and analysis for high data rate communications and electronic warfare

CENTER FOR BIO/ MOLECULAR SCIENCE AND ENGINEERING, CODE 6900
BIOMOLINFO@NRL.NAVY.MIL

BIOLOGICALLY DERIVED MICROSTRUCTURES
Self-assembly, molecular machining
Synthetic membranes
Nanocomposites
Tailored electronic materials
Low observables
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

**NOVEL MATERIALS**
Soil/groundwater explosives detection
Antifouling paint, controlled release
Single chain antibodies
Liquid crystal nanoparticles
Liquid crystal elastomers
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

**OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE**

**ACOUSTICS DIVISION, CODE 7100**
ACOUSINFO@NRL.NAVY.MIL

**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
REMOTE SENSING DIVISION, CODE 7200
REMSENINFO@NRL.NAVY.MIL

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

**OCEANOGRAPHY DIVISION, CODE 7300**
NRL/STENNIS SPACE CENTER, MISSISSIPPI
OCEANINFO@NRL.NAVY.MIL

**OCEAN DYNAMICS AND PREDICTION**

Circulation
- Global resolution of circulation and mesoscale 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

MARINE GEOSCIENCES DIVISION, CODE 7400
NRL/STENNIS SPACE CENTER, MISSISSIPPI
GEOSCIINFO@NRL.NAVY.MIL

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
- Geoacoustic 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

MARINE METEOROLOGY DIVISION, CODE 7500
NRL/MONTEREY, CALIFORNIA
METEORINFO@NRL.NAVY.MIL

ATMOSPHERIC DYNAMICS AND PREDICTION
Global to tactical scale
Deterministic and probabilistic
Large eddy simulation
Boundary layer
Land surface
Coastal
Arctic
Urban effects
Massively parallel computing
Coupled ocean/atmosphere
Tropical cyclones
Aerosols
Topographically forced flow
Predictability
Ensembles design
Advanced numerical methods

**DATA ASSIMILATION**
Hybrid techniques
3D and 4D variational analysis
Ensemble Transform Kalman Filter (ETKF)
Quality control and bias correction
Tropical cyclone initialization
Remotely sensed data assimilation
Adjoint applications
Direct radiance assimilation
Radar data assimilation
Targeted observations
Data selection techniques
Aerosol assimilation
UAV data assimilation

**TACTICAL ENVIRONMENTAL SUPPORT**
Rapid environmental assessment
Through-the-sensor measurements
Atmospheric impact on weapons systems
Chem-bio transport and dispersion
Data fusion
Nowcasting
Visualization
Expert systems
Aviation risk assessment

**ATMOSPHERIC PHYSICS**
Air-sea interaction
Cloud and aerosol microphysics
Radiative transfer
Aerosol characterization
Tropical cyclone structure

**SATELLITE DATA/IMAGERY**
Automated classification of cloud properties
Sensor calibration/validation
Satellite imagery analysis and enhancement
Multisensor data fusion
Tropical cyclone characterization
Dust/aerosols
Rain rate and snow cover
Nighttime environmental analysis
JPSS preparation
Tactical meteorology

**DECISION AIDS**
Refractivity/ducting
Ceiling/visibility
Fog/turbulence/icing
Atmospheric acoustics
EM/EO propagation effects
Tropical cyclones/consensus forecasts
Nuclear/chemical/biological transport and dispersion
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

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**SPACE SCIENCE DIVISION, CODE 7600**

**SPASCIINFO@NRL.NAVY.MIL**

**GEOSPACE SCIENCE AND TECHNOLOGY**
Research to observe, understand, model, and forecast the Earth’s operational environment that extends from the lower atmosphere to the magnetopause, in which region both terrestrial and solar effects influence the space environment.

**HIGH ENERGY SPACE ENVIRONMENT**
Research of energetic particle, γ-ray, and X-ray/ultraviolet environments in space and for other applications of interest to the DoD, homeland security, and national programs, such as detection and surveillance of nuclear materials in terrestrial and space applications.

**SOLAR AND HELIOSPHERIC PHYSICS**
Research to develop a fundamental physical understanding of highly variable transient and long-term solar activity; the radiative, plasma, and particulate emissions associated with the activity; and the responses of the heliosphere and the terrestrial magnetosphere to the activity. Relevant empirical data is collected.
by conceiving, developing, and operating state-of-the-art imaging, spectrometric, and in situ space flight sensors on national and international space missions. Physics-based models are hypothesized, tested with the collected empirical data and computer simulation, and developed.

NAVAL CENTER
FOR SPACE TECHNOLOGY

SPACE SYSTEMS DEVELOPMENT DEPARTMENT,
CODE 8100
SPASYSINFO@NRL.NAVY.MIL

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; hardware and software
Detailed electrical/electronic design of electronic and electromechanical payload and systems and components
Design and verification of real-time embedded multi-processor 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 timekeeping/
Universal Coordinated Time/UTC (NRL)

**SPACECRAFT ENGINEERING DEPARTMENT, CODE 8200**
SPAENINFO@NRL.NAVY.MIL

**DESIGN, TEST, AND PROCESSING**
Design, fabrication, and testing of spacecraft and hardware
Preliminary and detailed design, fabrication, testing, and integration onto launch vehicle
Systems engineering for new spacecraft proposals
Start-to-finish responsibility for NCST spacecraft mechanical systems

**SPACE MECHANICAL SYSTEMS DEVELOPMENT**
Research and development in spacecraft technology
Conceptual design trade studies
Integrated engineering design and analysis
Structural and thermal design and analysis
Development and transition of prototype hardware
Development and integration of experimental payloads
Mission integration and development

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
Computer animation
Robotics systems engineering
Proximity operations
Autonomous servicing
Autonomous inspection
End effector design
Compliance control
Trajectory planning
Machine control
Fault detection, isolation, and recovery

SPACE ELECTRONIC SYSTEMS DEVELOPMENT
Space system concept definition, design, and implementation including hardware and software
Detailed electrical/electronic design of electronic and electromechanical systems and components
Implementation of real-time flight software and embedded command, control, and telemetry software
Design and verification of real-time embedded multiprocessor software
Spacecraft antenna systems
Space systems fabrication, test, and integration
Launch and on-orbit support
Space test systems and electronic launch support equipment
Space TT&C and control systems
Space communication systems
Doing Business with NRL

Technology Transfer Office
NRL has a long history of working with industry and academia to assist in the transfer of its inventions for nonmilitary applications. Many of NRL’s research efforts result in materials, techniques and other products that have additional applications in the commercial or civilian sectors. NRL developments in areas such as radar, radio, satellite navigation, fire fighting, and a wide variety of materials and coatings have made significant contributions to the safety and welfare of the civilian sector.

Technology transfer ensures full use of the results of the nation’s federal investment in research and development by transferring federally owned or originated technology to the private sector for the public good.

The Technology Transfer Office markets NRL’s technologies in various ways, including distributing and posting fact sheets describing available technologies, participating in NRL exhibits at scientific and Navy conferences and working with local economic development groups. NRL’s social media program is also in TTO and provides another venue for marketing.

Mechanisms for technology transfer include Cooperative Research and Development Agreements (CRADAs) and licensing of inventions.

E-MAIL: TECHTRAN@RESEARCH.NRL.NAVY.MIL
URL: HTTP://WWW.NRL.NAVY.MIL/TECHTRANSFER

Cooperative Research and Development Agreements (CRADAs)
To promote the timely transfer of technology from government laboratories to the private sector and to improve the competitiveness of U.S. industry, Congress passed the Federal Technology Transfer Act (FTTA) of 1986. With this legislation, Congress authorized federal organizations to enter into CRADAs with nonfederal parties. The objective of a Navy CRADA is cooperative research that will enhance the mission of the Navy and benefit the non-Navy party. The CRADA defines the individual responsibilities of the Navy and non-Navy parties toward achieving the objective, as well as rights to intellectual property developed under the CRADA. The Navy party in a CRADA may provide personnel, facilities, and equipment to perform the cooperative research. The non-Navy party may provide personnel, facilities, equipment, and funding. CRADAs can be established
with industrial organizations, industrial development organizations, nonprofit organizations, universities, state and local governments, and licensees of inventions owned by federal agencies.

NRL signed the Navy’s first CRADA in 1989. Since that time, the Laboratory has continued to pursue and promote this program actively. NRL has entered into CRADAs directed at the development of novel techniques for airport luggage screening, detectors for drugs of abuse, location and mapping devices for unexploded ordnance, fiber-optic dosimeters for radiation exposure, and other technological advances that have impacted the military and the civilian sectors. Information on our CRADA process, including the CRADA boilerplate and questionnaire can be found at http://www.nrl.navy.mil/techtransfer/cradas.php.

e-mail: techtran@research.nrl.navy.mil

Licensing of Navy Inventions
Since the enactment of FTTA, the effort to encourage commercial use of government-funded technology has expanded in the federal laboratories. Title 35, Section 209, of the United States Code authorizes federal agencies to license their patentable inventions. A license grants the licensee the right to make, use, import and sell a product based on the licensed technology in exchange for royalty payments that are shared by the Laboratory and the inventors. NRL supports an active licensing program and has over 900 patents and patent applications available for licensing in fields as diverse as advanced materials, chemistry, biotechnology, optics, ocean and atmospheric sciences, electronics, radar, and satellite technology. NRL has licenses with small and large U.S. businesses, and foreign and multinational businesses.

To begin the process of acquiring a license, the potential licensee is required to fill out the Application to Practice a Navy Invention (found at http://www.nrl.navy.mil/techtransfer/licenses.php). This application must include a detailed business/commercialization plan that covers the important aspects of product development, marketing and sales, including a development plan with milestones, timelines, and relevant expertise; the source of funding for development of the invention; the risks associated with the technology and the market; and a projected sales forecast with the underlying assumptions used to generate the forecast.
Key items in the application are: the field of use and the type of license (non-exclusive, partially exclusive, or exclusive). Partially exclusive means exclusive in a field of use. For partially exclusive or exclusive licenses, the licensee’s plan submitted with the application must meet certain determinations from the federal regulations showing that exclusive licensing is a reasonable and necessary incentive to attract the investment of risk capital necessary to bring the invention to practical application. The proposed scope of exclusivity must not be greater than the licensee capabilities for developing and commercializing the technology, and granting the license must not substantially lessen competition.

For partially exclusive or exclusive licenses, if the application is acceptable and reasonable terms and conditions can be negotiated successfully, an “Intent to Grant” notice is published in the Federal Register for a minimum of 15 calendar days before a license can be executed. The Intent to Grant notice lists the company name and the field of use for the license.

Typical financial components to each license are: (1) a lump-sum upfront fee paid on execution of the license, (2) milestone fees, (3) a running royalty for sales other than to the federal government, and (4) a minimum annual royalty.

E-MAIL: TECHTRAN@RESEARCH.NRL.NAVY.MIL
URL: HTTP://WWW.NRL.NAVY.MIL/TECHTRANSFER

Work for Nonfederal Parties
NRL has many unique capabilities that may enhance the R&D efforts of organizations external to NRL. NRL may sell testing and other services, articles, models, and software if: NRL’s capabilities are unique; the sale would not constitute undue competition with industry; making them available for sale is in the interest of national defense; the sale requires no more than incidental subcontracting; and the nonfederal party agrees to hold harmless and indemnify the United States. The Navy requires advance payment, but incremental funding by task is often acceptable. The procedures for the approval of sales to nonfederal entities are covered in NRL Instructions.

Call (202) 767-2244 if you have any questions regarding work for nonfederal parties.
**Letters of Intent**
With increasing frequency, funding agencies are sponsoring R&D programs that are performed by “teams” consisting of industry, national laboratory, and/or university members. NRL participates actively in such programs that are funded by ONR, DARPA, and other public and private funding agencies. At the proposal phase of such programs, NRL may submit a letter of intent to the team lead that describes the work NRL will perform on a best efforts basis if the proposal is funded. Whenever possible, NRL arranges for direct funding of its efforts by a sponsoring U.S. government agency via the Economy Act. In the event that NRL cannot be directly funded by a federal sponsor, NRL will use its best efforts to negotiate an authorized agreement under applicable law and regulation with the team lead under which NRL will perform and be compensated for its assigned tasks under the proposal.

Call (202) 767-2244 if you have any questions regarding Letters of Intent.

**Memoranda of Understanding**
NRL scientists participate actively with scientists from other federal laboratories and organizations on projects of national interest. Such collaborations among federal organizations may be formalized with a Memorandum of Understanding or a Memorandum of Agreement that defines the scope of the work and the responsibilities of each federal party toward achieving the objectives. NRL has entered into Memoranda of Understanding or Agreement with the Army, Navy, Air Force, Marine Corps, Department of Energy, and other U.S. government activities.

Call (202) 767-2244 if you have any questions regarding establishing MOUs and MOAs with NRL.

**Funding External Activities**
NRL is the Navy’s corporate laboratory, conducting basic and applied research for the Navy in a variety of scientific and technical disciplines. The basic research program is driven by perceptions about future requirements of the Navy. In addition to actively performing research, NRL supports various R&D projects that directly relate to its ongoing work. This support is provided through contracts and grants with industrial firms, colleges and universities, and nonprofit organizations. The North American Industry Classification System (NAICS) Code is 541710 — Research and Development in the Physical, Engineering, and Life Sciences.
Performers are competitively selected after review of proposals submitted in response to Broad Agency Announcements (BAAs) or Requests for Proposals (RFPs).

Proposals may be submitted by any nongovernmental entity, including commercial firms, institutions of higher education with degree-granting programs in science or engineering (universities), or by consortia led by such concerns. NRL encourages small businesses, veteran-owned small businesses, service-disabled veteran-owned small businesses, small disadvantaged businesses, HUBZone small businesses, woman-owned small businesses, and historically black colleges and universities and minority institutions to submit proposals in response to BAAs.

**Broad Agency Announcements**

BAAs are issued under the provisions of paragraphs 35.016 and 6.102(d)(2) of the Federal Acquisition Regulation. Proposals may range from theoretical studies to proof-of-concept to include fabrication and delivery of a prototype. BAA topics include all NRL sites located in the Washington, DC area, the Stennis Space Center, MS, and Monterey, CA. Proposals submitted in response to a BAA announcement that are selected for award are considered to be the result of full and open competition and are in full compliance with the provisions of Public Law 98-369, “The Competition in Contracting Act of 1984.”

The selection of proposals for contract award will be based on a scientific review of proposals submitted in response to each BAA. The major purpose of the evaluation will be to determine the relative merit of the technical approach of each proposal. Business and contractual aspects, including cost realism, will also be considered as part of the evaluation. Selection of proposals for award will be based on the potential benefits to the government weighed against the cost of the proposals, in view of the availability of funds.

Current BAA information, including award considerations and instructions for submitting proposals, is available on the Internet at the following address: http://heron.nrl.navy.mil/contracts/baa/index02.htm.

**Commercial Contracts/Procurements**

NRL also contracts with commercial firms, nonprofit organizations, and academic institutions to obtain specific products and services. These contracts and purchases are for equipment (either complete systems or components), professional and technical services supporting
the Laboratory’s ongoing R&D programs, and special projects. NRL contract opportunities are announced as Requests for Proposals (RFPs) and NRL acquisitions are announced on the Federal Business Opportunities (Fed-BizOpps) website under Department of the Navy (USN), Office of Naval Research (ONR). ONR is NRL’s parent organization. NRL RFPs are also available from the NRL Contracting Division website. NRL RFPs are linked to the NECO site’s Associated Links under “ONR-Office of Naval Research.”

Purchases at or below the simplified acquisition threshold, orders against GSA schedule contracts, and MILSTRIP requisitions are processed by the Purchasing Branch (Code 3410) in the NRL Supply and Information Services Division (Code 3400).

More information on “Doing Business” with the Naval Research Laboratory is available on the Internet at the following address: http://heron.nrl.navy.mil/contracts/.

**Grants**

A grant is another mechanism used by NRL to fund outside activities. Grants are made primarily to educational and nonprofit organizations for proposals submitted under BAAs. NRL occasionally enters into cooperative agreements for research traineeships or fellowships and awards small grants for S&T conferences and symposia. For grants, contact the Contracting Division at (202) 767-5227.
NRL is always looking to recruit talented individuals in many fields of science. In addition to vacancies announced at http://hroffice.nrl.navy.mil/jobs/vacancy.htm, there are many programs for postdocs and students.

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 opportunity to pursue research at NRL in collaboration with NRL scientists and engineers. Research associates are guest investigators, not employees of the Naval Research Laboratory.

**NRL/NRC COOPERATIVE RESEARCH ASSOCIATESHIP PROGRAM:** The NRC 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.

Office of Naval Research Summer Faculty Research and Sabbatical Leave Program
This 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.

NRL/United States Naval Academy Cooperative Program for Scientific Interchange
This program 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.

Student Programs
The Naval Research Enterprise Intern Program (NREIP) This program 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@hro.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 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) is designed to provide 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 non-competitively converted to a permanent appointment within 120 days after completion of degree requirements. 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 up to one year in duration and may be extended for one additional year. This program enables students to earn a salary while continuing their studies and offers them valuable work experience. Our Intern Program opportunities are announced on USAJOBS. For additional information on our Intern Program, contact (202) 767-8313.

The **STUDENT VOLUNTEER PROGRAM** helps students gain valuable experience by allowing them to voluntarily perform educationally related work at NRL. Applications are accepted year-round. For additional information on our Student Volunteer Program, contact (202) 767-8313.

The **DoD SCIENCE AND ENGINEERING APPRENTICE-SHIP 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 understand-
ing of research, its challenges, and its opportunities through participation in scientific, engineering and mathematics programs. Criteria evaluated for acceptance are 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 one of the largest in DoD. For detailed information visit http://seap.asee.org/, or call (202) 767-8324, or email seap@hro.nrl.navy.mil.
CAREERS AT NRL

• Research Chemist
• Chemical Engineer
• Computer Scientist
• Computer Engineer
• Meteorologist
• Materials Research Engineer
• Metallurgist
• Mathematician
• Geologist
• Research Biologist
• Electrical Engineer
• Electronics Engineer
• Mechanical Engineer
• Aerospace Engineer
• Research Physicist
• Astrophysicist
• Oceanographer
• Geophysicist

Please use the Division or Department e-mail addresses in this guide to submit a resumé.

Current job vacancies can be found at http://hroffice.nrl.navy.mil/jobs/vacancy.htm
The Naval Research Laboratory has major facilities on the banks of the Potomac River in southwest Washington, DC; at the Stennis Space Center, Mississippi; and in Monterey, California. NRL was dedicated on July 2, 1923, and is the Navy's only corporate laboratory, charged with the mission of conducting a broadly based, multidisciplinary program of scientific research and advanced technological development.

Research is directed toward maritime applications of new and improved materials; techniques; equipment; systems; ocean, atmospheric, and space sciences; and related technologies. The Navy has established NRL as its “lead laboratory” in space technology, fire research, artificial intelligence, tactical electronic warfare, and microelectronic devices.

Looking for an exciting and rewarding career?

THiNk NRL

JOIN A TEAM THAT MAKES A DIFFERENCE TO DoD AND OUR NATION

The Naval Research Laboratory nurtures a multidisciplinary research environment to stimulate and support creative and innovative concepts in the physical sciences, engineering, and information technology. Young scientists and engineers are encouraged to team with the Lab's world-renowned researchers to promote individual creativity and to develop new technologies in support of the Navy, the Marine Corps, and the Nation.

For information or to submit a resume, simply use the e-mail link found in each research division of this guide.