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NRL GUIDE

U.S. NAVAL RESEARCH LABORATORY
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Washington, DC 20375-5320

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Cleared for public release.





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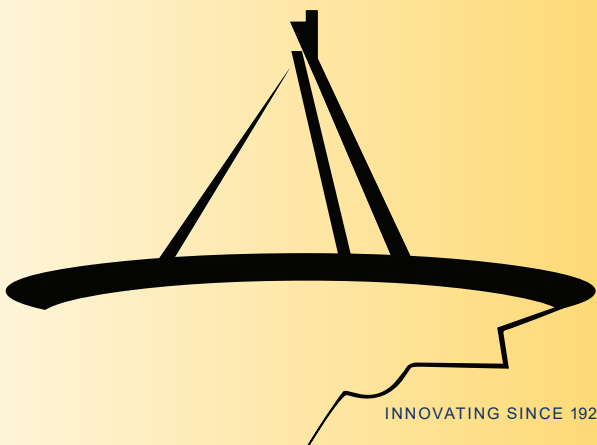
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INNOVATING SINCE 1923

Current Research and Development Efforts

Advanced Optical Sensors and Technologies

Advanced optical sensors
EM/EO/meteorological/oceanographic sensors
Satellite meteorology
Precise space tracking
Radio/infrared astronomy
Infrared sensors and phenomenology
UV sensors and middle/upper atmosphere research
VLBI/astrometry
Optical interferometry
Imaging spectrometry
Liquid crystal technology
High dynamic range, non-field distorting EO and MO sensors

Artificial Intelligence

Adaptive algorithms and systems
Cognitive architectures and models
Cognitive science
Generative AI (e.g., large language models (LLMs))
Human-computer interaction
Human-machine teaming
Intelligent systems (e.g., for resource allocation, signal identification, operational planning, and target classification)
Machine learning
Reasoning and task planning algorithms
Reservoir computing for data and systems analysis

Autonomous Systems

Algorithms for control of autonomous systems
Bio-inspired robotics
Cognitive robotics
Human-robot interaction and teaming
Machine ethics
Machine learning and adaptive algorithms
Navigation and planning algorithms
Networking and communications for mobile systems
Neuromorphic computing
Reasoning and task planning algorithms
Sensors for autonomous systems
Perception hardware and algorithms
Power and energy for autonomous systems
Swarm behaviors
Test and evaluation of autonomous systems

Directed Energy Technology and Railguns

High-energy lasers
Laser propagation

- Solid-state and fiber lasers
- High-power microwave sources
- Electromagnetic launchers (railguns)
- Pulse detonation engines
- Charged-particle devices
- Pulsed power
- DE effects
- Underwater laser acoustic sources
- Wireless recharging (power beaming)

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
- Radiation effects and satellite survivability
- Molecular engineering

Electronic Warfare

- EW/C2W/IW systems and technology
- SIGINT (COMINT/ELINT) technology
- EW decision aids and planning/control systems
- Intercept receivers, signal processing, and identification systems
- Passive direction finders
- Decoys and offboard countermeasures (RF and EO/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
Environmentally-informed battle management aids
Solar and geomagnetic activity
Magnetospheric and space plasma effects
Nonlinear science
Ionospheric behavior and effects on sensors and communications
Oceanographic effects on weapons, sensors, and platforms
EM, EO, and acoustic system performance/optimization
Environmental hazard assessment
Contaminant transport
Biosensors
Microbially induced corrosion
Laboratory simulation of space plasmas

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
Image processing

Information Technology

High-performance computing
High-performance communications
Requirements specification and analysis
Machine learning
Information filtering and fusion
Bandwidth management (quality of service)
High-assurance software
Distributed network-based battle management
High-performance computing supporting uniform and

non-uniform memory access with single and
 multithreaded architectures
 Distributed, secure, and mobile information infrastructures
 Network and communications security
 High-performance, heterogeneous physical layer networked
 communications systems
 Resilient, anti-jam networked communication links
 Wireless mobile networking and tactical mobile area
 networks (MANETs)
 Next-generation tactical data links
 Spectrum agility/co-existence
 Dynamic spectrum access, cognitive radio networks software
 defined networked communications systems
 Integrated internet protocol (IP) multicasting
 Reliable multicasting protocols, routing and transport
 mechanisms
 Information theory and networked communications systems
 optimization
 Communications systems integration and rapid capability
 development
 Automated/distributed sensor communications networks
 Communication network modeling, simulation, emulation
 Communication system engineering and information theory
 Mobile, wireless networking technology
 Joint service tactical-edge networking
 Automated testing of highly mobile tactical networks
 (Tactical MANETs)
 Reliable multicast routing, protocols, and applications
 Distributed sensor networks
 Advanced tactical data links
 Communications channel optimization and agility
 Data dissemination systems and services
 Distributed computing architectures over low-bandwidth/
 high-latency networks
 Cloud computing architectures
 Spectrum monitoring and management systems
 Spectrum policy distribution
 Reliable network control communications
 Discerning contention and risk to communications systems
 UAV communications engineering
 Spectrum sharing with commercial telecommunications
 Accelerating 5G/6G telecommunications capabilities for
 military applications
 Development of Dynamic Spectrum Sharing mechanisms
 Distributed beam forming for extended range
 communications
 Quantum Networking
 Quantum Algorithms and Protocols

Marine Geosciences

Marine seismology with both conventional and unique instrumentation, including analysis of acoustic reflections for seafloor physical and acoustic properties, and indications of fluid and gas seeps, methane gas, and methane hydrate, in support of acoustic performance prediction

Numerical simulation and prediction of seafloor sediment properties

Generation and analysis of interface (Scholte) waves in support of mine warfare and mine countermeasures

Laboratory measurements of a wide variety of sediment physical and acoustic properties.

Acoustic, electro-optic, and electromagnetic sensing for seafloor mapping and characterization

Modeling, simulation, and prediction of nearshore and riverine processes

Geospatial science and technology for enabling information dominance

Geotechnical investigations of seafloor structure and strength

Materials

Variable emissivity materials

Meta materials

Superconductivity

Magnetism

Ferroelectrics

Dielectrics

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

Multiphysics modeling and simulation

Computational material science

Computational fluid dynamics

Paints and coatings

Flammability

Chemical/biological materials

Spintronic materials and half metals

Bio-derived/biomimetic materials

Ecosystems biology
Molecular scaffolding and structures
Multifunctional materials
Power and energy
Synthetic biology
Microwave and high pressure processing
Additive manufacturing
Laser processing and modifications

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/wave/ice/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
Earth system prediction capability
Impact of measurements on atmospheric prediction

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 communication

Ocean Sciences

Ocean and seabed instrumentation
Open ocean, littoral, polar, and nearshore oceanographic and seabed forecasting
Numerical simulation of seabed properties (acoustic bottom loss)

Shallow water ocean and seabed effects on operations
Modeling, sensors, and data fusion
Ocean data assimilation
Reduced order modeling
Physics parameterization
Seismic/acoustic acquisition, modeling, and inversion
Bio-optical processes
Oceanographic processes observation: mixing, waves, and circulation
Waves, tides, and surf prediction
Sea ice modeling and prediction
Coupled ocean-ice-wave-air-land modeling and prediction
Coupled data assimilation
Global, theater, and tactical scale modeling and prediction
Remote sensing of oceanographic parameters
Satellite image analysis
In-water sensing of ocean optics and biology
Bioluminescence and bioluminescence potential
Microbiologically influenced corrosion
Turbulence effects on ocean optics
Generation and analysis of interface (Scholte) waves in support of mine warfare and mine countermeasures
Laboratory measurements of a wide variety of sediment physical and acoustic properties.
Acoustic, electro-optic, and electromagnetic sensing for seafloor mapping and characterization
Modeling, simulation, and prediction of nearshore and riverine processes
Geotechnical investigations of seafloor structure and strength
Next generation planning, charting and navigation systems
Convergence of human factors and machine learning
Hydrographic survey and data processing techniques

Space Systems and Technology

Advanced payloads and optical communications
Atomic time/frequency standards/instrumentation
Attitude determination and control systems
Controllers, processors, signal processing, and VLSI
Environmental simulations
Hypersonic systems design and analysis
Launch and on-orbit support
Maritime space sensor CONOP development
Mechanical systems for spacecraft
Onboard autonomous navigation
Passive and active ranging techniques
Precise Time and Time Interval (PTTI) technology
Precision orbit estimation, dynamics, and space object tracking
Reaction control, propulsion systems, and thruster and cathode systems
Robotics learning and machine learning

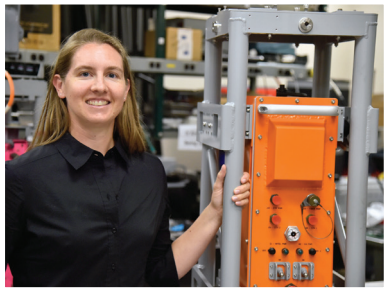
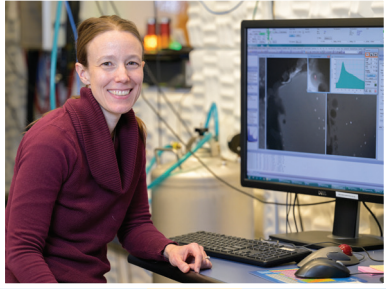
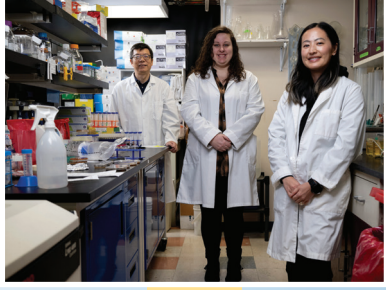
Robotic manipulation and locomotion technologies
Satellite ground station engineering integration, and operations solutions
Satellite Command and Control (C2) software
Satellite Mission Management (MM) software
Satellite Ground Resource Management (GRM) software
Space systems architectures and requirements
Spacecraft antenna systems
Spacecraft power systems and analog systems design and test
Spacecraft test systems software
Structural and thermal systems design and analysis
Tactical communication systems
Two-phase heat transfer systems
Unmanned robotic systems

Radar, Surveillance, and Sensor Technology

Radar imaging and automatic target recognition
Distributed radar
Multifunction RF systems
Millimeter-wave radar
Target classification/identification
Low observables technology
Ultrawideband technology
Interferometric imagery
Cylindrical and ultrawideband antennas
Computational electromagnetics
Electronic protection
Radar systems engineering
Advanced signal processing
Optimization techniques
Software systems engineering
High frequency over the horizon radar
Artificial Intelligence and Machine Learning (AI/ML) technologies
Microwave power beaming technology
High Frequency Surface Wave Radar
Shipboard OTH radar
Digital twin development
Integrated Topside Technologies
Cognitive resource management technology
Polar-OTH radar development
C-UAS discrimination

Undersea Technology

Autonomous vehicles
Bathymetric technology
Anechoic coatings
Acoustic holography
Unmanned undersea vehicle dynamics
Weapons launch



NRL RESEARCH DIVISIONS

EXECUTIVE DIRECTORATE

KNOWLEDGE MANAGEMENT DECISION SUPPORT OFFICE, CODE 1050

KMDSO@NRL.NAVY.MIL

Ruth H. Hooker Research Library
NRL Online Bibliography
Reference and citation services
Collections of print and digital books, journals, and
technical reports
Command data strategies
Analytics for process data
Analytics of research outputs
Command records management
NRL History office

INSTITUTE FOR NANOSCIENCE, CODE 1100

NANOINFO@NRL.NAVY.MIL

NANOSCIENCE AND NANOTECHNOLOGY

Low-power, high-speed electronics
Photonics, plasmonics, and polaratonics
Complex magnetism
Nanoscale energy generation, conversion, and storage
2D materials for sensing and information processing
Bio/inorganic hybrids
Neuroelectronics and signaling processes

SCIENTIFIC DEVELOPMENT SQUADRON ONE CODE 1600

VXS-1_PD@US.NAVY.MIL

AIRBORNE SCIENTIFIC EXPERIMENTATION AND ADVANCED TECHNOLOGY DEVELOPMENT

Support broad-based, multidisciplinary programs
across the spectrum of scientific research and applied
technologies
Support maritime application of new and improved
airborne data collection techniques, experimental
equipment, and system demonstration across the globe

AIRCRAFT

NP-3C Orion (2), UV-18A Twin Otter (1), RC-12M Huron
(1), and Aircraft Reporting Custodian for RQ-23A
Tiger Shark (13)

NP-3C ORION

All-weather, medium-altitude, long-endurance aircraft

configured to rapidly integrate science and technology projects

Max endurance of 12 hours (weight and fuel dependent), max altitude of 30,000 feet, and a speed range of 160 to 300 knots indicated airspeed

Capable of supporting sensors in nose and tail radomes

Configurable bomb bay equipment platform that can be outfitted with a 72" diameter radome and a payload of 3,000 lbs

External antenna mounting capability

Ability to mount sensors in forward and aft underbelly sensor wells

Capable of deploying sonobuoys and from an unpressurized chute and cabin door

Open architecture of the aircraft interior with mounting rails and multiple power and data ports

Project power distribution system that includes 3 Phase 400 Hertz (Hz) 115 Volts of Alternating Current (VAC), 1 Phase 400Hz 115VAC, 1 Phase 60Hz 115VAC, and 28 Volts of Direct Current (VDC)

UV-18A TWIN OTTER

Short-takeoff-and-landing unpressurized aircraft designed to be rapidly configured to support embarked projects

Max endurance of five hours (weight dependent), max altitude of 25,000 feet, and a speed range of 100 to 166 knots indicated airspeed

Features two bubble windows (one port, one starboard)

Research grade GPS antenna, a HF/VHF/ UHF/maritime band radio, an XM Satellite receiver option, two zenith ports, and project antenna mounting plate

Two nadir ports in the nose to accommodate multiple downward-looking sensors or an EO/IR turret, and a large fuselage cut-out designed to mount sensor packages

Configured with a freefall sonobuoy deployment chute

Removable wing pylon stations capable of carrying atmospheric or other sensors

Interior can be configured as required to support equipment racks rated for 250 lbs each, flexible operator location

Multiple project power outlets that include four 80 amp 28 VDC buses and four 15 amp 115 V AC 60 Hz bus

RC-12M HURON

Medium-altitude, medium-endurance aircraft

Modified to rapidly integrate science and technology projects that do not require the space or endurance of the NP-3C

Max endurance of six hours (weight and flight profile dependent), max altitude of 35,000 feet, and a speed range of 120 to 245 knots indicated airspeed

Mounted sensors in a belly radome can be fitted with or without an optical window
External antenna mounting capability as well as GPS and Iridium antennas
Interior of the aircraft is configurable for equipment and electronic racks and workstations
Multiple power structure options that include 3 Phase 400Hz 115VAC, 1 Phase 60Hz 115VAC, and 28VDC

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
Prototyping highbay for flight controls development and mixed reality
Desert highbay, with climbing wall and sandstorm capability
Tropical highbay for experiments in a jungle environment with programmable rain events
Littoral highbay with underwater localization, wave generator, and shoreline environment
Makerspace for small parts design and assembly
Flexible meeting support areas
Modular work and desk areas for visitors
Areas for outdoor experimentation
Nylon 3-D printing service

SYSTEMS DIRECTORATE

RADAR DIVISION, CODE 5300

RADARINFO@NRL.NAVY.MIL

RADAR ANALYSIS

Modeling and simulation
Target signature prediction, control, and measurement
Computational electromagnetics and antenna design
Inverse synthetic aperture radar (ISAR)
Automatic Target Recognition
Wideband array simulation and development
Cylindrical array design and development

ADVANCED RADAR SYSTEMS

High-frequency over-the-horizon radar technology and systems

Multifunction systems (radar/electronics warfare/communications)

Software systems engineering and software development

Real-time signal and data processing equipment

Standards-based software and system design and development

Computer-aided engineering (CAE)

ADVANCED CONCEPTS GROUP

Millimeter-wave radar

Unmanned aircraft systems (UAS) radar

Microelectronics design and development

Microwave power beaming

SURVEILLANCE TECHNOLOGY

Air and missile defense radar technologies

Airborne radar concepts and technologies

Distributed radar systems engineering

Optimization techniques and resource management

Advanced signal processing algorithms

Electronic counter-countermeasures and electronic protection (EP)

Target signature information extraction

Spectrum management

Counter-Unmanned Aerial System (C-UAS) target discrimination

Artificial Intelligence and Machine Learning (AI/ML) technologies

INFORMATION TECHNOLOGY DIVISION, CODE 5500

ITDINFO@NRL.NAVY.MIL

NAVY CENTER FOR APPLIED RESEARCH IN ARTIFICIAL INTELLIGENCE

Adaptive systems

Autonomous and intelligent systems (e.g., reasoning, task planning)

Autonomous and intelligent systems

Cognitive architectures and models

Cognitive science

Cognitive robotics

Distributed autonomous systems

Generative AI

Human-robot interaction

Human-robot collaboration and teaming

Intelligent decision aids
Machine ethics
Machine learning (e.g., deep learning, reinforcement learning, Bayesian models)
Mixed-reality systems
Perception and computer vision
Robotics software

CENTER FOR HIGH ASSURANCE COMPUTER SYSTEMS

Formal specification/verification of system security
Software engineering for secure systems
Key management and distribution solutions
Formal methods for requirements specification and verification
Network protocol modeling, simulation, and verification
Cross-domain solution technology development
High assurance cryptographic systems
Hardware/software co-design
Cyber Defense and network inspection technology
Cyber systems engineering
Cybersecurity posture assessments
Malicious code analysis
Autonomous cyber operations
Dynamic mission mapping of cyber key terrain
Anonymizing systems
Distributed trust
Stealthy communications
Assurance of cyber-physical systems
Infrastructure resiliency

NETWORKS AND COMMUNICATION SYSTEMS

High-performance, heterogeneous physical layer networked communications systems
Resilient, anti-jam networked communication links
Communication system engineering and information theory
Mobile, wireless networking technology
Joint service tactical-edge networking
Tactical data link modeling, simulation, and emulation
Distributed sensor networks
Advanced tactical data links
Cognitive radio and software-defined networking technology
Communications channel optimization and agility
Communications systems integration and rapid capability development
Spectrum agility/co-existence

Spectrum monitoring and management systems
Spectrum policy distribution
Reliable network control communications
Discerning contention and risk to communications systems
UAV communications engineering
Spectrum sharing with commercial telecommunications
Accelerating 5G/6G telecommunications capabilities for military applications
Development of Dynamic Spectrum Sharing mechanisms
Distributed beam forming for extended range communications

INFORMATION OPERATIONS

Advanced signal processing techniques
Resilient communications systems
LPI/LPD/LPG waveform development and evaluation
Special communications waveform development
Wireless network monitoring technologies
Network traffic analysis applications
High speed software defined radio architectures
COMINT systems
Reverse engineering technologies
Distributed signal processing
Non-kinetic effects development
Non-kinetic effects orchestration
Carrier landing system signals development
Automated radio testing
RF systems laboratory
Autonomous vehicle payload integration
Distributed autonomous systems
Distributed systems maneuver algorithms

INFORMATION AND DECISION SCIENCES

Virtual environments, augmented reality, and mixed reality
Visual analytics
Scientific and information visualization
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
Information geometry
Stochastic processes in human cognition
Computer vision
Algorithms for control of autonomous systems
Selection test development
Personnel selection and job placement
Human performance modeling
Physiological assessment
Adversarial machine learning
Game theoretic and multi-agent decision making
Comprehension and complexity of visual data
representations

CENTER FOR COMPUTATIONAL SCIENCE

Transparent optical network research and design
Parallel and novel computing architectures
Scalable high-performance computing and networking
for Navy and DoD
Secure high performance communications technologies
Distributed computing
Scientific visualization
High-performance and distributed file systems
High-definition video streaming technology
Automated testing of highly mobile tactical networks
(Tactical MANETs)
Reliable multicast routing, protocols, and applications
Communication network modeling, simulation, and
emulation
ATDnet and leading-edge WAN Layer 0, 1, and 2
research networks
Quantum networking
Quantum algorithms and protocols

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
Metamaterials
Planar waveguide devices

IR nonlinear materials and devices
Ceramic laser gain materials
Advanced photovoltaic materials
Fiber lasers/sources and amplifiers
Radiation effects

OPTICAL PHYSICS

Laser materials diagnostics
Nonlinear frequency conversion
Quantum optoelectronics
Optical interactions in semiconductor superlattices
and organic solids
Adaptive optics
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
LIDAR imaging systems
Hyper-temporal imaging systems
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
Microwave photonics
Photonic integrated circuits

OPTICAL TECHNIQUES

Fiber-optic materials and fabrication
Fiber Bragg grating sensors/systems
Fiber-optic sensors/systems (acoustic, magnetic,
gyroscopes)
Fiber-optic, condition-based maintenance

TACTICAL ELECTRONIC WARFARE DIVISION, CODE 5700

EWINFO@NRL.NAVY.MIL

OFFBOARD COUNTERMEASURES

Decoys and offboard payloads
Expendable technology and devices
Unmanned air vehicles

EW SUPPORT MEASURES

Radar signal intercept/electronic intelligence (ELINT)
Signal demodulation/feature extraction
Multiplatform geolocation
Advanced real-time digital signal processing

AEROSPACE EW SYSTEMS

Airborne radar CM systems
Communications CM technique development
RF-enabled cyber
Cognitive EW

SURFACE EW SYSTEMS

Shipboard EA systems
High-power EA transmitters
EA techniques and vulnerabilities
Signal processing for EA

ADVANCED TECHNIQUES

High-fidelity physics-based ASM modeling
New EW techniques
EO/IR EW modeling and flyable simulators
Experimental and developmental EO/IR CM systems

INTEGRATED EW SIMULATION

Hardware-in-the-loop simulation
Flyable ASM seeker simulators
Central Target Simulator
Foreign Military Equipment exploitation

EFFECTIVENESS OF NAVAL EW SYSTEMS

SIMDIS
Scenario Builder
High-level analysis and modeling simulation

MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE

LABORATORIES FOR COMPUTATIONAL PHYSICS AND FLUID DYNAMICS, CODE 6040

COMPHYSINFO@NRL.NAVY.MIL

PROPULSION AND DYNAMICAL SYSTEMS

Turbulent jets and wakes

Jet noise

Propulsion system analysis

Contaminant transport modeling

Fuel cells

Fire and explosion mitigation

Inertial confinement fusion

Bio-inspired propulsion for micro-air and unmanned
underwater vehicles

Control systems for unmanned air and underwater
vehicles

Detonation engines

Solid-fueled ramjet engines

Scramjet engines

MULTI-SCALE SIMULATION AND ALGORITHMS

Fluid dynamics in combustion

Turbulence in compressible flows

Multiphase flows

Plasma interactions with fluids and lasers

Microfluidics

Fluid structure interaction

Advanced computational methods for conservation laws

Non-equilibrium fluid dynamics

Shock waves in high energy density materials

Hypersonic flow-fields

Differentiable physics (ML-aided engineering design)

COMPUTATIONAL SCIENCE AND ARCHITECTURES

High performance computing

Advanced graphical and parallel processing systems

Physics-informed machine-learning

Data-driven scientific computing

Deployment of hybrid physics/ML codes

Code modernization methodologies

Emerging architectures

CHEMISTRY DIVISION, CODE 6100

CHEMINFO@NRL.NAVY.MIL

MATERIALS CHEMISTRY AND DYNAMICS

Bio-inspired materials
Biological laser printing
Degradation and stabilization mechanisms
Functional organic coatings
High-temperature resins
Ion/molecule processes
Kinetics of gas phase reactions
Magnetic resonance
Novel nanotubes and nanofibers
Optical diagnostics of chemical reactions
Polymer characterization
Reactive nanometals
Synthesis and evaluation of innovative polymers and composites

CORROSION SCIENCE AND ENGINEERING

Aquatic invasive organism control
Biofouling control
Cathodic protection
Corrosion control engineering
Corrosion science
Electrochemical systems
Environmental fracture and fatigue
Marine coatings
Materials failure analysis

SURFACE/INTERFACE CHEMISTRY

Adhesion and adhesives
Alternative energy sources
Battery safety
Bio/organic interfaces
Chemical/biological sensors
Diamond films
Electrochemistry
Energy storage materials
Nanostructured materials and interfaces
Marine biofouling surface/interface chemistry
Microbiology
Nanomechanics
Plasmonics
Surface/interface analysis
Surface properties of materials
Surface reaction dynamics
3D Printing of novel organic/inorganic materials
Tribology

SAFETY AND SURVIVABILITY

Analytical chemistry
Trace chemical sensing
Explosives detection
Mobility fuel chemistry
Machine learning/Cheminformatics
Fire suppression technology
Surfactant and emulsion chemistry and mechanics
Solid and liquid fuel combustion
Oil spill remediation
Personnel protection
Damage control
Firefighting doctrine
Theoretical chemistry
Modeling and simulation of nanoscale systems
Quantum computing methods

MATERIALS SCIENCE AND TECHNOLOGY DIVISION, CODE 6300

MATERIALINFO@NRL.NAVY.MIL

MULTIFUNCTIONAL MATERIALS

Integrated computational materials engineering (ICME)
Nanoscale, microscale, mesoscale material
 characterization and manufacturing
Phase transformation and microstructural evolution in
 material systems
Microstructure and process control in additive
 manufacturing
Multiple principal element alloys
Atom probe tomography
Computational simulations of materials in extreme
 environments (e.g., electromagnetic launch, blast,
 ballistic events)
Computational simulations of manufacturing processes
Multifunctional composite material systems
Magneto-electric sensors
Energy harvesting materials and devices
Nonlinear multiferroic materials
Corrosion, fatigue, and fracture of naval materials
High pressure synthesis
High energy density dielectrics
Bulk nanostructured ceramics
Ceramic thermal and environmental barrier coatings
Biomechanical simulation and response of live cell
 cultures
Surrogate model development for the warfighter
Personal protection equipment

Metamagnetic transitions for ultra low power and ultra high frequency devices
Advanced computational modeling development including finite element, crystal plasticity and uncertainty quantification
3D material characterization to elucidate microstructure-property relationship
Automated serial sectioning for statistically large, high resolution 3D material characterization data sets
Microstructural evolution of anisotropic polycrystalline systems
Digital twin and structural health monitoring
Neuromorphic computing for structural performance characteristics

MATERIALS AND SYSTEMS

Laser direct write
Terahertz sources, devices, and sensors
Graphene heterostructures and devices
Magnetic materials
Superconducting materials
Optoelectronic materials
Electroceramic materials
Multiferroic materials
Radar absorbing materials
Analysis of extrasolar materials
Chemical sensors
Additive manufacturing and flexible electronics
Thin film deposition for devices
Glass fiber processing and characterization
Polymer synthesis and characterization
Personal protective equipment
Remote explosives detection
Aberration-corrected STEM for single-atom spectroscopy and tomography
Photo-emission materials
Phase-change materials
Nuclear materials analysis
Materials and systems for carbon capture and energy storage

MATERIALS PHYSICS AND TECHNOLOGY

Condensed matter theory
Electronic structure of solids and clusters
Molecular dynamics
Quantum many-body theory
Theory of magnetism, magnetic materials and alloys
Materials for power and energy

Semiconductor and surface physics
 Theoretical studies of phase transitions
 Atomic physics theory
 Quantum dots
 Computational biophysics and protein modeling
 Continuum multiphysics modeling
 Reduced order modeling
 Multiphysics simulation of materials behavior
 Development of high-performance computational methods
 Spintronic/magnetoelectronic materials and devices
 Nonlinear dynamics and chaos theory
 Nanoplasmonic biosensors
 Automated learning
 Quantum information
 Radiation in matter
 Data and systems analysis
 Robotic multiaxial material testing and characterization
 Full field displacement vector and strain tensor field components measurements
 Inverse methods for multiphysics material systems
 Data- and model-driven process to performance relations for additive manufacturing
 High performance full field strain measurement methods
 Experimental methods for material characterization
 Machine learning for materials applications
 Development of digital twin technologies for qualification and condition-based maintenance
 Topological materials
 Two dimensional materials beyond graphene
 Van der Waals heterostructures

PLASMA PHYSICS DIVISION, CODE 6700

PLASMAINFO@NRL.NAVY.MIL

RADIATION HYDRODYNAMICS

Atomic physics and radiation transport in HEDP plasmas
 Non-local thermodynamic equilibrium ionization kinetics of pulsed power and laser-produced plasmas
 Radiation and neutron sources
 Dense plasma atomic physics, equation of state
 Spectroscopic diagnostics of HEDP and ICF plasmas
 2D and 3D magneto-hydrodynamic code development and utilization
 Kinetic modeling for plasma processing applications

LASER PLASMA

Laser inertial confinement fusion
High-energy ArF and KrF laser development
Laser fusion energy
High-power laser matter interaction experiments
Ultrashort ArF laser development and applications
Numerical modeling of laser-plasma instabilities
Rep-rate electron-beam applications
Simulations of direct-drive inertial-confinement-fusion
 pellet implosions
HEDP diagnostic development
Laser driven hypervelocity platforms

SPACE AND LABORATORY PLASMAS

Laboratory simulation of space plasmas
Rocket, satellite, and International Space Station natural
 and active experiments
Advanced laboratory and space plasma sensor
 development
Plasma antennas
Magnetic nanoparticle antennas for ELF/VLF applications
Space plasma theory and numerical simulation
Orbital debris detection technique development
Atmospheric and ionospheric GPS sensing
Ionospheric effects on communications
Radiation belt remediation
Microelectromagnetic pulses generated by hypervelocity
 impacts
Low-temperature plasma and discharge physics
Plasma processing sources
Surface modification of energy sensitive materials
Atmospheric pressure plasma applications
Electromagnetic launchers
High power microwaves
Cold cathode electron beam emission
Pulsed-power generators for Z-pinch physics

PULSED POWER PHYSICS

Advanced high-energy pulsed power applications
Nuclear weapons effects
High-power, flash radiography
Pinched-beam and reflexing x-ray diodes for high-energy
 x-rays
Intense electron and ion beams for materials testing
Production, focusing, and propagation of particle beams
Dense plasma focus and imploding plasma loads for
 pulsed neutrons
Pulsed and prime power for mission loads

Capacitive, inductive, and associated switching technologies

DIRECTED ENERGY PHYSICS

Directed energy and high-power laser propagation through the atmosphere

Advanced accelerators and radiation sources

Nonlinear stochastic dynamical systems

Laser-matter interactions at high and ultrahigh intensity

Underwater laser interactions

Advanced sensing and ultrafast diagnostics

ELECTRONICS SCIENCE AND TECHNOLOGY DIVISION, CODE 6800

ELECINFO@NRL.NAVY.MIL

QUANTUM OPTOELECTRONICS

PHOTON DETECTION & CONVERSION

III-V-based single and dual-band infrared sensor materials and devices covering SWIR to VLWIR

III-V-based avalanche photodiodes

Novel infrared materials for emitters and detectors

Bandstructure and device simulation of narrow-gap III-V semiconductor devices

Passivation of infrared sensor materials

Multispectral sensing using direct integration of metamaterials

Neuromorphic sensor readout technology

High-efficiency photovoltaic and power beaming systems

Stimulation of neurons with visible and infrared light

Heterogeneous integration of III-V materials through micro-transfer printing

PHOTOPHYSICS & RADIATION EFFECTS

Radiation effects and hardening for space and strategic applications

Photophysics and energy transport of DNA-organized dye molecule networks

Spectroscopy of photophysical processes in low dimensional semiconductors

Optical simulation of space radiation effects

NANO-OPTOELECTRONICS

Polaritonic materials and metamaterials

Physics-based electromagnetic modeling and design of metamaterials

Colloidal nanocrystal engineering and synthesis

Low Size Weight Power and Cost (SWaP-c) infrared detectors

Single-photon physics of colloidal nanocrystals
Optoelectronic structure-property relationships of self-assembled colloidal nanocrystal superlattices

QUANTUM SCIENCE & TECHNOLOGY

Quantum optics of semiconductors
Magnetometry with color center spin resonance
Coherent control of single spins in quantum dots
Nano-laser neural networks in photonic crystals
Spin-photon interfaces in silicon and SiC
Single- and entangled-photon sources

ELECTROMAGNETICS TECHNOLOGY

SOLID-STATE CIRCUITS & DEVICES

Microwave and millimeter-wave active and passive devices
Compact acoustic wave devices for advanced filtering
Neuromorphic computing devices
Small- and large-signal RF characterization techniques

THIN FILM MATERIALS

Metal-oxide and metal-nitride molecular beam epitaxy
Atomic layer deposition/epitaxy of insulators, semiconductors, and metals
Materials characterization and defect-property relationship determination
Thin film heterostructure simulation and design

THEORY & COMPUTATION

1D/2D/3D Physics-based solid-state and vacuum device modeling
Machine learning algorithm application
First principles atomistic calculations
3D GPU-based modeling coherent interaction of electromagnetic fields with electron beams

VACUUM ELECTRONICS & MATERIALS

Meso- to micro-scale fabrication techniques for vacuum electronic devices
Physics-based design tools for vacuum electronic devices
Microwave and millimeter-wave vacuum electronic device design, fabrication, and test
Electro- and magneto-active ceramic and polymer materials development

POWER ELECTRONICS & ADVANCED MATERIALS

HIGH POWER DEVICES

Si, SiC, GaN, Ga_2O_3 , and diamond power switching devices
Solid state devices for pulsed power
Thermal management in wide and ultrawide-bandgap devices
Doping of semiconductor materials
Reliability of power devices

WIDE & ULTRAWIDE BANDGAP MATERIALS

SiC, GaN, and Ga₂O₃ epitaxial growth research
Engineered nanocomposite materials
Surface science and atomic layer epitaxy
Characterization of defects SiC, GaN, and Ga₂O₃ bulk material
Spectroscopic evaluation of wide bandgap materials

NOVEL MATERIALS & APPLICATIONS

Graphene, transition metal dichalcogenides, and other low dimensional material growth
Ion beam processing of materials
Nanoscale fabrication, 2D layer stacking, 3D nano-lithography
Vapor and gas sensing
Optical characterization of materials

CENTER FOR BIO/MOLECULAR SCIENCE AND ENGINEERING, CODE 6900

BIOMOLINFO@NRL.NAVY.MIL

BIOLOGICALLY DERIVED STRUCTURES

Self-assembly
Molecular engineering
Synthetic structures
Nanocomposites
Tailored electronic and optical materials
Molecular imprinting
Viral scaffolds
Multifunctional materials

CHEM/BIOSENSORS

Distributed and autonomous sensing
Biosensors for underwater chemical sensing
DNA biosensors
Array-based sensors
Optical biosensors
Microfluidics and microarrays
Electrochemical sensors
Multifunctional recognition/reporter molecules

NOVEL MATERIALS

Soil/groundwater explosives detection
Single chain and single domain antibodies
Nanoparticles and quantum dots
Energetic materials
Nanoporous and mesoporous materials
Quantum dot and protein conjugates
Biomimetic materials

Multifunctional decontamination coatings
Molecularly templated nanomaterials

MOLECULAR BIOLOGY

Genomics, transcriptomics, proteomics and
metabolomics of microbes and microbial consortia
Systems and synthetic biology
Biomarker discovery
Molecular epidemiology of pathogenic
microorganisms
Antimicrobial resistance
Tissue engineering
Rational and machine-learning-based biomolecular
design
Genetic engineering of cell free systems
Next Generation Sequencing and rapid sequence analysis

ENERGY HARVESTING

Biomaterials for charge storage
Ocean floor biofuel cell
Photo-induced electron transfer
Novel photo-active polymers

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

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

PHYSICAL ACOUSTICS

Structural acoustics
Synthetic aperture sonar (SAS) signal processing
Broadband structural acoustics sonar (acoustic color
and AI for MCM, CUUV and ASW)
Target scattering modeling for multi-statics
Zero and low Doppler sonar signal processing
Buried object detection and classification
Acoustic stealth for underwater systems
Autonomy for unmanned underwater vehicles (UUV)
Acoustics transduction for broadband systems
Single crystal and textured materials for transduction
Nearfield acoustic and electromagnetic (EM) holography
Compact range scattering and radiation (CRSR)
Fiber-optic sensors
Hydrogen in graphene storage for fuel cells

Control of phonon transport in thin films
Fundamental loss mechanisms in thin films
Terahertz (THz) acoustics
Nanomechanical resonators and devices

ACOUSTIC SIGNAL PROCESSING AND SYSTEMS

Underwater acoustic communications and networking
Underwater acoustic network warfare
Long-range underwater communications
Underwater distributed sensing networks
Limits of array performance
Waveguide invariant processing
Acoustic field uncertainty
Acoustic noise forecasting
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

ACOUSTIC SIMULATION, MEASUREMENTS, AND TACTICS

Ocean acoustic propagation and scattering models
Fleet application acoustic models
High-frequency seafloor and ocean acoustic measurements
Riverine acoustics
Incorporating uncertainty in predictive models
Tactical acoustic simulations and databases
Warfare effectiveness studies and optimization

REMOTE SENSING DIVISION, CODE 7200

REMSSENSINFO@NRL.NAVY.MIL

ENVIRONMENTS

Cryosphere
Interstellar space
Ionosphere
Limnology, Riverine, Wetlands, Coastal Oceans
Magnetosphere
Marine ocean boundary layer
Middle atmosphere
Ocean surface
Sea floor

Thermosphere

Troposphere

PHENOMENOLOGY

Aerosol and cloud physics

Air-sea interface

Boundary layer hydrodynamics

Computational hydrodynamics

Environmental change

Exoplanet astronomy

Fundamental astrometry and reference frames

Fundamental astrophysics

Global ocean physics

Interstellar medium, interstellar scattering pulsars

Marine aerosol production

Marine hydrodynamics

Melt ponds

Mesoscale, fine-structure, and microstructure of ocean

Mixed layer and thermocline

Nonlinear and breaking ocean waves

Ocean surface wind vector

Precipitation

Pyro-cumulonimbus clouds

Radio Frequency Interference

Sea floor characterization

Sea ice concentration and type

Shallow benthic characterization

Snow depth

Soil moisture

Space Domain Awareness

Star formation

Stellar atmospheres, envelopes, and evolution

Stratified and rotating flows

Turbulence modeling

Turbulent jets and wakes

SENSORS AND TECHNOLOGY

Adaptive optics

Bi- and multistatic receivers

CCDs and focal plane arrays

Hyperspectral imaging systems

Lidar

Low frequency astronomy

Microwave and millimeter wave radiometers

Optical polarimetric imagers

Radio and optical interferometers

Sea-truth towed instrumentation

Synthetic Aperture Radar

Thermal IR cameras

PLATFORMS

Autonomous systems
Ground- and ship-based
Spaceborne and airborne

ALGORITHMS, ANALYSIS, AND TECHNIQUES

Compressive sensing
Data assimilation
Radiative transfer

IMAGING RESEARCH/SYSTEMS

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

OCEAN SCIENCES DIVISION, CODE 7300

NRL/STENNIS SPACE CENTER, MISSISSIPPI
OCEANINFO@NRL.NAVY.MIL

OCEAN DYNAMICS AND PREDICTION

Coupled systems
 Air-ice-ocean-wave coupling
 Ocean-acoustic coupling
 Data assimilation through coupled systems
Circulation
 Global prediction systems
 High-resolution prediction systems
 Ocean eddies
 Water mass formation and interaction
 Littoral and coastal circulation into bays and estuaries
 Tidal currents and heights
 Ocean data assimilation
 Forecasting uncertainty
 Internal waves
 Submesoscale eddies
 Frontal processes
 Convection
 Sea bottom currents and processes

Surface effects

- Surface waves globally and into bays
- Wave breaking, energy dissipation, noise generation
- Rogue waves
- Ship wakes
- Mixed layer dynamics
- Swell propagation and dynamics
- Phase averaged wave evolution
- Phase resolved wave dynamics

Ice processes

- Volume and thickness
- Iceberg drift
- Concentration and coverage
- Rheology and mechanical properties

Ocean observation processing and data assimilation

- Data assimilation of satellite and in situ observations
- Inverse estimation from observations through dynamics
- Observation system simulation experiments

Satellite

- Sea surface height
- Sea surface temperature
- Surface fluxes
- Surface waves
- Ice concentration, thickness

In Situ

- Profiling floats
- Ocean gliders
- Drifting sensors
- Moored arrays

Automated vehicle guidance

- Surface autonomous vehicles
- Underwater autonomous vehicles
- Vehicle swarm controls
- Targeted mission effects

Nearshore

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

Coupled systems

- Ocean-wave-ice coupling
- Ocean-atmosphere coupling
- Ocean-acoustic coupling
- Data assimilation through coupled systems

Acoustic effects

- Sound speed variation for acoustic propagation
- Internal waves, solitons, and bores for beam focusing
- Wave bubble entrainment and noise generation
- Surface wave generation of ambient noise

OCEAN SENSING AND PROCESSES

Dynamical processes

- Optical turbulence
- Biological sensing and modeling
- Optical thin layers
- Ocean current systems
- Fronts, eddies, and filaments
- Internal waves
- Flow over topography
- Waves, bubbles, and surface foam
- Ocean turbulence and mixing
- Air–sea interaction

Coupled systems

- Coupled bio/optical/physical processes
- Coupled physical/sediment processes

Remote sensing applications

- 3D optical profiling
- Color/hyperspectral signatures
- High resolution image analysis
- Ocean optics
- Upper layer heat content
- Sea surface salinity
- LIDAR/LASERS
- Bioluminescence and bioluminescence potential
- Intermediate trophic levels

Microbiologically influenced corrosion

- Metal–microbe interaction

SEAFLOOR SCIENCES

Geologic Process Modeling and Inversion

- Sediment transport, mass movement
- Bottom roughness evolution
- Heat and fluid flux
- Biogenic/thermogenic methane and hydrate distribution, formation, dissolution
- Diapirism, volcanism, faulting

Seabed Prediction

- Machine learning prediction of global physical properties – Seabed Characterization
- Global measured and predicted bathymetry
- Coastal and riverine hydrodynamic and morphodynamic properties

- Mine and UXO burial and mobility observations and predictions
- Sediment strength
- Acoustic modeling and inversion
 - Physics of high- and low-frequency acoustic propagation
 - High-resolution subseafloor 2D and 3D seismic imaging
- Littoral and sediment dynamics
 - Small-scale granular and fluid dynamics
 - Aeolian sediment transport observations and modeling
 - Unmanned systems integration
- Sensor development and seabed observing systems
 - Integrated acoustic/optical system for combined mapping of bathymetry/topography
- High-speed, small-scale particle image velocimetry for laboratory and field
- Instrumented mine/UXO shapes
- Unmanned and remotely operated underwater vehicles for bathymetry, and seafloor sampling
- In situ littoral morphodynamics (bottom roughness and sediment resuspension)
- Multi-property sediment core logging

CENTER FOR GEOSPATIAL SCIENCES

- High-performance data distribution
- Next generation planning, charting and navigation systems
- Convergence of human factors and machine learning
- Data compression techniques and exploitation
- Hydrographic survey and data processing techniques
- Incorporating uncertainty and human factors in decision making
- Software tools for geospatial and environmental analysis
- Tactical geospatial architectures
- Geospatial and environmental cloud computing architectures
- Geospatial and environmental data and systems integration

MARINE METEOROLOGY DIVISION, CODE 7500

NRL/MONTEREY, CALIFORNIA
METEORINFO@NRL.NAVY.MIL

ATMOSPHERIC DYNAMICS AND PREDICTION

- Global to tactical scale
- Deterministic and probabilistic numerical weather prediction

- Tangent linear and adjoint models
- Large eddy simulation
- Boundary layer processes
- Land surface processes and modeling
- Coastal processes and modeling
- Arctic processes and modeling
- Coupled ocean, atmosphere, wave, sea, ice, and land surface phenomena
- Madden Julian oscillation
- Atmospheric rivers
- Atmospheric waves and scale interactions
- Hydrology and hydrological cycle
- Tropical cyclones
- Aerosol particles
- Gravity waves
- Predictability
- Advanced numerical methods
- Subseasonal to seasonal forecasting
- High-performance computing
- Cloud computing
- Cloud processes and cloud prediction, including fog
- Moist convection

DATA ASSIMILATION

- Hybrid ensemble-variational techniques
- 3D and 4D variational analysis
- Ensemble Kalman Filter (EnKF and LETKF)
- Quality control and bias correction
- Tropical cyclone initialization
- Remotely sensed data assimilation
- Radar data assimilation
- Targeted observing strategies
- Data selection techniques
- Aerosol and trace gas assimilation
- Impact of observations on forecasts

TACTICAL ENVIRONMENTAL SUPPORT

- Rapid environmental assessment
- Atmospheric impact on weapons systems
- Data fusion
- Nowcasting
- Visualization
- Verification and validation
- Information assurance
- Expert systems
- Aviation risk assessment
- Unmanned aviation systems

ATMOSPHERIC PHYSICS

Air-sea interaction
Cloud and aerosol microphysics
Fire weather, smoke emission, and pyroCbs
Radiative transfer
Cloud and aerosol radiative properties
Aerosol analysis and prediction
Gravity wave drag
Aerosol and radiation instrumentation
Instrumentation calibration facilities

SATELLITE DATA AND IMAGERY

Automated cloud properties
Sensor calibration and validation
Nighttime environmental analysis
Tropical cyclone characterization
Dust, smoke, and aerosols monitoring
Satellite imagery analysis and enhancement
Rain rate and snow cover
Precipitation and cloud climatology
Future satellite and constellation assessment
Tactical meteorology
Training and public outreach

DECISION AIDS

Probabilistic decision aids
Refractivity and ducting
Ceiling and visibility
Fog, turbulence, and icing
Atmospheric acoustics
EM and EO propagation
Tropical cyclone forecasts
Port studies
Typhoon havens
Forecaster handbooks
Quantification of uncertainty
Counter-piracy guidance
Tropical cyclone sortie guidance
Ship wind and wave limits
Optimal ship routing and fuel savings
Directed energy applications
Environmentally-informed battle management aids
Machine learning applications
METOC services
Forensic meteorology

SPACE SCIENCE DIVISION, CODE 7600

SPASCIINFO@NRL.NAVY.MIL

Development and test facilities for satellite, sounding
rocket, and balloon instruments

Solar Coronagraph Optical Test Chamber (SCOTCH)

Sun Earth Connection Coronal and Heliospheric
Investigation (SECCHI) satellite instrument suite

Solar Orbiter Heliospheric Imager (SoloHI) satellite
instrument

Wide-field Imager (WISPR) satellite instrument

Large Angle Spectrometric Coronagraph (LASCO)
satellite instrument

Compact Coronagraph (CCOR-1, CCOR-2, CCOR-3)
satellite instruments

Very high angular Resolution Imaging Spectrometer
(VERIS) sounding rocket

EUV imaging spectrometer (EIS) satellite instrument

The Narrow Field Imager (NFI) satellite instrument

EUV High-throughput Spectroscopic Telescope (EUVST)
satellite instrument

Suborbital Instrument Assembly and Test Facility

Fermi Gamma-ray Space Telescope

Compton Spectrometer and Imager (COSI) satellite
instrument

Glowbug gamma-ray burst satellite instrument

Radiation Instrumentation (GARI, NeRDI, SIRI) satellite
instrument series

StarBurst Pioneer gamma-ray burst satellite instrument

SuperMISTI reconfigurable and adaptable stand-off
gamma ray and neutron radiation detection systems

Space borne high energy radiation detection

Neutron Characterization Laboratory

Gamma ray imaging laboratory

Pulsar discovery and characterization

Radiation processes and transport

SoftWare for Optimization of Radiation Detectors
(SWORD)

Special Sensor Ultraviolet Limb Imager (SSULI) satellite
instrument

Michelson Interferometer for Global High-resolution
Thermospheric Imaging (MIGHTI) satellite instrument

Next-Generation Ionospheric Model for Operations
(NIMO)

Whole Atmosphere-Ionosphere Predictive Modeling

ORPHEUS Cubesat experiment

Experiment for Characterizing the Lower Ionosphere &
Prediction of Sporadic-E (ECLIPSE)

Tiny Remote-sensing Instrument for Thermospheric
Oxygen and Nitrogen (TRITON)
Lasersheet Debris Sensor

NAVAL CENTER FOR SPACE TECHNOLOGY

SPACE SYSTEMS DEVELOPMENT DIVISION, 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
Application of Artificial Intelligence and Machine
Learning (AI/ML) techniques for maritime
exploitation Automation of AI workflows for training
and quality monitoring

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
Multi-INT/multi-domain data fusion
Maritime domain awareness
Near-real-time data analytics
Signal/waveform generation and collection

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-to-air laser communications
Space-to-space laser communications

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

POSITIONING, NAVIGATION, AND TIME

Advanced navigation satellite technology
Alternative Positioning, Navigation, and Timing (APNT)
Geospatial information systems
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 DIVISION, CODE 8200

SPAENGINFO@NRL.NAVY.MIL

SYSTEM INTEGRATION

Design of spacecraft mechanical components, structures, and mechanisms
Systems engineering of sea, air, and space systems from initial concept development through operations
Fabrication, assembly, integration, and testing of terrestrial and space systems

Development of space and missile mechanism systems from concept through operations
Space robotics mechanism design, integration, and testing
Launch system integration of spacecraft and payload systems
High-bay assembly, integration, and testing (AI&T) and modern machine shop facilities
Integrated thermal structures and two-phase thermal management system design
Morphing hypersonic vehicle structure, actuator, and control system design

DESIGN AND VERIFICATION

Research, development, and verification of mechanical systems for spacecraft and near space systems
Prototype spacecraft systems and experimental payloads
Detailed modeling, simulation, and testing of aerospace structural systems and precision morphing space structures
Thermal systems design, analysis, fabrication, integration, test, and flight operations
Pumped and advanced multiphase heat transfer systems and devices
Fiber-reinforced polymers and vascular composites design, analysis, fabrication, and test
Computational fluid dynamics, direct simulation Monte Carlo, and hypersonic flow simulation techniques for space systems
Vibration test lab, acoustic chamber facility, modal survey test system, loads test equipment, thermal and thermal vacuum test facilities, spin balance machine, and mass properties testing facilities for testing of spacecraft and spacecraft subsystems
Hypersonic Systems Wind Tunnel Test Facility
Space systems environmental simulation test design and operation
Space environmental simulation test facilities for component unit to large spacecraft systems: small to large scale thermal and thermal vacuum test chambers
Structural loads and mass properties test design and operation
Structural loads and mass properties test facilities for component unit to large spacecraft systems: vibration test lab, acoustic test chamber, modal survey testing, static loads test equipment, spin balance machine, and mass properties testing for testing of spacecraft and spacecraft subsystems

DYNAMICS AND CONTROL SYSTEMS

- Spacecraft orbit determination and modeling, attitude control, reaction control, robotics, and propulsion systems
- Advanced methodologies in space situational awareness, and analysis of dynamic systems and satellite mission planning analysis
- Spacecraft propulsion technologies: plasma and cathode systems, monopropellant and bipropellant systems, and hydraulic and pneumatic technologies supporting multiple platforms and applications
- Advanced robotics concepts, unmanned robotic systems, robotics systems engineering, machine learning, and autonomous servicing, inspection, and assembly operations
- Navigation, tracking, and orbit dynamics; orbital debris analysis and mitigation
- Space vacuum test facility for VLEO environmental simulation
- Digital twinning for robotic and multi-agent simulation
- Space object tracking, remote ground sensing, and in-space sensing
- Robotic manipulation and locomotion technologies to support terrestrial and undersea robotic missions
- Advanced Mission Simulation and Planning
- Zero-gravity/Frictionless and Proximity Testing Operations
- Orbital Proximity Operations Simulation
- Precision Line of Sight stabilization and control
- System Identification and Empirical Modeling of complex dynamical systems
- Neuromorphic computing and sensing, applied to robotics control and free space optical communications

ELECTRONICS AND SOFTWARE

- Space system concept definition, design, and implementation; detailed electrical and software design, development, and fabrication
- Whole of program system engineering for entirety of mission
- Advanced and unique antenna systems for space, software defined receivers and transmitters, wideband communications systems, EMI/EMC research, and small satellite solutions
- Advanced millimeter-wave technology applications for new space systems
- Advanced COTS software defined radio technology

Spacecraft demonstration missions of all sizes with RF and Microwave technology

Antenna test lab, near field scanner, RF test and Measurement Labs

Space qualified digital electronics for use in satellite computing, processing, and storage

Integrator of components, sub-systems and systems for high reliability space qualified programs

Electrical functional testing, thermal vacuum cycling, vibration and acoustic testing, and electromagnetic and radio frequency testing

Complex power, sensor, and interconnected systems enabling control, data acquisition, and processing

Space hardware design, fabrication, test, and integration

Power generation, control, storage, conversion and distribution

Design, build, and implementation of space test systems and electronic launch support equipment

Operational flight software for spacecraft command, control, data acquisition, and processing

Test software for running space test systems and verification of unit and system performance

MISSION OPERATIONS

Innovative, resilient, and secure multi-mission satellite operations solutions

Integrated multi-Mission Spacecraft Operations Center (SOC) and CONUS/OCONUS antenna network via the Blossom Point Tracking Facility (BPTF)

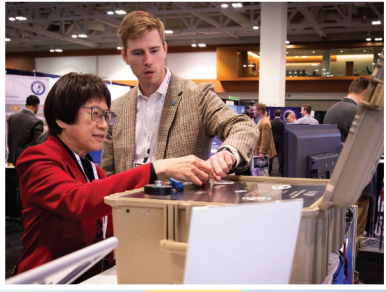
Ground Segment design and integrated architecture solutions from initial concept through on-orbit operations

Mission Management software (VMOC®) for spacecraft payload planning and operations

Network Mission Management (NMM) software for the integrated planning/operations of space and ground segments for constellations

Command and Control software (Neptune®) for automated spacecraft operations and ground resource management/operations

Transmit/Receive Enterprise (TREx) service for integration and connectivity of government and commercial RF networks.



DOING BUSINESS / CAREER OPPORTUNITIES

Doing Business with NRL

Technology Transfer Office

NRL has a long history of collaborating with a diverse array of partners in order to support its research endeavors and accelerate the transition of its technologies to the American warfighter. NRL's research efforts yield a wealth of innovative materials, devices, systems and methodologies that have tangible military and civilian applications, and NRL's technology transfer mission ensures that the outcomes of federal investments in research and development are made available to the public for their benefit.

NRL's Technology Transfer Office (TTO) is dedicated to supporting collaborative research and development projects while facilitating the commercialization of NRL technologies. NRL TTO plays a central role in enabling NRL's groundbreaking innovations to reach their full potential in the commercial marketplace and leverages a variety of technology transfer mechanisms, such as Cooperative Research and Development Agreements (CRADAs) and intellectual property (IP) licenses, to achieve this goal. Through these strategic initiatives, NRL TTO drives innovation, fosters economic growth, and provides critical support to further the capabilities and readiness of the U.S. military.

Cooperative Research and Development Agreements (CRADAs)

Cooperative Research and Development Agreements (CRADAs) serve as a mechanism for fostering collaboration between a federal laboratory and an external partner. NRL signed the Navy's first CRADA in 1989 and has entered into hundreds of cooperative research projects with industry partners, academic institutions, non-profit organizations, and state and local government agencies.

A CRADA partner can be any entity that is willing to collaborate with a federal laboratory on mutually beneficial research and development activities. The objective of a Navy CRADA is to conduct cooperative research that will enhance the R&D missions of NRL and benefit the Collaborator by enabling the parties to leverage each other's strengths and capabilities. The CRADA is a flexible framework for collaboration and defines the individual responsibilities of the Navy and Collaborator in the joint research endeavor.

CRADAs also offer an avenue for transferring federally-funded technologies to the Collaborator and defines the rights to intellectual property developed under the CRADA. Under a CRADA, NRL and the Collaborator may contribute personnel, facilities, and equipment to the cooperative research project. Additionally, the CRADA Collaborator may contribute funds to the laboratory to support NRL's participation in the project. NRL may not send funding to the Collaborator under a CRADA.

Information on the NRL CRADA process can be found on the Technology Transfer website.

Licensing of Navy Inventions and Software

Federal technology transfer licenses play a vital role in harnessing the full potential of government-funded research and innovation. By licensing its technologies to the private sector, NRL translates its discoveries into tangible benefits for society and the U.S. military. NRL has over 1300 active patents and patent applications that are available for licensing across a wide range of technical disciplines, such as advanced materials, optics, electronics, and satellite technology. NRL also maintains a large portfolio of licensable software.

In order to begin the process of acquiring a license to a NRL technology, all potential licensees should submit a signed license application, including a detailed commercialization plan, to the NRL Technology Transfer Office (TTO). NRL patent and software licenses are tailored to incentivize licensees to invest in commercialization efforts while also ensuring that NRL receives fair compensation for its licensed intellectual property (IP) rights. Licenses have different levels of exclusivity, fields of use, and financial terms that are negotiated on a case-by-case basis. Additionally, NRL offers low-cost commercial evaluation licenses for companies looking to assess the market opportunity for a given NRL technology and royalty-free Government Purpose Licenses (GPLs) that enable companies to access and use NRL technology in their performance on a government contract or agreement.

Royalties generated from NRL licenses play a crucial role in supporting further research and development initiatives of the lab. In recognition of their contributions, a share of the licensing royalties is distributed to the inventors and researchers who contributed to the development of the licensed technology. Royalties are also reinvested into ongoing research and development

initiatives that foster continuous innovation and facilitate technology commercialization.

Information regarding licensing of NRL technologies can be found on the Technology Transfer website.

E-MAIL: NRLTECHTRAN@US.NAVY.MIL

URL: [HTTP://WWW.NRL.NAVY.MIL/TECHTRANSFER](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.

For questions regarding work for nonfederal parties, contact Code1008_1@nrl.navy.mil.

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.

For questions regarding Letters of Intent, contact Code1008_1@nrl.navy.mil.

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.

For questions regarding establishing MOUs and MOAs with NRL, contact Code1008_1@nrl.navy.mil.

Funding External Activities

NRL is the Navy's corporate laboratory, conducting basic, applied, and advanced 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.

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 its business opportunities.

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 North American Industry Classification System (NAICS) Code is 541712 — Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology).

The selection of proposals for contract award are based on a scientific peer review of proposals submitted in response to each BAA. The major purpose of the evaluation is to determine the relative merit of the technical

approach of each proposal. Business and contractual aspects, including cost realism, are also 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, can be obtained via the NRL website at <https://www.nrl.navy.mil/Doing-Business/Contracts/Broad-Agency-Announcements/>.

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 via Federal Business Opportunities (FedBizOpps) website under the Department of the Navy (USN) Office of Naval Research (ONR). ONR is NRL's parent organization. A link to FedBizOpps is available on the NRL Contracting Division website.

More information on "Doing Business" with the Naval Research Laboratory is available at <http://www.nrl.navy.mil/doing-business/contracting-division>.

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. More information about grants may be obtained by submitting a message to the "Contracts Help" category via the "Contact Us" sidebar at <https://www.nrl.navy.mil/doing-business/contracting-division>.

Career Opportunities at NRL

[HTTPS://WWW.NRL.NAVY.MIL/CAREERS/](https://www.nrl.navy.mil/careers/)

The U.S. Naval Research Laboratory is always looking to recruit talented individuals in many fields of science. Programs for PostDocs, faculty, and students, and direct hire authorities for civilian positions are announced at <https://www.nrl.navy.mil/careers/>.

Research Associateships

Every year, NRL hosts several postdoctoral research associateship programs through the National Academies of Sciences, Engineering and Medicine (NRC) and the American Society for Engineering Education (ASEE). These competitive positions provide postdoctoral scientists and engineers an opportunity to pursue research at NRL in collaboration with NRL scientists and engineers. Research associates are guest investigators, not employees of the U.S. 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.nationalacademies.org/our-work/rap/nrc-research-associateship-programs>. Contact NRL's program coordinator at nrc@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. Associateship 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 five 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 <https://nrl.asee.org/>. Contact NRL's program coordinator at asee@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@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@nrl.navy.mil.

Student Programs

The **NAVAL RESEARCH ENTERPRISE INTERNSHIP PROGRAM (NREIP)** offers summer appointments at Navy laboratories to current undergraduate and graduate students from accredited U.S. colleges and universities. Application is online at <https://navalsteminterns.us/nreip/> through Saxman One. 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 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 ndseg@nrl.navy.mil.

The **SCIENCE, MATHEMATICS, AND RESEARCH FOR TRANSFORMATION (SMART) SCHOLARSHIP-FOR-SERVICE PROGRAM**, funded by the Department of Defense (DoD), is a combined educational and workforce development opportunity for STEM students. SMART offers scholarships for undergraduate, master's, and doctoral students pursuing a STEM degree. Scholarship recipients receive full tuition, annual stipends, internships, and guaranteed employment with the DoD after

graduation. Applications are open annually from August 1st through December 1st. For more information, visit <https://www.smartscholarship.org/smart>.

The **SCIENTIFIC, TECHNICAL, ENGINEERING AND MATHEMATICS (STEM) STUDENT EMPLOYMENT PROGRAM (SSEP)** is a direct hire authority for undergraduate- and graduate-degree seeking students enrolled in STEM majors. Students can work full-time or part-time and those on appointments scheduled to last longer than 90 days will earn annual and sick leave each pay period.

To be eligible for the program, students must be continuously enrolled in a STEM degree program on at least a half-time basis at a qualifying education institution. Students hired into the NP career track (Science & Engineering Professional) must maintain a 3.0 GPA (based on a 4.0 scale) in a related degree field. Students hired into positions in the NR career track (Science & Engineering Technical) must maintain a 2.5 GPA (based on 4.0 scale). Conversion to permanent, although not guaranteed, may be available upon degree program completion. U.S. Citizenship is required for all entry-level positions. For more information and to apply visit: www.nrl.navy.mil/careers/students/ssep or contact the Human Resources Office at ssep@nrl.navy.mil.

The **PATHWAYS INTERN PROGRAM** is available to students enrolled in a wide variety of educational institutions from high school to graduate level. Pathways applicants apply to vacancy announcements and are selected from certificates. Interns work full-time or part-time and those on appointments scheduled to last longer than 90 days will earn annual and sick leave each pay period.

To be eligible for the program, students must be continuously enrolled in high school or in a college degree program on at least a half-time basis at a qualifying education institution. Students hired into positions in the NR career track (Science & Engineering Technical) must maintain a 2.5 GPA (based on 4.0 scale). Conversions to permanent, although not guaranteed, may be available when students complete at least 640-hours before completing the degree program requirements. U.S. Citizenship is required for all entry-level positions.

Pathways internship openings are announced quarterly on the USAJOBS website. Students **MUST** apply to USAJOBS vacancy announcements in order to be considered for a Pathways intern position. Visit our website for more information on how to apply and vacancy announcement dates. For more information, contact NRL's Human Resources Office at intern@nrl.navy.mil.

The **WORKFORCE RECRUITMENT PROGRAM (WRP)** is a recruitment and referral program that connects federal and private-sector employers nationwide with highly motivated college students and recent graduates with disabilities who are eager to demonstrate their abilities in the workplace through summer or permanent jobs. Candidates apply to the WRP each fall through participating campuses managed by a School Coordinator and can receive elective informational interviews with federal employees who serve as volunteer recruiters. Candidates represent all majors, and range from college freshmen to graduate- and law-school students. Information from candidates is compiled in a searchable database that is available through the WRP website to employers. Candidates must be U.S. citizens who are eligible for the federal Schedule A Hiring Authority.

Students and recent graduates with disabilities apply through WRP-participating schools. Find out from your school's disability services or career services coordinator whether your college is participating in the WRP. If it is not, share this website, <https://www.wrp.gov/wrp> and information about the program and ask them to contact the WRP Program Managers at wrp@dol.gov. WRP is an annual program. Schools can register from April-June, and student and recent graduate candidate applications open in late August.

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, visit <https://www.nrl.navy.mil/Careers/Students/Volunteers/>.

The **DoD 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 evaluated for acceptance are science and mathematics courses completed and grades achieved; scientific motivation, curiosity, and the capacity for sustained hard work; a desire for a technical career; teacher recommendations; and exceptional grade point averages (GPA). The NRL program is one of the largest in DoD. For detailed information visit <https://>

navalsteminterns.us/seap/index.html or contact NRL's program coordinator at seap@nrl.navy.mil.

The **SUMMER RESEARCH PROGRAM FOR HISTORICALLY BLACK COLLEGE OR UNIVERSITY (HBCU) OR MINORITY INSTITUTION (MI) STUDENTS** is a ten-week summer internship program that provides opportunities for undergraduate and graduate students to participate in state-of-the-art research under the guidance of a mentor at NRL. Students are provided an opportunity to participate and engage in professional development workshops and attend scientific seminars. Preference is given to students planning careers in science, technology, engineering, and mathematics (STEM) disciplines. Applicants must be U.S. citizens or have permanent residency and be enrolled at an HBCU, MI, or Tribal College or University. Students must also have a minimum GPA of 3.0. Participating students receive a stipend, housing and travel subsidy. Online applications can be found at <https://nrl.e.twc.edu/>. On-line applications managed by The Washington Center for Internships and Academic Seminars (TWCAS). More information is available at the NRL Website <https://www.nrl.navy.mil/Careers/Students/HBCU-MI-Research-Internship-Program/> and TWCAS website <https://twc.edu/programs/departments-of-navy-internship-program>.

The **DEPARTMENT OF NAVY'S (DON) HBCU/MI POST-DOCTORAL (PD) RESEARCH PROGRAM** provides a unique opportunity for recent graduates to pursue challenging research problems through a two-year funded program focused on discovery and the advancement of science and technology for applications relevant to the Department of Defense (DoD), DoN and the NRL. Select PD candidates will engage with world-renowned scientist and engineers in Washington, D.C., to support discovery and innovation for naval defense applications. This two-year appointment provides an annual stipend, health benefits, travel and relocation costs. The Post-Doctoral program tailors specific research projects with the intent on enhancing the candidate's skill-set for careers in S&T with the potential for significant impacts in the scientific and global community. More information can be found at <https://www.nrl.navy.mil/Careers/Students/HBCU-MI-Post-Doctoral-Research-Program/>.

Civilian Employment and Direct Hire Authorities – Scientific and Engineering Opportunities with Advanced Degrees, Bachelor’s Degrees, and Veterans

For direct hire opportunities for Science and Engineering (S&E) professionals with advanced degrees, bachelor’s degrees, and veterans, applications are accepted on a continuous basis. Applicants must submit resume and transcripts. Candidates must meet minimum qualification standards as described in the Office of Personnel Management’s (OPM) operating manual, “Qualification Standards for General Schedule Positions.” Qualified candidates may be appointed to S&E positions in fields such as aerospace, ceramics, chemical, computer, electronics/electrical, materials and mechanical engineering, astronomy, biology, chemistry, computer science, engineering psychology, geology, geophysics, materials science, mathematics, metallurgy, meteorology, physical science, physics, and oceanography.

Qualified veteran candidates may be appointed to positions in the fields mentioned above, OR to any technician position that is in direct support of research and development, i.e., engineering technician, electronics technician, physical science technician, etc. Veteran candidates appointed to a technician position must meet minimum qualification requirements as described in OPM’s operating manual, operating manual, “Qualification Standards for General Schedule Positions” and meet any possible selective placement factor identified for the position to be filled. For more information, visit <https://www.nrl.navy.mil/careers/opportunities/>.

Equal Employment Opportunity at NRL

Equal Employment Opportunity (EEO) is a fundamental NRL policy for all employees and applicants regardless of race, color, religion, national origin, sex (including pregnancy, gender identity and sexual orientation), age (40 years and over), disability (mental and physical), genetic information and reprisal (for participating in EEO activity).

NRL is committed to an inclusive workplace that celebrates diversity. Our Nation comprises a broad spectrum of people with a diversity of backgrounds, ideas, and points of view. NRL strives to ensure the composition of our workforce reflects that of our Nation. We encourage and support all of our employees regardless of gender, race,

ethnicity, national origin, age, disability, sexual orientation, education, or work experiences. We are committed to equal opportunity for employment, advancement, and recognition throughout all of our divisions, programs, and worksites.

CAREERS AT NRL

- Aerospace Engineer
- Astrophysicist
- Biologist
- Chemical Engineer
- Chemist
- Civil Engineer
- Computer Engineer
- Computer Scientist
- Electrical Engineer
- Electronics Engineer
- Engineering Psychologist
- Environmental Engineer
- Geologist
- Geophysicist
- Materials Engineer
- Mathematician
- Mechanical Engineer
- Metallurgist
- Meteorologist
- Oceanographer
- Physical Scientist
- Physicist

You may use the Division email addresses in this guide to submit a resumé, or visit <https://www.nrl.navy.mil/careers/> for a list of current vacancies and for information on other avenues for submitting a resume for direct hire.

The U.S. Naval Research Laboratory has major facilities on the banks of the Potomac River in southeast Washington, D.C., at the Stennis Space Center, in Mississippi, in Key West, Florida, and in Monterey, California. NRL was dedicated on July 2, 1923, and is the Navy and the Marine Corps' corporate laboratory charged with the mission of conducting basic and applied research in a broad, multidisciplinary program to advance science and technological development for the National Defense Strategy. For more information, visit the NRL website or join the conversation on Twitter, Facebook, LinkedIn, Instagram, and YouTube.



WASHINGTON, DC



MONTEREY, CA



STENNIS SPACE CENTER, MS



We provide the advanced scientific capabilities required to bolster our country's position of global naval leadership. Here, in an environment where the nation's best scientists and engineers are inspired to pursue their passion, everyone is focused on research that yields immediate and long-range applications in the defense of the United States.

**We are advancing
further than you can imagine.®**

At the U.S. Naval Research Laboratory, we don't wait for tomorrow, we create it. Our spirit for discovery and application guides us as we support naval leadership, further research, and help our people build extraordinary careers.

Find out more at:

www.nrl.navy.mil