MISSION

Provide innovative, human-centric research solutions aligned with the Submarine Force’s strategic direction, to sustain superiority in the undersea domain.

VISION

To be the Department of Defense Center of Excellence for Undersea Biomedical Research.
The Naval Submarine Medical Research Laboratory (NSMRL) delivers research solutions to promote the health, welfare, and performance of undersea warfighters. NSMRL’s focus is to ensure the readiness and lethality of submariners and divers operating aboard the most medically challenging platform in the U.S. Navy, the submarine, as well as in one of the most challenging operational environments, the undersea battle space.

Conveniently located at the Submarine Base New London, Groton, CT, NSMRL researchers have local access to two submarine squadrons, the Navy Submarine School, the Naval Submarine Support Facility, the Naval Undersea Medical Institute, the Undersea Warfighting Development Center, and the U.S. submarine builder, General Dynamics Electric Boat. The laboratory is staffed by a diverse group of psychologists, audiologists, physicians, physiologists, and engineers. NSMRL’s mission essential assets include an on site military dive locker, the Genesis hypo/hyperbaric chamber, and a large anechoic chamber.

Areas of research include: health and performance, bioeffects of underwater sound and blast, submariner psychological fitness, human systems integration, diving and hyperbaric research, safety of the submarine atmosphere, epidemiology, and hearing conservation.
https://www.med.navy.mil/sites/nmrc/NSMRL/Pages/Home.aspx

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Public Affairs
Maria Pinto
(860) 694-2442
maria.d.pinto.civ@mail.mil

Technical Director
Ben Lawson, PhD
(860) 694-2514
benton.d.lawson.civ@mail.mil

Scientific Director
David M. Fothergill, PhD
(860) 694-2536
david.m.fothergill.civ@mail.mil

Naval Submarine Medical Research Laboratory
Naval Submarine Base New London, Box 900
Groton, CT 06349-5900
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NSMRL engages in strategic partnerships and collaborations with multiple military, public, and private institutions. The distinct strengths of these partners, combined with NSMRL’s unique capabilities, enhances the Navy’s ability to advance the health, performance, and readiness of its undersea warfighters.

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LEADERSHIP
RADM Timothy Weber is a native of Holland, Michigan. He earned a Bachelor of Business degree from the University of Notre Dame, Notre Dame, Indiana, and a Master of Science degree from the Naval Postgraduate School. He received his commission as an ensign in 1989.

Operationally, RADM Weber completed a one-year assignment in 2010 to the NATO Training Mission-Afghanistan / Combined Security Transition Command as Chief, Afghan National Police (ANP) Medical Advising Team/Advisor to the ANP Surgeon General. He has also served in senior staff positions as director of manpower resources, Medical Resources, Plans and Policy (OPNAV N931); legislative liaison, Secretary of the Navy’s Office of Legislative Affairs; various healthcare resourcing roles at the U.S. Navy Bureau of Medicine and Surgery; and chief of staff, TRICARE Management Activity, Office of the Assistant Secretary of Defense for Health Affairs.

Additionally, he has served as the director for administration, Naval Hospital Camp Lejeune, North Carolina and as executive officer, U.S. Naval Hospital Yokosuka, Japan. In 2015, Weber assumed command of U.S. Naval Hospital Okinawa, Japan. RADM Weber’s most recent assignment was at Navy Medicine West where he reported as chief of staff in 2017.

RADM Weber assumed duties as commander, Navy Medicine West (NMW), Aug. 16, 2019. In this capacity, he directed Navy Medicine’s health care system in the Pacific providing medical care to more than 850,000 beneficiaries and he oversaw Navy Medicine’s research and development activities worldwide. On Dec. 17, 2019, RADM Weber became commander, Naval Medical Forces Pacific, as NMW was renamed to reflect the command’s new readiness-focused mission. In this role, RADM Weber has oversight of 11 Navy Medicine Readiness and Training Commands on the West Coast and Pacific Rim that train, man, and equip medical forces, primarily in military treatment facilities, as well as Navy Medicine’s eight research labs. He currently is the 19th Director of the Medical Service Corps.
CAPT Adam Armstrong is a native of Birmingham, Michigan and raised in Clearwater, Florida. He graduated from Emory University with a BS in Biology in 1985. He was subsequently awarded his MS in Public Health from the University of South Florida in 1988, where he worked as a data analyst for the College of Public Health until 1992.

While attending Des Moines University’s medical school, CAPT Armstrong enlisted in the Navy after receiving a scholarship through the Health Professional Scholarship Program in exchange for service as a commissioned medical officer. Following his graduation in 1996, he was promoted to lieutenant in the Navy Medical Corps.

His first duty assignment was as an intern and then resident in Naval Medical Center Portsmouth’s (NMCP) Internal Medicine residency program where he served until 1999. Upon completion, he began Infectious Disease Fellowship Training at Walter Reed Army Medical Center (WRAMC) and National Naval Medical Center (NNMC) in Washington, D.C. In 2001 he returned to NMCP as a staff physician in the Infectious Diseases Department, and in 2004 became the department head, while also serving as Associate Program Director for Internal Medicine. He relocated to Cairo, Egypt in 2005 as head of Naval Medical Research Unit Three’s Clinical Trials and Military Studies Program and as Tropical Medicine Course Coordinator.

He returned stateside in 2008 and was promoted to head the Navy Central HIV Program at the NNMC in Bethesda, Maryland. In 2010 he received orders to deploy to Afghanistan as the senior medical officer of a provincial reconstruction team under the International Security Assistance Force. While in-country, he helped to develop health infrastructure.

He returned from Afghanistan in 2011, and soon after he became the first Officer in Charge of the newly created Navy Bloodborne Infection Management Center. In 2013 He was selected for Senior Executive Medicine and chosen as Naval Medical Research Unit Six in Lima, Peru’s Executive Officer, and became Commanding Officer of the unit in 2015.

After his successful tour in Peru, he became the first Commander to helm the Naval Medical Research Center (NMRC), Silver Spring, Maryland in 2017. Under his leadership, NMRC oversaw even subordinate labs (three are outside the U.S.). His goal is for the NMRC enterprise to continue delivering high-value, high-impact research products to support and protect today’s deployed warfighters, and support NMRC researchers who look to the readiness and well-being of future forces.
Captain Katharine (Katie) Shobe, a native of Naperville, IL, received a Bachelor of Science in psychology from the University of Illinois at Urbana-Champaign in 1993, and a Ph.D. in cognitive psychology from Yale University in 1999. In the fall of 2000 she was commissioned and attended Officer Indoctrination School in Newport, RI.

CAPT Shobe’s first assignment as a research psychologist was at the Naval Submarine Medical Research Laboratory (NSMRL) in Groton, CT as the Deputy Director of the Human Performance Department.

In November 2004 she transferred to the Human Performance Center Detachment, Submarine Learning Center in Groton, and her follow-on tour was at the Space and Naval Warfare Systems Center Pacific in San Diego as the Military Group Head for the Navigation and Applied Sciences Department.

In August 2009 CAPT Shobe was assigned as the Head of the Behavioral Sciences and Epidemiology Department at the Naval Health Research Center (NHRC) in San Diego, supporting military personnel readiness through studies in areas of stress, mental health, and suicide. CAPT Shobe deployed to Afghanistan from May 2010 until January 2011, serving as the Operations Officer for the NAVCENT Mobile Care Team. The team conducted mental health surveillance of Navy personnel and provided unit consultation on Sailors’ psychological well-being. Upon redeployment she returned to the NHRC.

CAPT Shobe reported to the Office of Naval Research in Arlington, VA in October 2012, serving in multiple roles, including Deputy Director of the Warfighter Protection and Applications Division of Warfighter Performance and Deputy Director of the Research Protections Division.

In August 2015, CAPT Shobe transferred to the Department of the Navy’s Sexual Assault Prevention and Response Office as the Director of Research, where she also served as the Acting Chief of Staff for five months. CAPT Shobe recently completed a tour as Executive Officer at the Naval Health Research Center from June 2018 until June 2020.

CAPT Shobe served as the Specialty Leader of the Research Psychology community, Vice President for the Sea Services Leadership Association, and completed an M.A. in National Security and Strategic Studies from the Naval War College and received Joint Professional Military Education Level 1 certification. She is a member of the Defense Acquisition Corps and is acquisition certified Level 3 in both Program Management and Systems Planning, Research, Development and Engineering – Science and Technology Management.
CAPT Brian Feldman was born at the Naval Medical Center in San Diego, California the son of a Naval Flight Officer. A graduate of Duke University with a dual degree in biomedical and electrical & computer engineering in 1997, he was accepted to the Health Professions Scholarship Program and graduated from Eastern Virginia Medical School in Norfolk, Virginia in 2001.

CAPT Feldman is a Fellow of the American Academy of Pediatrics, is board certified in General Pediatrics and Pediatric Hematology-Oncology, and holds an Associate Professorship of Pediatrics at the Uniformed Services University of the Health Sciences and at Eastern Virginia Medical School. He completed his residency at the Naval Medical Center and served as staff Pediatrician at the Halyburton Naval Hospital at Marine Corps Air Station, Cherry Point. He completed a two-year cancer prevention fellowship in the Pediatric Hematology-Oncology Department at the University of North Carolina at Chapel Hill, where he also earned a Master of Public Health in Epidemiology with research on the associations between perinatal vitamins and cancer.

CAPT Feldman has held numerous leadership roles at the Naval Medical Center in Portsmouth, Virginia, including the Inpatient Medical Director of Pediatric Specialty Services, Associate Director of Medical Services, and Chairman of the Pediatric Department. He established the first clinical directorate of the Tidewater Multi-Service Market Pediatric Service Line, expanding inpatient services and patient recapture throughout the tidewater region. He remains active in the community as a two-time President of the Tidewater Pediatric Society and champion of community partnerships in resiliency and care collaboration. He has lead the Uniformed Services Oncology Consortium through over 50 research protocols for children and active duty patients with cancer to ensure that military dependents received cutting-edge therapy. He is currently the government sponsor for outcomes research and advisor to the Navy Marine Corps Public Health Center on Cancer Epidemiology and community risk communication.

CAPT Feldman has deployed with the USNS COMFORT (T-AH 20) as the Pediatric Department Head, in the 5th fleet as the Officer-in-Charge of Fleet Surgical Teams FOUR and EIGHT, and Task Force Surgeon for the IWO JIMA (LHD-7) Amphibious Ready Group. CAPT Feldman assumed duties as Executive Officer of the Naval Submarine Medical Research Laboratory in July 2019.
Senior Chief Earl Wagner assumed duties as Senior Enlisted Leader, Naval Submarine Medical Research Laboratory on 25 March 2019. His previous assignment was the Senior Instructor at the Naval Undersea Medical Institute. Prior assignments include Medical Department tours on the USS MISSISSIPPI (SSN-782), Pearl Harbor, Hawaii, and USS PITTSBURGH (SSN-720), Groton Connecticut. Senior Chief Wagner’s previous assignments also include Naval Hospital Great Lakes, 2nd Battalion 5th Marines, Fleet Hospital 22, Naval Mobile Construction Battalion 7, and the Naval Submarine Support Center.

Senior Chief Wagner enlisted in the Navy in 1993. He is a distinguished graduate the Coast Guard Senior Enlisted Leadership Course class 67. He has also completed his Bachelors of Science from Trident University and is designated a Master Training Specialist.
Ben Lawson, PhD
TECHNICAL DIRECTOR

• Orientation
• Motion Maladaptation
• Cognition
• Human Factors

Ben Lawson has 27 years of experience in Navy and Army laboratories. He is an expert on spatial orientation, especially vestibular-tactile psychophysics, illusions of self-motion, motion/simulator sickness, and motion-induced drowsiness. He also has published on psychomotor coordination, situation awareness, auditory perception, cognitive performance, mishap analysis, human factors, pharmacological countermeasures, survey scales, teamwork, and technology transition. In addition to his research, he has transitioned materiel products and military standards. Dr. Lawson has served on military executive steering boards, program review panels, and international committees. He has chaired a multi-lab research portfolio, an IRB, and an SRB. He has served as an Adjunct Professor of Psychology, Human Factors, and Military Medicine, and on editorial and advisory boards for books, symposia, and journals. Dr. Lawson’s honors include the Navy’s Meritorious Civilian Service medal and the Army’s Superior Civilian Service medal.

David Fothergill, PhD
SCIENTIFIC DIRECTOR

• Diving & hyperbaric physiology
• Human physiology in extreme environments
• Submarine escape, rescue, & survivability
• Atmosphere contaminant monitoring

David Fothergill is the Scientific Director and former Submarine Medicine and Survival Systems Department Head at NSMRL. He is a qualified U.S. Navy trained diver and has, for the past 28 years, conducted research to support undersea warfighter health, readiness, and performance at the Naval Medical Research Institute and NSMRL. Dr. Fothergill served as Senior Research Scientist at the Center for Research and Education in Special Environments, State University of New York at Buffalo. His research interests and scientific publications cover a wide range of topics including: inert gas narcosis, CO2 toxicity, pulmonary O2 toxicity, nitric oxide physiology in extreme environments, underwater breathing apparatus design and evaluation, bioeffects of underwater sound, submarine escape and rescue, biomechanics of human strength, human thermal physiology, and environmental exposure monitoring.
RESEARCH PROGRAMS AND CAPABILITIES
The submarine is one of the most physically and mentally challenging platforms in the U.S. Navy, where submariners work, sleep, eat, and play in the same environment for extended periods. Lack of natural sunlight, disrupted circadian rhythms, challenging watch schedules, limited access to physical exercise, and reduced availability of fresh produce are some of the factors that may affect submariner health and performance during long deployments. NSMRL has initiated multiple efforts to understand how the undersea environment affects Sailor health and performance. These efforts include: the creation of the Unobtrusive Performance Measures Lab to measure human performance in real-time and under various conditions without the interference of intrusive technology, development of a team task simulation bridge to assess real-time team dynamics during virtually created bridge operations, and implementation of studies on the effects of the submarine environment and lifestyle on submariner performance and physiology.

Research Activities

- Understanding microbiome changes in submariners after prolonged submarine deployment and evaluation of those changes in relation to alterations in crew health and performance
- Evaluation of how underwater exercise affects cognitive function
- Evaluation of commercial off-the-shelf technologies to test the impact of diving on vestibular reflex function and monitor and predict effects on performance
- Evaluation of personal light treatment devices as a countermeasure for fatigue and circadian misalignment in a submarine environment
- Assessment of submariners’ sleep needs during a straight-8s, 24-hour watchbill
- Development of objective and unobtrusive measures of warfighter performance (eye-tracking, galvanic skin response, heart rate variability, electroencephalography) to provide real-time indications of Sailors’ degraded performance
- Characterization of caffeine use on submarines
Submarine atmospheric monitoring research at NSMRL is composed of both the Submarine Atmosphere Health Assessment Program (SAHAP) Program of Record, which provides ongoing atmospheric monitoring support, and independent research on developing new monitoring technologies. During underway periods, submariners are in a closed environment, requiring close monitoring of the atmosphere to ensure that it does not pose a hazard to the crew. While automated systems continuously measure levels of the most critical gases, including O2 and CO2, other possible contaminants, such as oil particulates or organic compounds produced by machinery, must also be monitored on a long-term basis.

As one of the Navy’s primary resources to ensure the safety of the submarine atmosphere, SAHAP provides long-term, passive monitoring for defined atmospheric compounds of concern while underway. The program also provides guidance on the effects of evolving technology that could affect the submarine environment, such as the emittance of nano-particles from 3D printers. Additional NSMRL research related to the atmosphere monitoring is focused on exploring the use of personally worn passive dosimeters to determine individual exposures to environmental contaminates in the submarine atmosphere while underway.

Research Activities

- Management of ongoing monitoring of submarine atmospheric constituents
- Provision of expertise in sampling enclosed spaces for long periods of time
- Development of wearable submarine atmosphere contaminant monitors
- Evaluation of Commercial off the Shelf instruments to develop hand-held, real-time monitoring of contaminants expected during a disabled submarine (DISSUB) event
- Development of Passive Personalized Atmospheric Monitors
Divers are among the most highly trained, highly skilled Navy Sailors, and are critical for the protection, safety, and success of our submarine and surface fleets. While the divers work to protect us, NSMRL’s underwater bioeffects team works to protect them. The team conducts human effects research and provides guidance to the fleet on how underwater sound and blast from sources such as sonar, tools and equipment, and impulse sound affect human divers. Their work on underwater sound detection and localization and hearing in hyperbaric conditions has led to advancements in our understanding of the underwater hearing abilities of humans, with NSMRL researchers being the first to document that humans can detect underwater sounds as high as 190 kHz. NSMRL translates research findings into evidence-based guidance for diver exposure to underwater sound and blast. Research focuses include: physiological mechanisms for underwater sound perception, diver protection from underwater sound and blast, the use and effectiveness of underwater sound in nonlethal diver deterrence systems, creation of physical and computational models of physiological response to underwater sound, and development of tools and guidance for underwater hearing conservation.
Research Activities

- Provision of updated and expanded tables for underwater explosive safe standoff distances in the EOD 60-series publication, used across the U.S. and allied international armed forces

- Development of an interactive software application to provide recommendations for human exposure limits to underwater noise

- Development of methodology to standardize the measurement of underwater acoustic signals emitted by new technologies

- Measurement of sound transmission properties of the KM-37 diving helmet to allow evaluation of noise exposure to helmeted working divers

- Development of surrogate models for studying the effects of underwater blasts, including an artificial human torso

- Development of an ingestible pill to measure internal response to blast exposure
Submariners face significant stressors that are unique among the military community. The confined space and isolation of the submarine can be mentally and emotionally challenging, and yet mission success depends on optimal psychological readiness of Sailors. NSMRL’s psychological screening and fitness program is dedicated to improving the psychological suitability of prospective submariners, predicting and reducing the number of unplanned losses (unexpected separation from service) from operational units, and exploring and enhancing individual and team resilience.

NSMRL has an ongoing effort to maintain, administer, and score the psychological screening assessment for prospective submariners. This assessment process, known as SUBSCREEN, seeks to identify Sailors with psychological and/or motivational factors incompatible with submarine duty.

NSMRL is also conducting studies to define the ideal psychological profile for successful service in submarines and other nuclear-powered Navy platforms and strives to support the psychological fitness of submariners by providing mental health support tools for use while underway.

Research Activities

- Modernization of SUBSCREEN by developing and testing an updated submariner psychological screening tool
- Evaluation of psychological factors that can predict the success of officers and enlisted service members enrolled at the Naval Nuclear Power Training Command (NNPTC)
- Identification of predictors of psychological resilience and development of a predictive model of psychological resilience indicators in submariners
- Objective assessments of anxiety-related risks and vulnerabilities in submariners
- Development of VirGIL (Virtual Reality Guide In Life): a psychology self-help software program that provides confidential cognitive behavior therapy content to deployed submariners
With the emergence of new submarine technologies, Sailors are increasingly required to process complex information, make advanced decisions, and operate complicated equipment. Human Systems Integration (HSI) is a process NSMRL researchers use to provide tools to present information in an accessible manner, assist in decision making, and facilitate usability of hardware and software technologies. HSI combines our knowledge of human capabilities and limitations with systems development to make them more effective, efficient, and safe. By combining theory with an iterative feedback process with the line community, NSMRL applies an HSI approach to develop and improve submarine systems, enhance submariner performance, and increase readiness. The program also seeks to predict and mitigate degradation in performance through non-invasive monitoring of a variety of novel physiological measures.

**Research Activities**

- Prediction of degradation in performance with cognitive and machine learning models based on monitoring changes in physiological measures such as face and eye tracking, heart rate, and skin conduction
- Development of a computational model that mimics how humans process audio and visual cues
- Support of the creation of a software tool that provides individualized fatigue-based schedule management of submariners for optimized watchstanding schedules
- Development of a software training and knowledge transfer platform that, based on individualized learning styles, can be used to design custom performance support that optimizes (or enhances) learning for complex submarine-based tasks
- Establishment of a submarine command and control simulation lab to evaluate team performance and identify individual tasks that are most susceptible to fatigue
- Evaluation of the effectiveness of transcranial direct current stimulation on reducing the effects of time-on-task fatigue
- Tracking cognitive performance decrements in cold environments
SMRL’s diving and hyperbaric research program focuses on evidence based solutions that promote the health and enhance the performance of the undersea warfighter. At the centerpiece of NSMRL’s diving and hyperbaric research program is the one-of-a-kind Genesis Hypo/Hyperbaric chamber complex. NSMRL’s diving mission is supported by a full Navy dive locker with SCUBA and Surface Supply capabilities, an indoor immersion test pool, and a command dive boat for open water diving operations. NSMRL’s diving research program has advanced the field’s understanding of saturation diving, nitrogen narcosis, CO2 toxicity, pulmonary O2 toxicity, decompression stress, NO physiology under ambient pressure extremes, temperature regulation, and disabled submarine escape and survival. In addition, it has provided knowledge about the environmental stress diving can have on warfighter health, cognition, and performance. A complete renovation of the chamber was initiated in 2019, with expected completion in 2021. As a result of the overhaul, NSMRL will have a fully-functional, state-of-the-art chamber facility to advance diving and hyper/hypobaric medicine research.

Research Activities

- Evaluation of the sensitivity and reliability of exhaled NO as a non-invasive biomarker of pulmonary hyperoxic stress and pulmonary O2 toxicity

- Investigation of undersea warfighter relevant oxygen toxicity (genetic changes): identification of genetic markers and metabolic pathways that are altered by exposure to hyperbaric oxygen
In the rare event that a submarine becomes disabled and is unable to return to the surface (DISSUB), the crew must decide whether to remain onboard and await rescue or escape from the vessel. This decision rests on a complex set of factors including condition of the crew, the status of the submarine atmosphere, depth, and proximity of rescue assets. NSMRL maintains military and civilian expertise in submarine survival, escape, and rescue to provide NAVSEA 00C and SUBFOR fleet advice in case of a DISSUB incident. Areas of research focus include: DISSUB survival (e.g. survival times and survival equipment evaluation), DISSUB escape (e.g. saturation decompression drop out modeling, escape suit testing, medical hazards of escape), rescue procedures and equipment testing (e.g. test and evaluation of closed circuit O2 rebreathers for accelerated decompression of DISSUB survivors), and science-based recommendations to modify the GUARD book, the manual that gives guidance to survivors of a submarine casualty on when to escape versus when to await rescue for survival and escape.

**Research Activities**

- Optimization of rescue and triage of crewmembers during a DISSUB event
- Creation of medical response strategies to optimize DISSUB escapee survival
- Provision of recommendations for modifying the Guard Book to facilitate the ability of survivors to determine escape times while under stress
- Development of the eGuard book, an electronic version of the Guard Book for use during a DISSUB scenario
- Exploration of the effects of DISSUB stressors on submariner cognition
- Development of the Submarine Rescue software application that provides decompression protocols for rescuees and rescue personnel from a disabled submarine
- Critical review of casualties from historical DISSUB incidents
Noise-induced hearing loss is one of the most prevalent occupational health hazards in the military. To help protect our service members’ hearing, NSMRL’s Regional Hearing Conservation (RHC) Program of Record (POR) provides subject matter expertise on hearing conservation, psychoacoustics, audiology, and hearing protection to the Navy and Marine Corps line communities. The program also provides support to Navy audiologists, otolaryngologists, allied health professionals, audiometric technicians, and consultants across the DoD and Defense Health Agency. NSMRL houses an expansive state of the art audiology test suite that includes one of the largest anechoic chambers in the DoD, a large reverberant room, a Real-ear Attenuation at Threshold (REAT) facility, and multiple audiology test booths. RHC POR efforts include basic to applied research.

The team’s principal investigator sits on multiple American National Standards Institute (ANSI) working groups related to speech-in-noise understanding and assessing the effects of head-worn devices on human auditory localization ability.
Research Activities

- Testing and evaluation of head-worn hearing protection devices (HPDs) for their impact on hazardous noise exposure, communication, sound localization, and attenuation of impulse (blast) noise

- Execution of large-scale shore and afloat hearing conservation field studies

- Evaluation of HPDs to determine the effective and most appropriate forms for Sailors and Marines at accession and in positions routinely exposed to hazardous noise

- Testing and evaluation of field attenuation estimation systems’ performance for enterprise-wide DoD use
This unique program maintains an epidemiologic database that cross-references a number of Navy data sources and aids in characterizing the health effects of the submarine and diving environment. With the ability to provide rapid analysis, the program can serve as a reference source for operational planning and risk mitigation. As part of this program, NSMRL initiated the first-ever epidemiological study to evaluate the medical impacts of the submarine environment on Sailors. The program recently expanded its research to include divers to assess the impact of the undersea environment on diver health.

UHERP’s main objectives are: to identify any environmental or occupational exposure risk that correlate with negative health outcomes, premature separation from military service, and medical evacuations, and to improve the health and warfighting capability of undersea warfare community by harnessing information from “big-data” platforms.

**Research Activities**

- Development of a centralized database linking medical and personnel data for Navy divers and submariners
- Summarization of the “who,” “when,” and “why,” for submarine medical evacuations
- Assessment of mental health risk factors for unplanned losses
- Identification of risk factors for hearing loss and tinnitus in the submarine community, two of the most burdensome health conditions for the DoD and VA
INVESTIGATOR PROFILES
Brandon Casper, PhD

**Department Head, Warfighter Performance; Research Physiologist**

- Underwater Bioeffects
- Environmental Impact
- Underwater Hearing
- Acoustic Injury Prevention

In his role as research physiologist, Dr. Casper is the Navy’s lead on the bioeffects of underwater sound and blast on divers. His research focuses on predicting injury to divers exposed to sonar, underwater explosives, and other acoustic sources and he provides guidance recommendations to the fleet on safe standoff distances for injury prevention. He also supports research on impacts of underwater blasts on aquatic life and leads projects that advance the Navy’s mobile technological capabilities, including development of software applications that streamline submarine rescue processes and house cognitive behavioral therapy to provide mental health support to submariners while underway. Dr. Casper’s PhD research on hearing in sharks and stingrays marked a resurgence in that field.

Sarah Chabal, PhD

**Deputy Department Head, Warfighter Performance; Research Psychologist**

- Cognitive Performance
- Fatigue/ Circadian Misalignment
- Warfighter Operational Readiness
- Physiological Monitoring

Sarah Chabal is a research psychologist at NSMRL, where she leads the Cognitive and Operational Performance Research Group. Dr. Chabal’s research focuses on providing operationally-feasible guidance to the submarine fleet, in order to enhance the cognitive and operational performance of the warfighter. Some of her ongoing efforts include the development and testing of unobtrusive measurement techniques for the assessment of human performance, the exploration of cognitive and military performance under stressful environmental conditions (e.g., disabled submarines), and the development of countermeasures for fatigue/circadian misalignment. Dr. Chabal’s work has been recognized by NATO and international military communities. Outside of NSMRL, Dr. Chabal serves as the Navy liaison to the Joint Program Committee-5 Fatigue Mechanisms and Countermeasures working group, and is an invited participant at the Cognitive Demands and Requirements of Military Job Performance working group.
LT Luke Beardslee, MD, PhD

*Undersea Medical Officer; Electrical Engineer*

- Microelectromechanical Systems
- Nanotechnology
- Sensors & Sensor Systems
- Micro/Nanofabrication

LT Luke A. Beardslee is an Undersea Medical Officer and electrical engineer at NSMRL. His research focuses on the development of sensing systems to support the warfighter in the areas of occupational exposure monitoring and combat casualty care. He applies his knowledge of micro/nanosystems in support of these research efforts. Currently, he is developing sensing systems to better characterize atmospheric exposures aboard submarines, understand individual exposures to underwater blast, and conduct physiological monitoring. LT Beardslee has established collaborations with several academic institutions across the country in support of his research efforts. LT Beardslee’s background in both engineering and medicine allows him to identify potential areas of medical concern and then formulate an engineering approach to address the concern.

Matthew Babina, MEng

*Research Engineer*

- Underwater Bioeffects
- Acoustics & Signal Processing
- Psychophysics
- Acoustic Injury Prevention

Matthew A. Babina is a research engineer at NSMRL in the Warfighter Performance Department. Since 2008, he has supported NSMRL’s role as the Navy’s primary source of expertise on the human bioeffects of underwater sound and blast, and he continues to serve as a subject matter expert in this field. In his role as a technical lead, Mr. Babina guides research to understand physiological damage mechanisms and psychological effects of underwater sound. This scientific knowledge informs guidance recommendations that aim to maximize Navy diver operational capability while minimizing risk to the diver. Some examples of these research outcomes include quantification of human ultra-high frequency perception, amendment of the underwater blast standoff tables in the EOD 60-Series publication, and measurement of noise transfer into the KM-37 diving helmet for hearing conservation standards.
Andrea Bizarro, PhD

Research Psychologist

- Psychological Assessment & Measurement
- Survey Design
- Structured Interviews & Focus Groups
- Employee Retention & Attrition

Andrea Bizarro is a contracted research psychologist at NSMRL where she leads efforts to modernize the submariner psychological screening and assessment program. Leveraging her expertise in psychometrics, employee retention, and organizational commitment, she has implemented improvements to the psychological screening program that have enhanced the efficiency of the assessment and reduced the number of false-positive psychological referrals. Before joining NSMRL, Dr. Bizarro worked in industry where she designed and led various programs supporting employee surveys, analytics, and action-planning strategies that directly contributed to the business strategy and overall vision at two Fortune 500 companies. During her graduate studies, Dr. Bizarro gained experience with quasi-experimental field research, workplace intervention design, and participatory ergonomics. She holds a graduate certificate in Occupational Health Psychology.

Jeffrey Bolkhovsky, PhD

Research Physiologist

- Human Factors
- Signal Processing & Machine Learning
- Physiological Monitoring
- Sleep & Fatigue

Jeffrey Bolkhovsky is a research physiologist at NSMRL who conducts human factors and physiological monitoring research to optimize warfighter performance. He explores noninvasive and non-disruptive monitoring tools to track physiological factors such as facial and eye movements, heart rate, and skin conductance to predict operational performance decrement due to stressors such as fatigue and cold exposure. As part of his human factors work, Dr. Bolkhovsky supported the development of a software program that creates submarine watch bills and schedules based on individualized predictions of crew member fatigue. He has also developed training tools to provide performance support for complicated onboard operations and designed submarine control room interfaces that optimize presentation of information and facilitate decision making. His work on developing models of submarine processes and watch stations allows him to connect his research directly to the operational environment.
Lia Bonacci, PhD

**Research Scientist**
- Auditory & Visual Attention
- Signal Processing & Machine Learning
- Auditory Scene Analysis
- Human Factors Engineering

Lia Bonacci is a contracted research scientist at NSMRL. Her doctoral research focused on characterizing neural correlates of spatial attention in complex auditory scenes using non-invasive electroencephalography. In her role as research scientist at NSMRL, she works on developing computational models of human auditory processing in order to enable autonomous systems to listen in submarine and urban environments. This work aims to enhance the ability of these systems to extract key information from their environment in order to assist human operators. In addition to her work on auditory processing, Dr. Bonacci works on various human factors engineering projects, which include modeling the submarine MEDEVAC process, predicting human performance via non-invasive physiological monitoring, and developing tools to provide performance support for various submarine tasks.

Justin Handy, PhD

**Research Psychologist**
- Psychological Readiness
- Stress & Coping
- Human Cognition
- Behavioral Neuroscience

Justin Handy is a research psychologist at NSMRL, having joined the lab in 2018 following completion of a post-doctoral training program at the Syracuse Veterans Affairs Medical Center. His research centers on understanding the impacts of stress and motivated behavior on mental health and well-being. Dr. Handy leverages his background in cognitive psychology and behavioral neuroscience to advance the Navy’s mission to maintain cognitive and psychological readiness among undersea warfighters. To this end, he supports efforts to identify behavioral and non-behavioral indices of psychological distress and resilience, directly informing psychological screening programs for submarine duty and the development of preventative, resilience-based training initiatives. In addition, he leads projects to determine the effects of environmental and physiological stress on neurocognitive function in Navy divers and other specialized operational communities.
Dominica Hernandez, PhD

Research Psychologist

- Obesity Prevention & Intervention
- Psychological Assessment & Treatment
- Cardiometabolic Disorders
- Social Determinants of Health

Dominica Hernandez is a contracted research psychologist at NSMRL and Adjunct Professor of psychology at the University of Connecticut. In her role as a research psychologist, Dr. Hernandez is the technical lead on projects, including the psychological screening of prospective submariners and examining contributors of obesity and cardiometabolic comorbidities among Sailors in the submarine environment. Her research focuses on assessing physical, psychological and personality correlates that may impact submarine warfighter performance and readiness. In addition to her research background, Dr. Hernandez is a trained clinical therapist with over ten years of experience in treating behavioral health disorders and has held training placements at Columbia University, UConn Health Center, and the VA Hospital. Dr. Hernandez also supports research focused on examining predictors of resilience, submariner success, and social determinates of health among Submariners.

LT Chad Peltier, PhD

Research Psychologist

- Individual Differences
- Attention
- Psychological Health
- Cognitive Performance

LT Chad Peltier joined the Navy as a research psychologist in June, 2018. He has since become the primary investigator on a number of research initiatives, including the administration and modernization of the SUBSCREEN, which is used to assess prospective submariners for psychological incompatibilities with submarine service. Under his direction, the SUBSCREEN was updated for the first time since 2001. His team is working to update the SUBSCREEN to better measure motivational factors that may predict success and reduce unplanned losses in the fleet. In addition to his applied work, LT Peltier has continued his academic research as he works with universities to publish work measuring and predicting performance and individual differences in cognitive tasks.
CDR Douglas McAdams, MD

Department Head, Submarine Medicine & Survival Systems; Undersea Medical Officer; Neurologist

- Clinical Neurology
- Undersea & Diving Medicine

CDR Doug McAdams is an undersea/diving medical officer at NSMRL, where he is also the Submarine Medicine and Survival Systems Department Head and IRB Chair. In addition, he is a practicing Neurologist at NHCNE. Previous assignments include Staff Neurologist and Department Head at Naval Medical Center Portsmouth and Senior Medical Officer and Department Head at Commander, Submarine Group 9 where he obtained additional qualification in dry-dock shelter operations and saturation diving. He is a prior submarine line officer and completed a junior officer tour on the USS Henry M. Jackson. He holds an appointment as Assistant Professor of Neurology at the Uniformed Services University. He was a voting member of the Walter Reed and Naval Medical Center Portsmouth ethics committees, and the Ethics, Law, and Humanities Committee for the American Academy of Neurology. He has publications in medicine, physiology, and ethics.

Linda Hughes, MS

Deputy Department Head, Submarine Medicine & Survival Systems; Statistician

- Biostatistics
- Epidemiology
- Experimental Design
- Privacy

Linda Hughes is NSMRL’s statistician, the Submarine Medicine and Survival Systems Deputy Department Head, and program manager of the Undersea Health Epidemiology Research Program. Since joining the NSMRL in 1998, Ms. Hughes has collaborated on numerous research projects relating to warfighter health. Her contributions include work in the following areas: hearing conservation, submarine escape and rescue, women in submarines, submarine atmosphere health, test and evaluation, and epidemiology. Ms. Hughes also serves on the Institutional Review Board, the Library and Training & Professional Development committees, and is NSMRL’s HIPAA Privacy and Security Officer.
CAPT Marcus Larkin, MS

*Industrial Hygiene Officer*

- *Industrial Hygiene*
- *Occupational Health & Safety*

CAPT Marcus Larkin is an industrial hygiene officer at NSMRL and an Independent Duty Corpsman Instructor at the Naval Undersea Medical Institute. Throughout his career, Capt. Larkin has performed numerous industrial hygiene surveys and provided fleet industrial hygiene support for various classes of ships and submarines and has provided occupational health and safety support for the Marine Corps. He has served as Special Programs Officer at the Chief of Naval Operations, Medical Resources, Plans, and Policy Division (N931), Homeland Defense Coordinator and Director for Industrial Hygiene and Occupational Health at the Marine Corps Headquarters, and Director for Safety, Occupational Health, and Environmental Health at Navy Bureau of Medicine & Surgery. Capt. Larkin’s operational tours include: USS Coontz (DDG 40), USS John F. Kennedy (CV-67), USS John C. Stennis (CVN-74), and the 3D Force Service Support Group, Fleet Marine Force, Okinawa, Japan.

LT Brian Kupchak, PhD

*Research Physiologist*

- *Physiology*
- *Environmental Stressors*
- *Exercise & Nutrition*

LT Brian Kupchak is a research physiologist at NSMRL. His primary research focus is understanding microbiome changes in submariners after long-range submarine deployment and evaluating of those changes in relation to alterations in crew health and performance. Previously, LT Kupchak was an assistant professor at the Uniformed Services University of the Health Sciences in the Department of Military & Emergency Medicine and an assistant clinical professor at the University of Connecticut in the Department of Kinesiology. His research interests include examining environmental stressors, such as heat, cold, and altitude, on human physiology as well as the effects of exercise and nutrition on blood coagulation and fibrinolysis.
David Burnside, MPH

*Program Manager*

- *Submarine Atmosphere Monitoring*
- *Industrial Hygiene*

David Burnside is the manager of the Submarine Atmosphere Health Assessment Program (SAHAP) at NSMRL. He has twenty years of expertise in submarine atmosphere monitoring. In his role as SAHAP manager, Mr. Burnside is the Navy’s lead on determining the presence of chemical contaminants in submarine air. His research focuses on ensuring state of the art techniques in atmosphere monitoring are employed. He has participated in and overseen multiple on board submarine atmosphere sampling evolutions. These sampling evolutions have included the development of novel techniques to sample air for multiple compounds simultaneously, a necessary component for sampling an environment as variegated as the submarine. Mr. Burnside is the also the recording secretary for the Submarine Environment Advisory Board (SEAB), a CNO chartered group devoted to advising the submarine force on environmental issues.

Surgeon Commander Joanna Halford, MFOM

*Royal Navy Exchange Officer; Consultant Occupational Physician*

- *Occupational Health*
- *Injury Recovery*
- *Sports Medicine*

Surg. Cdr. Joanna Halford is a Consultant Occupational Physician in the Royal Navy, having previously served for 11 years in the British Army. Her career, to date, has been primarily in clinical roles, most recently as a Regional Occupational Health Consultant. This involved assessing fitness for work of Royal Marines and Royal Navy personnel following illness or injury, with the aim of returning them to gainful military employment, thus contributing to operational capability. Surg. Cdr. Halford is currently assigned to NSMRL as an Exchange Officer, where her research focus is on determining the impact of the gut microbiome on the health, resilience, and operational readiness of submariners. Previous research, linked to her interest in sport and sports medicine, studied the effects of anterior cruciate ligament reconstruction on fitness for service in the British Army.
Jeremy Federman, PhD

**Research Audiologist**

- Hearing Conservation
- Audiology
- Psychoacoustics

Jeremy Federman is a research audiologist who leads NSMRL’s Regional Hearing Conservation Program of Record. He is an American Speech-Language and Hearing Association certified audiologist. He was named Navy Audiologist of the Year in 2014 and received the prestigious Military Audiology Association’s Research Award in 2015. He completed his Masters in Audiology and PhD in communications sciences and disorders at Vanderbilt University. At NSMRL, Dr. Federman uses his research and clinical training to pursue interests in hearing conservation and psychoacoustics. He is currently conducting experiments related to Hearing Protection Device (HPD) fit-testing and training, the effects of ongoing and impulse noises on HPDs and communications, and the effects of head-worn devices on auditory localization. The primary aim of his research program is to eliminate noise induced hearing loss in the Navy and Marine Corps.

Stephanie Karch, PhD, AuD

**Research Audiologist**

- Hearing Conservation
- Auditory Function
- Auditory Injury
- Vestibular Function

Stephanie Karch is a research audiologist at NSMRL and works on the Regional Hearing Conservation Team. In this role, she investigates the prevention of auditory injury (e.g., hearing loss, tinnitus) among service members. Specifically, she studies the effect of training and verification of hearing protection in the field, clinic, and laboratory; and the effect of hearing protection on auditory function (e.g., situational awareness, speech intelligibility, and localization). Dr. Karch has over five years of PhD-level experience in military medical research, having served in Navy and Army medical research laboratories. Previous to her work at NSMRL, she characterized the vestibular function of military aviators, and investigated the comorbidity of auditory injuries and mild traumatic brain injuries. In addition to her AuD and PhD in audiology, she holds the American Speech-Language-Hearing Association’s Certificate of Clinical Competence in Audiology.
Brian Maguire, PhD

Epidemiologist

- Epidemiology
- Safety
- Public Health
- Health Promotion

Brian Maguire is a contracted epidemiologist with the Undersea Health Epidemiology Program at NSMRL. The objective of his work is to improve health and reduce injury risks for submariners and Navy divers. Dr. Maguire and the UHERP team conduct research on medical evacuations and injuries in the Navy, publish findings, present at conferences and meetings across the country and internationally, and created a new database with 495,000 person-years of records. Dr. Maguire’s other career accomplishments include being a senior Fulbright scholar, a university professor, a member of the CDC’s Public Safety Council, and the author of over 70 publications, including a Cochrane Review and a systematic literature review.

Derek Schwaller, BS

Research Engineer

- Hearing Protection Evaluation
- SONAR Headset Selection
- Underwater Hearing
- Underwater Blast/Noise Injury Prevention

Derek Schwaller is a research engineer at NSMRL. In this role, Mr. Schwaller is the lead engineer on the Regional Hearing Conservation Team. His research focuses on quantifying the effects of wearing hearing protection devices on situational awareness, protection from impulses, as well as protection from continuous noise. He also conducts research on selecting a headset for submarine SONAR operators. In Mr. Schwaller’s fifteen years as a government employee at NSMRL, he has served as NSMRL’s IRB Chair, Warfighter Performance Department Head, Contract Manager, and Financial Manager.
**Dive Locker**

### ND1 Kyle Smith

*Department Head, Dive Locker; 1st Class Diver*

- Navy Diving
- Diving Research

ND1 Kyle Smith is a first class Navy diver and Diving Department Head at NSMRL. He graduated Second Class Dive School in 2008 and was stationed at Mobile Diving Salvage Unit One in Pearl Harbor, Hawaii. From there, he transferred to Naval Undersea Warfare Center in Keyport, Washington before attending First Class Dive School in 2014. Before reporting to NSMRL he was stationed at the Ship Repair Facility in Sasebo, Japan. ND1 Smith is the current Diving Department head, overseeing diving operations in support of research protocols for the lab.

### John Connors

*Deputy Department Head, Dive Locker; Hyperbaric Systems Specialist*

- Hyperbaric Systems
- Diving Research

John Connors is the Hyperbaric Systems Specialist and Diving Deputy Department Head at NSMRL. In his role as the Hyperbaric Systems Specialist, Mr. Connors ensures that the department supports diving-related research at NSMRL by assisting as a U.S. Navy research diver and diving supervisor for human subjects research protocols. His efforts and support have allowed for the success of many projects, including: Phase Locking the Circadian Rhythm of Warfighters, Effects of Underwater Blast against Anti-Swimmer Devices, and Underwater Sound Localization. Mr. Connors is a retired U.S. Navy Independent Duty Corpsman.
Louis Deflice is the resident Diving and Hyperbaric Subject Matter Expert at NSMRL. Mr. Deflice has an extensive background in complex diving and hyperbaric human subject research as both a supervisor and a credentialed institutional review board member. His previous work history includes tours as Command Master Chief at the U.S. Navy’s Experimental Diving Unit and Command Master Diver at Naval Submarine School’s high-risk submarine escape trainer. Mr. Deflice is well-versed in deep diving systems, saturation diving techniques / procedures, and quality assurance programs associated with maintaining certified diver’s life support systems. Mr. Deflice finished his 30-year military career in June 2019 as a Master Chief Navy Diver (E9), qualified Master Diver, Submarine Service and Master Training Specialist.
NSMRL’s 2019 PUBLICATIONS


