NATIONAL ACADEMIES Sciences Engineering Medicine

Emerging Science and Technology to Address Naval Undersea Medicine Needs: A Workshop

March 21, 2024 | 9:00–5:30pm EST | Virtual

MEETING BOOK

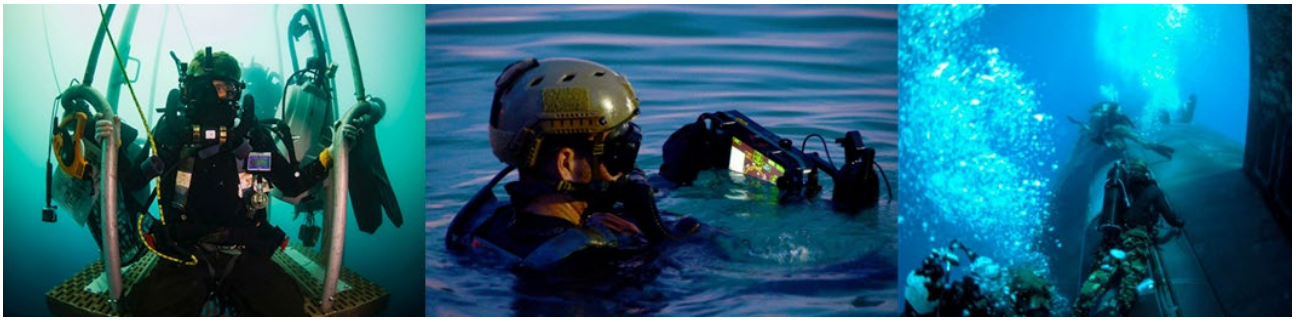


Table of Contents

AGENDA

9:00-9:25AM | SESSION 1 | The State of the Science, Then and Now

9:00-9:05AM (ET) **Welcome**
KENNETH W. KIZER, *Committee Chair*
Stanford University School of Medicine

9:05-9:20AM **Stage Setting by the US Navy Office of Undersea Medicine**
MICHAEL LAFIANDRA, Division Director, Warfighter Protection and Applications
SANDRA CHAPMAN, Program Officer, Undersea Medicine

9:20-9:25AM **Program Overview**
KENNETH W. KIZER, *Committee Chair*
Stanford University School of Medicine

9:25AM-11:15AM | SESSION 2 | Dive Monitoring and Injury Prevention

Session Objectives:

- Review key developments in dive physiology and submarine medicine in the years since the 2002 Underwater Hyperbaric Medical Society report, *An Assessment of a National Naval Need for Undersea Biomedical Research*.
- Review advances in understanding the pathophysiology of decompression sickness, and consider the implications for prevention and treatment research opportunities.
- Explore the approaches that can be taken to support diver safety and injury prevention through work at the intersection of dive physiology and dive equipment development.
- Discuss new approaches in neurophysiological monitoring to prevent the most common causes of military dive injury: hypoxia, hyperemia, and hypothermia.

9:25-9:40AM **FRAMING TALK: Key Advances in Undersea Medicine and Human Performance Since 2000**
SIMON MITCHELL, Diving Physician, Head of Dept of Anesthesiology, University of Auckland

9:41-9:51AM **FLASH TALK 1: Implications of High Within-Diver Variability in Bubbling Across Identical Dives for Research Opportunities in Decompression Sickness Prevention**
DAVID DOOLETTE, Research Physiologist, US Navy Experimental Diving Unit/NAVSEA

9:52-10:02AM **FLASH TALK 2: Preventing Leading Causes of Military Dive Casualties with Emerging Technologies in Rebreathers**
ARNE SIEBER, Co-founder/CEO of SEABEAR, Associate Professor for Biomedical Engineering, Chalmers University of Technology, Gothenburg, Sweden

10:03-10:13AM **FLASH TALK 3: Neurophysiological Monitoring for Dive Injury Status**
XAVIER VRIJDAG, Diving Medical Researcher, University of Auckland

10:14-10:20AM **Break**

[10:20-11:15AM] Questions and Reflections between Presenters and Discussants

The moderator and principal speakers of Session 2 (Mitchell, Doolette, Sieber, and Vrijdag) are joined by the discussants below. Each discussant below is afforded 10 min to: introduce themselves, describe how their expertise intersects with the session theme, offer reflections to the flash talks, and pose a top-line pressing question to the presenters for an immediate response. Additional questions the discussant may have will be deferred to the Q&A round at the end of the session.

10:20-10:30AM **CAPT EVAN COLBERT, USN,** Deputy Director for Navy Diving, Office of Undersea Warfare (OPNAV N97)

10:31-10:41AM **RICHARD E. MOON**, Professor of Anesthesiology and Hyperbaric Center Medical Director, Duke University Health System

10:42-10:52AM **PETER LINDHOLM**, Professor & Gurnee Endowed Chair of Hyperbaric and Diving Medicine Research, University of California, San Diego

10:53-11:15AM Q&A with Workshop Planning Committee and Audience

11:15-12:00PM | SESSION 3 | Women Operators

Session Objectives:

- Discuss challenges and opportunities in understanding sex-specific physiological responses to diving and to the submarine environment, and how this translates to occupational injury risk for female operators.
- Explore how existing data archives can be mined for patterns and trends that inform safety and performance considerations for female divers and submariners.

11:15-11:20AM **Session Introduction and Framing Comments**
KAREN VAN HOESEN, Professor of Emergency Medicine, Co-Director of the San Diego Center of Excellence in Diving, Co-Director of the San Diego Center of Excellence in Diving, *Planning Member*

11:20-11:45AM **Discussion**

LINDA HUGHES, Statistician, Navy Submarine Medical Research Laboratory
FRAUKE TILLMANS, Research Director, Divers Alert Network
BRIAN MAGUIRE, Epidemiologist, Leidos

11:45AM-12:00PM Q&A with Workshop Planning Committee and Audience

12:00-12:30PM **LUNCH**

12:30PM-3:00PM | SESSION 4 | Monitoring Tools in Submarine Medicine

Session Objectives:

- Explore the impact of changes in submarine operations since 2000 on submarine medicine research, focusing on gender integration and watch schedule adjustments as key drivers.
- Consider the importance of non-invasive monitoring to track cognitive performance affected by fatigue.
- Examine human factors impacting extended manned submarine operations, addressing physical fitness, nutrition, and morale considerations.
- Analyze lessons learned from analog contexts in lunar mission planning, focusing on contingency operations, emergency management, treatment, and risk mitigation.
- Consider how the issues above relate to and intersect with priority research questions and challenges in other subdomains of submarine medicine - including gastroenterology, psychology, personnel development, and human factors engineering.
- Discuss how the above issues impact readiness and the ability of the submarine force to carry out their mission.

12:30-12:35PM	**Session Introduction** David Fothergill, Scientific Director, Navy Submarine Medical Research Laboratory *Planning Member*
12:36-12:46PM	**FRAMING TALK: How Changes in Submarine Operations Since 2000 Have Shaped Submarine Medicine Research** Enrique (Rick) Panlilio, Deputy Director for Plans, Policy, and International Engagement, Commander, Submarine Force Atlantic (COMSUBLANT)
12:47-12:57PM	**FLASH TALK 1: Non-invasive Monitoring of Fatigue** Jeffrey Bolkhovsky, Research Physiologist, Naval Submarine Medical Research Laboratory
12:58-1:08PM	**TALK 2: Human Factors for Extended Manned Submarine Operations** CAPT Michael Daigle, USN**,** Future Attack Submarine Requirements, Office of the Chief of Naval Operations (OPNAV)
1:09-1:19PM	**FLASH TALK 3: Lessons Learned from Analog Contexts and Lunar Mission Planning** Robert Sanders, Flight Surgeon, Program Medical Officer, Extravehicular Activity and Human Surface Mobility Program, National Aeronautics and Space Administration (NASA)
1:20-1:25PM	**Break**
	[1:25-2:45PM] Questions and Reflections between Presenters and Discussants The moderator and principal speakers of Session 4 (Fothergill, Panlilio, Bolkhovsky, Daigle, and Sanders) are joined by the discussants below. Each discussant below is afforded 10 min to: introduce themselves, describe how their expertise intersects with the session theme, offer reflections to the flash talks, and pose a top-line pressing question to the presenters for an immediate

response. Additional questions the discussant may have will be deferred to the Q&A round at the end of the session.

1:25-1:35PM **MICHAEL GOODSON**, Research Biologist, Air Force Research Labs

1:36-1:46PM **JUSTIN HANDY**, Research Psychologist, Navy Submarine Medical Research Laboratory

1:47-1:57PM **DOMINICA HERNANDEZ**, Research Psychologist, Navy Submarine Medical Research Laboratory

1:58-2:08PM **MANIK ANAND**, Mechanical Engineer, Carderock Naval Surface Warfare Center

2:09-2:39PM Q&A with Workshop Planning Committee and Audience

2:40-2:55PM Break

2:55-4:20PM | SESSION 5 | Performance

Session Objectives:

- Provide insights into the importance of undersea medicine for operator needs, emphasizing the challenging conditions faced by Navy warfighters in undersea theater, and highlighting remaining challenges constrained by human factors.
- Highlight the need for neurocognitive research and technology development at depth in order to optimize readiness and maximize performance during and after dives.
- Emphasize the importance of research and technology development to neutralize the impact of ocean temperature on warfighter performance.
- Explore promising directions in CNS and pulmonary oxygen toxicity injury prevention, management, and treatment.

2:55-3:05PM **Session Introduction and Brief Remarks on Performance Medicine at the Navy Experimental Diving Unit**
JOHN FLORIAN, Scientific Director, Navy Experimental Diving Unit, *Planning Member*

3:06-3:16PM **FRAMING TALK: Perspectives on Undersea Medicine for Operator Performance Needs**
CAPT (ret.) DAVID REGIS, Supervisor of Diving and Salvage (SUPSALV), Program Manager, Deep Submergence Biomedical Development Program, NAVSEA

3:17-3:27PM **FLASH TALK 1: Neurocognitive Effects**
LCDR JENNIFER JEWELL, USN, Research Psychologist, Director of Biomedical Research, Preservation of Force and Family Cognitive Domain Lead, Naval Special Warfare Command

3:28-3:38PM **FLASH TALK 2: Thermal Protection**
DAVID HOSTLER, Director of the Center for Research and Education in Special Environments (CRESE) and the Emergency Responder Human Performance Lab, SUNY Buffalo

3:39-3:49PM **FLASH TALK 3: Pulmonary and CNS Oxygen Toxicity**
AARON HALL, Research Physiologist, Navy Medical Research Center

3:50-4:20PM Q&A with Workshop Planning Committee and Audience

4:20-5:30PM | SESSION 6 | Closing Reflections

Session Objectives:

- Consider the question, “If you had to balance undersea medicine research needs and could only pick three research areas, what would they be?”
- Synthesize insights from the workshop's discussions to identify emergent themes in undersea medicine research and development.
- Highlight underexplored areas within undersea medicine that present opportunities for groundbreaking research and technological innovation.
- Reflect on the implications of the workshop's findings for enhancing diver and submariner health, safety, and performance in challenging undersea environments.
- Discuss the role of workforce development and interdisciplinary collaboration in advancing the field of undersea medicine, drawing on perspectives shared throughout the workshop.

4:20-5:25PM **Reflections on Promising Opportunities for Naval Undersea Medicine**
Moderated by Kenneth W. Kizer, *Workshop Chair*

SANDRA CHAPMAN, Program Officer, Undersea Medicine, Office of Naval Research

PETER WITUCKI, President, Undersea and Hyperbaric Medicine Society, Emergency Medicine Physician, University of California, San Diego; Diving Medical Officer, US Naval Reserves

CAPT. EVAN COLBERT, Deputy Director of Navy Diving, OPNAV N97, USN

CAPT TIMOTHY OLIVER (ret.), USN, Executive Director, Naval Submarine League

VIRGINIE PAPADOPOULOU, Research Assistant Professor, University of North Carolina Chapel Hill

JOHN MARSACK, Founder and Managing Partner, Legion Undersea Services, Chief Petty Officer (ret.), Special Operations (ret.), USN

JIM BAGIAN, Professor of Engineering Practice; Co-Director, Center for Risk Analysis Informed Decision Engineering, University of Michigan

5:25-5:30PM **Close Out**
KENNETH W. KIZER, *Committee Chair*
Stanford University School of Medicine

Planning Committee Roster

Note: The planning committee's role is limited to organizing the event. A proceedings-in-brief based on the event will be prepared by an independent rapporteur.

Kenneth Kizer, MD, MPH, *Chair*
Adjunct Professor,
Stanford University

Olujimi Ajijola, MD, PhD
Associate Professor of Medicine,
University of California, Los Angeles

Serena Maria Auñón-Chancellor, MD
Associate Professor of Clinical Medicine,
Louisiana State University

John Florian, PhD
Scientific Director,
Navy Experimental Diving Unit

David Fothergill, PhD
Scientific Director,
Navy Submarine Medical Research Laboratory

William F. Hoeft, Jr., PhD
Fellow for Undersea Strategy,
Systems Planning & Analysis, Inc.

William Johnson
Consultant,
WMJ Associations, LLC

Simon Mitchell, MB, ChB, PhD, DipOccMed, DipAdyDHM (ANZCA), FUHM, FANZCA
Diving Physician, Head of Dept of Anesthesiology,
University of Auckland

Virginie Papadopoulou, PhD
Research Assistant Professor,
University of North Carolina, Chapel Hill

David Regis, MD
Supervisor of Diving and Salvage (SUPSALV), Program Manager, Deep Submergence Biomedical Development Program,
Naval Sea Systems Command

Karen Van Hoesen, MD
Professor of Emergency Medicine,
Co-Director of the San Diego Center of Excellence in Diving,
University of California, San Diego

Biosketches of Speakers

Manik Anand

Manik Anand is the vulnerability and recoverability technical lead for the SSN(X) program office and support the Live Fire Test and Evaluation (LFT&E) programs for the VIRGINIA Class and COLUMBIA Class submarine programs. Manik Anand is the subject matter expert on submarine vulnerability and weapons effects at the Naval Surface Warfare Center Carderock Division. Manik Anand graduated with honors with a Bachelor of Science (B.S.) in Mechanical Engineering from University of Maryland, and a Master of Science in Mechanical Engineering from George Washington University.

Jim Bagian

Dr. Jim Bagian, PhD, is a Professor in the College of Engineering, Medical School, and is the Executive Director of the Center for Risk Analysis Informed Decision Engineering at the University of Michigan. He has extensive experience in the fields of human factors, aviation, and patient safety. He was the founding director of the Veterans Administration's National Center for Patient Safety and was the VA's first Chief Patient Safety Officer where he implemented the first large-scale patient safety program founded on risk analysis principles and developed numerous patient safety related tools and programs that have been adopted nationally and internationally. He was also NASA astronaut for over 15 years and is a veteran of two Space Shuttle missions including as the lead mission specialist for the first dedicated Life Sciences Spacelab mission. Following the 1986 Challenger space-shuttle explosion he dove and supervised the capsule's recovery from the ocean floor and was one of the leaders of the development of the Space Shuttle Escape System. He also served as the Chief Flight Surgeon and Medical Consultant for the Space Shuttle Columbia Accident Investigation Board. He also served in the US Air Force with Pararescue where he participated in numerous diving and airborne activities.

Jeffrey Bolkhovsky

Dr. Jeffrey Bolkhovsky, PhD, is a research physiologist at the Naval Submarine Medical Research Laboratory 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. In recognition of his research achievements, Dr. Bolkhovsky was honored as the

recipient of the Dr. Dolores M. Etter Emergent Scientist of the Year Award in 2023. He holds a PhD in Biomedical Engineering from the University of Connecticut, as well as ME and BS degrees in the same field from Worcester Polytechnic Institute.

Sandra Chapman

Dr. Sandra Chapman, PhD, is a Program Officer in the Warfighter Performance Department at the Office of Naval Research and manages the Undersea Medicine and Marine Mammal Health programs. In this role Sandra manages national and international research projects from academia, industry, and Department of Defense laboratories to advance technologies to improve the health and safety of military undersea operators. Sandra is the US co-lead for the Technical Cooperation Program Maritime Human Performance Group. In 2013, Sandra completed the American Association for the Advancement of Science, Science and Technology Policy Fellowship with two assignments, one in the Engineering Directorate Office of Evaluation and Assessment at the National Science Foundation (NSF) and the other at the Office of Cancer Nanotechnology Research at the National Institutes of Health (NIH). Sandra earned her graduate degree through a partnership program between Penn State and the National Institute of Allergic and Infectious Disease studying the life cycle of the human papillomavirus in its natural host, primary keratinocytes. Her work led to the discovery of a novel immortalization mechanism that has greatly expanded opportunities for research with primary cell cultures.

Evan Colbert

CAPT Evan Colbert is an Explosive Ordnance Disposal(EOD) Officer currently serving as the Deputy Director for Navy Diving in the Undersea Warfare Division, Chief of Naval Operations (OPNAV N97). In his current position he serves as the primary advisor on policy, capabilities and requirements, and resourcing/POM management for Navy diving and submarine escape and rescue. Captain Colbert's operational experience include a tour as a surface warfare officer prior to laterally transferring to the EOD community in 2001. For the past 23 years he has led EOD technicians and divers at the Platoon Commander, Executive Officer, and Commanding Officer level while operating and deploying globally in support of the Fleet and U.S. Special Operations. He is a 2002 graduate of the Naval Diving and Salvage Training Center and qualified as a SCUBA, surface-supplied, and mixed gas diver. Captain Colbert is a 1999 graduate of the United States Naval Academy with a BS in Ocean Engineering. In 2007 he graduated from the Naval Postgraduate School with a MS in Defense Analysis – Special Operations / Low Intensity Conflict.

Michael Daigle

CAPT Michael Daigle is an Active Duty USN O-6/CAPT serving on OPNAV/N97 Undersea Warfare staff as the Branch Head for Tactical Submarines and Sustainment. I have served on 4 submarines including Command of the USS LOUISIANA (SSBN-743)(BLUE).

David Doolette

Dr. David Doolette, PhD, is a Research Physiologist at the U.S. Navy Experimental Diving Unit and an Associate Professor of Anaesthesiology at the University of Auckland. He is a leading international expert in undersea medicine and physiology. His expertise is the result of more than four decades of pioneering technical diving and more than three decades of research, development, testing, evaluation, and operationalization of new diving technologies including decompression procedures, saturation-excursion diving, submarine lock-in/out diving, closed-circuit rebreather diving, and diver thermal protection. Other areas of expertise are diver fitness, performance, health surveillance, injury mitigation and recovery, and survivability. Dr Doolette is a recipient of the Albert R. Behnke Award and the U.S. Navy Meritorious Civilian Service Award in recognition of outstanding scientific advances in the undersea biomedical field and contributions to the U.S. Navy. Dr Doolette has a PhD in physiology and numerous diving qualifications.

Michael Goodson

Dr. Michael Goodson, PhD, is a molecular biologist and microbial ecologist with 23 years post-doctoral experience, the most recent 15 years of which have been working on projects at the Air Force Research Laboratory. Dr. Goodson's areas of expertise involve analyzing and manipulating microbes, their communities, and their genetic structure. His principle area of research is assessing and augmenting human health and performance through microbiome analysis and synthetic biology of probiotic microbes. Dr. Goodson is the technical lead of projects determining how the gut microbiome of deployed personnel affects human health and performance, and the design and generation of 'smart probiotics' that sense and respond to maintain optimum human performance. He is the current Chair of the Tri-Service Microbiome Consortium, Co-Chair of the NATO Microbiome for Human Health and Performance Research Task Group, and an Office of the Under Secretary of Defense Laboratory-University Collaboration Initiative (LUCI) Fellow.

Aaron Hall

Dr. Aaron Hall PhD is a supervisory research physiologist in the Undersea Medicine Department of the Naval Medical Research Command. Dr. Hall conducts translational research using both small and large animal models to provide operationally relevant pre-clinical data which supports the transition to human testing. Dr Hall’s research portfolio includes the development of countermeasures for decompression sickness and oxygen toxicity. Additionally, he has spearheaded a multi-institutional technology development initiative. This initiative is to develop and field a ruggedized sensor, based on breath analysis, which predicts onset of oxygen toxicity. Dr. Hall is an expert

in undersea medicine and physiology with particular emphasis in oxygen toxicity. Dr. Hall received a doctoral degree in Medical Sciences from the University of South Florida with an emphasis on Pharmacology and Physiology.

Justin Handy

Dr. Justin Handy, PhD, serves as a Research Psychologist in the Warfighter Performance Department at the Naval Submarine Medical Research Laboratory (NSMRL). 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. Dr. Handy received his Ph.D. in Cognitive Psychology from Texas A&M University in 2015, followed by two years of post-doctoral training at the Syracuse VA Medical Center as a member of the Stress and Motivated Behavior Institute before arriving at NSMRL in 2018.

Dominica Hernandez

Dr. Dominica Hernandez, PhD, is a civilian research psychologist at the Naval Submarine Medical Research Laboratory (NSMRL). At the NSMRL she leads effort to modernize the submarine psychological screening and assessment program, and submarine leadership developmental programs. 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 licensed psychologist and practices in the civilian sector as a behavioral health practitioner. She has held training placements at Columbia University, UConn Health Cetner, and the VA medical facilities. Dr. Hernandez also supports research focused on examining predictors of resilience, submariner success, contributors of obesity and cardiometabolic comorbidities among Sailors in the submarine environment.

David Hostler

Dr. David Hostler, PhD, is a Professor and Chair of Exercise and Nutrition Sciences, Clinical Professor of Emergency Medicine, and the Director of the Center for Research and Education in Special Environments at the University at Buffalo. He earned his PhD in physiology from Ohio University and completed an Emergency Medical Services (EMS) Research Fellowship at the University of Pittsburgh. His research program focuses on health and safety of the first responder and warfighter. He has conducted studies examining the cardiovascular and cognitive effects of working in the heat, recovery after exertional heat stress, cold stress during diving, and post

immersion performance. Dr Hostler is a member of the NIOSH SOH study section and the NFPA Emergency Responders Occupational Health (ERH-AAA) committee. He has 30 years of experience in public safety working as a firefighter, paramedic, and hazardous materials technician.

Linda Hughes

Ms. Linda Hughes serves as the Naval Submarine Medical Research Laboratory's (NSMRL) Statistician. She also serves as the Program Manager for the Undersea Health Epidemiology Research Program and has been a key member of the program since its inception in 2010. Since joining the NSMRL in 1998, Ms. Hughes has authored of over 50 publications and presentations relating to the health of undersea warfighters. Her work includes identifying health, occupational, and demographic risk factors associated with training attrition; unplanned separation from service; and medical evacuations. Ms. Hughes is the Vice Chairperson for NSMRL's Scientific Review Board, serves on the NSMRL Institutional Review Board, and is NSMRL's HIPAA Privacy Officer and HIPAA Security Officer. She is a reviewer for Military Medicine journal, has taught courses in statistics and research methods, and is a member of the American Statistical Association. She received a Master of Science degree in Research, Statistics, and Measurement for Southern Connecticut State University.

Jennifer Jewell

LCDR Jennifer (Jenna) Jewell is a Navy Research Psychologist currently serving as the Biomedical Research Director and POTFF Cognitive Domain Lead at Naval Special Warfare Command. LCDR Jewell's previous tours include serving as Research Psychologist at the Navy Experimental Diving Unit and Naval Leadership and Ethics Center. Prior to commissioning, LCDR Jewell completed her Masters and Doctoral Degrees in Experimental Psychology at the University of Kentucky. LCDR Jewell has been awarded the Navy and Marine Corps Commendation Medal (2 awards), Navy and Marine Corps Achievement Mental (2 awards), and various unit and campaign medals.

Michael LaFiandra

Dr. Michael LaFiandra, ScD, currently serves as the Director of the Warfighter Performance and Application Division and the Human and Bioengineered Systems Division at the Office of Naval Research, Arlington, VA. He directs basic and applied research in the areas of Human Performance Optimization, Biocentric Technologies, Intelligent and Autonomous Systems, Naval Medicine, Manpower, Personnel, Training and Education, Information Operations, and Decision Support. Prior to working for the Office of Naval Research, Dr. LaFiandra worked at the United States Army Research Laboratory from 2005 until 2021 where he served as the Chief of the Dismounted Warrior Branch (2008-2015), the Chief of the Dismounted Soldier and Team Performance Branch (2015-2016), the Chief Scientist of the Human Research and Engineering Directorate (2016-2017), and as the Deputy Chief Scientist of the Army

Research Laboratory (2020-2021). Dr. LaFiandra was recruited to be a visiting instructor at the United States Military Academy at West Point during academic years 2018 and 2019.

Peter Lindholm

Dr. Peter Lindholm, MD, PhD is Professor in Residence, Gurnee Endowed Chair of Hyperbaric and Diving Medicine Research, Department of Emergency Medicine, University of California San Diego. He is a radiologist (licensed in Sweden), and associate professor in physiology and radiology from the Karolinska Institutet in Sweden. He has also served as director of thoracic radiology at the Karolinska University Hospital. His research interest is in pulmonary medicine and applied respiratory physiology, primarily in the field of diving and hyperbaric medicine including breath-hold diving. Current research involves the study of in vivo nitrogen gas distribution (for decompression physiology), pulmonary edema in swimmers and divers as well as why humans drown. He has grants from Office of Naval research, Divers Alert Network and NIH and is a member of the board of directors for the society of undersea and hyperbaric medicine (UHMS).

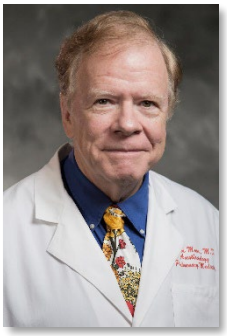
Brian Maguire

Since 2018, Dr. Brian Maguire, PhD, has been employed by Leidos and is the senior epidemiologist at the Naval Submarine Medical Research Laboratory (NSMRL) in Connecticut. At NSMRL he is focused on increasing military readiness by improving health outcomes and reducing health risks for Navy divers and submariners. In 2022, his team's poster won the "Best in Show" award from over 1,200 posters at the Military Health System Research Symposium in Florida. He has a doctoral degree in public health from the George Washington University in Washington, D.C., and is a 2009 Senior Fulbright Scholar. His more than 120 publications include articles and book chapters in the areas of epidemiology, public health, emergency medical services, disaster management, health administration, and education. Since 2010, he has been on the CDC's NORA Public Safety Council. Dr. Maguire's academic experience includes being a university professor, graduate program director, and university research center director. He began his career in the NYC health care system where he worked in positions including agency president, hospital department head, board member, educator, researcher, and paramedic. He is a diver and a pilot.

John Marsack

John Marsack, retired Chief Petty Officer and special operations Navy diver, is a seasoned veteran of maritime operations and is well-versed in hyperbaric medicine and decompression sickness interventions. He served as a Navy deep sea diver from 1994 to 2017, including service with the Seal Delivery Vehicle Team-2 (SVDT-2) between 2010-2013. These teams are tasked with conducting covert underwater operations, which can include underwater insertion and extraction of SEALs, placing mines or other explosives, underwater reconnaissance, and maritime counterterrorism missions. Today, he is Owner, Founder, and Managing Partner of Legion Undersea

Services, a commercial dive consulting firm specializing in sub-sea operations, commercial/military diving operations, strategic planning, and risk mitigation. The firm takes on assignments for international salvage, underwater construction, and archaeological assignments, including work in collaboration with the U.S. Army Corps of Engineers to support vital waterways for international shipping. Over the past two years, Legion Undersea Services has received contracts from the Office of Naval Research to conduct cold water dive equipment tests and evaluations. In addition, Marsack and his firm are dedicated partners of Project Recover, a non-profit organization that locates and repatriates the underwater remains of U.S. service members killed in action, dating back to World War II. This work is performed in conjunction with institutions like the Scripps Institute of Oceanography and the University of Delaware, and is conducted on behalf of the Defense POW/MIA Accounting Agency. Marsack is also a Member of the Board of Directors of the Central Florida Navy League.



Richard Moon

Dr. Richard Moon, PhD, is Professor of Anesthesiology, Professor of Medicine and Medical Director of the Duke Center for Hyperbaric Medicine & Environmental Physiology. His research has included predictors of arterial PCO2 during underwater exercise and causes and prevention of immersion pulmonary edema. He has investigated the use of an experimental breathing gas (perfluoromethane) to decrease decompression requirements after heliox dives, and after completing human experiments demonstrating upregulation of mitochondrial biogenesis with low dose carbon monoxide exposure, he is currently studying its effect on training of the respiratory muscles. His awards include the Mentorship Award from the AMA-Women Physicians Congress Physician Mentor Recognition Program, Leonard Palumbo Jr, MD Faculty Achievement Award for compassionate patient care and excellence in the teaching and mentoring of young physicians, Duke awards for Excellence in Medical Student Education and two awards as Duke Anesthesiology Teacher of the Year. His professional society memberships include Alpha Omega Alpha, American Society of Anesthesiologists, Undersea & Hyperbaric Medical Society, South Pacific Underwater Medicine Society, American College of Physicians (Fellow), American College of Chest Physicians (Fellow), American Physiological Society, Sigma Xi Society, Physiological Society (UK) and Royal Society of Medicine (UK).

Timothy Oliver

Tim Oliver has served on five submarines during his 26 years in the Navy, and has been the Executive Director of the non-profit Naval Submarine League since 2013, and He enlisted in the U.S. Naval Reserve in 1964. He entered the U.S. Naval Academy and graduated in 1969. Following nuclear power and submarine training, he reported to USS SAM HOUSTON (SSBN 609) (BLUE), where he qualified in submarines in October 1972. In July 1973, he reported to USS SKATE (SSN578) and served as Damage Control Assistant, Weapons Officer and Navigator. In February 1975, he reported to USS SILVERSIDES (SSN 679) where he served as Engineer Officer until May 1978. He then reported to the Department of Energy, Naval Reactors Division where he worked on Admiral Rickover's staff from June 1978 to February

1981. He served as Executive Officer on USS PARCHE (SSN 683) from March 1981 to October 1983. He then reported to the staff of Commander Submarine Force, U.S. Atlantic Fleet in Norfolk, Virginia, and served as the Force Nuclear Power Officer from November 1983 to June 1985.Captain Oliver served as the Commanding Officer, USS GLENARD P. LIPSCOMB (SSN 685), from February 1986 to December 1988. LIPSCOMB was the second electric-drive, nuclear-powered submarine and was homeported in Norfolk, Virginia. He returned to the staff of Commander Submarine Force, U.S. Atlantic Fleet as Deputy Chief of Staff for Force Training and Readiness. Following this tour, he relieved as the SEAWOLF Class Submarine Assistant Program Manager for Combat Control Systems where he served until June 1992. From July 1992 to June 1994 Captain Oliver served as Officer-in-Charge Naval Undersea Warfare Center Detachment, Norfolk. Following that assignment, he served as the Operations Director for Naval Stations and Bases on the staff of the Commander-in-Chief of the U. S. Atlantic Fleet Forces until his retirement in May 1995. After retirement, he worked for consulting and software engineering companies that support the federal government for 17 years.

Enrique Panlilio

CAPT Enrique Panlilio, USN (ret.) is a retired career submarine officer and Navy diver, now serving as a civilian director on the Submarine Force staff. On active duty, he commanded at the unit, squadron, and task force levels. He has significant experience in the deep submergence community, piloting deep submergence rescue vehicles and commanding the Navy's deep-diving nuclear-powered Submarine NR-1. He is a graduate of Auburn University (BS Physics) and the Naval War College (MS Strategic Studies and International Relations). He is also an Explorer's Club member and was appointed as an admiral in the Texas Navy by the governor of the Lone Star State.

Robert Sanders

Dr. Robert Sanders, MD, began his medical career in 1989 as an EMT & Ski Patrol member. In 1993 he ventured into hyperbarics as a technician and supervisor at the USC/Catalina Hyperbaric Chamber. He also served as a diver and field safety officer (dive medic) in Antarctica for 4 seasons collecting single-celled organisms in 28º water 100' below 12' of ice. Needing to learn more, Sanders received an MD from Chicago Medical School. After residency in Emergency Medicine at the University of Pittsburgh, he became boarded in Emergency Med, & Undersea and Hyperbaric Medicine training at the University of Hawaii at Manoa Hyperbaric Treatment Center. Currently, Sanders is a Flight Surgeon for NASA serving as the Program Medical Officer for the EVA (spacewalking) and Human Surface Mobility (Lunar Rovers) Program. Previously he spent 8 years on contract to NASA's Neutral Buoyancy Laboratory from UTMB as the Medical Director. He has also been the Medical Director for American Hyperbaric Centers in Anchorage AK (overseeing clinical hyperbarics; commercial dive operations), and still works as an Attending Emergency Department Physician. Prior, he was at the University of Hawaii's Hyperbaric Treatment Center, and served as Medical Advisor for Pittsburgh River Rescue, and as a Flight Physician for Stat MedEvac. Dr. Sanders serves as the tactical medicine physician for the Harris County Sheriff's Office Dive Team, after spending 8 years diving with the LA County

Sheriff conducting search and recovery of bodies and evidence. He is an avid technical (Cave, Wreck, Ice) and scientific diver. He has conducted shark diving & tagging operations, and worked as a set medic and water safety coordinator in Hollywood. He is a recognized author and educator in emergency medicine, hyperbaric medicine and diving medicine.

Arne Sieber

Dr. Arne Sieber, PhD is the CEO of Oxygen Scientific GmbH, Graz, Austria and Docent for Biomedical Engineering at Chalmers University of Technology, Gothenburg, Sweden. His expertise is life-supporting systems, rebreathers, sensors for rebreathers, dive computers and diving physiology. Before he worked for 7 years I medical Industry (Roche Diagnostics), then about 5 years in academia at the Institute of Clinical Physiology of the National Research Council of Italy as well as the Scuola Superiore Sant' Anna, Pisa, Italy. He has been the CEO of Seabear Diving Technology, which became later a part of Johnson Outdoors. Following the acquisition of Seabear Diving Technology, he was R&D Manager for dive computers at Scubapro. Arne Sieber is the author or co-author of more than 50 scientific journal papers and more than 200 scientific conference contributions. He is also the inventor of 17 patents in the field of diving technology, including for instance the patent covering the sensor validation technology used in the Poseidon rebreathers or a touchscreen dive computer. Arne Sieber has been part in research projects funded by Austrian national funds, the European Union or ONRG.

Frauke Tillmans

Dr. Frauke Tillmans, PhD, is the Research Director at Divers Alert Network (DAN), adjunct assistant professor in the Department of Biomedical Engineering at the University of North Carolina in Chapel Hill and a visiting scientist at the University of California, San Diego. She holds a Master's degree in Neuroscience, and a PhD in Human Biology. Dr. Tillmans now oversees DAN's research initiatives in diving injury and fatality monitoring, population health, and diving physiology including acute diving injuries as well as long-term health effects of extreme exposures. Throughout her career she has participated in numerous projects covering various medical aspects in recreational, professional, and military diving. Starting in 2019 when she left a position at the German Naval Medical Institute to relocate to the United States, she has become DAN's point of contact for global scientific collaborations and is in charge of DAN's research grant program and STEM-focused internship program, inspiring young scientists and prospective physicians to pursue a career in diving and hyperbaric medicine.

Xavier Vrijdag

Dr. Xavier Vrijdag, PhD, is a diving medical researcher at the Department of Anesthesiology at the University of Auckland investigating the effects of gas narcosis in divers. He has a master's degree in Technical Medicine from the University of Twente, the Netherlands in 2010, where he developed an algorithm to quantify

cerebral arterial gas embolism in the hyperbaric environment. In 2022, he completed his doctoral thesis on the effects of nitrous oxide, nitrogen, oxygen, and helium under pressure. Xavier has worked as a researcher and technical physician at the department of Diving and Hyperbaric Medicine of the Academic Medical Centre, Amsterdam, the Netherlands and as a hyperbaric technician and researcher at Deep Dive Dubai, United Arab Emirates, and is currently employed as Research Fellow at the university of Auckland, New Zealand. He is an author on 19 journal articles on the intersections of diving medicine, anesthesiology and neuroscience. Dr. Vrijdag is a member of the Dutch Professional association for Technical Physicians (NVvTG) and board member of the South Pacific Underwater Medical Society (SPUMS). He has received over 1 million USD in funding awards, and a PhD award publication from the British Journal of Sports Medicine.

Peter Witucki

Dr. Peter Witucki, MD, serves as a professor of Emergency Medicine and Hyperbaric/Diving Medicine at the University of California San Diego. He retired from the US Navy Reserves as an Undersea Medical Officer in 2017 with the rank of Captain (O-6). His clinical research is focused on Hyperbaric/Diving Medicine. He currently serves as the President of the Undersea and Hyperbaric Medical Society. He completed Emergency Medicine residency training at UC Davis in 2003 and Undersea and Hyperbaric fellowship training at UC San Diego in 2004.

Biosketches of Moderators and Planning Committee Members

Kenneth W. Kizer

Planning Committee Chair

Kenneth Kizer, MD, MPH (NAM) is a former US Navy Undersea Medical Officer and diving medical expert who is widely known as an internationally acclaimed physician executive in health system transformation. His expertise and accomplishments lie in patient safety and quality improvement, population health management, and Veterans health issues. Dr. Kizer's engineered the internationally acclaimed transformation of the Veterans Healthcare System – the nation's largest healthcare system – in the late 1990s when serving as the VA's Undersecretary for Health. This transformation implemented numerous systemic changes that produced dramatically improved quality of care, service satisfaction and operational efficiency. Dr. Kizer was also the founding President and CEO of the National Quality Forum, considered by many as the nation's premier health care quality improvement organization. Early in his career, he orchestrated California's response to the then new HIV/AIDS epidemic, established the internationally renowned California Tobacco Control Program, pioneered Medicaid managed care, and was the architect of California's statewide Emergency Medical Services system. He is the founding Director of the Institute for Population Health Improvement in the University of California Davis Health System and served as the inaugural Chief Medical Officer for the former California Department of Health Services. Dr. Kizer has the rare distinction of being an elected member of both the National Academy of Medicine (NAM) and the National Academy of Public Administration. He is an experienced Chair of NASEM's convening activities and has presided in this role on numerous occasions as part of expert panels and committees on Veteran and military health issues. He is a former member of NASEM's Board on Naval Studies, the National Roundtable on Health Care Quality, and the Board on Population Health and Public Practice. Dr. Kizer graduated with honors from Stanford University and earned his MD and MPH from the University of California, Los Angeles. He is board-certified in six medical specialties and sub-specialties, is a fellow or distinguished fellow of 12 professional societies, has authored more than 500 original articles, book chapters and other reports in the professional literature, and is the recipient of numerous national awards and recognitions.

Olujimi Ajijola

Olujimi Ajijola, MD, PhD, is an Associate Professor in the Departments of Medicine-Cardiology, and Molecular, Cellular, & Integrative Physiology at the University of California-Los Angeles (UCLA). He serves as Director of the Neurocardiology Research Program and Co-Director of the UCLA-Caltech Medical Scientist Training Program. His clinical training in internal medicine and cardiovascular diseases/cardiac electrophysiology were performed at the Massachusetts General Hospital/Harvard Medical School and at UCLA, respectively. His clinical and research interests revolve around innovative methods to control life-threatening cardiac arrhythmias by modulating the autonomic nervous system. His lab utilizes cutting edge electrical, genetic, and computational tools to examine how cardiac injury remodels the autonomic nervous system, and how this dysregulation drives arrhythmogenesis. He is also an alumnus of the

National Academies' New Voices Program, Howard Hughes Medical Institute's Medical Fellows Program, a recipient of the NIH Director's New Innovator Award (DP2), and a Young Physician Scientist Award from the American Society for Clinical Investigation. He is involved in several national initiatives to diversify the medical and scientific workforce. Dr. Ajijola received his BA with Distinction from the University of Virginia, his medical degree from Duke University, and his PhD in Molecular, Cellular, and Integrative Physiology from UCLA.

Serena Auñón-Chancellor

Serena Auñón-Chancellor, MD, MPH, is an Associate Professor of Clinical Medicine for the LSU Internal Medicine Residency Program in Baton Rouge, LA in partnership with Our Lady of the Lake Regional Medical Center where she continues to actively teach and lead hospital teams with residents and medical students. She is also the current UTMB Aerospace Medicine Residency Program Director and focuses on the training of physicians to serve this nation's space program as well as the burgeoning commercial space industry. Dr. Auñón-Chancellor maintains an active role in the Astronaut Office where she covers medical issues and provides guidance for ISS, Lunar, and Exploration-Class missions. From 2006-2009, Dr. Auñón-Chancellor served as a Johnson Space Center Flight Surgeon, where she supported medical operations for International Space Station crew members in Russia, served as the Deputy Crew Surgeon for STS-127 (2009), and as Deputy Lead for Orion - Medical Operations (2009-10). In 2009, Dr. Auñón-Chancellor was selected as one of 14 members of the 20th NASA astronaut class. She graduated in 2011 from Astronaut Candidate Training, which included scientific and technical briefings, intensive instruction in space station systems, spacewalks, robotics, physiological training, T-38 flight training and water and wilderness survival training. In 2018 during NASA Expeditions 56 and 57, where she served as Flight Engineer, her crew completed over 150 different experiments in multiple fields including: biology & biotechnology, cancer, Parkinson's, and Alzheimer's research, materials science, nuclear physics, physical sciences, and Earth science. Investigations were led into new cancer treatment methods and algae growth in space. The crew also installed a new Life Sciences Glovebox, a sealed work area for life science and technology investigations that can accommodate two astronauts. Dr. Auñón-Chancellor participated as an aquanaut in the NEEMO 20 crew in 2015, and piloted a DeepWorker 2000 submersible as part of the NASA/NOAA NEEMO 16 underwater exploration mission off Key Largo, Florida in 2021. She holds a BS in Electrical Engineering from George Washington University, an MD from the University of Texas Health Science Center at Houston, and an MPH from the University of Texas Medical Branch. She is board-certified in internal medicine and aerospace medicine. At NASEM, she serves as a member of the Standing Committee on Aerospace Medicine and the Medicine of Extreme Environments.

John Florian

John Florian, PhD, is the Scientific Director for the Navy Experimental Diving Unit (NEDU) in Panama City, Florida where he serves as the most senior scientific civilian, leading a critical unmanned and manned science and technology program to expand the U.S. military's advantage in undersea and extreme environments. Prior to his current position, Dr. Florian served as NEDU Warfighter Performance Division Head, where he led a long-term, strategic line of research to enable warfighters in extreme environments to meet current and future operational requirements. Detailed to the Pentagon in 2018 as part of a Naval Sea Systems Command program, Dr. Florian served the Chief of Naval Operations N95 and Deputy Assistant Secretary of the Navy for Research, Development, Test & Evaluation where he facilitated a better link between resource sponsors, requirements, future capabilities, and transition of novel research deliverables to support the Fleet. Dr. Florian's research has spanned spaceflight, aviation, and diving, including overall human performance and resilience, thermoregulation, environmental physiology, oxygen toxicity, and biometric monitoring. Dr. Florian holds a PhD in Integrative Human Physiology with a minor in Gerontology from the Pennsylvania State University, and Bachelor of Science in Exercise Physiology from the Florida State University.

David Fothergill

David Fothergill, PhD, is the Scientific Director and former Submarine Medicine and Survival Systems Department Head at the Naval Submarine Medical Research Laboratory, (NSMRL), Groton, CT. For the past 31 years Dr. Fothergill has conducted research in support of undersea warfighter health, readiness, and performance at the Naval Medical Research Institute (NMRI), Bethesda, MD (1992-1997) and NSMRL (1997-present). Dr. Fothergill also served as Senior Research Scientist at the Center for Research and Education in special environments, State University of New York at Buffalo from 1994 - 2009. His research interests and 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. Dr. Fothergill's education includes a BSC(Hons) in Sport Science from Liverpool John Moores university, UK, an MSC in Kinesiology from Simon Fraser University, Canada, and a Ph.D. in Occupational Biomechanics from the Royal Free Hospital School of Medicine (University of London), UK. From 1992-1994, he was a national research council resident research associate at NMRI where his research focused on diver work performance under extreme hyperbaric pressure. He is also a qualified U.S. navy trained diver.

William Hoeft, Jr.

William Hoeft, Jr., PhD, is the Fellow for Undersea Strategy at Systems Planning and Analysis (SPA), Inc., in the Washington D.C. area. He is responsible for the full range of undersea system related recommendations in support of our U.S. government national security clients. His areas of emphasis include future capabilities in manned undersea platforms, unmanned systems, weapons, sensors, operational profiles, operational and employment concepts, survivability, deterrence, stealth and defensive systems. Prior to his time at SPA, where he has been for 19 years, he served as a US submarine officer for 24 years where he operated in all theaters – including 11 deployments on four different attack submarines, and command of the USS SALT LAKE CITY (SSN-716) from 1998 to 2001. His submarine service through command included comprehensive exposure to crew health related issues including radiation health, Personnel Reliability Program, injury treatment, mental health, atmosphere control/contamination, sanitation, food service, and prospective mass casualty treatment. Presented at and served as session chair for the premier U.S. undersea technology forum. He has previously presented to the NASEM Board on Naval Studies as a technical expert in Unmanned Systems in support of the Navy Director of Submarine Warfare. He earned his BS in Systems Engineering from the US Naval Academy, his MA in National Security Studies from Georgetown University, and his PhD in Political Science and International Relations from Georgetown University.

William Johnson

William (Bill) Johnson, is the founder of a defense industry consulting practice from which he advised government, academic and industry leaders on enterprise leadership, program management, and business transformation as it relates to modernization and the acquisition of complex systems. He has over 50 years of experience in this field, including 35 years of government service. Johnson has received numerous honors and awards for his service to the Navy, including the Distinguished Civilian Engineer by both the Navy (2008) and the Naval Submarine League (2018). Johnson graduated from Cornell University with a BS(‘70) and MEE(’75) in electrical engineering. Johnson began his Navy service in 1970, serving as an Oceanographic Research Watch Officer during the Vietnam War years. After completing active duty, he served as a civilian engineer for the Naval Engineering Center in Hyattsville, MD, where he performed software certification testing for the onboard systems of the U.S.S. Virginia, the Navy’s most advanced surface ship at the time. He was subsequently recognized by Naval Sea Systems Command for his exemplary leadership over the certification of the Navy’s largest software system in operation. After successful assignments on various surface ship modernizations, Bill was promoted to system engineer with the Submarine Combat System Program Office, where he incorporated new capabilities into the submarine combat systems for acoustic and combat control. Here, he oversaw the design, development, and production of revitalization initiatives for the Navy’s submarine sonar programs. A significant transformation that Johnson envisioned and successfully led was the transition from a traditional acquisition approach to an open-system acquisition approach. This new strategy was successful in providing improvements to the Navy’s submarine sonar systems at a greatly reduced cost. Johnson’s approach has since been adopted by both Navy and DoD leadership in their published acquisition policy.

Simon Mitchell

Simon Mitchell, M.B., Ch.B., Ph.D., DipOccMed, DipAdyDHM (ANZCA), FUHM, FANZCA, is Professor and Head of the Department of Anaesthesiology at the University of Auckland Medical School, and a consultant anesthesiologist and diving physician at Auckland Hospital. He is Editor-In-Chief of Diving and Hyperbaric Medicine Journal. His primary research interests are diving medicine / physiology, and human factors in complex hazardous tasks. He is a leading technical diver using mixed gases and rebreathers to explore shipwrecks and caves, with a record that includes the world's deepest wreck dive (at the time) in 2002 and supervision of the first deep rebreather dive using hydrogen in 2023. He received the Undersea and Hyperbaric Medicine Society's highest award for scientific contributions to the field in 2010 and their 'Excellence in Diving Medicine' Award in 2016. He was conferred Fellowship of the Explorer's Club of New York in 2006, the Rolex Diver of the Year in 2015, and was ranked by Expertscape as the world's foremost expert in decompression sickness and arterial gas embolism in 2022. Dr Mitchell received his medical degree from the University of Auckland. His PhD thesis addressed gas embolism and neuroprotection in cardiac surgery, and he holds specialist qualifications in anesthesiology and diving and hyperbaric medicine.

Virginie Papadopoulou

Virginie Papadopoulou, PhD, is a Research Assistant Professor in the Department of Biomedical Engineering at UNC Chapel Hill in 2017, where her research aims to bridge the different areas dealing with bubbles and ultrasound. Her current interests lie in: a) refining the imaging and analysis of ultrasonically detected decompression emboli in the context of decompression sickness; b) using oxygen microbubbles to modulate tumor hypoxia and improve radiotherapy; and c) enhancing topical drug-delivery using phase-change contrast agents, most recently in the context of chronic wound biofilm infections. Her work has resulted in over 40 journal papers, 100 conference presentations and 17 invited presentations to date. She has been awarded the 2017 Divers Alert Network/Bill Hamilton Memorial Grant by the Women Divers Hall of Fame, the 2020 Undersea and Hyperbaric Medicine Society's "Young Scientist/Medical Doctor Award", as well as the title of Divers Alert Network Scholar since 2018, for her on-going work creating a dynamic ultrasonic assessment of decompression bubbles. She is also the recipient of the 2022 University of North Carolina Women's Leadership Council "Faculty to Undergraduate Mentoring Award". She currently serves as the Principal Investigator (PI) of three diving-related research grants awarded by the nonprofit organization Divers Alert Network (DAN) and the US Department of Defense's Office of Naval Research (ONR), mentoring one postdoctoral student, two graduate students and three undergraduates, and recently completed an ONR STEM planning grant aiming to support graduate students focused on optimizing human performance in extreme environments. Dr. Papadopoulou is also PI, or co-PI, of two early commercial development grants from the North Carolina Biotechnology Center (NCBC) and a newly funded R01 grant from the National Institute of Health (NIH) related to improving wound infection treatment using ultrasound-stimulated phase-change contrast agents. She is a physicist by background and received her PhD in Bioengineering in 2016 from Imperial College London.

David Regis

David Regis, MD, received his commission as Ensign in the U.S. Navy upon matriculation to the Uniformed Services University of the Health Sciences (USU) F. Edward Hébert School of Medicine. He completed his residency in Pediatrics in 1998 as part of the first Joint Class of the National Capital Consortium (NCC) and served his utilization tour at the USNH Guam as a Staff Pediatrician and Head of Pediatrics before returning to NCC to complete a Fellowship in Pediatric Infectious Disease. CAPT Regis completed one year as Chief of Pediatric Infectious Diseases at then National Naval Medical Center Bethesda in 2004 before taking over as Director of Clinical Trials for the Navy's Malaria Vaccine Program at the Naval Medical Research Center (NMRC) in Silver Spring, MD where he was responsible for testing one of the first adenovirus vectored malaria vaccines in humans. He then went on to complete Undersea Medical Officer training and was assigned to various Undersea Medicine research positions including Head of Biomedical Research at the Navy Experimental Diving Unit, Panama City, FL and Head of Undersea Medicine at NMRC. He was then selected for a two year tour as an Undersea Medicine Exchange Officer to the Royal Navy at the Institute of Naval Medicine in Alverstoke, UK after which he successfully screened and was assigned as the Executive Officer to the Naval Submarine Medical Research Laboratory, Groton, CT. He currently serves at the Naval Sea Systems Command as the UMO for the Navy Supervisor of Diving & Salvage (SUPSALV) as well as the Program Manager for the Deep Submergence Biomedical Development Program. He is also a voting member of the Navy Bureau of Medicine Undersea Medicine Working Group. He has taught lectures at USU in infectious diseases and diving medicine and has served as a member of the NASA Human Research Program Human Health Countermeasures Decompression Sickness Risk Standing Review Panel among other committees.

Karen Van Hoesen

Karen Van Hoesen, MD**,** is a board-certified emergency medicine physician who specializes in undersea and hyperbaric medicine. She co-founded the San Diego Center of Excellence in Diving (SDCED) and serves as Director of the UCSD Diving Medicine Clinic. Since 1998, she has served as Director of UCSD's Undersea and Hyperbaric Medicine Fellowship - one of the first fellowships in diving medicine to train physicians how to recognize and treat diving injuries and fitness to dive exams. She serves on the Scripps Institution of Oceanography Diving Control Board, has served on the board of directors for Divers Alert Network (DAN). She has a special interest and personal experience in high-altitude medicine and wilderness medicine. Dr. Van Hoesen has also served on Undersea and Hyperbaric Medical Society committees and held leadership positions at the local and national level. She has co-authored numerous research papers, book chapters and abstracts and frequently speaks to divers, instructors, scientific diving officers and physicians about all aspects of diving medicine and safety. She has been a NAUI diving instructor since 1983 and has dove on all seven continents. Her honors include the 2014 DAN/Rolex Diver of the Year Award, 1988 Our World Underwater Scholarship Recipient, and inaugural member of the Women Divers Hall of Fame. She is board certified in Emergency Medicine and subspecialty certification in Undersea and Hyperbaric Medicine. Dr. Van Hoesen earned her medical degree from Duke University School of Medicine and completed a residency in emergency medicine at UC San Diego School of Medicine.

Preventing Discrimination, Harassment, and Bullying Expectations for Participants in NASEM Activities

The National Academies of Sciences, Engineering, and Medicine (NASEM) are committed to the principles of diversity, integrity, civility, and respect in all of our activities. We look to you to be a partner in this commitment by helping us to maintain a professional and cordial environment. All forms of discrimination, harassment, and bullying are prohibited in any NASEM activity. This commitment applies to all participants in all settings and locations in which NASEM work and activities are conducted, including committee meetings, workshops, conferences, and other work and social functions where employees, volunteers, sponsors, vendors, or guests are present.

Discrimination is prejudicial treatment of individuals or groups of people based on their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws.

Sexual harassment is unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature that creates an intimidating, hostile, or offensive environment.

Other types of harassment include any verbal or physical conduct directed at individuals or groups of people because of their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws, that creates an intimidating, hostile, or offensive environment.

Bullying is unwelcome, aggressive behavior involving the use of influence, threat, intimidation, or coercion to dominate others in the professional environment.

Section 1.01 REPORTING AND RESOLUTION

Any violation of this policy should be reported. If you experience or witness discrimination, harassment, or bullying, you are encouraged to make your unease or disapproval known to the individual, if you are comfortable doing so. You are also urged to report any incident by:

- Filing a complaint with the Office of Human Resources at 202-334-3400, or
- Reporting the incident to an employee involved in the activity in which the member or volunteer is participating, who will then file a complaint with the Office of Human Resources.

Complaints should be filed as soon as possible after an incident. To ensure the prompt and thorough investigation of the complaint, the complainant should provide as much information as is possible, such as names, dates, locations, and steps taken. The Office of Human Resources will investigate the alleged violation in consultation with the Office of the General Counsel.

If an investigation results in a finding that an individual has committed a violation, NASEM will take the actions necessary to protect those involved in its activities from any future discrimination, harassment, or bullying, including in appropriate circumstances the removal of an individual from current NASEM activities and a ban on participation in future activities.

Section 1.02 CONFIDENTIALITY

Information contained in a complaint is kept confidential, and information is revealed only on a need-to-know basis. NASEM will not retaliate or tolerate retaliation against anyone who makes a good faith report of discrimination, harassment, or bullying.

Article V. Diversity, Equity, and Inclusion Statement and Guiding Principles

We, the National Academies of Sciences, Engineering, and Medicine (the National Academies), value diversity among our staff, members, volunteers, partners, vendors, and audiences. We recognize that talent is broadly distributed in society and that many perspectives enhance the quality of our work and drive innovation and impact.

We pledge to cultivate a workplace culture and climate that promotes inclusion, belonging, accessibility, and anti-racism; upholds equity; and values the participation of all who are engaged in advancing our mission.[1] By embracing the values of diversity, equity, and inclusion in our programs, institutional policies and practices, and products, we will be able to better advise the nation on the most complex issues facing society and the world.

Guiding Principles:

The following diversity, equity, and inclusion principles guide our work at the National Academies:

1. Integrate diverse perspectives and experiences into our programs, institutional policies and practices, and products.

2. Foster a culture of inclusion where all staff, members, and volunteers have full access to participation and feel welcomed, respected, valued, and a sense of belonging.

3. Approach scientific endeavors with a consideration of diversity, equity, and inclusion frameworks.

4. Cultivate mutually beneficial diverse partnerships and collaborations with a variety of communities, including, but not limited to, marginalized and underrepresented communities.

Our institutional strategy for putting these values and principles into practice are outlined in the National Academies DEI Action Plan, a comprehensive five-year plan that charts a path toward achieving our diversity, equity, and inclusion goals. The DEI Action Plan is one of many ways that we commit to systems of accountability and transparency to uphold these principles and allow for continuous learning and improvement.

Updated June 7, 2018