

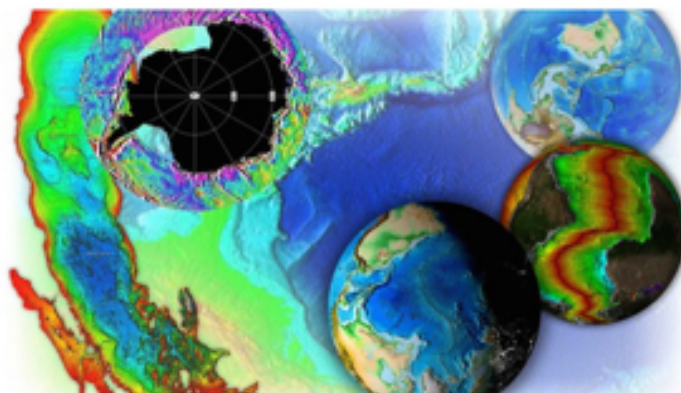
2023 Global Ocean Science Education (GOSE)

Workshop

May 23-25, 2023

Graduate School of Oceanography

University of Rhode Island



Welcome 2023 GOSE Workshop Participants!

Welcome to the fifth Global Ocean Science Education Workshop (GOSE), being held at the University of Rhode Island Graduate School of Oceanography. This year's GOSE Workshop welcomes over 65 workshop delegates from across the world. Our plenary speakers and panelists will share their knowledge on a suite of key topics related to underwater acoustics – sound in the sea. We are delighted that this year, two of our panels will be composed of early career professionals and graduate students.

Delegates will discuss the importance of integrating ocean acoustics into ocean education and ocean literacy initiatives, workforce development through an ocean acoustics microcredentials program, and furthering the goals of the global ocean science community. As the United Nations Decade of Ocean Science for Sustainable Development (the Decade) continues, delegates will also have the opportunity to learn about the Decade's endorsed Marine Acoustics Environment Program. The 2023 workshop provides the opportunity to meet colleagues from across the globe, engage in stimulating dialog, and contribute your expertise.

Since the first GOSE Workshop in 2015, our international community, focused on ocean science education within the research, policy, business, and education sectors, has grown. The GOSE Workshop is the only international workshop that brings together these different sectors with the goal to improve ocean education and workforce development.

The next two and a half days have been designed to encourage rich discussions within plenaries, panels, breakout groups, and open space time, as we explore ways to make a difference together in support of ocean education and workforce development. We will strive to meet the opportunities that the UN Decade presents as an international community and raise awareness of the science of underwater sound and related issues. It is hoped that discussions from the GOSE 2023 Workshop will provide recommendations for our individual and collaborative activities through 2030 and beyond.

The GOSE Workshop Steering Committee encourages you to build connections with each other during the workshop that will support effective ocean science education across sectors. We look forward to a productive workshop and a bright future for new international collaborations.

Kind Regards,

The GOSE Workshop Steering Committee

Gail Scowcroft, Peter Tuddenham, Tina Bishop, Kathleen Vigness Raposa, Christopher Knowlton, Liesl Hotaling, Greg DeCelles, and Ellen Bellagamba Fucile

**Many thanks to the U.S. Office of Naval Research
for supporting the 2023 GOSE Workshop**

AGENDA

The 2023 GOSE Workshop Goals are to:

1. Bring together the ocean science, education, policy, and business/industry sectors.
2. Increase knowledge and awareness of the importance of ocean acoustics/underwater sound to society.
3. Share information about the current state of knowledge and innovative technologies.
4. Identify educational strategies and industry needs to train the next generation and educate the public and support workforce development across sectors.
5. Integrate ocean acoustics into education resources for enhanced global societal ocean literacy and decision making.
6. Identify strategies and activities to support the Maritime Acoustic Environment Program of the United Nations Decade of Ocean Science for Sustainable Development.

TUESDAY, May 23, 2023

- 9:00 **Welcome and Introductions and Workshop Goals**
 Speakers: Robert Pockalny, University of Rhode Island
 Peter Tuddenham, College of Exploration
 Gail Scowcroft, University of Rhode Island
- 9:30 **Plenary I: Forefront of Ocean Acoustics Research**
 Speaker: James Lynch, Woods Hole Oceanographic Institution
- 9:50 **Panel I: Importance of Ocean Acoustics for Society**
 Moderator: Christopher Knowlton, University of Rhode Island
 Speakers: Stephen Hall, Freelance Ocean Consultancy
 Greg DeCelles, Ørsted
 Kathleen Vigness Raposa, INSPIRE Environmental
 Susan Balcirak, Naval Undersea Warfare Center
- 10:35 **Break**
- 10:55 **Plenary II: Marine Mammal Sound Production and Reception**
 Speaker: Darlene Ketten, Brown University and Woods Hole Oceanographic Institution
- 11:30 **Plenary III: Marine Fish Sound Production and Reception**
 Speaker: Clara Amorim, University of Lisbon
- 11:50 **Plenary IV: Marine Invertebrate Sound Production and Reception**
 Speaker: Louise Roberts, University of Liverpool
- 12:10 **Lunch**

- 13:10 **Breakout Group I: Integrating Ocean Acoustics into Ocean Education/Ocean Literacy Initiatives**
Example Discussion Topics:
A. Using acoustic research and data in programs for museum and aquarium audiences during the Ocean Decade, including existing programs and currently available ocean acoustics resources and materials.
B. Using ocean acoustics research and data in K-12 science, including existing programs and currently available ocean acoustics resources and materials.
C. Using ocean acoustics research and data in undergraduate education, including existing programs and currently available ocean acoustics resources and materials.
D. Using the media and social media to highlight ocean acoustics initiatives.
- 14:00 **Breakout Group I Reports**
- 14:20 **Panel II: Skills Needed by the Ocean Acoustics Workforce**
Moderator: Kathleen Vigness Raposa, Inspire Environmental
Speakers: Meme Lobecker, Kongsberg
Siobhan Niklasson, Los Alamos National Laboratory
Helen Stewart, Fugro
Lora Van Uffelen, University of Rhode Island
- 15:10 **Break**
- 15:40 **Plenary V: Introduction to Microcredentials**
Speaker: Liesl Hotaling, Eidos Education and Marine Technology Society
- 15:55 **Breakout Group II: A Framework for an Ocean Acoustics Microcredentials Program**
A. What careers would benefit from a microcredentials program in ocean acoustics?
B. What topics/content should be included for specific microcredentials?
C. What competencies are employers seeking in the ocean acoustics workforce (such as using technologies)?
D. Who could provide these programs, where could they be held, and how do people find out about them?
- 16:30 **Breakout Group II Reports**
- 16:50 **Lightning Round I: Student Presentations**
Moderator: Holly Morin, University of Rhode Island
Speakers: Hailey Davies, University of Victoria
Lauren Fritz, University of California Santa Cruz
Mark Goldwater, Woods Hole Oceanographic Institution
Tiffany Raetzelt, University of South Florida
Ashley Taylor Cook, University of Miami
- 17:30 **Adjourn**
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WEDNESDAY, May 24, 2023

- 9:00 **Welcome and Reflection**
- 9:15 **Plenary VI: The Ocean Decade's Maritime Acoustic Environment Program**
 Speaker: Kyle Becker, Office of Naval Research
- 9:35 **Plenary VII: Impacts and Mitigation Strategies**
 Speaker: Benjamin Colbert, US Navy, Infrastructure, Posture, and
 Environmental Planning Branch
- 10:15 **Break**
- 10:40 **Panel III: Strategies for Integrating Research, Education, Business and Policy**
 Moderator: Christopher Knowlton, University of Rhode Island
 Speakers: Shane Guan, Bureau of Ocean Energy Management
 Holly Morin, University of Rhode Island
 Maggie Merrill, Blue Venture Forum
 Kim Gavin, BlueIQ
- 11:20 **Breakout Group III: Actions Needed to Develop and Implement an Ocean Acoustics
Microcredentials Program**
Example Discussion Topics:
A. Who is/are the audience/audiences for a microcredentials program?
B. Who needs to be included in the development of a microcredentials program?
C. What should be the essential content ingredients of a microcredentials program?
D. Where and how should a microcredentials program be offered?
E. How can a microcredentials unit fit into existing academic programs?
- 12:10 **Breakout Group III Reports**
- 12:30 **Lunch**
- 13:30 **Plenary VIII: International Regulations Related to Anthropogenic Sound**
 Speaker: Klaus Lucke, JASCO (virtual)
- 14:00 **Panel IV: Acoustics Applications**
 Moderator: Liesl Hotaling
 Speakers: Jeff Kneebone, New England Aquarium
 Sofie Van Parijs, National Oceanic and Atmospheric Administration
 Robert McGurrin, BlueIQ
- 14:40 **Break**
- 15:10 **Lightning Round II: Early Career and Student Presentations**
 Moderator: Gail Scowcroft, University of Rhode Island
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Speakers: Danielle Goudreau, Collins Engineers, Inc.
Ian Jones, University of New Hampshire
Grant Milne, University of New Hampshire
Kelsey Rudes, National Oceanic and Atmospheric Administration
Luis Pomales Velázquez, University of Rhode Island

- 15:45 **Breakout Group IV: Developing Cross-Sector Partnerships**
Example Discussion Topics:
A. What needs might be met with cross-sector partnerships?
B. What might be some goals for cross-sector partnerships?
C. Have you found challenges to cross-sector partnerships, and if so, have you found any solutions?
D. What forum could be used to foster cross-sector partnerships?
- 16:30 **Breakout Group IV Report Out**
- 16:50 **Plenary IX: Introduction to Open Space Session**
 Speaker: Peter Tuddenham, College of Exploration
- 17:15 **Adjourn**

THURSDAY, May 25, 2023

- 9:00 **Welcome and Review**
- 9:15 **Open Space Session – Furthering the Goals of the Global Ocean Science Community**
(Examples: one group could focus on the certificate program for business and industry, another could focus on activities for the Decade)
- 10:15 **Break**
- 10:45 **Open Space Continues**
- 11:15 **Open Space Group Reports**
- 11:45 **Plenary X: Moving the Field Forward – Artificial Intelligence and Machine Learning on the Horizon**
 Speaker: Elizabeth Ferguson, Ocean Science Analytics
- 12:10 **Large Group Discussion – Reflection on 2023 GOSE Workshop and Ideas for the Future**
- 12:30 **Lunch**

PRESENTERS BIOS**Clara Amorim, University of Lisbon**

Clara Amorim (PhD) started her research in Behavioural Ecology at the University of Leicester with a Master by research (MPhil, 1994). She completed her PhD (1997) in Fish Acoustic Communication at the University of Aberdeen, under the supervision of Tony Hawkins. Since then, she has focused her research on acoustic communication in fish, eco-acoustics and the impact of anthropogenic noise on fish. She is presently an Assistant Professor at the University of Lisbon.

Susan Balcirak, Naval Undersea Warfare Center, Newport Rhode Island

Susan received a B.S. in Ocean Engineering from the United States Naval Academy in 1998 and a M.S. in Ocean Engineering from the University of Rhode Island in 2007, with a focus in underwater acoustics. She served active duty in the U.S. Navy as a Surface Warfare Officer from 1998-2004. Responsibilities included Anti-Submarine Warfare Officer on a Spruance Class Destroyer, Navigator on a Ticonderoga Class Cruiser, and Navigation Instructor at Surface Warfare Officer's School. Since 2005 she has been working as an ocean engineer at Naval Undersea Warfare Center in Newport, Rhode Island. She spent 15 years in the Sensors and Sonar Systems Department and has been the Signal Processing and Analysis Branch Head in the Undersea Weapons, Vehicles, and Defensive Systems Department for 3 years. Her team consists of a multidisciplinary group of scientists and engineers focused on the advancement of basic and applied research concepts to experiment, prototype, and deliver mature technical solutions for naval operational use.

Kyle M. Becker, Office of Naval Research

Dr. Becker is a Program Officer at the Office of Naval Research (ONR) and directs the Ocean Acoustics Program, A National Naval Responsibility (NRR). He is primarily responsible for a basic research program in ocean acoustics focused on the development of talent and knowledge that ensures US leadership in this critical area of ocean science. His other roles include coordinating and facilitating ocean sound related activities among federal agencies as co-Chair of the Interagency Working Group on Ocean Sound and Marine Life (IWG-OSML) and developing the Ocean Decade Research Program on the Maritime Acoustic Environment (OD-MAE), an endorsed activity of the United Nations Decade of Ocean Science for Sustainable Development. From June 2010 – May 2012, he was a Senior Scientist at the NATO Centre for Maritime Research and Experimentation (CMRE) in La Spezia, Italy. Prior to joining CMRE, Dr. Becker was with The Pennsylvania State University. At Penn State he had a dual appointment as an Assistant Professor of Acoustics in the Graduate Program in Acoustics, and as Research Associate at the Applied Research Laboratory. Kyle is a fellow of the Acoustical Society of America, received the A.B. Wood Medal from the Institute of Acoustics (U.K.) in 2011, and a Scientific Achievement Award from the NATO Science & Technology Organization in 2014. He earned a Ph.D. in Applied Ocean Science from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program in Oceanography and Ocean Engineering, a M.S. in Acoustics from Penn State, and a B.S. in Mechanical Engineering from Boston University.

Kristina Bishop, College of Exploration

Dr. Bishop is the Academic Director and one of the founders of the College of Exploration (<http://www.coexploration.org>) a 501 c-3 not-for-profit organization based in Potomac Falls, Virginia, USA. She has a Doctoral Degree (Ed.D.) in Higher Education and an MBA from Virginia Tech, as well as an M.A. in Education Measurement and Statistics from University of Maryland. For over 25 years, she has supported the development and implementation of interactive online learning programs for educators and scientists. She has extensive experience in research and evaluation of informal and formal science education programs, including for the National Science Foundation's In Search of Earth's Secrets and Centers for Ocean Sciences Education Excellence COSEE-Coastal Trends program, online and face-to-face teacher professional development workshops, instructional materials for National Geographic, NOAA, and PBS, and academic competitions, such as the National Ocean Sciences Bowl, QuikScience, and ThinkQuest. She has supported the College of Exploration's development of the Ocean Literacy Essential Principles and Fundamental Concepts initiative since its inception and promoted ocean literacy in Europe. Currently she is an external evaluator for the NOAA EPP Living Marine Resources Cooperative Science Center, a consortium of universities, which encourages and supports underrepresented graduate and undergraduate students to pursue careers in NOAA-mission science, particularly fisheries. She also has been conducting a 20-year ongoing educational research project for the National Ocean Sciences Bowl, tracking student competitors in their ensuing college and career choices.

Benjamin Colbert, US Navy, Infrastructure, Posture, and Environmental Planning Branch

Benjamin Colbert works for the Navy as the Chief of Naval Operations marine resources and ocean acoustics lead where he provides policy, oversight, and technical support for Navy compliance with Endangered Species Act, Marine Mammal Protection Act, other environmental resource laws. Ben additionally oversees resourcing for the Navy's monitoring and Living Marine Resources programs. Ben received his B.S. in Organizational Leadership from Thomas Edison State University and his M.S. in Environmental Science and Policy from Johns Hopkins University. He is currently pursuing a doctorate from the University of Maryland with a research focus in ecology, physiology, and anatomy of hearing and sound production of fishes (he does not recommend attempting a PhD while working full-time). Ben lives with his wife, Jenna, and six-year-old daughter, Ellie, in Alexandria, VA.

Hailey Davies, University of Victoria

Hailey Davies is a Ph.D. Candidate at the University of Victoria, on Vancouver Island, British Columbia, Canada. She studies conservation of marine fishes and invertebrates through research on rockfish barotrauma, bioacoustics in Rockfish Conservation Areas, and effects of sound on marine invertebrates. Hailey is also a collaborator on the FishSounds project (FishSounds.net) and is a lead researcher and project coordinator of FishSounds Educate. This science outreach initiative is a free educational program that aims to use the topic of bioacoustics to encourage future conservation leaders and enhance ocean literacy across Canada.

Greg DeCelles, Ørsted

Dr. Greg DeCelles is a Senior Strategic Specialist with Ørsted, working on the Global Strategic Permitting Team. Greg supports environmental monitoring for offshore wind projects by working in

partnership with leading research universities and consultancies. Greg also co-manages the Environmental Research and Development Program for Orsted. His background is in fisheries science, where he has over 15 years of experience in collaborative research, fisheries management, stock assessment, and stock identification.

Liz Ferguson, Ocean Science Analytics

Liz Ferguson is the Chief Executive Officer for Ocean Science Analytics, an ocean science research and online technical training company. She specializes in marine mammal bioacoustics research and marine spatial ecology. Ocean Science Analytics incorporates advanced technology methods in project efforts, such as deep learning for marine mammal call detection and as an early adopter for NASA's PACE (Plankton, Aerosol, Cloud, ocean Ecosystem) satellite mission. Liz founded Ocean Science Analytics in 2018 to leverage big ocean data in analytical methods, develop user-friendly tools to increase end-user interaction with ecological data, and support training of others through online technical training.

Lauren Fritz, University of California Santa Cruz

Lauren is a second-year Ph.D. student at the University of California Santa Cruz working with Dr. Ari Friedlaender in the Biotelemetry and Behavioral Ecology Lab. Her research examines how human activities influence cetacean behavior and physiology along the Western Antarctic Peninsula. For her dissertation, she is conducting a series of controlled exposure experiments to investigate if tourism operations here impact the behavior and health of foraging humpback whales. Using a combination of drone-based behavioral observations, remote biopsy collection, and acoustic recordings, she can compare various metrics like stress levels, seasonality, location, vessel type, and demographic to explore what might affect the whales' sensitivity to disturbance. Before embarking on her graduate studies, she worked as a marine mammal tourism guide in various places around the globe. In addition, she is interested in expanding the reach of her research through effective science communication, including data animation, art, and journalism.

Kimberly Gavin, BluelQ

Kimberly Gavin is a distinguished professional with over two decades of experience in strategic planning, business development, public-private partnerships, and research and development in science and technology. As CEO and Founder of BluelQ, a leading company specializing in cutting-edge blue tech solutions for biodiversity and national security challenges, Kim is an exceptional leader. With extensive collaborations in the Intelligence Community, Department of Defense, and Space sectors, Kim provides invaluable strategic guidance and drives successful outcomes through emerging technologies. Kim holds board memberships and ambassador roles in esteemed organizations such as the Association of Former Intelligence Officers, founding member of CHIEF Executive Women's Network, MIT Minority Education Program, IEEE and ACM, and has been recognized with prestigious awards, including the Raytheon Innovative Science & Technology Award and CEO Leadership Award. Prior to founding BluelQ, Kim delivered exceptional services in executive positions at STR, Raytheon BBN Technologies, and ESRI. Her career began as a Scientist and Intelligence Officer with the U.S. Government and the esteemed RAND Corporation, establishing a solid foundation at the intersection of commercial space sensing and fulfilling national

security ISR requirements. Kim holds a B.S. from Villanova University, M.S. from Boston College, National Security Studies from Georgetown University, and Executive Management Business Administration from MIT Sloan School.

Mark Goldwater, Massachusetts Institute of Technology - Woods Hole Oceanographic Institution

Mark is a second-year PhD student in the Massachusetts Institute of Technology - Woods Hole Oceanographic Institution (MIT-WHOI) Joint Program within the Electrical Engineering and Computer Science (EECS) department at MIT and the Applied Ocean Science and Engineering (AOP&E) department at WHOI. Prior to entering the Joint Program, Mark received his B.S. in Electrical and Computer Engineering from Olin College of Engineering where he enjoyed working on applications in communications systems, signal processing, and machine learning. Currently, his research focuses on augmenting the capabilities of acoustic sensors using machine learning to use in monitoring marine mammal populations.

Danielle Goudreau, Collins Engineers, Inc.

Danielle Goudreau, P.E. is a Project Manager at Collins Engineers, Inc. with a focus on waterfront engineering. She has over eight years of specialized experience for the assessment, design, and construction of marine structures including piers, wharves, bulkheads, seawalls, marinas, and shore protection structures. Through this work, Ms. Goudreau has been responsible for the completion of field surveys, condition evaluations, design of new construction and repairs, construction administration and oversight, and preparation of local, state, and federal permit applications throughout New England. Recently, Ms. Goudreau was the Environmental Permitting Lead for a large-scale pier replacement project at the U.S. Coast Guard Base Boston which required sound monitoring during construction.

Shane Guan, U.S. Bureau of Ocean Energy Management (BOEM)

Dr. Shane Guan is an oceanographer with the Environmental Studies Program of the U.S. Bureau of Ocean Energy Management (BOEM), where he works to develop, fund, and manage scientific research to inform BOEM's decision on the development of energy and mineral resources on the Outer Continental Shelf. Dr. Guan has more than 20 years of experience in underwater acoustics studies. His research interests include anthropogenic noise impacts to marine life, sound source characterization, and ambient and soundscape measurements. Dr. Guan has a Ph.D. in mechanical engineering from The Catholic University of America, a M.Sci. and a B.S. in marine biology from the University of Charleston and Nagasaki University, respectively. Dr. Guan also serves as an Adjunct Professor at The Catholic University of America. He is a member of the Acoustical Society of America and an Associate Editor for the Journal of the Acoustical Society of America and the Proceedings of Meetings on Acoustics.

Stephen Hall, Freelance Ocean Consultancy

Stephen Hall is a Wales-based ocean science, technology, and policy consultant with over 35 years' experience in a broad range of duties that have included managing the Autosub AUV science missions programme for the UK's national Oceanography Centre, work on sustained ocean observing and tsunami warning systems, and development of marine policy, including use of marine

autonomous systems, offshore renewable energy, underwater sound, marine spatial management, and UN policy on use of resources in areas beyond national jurisdiction. He was CEO of the Society for Underwater Technology 2017-2020, Vice Chair of the Intergovernmental Oceanographic Commission of UNESCO 2015-2017, and today mainly consults for industry and the Nippon Foundation - GEBCO Seabed 2030 ocean mapping project. He is interested in legal status of armed AUVs, use and impact of sound in the subsea environment, technology foresight and sustainable use of ocean resources. Steve is a Chartered Marine Scientist and a Fellow of the Institute of Marine Engineering, Science and Technology and of the Society for Underwater Technology, and a Member of the Marine Technology Society, Scottish Association for Marine Science, and Challenger Society for Marine Science.

Liesl Hotaling, Eidos Education

Liesl Hotaling is President of Eidos Education. She serves as the Project Manager of the Student Enabled Network of Sensors for the Environment using Innovative Technology (SENSE IT) and specializes in real time data education projects and hands-on STEM educational projects supporting environmental observing networks. She is the co-editor and contributor to the 2021 publication *Preparing a Workforce for the New Blue Economy: People, Products and Policies*. She serves as the Vice President for Communications and Publications for the Marine Technology Society (MTS) and is an MTS Fellow. She holds a B.S. in Marine Science, a M.A.T. in Science Teaching, and a M.S. in Maritime Systems.

Ian Jones, University of New Hampshire

Dr. Ian Jones is a postdoctoral researcher in the Center for Acoustics Research and Education at the University of New Hampshire. He uses passive acoustics to study natural sounds made and detected by fishes and aquatic invertebrates. He also studies noise from human activities such as shipping and construction, and impacts of noise on the hearing and behavior of marine animals. He is currently investigating particle motion (the sound field quantity detected by fishes and invertebrates) in underwater habitats and how it can be predicted by non-acoustic oceanographic variables, the presence of fishes and invertebrates, and human activities. Dr. Jones earned his PhD through the Massachusetts Institute of Technology-Woods Hole Oceanographic Institution Joint Program in Oceanography/Applied Ocean Science and Engineering, during which he studied coral reef soundscapes and the effects of marine construction noise on squid behavior.

Darlene R. Ketten, Woods Hole Oceanographic Institution

Dr. Darlene R. Ketten is an American Senior Scientist at the Woods Hole Oceanographic Institution. She is best known for her work on marine mammal science, the biomechanics of hearing, and hearing loss. Ketten received her B.A. from Washington University in St. Louis in 1971. In 1979, she completed her M.S. at Massachusetts Institute of Technology, and in 1985 she earned her Ph.D. from Johns Hopkins University. Ketten has been affiliated with Harvard Medical School since 1985. Since 1997, she has been affiliated with the Woods Hole Oceanographic Institution. From 2013-2015, she was a Professor of Physics at Curtin University, Australia. In 2015, she was a Fellow at the Hanse-Wissenschaftskolleg in Germany and from 2015-2016 served as a Jefferson Science Fellow in the Bureau of Near Eastern Affairs of the United States Department of State and at the US Embassy in

Berlin. Ketten is a Fellow of the American Association for the Advancement of Science and of the Acoustical Society of America. Ketten's research on hearing has raised questions about the impacts of human uses of sonar on the hearing and navigation of whales and other marine mammals.

Jeff Kneebone, Anderson Cabot Center for Ocean Life at the New England Aquarium

Jeff Kneebone is a Senior Scientist at the Anderson Cabot Center for Ocean Life at the New England Aquarium. His research focuses on numerous aspects of fish biology, ecology, and physiology, and aims to generate novel data that can directly inform marine policy and fishery stock assessments. Through his collaborations with fishery management entities and members of the commercial and recreational fishing community, Jeff hopes to foster improved fishery management and sustainability, particularly for imperiled and data poor species. He is also interested in the physical and physiological stressors experienced by fish during capture in commercial and recreational fisheries, and the development of recommendations that can reduce incidental fishing mortality. Jeff's current research focuses on a wide variety of marine fishes, including common thresher sharks, black sea bass, yellowfin tuna, bluefin tuna, and thorny skate.

Christopher Knowlton, Inner Space Center, University of Rhode Island

Christopher Knowlton is the Assistant Director in the Inner Space Center (ISC) at the University of Rhode Island Graduate School of Oceanography. Chris is a marine geologist with a background in climatology and low temperature geochemistry focused on paleoceanography of the last 1MA, particularly changes across glacial-interglacial cycles. He has conducted oceanographic research from the tropics to the poles. His work at ISC spans both operations at ISC and education projects. Chris coordinates operations with NOAA and other ship partners, as well as managing streaming video operations and cloud computing efforts at ISC. He has been working in education and outreach for more than 20 years and has been working on the award-winning Discovery of Sound in the Sea project from its beginning. Chris has worked on other international oceanographic education projects on topics from deep sea biology to tropical storms and hurricanes.

Meme Lobecker, Kongsburg

Meme Lobecker has worked in the seafloor mapping arena since 2002, spending over 1,300 days offshore in various capacities as a shallow water hydrographer for SAIC, a geophysicist for subsea cable and offshore energy infrastructure planning and inspections and offshore mining exploration, and finally spending 12 years as a mapping team and cruise leader for NOAA Ocean Exploration operations on NOAA Ship *Okeanos Explorer*. In January of 2022, she started in a new role as Technical Sales Manager at Kongsberg Discovery, supporting the deepwater mapping and remote services needs of the US academic and research fleets. She resides in Kittery, ME and maintains an office at the University of New Hampshire's Center for Coastal and Ocean Mapping / Joint Hydrographic Center.

Klaus Lucke, JASCO Applied Sciences

Dr. Klaus Lucke is a marine biologist working as a senior scientist for JASCO Applied Sciences. He holds a PhD for his work on 'Auditory studies in marine mammals' from the Christian-Albrechts-University in Kiel, Germany. Klaus is a specialist on sensory biology in marine animals and brings in

his experience in assessing bio-acoustical aspects of underwater sound on marine fauna. His main responsibilities at JASCO are to provide scientific guidance on hearing and noise-induced effects in marine animals in all aspects of project-related work. For over ten years, Klaus has been involved in the development and international harmonization of regulation of underwater noise.

James F. Lynch, Woods Hole Oceanographic Institution

Dr. James Lynch obtained his B.S. in Physics from the Stevens Institute of Technology in 1972 and his Ph.D. in Physics from the University of Texas at Austin in 1978. He currently holds the position of Senior Scientist Emeritus at the Woods Hole Oceanographic Institution. Dr. Lynch is a Fellow of the Acoustical Society of America (ASA), a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), former Editor-in-Chief of the IEEE Journal of Oceanic Engineering, and current Editor-in-Chief of the Journal of the Acoustical Society of America. He is recipient of the Walter Munk Award (2009), the Oceanic Engineering Society Emeritus Award (2019), and the ASA Gold Medal (2021). His primary hobby is amateur astronomy, and he is the current president of the Cape Cod Astronomical Society. He is also a (returning) amateur pianist trying to relearn Chopin's A-flat Ballade and Mozart's K332 Sonata, among others.

Robert McGurrin, BlueIQ

Robert McGurrin is Founder and CTO of BlueIQ, a new blue tech startup building low power passive acoustic sensors to protect biodiversity. BlueIQ is developing technology that can detect, classify, and track marine mammals and other underwater objects of interest. Rob is an experienced technical leader in all phases of applied research and development programs from prototype to production. Using a combination of entrepreneurial and DoD research experience, Rob has transitioned several R&D projects into innovative field-able products. Rob's experience in technical development and team leadership spans across multiple domains, including low power wearable HR sensing at WHOOP, low SWaP-C acoustic localization of snipers at Raytheon/BBN (Boomerang Warrior X and Boomerang Air), and low power distributed underwater sensor network DARPA research at STR. Rob received his Bachelor of Science degree in Electrical Engineering from Tufts University and holds Master of Science degrees in Electrical Engineering from The Georgia Institute of Technology and Engineering Management from the Tufts Gordon Institute.

Holly Morin, URI Inner Space Center/Ocean Exploration Cooperative Institute

Holly is the Manager of Education Programs at the University of Rhode Island's Inner Space Center, located at the Graduate School of Oceanography. Her work involves the development, coordination, and promotion of interactive, content-rich, ocean science websites and public engagement initiatives, including the Discovery of Sound in the Sea (DOSITS) project, as well as ocean science exploration camps, interpretive programs, professional development programming, and live, interactive ocean science broadcasts. In 2019, she provided at-sea, undergraduate mentorship as part of the *Northwest Passage Project* and hosted ship-based interactions from the Arctic (check out the *Frozen Obsession* documentary on PBS). That same year, she was lucky to then sail and conduct ship-based broadcasts from the Antarctic's Palmer Station. Holly also coordinates a variety of projects for the Ocean Exploration Cooperative Institute, including the *Bridge to Ocean Exploration* experiential learning program. Holly graduated from the University of New Hampshire with a BS in

Marine Biology and a minor in Art and her Master's Degree in Wildlife and Fisheries Science from Texas A&M University, using satellite telemetry to study the diving behavior and movement patterns of young Steller sea lions in Prince William Sound, Alaska. In addition to being a marine biologist, informal educator, and science communicator, Holly is a creative that loves to dabble with oil pastels, an avid gardener, and the happy Mom of an 11- and 8-year-old.

Maggie L. Merrill, Blue Venture Forum

Maggie L. Merrill, Program Manager, Blue Venture Forum, connects Blue Tech entrepreneurs with the investment community via pitch sessions, mentoring, and networking with resource providers. For the past 10 years, she has been focused on the emergent marine renewable energy space. She has organized, spoken at, and reported on multiple technical conferences on ocean wind, wave, and tidal power in New England and Washington D.C. She also serves as communications manager for the Marine Renewable Energy Collaborative. She holds a degree from Boston College in English and Environmental Studies, and a Masters in Public Policy from UMass Dartmouth in marine science and technology policy. Merrill was the founding editor and publisher of Marine Technology Reporter and the founding director of the Marine and Oceanographic Technology Network. She has held positions at WHOI in marine policy and at MIT in the Sea Grant Program in fisheries outreach and offshore technology transfer. She is an avid sailor, boater, bicyclist and also enjoys the chilly slopes of New Hampshire. Merrill holds a USCG masters license 25 ton inland waters; inspected vessels.

Grant Milne, University of New Hampshire

Grant received his B.S. in Conservation Biology and B.A. in Biology from Thiel College in 2019. He is currently a Ph.D. candidate in the Department of Biological Sciences and Center for Acoustics Research and Education at the University of New Hampshire. His dissertation research involves exploring the relationship between passive acoustic monitoring and marine metagenomics as tools for observing and comparing the acoustic environments of coastal marine habitats in the Gulf of Maine. Grant is also a research diver at UNH, assisting projects that involve eelgrass restoration, engineering equipment testing, and measurement of light levels in New Hampshire's Great Bay.

Siobhan Niklasson, Los Alamos National Laboratory

Siobhan Niklasson is a Ph.D. student at New Mexico Tech and a Graduate Research Assistant in the National Security Earth Sciences group at Los Alamos National Laboratory. She holds a Master of Science in Geophysics from UC Santa Barbara and a Bachelor of Science in Geological and Environmental Sciences from Stanford University. Her research projects include seafloor seismic noise modeling and hydroacoustic propagation in the Arctic Ocean. Siobhan spent many years working in environmental education, including 12 years at Pajarito Environmental Education Center (PEEC) in Los Alamos, where she was the Director of Education, providing outreach to students on a variety of natural science topics and building community partnerships throughout New Mexico. She lives in Los Alamos, New Mexico with her husband and two teenagers.

Luis Pomales Velázquez, University of Rhode Island

Luis is a 5th year PhD Candidate at the Graduate School of Oceanography at URI. He works under Dr. Lora Van Uffelen at the Ocean Platform Experiments and Research in Acoustics laboratory

studying the use of autonomous underwater vehicles for long-range underwater acoustic experiments in the western Arctic Ocean. Luis hopes to finish his dissertation work by the Spring of 2024 and join in current international efforts to study transarctic experiments studying the acoustic propagation changes due to the Arctic's fast-paced warming.

Tiffany Raetzel, University of South Florida

Tiff Raetzel is currently a master's student in the College of Marine Science at the University of South Florida working in the Fisheries and Ecosystems Ecology Lab. She is also a part of the college's Education and Outreach Team where she is working on developing a Marine Acoustics lab activity to be implemented at a local oceanography summer camp for eighth grade girls.

Louise Roberts, University of Liverpool

Dr. Roberts is a Lecturer (Assist. Prof.) in Marine Biology at the University of Liverpool, UK. Her research explores aquatic biotremology and bioacoustics, with emphasis on behavioral and sensory ecology. Her particular interests include investigating potential impacts of anthropogenic stimuli, and sensitivities of animals to substrate-borne and acoustic stimuli. In 2020 she received the A.B. Wood Medal from the Institute of Acoustics (UK) for her contribution to underwater acoustics research. Prior to Liverpool Louise was a postdoctoral researcher at Cornell University (NY, USA) where her research regarded passive acoustic monitoring of below-ground invertebrates within the context of environmental management. Before Cornell, at Dartmouth College (NH, USA), her research focused on terrestrial crustacean bioacoustics with field seasons based in Costa Rica. In 2018 she was a Scientist-In-Residence Fellow at Shoals Marine Laboratory (University of New Hampshire and Cornell University, USA) where she mentored undergraduate students in island-based projects and undertook research focused on crustaceans and noise in the intertidal. Dr Roberts received her PhD from the University of Hull, UK, which regarded the effects of noise upon the behavior of fishes and invertebrates in both field and laboratory conditions. She has an M.Sc. from Bangor University (Wales, UK) and a B.Sc. from Durham University (UK).

Kelsey Rudes, Knauss Marine Policy Fellow, US Naval Observatory

Kelsey is a NOAA Sea Grant Knauss Fellow, placed with the Office of the Oceanographer of the Navy. In her role as the International and Interagency Policy Liaison, she works within the Naval Deputy to NOAA/Interagency Coordination Branch. This Branch sits at the nexus of operational environmental data, federal decision making, and national security, serving as a mechanism for oceanographic policy for the Navy. Kelsey graduated from the University of Washington with master's degrees in International Studies and Marine and Environmental Affairs.

Gail Scowcroft, University of Rhode Island

Gail Scowcroft, an ocean scientist and education professional, is the Associate Director of the Inner Space Center at the University of Rhode Island Graduate School of Oceanography, a national facility for ocean science research and education. She served as the Executive Director of the *Consortium for Ocean Science Exploration and Engagement (COSEE)*, an independent global network of ocean science research and education institutions. Gail also served as the Director of the Alliance Office for the National Science Foundation's *Climate Change Education Partnership*, a network of U.S. climate

change education programs. For the first 18 years of her career, Gail conducted ocean science research focused on climate reconstruction and global climate change. For the last 20 years, she has also served as principal investigator for ocean and climate science education programs, including the *Discovery of Sound in the Sea* project. She is the co-founder of the Global Ocean Science Education Workshops that bring together ocean scientists, education professionals, business leaders, and policymakers. In addition to service on several U.S. and E.U. advisory committees, Gail served a four-year term on the U.S. Ocean Research Advisory Panel under President Obama.

Helen Stewart, Fugro

Helen Stewart is a member of The Hydrographic Society of America (THSOA) and a subject matter expert in hydrography for Fugro in Houston, USA. In her eclectic career, she has worked on projects starting with nautical chart hydrography for NOAA and deep-ocean geological research as a graduate student to deep-water geohazard surveys and unexploded ordnance removal surveys for offshore wind energy. In 2020, she introduced a novel hydrographic survey method using multispectral satellite imagery for detecting dangers to surface navigation, which she is now developing for structural health monitoring surveys in inland waterways. She has a Bachelor of Science in Mathematics from the University of Texas and a Master of Science in Marine Science from the University of Cape Town. Helen firmly believes that “Y’all Means ALL” and is grateful to be in a position in her life to support others as they have supported her. Since July of 2021, she has been involved in the IHO Empowering Women in Hydrography Project, including writing two Notes for the International Hydrographic Review on the subject. She has since expanded her advocacy on the subject of the first Note on women’s safety to other professional societies and universities in the United States and Canada. In her personal time, Helen is an artist, a cyclist, a gardener, and a summertime windsurfer.

Peter D Tuddenham, College of Exploration

Peter D Tuddenham is the cofounder and president of the College of Exploration. Since 1991 the College of Exploration has engaged over 18,000 adult students from around the world in online workshops, courses, and conversations on ocean, earth, and systems topics. He has participated in program, project, and educational evaluations. He is a co-founder of the European Marine Science Education Association. Peter was one of the co-organizers of the first ocean literacy guides in 2002. He has a diverse career in the UK and USA. He served in the British and U.S. Army. He has worked in business, ethics, and education in academia, human resources, strategy, and public affairs in Fortune 500 companies in the consumer goods and public utilities sectors. He was president of the International Society for the Systems Sciences 2018 to 2019 and is currently a trustee of the American Society for Cybernetics.

Sofie Van Parijs, NOAA Northeast Fisheries Science Center

Dr. Sofie Van Parijs leads the Northeast Passive Acoustic Research Group at the NOAA Northeast Fisheries Science Center in Woods Hole, MA. As a bioacoustician, Dr. Van Parijs’ experience has spanned from micro-bats to marine mammals and includes work from the tropics to the Arctic. In 2006, she established the Passive Acoustics Research Program at NOAA Fisheries aimed at using novel acoustic technologies to study the ecology of marine animals and to drive conservation and

management needs throughout the western Atlantic Ocean. Her group's international collaborations range from Australia to Hong Kong and Europe and the group works primarily on endangered whales, dolphin, soniferous fish, and soundscapes. Recently their focus has been on innovative research, providing direction for renewable energy development and strengthening their real time acoustic applications.

Lora Van Uffelen, University of Rhode Island

Dr. Lora Van Uffelen is an Assistant Professor in the Department of Ocean Engineering at the University of Rhode Island and has a joint appointment in the Graduate School of Oceanography. She is a recipient of the 2023 Early Career Faculty Research and Scholarship Excellence Award at URI in Life Sciences, Physical Sciences, and Engineering. She has a PhD in Oceanography from Scripps Institution of Oceanography at the University of California San Diego. Dr. Van Uffelen is interested in acoustic propagation and the effects of oceanographic variability at long ranges. She is particularly interested in acoustic receiving on mobile platforms and the use of long-range acoustic signals for underwater positioning. Her recent work focuses on sound-propagation in the Arctic. In addition to mentoring graduate students, she teaches undergraduate and graduate courses in underwater acoustics and ocean engineering.

Kathleen J. Vigness-Raposa, INSPIRE Environmental

Dr. Vigness-Raposa is a Principal Scientist with INSPIRE Environmental, specializing in bioacoustics, spatial modeling, and impact assessments of anthropogenic activities in the marine environment. She is co-PI of the award-winning educational project "Discovery of Sound in the Sea" (dosits.org) with colleagues at the University of Rhode Island's Graduate School of Oceanography. Over the course of her career, she has authored numerous reports assessing the impacts of anthropogenic activities on marine mammals, sea turtles, and fishes; predicted marine mammal distributions and abundances; led passive underwater acoustic monitoring teams on research cruises; and taught graduate-level courses at the University of Rhode Island. Dr. Vigness-Raposa participated in the acoustics and electromagnetic studies for the Rhode Island Ocean Special Area Management Plan (Ocean SAMP), as well as the Bureau of Ocean Energy Management studies of the underwater sound from construction and operation of offshore wind facilities. Dr. Vigness-Raposa has more than twenty years of experience in environmental studies and communicating complex scientific topics to multiple stakeholder audiences.

DELEGATES

The 2023 GOSE Workshop has delegates attending from Bangladesh, Bermuda, Canada, England, France, India, Portugal, South Africa, and the United States.

Alejandro Acosta, FWC / Florida Fish and Wildlife Institute / SFRL

Joseph Altongy, Village Green Charter School

Clara Amorim, University of Lisbon

Kayla Anatone-Ruiz, McLaughlin Research Corp

Ivar Babb, University of Connecticut

Susan Balcirak, Naval Undersea Warfare Center

Kyle Becker, Office of Naval Research

Ellen Bellagamba Fucile, INSPIRE Environmental

Tina Bishop, College of Exploration

Aimee Bonanno, UMass Boston

Susan Bryant, Center for Student Coastal Research

Benjamin Colbert, US Navy, Infrastructure, Posture, and Environmental Planning Branch

Ashley Taylor Cook, Rosenstiel School of Marine, Atm. and Earth Science

Jackie Culotta, Sea Grant

Hailey Davies, University of Victoria

Greg DeCelles, Orsted

Sasha Dines, Seasearch Research and Conservation

Rachel Dragos, Cape Cod Regional STEM Network at Cape Cod Community College

Elizabeth Ferguson, Ocean Science Analytics

Jill Freidberg, University of Washington Bothell

Lauren Fritz, University of California Santa Cruz

Kim Gavin, BlueIQ

Mark Goldwater, Woods Hole Oceanographic Institution

Danielle Goudreau, Collins Engineers, Inc.

Shane Guan, BOEM

Stephen Hall, Freelance Ocean Consultancy

Liesl Hotaling, Eidos Education and Marine Technology Society

Ian Jones, Center for Acoustics Research and Education, University of New Hampshire

Jessica Keller, Florida Fish and Wildlife Conservation Commission

Darlene Ketten, Brown University

Jeff Kneebone, New England Aquarium

Christopher Knowlton, Inner Space Center, University of Rhode Island

Brad Lisle, Foxfire Interactive

Meme Lobecker, Kongsburg

David Loiselle, McLaughlin Research Corp

Klaus Lucke, JASCO

Jim Lynch, Woods Hole Oceanographic Institution
Robert McGurrin, BluelQ
Alexandra Merkle Raymond, Bermuda Institute of Ocean Sciences
Maggie Merrill, Blue Venture Forum
Grant Milne, University of New Hampshire
Kristin Miltner, Tremology Lab
Christophe Mocquet, Université Côte d'Azur
Holly Morin, Inner Space Center, University of Rhode Island
Elizabeth Murphy, ThayerMahan
Swarna Muthkrishnan, Clean Ocean Action
Siobhan Niklasson, Los Alamos National Laboratory
Kaitlin Noyes, Bermuda Institute of Ocean Sciences
Ken Pearce, Center for Cellular Construction
Luis Pomales Velazquez, University of Rhode Island
Tiffany Raetzelt, University of South Florida
Louise Roberts, University of Liverpool
Kelsey Rudes, NOAA
Melissa Ryan, Global Foundation for Ocean Exploration
Anthony Salazar, ThayerMahan
Subramanian Sankaranarayanan, Sthiti Bioacoustics Private Limited
Laela Sayigh, Woods Hole Oceanographic Institution/Hampshire College
Gail Scowcroft, Inner Space Center, University of Rhode Island
Michael Smith, Center for Coastal and Ocean Mapping
Helen Stewart, Fugro
Sawako Sugimura, Providence School District
Amoshaun Toft, University of Washington, Bothell
Peter Tuddenham, College of Exploration
Mohammad Muslem Uddin, Department of Oceanography, University of Chittagong
Sophie Van Parijs, NOAA
Kit van Wagner, Seaworthy Ventures LLC
Lora Van Uffelen, University of Rhode Island
Kathy Vigness Raposa, INSPIRE Environmental

RESOURCES

Links to Associated Content on the Discovery of Sound in the Sea Website

The DOSITS website has close to 500 pages of content on a variety of topics related to underwater sound. Below are some links to content that is related to the GOSE Workshop agenda. There are many more pages of information in addition to the links below. A full exploration of the website can be conducted at www.dosits.org.

Importance of Ocean Acoustics for Society

<https://dosits.org/people-and-sound/navigation/>

<https://dosits.org/people-and-sound/fishing/how-is-sound-used-to-locate-fish/>

<https://dosits.org/people-and-sound/communication/how-is-sound-used-to-communicate-underwater/>

<https://dosits.org/people-and-sound/communication/how-is-sound-used-to-transmit-data-underwater/>

<https://dosits.org/people-and-sound/research-ocean-physics/how-is-sound-used-to-measure-temperature-in-the-ocean/>

<https://dosits.org/people-and-sound/research-ocean-physics/how-is-sound-used-to-measure-global-climate-change/>

<https://dosits.org/people-and-sound/research-ocean-physics/how-is-sound-used-to-measure-currents-in-the-ocean/>

<https://dosits.org/people-and-sound/research-ocean-physics/how-is-sound-used-to-measure-waves-in-the-surf-zone/>

<https://dosits.org/people-and-sound/study-weather/how-is-sound-used-to-measure-rainfall-over-the-ocean/>

<https://dosits.org/people-and-sound/examine-the-earth/how-is-sound-used-to-explore-for-oil-and-gas/>

<https://dosits.org/people-and-sound/national-defense/how-is-sound-used-to-find-submarines/>

<https://dosits.org/people-and-sound/national-defense/how-is-sound-used-to-monitor-and-defend-harbors/>

<https://dosits.org/people-and-sound/people-and-sound-summary/>

Marine Mammal Sound Production and Reception

<https://dosits.org/animals/sound-production/how-do-marine-mammals-produce-sounds/>

<https://dosits.org/animals/sound-reception/marine-mammals-hear/>

Marine Fish Sound Production and Reception

<https://dosits.org/animals/sound-production/how-do-fish-produce-sounds/>

<https://dosits.org/animals/sound-reception/how-do-fish-hear/>

Marine Invertebrate Sound Production and Reception

<https://dosits.org/animals/sound-production/how-do-marine-invertebrates-produce-sounds/>

<https://dosits.org/animals/sound-reception/how-do-marine-invertebrates-detect-sounds/>

Integrating Ocean Acoustics into Ocean Education/Ocean Literacy Initiatives

<https://dosits.org/resources/>

Impacts and Mitigation Strategies

<https://dosits.org/animals/effects-of-sound/determine-if-a-sound-affects-a-marine-animal/>

<https://dosits.org/animals/effects-of-sound/potential-effects-of-sound-on-marine-mammals/>

<https://dosits.org/animals/effects-of-sound/potential-effects-of-sound-on-marine-fishes/>

<https://dosits.org/animals/effects-of-sound/potential-effects-of-sound-on-marine-invertebrates/>
<https://dosits.org/animals/effects-of-sound/moderate-or-eliminate-the-effects-of-human-activities/>
<https://dosits.org/animals/effects-of-sound/anthropogenic-sources/>

International Regulations Related to Anthropogenic Sound

<https://dosits.org/decision-makers/ocean-policies/>
<https://dosits.org/resources/resource-categories/meetings/decade/>
<https://dosits.org/decision-makers/resources/>

Acoustics Applications

<https://dosits.org/decision-makers/webinar-series/2021-webinar-series/webinar-passive-acoustic/>
<https://dosits.org/decision-makers/webinar-series/2020-webinar-series/passive-acoustics-data/>
<https://dosits.org/glossary/passive-acoustics/>
<https://dosits.org/people-and-sound/investigate-marine-animals/active-acoustics-fisheries/>
<https://dosits.org/people-and-sound/investigate-marine-animals/how-is-sound-used-to-study-the-distribution-of-marine-fishes/>

LOGISTICS

- Any questions or issues can be brought to the staff members at the registration table or any of the steering committee members during the meeting.
- Daily Transportation: For delegates who are not driving, a bus will be available at 8:20 am each morning outside the Hampton Inn for transportation to campus and at the close of the day for transportation back to the hotel.
- Wireless Internet Access: From your device's WiFi settings, choose the "URI_Open" WiFi network. There is no password required to access this network. Most devices do not prompt for a login. If you are asked for a login, choose "guest." URI also offers another network "eduroam" if your institution supports it, and you can login with your institution's credentials.
- Breaks and Lunches: Refreshments at the breaks and lunches will have vegetarian, vegan, and other dietary choices only for delegates who have requested these options prior to the workshop. Please do not take one of these options if you have not specifically requested it.
- Dinners: Delegates are on their own for dinners. There are several restaurants within South County Commons (within walking distance of the hotel). A list of these choices can be found at <https://southcountycommons.com/category/food/>. There are also many restaurants within a short drive of the hotel.
- Water: A filtered water station is located in the hallway behind the women's restroom where you can fill your water bottles.
- Building Map: Meeting rooms are highlighted on the map below.

