

The 2nd KULOS Symposium

Ocean Research and its Application for a Sustainable Society

Program

2:00 pm- **Opening Remarks**

2:15 pm- **Dr. Christopher BASSETT**
Applied Physics Laboratory, University of Washington

2:45 pm- **Prof. Hiroshi KAWAI**
Research Center for Inland Seas, Kobe University

3:15 pm- **Simon GEERLOFS**
Board Chair, Washington Maritime Blue, Pacific Northwest National Laboratory
Rachel ARONSON
Quiet Sound Program Director, Washington Maritime Blue

3:45 pm- **Discussion**

4:00 pm- **Closing Remarks**

Marine Energy Research & Development for a Sustainable Future

Christopher Bassett

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Associate Director, Pacific Marine Energy Center

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Marine energy resources including tidal and river currents, waves, and offshore wind and solar represent a vast supply of largely untapped renewable energy. With the exception of offshore wind, there has been relatively little development to harness these renewable resources due to their comparatively high costs, which are driven primarily by technical challenges. In this presentation, I will present an overview of marine energy resources, specifically current (tidal and riverine) and wave, and developments in technology to harness them. The remainder of my talk will focus on University of Washington (UW) efforts with related to marine energy that include foundational research (laboratory and numerical studies), prototype development and testing of marine energy converters and associated technologies (e.g., energy storage, end-user technology), environmental impacts studies, and social factors. In doing so I will describe the unique resources and capabilities at UW by highlighting, at a high-level, clusters of research and their relationship to marine energy development. In keeping with the 2nd KULOS Symposium, this discussion will be framed around the United Nations' Sustainable Development Goals and the role that our collective body of research can play in developing a sustainable society.



Christopher Bassett is a researcher/engineering at the Applied Physics Laboratory at the University of Washington (APL-UW). Following his PhD work studying underwater noise in high-energy environments suitable for marine energy development he was a Postdoctoral Scholar Fellow at Woods Hole Oceanographic Institute focused on high-frequency acoustic scattering applications. From 2015-2019 he worked at the Alaska Fisheries Science Center (U.S. National Marine Fisheries Service) where he focused on technologies in acoustic trawl surveys. He returned to APL-UW in 2019 where he has split his efforts between acoustic studies and applied research related to marine renewable energy. Among other roles, he currently he serves as an Associate Director for the Pacific Marine Energy Center and as the Convener for the IEC TC-114 effort to establish standards for measuring radiated noise from marine energy converters.

Application of the Macroalgal Culture Collection for Blue Carbon technology

Hiroshi Kawai

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The carbon captured and stored by marine algae and seagrasses is called ‘blue carbon’, and together with ‘green carbon’ captured and stored by land plants, it is considered a promising countermeasure against global warming. Carbon fixation using marine macroalgae (seaweeds) is especially promising for Japan, which is surrounded by the sea on all sides, with a long rocky coastline and a centuries-long tradition of seaweed cultivation. However, there are many restrictions on the installation of seaweed cultivation facilities for the purpose of blue carbon capture in Japan’s coastal areas, as they may frequently interfere with existing sea surface uses such as ship transport, fisheries, and mariculture. On the other hand, new offshore wind power generation facilities currently under consideration in various regions of Japan are planned so as to avoid such interference. In other words, offshore windfarms have high potential as excellent seaweed cultivation sites. In addition, the creation of new seaweed-bed ecosystems will be beneficial and provide various ecosystem services.

Kobe University has one of the world’s largest macroalgal culture collections at the Research Center for Inland Seas (KU-MACC; Kobe University Macroalgal Culture Collection). KU-MACC provides culture strains under the umbrella of the National BioResource Project (NBRP) in collaboration with the Microbial Culture Collection of the National Institute of Environmental Studies (NIES). KU-MACC principally holds subcultures and cryo-preserved unialgal culture strains of macroalgae (green, red and brown algae). More than 1,100 strains of about 300 species in 35 orders, covering a broad range of macroalgal lineages, are maintained and are available for distribution. The Kobe macroalgal culture collection is a valuable resource for selecting the most suitable seaweed species and strains for cultivation in the target coastal areas. Using the facilities installed for offshore wind power generation, we can successfully implement large-scale seaweed mariculture for biomass production and carbon fixation.



Hiroshi Kawai is a Professor Emeritus of Kobe University and is currently working as a Project Professor at the Kobe University Research Center for Inland Seas (KURCIS). After receiving a D.Sc. from Hokkaido University’s Graduate School of Science in 1983, he obtained his first position there as an Assistant Professor and Lecturer, moving to the Faculty of Science, Kobe University as an Associate Professor in 1993. In 1995, he joined the newly established KURCIS, and was its Director from 1997 until his retirement in 2020. His major research topics have been life histories, molecular systematics and genomics of brown algae and related taxa; long-term monitoring and restoration of coastal ecosystems; and biogeographical studies of introduced seaweeds. He has been a council member of the Asian Pacific Phycological Association since 2003 and its President (2017 and 2020), supporting various activities highlighting the importance of seaweeds in carbon sequestration in the region.

An Introduction to Washington Maritime Blue And Research Partnerships to Support the Blue Economy

Simon Geerlofs

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Washington Maritime Blue is a non-profit, strategic alliance formed to accelerate innovation and sustainability in support of an inclusive blue economy. With a mission to implement Washington State's Strategy for the Blue Economy delivered by Governor Jay Inslee's Maritime Innovation Advisory Council, Maritime Blue is a partnership between industry, public sector, research & training institutions, and community organizations. Maritime Blue works to create a world-class, thriving, equitable and sustainable maritime and ocean industry through knowledge sharing, joint innovation, entrepreneurship, commercialization, business and workforce development.

Pacific Northwest National Laboratory (PNNL) advances the frontiers of knowledge supporting the US Department of Energy's missions for sustainable energy, fundamental science, and national security. PNNL researchers collaborate with academia in fundamental research and with industry to transition technologies to market. PNNL manages DOE's only Coastal Science laboratory, located in Sequim, WA and partners closely with Maritime Blue to connect our ocean and coastal research and test beds to opportunities for a sustainable, equitable, and profitable blue economy.

This talk will introduce Maritime Blue and describe how its cluster model supports partnerships across industry, research, community organizations, and the public sector to address challenges in realizing the triple-bottom line goals of the blue economy. From the perspective of one of Maritime Blue's founding members, the talk will describe how partners derive value from Maritime Blue's cluster model, and how research partners like PNNL are able to better define research needs through interaction with the Maritime Blue community.



Simon Geerlofs is a senior advisor at Pacific Northwest National Laboratory's (PNNL) Marine and Coastal Research Laboratory specializing in partnerships, policy, and community engagement in support of energy innovation in the Blue Economy. Before his employment at Mr. Geerlofs served as a legislative assistant to Senator Maria Cantwell, working closely with Congress, constituents, agencies, and others to enact effective marine policy. Simon has a master's degree from the University of Washington School of Marine Affairs and served as a John A. Knauss Marine Policy Fellow in 2006.

Protecting Southern Resident Killer Whales from the Acoustic and Physical Impacts of Large Commercial Vessels

Rachel Aronson

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The waters of Washington State are critical habitat for the endangered southern resident killer whales. Only 73 of these whales remain in the wild. These killer whales swim, rest and forage for fish in these waters. Underwater noise is identified by Canada and the United States as one of the main threats to southern resident killer whales due to its interference with their ability to hunt, navigate, and communicate.

The **Quiet Sound program** was created with the goal of reducing the acoustic impacts of large commercial vessels on these endangered whales in Washington. To do this, a coalition of federal, state, tribal, port, maritime industry, scientist, and NGO representatives developed several strategies, such as a trial voluntary slowdown in Admiralty Inlet and north Puget Sound. During the trial slowdown, large commercial vessels are encouraged to slow down when safe and operationally feasible to do so. By slowing down, large vessels reduce their underwater noise output. Quieter waters give orcas better opportunities to hunt and communicate with their pod.

Quiet Sound is collecting data on underwater noise reduction and vessel speeds during this trial. Quiet Sound's scientific research will lay the groundwork for improved habitat quality for the endangered southern resident killer whales and a more sustainable "Blue Economy" or maritime economy in Washington.



Rachel Aronson is the Quiet Sound Program Director. Rachel holds an M.M.A. from the University of Washington's School of Marine and Environmental Affairs, as well as a B.A. in Biology and Hispanic Studies from the University of Pennsylvania. She brings experience in connecting with stakeholders to inform decisions about how to manage natural resources, such as endangered species, and develop effective, durable policies.