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Sciences
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24th Annual
ROGER REVELLE COMMEMORATIVE LECTURE

Making Waves and Charting New Paths

A conversation with Dr. Kathryn Sullivan and
Dr. Margaret Leinen, with introductions by
Dr. D. James Baker and moderation by Taylor Goelz.

May 19, 2023 · 5:30 pm ET



The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. John L. Anderson is president.

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The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

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DEAR LECTURE PARTICIPANT

On behalf of the Ocean Studies Board of the National Academies of Sciences, Engineering, and Medicine, we would like to welcome you to the 24th Annual Roger Revelle Commemorative Lecture. This lecture was created by the Ocean Studies Board in honor of Dr. Roger Revelle to highlight the important links between the ocean sciences and public policy.

TONIGHT'S LECTURE

This evening, we welcome you to a fireside chat with two leading oceanographers, Dr. Margaret Leinen and Dr. Kathryn Sullivan, moderated by Taylor Goelz, a senior program manager at the Aspen Institute. The discussion will focus on their pioneering careers.

SPONSORSHIP

The Ocean Studies Board thanks the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the National Science Foundation, the Office of Naval Research, and the U.S. Geological Survey. This lecture series would not be possible without their generous support.

We hope you enjoy tonight's event.

Claudia Benitez-Nelson

Chair, Ocean Studies Board

Susan Roberts

Director, Ocean Studies Board

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MARGARET LEINEN

Dr. Margaret Leinen is the director of the Scripps Institution of Oceanography and the vice chancellor for Marine Science at the University of California, San Diego. She is an ocean biogeochemist and paleoceanographer whose research includes the study of ocean carbon cycling and the role of the oceans in climate. Dr. Leinen is currently the co-chair for the Decade Advisory Board for the United Nations Decade of Ocean Science for Sustainable Development. During 2017 and 2018 Dr. Leinen was a U.S. Department of State Science Envoy for the oceans to Latin America and the Pacific. She served as the assistant director for geosciences at the National Science Foundation from 2000 to 2007. She has also served as the president of the American Geophysical Union, the president of The Oceanography Society, and the chair of the American Association for the Advancement of Science Section on Atmospheric and Hydrospheric Science. She is a Fellow of all three societies and an elected member of the American Academy of Arts & Sciences.



Rick Buchanan Photography

KATHRYN SULLIVAN

Dr. Kathryn Sullivan is an oceanographer and astronaut.

She is currently a member of the President's Council of Advisors on Science and Technology and a senior fellow at the Potomac Institute. She has served as an Ambassador at Large for the Smithsonian National Air & Space Museum. In 1978, Dr. Sullivan joined the National Aeronautics and Space Administration (NASA) as a Mission Specialist Astronaut, and she is a veteran of three shuttle missions, having spent more than 500 hours in space. While at NASA she also served as a mission manager, in-flight scientist, and chief of the Astronaut Office's Mission Development Branch. For her contributions, Dr. Sullivan was awarded the Medal for Outstanding Leadership, Exceptional Service Medal (twice), and Spaceflight Medal (three times). Following her service at NASA, Dr. Sullivan served as the chief scientist at the National Oceanic and Atmospheric Administration (NOAA), the president and the chief executive officer of the Center of Science and Industry, the Undersecretary of Commerce for Oceans and Atmosphere and NOAA administrator, among other roles. While at NOAA, Dr. Sullivan launched an innovative partnership with five major cloud service providers to make NOAA's data accessible to scientists and innovators. Dr. Sullivan is a member of the National Academy of Engineering, the American Academy of Arts & Sciences, the National Academy of Public Administration, the Association of Space Explorers, the Explorer's Club, the Society of Woman Geographers, the Naval Reserve Association, and the Girl Scouts USA. She is also a Fellow of the American Association for the Advancement of Science, the American Institute of Aeronautics and Astronautics, and the American Meteorological Society.

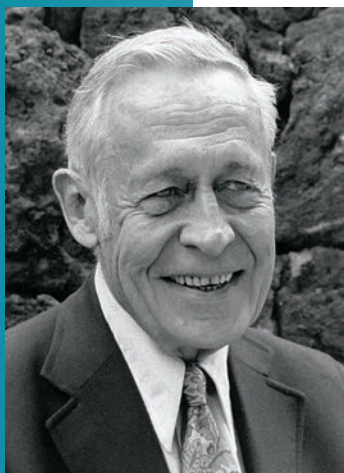


TAYLOR GOELZ

Taylor Goelz is the senior program manager of ocean and climate for the Aspen Institute's Energy & Environment Program. At the Aspen Institute, Goelz is part of the Shipping Decarbonization Initiative team that is partnering with leading organizations and companies from around the world, tapping into a vast network to drive the transition to zero-emission maritime shipping and decarbonize one of the most important sectors of the global economy.

Goelz is also the host of *The Ocean Decade Show* podcast on the American Shoreline Podcast Network, a monthly source of behind-the-scenes information featuring guests from around the world about the United Nations Decade of Ocean Science for Sustainable Development 2021–2030. Goelz developed the podcast concept while working as the inaugural Ocean Decade John A. Knauss Marine Policy Fellow with National Oceanic and Atmospheric Administration Research in 2020; today it is an endorsed Action of the United Nations Ocean Decade.

Goelz holds both an M.S. and an M.P.P. from the William & Mary and Virginia Institute of Marine Science dual degree program. She received her bachelor's degree in environmental studies from the University of San Diego. She lives in the Washington, DC, metro area.



The Ocean Studies Board is proud to present the 24th Annual Roger Revelle Commemorative Lecture.

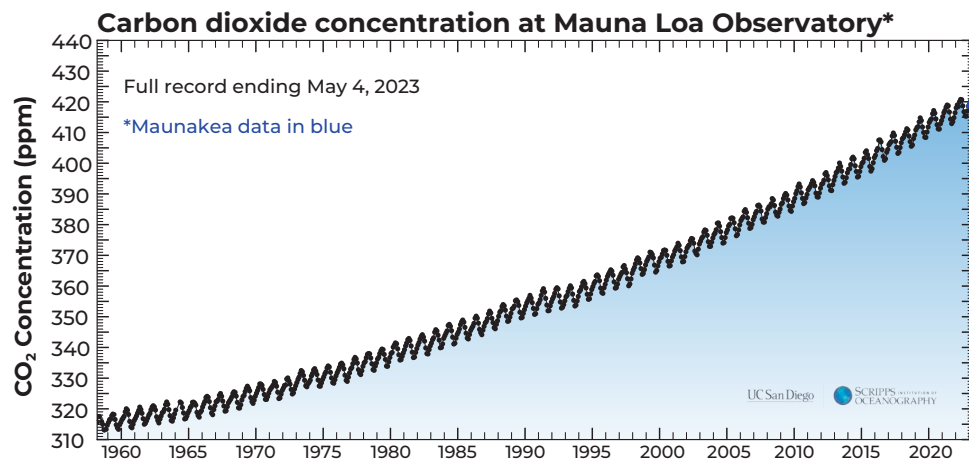
This lecture provides an opportunity to share work occurring at the intersection of public policy and science, continuing Revelle's legacy of scientific research that advances knowledge and provides critical information on issues of importance to society.

Revelle was a pioneer in oceanography who over his 50-year career pursued innovative research and created a vision that still influences the field of oceanography to this day. A strong proponent of science communication and public policy, Revelle was a leader in encouraging the scientific community to devote time to address the "long-range problems of society" (Day, 2000, quoting Revelle, 1957). Revelle conducted his graduate work at the Scripps Institution of Oceanography and earned his degree in 1936. After a year's study in Norway, Revelle returned to

Scripps where he worked as an instructor and researcher until he was called up for service in the U.S. Navy. During his military career Revelle helped to persuade the Navy to create the Office of Naval Research (ONR), not only to focus on instrumentation but also to support basic research in oceanography. In 1946, Revelle was appointed the first head of ONR's geophysics branch and 2 years later he returned to Scripps where he was appointed the director in 1950.

During his directorship, Revelle initiated and supported a transformative decade at Scripps, expanding research laboratories, institutes, and programs. Most importantly, he championed at-sea expeditions that revealed a number of surprising findings. Indeed, Revelle commented that it was "difficult to go to sea during the decade without making a discovery, because there was still so much to learn" (Day, n.d.). One notable example was the discovery of heat flow through the ocean crust, an indication of mantle convection and seafloor spreading that provided an empirical foundation for the theory of plate tectonics. For this and other contributions to geophysics, Revelle was elected to membership in the National Academy of Sciences (NAS).

Under Revelle's leadership, Scripps was designated a participant in the Atmospheric Carbon Dioxide Program for the International Geophysical Year of 1955. The recruitment of scientists to Scripps, such as Hans Suess and Charles Keeling, created a nexus of innovative research in carbon cycling. With Hans Suess, Revelle published a seminal paper, "Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades," which demonstrated atmospheric carbon dioxide was increasing as a consequence of fossil fuel consumption (Revelle and Suess, 1957). In 1958, Revelle supported the first continual measurement of atmospheric carbon dioxide, an effort led by Charles Keeling, that resulted in the long-term record of CO₂ in air samples from the summit of Mauna Loa on the island of Hawaii (see figure below). These measurements have tracked the accumulation of CO₂ in the atmosphere, a time



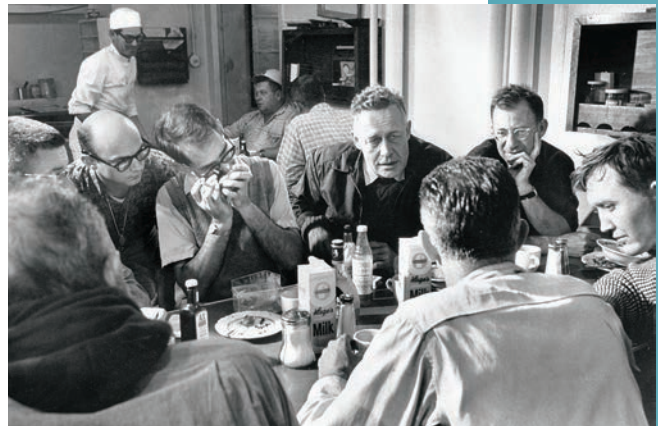
SOURCE: Scripps Institution of Oceanography at the University of California, San Diego.

series that continues to be central to research on global climate change. Revelle's contributions to oceanography were recognized by the NAS with the 1963 Agassiz Medal, one of the nation's highest honors for oceanography.

Revelle brought the issue of increasing carbon dioxide levels before the public and spearheaded efforts to investigate the mechanisms and consequences of climate change. Revelle left Scripps to take on influential policy positions, serving as the science advisor to the U.S. Department of the Interior (1961–1963) and then becoming the first director of the Center for Population Studies at Harvard (1964–1976). In 1974 he became the president of the American Association for the Advancement of Science (AAAS). Revelle's view on the relationship between science and policy is captured in this quote from his election as AAAS president:

In our times science, technology, and politics are inextricably related. But the AAAS should not act as a lobbyist for any particular position. Instead, it should try to ensure that political issues that have a scientific component are squarely faced and rationally examined in light of all knowledge. Scientists can and should immerse themselves in politics, but they should not claim any peculiar political virtue because they are scientists. (Thomas, 1973)

Revelle's commitment to science policy is evident in his extensive contributions to the work of the NAS. Revelle served as a member of the Ocean Studies Board and its predecessor (Ocean Sciences Board) from 1983 to 1987. He also served on the Board on Atmospheric Sciences and Climate (1982–1986) and contributed to numerous NAS activities, such as the U.S. Committee on the International Geosphere-Biosphere Program. He served as a committee member for several influential National Academies' studies, including the Panel on Carbon Dioxide, the Panel on Sea Level Change, and the Ocean Climate Research Committee. In addition to his considerable contributions to the U.S. scientific enterprise, Revelle strongly supported international scientific efforts. In 1957, Revelle organized the Special Committee on Oceanic Research (now the Scientific Committee



SOURCE: Munk, 1997. Copyright 1997, National Academy of Sciences, U.S.A.

on Oceanic Research [SCOR]) and was named its first president. He subsequently spearheaded the International Indian Ocean Expedition, one of the first large oceanographic expeditions mounted by the international community.

The Ocean Studies Board initiated the Roger Revelle Commemorative Lecture in 1999. The Ocean Studies Board was interested in increasing outreach to the broader policy community and decided to host a public lecture on ocean science and policy. By choosing to honor Revelle, a former member, the Ocean Studies Board recognized his enduring commitment to making the connections between science and policy. Over the more than two decades of the lecture, speakers from a wide range of disciplines have embodied Revelle's commitment to providing science to inform critical policy decisions. Each of the lectures has been published in *Oceanography* magazine, and in recent years, the lectures have been recorded and made available for viewing online (<https://www.nationalacademies.org/our-work/revelle-lecture>).

In keeping with Revelle's interest in the role of carbon dioxide in climate change, the first lecture hosted by the Ocean Studies Board was given by Peter Brewer, whose talk was titled *Contemplating Action: Storing Carbon Dioxide in the Ocean*. Although that lecture was given 24 years ago, the topic of CO₂ sequestration remains a focus of intense interest as researchers explore various strategies to capture excess CO₂ from the atmosphere to mitigate global warming. Notably, in 2022 the Ocean Studies Board published the report *A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration* that has garnered considerable attention.

Since that first lecture, the Ocean Studies Board has invited a broad spectrum of speakers to take the lectern for the annual Roger Revelle Commemorative Lecture. The topics have ranged from ocean exploration to ocean management, highlighting the work of social and natural scientists. For the 100th meeting of the Ocean Studies Board, the 24th lecture will focus on the power of exploration and discovery by two pioneering women in the ocean sciences, Dr. Kathryn Sullivan, former NASA astronaut and former National Oceanic and Atmospheric Administration administrator, and Dr. Margaret Leinen, director of the Scripps Institution of Oceanography and vice chancellor for marine science at the University of California, San Diego. We invite you to listen to their stories in this first episode chat moderated by Taylor Goelz, senior program manager of ocean and climate at the Aspen Institute's Energy and Environment Program and host of *The Ocean Decade Show* podcast. Their stories will illuminate how personal motivation, a wealth of optimism, and a thirst for discovery has led these women pioneers to explore the frontiers, ranging from the remote depths of the ocean to the vastness of space.

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ROGER REVELLE COMMEMORATIVE LECTURE SPEAKERS

1st	1999	Peter Brewer
2nd	2000	Shirley Pomponi
3rd	2001	Marcia McNutt
4th	2002	Michael Orbach
5th	2003	Admiral James Watkins
6th	2004	Richard Alley
7th	2006	Roger Pielke, Jr.
8th	2007	Ken Caldeira
9th	2008	Michael Freilich
10th	2009	Paul Falkowski
11th	2010	Jane Lubchenco
12th	2011	Nancy Rabalais
13th	2012	Eddie Bernard
14th	2013	John Walsh
15th	2014	David Karl
16th	2015	Susan Lozier
17th	2016	Phillip Clapham
18th	2017	Dawn Wright
19th	2018	Jeffrey Bolster
20th	2019	Lisa Levin
21st	2020	Chelsea Rochman
22nd	2021	Harriet Harden-Davies and Alfredo Giron-Nava
23rd	2022	John Dabiri
24th	2023	Kathy Sullivan and Margaret Leinen

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