




2020 Annual Report

CELEBRATING 90 YEARS OF EXCELLENCE IN OCEAN
DISCOVERY, INNOVATION, AND EDUCATION



WOODS HOLE
OCEANOGRAPHIC
INSTITUTION

A full-page photograph of a massive glacier wall, likely Perito Moreno, with a small boat carrying several people in red life jackets on the water in the foreground. The text "OUR OCEAN. OUR PLANET." is overlaid in white, bold, sans-serif font. A short yellow horizontal line is positioned below the first few letters of the word "OUR" in the first line.

OUR OCEAN. OUR PLANET.



OUR FUTURE.

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Cover: Postdoctoral scholar Robert Lamb swims through a school of striped salema. Alejandro Perez-Matus © WHOI Left: On the way home from a research expedition in the Beaufort Sea, a science party explores the glacier in Aialik Bay, Alaska. Peigen Lin © WHOI

A Message from the Board Chair and the President

Twenty-twenty was an extraordinary year at the Woods Hole Oceanographic Institution (WHOI). Who would have predicted that we would mark our 90th Anniversary with a virtual gala on a platform called Zoom in the middle of a pandemic? But, as with everything we did this year, we navigated stormy seas with courage and respect, and pivoted to play by new rules. We also continued to carry forward the legacy of the young men and women who have come from all over the world to Woods Hole, Massachusetts to dedicate their lives to understanding our ocean.

This legacy that has continued throughout WHOI history will continue in the face of whatever future challenges we face. Ocean science has never been more important as humanity strives to understand its impact on the ocean and how we might protect and use it more sustainably for generations to come.

Oceanography was in its youth when the Institution was founded. Despite the myriad discoveries made in the last 90 years, many of which took place at WHOI, our discipline is still in its formative period. Led by advances in technology and autonomy, we are likely at the dawn of the greatest age of ocean exploration—one that will produce insights that alter and improve the quality of life on Earth.

Interdependence and resilience have characterized WHOI from the beginning. Our seaside village is home today to the largest collection of oceanographers anywhere on Earth, studying the biology, chemistry, and physics of the ocean. This was not an accident, as an excerpt from the Report of the Committee on Oceanography of the National Academy of Sciences from April 1930 makes clear:

“... with every advance in our knowledge of the sea making this interdependence more and more apparent, it is not likely that we shall soon see any general abandonment of this concept of Oceanography as a mother science, the branches of which, though necessarily attacked by different disciplines, are intertwined too closely to be torn apart.”

And so, in 2020, we expressed our gratitude to Mark Abbott on his retirement as the tenth director of WHOI. During his tenure, he provided steady leadership and created a strong foundation to propel the Oceanographic into the future. Then we set to work to create a bold new vision for even greater engagement on many of the most complex and important challenges facing humanity today, including sustainable fisheries, climate and weather, and pollution. A vision that

We thank our supporters, scientists, engineers, and staff for persevering with us during a year of great uncertainty

is additive to an already great mission, but that calls for a problem-solving approach like never before. A vision that is fully committed to diversity, equity, and inclusion.

The response to this new vision has been phenomenal. In 2020, in the face of a worldwide pandemic, WHOI's revenue was \$272 million. This is thanks to our ardent supporters, including individuals, foundations, corporations, and government grants. It is also a tribute to our ongoing research, engineering, and education excellence, as well as strategic advancement efforts that have elevated WHOI's profile as an international ocean leader.

We are especially grateful to our trustees, life trustees, and corporation members, who doubled down on their support and ambassadorship. Other WHOI members also played a role, including our WHOI-New York, WHOI-New England, WHOI-Dallas, and WHOI-National Chapters as well as our Fye Society members, 1930 Society Members, Associates, and others.

The discoveries and decisions we make in the next decade will likely determine what the ocean—and our planet—will look like for centuries to come. WHOI is at the forefront of this effort, even as we carry on the important tradition of educating the next generation of ocean scientists and engineers. Our seaside village remains a vital, creative, and thriving global community united by a passion and love for the ocean and a belief in the power of science to shape a better world for future generations.

We thank our supporters, scientists, engineers, and staff for persevering with us during a year of great uncertainty. We hope you enjoy reading about the achievements of 2020 in the pages that follow, knowing that everything WHOI accomplished this year was as challenging as it has ever been and a tribute to the remarkable people who are committed to our ocean, our planet, and our future at a time when it matters most.

Onward!



David Scully
Board Chair



Peter de Menocal
President and Director



2020

RESEARCH HIGHLIGHTS

WHOI science and engineering spanned the globe and revealed crucial knowledge about the ocean's influence on our climate, the health of marine and human life, and the impacts of marine pollution using innovative tools of our own creation. COVID-19 presented difficult challenges, but through careful protocols, WHOI scientists, engineers, and mariners prevailed. Through their perseverance, WHOI continued to break new ground in the name of our ocean, our planet, and our future. Here are some of their findings.



WHOI RESEARCHER DIVES TO CHALLENGER DEEP

In June, WHOI scientist Ying-Tsong (Y.T.) Lin became the 12th person in history and the first person of Asian descent to visit the deepest part of the ocean, Challenger Deep. He traveled 6.8 miles down with Caladan Oceanic's Victor Vescovo in the submersible *Limiting Factor*. Lin is an acoustic scientist who is studying how sound propagates in the ocean. The research conducted during the dive, and in Dr. Lin's shipboard experiments, promotes the understanding of sound refraction in the ocean and how acoustic communication and geolocation may be improved at extreme ocean depths.

WHOI WELCOMES NEW PRESIDENT AND DIRECTOR PETER DE MENOCAL

In October, just in time to celebrate WHOI's 90th anniversary (see back pages), Peter de Menocal took the helm as WHOI's eleventh president and director. Previously, he was Thomas Alva Edison/Con Edison Professor in the Department of Earth and Environmental Sciences at Columbia University's Lamont-Doherty Earth Observatory and in 2015 became the founding director of Columbia's Center for Climate & Life. A marine geologist and paleoclimatologist, de Menocal's research uses deep-sea sediments as archives of how and why Earth's ocean and climate have changed in the past in order to predict how they may change in the future. His new vision for WHOI includes a more solutions-based approach to science, increased collaborations and partnerships, and a commitment to Diversity, Equity, and Inclusion at WHOI and in Oceanography.

NORTH ATLANTIC RIGHT WHALES ARE IN MUCH POORER CONDITION THAN THEIR SOUTHERN COUNTERPARTS

Using drones and aerial photogrammetry, WHOI scientists and their colleagues learned that endangered North Atlantic right whales are in much poorer body condition than their counterparts in the southern hemisphere. The scientists measured the body length and width of individual right whales in four regions around the world, then compared body condition of individual North Atlantic right whales with individuals from three increasing populations of Southern right whales: off Argentina, Australia, and New Zealand. The study revealed that individual North Atlantic right whales—juveniles, adults, and mothers—were all in poorer body condition than individual whales from the three populations of Southern right whales.



WHOI scientist Ying-Tsong (Y.T.) Lin emerges from the deep-sea submersible *Limiting Factor* following his historic dive to the deepest part of the ocean, Challenger Deep, with Caladan Oceanic's Victor Vescovo on June 22, 2020. (Photo © Mike Moore, EYOS Expeditions)

An aerial view of an adult North Atlantic right whale and calf. North Atlantic right whales are in much poorer condition than their southern counterparts Photo: WHOI, NOAA Permit #17355

WHOI SCIENTIST PART OF EPIC ARCTIC MISSION

WHOI scientist Carin Ashjian collaborated in the largest polar expedition in history, the MOSAiC Project. The year-long project took place aboard the German icebreaker *Polarstern*, which drifted through the Arctic Ocean—trapped in ice and taking the closest look ever at the Arctic as the epicenter of global warming. Hundreds of researchers from 20 countries participated. The data gathered will help take global climate research to a completely new level.



CAN SEAWEED POWER THE FUTURE AND PROVIDE A LOW-EMISSION ALTERNATIVE TO FOSSIL FUELS?

Marine aquaculture holds great promise to meet the world's growing energy needs. Demand for energy is increasing by 1% to 2% each year, driven by a growing population and increasing economic development with about 90% of our energy currently coming from finite natural resources—oil and gas—whose extraction and use contribute to climate change. Biofuels made from marine algae and seaweeds show promise as a low-emission alternative to fossil fuels and they are less intensive to grow than corn and sugarcane.

WHOI scientist and engineer Erin Fischell and research specialist Scott Lindell worked to demonstrate how to sustainably scale up marine biofuel and make it economically viable. Fischell led the development of technologies to enable autonomous underwater vehicles (AUVs) to monitor kelp farms using acoustic sonars, cameras, and environmental sensors. Lindell and his team have been growing, evaluating, and crossbreeding strains of sugar kelp, with the goal of developing high-yield varieties that are also

resistant to ocean warming. The Lindell Lab is also helping to develop novel large-scale demonstration seaweed farms in Alaska, Florida, and Puerto Rico.

OCEAN TWILIGHT ZONE PROJECT CONTINUES TO YIELD GROUNDBREAKING KNOWLEDGE

The Ocean's "Biological Pump" Captures More Carbon than Expected

In a paper published in *Proceedings of the National Academy of Sciences*, WHOI scientists and colleagues showed that the efficiency of the ocean's "biological carbon pump" has been drastically underestimated, with implications for future climate assessments. The scientists demonstrated that the depth of the sunlit area where photosynthesis occurs varies significantly throughout the ocean. This matters because the phytoplankton's ability to take up carbon depends on the amount of sunlight that is able to penetrate the ocean's upper layer. By taking account of the depth of the euphotic, or sunlit zone, the authors found that about twice as much carbon sinks into the ocean per year than previously estimated.



Economic Value of the Studying Ocean “Biological Carbon Pump” is \$500 Billion

In a study published in the journal *Science of the Total Environment*, WHOI put an economic value on the benefit of research to improve knowledge of the biological carbon pump and reduce the uncertainty of ocean carbon sequestration estimates. If the science leads to policy decisions that mitigate the effects of climate change, the global economic benefit of studying the carbon pump is \$500 billion, said the paper’s lead author lead author Di Jin of WHOI’s Marine Policy Center.

The Woods Hole Oceanographic Institution Ocean Twilight Zone Project is funded by the Audacious Project housed at TED.

\$8.3 MILLION AWARD TO WHOI EXTENDS OBSERVATIONAL RECORD OF CRITICAL CLIMATE RESEARCH

The National Science Foundation (NSF) awarded WHOI scientists \$8.3 million to extend the life of the Overturning in the Sub-polar North Atlantic Program (OSNAP) in a key location of Earth’s ocean-climate system. The award was

part of a \$15.5 million grant to four U.S. institutions that will help add four years to the record being assembled by the observatory. Increased data is essential to grasping the ocean’s role in our climate.

A COMPREHENSIVE LOOK AT MARINE POLLUTION’S IMPACTS

Human-produced marine pollution is widespread, getting worse and, in most countries, poorly controlled with the vast majority of contaminants coming from land-based sources. That is the conclusion of a study by an international scientist coalition that scrutinized the sources, spread, and impacts of ocean pollution worldwide. The study is the first comprehensive examination of the impacts of ocean pollution on human health. It was discussed at the Monaco International Symposium on Human Health & the Ocean in a Changing World, convened in Monaco and online by the Prince Albert II de Monaco Foundation, the Centre Scientifique de Monaco, and Boston College.



LESSONS FROM DEEPWATER HORIZON

In a 2020 review paper published in *Nature Reviews Earth & Environment*, WHOI marine geochemists and their colleagues shared the following lessons learned from studying the Deepwater Horizon spill:

- Some coastal ecosystems around the Gulf of Mexico recovered, but in areas such as deep-sea coral communities, the oil, gas and dispersants combined with other stressors to create long-lasting impacts;
- Certain microbes consumed oil, gas, and dispersants in marine ecosystems; and
- Weathering on the ocean surface, particularly photo-oxidation, changed the oil composition but reduced the effectiveness of dispersants applied to the surface.



STUDY RECONSTRUCTS ANCIENT STORMS TO PREDICT CHANGES IN A CYCLONE HOTSPOT

Intense tropical cyclones are expected to become more frequent as climate change increases temperatures in the Pacific Ocean. But not every area will experience storms of the same magnitude. WHOI research published in *Nature Geosciences* demonstrated that tropical cyclones were actually more frequent in the southern Marshall Islands during the Little Ice Age, when temperatures in the Northern Hemisphere were cooler than they are today.

The researchers reconstructed the history of tropical cyclones in the southern Marshall Islands over the last 3,000 years. The western North Pacific is the world's most active zone for tropical cyclones but has been under-studied compared to the North Atlantic. This means that changes in atmospheric circulation, driven by differential ocean warming, heavily influence the location and intensity of tropical cyclones.

ANTARCTIC ICE SHEET LOSS EXPECTED TO AFFECT FUTURE CLIMATE CHANGE

A new WHOI-led climate modeling study that explored the impacts of accelerated ice melt from the Antarctic Ice Sheet (AIS) on future climate reported that a future collapse of the West Antarctic Ice Sheet could dramatically cool the southern hemisphere by up to 10 degrees Celsius. Significantly, this cooling reduces the projected rise in global temperature by up to two degrees Celsius. While the predicted future warming may sound like good news, researchers caution that serious warming and sea level rise will still occur with unabated greenhouse gas emissions, which will impact coastal communities and ecosystems worldwide.

MULTI-INSTITUTIONAL GRANT SUPPORTS FLEET OF ROBOTIC FLOATS

The National Science Foundation awarded a five-year, \$53 million grant to a consortium of ocean-research institutions to build a global network of 500 robotic biochemical sensors. WHOI is a partner in the project, known as the Global Ocean Biogeochemistry Array. Other partners include leader Monterey Bay Aquarium Research Institute, the University of Washington, Scripps Institution of Oceanography, and Princeton University. The array will measure critical indicators of ocean health, including temperature, salinity, oxygen concentration, pH, nitrate concentration, chlorophyll, and light levels from the surface to 2,000 meters depth. WHOI will oversee the construction and deployment of floats in the Atlantic Ocean with academic and commercial partners.

2020 EDUCATION HIGHLIGHTS

WHOI's educational programs were heavily impacted in 2020 by the COVID-19 situation. Undergraduate, graduate, and postdoctoral researchers and programs were all affected. Course instruction and both formal and informal meetings were held remotely. Many research projects shifted to focus on data analysis, and students and postdocs took advantage of this time to write up results as they waited for labs to reopen and cruises and fieldwork to be rescheduled. While learning and doing research remotely was challenging, there were some unexpected benefits of virtual formats. Here are some highlights from this unusual academic year.

THE MIT-WHOI JOINT PROGRAM (JP) IN OCEANOGRAPHY/APPLIED OCEAN SCIENCE AND ENGINEERING

Program Description: A five-year doctoral degree program, or 27-month master's degree program (for U.S. Naval Officers), that combines the strengths of WHOI and MIT to provide research and education opportunities in ocean science and engineering disciplines.

Joint Program elements, including classes, went remote in March 2020. The transition was successful, aided by the JP's experience with teaching over the VideoLink to reach students at both MIT and WHOI. The use of Zoom meetings stimulated more virtual face-to-face interactions and provided models for increased interaction in post-pandemic times. Many of the students modified their research plans to focus on data analysis or computational studies. By summer, some of the students returned to labs and/or were able to do fieldwork, using appropriate safety precautions, and undergoing quarantine prior to research cruises. A benefit of the pandemic adjustments was the high attendance at virtual thesis defenses.

THE 2020 WHOI SUMMER STUDENT FELLOWSHIP PROGRAM

Program Description: A 10-week ocean science and engineering research experience for undergraduates, carried out remotely due to COVID-19.

Students: A diverse group of 26 rising seniors in Science, Technology, Engineering, and Mathematics (STEM)

The 2020 Fellows were admitted in March 2020, then WHOI quickly pivoted to a remote format. WHOI's Academic Programs Office purchased and mailed needed laptops, hard drives, and equipment for remote lab work to the students; WHOI staff and students provided 15-hour R and Python workshops; several postdocs and JP students provided MATLAB tutorials; and the virtual summer lecture series featured researchers telling the stories of their career paths, a highlight of the program. Virtual mid-summer reports and poster sessions were a great success and fourteen of the students went on to attend and present their research at fall 2020 national conferences held virtually.

POSTDOCTORAL RESEARCHERS

Postdoctoral Researchers engaged in WHOI research for some portion of the year: 30 Postdoctoral Scholars, 22 Postdoctoral Fellows**, and 53 Postdoctoral Investigators***

These typically on-campus researchers adapted to the COVID-19 situation in several ways: some shifted their project focus towards analysis; some were still able to participate in research cruises and fieldwork while following necessary quarantine protocols; and, by summer, some were able to get back into labs.

**Awarded competitively and funded with endowment funds and other scholarship*



In February 2020, just prior to the shutdown, 2019 Summer Student Fellows attended Ocean Sciences 2020 in San Diego, California and presented results of their research.

*funding sources; **Funded through competitive awards from external agencies, foundations, and foreign countries; ***Funded by grants from external sources that are part of the research base in each department*

RECRUITMENT AND DIVERSITY SUCCESS

The Academic Programs Office (APO) enhanced its efforts to recruit members of underrepresented groups into the ocean sciences using traditional advertising, social media, and enlisting help from JP alumni, JP students, postdocs, faculty, and WHOI Board and Corporation Members. The virtual nature of many national meetings and workshops allowed WHOI APO staff and JP students and postdoctoral researchers to reach wider audiences (e.g., at SACNAS - *Society for Advancement of Chicanos/Hispanics and Native Americans in Science*, 2020). In 2020, 65% of the 26 participating undergraduates in the WHOI Summer Student Fellowship Program and 35% of the 34 incoming graduate students to the MIT-WHOI Joint Program in Oceanography/Applied Ocean Science and Engineering, were from underrepresented groups in the ocean sciences. In fall 2020 there were 151 Joint Program students in the five disciplines of Biological Oceanography (29), Chemical Oceanography (36), Marine Geology and Geophysics (20), Physical Oceanography (24), and Applied Ocean Science and Engineering (42). The JP students continued their proactive recruiting efforts, helping to create a video now posted on the MIT-WHOI Joint Program website. Also,

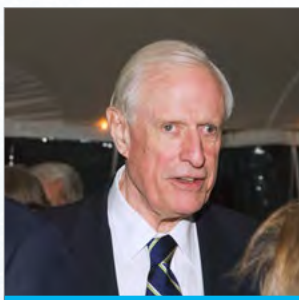
increased efforts to recruit diverse postdoctoral applicants in fall 2020 yielded positive results. Five of 14 postdoctoral scholars for the 2021 cohort were from underrepresented groups in the ocean sciences.

DOHERTY DIVERSITY-EQUITY-INCLUSION FACULTY ADVISOR APPOINTMENTS

In the fall of 2020, Vice President for Academic Programs and Dean Meg Tivey and President and Director Peter de Menocal appointed two new Doherty Diversity-Equity-Inclusion Faculty Advisors: Dr. Lauren Mullineaux, Senior Scientist in the Biology Department and Dr. Adam Subhas, Assistant Scientist in the Department of Marine Chemistry and Geochemistry. To address WHOI's DEI goals, Adam is coordinating efforts across departments and the institution to increase the diversity of invited seminar speakers, working with the Workplace Climate Committee and Committee for Diversity and Inclusion to bring in speakers to report on gender and racial bias and present on efforts for culture change in STEM; Lauren is focusing on bridging transitions for undergraduates, and for postdoctoral researchers transitioning to faculty positions, through longitudinal mentoring. With support from the Academic Programs Office, Lauren and Adam are each devoting one month of time each year for two years to collaborate and move the needle on this important WHOI priority.

IN MEMORIAM

SADLY, WHOI LOST TOO MANY BELOVED FRIENDS, LEADERS, AND SUPPORTERS IN 2020. THEY ARE DEEPLY MISSED. PLEASE JOIN US IN REMEMBERING THEM FONDLY FOR THEIR EXTRAORDINARY GENEROSITY AND THEIR SERVICE TO WHOI AND THE OCEAN.



ARTHUR YORKE ALLEN, LIFE TRUSTEE, 32 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed

“Arthur was a true gentleman, generous and dedicated to WHOI. He is sorely missed across the institution.”

—Mark R. Abbott, WHOI President and Director Emeritus

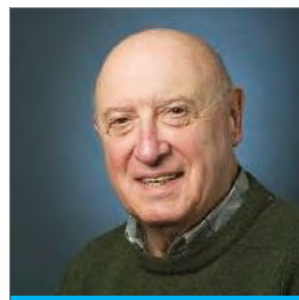


COLEMAN “COLEY” BURKE, LIFE TRUSTEE, 25 YEARS WITH WHOI

Giving Highlights: R/V Neil Armstrong Endowment; Susan and Coley Burke Ocean Observing Operations Room; LOSOS Laboratory; Ocean Worlds

“Coley was a stalwart supporter of WHOI’s work. He combined his love of the ocean with a deep understanding of the need to study it. He understood that science is key. The contributions his foundation made are of immense importance and are making a real difference.”

—Peter de Menocal, WHOI President and Director



ROBERT “BOB” FROSH, FORMER WHOI GUEST INVESTIGATOR, LIFE TRUSTEE, 40 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed

“Bob had one of the brightest scientific minds I have ever known. He was always willing to share his ideas, was a mentor to me for over three decades, and I always looked forward to our twice-weekly phone calls after he moved off Cape.”

—David Ross, WHOI Scientist Emeritus



ANN THORON HALE, CORPORATION MEMBER, 20 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed

“Ann had a strong interest in conservation and was a devoted annual WHOI supporter. She was particularly committed to stimulating interest and involvement of others in conservation through education.”

—Jane Neumann, Retired WHOI Principal Gifts Officer

NOT PICTURED: GERARD L. SWOPE, CORPORATION MEMBER, 29 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed

“Gerry came to Woods Hole during his whole life and when he retired became a year-round resident. He loved the ocean and supported WHOI and its important work.” —John Swope, Gerry’s Brother



THOMAS “TOM” MULLINS, LIFE TRUSTEE, 29 YEARS WITH WHOI

Giving Highlights:

Thomas D. and Corinne M. Mullins Ship’s Library Fund; Annual gifts for use where needed; Tropical Research Initiative Endowment

“Tom brought a unique breadth of scientific and international experience to WHOI. His views in these areas were highly appreciated by Board members and his dedication to the Institution was exceptional.”

—Jim Moltz, WHOI Life Trustee and Former Board Chair



HOPE SMITH, LIFE TRUSTEE, 22 YEARS WITH WHOI

Giving Highlights: WHOI R/V *Tioga*; The Walter A. and Hope Noyes Smith Endowed Chair; Annual gifts for use where needed

“Hope and husband Walter were devoted to the ocean and WHOI. In recent years, Hope remained a staunch supporter, traveling to WHOI Joint Meetings with help from her son Willie. Thanks to Hope and Walter, the WHOI research vessel, *Tioga*, continues to make important advances in ocean science.”

—Admiral Richard Pittenger, Former WHOI Chief Development Officer



CECIL THOMPSON, CORPORATION MEMBER AND TRUSTEE, 13 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed

“As a first-generation son of Caribbean immigrant parents, Cecil’s love of the ocean came naturally. His involvement with WHOI enriched his life immensely. He was grateful for the knowledge shared and the relationships fostered during his time of service.”

—Karen Thompson, Cecil’s Wife



GEOFFREY “JEFF” THOMPSON, TRUSTEE, 22 YEARS WITH WHOI

Giving Highlights: Annual gifts for use where needed, Investment in Science Fund

“As a long-time Trustee of the Institution, Jeff provided important advice and counsel in his capacity as a member of many important board committees. We miss him.”

—Mark R. Abbott, WHOI President and Director Emeritus

THE POWER OF GIVING

PRIVATE PHILANTHROPY IS WHAT KEEPS WHOI AT THE LEADING EDGE OF SOLUTIONS-BASED SCIENCE AND INNOVATION AT A TIME WHEN OCEAN PROBLEMS ARE AFFECTING ALL OF HUMANITY.

Every year, WHOI relies on gifts from individuals and foundations that support high-risk, high-reward science that pushes ocean science boundaries. In 2020, during the COVID-19 pandemic, this support made a major impact. Meet some of these of these generous and visionary supporters.

B WU, WHOI CORPORATION MEMBER

Fostering Scientific Leadership While Honoring an Ocean Leader

Our family enjoys contributing to discovery and exploration, says WHOI Corporation Member B Wu. “We support research organizations by encouraging good governance practices; creating cultures that enhance cooperation, collaboration, and innovation; and promoting career development to attract and retain a talented staff. We support individual scientists and explorers at an early or a transitional stage where traditional funding sources are not available.”

B Wu and Eric Larson have done this for WHOI by looking for areas of need that fit with their giving goals. “Eric and I believe that leadership is developed,” says B, whose support is all about developing and recognizing WHOI

leaders. A recent example is their creation of the Mark Abbott Leadership and Professional Development Fund. The fund honors WHOI president and director Mark Abbott, who retired in 2020 and is administered by Rick Murray, WHOI Deputy Director and Vice President for Science and Engineering.

“We are indebted to B and Eric for providing much-needed support for WHOI staff to serve on important national and international panels,” says Rick. “The Abbott Fund’s ability to cover scientists’ time is bridging a critical funding gap and significantly improving WHOI’s ability to take advantage of leadership and network building opportunities on the world stage.”

“Eric and I hope our example will encourage others to align their WHOI giving with their values,” says B.

“Eric and I hope our example will encourage others to align their WHOI giving with their values,”

~B Wu, WHOI Corporation Member





MINDY HALL AND LARRY PRATT, MIT/WHOI ALUMS AND WHOI PHYSICAL OCEANOGRAPHERS

Championing First-Year Students with Current Gifts and an Endowment

Drs. Mindy Hall and Larry Pratt are the quintessential WHOI couple. Now married, they met as students at WHOI in 1979. Today, they both hold degrees from the MIT-WHOI Joint Program in Oceanography/Applied Ocean Science and Engineering (JP), are long-time members of the WHOI Physical Oceanography Department, and are generous WHOI donors. Their giving legacy includes support of the Henry Stommel Chair and the creation of two funds to support WHOI students: the current-use Hall Pratt Graduate Student Fellowship and the Hall Pratt Graduate Student Endowed Fellowship. They have also endowed the Lawrence Pratt and Melinda Hall Award for Interdisciplinary Research, a competitive award that encourages the cross-fertilization of ideas.

“Supporting oceanography at this point in time is critical to solving the climate crisis and for addressing the growing problem of microplastics pollution,” says the couple.

Mindy, a 1985 JP graduate, is a research specialist in WHOI’s Physical Oceanography department with interests in the analysis of general ocean circulation, meso-scale eddies, western boundary currents, and trans-ocean heat transport.

Larry, a 1982 JP graduate, is a Senior Scientist in Physical Oceanography, who studies the physics of ocean circulation and turbulence, including motions that occur near the ocean bottom. His work has taken him to exotic locales, such as the Philippine and Indonesian Archipelagos and the Red Sea.

“We were drawn to the WHOI Joint Program for its great reputation, its connection, and the beautiful location,” say Mindy and Larry. “We decided to fund WHOI student fellowships to make it easier for first-year students to obtain funding and admission and to assure that their WHOI advisor has the time to raise support for mentoring them.”

“We decided to fund WHOI student fellowships to make it easier for first-year students to obtain funding and admission and to assure that their WHOI advisor has the time to raise support for mentoring them.”

~Drs. Mindy Hall and
Larry Pratt

GAIL CAUSEY AND LAWRENCE GOODWIN, PLANNED GIVING BENEFACTORS

Two bequests provide help during COVID-19

Lightning (a very good kind) struck twice in 2020. Amid the pandemic, WHOI was notified of two large estates coming its way. We are grateful to these thoughtful individuals, whose planning made all the difference.

Early in the year we were notified that a woman in central Illinois had made a significant bequest to WHOI. Gayle Causey had had very little interaction with WHOI, as far as we knew, aside from a phone call several years ago when she asked for WHOI's information for her will.

The estate turned out to be quite large and WHOI received 30% of the total after some gifts were made to friends and family. The remainder of the estate will be split among four other environmental organizations.

"Gayle's generosity is deeply appreciated, as are all estate gifts to Woods Hole Oceanographic Institution," said WHOI President and Director Peter de Menocal. "Her gift will keep ocean research moving forward and her commitment to environmental research and protection will have profound effects in the coming years."

Several months later, WHOI was notified that we were among several beneficiaries of a trust established by longtime WHOI Associate F. Lawrence Goodwin of Wilton, CT. Mr. Goodwin passed away in 2000. His wife, Terry, passed away in 2019, which resulted in the dispersal of funds in the trust to three charitable organizations, including WHOI.

Lawrence's sister, Emily Kemp, recalls her brother's love of the sea. "Lawrence learned to sail at Quissett in the

1930s and was an avid sailor. He sailed across the Atlantic from the Canary Islands and in several Bermuda races with his skipper, Forbes Morse. He ran the frostbite series at the Norwalk Yacht Club in Connecticut. I recall his being a member of WHOI for years."

Both of these gifts were unrestricted, meaning WHOI could use them where they are needed most. In recognition of their gifts, WHOI is naming spaces in their honor in the newly constructed Quissett Research Facility.

MIKE AND WENDY ESPOSITO, OCEAN LOVERS WHO FOUND WHOI, ARE EXEMPLARY SUPPORTERS

Mike and Wendy Esposito have a deep appreciation of the beauty of the ocean and its animals, especially dolphins and whales. Avid boaters, who also love ocean swimming, several years ago Mike and Wendy decided to support some ocean-related causes. One of their gifts was to WHOI and the rest is history. Today Mike is an active trustee who graciously gives WHOI his time, talent, and support. He is a member of several board committees, including the Executive Committee, the Finance Committee and the Advancement Committee and his experience on several boards in New York is highly valued at WHOI. Mike and Wendy also donated the use of one of their boats to coral scientist Amy Apprill for coral research in Florida. The couple are exemplary WHOI supporters. Their love of the WHOI mission and their generous giving puts them in the President's Circle, WHOI's elite group of major supporters.



Mike and Wendy Esposito on one of their favorite beaches.

**MARCH LIMITED, WHOI
FUNDING PARTNER**

**Underwriting Marine Microplastics
Research for A Healthier Ocean**

When company leaders at March Limited sought out a compelling ocean research project to fund, the issue of marine microplastics, tons and tons of tiny plastic fragments that are seemingly everywhere in the ocean, caught their attention. “Our company wanted to fund research that closes knowledge gaps that stand in the way of a healthier ocean,” says Hannes Frey, a March Limited director. “There is still much to learn about how marine microplastics are impacting everything from the environment to animals and humans, so we decided we could make a real impact by funding the WHOI Marine Microplastics Innovation Accelerator Fund.”

Frey says that in talking to WHOI scientists, the March Limited team realized that understanding microplastics and their entry into the food chain is one of today’s most challenging problems. “It’s not as visible as animals trapped in fishnets or a seashore covered with plastic bags, but I think in scientific terms it is very crucial,” he says.

March Limited’s support will enable WHOI scientists to answer some of the most pressing questions about microplastics, including how they affect environments, animals, and humans—information that is critical to solving this hidden but very real problem.

“There is still much to learn about how marine microplastics are impacting everything from the environment to animals and humans, so we decided we could make a real impact by funding the WHOI Marine Microplastics Innovation Accelerator Fund.”

~Hannes Frey, a March Limited director

Mike and Wendy Esposito have a deep appreciation of the beauty of the ocean and its animals, especially dolphins and whales. Several years ago Mike and Wendy decided to support some ocean-related causes. One of their gifts was to WHOI and the rest is history.

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This oarfish juvenile (*Regalecus glesne*) may be small, but adult oarfish are considered the longest bony fish in the world—sometimes reaching 10 meters (~36 feet). Rare and mysterious, oarfish probably inspired sea serpent myths, according to former WHOI postdoc Paul Caiger. While oarfish are believed to dive anywhere between 200 and 1,000 meters deep, Caiger took this picture diving at only 5 meters. © Paul Caiger

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This 5-cm-long blue dragon (a pelagic nudibranch) lies upside down on the surface of the water with its blue-shaded belly pointing to the sky and its silvery upper body pointing to the depths. "This nudibranch is a perfect example of countershading," says photographer Paul Caiger. "Birds can't see it well looking down into the ocean or fish from below looking up." Blue dragons also can eat venomous animals such as the Portuguese man o' war without activating the prey's stingers. © Paul Caiger

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The hydroid *Bouillonina cornucopia* spawns under a microscope after collection from the Arctic deep sea. Hydroids are related to anemones, jellies, and corals. WHOI scientist Kirstin Meyer-Kaiser found this *B. cornucopia* on an oceanographic mooring 2,500 meters deep. "We typically think of Arctic deep-sea species being slow-growing and reproducing very little," Meyer-Kaiser says. "But this is a unique species because it grows quickly, produces a lot of young, and settles on anthropogenic surfaces. It's an opportunist." Kirstin Meyer-Kaiser and Kharis Schrage © WHOI

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A research team led by WHOI scientist Sarah Das follows a supraglacial stream in Greenland to study where meltwater is flowing and how this influences the speed at which ice floes travel. As the climate warms across the Arctic, the summer melt season in Greenland is growing longer and hotter, contributing to an accelerating pace of ice loss. Sarah Das © WHOI

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R/V Neil Armstrong waits out a storm in Prince Christian Sound, Greenland. The ship was in the Irminger Sea to maintain equipment for the Ocean Observatories Initiative (OOI), including sensors that collect real-time data at multiple sites in the world's oceans. WHOI scientists and technicians travel to the region annually to replace moorings and gliders. Long-term data from OOI sites, freely available to a global user community, represents a fundamental shift in how research is done and inspires new ideas and approaches for research and education. Croy Carlin © WHOI



2020 FINANCIAL STATEMENTS

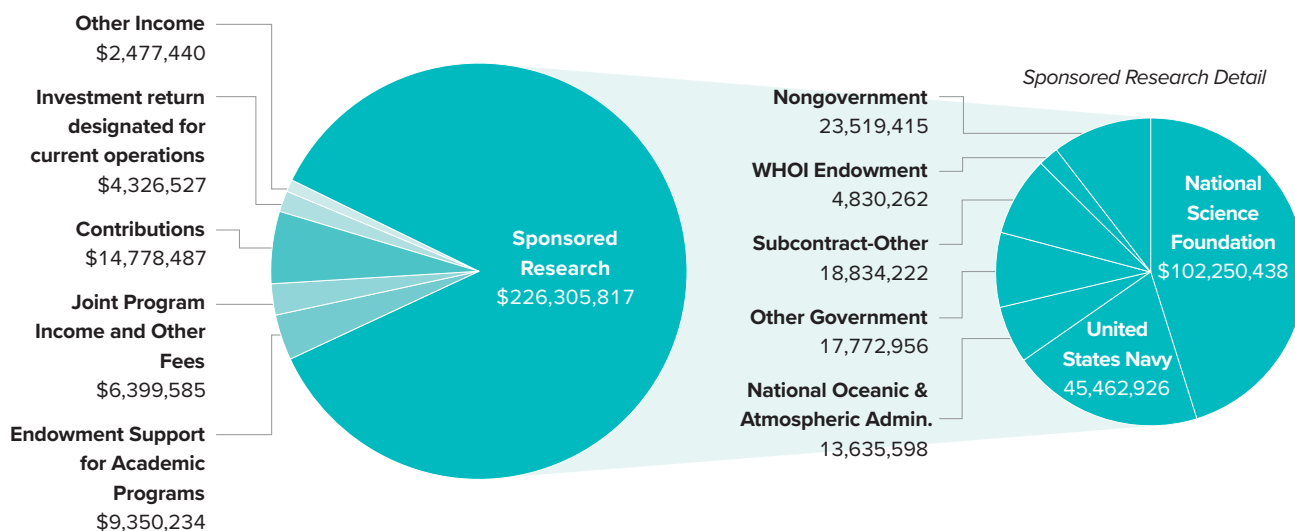
WE ARE PLEASED TO PRESENT THE 2020 AUDITED FINANCIAL STATEMENTS OF THE WOODS HOLE OCEANOGRAPHIC INSTITUTION (WHOI) AND ARE GRATEFUL TO OUR MANY FUNDERS, BOTH PRIVATE AND PUBLIC, FOR THEIR SUPPORT OF WHOI'S MISSION OF OCEAN RESEARCH, EXPLORATION, AND EDUCATION.

The Institution weathered the unprecedented headwinds of the 2020 pandemic with remarkable resilience. Our scientists, engineers, and technical and support staff remained fully employed and productive, resulting in an increase of 3.4% to our total funded sponsored research portfolio. Funding from the United States Navy was a key driver of this increase. We continued to make significant investments in our fund-raising activities and finished the year with a surplus of unrestricted funds. We made substantial

progress on the new Quissett Research Facility and anticipate completing that project on time and on budget in July 2021. The mid-life refit of the *Atlantis* also advanced on schedule and on budget and we anticipate returning her to full operation in August of 2021; this refit and the pandemic decreased the number of shipboard research missions in 2020. Our endowment realized strong returns, ending 2020 with a market value of \$469.4 million. We are grateful to our trustees for their generosity and fiduciary guidance.

REVENUES

Total: \$263,638,090



STATEMENT OF FINANCIAL POSITION

As of December 31, 2020, WHOI's total assets were \$682.9 million, total liabilities were \$269.2 million and total net assets were \$413.7 million. Net assets represent the accumulated financial strength of a not-for-profit organization and are an important gauge of its ability to carry out its mission. As noted in our 2019 report, the Institution issued \$75.5 million in MassDevelopment Fixed Rate Revenue Bonds Series 2018, during 2018. The Institution received net proceeds of \$85.5 million, of this amount \$50.7 million was used to retire the Series 2008 Bonds, with the remaining amount to be used for the Quissett Research Facility and renovations and maintenance projects throughout the Institution. The Federal government allows interest and depreciation for real property and equipment in the Institution's overhead rates for reimbursement. Principal payments on the Series 2018 Bonds began in 2019.

The endowment, \$469.4 million, represents 69% of the total assets as of December 31, 2020.

STATEMENT OF ACTIVITIES

WHOI's total revenues without donor restrictions increased by \$8.3 million; from \$255.3 million in 2019 to \$263.6

million in 2020; and the Institution's change in net assets from operating activities was \$1.6 million. \$20.7 million of endowment income and appreciation was distributed to operations as follows:

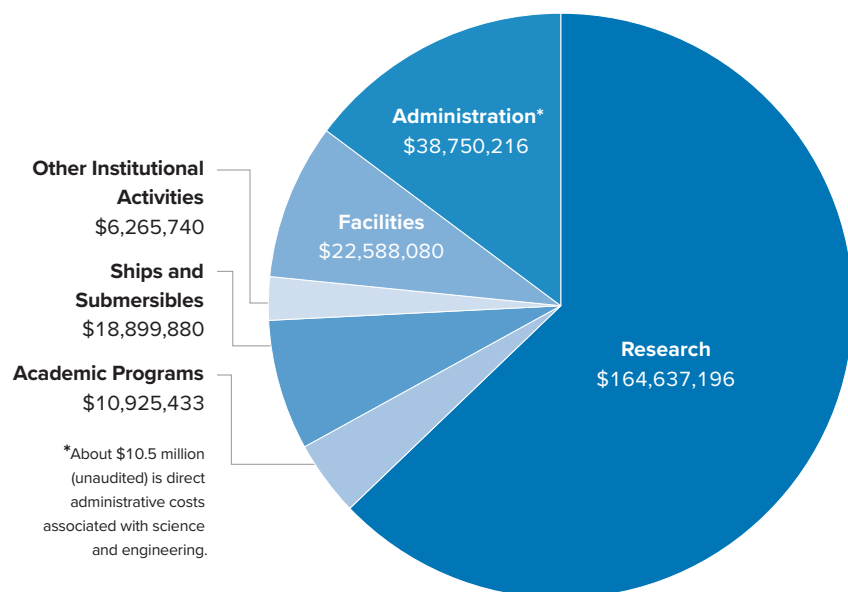
- Education \$9.2 million
- Research \$7.2 million
- Unrestricted \$4.3 million

The Institution had Facilities and Administration costs of \$61.3 million, and approximately 82% of that amount, \$50.7 million, was recovered from the government and non-government research. This included \$2.0 million of interest associated with the Series 2018 Bonds. The remainder was institutional expenses.

Philanthropy continues to play a larger role in meeting both the research and educational programming obligations. Current-use giving and endowment income accounted for 16.4% of the institution's revenue in 2020. In total, 4,789 supporters invested in high-impact ocean science at WHOI in fiscal year 2020. The continued expansion of the donor base at all levels remains an essential growth strategy in the coming years.

EXPENSES

Total: \$262,066,545



SUMMARY

Looking ahead, we will continue to attract, retain, and develop talented individuals to explore, observe, innovate, and create knowledge about our ocean and its role in our changing planet. We will continue to steward our resources and develop new funding and relationships in order to amplify our strength as the leader in ocean science for the global good.

WHOI AT NINETY

CELEBRATING HISTORIC MILESTONES AND PLANNING FOR A BOLD FUTURE

On October 2, 2020, WHOI held a virtual 90th anniversary celebration that also served to welcome Peter de Menocal as WHOI's 11th president. Leveraging WHOI's brilliant legacy, Peter laid out a bold vision for WHOI's future. The event also celebrated WHOI's storied history. The historical milestones that follow are a powerful reminder of how far WHOI has come since its 1930 founding. They also serve as inspiration for all that can be done to unleash new knowledge in service of society in the next 90 years.

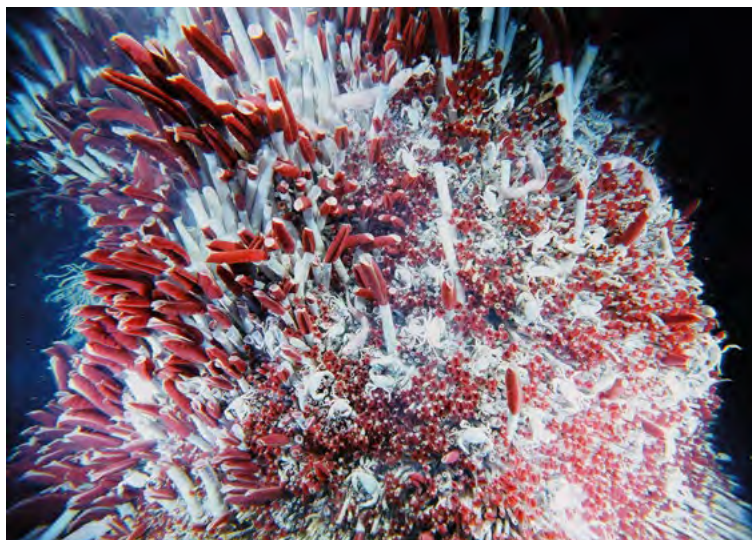


Founded in 1930, WHOI began with a dozen scientists, a single laboratory building, and a small wooden research vessel: the 142-foot ketch *Atlantis*, whose profile still appears on the Institution's historic seal.

The human-occupied submersible *Alvin* was commissioned on June 5 in Woods Hole on the WHOI dock. *Alvin*'s first pilot was William Rainnie, who took the sub on a test dive in Woods Hole Harbor on June 26. (1964)

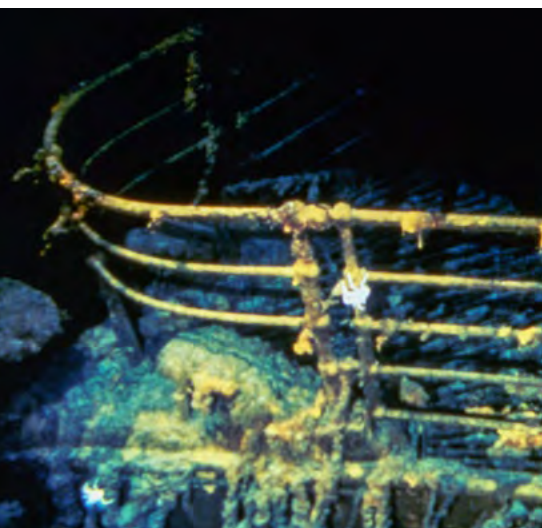


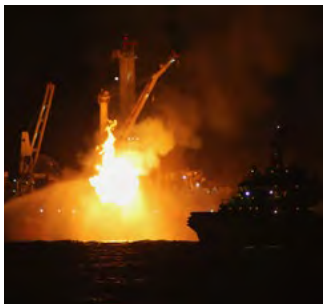
The U.S. Navy called in *Alvin* to help find and recover a hydrogen bomb that was accidentally dropped into the Mediterranean Sea off the coast of Spain. (1966)



Discovery of hydrothermal vents: A team led by marine geologist Robert Ballard found the first-known active hydrothermal vent on the seafloor of the Galápagos Rift, shattering the long-held notion that life could not exist on the ocean bottom. (1977)

The RMS *Titanic* is discovered during an R/V *Knorr* expedition, shining an international spotlight on WHOI. (1985)



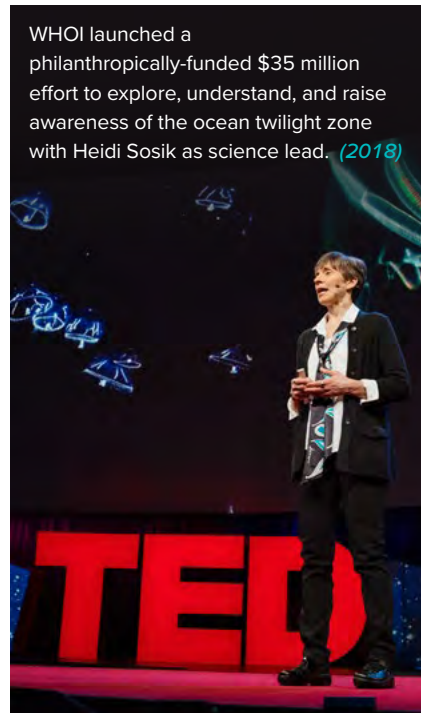


The Deepwater Horizon oil spill: An explosion at the Deepwater Horizon drilling platform in the Gulf of Mexico killed 11 workers and unleashed the largest accidental marine oil spill in history. WHOI administrators were among those called by oil and gas company BP and the federal government for advice and assistance to monitor the spill and assess its impacts on fragile Gulf ecosystems. (2010)

Air France Flight 447: In 2011, a search team led by WHOI located the wreckage of Air France Flight 447 nearly 2.5 miles below the surface of the Atlantic Ocean, helping French investigators answer questions related to the cause of the crash and help avoid a similar disaster in the future. (2011)



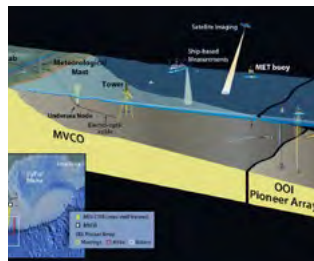
Fukushima Dai-ichi nuclear accident: Following the largest accidental release of radiation into the ocean in history, WHOI marine chemist Ken Buesseler assembled a research team to sample ocean water around the Fukushima Dai-ichi power plant and detected unhealthy levels of Cesium in plankton and fish. He continues to be a go-to expert on marine radiochemistry related to Fukushima and natural and human sources of radioactivity. (2011)



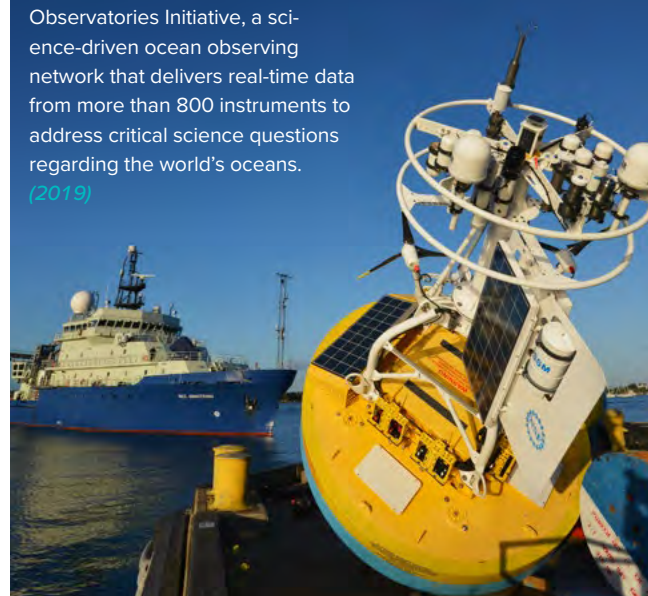
The National Science Foundation selected WHOI to lead the Ocean Observatories Initiative, a science-driven ocean observing network that delivers real-time data from more than 800 instruments to address critical science questions regarding the world's oceans. (2019)



Alvin celebrated the 50th anniversary of its commission. (2014)



The National Science Foundation (NSF) awarded WHOI a \$5.6 million grant over five years to support a new Long-Term Ecological Research (LTER) site along the Northeast U.S. continental shelf, led by senior scientist Heidi Sosik. (2017)



At the request of the National Transportation Safety Board (NTSB), WHOI assisted in locating the Video Data Recorder of the sunken cargo ship *El Faro*. (2016)



The MIT-WHOI Joint Program celebrated its 50th anniversary and its 1,000th Ph.D. graduate. (2019)





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