One of the 20th century’s most important scientific discoveries was hydrothermal vents on the seafloor. The first detailed look at hydrothermal vents on the deep ocean floor by scientists towing a WHOI camera from Knorr and diving in Alvin. WHOI scientists and their colleagues from many other institutions are slowly writing a still-emerging story of hydrothermal systems that contribute significantly to the temperature and chemical balances of the world ocean. The vents also support thriving communities of animals that depend not on a photosynthetic (sunlight driven) system but on a chemosynthetic (chemically driven) system in which bacteria absorb chemicals from the vent water and then serve as food for other animals. Ultimate practical applications of this new knowledge may be expected to range from the pharmaceutical industry to mineral exploration.

This is oceanography at its best, using a pool of intellectual talents and innovative tools to bring knowledge from unchartered waters to enlightened and better humankind’s use and preservation of the oceans.

Today the US National Deep Submergence Facility operated by WHOI includes the submersible Alvin, pictured along with robotic and small vessel techs. The Institution operates 130 Joint Program students, 60 ships’ crew and officers, and a variety of scientific, services, and administrative support staff. The Institution operates three large research vessels, Atlantis (275 feet), Knorr (279 feet), and Oceanus (177 feet), as well as Tsuga (60 feet), the submersibles Alvin, remotely operated and autonomous vessels, and several small boats.

Institution scientists work in the marine components of engineering and all scientific fields. The following projects are among hundreds of investigations underway in the five scientific departments:

- Biologists probe the reasons for the collapse of Georges Bank and other fisheries and the causes and spread of “red tides,” examine marine viruses, and analyze whale sounds.
- Physical oceanographers study water movement, from the rapid flow of the Pacific Kuroshio Current to the slower subsurface spread of Mediterraneaean water across the Atlantic and the six-year trip of Labrador Sea climate signatures south to Bermuda.
- Chemists study the unique natures of marine compounds and employ sophisticated instruments to follow substances as they travel through the ocean’s depth and breadth.
- Geologists and geophysicists tap knowledge of the earth bound in sea-floor rock and sediment as well as the deeper, molten layers of our planet, and they bring innovative techniques to the quest for new sources of minerals and petroleum.
- Members of the Applied Ocean Physics and Engineering Department study interactions of ocean and atmosphere, sediment transport, and other physical phenomena, and they develop instruments for a wide variety of disciplines and projects.

At the Marine Policy Center, scholars study the economics, conservation, and wise management of coastal and marine resources. They undertake projects in such areas as marine transit technology and safety, conservation of biological diversity, land-based marine pollution, and fisheries management. Cross-disciplinary work is nurtured in four Ocean Institutes initiated in 2000 and a cooperative institute with the National Oceanic and Atmospheric Administration.

One of the most exciting recent oceanographic stories began 25 years ago with the first detailed look at hydrothermal vents on the deep ocean floor by scientists towing a WHOI camera from Knorr and diving in Alvin. WHOI scientists and their colleagues from many other institutions are slowly writing a still-emerging story of hydrothermal systems that contribute significantly to the temperature and chemical balances of the world ocean. The vents also support thriving communities of animals that depend not on a photosynthetic (sunlight driven) system but on a chemosynthetic (chemically driven) system in which bacteria absorb chemicals from the vent water and then serve as food for other animals. Ultimate practical applications of this new knowledge may be expected to range from the pharmaceutical industry to mineral exploration.

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You can learn more about WHOI by visiting our Exhibit Center, subscribing to our publications, and becoming an Associate through a contribution to support research. For general information about Woods Hole Oceanographic Institution, please call or write:

Woods Hole Oceanographic Institution, Information Office - MS 416
Woods Hole, MA 02543 • (508) 289-2252 • www.whoi.edu

Cover photos, top to bottom: Henry Bigelow, the Bigelow Laboratory, the research vessel Atlantis, and the WHOI jet in 1962.
Bigelow applied knowledge gained on many research voyages in the Gulf of Maine to design of Bigelow, applied knowledge gained on many research voyages in the Gulf of Maine to design of the expedition, and the first five vessels designed and built for the Institution's use and called the Bigelow Laboratory, which is still in use and called the Bigelow Laboratory. With laboratory and ship under construction, there was no time to test in the summer of 1940, so the $50,000 allotment for that season was contributed to an expedition to send the submarine Nautilus under the poles. It was possible when the sub lost a diving rudder, commendable work was done on the expedition, and the first five contributions numbers on a list of WHOI scientific publications now totaling more than 14,000 were assigned to papers written on the work of that expedition. Atlantis, launched December 31, 1939, was still in the last stages of construction in Copenhagen the following summer, but Asterias, a 40-foot launch, had been delivered and served as a collecting vessel for the summer's work. A typical summer would find the ship exploring newly discovered canyons off Georges Bank, collecting mud cores for bacteriological studies, taking samples from mooring stations, dragging for Gulf of Maine shrimp, collecting plankton, taking light intensity readings, and crossing the Gulf Stream with lines of buoy stations. During the winter, Atlantis made cooperative cruises with Yale University's Bingham Oceanographic Foundation and the joint staff from Harvard University and the University of Havana for a wide variety of work in the Caribbean and Gulf of Mexico. Conceived of the decade brought profound change to oceanography. Columbus Iselin, who succeeded Bigelow as director in 1940, and the WHOI trustees offered the Institution's facilities for the government's war work. During the war, the US Navy realized more and more that many of its operations were intimately dependent on the environment in which it operated, and physicists found themselves consulted more and more frequently on matters of national defense. "The U.S. government was exposed to a year-round complement of more than 100, and the annual operating budget skyrocketed to over $1 million. The first Navy-sponsored program of research was begun in 1948, and in 1954 it became possible that the sub lost a diving rudder, commendable work was done on the expedition, and the first five contributions numbers on a list of WHOI underwater sound and its application to anti-submarine warfare. Many other research activities with direct application to naval problems followed, the largest of which was the investigation of underwater water explosives. Its staff included chemist Paul M. Fye, who later became the Institution's fourth director. The wartime work was rewarded in the award of the Legion of Merit to the Institution's Director. The citation with the having saved many of our ships and the acknowledgment that the underwater sound studies had "saved ten percent of the Navy's fuel bill." After the war, there was a period of uncertainty about oceanography's future. For a while it appeared that the Institution might return to the routine of busy summers and quiet winters. But both of the direction of oceanography as a science and its economic situation had changed. As marine historian Susan Schlee describes it, "Before the war the goal of most oceanographers had been to define the steady state or average conditions, be it of a current, a trace element in the water, a population of lobsters, or a bed of茫茫的中礁石散布在江面。14,000 were assigned to papers written on the expedition, and the first five contributions numbers on a list of WHOI scientific publications now totaling more than 14,000 were assigned to papers written on the work of that expedition. Atlantis, launched December 31, 1939, was still in the last stages of construction in Copenhagen the following summer, but Asterias, a 40-foot launch, had been delivered and served as a collecting vessel for the summer's work. 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