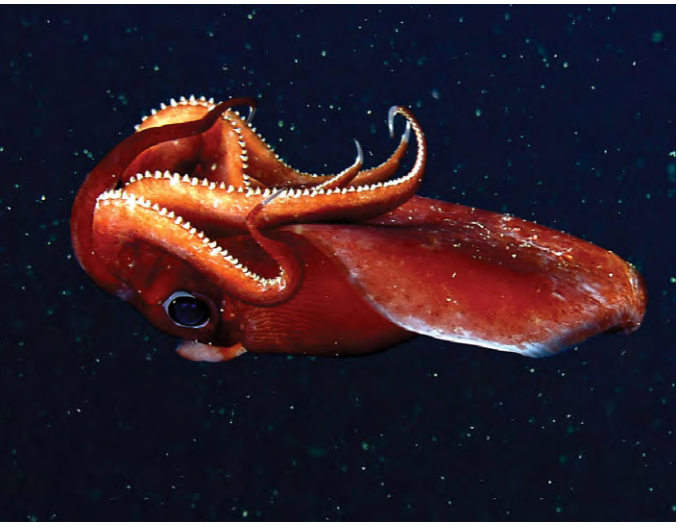
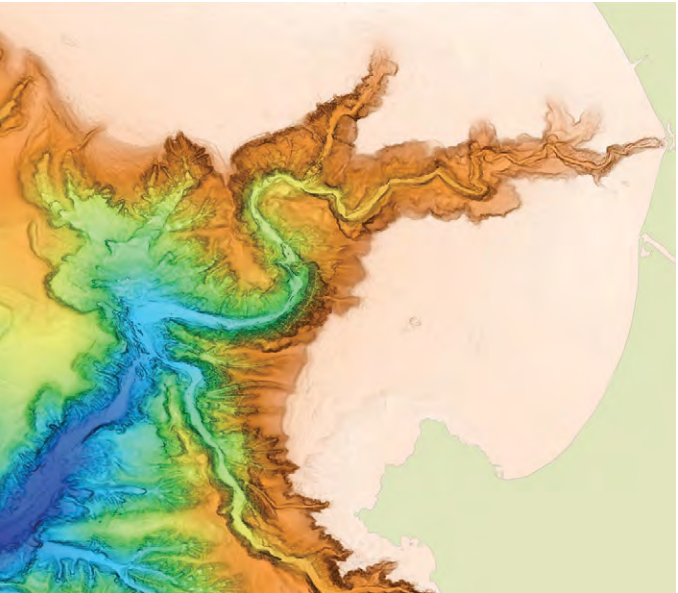

MBARI
Monterey Bay Aquarium Research Institute
A nonprofit oceanographic research center





Research programs at the Monterey Bay Aquarium Research Institute (MBARI) encompass the entire ocean, from the surface waters to the deep seafloor, and from the coastal zone to the open sea.

The more we learn about seafloor geology, ocean life, and marine chemistry, the better we can understand human impacts on the ocean and the influence of the ocean on all life on Earth. This need to understand the ocean in all its complexity and variability drives MBARI's research and development efforts. Scientists and engineers team up to determine the most pressing ocean science questions, then create the instruments and methods to resolve those mysteries.

Founded in 1987 by David Packard, MBARI continues to receive substantial support from the David and Lucile Packard Foundation. This ongoing funding enables the nonprofit institute to take on high-risk projects, as well as long-term

- *Advanced sensors on simple floats are deployed around the world to collect information about changing ocean chemistry.*
- *High-definition video cameras on MBARI's remotely operated vehicles (ROVs) provide views of unfamiliar animals and behaviors, such as this* Octopoteuthis *squid.*
- *Monterey Canyon plunges to depths greater than 4,000 meters, providing researchers with easy access to the deep sea. Detailed seafloor maps are created with data collected by the institute's advanced mapping autonomous underwater vehicles (AUVs).*

studies that traditional granting agencies may be reluctant to fund. MBARI's work contributes to the Packard Foundation's goal to restore the health and productivity of the world ocean.

MBARI researchers pursue a range of challenging problems, such as how the tiniest microbial organisms affect other sea life, causes and consequences of geological disturbances on the seafloor, and how the chemistry of ocean surface waters affects the food available to animals living thousands of meters below on the deep seafloor.

The creation of new sensors for observing the ocean and systems for conducting experiments at sea are hallmarks of MBARI's achievements. The capacity to develop and quickly test new technologies, then put these new tools to use for science, distinguishes the institute in the oceanographic community.

MBARI addresses issues of global and societal relevance within the following research themes:

- **Ocean visualization**—creating representations of the ocean's interior, its inhabitants, and its bottom topography.
- **Ecosystem dynamics**—studying complex interactions between microorganisms and the transfer of nutrients between the ocean surface and the deep sea.
- **Ocean biogeochemistry**—reaching an understanding of global-scale processes by recording variations in ocean acidity, oxygen, temperature, density, nutrient transport, and trace metals.
- **Exploration**—investigating areas of the sea never seen before, which can lead to discoveries of new seafloor features and processes, novel animals, and previously unknown biological, chemical, and geological events and systems.

MBARI owns and operates two research vessels, two remotely operated vehicles, a cabled ocean observatory, and a growing fleet of autonomous underwater vehicles. These tools, coupled with a wide array of sensors, moorings, and other research instruments allow researchers to conduct unique experiments in harsh environments, sometimes with remote control of the experiment from land. MBARI explores the Pacific Ocean as far north as Canada and as far south as Mexico, although most projects are centered on the Monterey Bay region of California. Through collaborations with other organizations, MBARI's field efforts are also conducted in other ocean basins around the globe. MBARI is located in Moss Landing, California, at the head of Monterey Canyon, the deepest submarine canyon adjacent to the continental United States.


▸ *Scientists perform sophisticated genetic analyses to study minuscule organisms that support many ocean food webs and are critical to all life on Earth.*

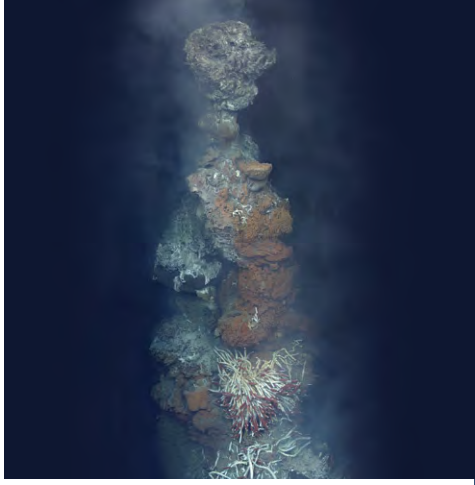
▸ *Remotely operated vehicle* Doc Ricketts *is launched from the research vessel* Western Flyer.

▸ *While the remotely operated vehicle dives thousands of meters below, scientists and ROV pilots guide it from the darkened ROV control room on board the ship.*

◂ *The R/V* Rachel Carson *can launch both ROVs and AUVs and conduct multi-day research expeditions. The research vessel was named in honor of marine biologist and conservationist Rachel Carson.*

*MBARI-developed sensors measure the increasing ocean acidity along the West Coast of North America.*

*The summer internship program provides hands-on experiences for educators and undergraduate and graduate students.*



*Exploratory expeditions lead to the discovery of seafloor features such as this hydrothermal vent and the marine life that thrive on its mineral-rich waters.*

A key aspect of MBARI's mission is the sharing of knowledge, solutions, and technology with communities outside the institute—researchers, educators, policy makers, resource managers, industry, and the general public. MBARI research provides valuable insight into the health of the environment and scientific information that can inform policy decisions. Licensing MBARI technology to other researchers or commercial enterprises also extends the reach of MBARI inventions to a wider audience.

The institute nurtures its alliance with the Monterey Bay Aquarium, a sister institution also founded by the Packard family. Collaborations with the aquarium help interpret MBARI scientific research to millions of people.

MBARI also brings oceanographic data into classrooms and engages teachers to use these data in their lessons. The institute's scientific methods and inventions also reach a wider audience through the education of young scientists, engineers, and teachers who come to MBARI as postdoctoral fellows or summer interns.

◂ *The annual Open House gives the public a chance to learn about MBARI projects, such as this Environmental Sample Processor—capable of identifying microorganisms remotely and in real time.*

*Engineers monitor the progress of a long-range autonomous underwater vehicle as part of an institute-wide initiative to learn about ocean processes and test new research tools and techniques.*

M B A R I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▲ *Autonomous underwater vehicles collect data, images, and water samples, based on both preprogrammed missions and artificial intelligence to respond to unexpected findings.*

▶ *The research vessel* Western Flyer *is the host ship for the tethered remotely operated vehicle* Doc Ricketts.