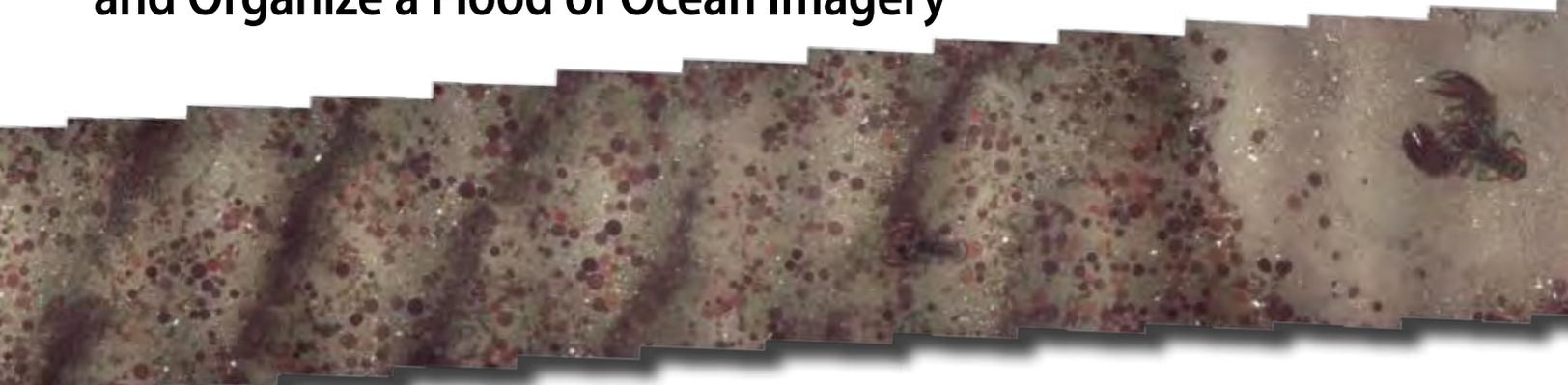


Moore Foundation Grant Catalyzes New Ways to Analyze and Organize a Flood of Ocean Imagery

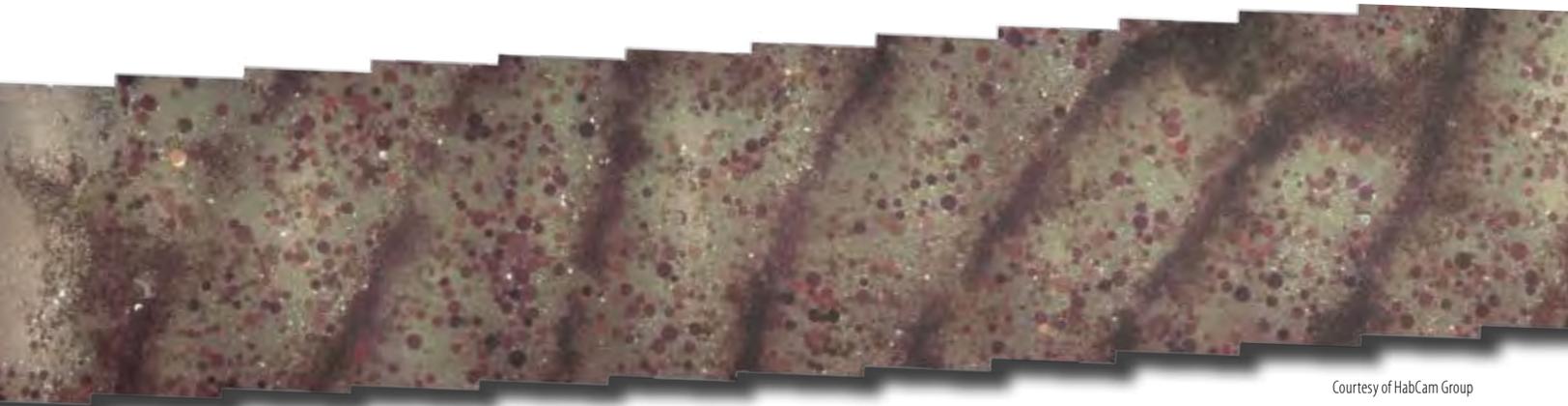


Over the past decade, ocean scientists have built underwater systems that have greatly expanded their capacity to collect images from under the sea. But the value of such instruments remains limited by the lack of efficient tools to extract information from millions of images gathered each day—and then make this potential treasure trove of scientific data readily accessible to many users.

In a significant step toward designing innovative solutions to organize and analyze the incoming flood of scientific data from new ocean sensors, Woods Hole Oceanographic Institution has received a \$2.17 million grant from the Gordon and Betty Moore Foundation to develop ocean-imaging informatics tools.

“Informatics has been described as the art and science of organizing knowledge and making it useful for problem solving,” said WHOI information systems specialist Andrew Maffei, who will co-lead the project with WHOI biologist Heidi Sosik. “I’m most excited about learning how to build ocean-scientist/computer-scientist partnerships.” The work will be done in collaboration with the Tetherless World Constellation group at Rensselaer Polytechnic Institute.

The project will focus on three innovative underwater imaging systems that WHOI has developed in recent years to study fisheries, corals, and harmful algal blooms. The Imaging FlowCytobot, an automated underwater microscope system developed by Sosik



Courtesy of HabCam Group

and colleagues, has been recording high-resolution images of hundreds of millions of phytoplankton at the WHOI Martha's Vineyard Coastal Observatory for more than four years. HabCam, a vehicle-mounted camera system, is towed over the ocean bottom, taking high-resolution images and creating continuous 100-nautical-mile-long ribbons of images each day. SeaBED, developed by WHOI scientist Hanumant Singh, is an autonomous underwater vehicle that can swim slowly or hover over the seafloor to depths of 6,561 feet (2,000 meters); it collects highly detailed sonar and optical images of the seafloor, which can be made into photomosaics.

“HabCam provides an expansive view of the seafloor, but we are swamped in images—we collect a half million every day,” said WHOI biologist Scott Gallager, who developed HabCam. “Extracting information from those in an automated and efficient way

Towed over the seafloor, the HabCam system takes images that can be assembled into photomosaics.

is essential to addressing long-standing science questions” and could eventually be used operationally to survey sea scallops, groundfish, and other commercially important species for fisheries management.

“It is the beginning of a long-term strategy that involves a partnership with Rensselaer Polytechnic Institute to help generate image informatics tools that have broad academic and societal impact,” said Susan Avery, president and director of WHOI. “WHOI is known for having a strong connection between scientists and engineers, who together tackle the challenges of working in the marine environment. Informatics is the next essential technological advance that will ensure the rapid production of scientific output.”

—Joel Greenberg

Program Seeks to Counteract Dearth of Diversity in Geosciences

For the second consecutive summer, the unique scientific community of Woods Hole banded together to continue its pioneering Partnership in Education Program (PEP) and help increase the flow in the parched pipeline of young, diverse students entering the fields of geosciences and oceanography.

The demographics are stark: Of the more than 21,000 people who earned Ph.D.s in geosciences between 1973 and 2003, only 415 were Hispanic-, African- or Native Americans, according to the American Geophysical Union. In 2010, whites held 92 percent of the geosciences jobs, according to the Bureau of Labor Statistics. By 2018, the bureau projects 18 percent employment growth in geosciences occupations. With minorities expected to comprise about 50 percent of the national population by 2050, the National Research Council warned that unless more minorities enter the field, there will be a dire shortage of a skilled, knowledgeable work force, which will undermine the United States' competitive edge in geosciences.

Seeking to change this course, six Woods Hole institutions joined to launch the PEP program in 2009, bringing 16 undergraduates from underrepresented groups for a four-week course on environmental and ocean science taught by scientists from all the institutions. Then the students conducted research internships with mentors from the Woods Hole institutions: the National Oceanographic and Atmospheric Administration's Northeast Fisheries

Science Center, Woods Hole Oceanographic Institution, the U.S. Geological Survey, Marine Biological Laboratory, Woods Hole Research Center, and Sea Education Association. NOAA supplied the majority of funding for PEP; other institutions contributed a wealth of in-kind services, including housing, seminars, teachers,

and mentors. The University of Maryland Eastern Shore, a historically black college, and NOAA's Living Marine Resources Cooperative Science Center designed the course and arranged student college credit.

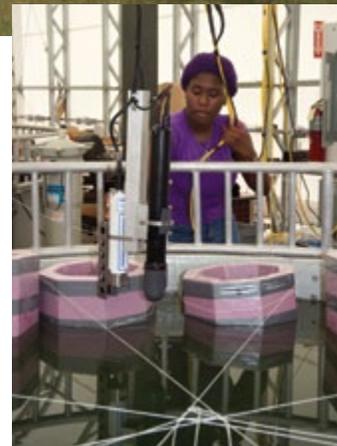
Sixteen more undergraduates attended the program in 2010, and eight of the students pursued research with WHOI scientists Ken Foote, Scott Gallager, Porter Hoagland,

Gareth Lawson, and Lauren Mullineaux, on topics ranging from biology to engineering and marine policy. Anna-Mai Christmas (left), a 2010 graduate of the University of the Virgin Islands, worked on coastal ocean invertebrates in biologist Gallager's lab. Christmas, now in graduate school at the University of Washington, studied changes in lobster development.

—Lonny Lippsett



Amy Caracappa-Ouberti, WHOI



Tom Kleindinst, WHOI

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