

2009 Annual Report: Marine Operations

WHOI has a long history of operating a variety of research vessels and developing innovative vehicles, instruments and other technologies that provide access to the sea for observations, experimentation, and data collection. In 2009 the three large research vessels that WHOI operates—*Knorr*, *Atlantis* and *Oceanus*—continued to serve the U.S. scientific community with cruises in the eastern Pacific and North Atlantic oceans, and the Mediterranean Sea, while our coastal vessel, *Tioga*, operated in New England waters.

The National Deep Submergence Facility, consisting of the HOV *Alvin*, the ROV *Jason*, and the AUV ABE/*Sentry*, had vehicles working in the western and eastern Pacific and in the Caribbean Sea. The Center for Ocean, Seafloor and Marine Observing Systems (COSMOS) continued to oversee the Martha's Vineyard Coastal Observatory and coordinate observing systems under development at WHOI, while the NSF-funded Ocean Observatories Initiative accelerated its efforts to design and construct new marine observing systems for global and regional use.

WHOI continues to build on its very strong tradition of developing cutting-edge underwater technology for deep-sea research. In May, *Nereus*—a newly-built vehicle that can operate either as an autonomous underwater vehicle or as a remotely operated vehicle—successfully conducted a dive to Challenger Deep (10,902 meters) in the Mariana Trench in the western Pacific Ocean. As the only vehicle in the world capable of reaching the deepest parts of the ocean, *Nereus* opens up a whole new and previously inaccessible part of the planet for exploration by the U.S. community.

Substantial progress was also made this year on the NSF-funded project to complete a major upgrade to the HOV *Alvin*. A major milestone in the construction of the new personnel sphere (capable of withstanding pressures at 6,500 m water depth) was reached in August with the successful welding together of the two titanium hemispheres that were forged in 2008. Work continues on insert welding for the hatch, penetrator plate, and viewports. This is the first time that a project involving forging and welding of such thick (3") titanium has ever been undertaken in the U.S., making the design and fabrication of the sphere very challenging. However, with much of the technically difficult work complete, we look forward to delivery of the personnel sphere in March 2011.

A second milestone that was reached in December was the successful completion of a Preliminary Design Review conducted by a panel selected by the National Science Foundation. This involved a complete review of the engineering design and scope, budget, schedule and management of the first stage of the project, due to be completed by the end of 2011, which includes installation of the new personnel sphere into *Alvin*'s modified frame. This vehicle, while still diving to only 4,500 meters, will provide improved viewport configuration for the pilots and observers, more interior space, improved imaging and lighting systems and an increased ability to carry equipment and samples. The second stage, to be completed when battery technology and funding permit, will upgrade all other vehicle components to a 6,500 meter depth capability, and will also install a different type of batteries that will enable the submersible to make longer dives. The result will be a next-generation submersible that can reach 98% of the seafloor.

—[Susan Humphris](#), Acting Vice President of Marine Facilities/OPS

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A brown pelican (*Pelecanus occidentalis*) checks out the WHOI-operated research vessel *Atlantis* off the coast of the Galápagos Islands in January 2009. The research vessel and the *Alvin* submersible were in the area recovering ocean-bottom seismometers and other seafloor instruments. (Photo by Brendon Todd, Woods Hole Oceanographic Institution)

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