A Fleet Too Good to Afford?

The U.S. research fleet, with three new vessels, may be the best in the world. But rising costs and tightening budgets could leave scientists high and dry

The christening of a ship is usually cause for celebration. But last month, when the Navy's 84-meter Research Vessel *Atlantis* splashed into the water at Moss Point, Mississippi, off the Gulf of Mexico, the joy over the latest deep-sea addition to the nation's oceanographic fleet—already viewed as the best in the world—was tempered by concern that the country may not be able to afford its newly acquired riches.

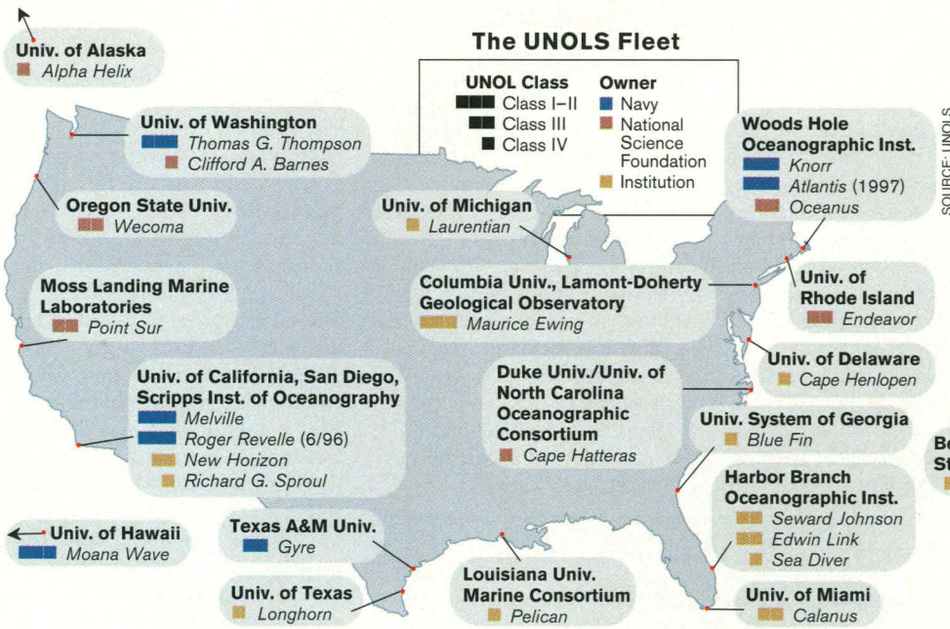
A new report by a consortium of institutions that operate the country's 27-ship academic fleet projects an $18 million gap by the end of the decade between operating costs and expected revenues. That prospect is forcing the oceanographic community to take a hard look at itself and its sources of support. It has prompted the National Science Foundation (NSF), its main benefactor, to broach the sensitive topic of fleet realignment, in which some vessels would be retired and others moved to different home ports to reduce transit times and lower costs. And it has led a unit of the National Research Council (NRC) to propose a study of consolidating the management of all the oceanographic ships now operated by government agencies, companies, and academic institutions. The goal of all these efforts is to help U.S. oceanographers stay afloat in troubled fiscal seas.

"The system is becoming strained," says Donald Heinrichs, head of NSF's oceanographic facilities section. "It's clear that we can't continue to do business as usual. If nothing happens and budgets keep shrinking, there's going to be a lot of ships tied to the pier."

In a situation familiar to optical astronomers, who have a plethora of new telescopes without enough funds to use them (*Science*, 21 October 1994, p. 356), oceanographers are facing an embarrassment of riches just as operating budgets are tightening. The $50 million *Atlantis*, to be operated by Woods Hole Oceanographic Institution as a replacement for its 33-year-old *Atlantis II*, is the third such ship that the Navy has built since 1990 for use by U.S. oceanographers. The University of Washington began operating its sibling, the *Thomas Thompson*, in 1992, and this June a third sister, the *Roger Revelle*, will leave from the Scripps Institution of Oceanography in San Diego on its first scientific cruise. Next year the National Oceanic and Atmospheric Administration (NOAA) takes possession of a nearly identical vessel, the *Researcher*, that was built as the new flagship of its endangered research fleet.

The ships are the fruits of an ambitious, decade-long construction program begun during an era when the Navy was expanding and NSF had been promised continued growth. In addition to building its three new ships, the Navy renovated and stretched two other vessels operated by Woods Hole and Scripps, and NSF spruced up four intermediate-sized (54-meter) vessels. But a larger fleet costs more to operate—the *Revelle*, for example, will add an estimated $4.6 million a year to Scripps's budget—and more capable ships also come with higher daily price tags.

As these new vessels come into service, funds to operate them are unlikely to keep pace. NSF has always been the primary support for academic oceanography, and its contribution—both in absolute dollars and as a percentage of the total—has risen sharply over the years. But that trend is coming to an end. "We don't expect any growth in the next few years," says Heinrichs.



Managerial crosscurrents

The fiscal crisis has exposed strains in the complex network of agencies and institutions that own, operate, and lease research vessels. A central component of this tangled network is the University-National Oceanographic Laboratory System (UNOLS), which serves scientists from a far-flung collection of universities and research centers.

UNOLS's job is to make the best use of a mixed fleet owned by the Navy, NSF, and institutions and operated by a variety of universities and research institutions. The Navy's seven ships are by and large the biggest and newest in the UNOLS fleet, capable of taking as many as 37 scientists and a crew of 22 on deep-ocean cruises covering thousands of kilometers and lasting more than a month. NSF owns six intermediate-sized vessels, which accommodate a dozen or so scientists on short-term cruises closer to shore. The rest of the fleet, mostly smaller ships, is owned by individual institutions and used mainly for day trips.

The 25-year-old consortium, currently based at the University of Rhode Island, gets high marks from most government officials and oceanographers for integrating a diverse collection of scientists, ship owners, and shore facilities. "It's an example of a successful partnership," says Heinrichs. "It's the primary research fleet in the country and the best in the world."

Under the UNOLS system, a scientist

Breaking the Ice on Cooperation

A new arctic research vessel is the top priority for U.S. oceanographers, who believe this vital region needs a vessel dedicated to exploring fundamental questions ranging from marine geology and world ocean circulation to pollution run-off and Arctic biology. And this month the U.S. Coast Guard begins construction of a vessel that seems to be just what oceanographers had in mind: a $330 million, 110-meter icebreaker, the *Michael Healy*, whose primary mission is to conduct research while patrolling Arctic coastal waters.

A perfect marriage of the two communities? Hardly. Scientists want their own ship. Even though operating funds for university-operated ships are running short (see main text), they are pushing a proposal for a $120 million arctic research vessel (ARV) to be built by the National Science Foundation (NSF) and operated by an academic institution. "The *Healy* isn't well designed for science," contends Garrett Brass, head of the government's Arctic Research Commission and former executive director of the University-National Oceanographic Laboratory System (UNOLS), the nation's primary research fleet. "The best way for the two agencies to work together is for the Coast Guard to get out of the business of operating research ships and let UNOLS do it."

Researchers' antipathy to the *Healy* stems in part from bitter experience in trying to conduct research on other Coast Guard vessels. Scientists complain that large and inexperienced crews at times have hampered their ability to work effectively, and that existing icebreakers have broken down in midcruise as a result of balky propulsion systems. Coast Guard officials are well aware of such complaints, but they feel scientists aren't giving the new vessel a fair shake.

"The *Healy* is being built from the ground up as a research vessel," says Captain Alan Summy of the Coast Guard's ice operations division, adding, "It's got as much lab space and carrying capacity for science as what NSF has proposed for its ARV." Summy says the Coast Guard plans to cut the size of the *Healy*'s crew to half the normal complement for a ship of its size and hopes to gain a waiver of normal rotation schedules to allow crew members to become more proficient at operating a research vessel.

Meanwhile, other parties are urging oceanographers to patch up their differences with the Coast Guard. Last fall a National Research Council panel urged the two agencies "to develop a coordinated bipolar strategy" for the efficient use of icebreakers and ships. Last month an NSF delegation met with Coast Guard officials in Louisiana, where the *Healy* is being built, and a working group has been formed to ensure ongoing communications.

Oceanographers may have little choice in the matter, in any case: The imminent construction of the *Healy* means that NSF is unlikely to get the money anytime soon for its own ARV. Last year, for example, the General Accounting Office gave Congress a report with the blunt title: "NSF's need for an additional icebreaking research vessel [is] not demonstrated."

Still, NSF's Mike Purdy, head of the division of ocean sciences, says he doesn't know if researchers will want to use the *Healy* once it's ready. "My job is to accurately represent to the Coast Guard the needs of academic scientists," he says. "If the *Healy* is not a useful tool, then scientists may choose not to use it."

Summy says that the community ignores the new vessel at its peril. "If NSF doesn't provide enough funding [for scientists] to keep the *Healy* busy, then it's going to be pretty hard for them to convince Congress to build another ship," he says. "In my opinion, the best thing they can do to help their cause is to oversubscribe the *Healy*."

–J.D.M.

with an approved grant puts in for time on a specific ship, and each institution uses that information to draw up an annual schedule for its ships. Then representatives from each UNOLS institution meet to make sure that the schedules reflect the best use of existing resources. NSF provides 75% of the consortium's current annual budget of $50 million to operate the ships and port facilities, with the Office of Naval Research (ONR) chipping in 12% and the rest coming from a variety of federal agencies, state governments, and private sources.

Not all the nation's research vessels are part of the UNOLS fleet. The NOAA Corps operates its own 16-vessel fleet, most of which is devoted to charting, mapping, and fisheries work, although it also pays for small amounts of time on UNOLS vessels. Other agencies, including the Environmental Protection Agency (EPA) and the U.S. Geological Survey, own vessels that have made a modest contribution to oceanographic research. The Coast Guard operates icebreaking vessels that piggyback science onto coastal patrol duties. Rounding out the fleet is a handful of commercial vessels available for hire, as well as the growing capacity of the privately endowed Monterey Bay Aquarium Research Institute—including a new $20 million ship with an innovative twin-hulled design to be used in high seas as well as in support of the institute's remotely operated vehicles.

Whether or not they use the UNOLS fleet, each federal agency must square its reasons for going to sea with its mission, from the Navy's duty to defend the country to the EPA's desire to monitor offshore sources of pollution. And those missions don't always square with researchers' needs. Indeed, even when two agencies share a common goal (see box), they often have a hard time working together to achieve it.

In the past, UNOLS has been able to cope with excess capacity among intermediate-sized vessels by laying up one ship for a year (with the approval of the ship's owner) and moving its scheduled cruises to other vessels. But a new study by a UNOLS panel, headed by oceanographer Peter Betzer of the University of South Florida, indicates that the gap between revenues and operating costs will be too large to close by that mechanism alone. The panel predicts that the shortfall will grow from $4.2 million in 1995 to $13.2 million in 1997 and $18.2 million in 2000. That would result in downtime equivalent to operating three large vessels and one intermediate-sized vessel.

SHELLEY LAUNCH/WHOI

Fiscal bath? The new *Atlantis* will add capacity—and cost—to the UNOLS fleet.

UNOLS officials have a simple solution to avoid such a catastrophic fate: Increase support from federal agencies. And they are pinning their hopes on NOAA. NOAA is a logical target because the unit that operates its fleet, the NOAA Corps, is being dismantled and its two vessels that do general-purpose oceanography, the *Discoverer* and the *Baldrige*, are being retired this year to make room for the new *Researcher*. The agency is under fierce pressure from Congress to trim costs, including getting out

of the business of operating vessels and retiring most of them. If that happens, much of the agency's $62 million annual ship operating budget could become available to spend on other ships, including those in the UNOLS fleet. "If we could get 300 days [of operating funds] from NOAA, that would cut the shortfall in half," says Betzer.

But not everyone agrees that supporting business as usual for UNOLS is the answer. "I think that we should go out for bids rather than have UNOLS institutions retain the right to operate [government-owned] vessels indefinitely," says Mary Hope Katsouros, the NRC ocean board's longtime executive secretary. "And I don't think that UNOLS is necessarily the most cost-effective way to run things."

Instead, the NRC is now asking whether consolidating all these vessels into a single national fleet—with a management structure yet to be determined—might be a better way to coordinate the resources of government, academic institutions, and commercial operators. The board hopes to win backing shortly from NSF, NOAA, and ONR for a 1-year study to examine the issue.

"The current system has served science well, and it's more capable than ever," says University of Texas geologist Paul Stoffa, a member of the board. "But all these issues have to be looked at in light of the anticipated shortfall." Adds Otis Brown, dean of the Rosenstiel School of Marine and Atmospheric Sciences at the University of Miami, "Right now we have a pastiche of approaches to fulfilling a national need. You can say there's strength in diversity, or you can say there must be a way to save money."

The question of whether the academic fleet could be operated more efficiently under some other mechanism is a difficult one to answer, however. Some operators point to the differences in the daily rates institutions charge NSF to operate essentially identical vessels as evidence of the potential for cost savings. Scripps runs the most expensive ships this year—the *Revelle*, at $18,000 a day, and the *Melville*, at $17,900—while the University of Washington charges $16,200 a day to run the *Revelle*'s sister ship, the *Thompson*. Woods Hole bills the *Knorr*, which is similar to the *Melville*, at $16,100 a day and the *Atlantis II*, in its last year of operation, at the bargain rate of $14,600.

Shuffling the deck

Short of overhauling the entire system, some administrators, including Barry Raleigh, dean of ocean and earth sciences at the University of Hawaii, believe there may be potential savings in concentrating ships in fewer ports. His institution is competing for the chance to operate the NOAA's *Researcher* as the replacement for the *Moana Wave*, a 64-meter vessel based at Hawaii that the Navy is expected to retire within a few years. It's offered NOAA a package deal to operate one of its fisheries vessels, too. Raleigh estimates that by spreading the cost of shore support facilities over both vessels, Hawaii could lower the *Researcher*'s daily rate by $1000. "I don't see how you could avoid economies of scale," he says.

But other UNOLS officials says shifting vessels around won't solve the problem. John Bash, UNOLS executive director, points to a 10-year-old study showing that there are no economies of scale in operating more than one research vessel. And he notes that there are good arguments for encouraging geographic diversity: It gives more institutions a chance to benefit from having a ship on site, expands the potential pool of contributors, and spurs competition among operators to provide scientists with the best possible service and facilities. "Moving ships is not something you do lightly," adds Heinrichs, who last year suggested that UNOLS consider moving Scripps's 85-meter *Melville* to Hawaii to replace the *Moana Wave* and take advantage of Hawaii's proximity to prime research sites in the South Pacific. UNOLS's governing body deferred any action, and Heinrichs says he wasn't surprised: "In my entire career I have been involved in one such move, and the institution that lost a vessel had two left."

Raleigh, however, thinks UNOLS may have to consider a more drastic solution. "Should we bite the bullet and downsize the fleet?" he asks. "I think it may come to that, but everybody steps very gingerly around the issue out of fear that they may be the one to lose out."

Many UNOLS institutions don't agree that retrenching is a viable response to the new fiscal realities. "The issue of fleet reduction is something that needs to be approached most carefully," states the Betzer report, noting the accompanying loss of crew expertise and status for the affected institution, as well as the rapid deterioration of the asset itself. "Even in the face of [excess] resources, the UNOLS/science community should continue planning for new assets," it adds. The current budget shortfall could be a temporary phenomenon, says Bash, while pulling ships out of the water is a decision that's hard to reverse.

In the meantime, the clock is ticking. The *Atlantis* is scheduled to go out on its first cruise next spring, at a cost likely to be several thousand dollars a day higher than its predecessor's. "My biggest fear is that we won't come up with a plan, but we'll just go to sea less," says the NRC's Katsouros. "That would be a real shame."

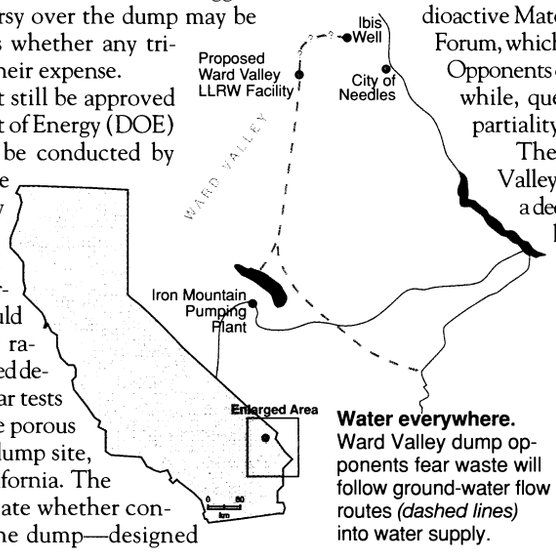
–Jeffrey Mervis

NUCLEAR WASTE

Study Inflames Ward Valley Controversy

When the U.S. Department of Interior said last month that it wants yet another study of a proposed low-level nuclear waste dump at Ward Valley, California, some public officials hailed it as a triumph for public health and sober science. "We must proceed with caution and with science," declared U.S. Senator Barbara Boxer (D–CA) when the decision was announced. But scientists dragged into the controversy over the dump may be asking themselves whether any triumphs will be at their expense.

The study must still be approved by the Department of Energy (DOE) because it would be conducted by Lawrence Livermore National Laboratory (LLNL), a DOE-funded lab. If DOE gives the nod, Livermore scientists would examine how fast radionuclides deposited decades ago by nuclear tests are permeating the porous desert soil at the dump site, near Needles, California. The results could indicate whether contaminants from the dump—designed to hold waste from utilities, hospitals, and laboratories in California and other states—could seep into California's water supply. But instead of welcoming a possible resolution to doubts about the project, both sides in the controversy are assailing the study. "It's all part of a strategy of delay," charges Alan Pasternak, an LLNL chemical engineer who is technical director of the California Radioactive Materials Management Forum, which favors the project. Opponents of the dump, meanwhile, question LLNL's impartiality.



Water everywhere. Ward Valley dump opponents fear waste will follow ground-water flow routes *(dashed lines)* into water supply.

SOURCE: GEOSCIENCE SUPPORT SERVICES

The battle over Ward Valley has raged for nearly a decade. The U.S. Geological Survey, the Metropolitan Water District of Southern California, and the Environmental Protection Agency, to name a few, have all studied the site, and each has been lambasted for its findings, whether