US scientists seek support for nuclear sub

Houston. Wanted: one decommissioned US Navy nuclear submarine for use as a dedicated scientific research vessel. This may be the ultimate in dual-use concepts now being explored in the wake of the Cold War. But it will be top of the agenda at a scientific workshop being held next week in Washington to gauge the level of interest in scientific and government circles for what has been coined the 'white submarine' concept.

Meeting organizers hope that the workshop will also allow them to pin down the scientific rationale for using this type of vessel for scientific research primarily in — though not limited to — Arctic waters.

The scientists backing the idea emphasize that they are not advocating the use of a nuclear submarine for research that could be done using surface ships or other means. Nuclear submarines come into their own when there are "hostile conditions at the surface, be it ice or storms", says Lloyd Keigwin, a senior scientist at the Woods Hole Oceanographic Institution in Massachusetts, and one of the organizers of the two-day workshop.

A nuclear submarine, he says, would enable researchers to map the sea-floor in the Arctic or Southern Oceans, to study global climate change, to improve our understanding of basic ocean circulation, or to track environmental pollution. "Understanding upper ocean physics and sea floor processes in the Arctic and Antarctic are just two very fundamental things that we'll never be able to do any other way," says Keigwin.

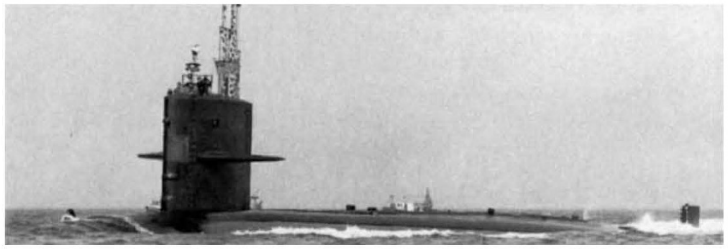
Next week's meeting will bring together researchers from a broad range of scientific disciplines, including chemists, geologists, geophysicists, marine biologists, physical oceanographers, 'acousticians' and specialists in submarine technology, as well as government officials.

Keigwin hopes that it will produce a set of research priorities (and geographical locations) that will form the basis of a 'white paper' to follow on from the SOONS (*Scientific Opportunities Offered by a Nuclear Submarine*) report, published in 1992 by the University National Oceanographic Laboratory System.

What makes the matter more urgent is that the entire fleet of nuclear submarines considered to be most appropriate — the *Sturgeon* class, which first came into service in the 1960s — is due to be decommissioned by the US Navy over the next decade or so. Special design features of these submarines, in particular toughened sails and diving planes that can be rotated to the vertical position, enable them to break through the Arctic icepack to surface should the need to do so arise.

"We have this one-time window of opportunity, as these boats go out of service, to use them for a little while before their reactors are worn out," says Garrett Brass, executive director of the US Arctic Research Commission. "That's why we're anxious to strike now while the iron is as hot as it will ever be," he says.

Cost estimates for a white submarine vary enormously. After reinforcing scientific support, a detailed cost study would probably be the next task, says Keigwin. Estimates for overhauling a nuclear submarine range from $50 million to three times that amount; running costs could range between $8 million and $12 million a year.



A *Sturgeon*-class submarine: new role in a post Cold War world?

The question of who would foot the bill also remains open. Costs of that order of magnitude make it "impossible for any one agency to fund", says Gary Hill, chief of the Office of Energy and Marine Geology at the US Geological Survey (USGS), which has responsibility for monitoring and mapping the sea-floor and sea-bed. But Hill, who argues that the project would support USGS's mission, thinks that one of the keys is going to be the Navy's reaction.

The Navy itself has yet to be convinced. David Albritton, a spokesman for the service, says that the white submarine proposal is "currently being evaluated" and that it would therefore be "premature" for the Navy to comment on the scientists' suggestions. He declined to say who, if anyone, from the Navy would be attending next week's workshop.

Although there is no precedent in the United States for a white submarine, Russia has on several occasions offered to convert a nuclear submarine from its own fleet into a research vessel for use in the west. Indeed, Keigwin was a member of a US delegation that went on a fact-finding mission in 1992 to the Russian Submarine Design Bureau in St Petersburg.

This, and other similar initiatives, proved to be a political hot potato and came to nothing. But there are indications that the US Navy might slowly be warming to the idea of making its military hardware more accessible to the civilian science community at large. Last summer saw the first unclassified science mission aboard a fully operational nuclear attack submarine, the *Pargo*, which sailed from Groton, Connecticut, to the Arctic with five civilian scientists on board.

The *Pargo* mission was widely seen as a success, and by some as the litmus test for future missions. The Navy has committed itself to five more dedicated science missions, each lasting 45–60 days, over the next five years. It recently signed a memorandum of understanding along with several government agencies that include the National Oceanic and Atmospheric Administration, the National Science Foundation and USGS. The next mission to the Arctic is set for March.

Diane Gershon

Pearson resigns as head of Darwin Corp.

San Francisco. Only months after three high-powered investors joined its board, the president of Darwin Molecular Corporation has resigned over "strategic differences". Mark Pearson, president and chief executive of the small Seattle-based gene sequencing company — and previously an executive director at DuPont Merck Pharmaceutical Co. — blamed conflicts with the board for his resignation, but declined to elaborate.

In May, William Gates III and Paul Allen, the co-founders of Microsoft Corp., invested $10 million in Darwin. They joined the board along with George Rathmann, chairman and chief executive of Icos Corp. in Seattle, and chairman emeritus of Amgen Inc. (see *Nature* **369**, 88; 1994).

The company says that Pearson's departure will not lead to any change in its scientific focus or technical strategy. Darwin is using a three-pronged approach to drug discovery, involving gene sequencing, the computer-aided analysis of sequencing information, and 'test-tube evolution', which subjects generations of targeted molecules to a test of survival.

Pearson said Darwin is preparing to announce a significant additional cash infusion by a large group of investors. David Galas, who came to the company from the Human Genome Project at the US Department of Energy, will act as interim chief executive until a replacement for Pearson is appointed.

Sally Lehrman