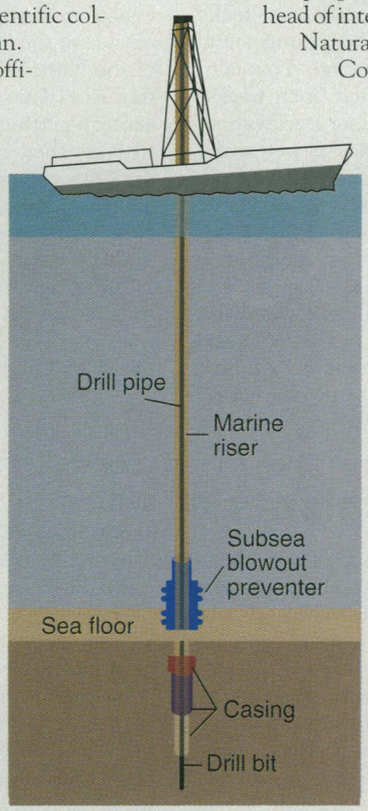
Japan Trolls for Global Support Of Deepest Drilling Vessel

HAYAMA, JAPAN—The Japan Marine Science and Technology Center (JAMSTEC) loves superlatives. In 1995 it launched *Kaiko*, the world's deepest diving submersible. Next year it hopes to complete work on the world's largest oceanographic research vessel. Now the government agency, armed with a budget projected to grow by as much as 20% annually, wants to build the world's deepest drilling scientific ocean drill ship. And if favorable reviews of the project's scientific agenda from other countries can be converted into operating funds, the new ocean drilling vessel could also become the anchor for the first major international scientific collaboration initiated by Japan.

Last month JAMSTEC officials held a conference here to acquaint scientists and government officials from the United States, Britain, France, and Germany with its ambitious Ocean Drilling in the 21st Century (OD21) program. The agency, which is affiliated with Japan's Science and Technology Agency (STA), hopes to win Japanese government approval for a 160-meter vessel to be launched in 2003. Final budget data are not available, but sources have estimated it will cost $500 million to $600 million to build and $100 million a year to operate. Japan expects to pay for the ship and the lion's share of the operating costs, says Yoichiro Otsuka, manager of JAMSTEC's policy division, but international partners are needed to help plan and carry out the research as well as help out with operating costs.



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Rising fortunes. A double-walled pipe, called a riser, enhances drilling and prevents blowouts.

Japan's overtures are prompting some soul-searching in the ocean science community. High on the list of concerns is how this ambitious effort would mesh with the current Ocean Drilling Program (ODP), begun in 1975 and now one of the world's longest running international scientific collaborations. Indeed, there is even concern that it could compete for funds with the ODP. As a result, although the foreign participants say they like the idea of a new drilling vessel, they are not yet jumping at the chance to help pay for its operation.

"We are extremely interested" in the project, says Michael Purdy, director of the U.S. National Science Foundation's (NSF's) division of ocean sciences. "But whether NSF can come up with money to support this program is something I cannot answer." European officials offer a similar reaction. "We all have limited budgets," says Jean-Pierre De Longueau of France's marine research agency, IFREMER. "The problem is that we can't pay for two programs." Adds Anthony Mayer, head of international affairs for Britain's Natural Environment Research Council, "We certainly welcome Japan's initiative and leadership."

Japan sees the OD21 project as an extension of the ODP. NSF picks up about 60% of the annual $45 million cost of the program, based at Texas A&M University, with the rest coming from six members—France, Germany, Britain, Japan, an Australian-Canadian team, and a consortium of smaller European countries. The ODP's scientific agenda is set by the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), a collection of committees and panels with representatives from the participating countries, and the work is performed on the 143-meter JOIDES *Resolution*.

Despite its record of success, ODP has recently come under fire. A review of the program by a French panel earlier this year bluntly recommended withdrawal at the end of the current agreement in 1998, saying that the program's scientific output did not match France's contribution. However, IFREMER's De Longueau now says the French concerns are mostly over procedural matters and not about participation itself. Similar questions about the value of the program have been raised in Britain, where a midterm review has been completed but not made public. Even so, sources close to the program say they expect both countries to renew their membership.

Japan's proposal has added a new dimension to these deliberations. The idea of a next-generation ocean drilling vessel was put on Japan's scientific agenda in 1993 by the Ocean Development Council, which advises the prime minister on matters ranging from harbor development to deep-sea research. Its chair at the time was marine geologist Noriyuki Nasu, former director of the University of Tokyo's Ocean Research Institute. "I saw the importance of reinforcing Japan's contribution [to ocean drilling efforts]," he says.

The council recommended that Japan develop a drilling vessel to be operated as an international facility, and STA and JAMSTEC used that endorsement to win funding for preliminary studies. A decision to proceed with the design of the new ship is expected next year, followed in 1998 or 1999 by a decision on whether to begin construction.

The new ship, if built, would offer scientists the capacity to drill deeper into the Earth's crust, in areas now closed to them, and to retrieve better quality samples. Its key technical feature is a pipe, called a riser, that would run from the sea floor to the water surface. In a drilling technique common in the oil industry, the drill pipe and bit are lowered through the riser and drilling mud—a dense, viscous slurry—is circulated down through the pipe and back up through the riser. The mud stabilizes the hole as it is being drilled, cools and lubricates the bit, and carries cuttings to the ship for analysis.

With the riser system and the placement of casings at the top of the drill hole, the OD21 vessel would be able to drill as deep as 3500 meters under the sea floor, about double the penetration depth of the JOIDES *Resolution*. The riser system would also allow greater recovery of higher quality cores and facilitate placement of seismographic and other instruments in the hole. And a blowout preventer at the top of the drill hole would reduce the chances of oil and gas leaks should the drill hit natural deposits, allowing scientific drilling in areas now off-limits for environmental reasons.

Researchers from a range of disciplines are eager to make use of a riser drill ship. Marine geologist Henry Dick, of Woods Hole (Massachusetts) Oceanographic Institution, was part of a team that drilled the deepest hole in the ocean's crust in the Pacific Ocean, off South America. The drilling was halted by problems that a riser drilling system could have avoided. He notes that the previously generally accepted model of the ocean crust—based on seismic evidence—consisted of a fairly simple layered structure with little variation in thickness. But this model has been upset by re-

cent exploratory findings. "We no longer know the overall composition of the ocean crust," Dick says.

Specialists in other disciplines see similar opportunities. Geophysicist Mark Zoback of Stanford University says the depth, core recovery, and instrument-placement capabilities of OD21 would help answer fundamental questions about fault conditions at the major oceanic subduction zones and shed light on earthquake mechanisms. Marine geologist Kozo Takahashi, of Hokkaido Tokai University, is excited by the chance to recover shafts of sediment with sufficient integrity to form a long-term record of environmental changes and to study the evolution of such climatic phenomena as the Asian monsoon. And micropaleontologist Hisatake Okada, of Hokkaido University, says the enhanced core-recovery capabilities of the OD21 vessel would provide a "new tool for studying the paleogeographic climate" through the recovery of molecular fossils going back to the Jurassic period.

But geologist James Kennett of the University of California, Santa Barbara, worries that the high cost of OD21 will restrict it "to doing what it does best"—drilling deep into the continental margin—and limit exploration elsewhere in the world's oceans. That would be a disaster to science, he says, if the United States and other countries were to end support for the current drilling program.

To encourage full coordination between the two efforts, ODP and JAMSTEC officials have separately proposed rearranging JOIDES and placing both vessels under the same scientific advisory structure. James Briden, a geologist at University of Oxford and current chair of the JOIDES executive committee, says "a joint planning office is needed" to get the most out of both vessels. Hajimu Kinoshita, director of deep-sea research for JAMSTEC, expects synergy from the fact that both vessels would be trying "to solve problems in earth sciences." But one thorny issue is how to collect and split operational costs. The ODP program throws all financial contributions into one pot, a system that might prove difficult for two ships based in different countries.

Ultimately, however, the relationship between ODP and OD21 will hinge on whether the international community will be able to support two vessels. "We have a responsibility to the U.S. science community to see whether we can make it work," says NSF's Purdy. But his crystal ball is hazy. "We've got some tough decisions to make in the next 1 to 3 years," he says.

–Dennis Normile

BIOMEDICAL RESEARCH

Gallo's Institute at the Last Hurdle

Political leaders in Maryland regard biomedicine and particularly AIDS research as a growth industry. The state is already home to the National Institutes of Health (NIH) and ranks third in biotech employment after California and Massachusetts. That helps explain why the Maryland legislature is about to commit $20 million over 5 years and part of a $50 million state-owned facility to a new center in Baltimore run by AIDS researcher Robert Gallo, formerly of the National Cancer Institute (NCI). The project—the Institute of Human Virology (IHV)—ran into some opposition last year because of Gallo's controversial past, but it is expected to win final approval from the legislature in mid-March, according to state representative Howard Rawlings, chair of a key appropriations committee. Says Rawlings: "It's a done deal."

Gallo's plans for the institute—and the state's expectations for it—have emerged in legislative hearings and planning documents over the past few months. The project began last year when Gallo and two colleagues, Robert Redfield, a former U.S. Army clinician and AIDS vaccine developer, and William Blattner, an epidemiologist who was also at NCI, offered themselves to potential sponsors as a "dream team" in AIDS research. They were courted by Maryland, Pennsylvania, South Carolina, and Virginia. Maryland's governor clinched a deal with Gallo last May (*Science*, 26 May 1995, p. 1119).

State planning documents indicate that IHV—which will be an adjunct to the University of Maryland, Baltimore—will expand from an initial state-supported staff of about 46 to around 70 by 1999, and 200 by 2001. The IHV's interim staff director, James Jennings of the Hill and Knowlton public relations firm in Washington, D.C., has more ambitious plans: "We expect to have 100 to 150 people on board by the end of the year, and our objective is to have 350 in 3 to 5 years."

The sponsors anticipate big returns on the state's investment in the institute, which will develop new therapeutics for AIDS, other viral diseases, and cancer based on natural products of the immune system. During hearings on this plan in December, state finance analyst William Ratchford noted that Gallo's patent on an HIV test has generated $40 million in income for NIH, and he said Gallo "has expressed confidence that the institute will generate research findings not unlike his previous efforts at NIH." Ratchford added that IHV will help fill local hotels by bringing hundreds of AIDS researchers to international scientific conferences, and he said the state anticipates the team will draw patients from around the world, generating "significant revenues" for the University of Maryland hospital in Baltimore.

"No information has been forthcoming that would justify us not going ahead."

—Howard Rawlings

Ratchford said that by 1999, IHV is supposed to "generate sufficient external funds so as to be largely self-supporting." Patents on IHV inventions will be held by the university, but net revenues will be split 50–50 between the university and the inventors. A spin-off company in Baltimore called Omega Biotherapies Inc.—directed by the three IHV principals and Jennings—will get first rights to IHV's discoveries. IHV will also receive some funding from federal grants, according to Jennings, and from sponsored pharmaceutical company projects and charitable contributions.

Critics of the venture tried to derail it in December. Among those who spoke against it in state legislative hearings were Suzanne Hadley, a former investigator who worked for Representative John Dingell (D–MI) and looked into allegations of scientific misconduct against Gallo. William Hagins, an NIH researcher, also denounced the proposal as "politically mandated" and "big science–big business run amok." Hagins objected that past controversies involving Gallo, including allegations that he refused to share reagents, would make it hard to attract top scientists to IHV or start international collaborations. At the hearings, Gallo called such comments "innuendoes and allegations" and a "frightening aspect of political intervention into science."

Key Maryland legislators have endorsed Gallo's plan individually and in committee. They have, however, added a clause to the bill funding the IHV asking the University of Maryland to issue a report giving its assurance that high ethical standards will be maintained at the institute. But they see no reason to waver in their support for the project, says Rawlings: "No information has been forthcoming that would justify us not going ahead."

–Eliot Marshall