Explorer's Ocean Drilling Role Expanded

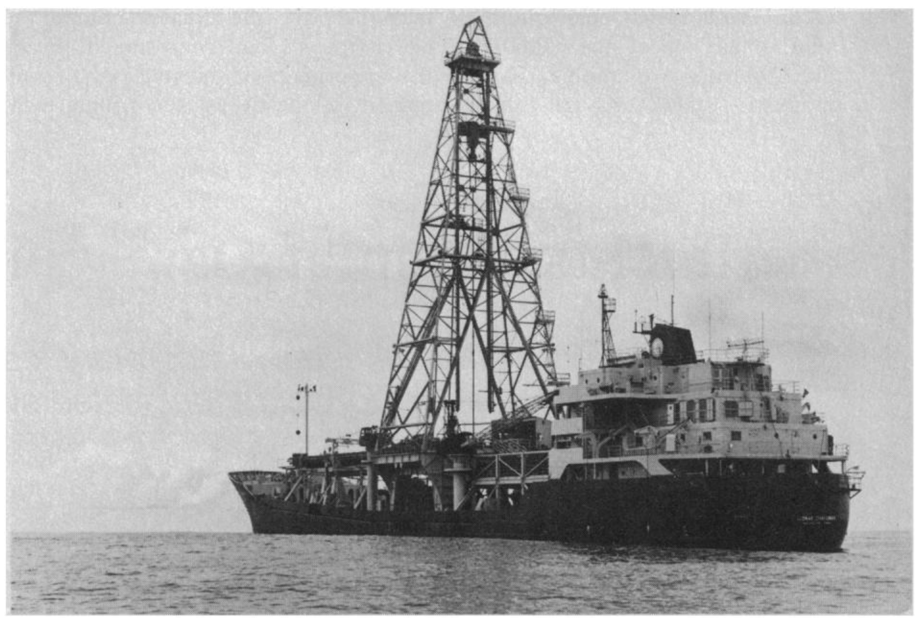
Since NSF has money for only one drilling ship, it wants the two independent drilling programs combined

The National Science Foundation has been loath to choose between its rejuvenated Deep-Sea Drilling Program, which uses the drill ship *Glomar Challenger*, and its ambitious plans for the new Ocean Margin Drilling Program, which would rely on the more powerful, and more expensive, *Glomar Explorer*. NSF has finally decided that there is no way to support the two separate deep-ocean drilling programs. In a public announcement made on 5 August, it proposed a consolidation of the two that would delay the expensive development of some equipment and use *Explorer* alone, at times for jobs that *Challenger* could have done. The plan is a compromise between the hopes of many researchers, that *Challenger* would continue its scientifically productive drilling throughout the ocean, and NSF's ambitious plans to replace *Challenger* with *Explorer*, which would concentrate on ocean margins. NSF's plan also makes a bid for increased support from the oil industry and continued assistance from foreign countries. Initial reaction to the proposal is generally positive, although some key oil companies still appear reluctant to support the program.

John Slaughter, director of NSF, first revealed the new proposal on 22 July at a meeting in Houston of representatives from more than 20 oil companies. In the new plan, *Challenger* would continue as the sole drill ship until about 1983 when *Explorer*, the ex-CIA submarine salvage ship, will be converted into a drill ship. *Challenger* would be retired shortly before *Explorer* is ready. Allen Shinn, who was appointed head of NSF's new Office of Scientific Ocean Drilling on 4 August, says that there will "undoubtedly be a hiatus [in drilling], but it would not be very long, perhaps 6 months to a year." From 1983 to 1987, *Explorer* would operate in much the same way that *Challenger* does now, only in deeper waters, in rougher weather, and in colder, more ice-strewn seas.

Then, in 1987, *Explorer* would be outfitted with a riser, which is a casing around the drill pipe, and equipment to control the high pressures in the pipe that would develop if the drill bit accidentally hit oil or gas deposits. This technology, which was originally to be developed and installed soon after the ship's conversion, would finally bring *Explorer* up to the capabilities envisioned for the Ocean Margin Drilling Program (OMDP), the follow-up program to the *Challenger*'s Deep-Sea Drilling Program (DSDP) originally intended to start in the early 1980's. *Explorer* could then drill on the ocean margin beyond the edge of the continental shelf, an area previously avoided for fear of causing an oil or gas blowout. It could also drill deeper holes, especially in the rock of the ocean crust. But even after 1987, *Explorer* would alternate between drilling with a riser on the ocean margins and non-riser drilling in other areas. This non-riser drilling is the sort that *Challenger* would have pursued if the DSDP were extended beyond 1983 (its present termination) to run in parallel with the OMDP, as was being proposed by DSDP's managers.

Although ocean drilling would be combined into a single program, some of the funding for the two kinds of drilling would still come from separate sources. A consortium of oil companies, ten of whom had signed on as tentative partners in the OMDP, would contribute $18 million per year toward drilling of the ocean margins, where clues to how oil and gas deposits form may be found. The five foreign countries now each contributing $1.2 million per year toward DSDP's *Challenger* drilling would continue to support non-riser drilling, joined perhaps by Australia and the Netherlands. Foreign countries had been leery of the high costs of margin drilling and the emphasis on U.S. margin drilling sites.


DSDP

Glomar Challenger

"We're trying to find a way," Shinn says, "to avoid making a choice between two major areas of science." Until now, many in the deep-sea drilling community thought that the wrong choice was being made. *Challenger*, costing about $20 million per year, was to be replaced in the early 1980's by *Explorer*, which would drill almost exclusively with a riser at a cost of about $60 million per year. Scientists would have only two or three holes drilled per year instead of *Challenger*'s 15 or 20. Much of the drilling would be off the U.S. east coast and other margins, where the oil industry's interests lie, rather than within ocean basins. For these gains, academic scientists would have been giving up a *Challenger* program recently rejuvenated by technological developments that allow the recovery

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of undisturbed sediment samples and detailed measurements within the drill holes.

Resistance within the scientific community developed early. Small lobbying groups formed, especially after the invitation to the oil industry to participate (*Science*, 8 February 1980, p. 627). By late 1980, concern over the split among academic scientists had become so strong that the executive committee of JOIDES, the DSDP's scientific advisory committee, arranged for a fall 1981 Conference on Scientific Drilling to develop a new consensus on the appropriate scientific goals of ocean drilling. The consensus paper brought out in 1978 supporting an *Explorer*-like program obviously had become outdated.

Amid this doubt, the initial reaction of ocean scientists to Slaughter's proposal has been almost wholly positive. Arthur Maxwell of Woods Hole Oceanographic Institution, chairman of the OMDP's Scientific Advisory Committee, says, "I'm optimistic. I think it's a great thing to happen. I think everybody is really delighted that it's going this way." Even OMDP detractors find the proposal attractive. The one question most observers have is still the cost. Will it be reasonable to pay the higher costs of *Explorer* in part to achieve the goals of a *Challenger*-type program? Comparisons of operating costs for the two ships have been studiously avoided in public. Shinn says *Explorer* costs would "not be way out of line." Figures cited in private by others, which are subject to numerous assumptions, are about $50,000 per day to operate *Challenger* in 1984, after a required refurbishing and a new contract with its operator, and about $70,000 per day for *Explorer*. Conversion of *Explorer* might require upwards of $50 million and the riser would mean additional capital costs.

Although academic scientists have been receptive, the initial reaction of the oil companies has been mixed. Firms that are primarily interested in the development of the deepwater drilling technology promised by OMDP are reportedly disappointed by its delay to 1987, although this is a crucial cost-cutting feature of the new proposal. Many in industry expect that they will be able to drill in water that deep by then with or without NSF's program. Another major problem seems to be convincing enough of the larger companies that the payback on their investment, as risky and as distant as oil and gas production in the deep sea will be, is worth forgoing other, more immediate investment opportunities.

While NSF is attempting to please both oil companies and academic scientists, it has yet to tackle problems on Capitol Hill. Both programs had been surviving scrutiny, but the OMDP has recently hit a snag in a House subcommittee. The proposed cost-cutting, a popular pastime in Washington these days, and the development of a consensus within the scientific community are expected to help out on the Hill.

—RICHARD A. KERR

Experiments Begin at Daresbury's SRS

When the Daresbury Laboratory lost a high energy accelerator, it seemed only natural to build a dedicated synchrotron light source there

Daresbury. The British Rail line from London makes a last stop at Runcorn just before crossing the River Mersey and stretching the last 20 miles to Liverpool in the haze-shrouded distance. A minute or two before the stop, an observant passenger notices over the crest of a hill the uppermost part of an enormous tower looking something like the bridge of a supermodern battleship. Although there is a canal some distance away that is plied by freighters on the way to Manchester, the tower belongs not to a ship but to the Nuclear Structure Facility, a 30-million-volt tandem Van de Graaff heavy ion accelerator. The accelerator is part of the *new* Daresbury Laboratory, which is also the hub of a nationwide scientific computer network and the home of a Cray supercomputer.

The third leg in the triad on which the former high energy physics laboratory now stands is the world's first high energy electron storage ring built expressly for the production of synchrotron radiation. The Synchrotron Radiation Source (SRS) was inaugurated last November, and the first experiments with both vacuum ultraviolet and x-ray light began last month. Allowing for inflation, the SRS storage ring was completed within budget at £5.4 million. But a synchrotron radiation facility has two sides: an electron accelerator to provide the light, and the instrumentation to use it. Because of tight research budgets in the United Kingdom, money originally intended for instrumentation has been diverted to cover the inflation-increased construction costs. So there were at first only three experimental stations operating, although the plan is to have at least 11 in use by May of next year. Already, about 100 research teams have submitted proposals or expressed strong interest in coming here to use the SRS. The intense beams of synchrotron radiation, which comes in a smooth spectrum from below the infrared up to soft x-rays (1 angstrom or longer), can be used for all manner of spectroscopic and diffraction experiments, as well as for x-ray topography and interferometry. Negotiations are under way to allow industrial and foreign scientists to do research at the laboratory, which by charter exists for the purpose of serving British universities.

Before 1963, Daresbury was best known as the birthplace of Lewis Carroll. But in that year, construction began on a high energy physics laboratory to service the northern universities, Glasgow, Liverpool, and Manchester at first and Lancaster and Sheffield later on. Operation of a 5-billion-electron-volt (GeV) electron synchrotron named NINA began late in 1966. Interest in using the machine for synchrotron radiation also began at this time when Ian Munro, then at Manchester, inquired about the possibility of a beam line being attached to NINA. By 1970, work had started on a Synchrotron Radiation Facility, which then grew to encompass the research of about 60 scientists working mainly in atomic, molecular, and solid-state physics. Although there was some crystallography and molecular biology as well, British researchers in these fields with an interest in synchrotron radiation tended to go to the DESY laboratory in Hamburg, West Germany, which had started up a few years earlier (see box).

The synchrotron radiation research

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