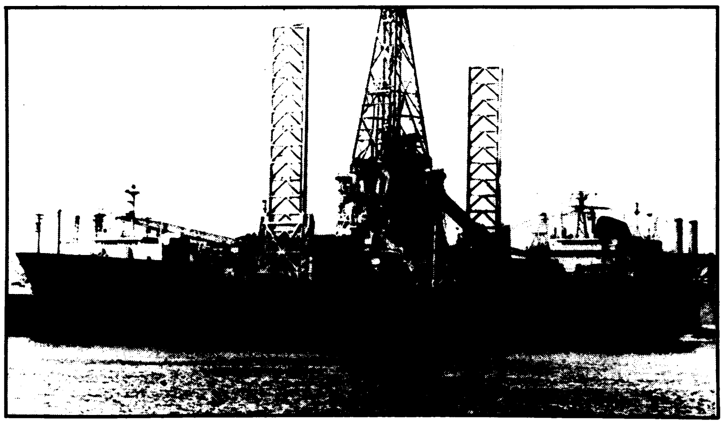
current and confinement times on the order of 100 milliseconds are expected to be achieved if outstanding problems can be overcome.

A final footnote to the whole business is that big physics has reached its ultimate. There have been papers signed with two or three dozen names—in some cases the list of authors is longer than the paper. There have been papers modestly inscribed by the X group of Y laboratory or the so-and-so experimental group. Here comes the end. The first paper in the PLT session at San Francisco was signed by "everybody." To pile up the irony, in the act it was presented by "nobody." The material in it was combined with Stodiek's presentation. □

Glomar Explorer: Conversion to science?



The sophisticated salvage ship Glomar Explorer may be converted to handle deep-sea drilling, extending research to previously impossible areas.

After the Central Intelligence Agency gave up attempts to raise the rest of a sunken Russian submarine, with its specially constructed salvage vessel, the Glomar Explorer (SN: 3/29/75, p. 204), the government found itself holding a uniquely designed, $300 million white elephant. A year-long effort to commercially lease the vessel has found no takers, and the Explorer is languishing unused.

Now the National Science Foundation has authorized a feasibility study to determine what would be necessary to modify the ship for deep-sea scientific research drilling. The $75,000 study is expected to take three months and will be conducted by Global Marine Development, Inc., of Newport Beach, Calif.

As a research vessel, the Glomar Explorer could offer some unique advantages. The ship is 618 feet long by 115 feet wide and displaces 21,000 tons. This displacement is nearly twice as large as that of the vessel currently used for deep-sea scientific drilling, the 400-foot Glomar Challenger. The greater size, coupled with a larger derrick and more powerful engines, means that the Explorer has a lifting capability nearly 10 times greater than the Challenger and could operate under more adverse conditions of weather or currents.

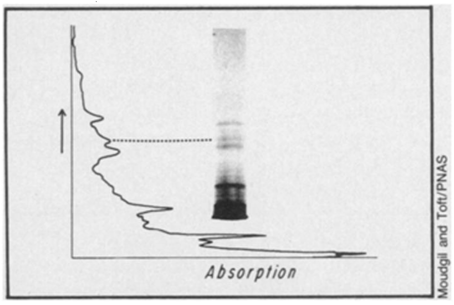
These developments come at a time when the current Deep Sea Drilling Project (DSDP) is approaching the limits of what can be accomplished with the Glomar Challenger. After years of virtually round-the-clock operation, the Challenger is beginning to show signs of age, and the ship is expected to be returned to its owners, Global Marine, Inc., in 1979. Also there have been three major areas of the oceans where the Challenger has not been able to function adequately: deep trenches, arctic seas and regions with hydrocarbon deposits.

The NSF project officer for DSDP, Peter E. Wilkniss, told SCIENCE NEWS the Glomar Explorer might be able to operate in these three neglected areas for an expanded research drilling effort in the 1980s. With its thicker hull it could probably venture farther into icy areas of the arctic seas. With a greater lifting capacity, it could hold the heavier drills needed for obtaining cores from deep trenches, and it could handle the complex, self-contained "riser system" and "blowout preventer" needed to drill safely in oil or gas fields. (Risers circulate viscous "drilling muds" around a drill to equalize pressure in case of striking a subterranean gas chamber, and should a "gusher" occur, the blowout preventer seals the hole.)

Scientifically, ocean trenches are particularly interesting since it is unknown whether ocean sediment is concentrated in them or carried away under a continental plate. An expanded drilling program obviously has practical implications also; mineral deposits may be found in trenches and new petroleum beds may be discovered in previously unexplored areas of the continental shelves. Drilling in arctic seas is important for determining the history of climate changes, since organisms in these areas are most susceptible to temperature variations.

Officials at NSF hope the feasibility study will be completed in time to submit it to the next meeting of the international consortium that finances DSDP. A change-over to the Glomar Explorer would probably entail a doubling of expenses, Wilkniss estimates. □

Cell receptors pinch-hit as enzymes



Progesterone receptor (position indicated by broken line).

Cell receptors are one of the hot topics in molecular biology these days. Researchers have discovered that these tiny proteins, which may have sugar chains attached, reside on cell membranes and catch hormones, drugs, viruses, neurotransmitters and other chemicals that pass by. Receptors, they have found, can sit inside cells and pass along or interpret chemical messages that enter cells. Receptors even appear to play a role in diabetes, obesity and some other diseases (SN: 8/16/75, p. 110).

Now that scientists have learned quite a bit about *what* receptors do for cells, they want to better understand *how* the receptors do it. In the case of cell membrane receptors for protein hormones, for instance, the receptors probably pass a chemical message from hormones to a membrane enzyme, which then activates the intracellular messenger cyclic AMP. But how about those receptors that operate inside cells, say the receptors for the steroid hormones? Two Mayo Clinic molecular biologists have found that one of these receptors, for progesterone, actually works as an enzyme. "This activity," they declare in the October PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, "could represent a major event in the mechanism of steroid hormone action."

Last year the Mayo scientists, Verinder K. Moudgil and David O. Toft, found that the progesterone receptor interacts with ATP, the primary high-power energy molecule inside cells. But what kind of interaction? Moudgil and Toft attempted to find out, and they now report that the receptor catalyzes an exchange reaction between ATP and pyrophosphate. In other words, the receptor works as an enzyme.

Specifically, ATP, which had been previously shown to bind to the progesterone receptor, is apparently split into an AMP-enzyme complex and pyrophosphate, and can be totally regenerated in the presence of pyrophosphate. This exchange reaction is totally dependent not only on the receptor, the investigators have found, but also on ATP and magnesium cations. Other cations, such as calcium, and nucleotides, such as cyclic AMP and ADP, will simply not do. However, some other well established enzymes, notably the DNA polymerases and the RNA and DNA ligases, are also known to be capable of catalyzing this exchange reaction.

Evidence from other labs likewise reinforces the progesterone receptor's putative enzymatic role. For instance, the receptor is closely associated with the synthesis of RNA and is able to bind to polynucleotides, the stuff from which nucleic acids are made. Nucleic acid synthesis from polynucleotides depends on the presence of ATP or other high-energy molecules. Further studies, of course, are needed to determine exactly how the receptor might interact with ATP in order to influence nucleic acid synthesis, how these various interactions mesh with the receptor's interface with progesterone in the cell cytoplasm or nucleus and whether the receptor is an enzyme, an enzyme subunit or a precursor of an enzyme. □

Technology transfer: Toward a redirection

In search of new markets and armed with many good intentions, American government and industry have spent years selling or giving modern technology to underdeveloped countries. Individual successes have been spectacular, but many unfortunate side effects have also resulted. Farm machinery has increased food production, but richer farmers have sometimes benefited more than poor. Irrigation schemes have led to epidemics in some areas, and misdirected industrialization has swollen many Third World cities with slums.

To find less disruptive methods of technology transfer, the United Nations will convene an international Conference on Science and Technology for Development in 1979. In preparation for this conference, the U.S. State Department has scheduled a series of meetings involving government, business and academic leaders, to formulate an official American position. The first such meeting was held last week in Washington, and a lively interchange suggested that the course of American science and technology, as well as foreign policy, may be approaching an important watershed.

Secretary of State Henry Kissinger underscored the importance of the issue: "The problem of world order is the dominant problem of our time. We have talked a great deal about its military component, and we have an understanding of its political component. But in the decades ahead it is very probable that the social and economic aspects of international order will dominate our concerns."

If developing countries are to provide a better life for their people through modern science and technology, he said, they must look toward the industrial democracies, from whence come 90 percent of all transfers of capital. In return, Third World countries will need to stabilize primary commodity markets and offer foreign investors a business environment "free from harrassment and unreasonable restraints."

The vital connection between money, technology and quality of life is generally, but only vaguely, understood. Daniel Parker, AID administrator, expressed it in particularly stark terms: "One-third to two-thirds of the world's population . . . is essentially a nonentity in economic terms. Thus, they cannot consume." Landless, jobless and pennyless, these people can only survive if they can increase their productivity. This, in turn, requires introduction of new technology, but technology carefully selected so it does more good than harm.

To accomplish this difficult task will require more research concentrated on the problems of the small farmer and rural industry, according to James P. Grant, president of the Overseas Development Council. Little of the world's research now addresses the problems of the majority of the world's people. Crop strains need to be bred that will raise the productivity of harvests, without requiring large machinery or inputs of fertilizer. Local, renewable sources of energy must be developed to serve remote villages long before massive rural electrification is feasible. Most of all, Grant said, more social science research is needed to foretell the effects of technology transfer and improve market and production systems to enhance orderly development.

Several speakers echoed one aspect of this systems-approach to development through technology transfer. In the words of Orville Freeman, president of Business International Corp., "*Management* is the most important type of technology." While many developing countries may request what might be called "naked" technology—a factory or a patent license free from integrated market arrangements or systems of management—the speakers generally agreed that this approach is self-defeating. Herbert Fusfeld of Kennecott Copper Corp. pointed out that, ironically, even the Soviet Union is experimenting with Western-style business "complexes" (the equivalent of individual private companies, but without the profit motive) in key segments of its advanced technology industry. The implication is that Western technology cannot be entirely separated from Western institutions, though these institutions may have to be adapted.

Then came the shocker. Even the best conferences tend to drag after 6 hours and even people as accustomed to sustaining or feigning attention as these 900 invited guests tend to nod or fidget. But not after William W. Winpisinger of the Machinists and Aerospace Workers union shattered the calm aura of consensus that was slowly settling over the meeting. When talk turns to technology transfer, he stormed, "it's time for the American worker to put his hand over his wallet." American technology was developed largely at taxpayers' expense, it is a commodity with a high market value, and it belongs to the American people as a whole, he asserted.

While technical know-how may not be able to be kept corked up, he said, "we don't have to cut our own throats by exporting American jobs." The government, he warned, must make a closer accounting of what the domestic impact will be when an American company builds a plant or sells a license to some developing nation with cheap labor, whose products will soon flow back to the United States at low prices.

It was a hard act to follow. Only Orville Freeman tried. While admitting there are few statistics on just what effect technology transfer as a whole has on unemployment at home, he said in some instances it can actually help. From 1960 to 1974, for example, American companies with the highest proportion of investment outside the United States have shown the fastest growth of jobs in their U.S. plants, he said.

The conference moderator, Assistant Secretary of State Frederick Irving, called the session a "town meeting approach" toward developing a coherent foreign policy on an important issue. An equally apt analogy might be that of a circus holding a shake-down performance in its home town before hitting the road. Future engagements include a series of national and international encounters (an official U.S. National Conference will be held next October) with side-shows likely in Congress and in various private forums. If successful, these may prove to be a unique new exercise of democracy, whose ultimate implications for American science and technology cannot now even be estimated. □

What went wrong? Anatomy of failures

The course of science and technology is littered with the residue of failure. False starts, wrong turns, sudden pitfalls all hinder the path toward successful technological innovation. Some attempts make it, some don't. Everyone knows that, or should, but nevertheless the problems and failures along the way often get swept into the closet and forgotten. It's the glowing successes we remember. That's understandable, for failure is uncomfortable to be around.

In the express hope that out of failure important lessons can be learned, the editors of IEEE SPECTRUM have devoted almost an entire issue of their publication