Ocean Technology: Race to Seabed Wealth Disturbs More than Fish

Two-thirds of the world's surface is covered by the oceans, and a large portion of the ocean floor, known as the deep seabed, contains what are believed to be the richest mineral resources on the planet. A bitter international and congressional fight has been brewing over who should be allowed to exploit this wealth and under what conditions. The fight is between those who maintain that the developing countries ought to share in this common heritage of mankind and the mining interests in the technologically elite countries who are acquiring a seabed mining capability and want to stake their claims to the ocean floor as soon as possible. Foes of the latter approach, including the late President Lyndon B. Johnson, have objected that the race for undersea wealth amounts to a new form of colonialism and the "Americanization" of the ocean floor. They warn it could wreck a forthcoming international oceans conference and ultimately create conflict on the high seas.

Present seabed mining technology, which could permit operations to start in 2 or 3 years, is under development by a handful of U.S. companies: Hughes Tool Co., Kennecott Copper Corp., Union Carbide Exploration Corp., and a subsidiary of Tenneco, Inc., Deepsea Ventures, Inc. In addition there are probably others who have kept their interest a company secret. Also a Japan-based consortium is carrying out preliminary exploration in the Pacific, and development is also under way in France, West Germany, and the Soviet Union.

Either by scraping the ocean floor with buckets or by sinking a barge to the bottom, loading it, and retrieving it (see photo), or with a vacuum cleaner–type suction system, manganese nodules can be gathered from the sea floor 2 to 4 miles below the ocean surface. Manganese nodules, sometimes called the greatest resource of the oceans, are potato-sized lumps of rock containing cobalt, copper, nickel, and manganese. They accrue through natural chemical processes over hundreds of thousands of years and are believed to be located over most of the seabeds of the world. A 1968 economic analysis of their potential estimated that a single plant could increase world cobalt production by one-third to 20.6 thousand tons and shrink its price by 27 percent. The mining interests have argued that proceeding with seabed mining will reduce U.S. dependence on foreign minerals producers, improve the balance of payments, and preserve the nation's lead in this big new technology.

The only trouble with this industry "can-doism" is that, in the words of a critic, it "flies in the face of" present U.S. foreign policy and a 1970 United Nations moratorium resolution on seabed mining (which the United States opposed). Certainly it has some famous foes. When he was President, Lyndon Johnson wrote:

> Under no circumstances, we believe, must we ever allow the prospects of a rich harvest in mineral wealth from the seabed to create a new form of colonial competition among the maritime nations.

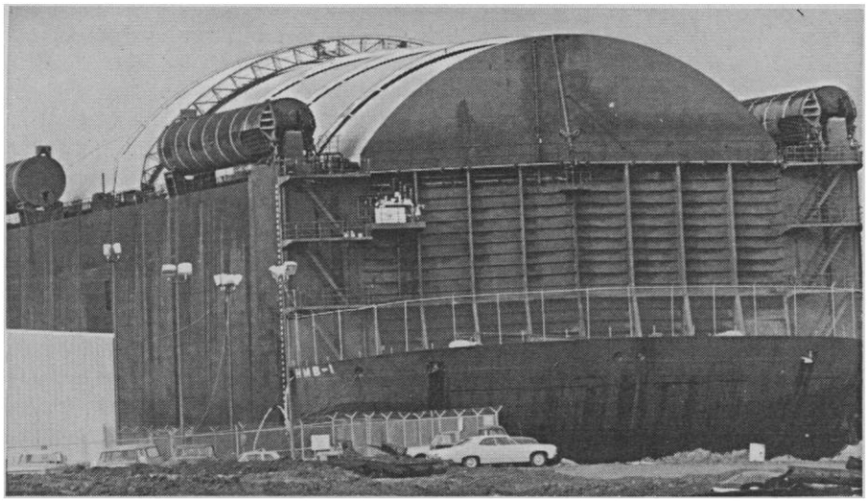
In 1970, President Nixon unveiled this country's draft international convention on the law of the sea, covering all issues from military maneuvers to fishing rights, which set up a strong international body to oversee all seabed mineral exploitation, and specifically instructed it to channel some of the profits to the developing nations of the world. Last March in testimony before the House of Representatives, former Secretary of State Dean Rusk called a seabed land grab "sheer insanity" and warned that such a move by the technologically advanced countries could stir the developing nations to "filibuster" the 91-nation Law of the Sea Conference due to convene in Chile in 1974.

The mining companies' eagerness to press ahead with their new technology and their sea floor claims have coalesced around a bill written by the American Mining Congress, a trade group, and introduced by Senator Lee Metcalf (D–Mont.) and Representative Thomas N. Downing (D–Va.). It represents the best possible deal the companies could obtain from the government, and even Senator Metcalf has been described as believing it "preposterous." Any "qualified" company, under the bill, could obtain a government license to blocks of ocean floor 40,000 kilometers square—an area larger than Vermont and New Hampshire combined—as well as a pledge from Uncle Sam to underwrite any company losses for the next 40 years, all in exchange for a mere $5000 license fee. The bill also substitutes for the more common treaty approach for apportioning international resources, such as Antarctica, a "reciprocating states" provision. Under this, the United States would agree to respect the claims to mining blocks authorized by Japan or other nations, so long as they passed similar laws.

The legal authority behind the "reciprocating states" concept, John G. Laylin of the Washington, D.C., law firm of Covington and Burling and formerly retained by Kennecott, says that this approach would assure "orderly development" of the seabed. But Louis Sohn of the Harvard Law School and the U.S. delegation to the U.N. seabeds committee, says the provision would spur international strife.

"This is the kind of deal the colonial powers made with Africa in the nineteenth century," Sohn said in an interview, "and you wound up with the Boer war and the Fashoda incident. . . . Here you're going to have the same thing. Assume that an American mining company finds a rich area 500 miles off Hawaii and the Japanese come along and start mining nearby, moving their ships in closer and closer. It's an awfully dangerous game."

Nonetheless, the mining interests' spokesmen, in testimony on this legislation, have put forth arguments in favor of it which resemble, in fact, those put forward for another big technology development, the supersonic transport plane (SST). John Flipse, president of Deepsea Ventures, Inc., which is working on the suction system mentioned above, said last May that economically the United States now imports 98 percent of the manganese ore it uses, 84 percent of the nickel, and 92 percent of the cobalt. By diversifying sources and acquiring these metals under the American flag, the nation would become less dependent on "the internal affairs" of major metals exporters such as Chile, Brazil, and Zaire.



Among the competitors in the hot race to mine the ocean floor is the elusive billionaire Howard Hughes. Pictured here is the giant barge he has built to be submerged to a depth of 3 miles and loaded with valuable seabed metals.

(Flipse did not mention, nor did anyone ask him, how the bill would affect Canada, which supplies the United States with 70 percent of its nickel. A Washington spokesman for the International Nickel Co., Inc. (INCO), a subsidiary of the Canadian monopoly firm, International Nickel Co., Ltd., stated that INCO has several reservations about the bill, chiefly spurred by concern about how an influx of seabed nickel would affect its own sales. The fact that the American Mining Congress bill does not have the full support of the mining companies has rarely been mentioned in the friendly hearings Metcalf and Downing have held.)

As in the case of the SST, the industry wants government underwriting of the costs and risks of developing this big technology. The bill states that the government will "fully reimburse the licensee for any loss of investment or increased costs" incurred by the mining company for 40 years after the license is issued. In addition, looking to the day when the Law of the Sea Conference imposes an international regime on ocean mining, the bill provides that the government will "bear whatever payment of whatever kind required . . . under the international regime." Government economists say that they have not calculated what this could cost, but agree with the implication, that, if Howard Hughes experiences losses in building his giant mining barge (see photo), the taxpayer would make it up to him. Thus, for the sake of economics, technological lead, and underwriting the costs of a risky new venture, seabed mining, like the SST, needs government protection.

Whereas the chief argument against the SST was a mere drying up of precious industry resources, the foes of deep seabed mining say it will risk diplomatic storms. Particular opposition, Rusk and others have warned, will come from the developing countries who do not have the technology to mine the sea but want to share in the rewards.

One long-term proponent of halting all seabed mining until an international group can supervise exploitation is Samuel Levering, of a Quaker group titled Save Our Seas (SOS). Levering has testified that the "first come, first served" approach embodied in the Metcalf-Downing bill would be a "unilateral" act which would "Americanize" the oceans. "These bills," he said in conclusion to a prepared statement in June 1972, ". . . can only cause trouble."

As part of ensuring that "orderly development" will take place, the mining companies have also seen to it that they have their ear to the ground—and their representatives present—at international meetings. Since the mining interests want to be able to sail out into the Pacific and lower their gadgetry as soon as is technically practicable, their interests internationally are directly opposed to that of the official U.S. position which urges that an international organization oversee all claims to the seabed resources. Thus, in forums at Geneva and New York for the last 2 years, the odd situation has developed where pro-industry congressional staff observers and industry executives themselves have been making their views known to foreign delegations even though the State Department is taking another line. This lobby has in fact been so diligent that an outsider would get the impression that the mining advocates want to get their bill approved, not by the Congress, but by the United Nations.

In fact, reports of industry lobbyists sitting in for official delegates at meetings, or circulating on the floor of the meetings at times when only the official delegation is allowed there, and a series of apparently turbulent incidents last April involving the delegation and industry advisers with a reporter named Judy Joy who was allegedly looking into possible misconduct, have been widespread enough to alarm senators Clifford Case (R–N.J.) and Claiborne Pell (D–R.I.). They plan to investigate industry influence during law of the sea hearings later this year.

Moreover, although, Metcalf has been saying that he introduced the American Mining Congress bill "for discussion only," he himself has spoken for the Washington arm of this vigorous lobby, and thus helped the mining interests. An example occurred last March, when in a U.N. seabeds meeting, Chilean and Peruvian representatives questioned the bill's relation to the U.N. moratorium. Within 5 days, Metcalf bitterly attacked the Chilean from the Senate floor. Metcalf charged that he had called for a condemning resolution of his bill, "demanded" information on "all U.S. mining companies' activities;" he also called the speech "an attempt to intimidate the U.S. Senate." In fact, the official record of the Chilean's remarks contain no mention or hint of a condemning resolution, no demand for company information. He merely suggests that the committee take up the question of interim seabed mining license before a Law of the Sea treaty comes into effect. A staffer explained the accounts differ because the Chilean edited his remarks for the record.

Metcalf again was drawn into aiding the mining lobby, when, in April, from the floor of the Senate, he praised the State Department's "foresight" in having "a large advisory group from industry" at U.N. seabeds meetings. He said he would oppose any effort to prevent industry advisors there, who identified themselves properly, "from discussing his personal views or his company's views with members of foreign delegations." Why Metcalf, who doesn't even support his bill, has participated in the pro-industry lobby so much, remains a mystery.

Controversial lobbying aside, the

pressure to stake seabed mining claims as fast as possible, which Rusk warned could produce a "direct rivalry among those with the technological capacity to exploit the seabeds and . . . the large majority of nations without such capability," has a substantive side. The most obvious is the economic threat which unilateral claims by the United States or Japan would pose to developing nations. A U.N. report, which was cited by Levering in testimony, said that the developing countries produced in 1971 half the world's 5.4 million metric tons of copper, one-fourth of its 0.5 million metric tons of nickel, one-third of its manganese, and three-fourths of its cobalt. Thus, nations like Zaire, which are mineral-rich and mineral-exporting, have an economic stake in preventing new minerals—to which they cannot have access—from entering world metals markets. The looming diplomatic thunderclouds, then, seem to have monetary linings.

Unilateral action could also hinder U.S. leadership in the Law of the Sea Conference on other issues such as defense and fishing rights. According to the Federation of American Scientists (FAS) which opposes the Metcalf bill, the draft international treaty President Nixon issued in 1970 embodied "an enlightened compromise between internationalist and nationalist interests"—including the proposed international body for regulating the deep seabed. Any unilateral moves by the mining companies would be provocative, like Peru's proclaimed 200-mile tuna fishing limit which nearly caused a military confrontation with the United States a few years back, or Iceland's extension of her fishing limits last year which touched off the cod war with England and Germany (*Science*, 1 Dec. 1972). According to FAS, the Metcalf-Downing bill, and the threat it poses, "has become a symbol to many countries of defiance of the multilateral negotiating process." Should the mining companies proceed, FAS fears, the U.S. position as an enlightened international negotiator will cave in.

The third problem posed by the mining interests' barging ahead with their new technology is that their claim to the ocean resources may be illegal. Laylin has written* that legally, "any person may now carry on activities on the deep ocean floor without a license provided that he conducts these activities 'with reasonable regard' to the equal right of others." This is possible, he says, under the customary law of the freedom of the seas, which has evolved since it was first pronounced by Hugo Grotius, a Dutchman, in 1609, to include fishing rights, military maneuvers, and shipping jurisdiction.

But Wolfgang Friedmann of the Columbia Law School has pointed out that the legal issue may work the other way: If the seas belong to everybody, then no one can take anything without everyone's permission that is, without an international organ to approve the taking. Friedmann said in a prepared statement:

> Under classical international law it was a contested question whether the deep sea was nobody's property (Res Nullius), and therefore in principle subject to national appropriation, or everybody's property (Res Communes), and therefore not subject to any state's appropriation or sovereignty.

Sohn said that under the "res communes" principle, and in the view of the U.N. moratorium resolution and related declarations, some legal experts would regard the appropriation of seabed minerals as unlawful. "To implement this bill would probably be doing something illegal."

With so many foes—from Johnson and Rusk right down to the smallest developing country—it could seem that an unfettered race to lay claim to the seabed would be out of the question. But on the contrary, the mining com-

(*Continued on page 893*)

* John G. Laylin, "Past, present and future development of the customary international law of the sea and deep seabed," *International Lawyer*, **5** (No. 3) (July 1971).

RESEARCH NEWS

Earthquake Predictions: Breakthrough in Theoretical Insight?

Earthquake prediction, an old and elusive goal of seismologists and astrologers alike, appears to be on the verge of practical reality as a result of recent advances in the earth and material sciences.—C. H. SCHOLZ, Lamont Geological Observatory, speaking before the American Geophysical Union, 18 April, 1973, in Washington, D.C.

No one is routinely predicting earthquakes yet. Japanese seismologists, however, have been able to forecast intermediate-sized quakes in one region with some accuracy. In the U.S.S.R., three relatively large quakes have been successfully predicted on an experimental basis. But the real news about earthquake prediction and the motivation for the optimistic assessment above concern the discovery of what seem to be changes in the properties of rocks surrounding a fault which occur prior to earthquakes and the development of an explicit physical model that appears to account for these premonitory signals.

Verification of the proposed model would put earthquake prediction on a scientific basis, removing this kind of forecast from the province of astrologers and other seers. Indeed, nonscientific prophecies of major earthquakes still attract considerable attention in California, where the devastating quakes of 1857 and 1906 have not been forgotten and where smaller quakes serve to remind the inhabitants of the presence of active faults.

Less well remembered are the possibly more destructive quakes known to have occurred in the Mississippi Valley near Memphis, in Boston, Massachusetts, and in Charleston, South Carolina. Concern over possible seismic activity is becoming more widespread in the United States, however, with debates over the siting of nuclear power plants and other land use plans. (Proposed nuclear plants in Northern California have twice been canceled because of uncertainties regarding the seismic risk of the selected sites). Reports of major earthquakes in Nicaragua and Turkey in recent years and of the moderate-sized 1971 event in San Fernando, California, have increased awareness that a major earthquake in the United States could cause catastrophic damage. Estimates of the potential damage in Southern California alone run as high as $20 billion. Development of the capability to fore-

(continued from page 850)

panies may yet get their way. The Hughes interests, according to industry rumor, have said they don't need the government's help anyway and plan to launch their barge irrespective of congressional or U.N. action. So the specter that the Japanese, Russian, or French mining vessels may close in on an American barge, with the U.S. Navy coming to defend its claim, may yet become reality.

For one thing, the State Department seems to be bowing to industry pressure and implying that the bravado of the mining interests at the U.N. and in Congress, and the Metcalf-Downing bill's threats of unilateral action, are a helpful club in the negotiations. John Norton Moore, the new chief of the U.S. delegation to the U.N. seabeds meeting, was asked in an interview whether it was confusing to have mining industry spokesmen, with a vested interest opposed to those of the official U.S. delegation, all wheeling around the United Nations. "We're simply doing what is straightforward and honest and conveying very clear signals to other countries—as to what our interests are. . . . I don't think there's any confusion. . . . They all know we have a Congress." Other observers have said that the State Department wants to keep the bill alive as a way of making certain other countries take our views seriously. And in an interview, Moore was surprisingly reluctant to criticize the Metcalf-Downing bill, even though Metcalf is on record as thinking it preposterous. And, as though this were insufficient warmth, Moore downplayed the reports of heavy lobbying by industry advisers to the delegation at seabed meetings.

Even though their favorite bill doesn't stand a chance of passage, the U.S. mining companies may yet launch their proposed undersea mining ventures—with or without the blessing of Congress or the 91-nation Law of the Sea meeting. Such an action could lead to a new congressional examination of the problem reminiscent of the fight over the SST; it could lead to an improved balance of payments and a stunning U.S. technology lead. Or it could lead to chaos over rival mining claims on the seas. In any event, deep-sea mining is sure to stir up more than just a few fish.—DEBORAH SHAPLEY

Erratum: In the letter "Politics of psychiatry" (23 Mar., p. 1184), the first signature should have been Paul L. Watson, not Peter L. Watson.
—EDITOR

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