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•1967-68, Commission on Marine Science, Resources and Engineering (the Stratton Commission)

•1978-85, National Advisory Committee on Oceans and Atmosphere. He served as chairman of NACOA 1981-85.

He chaired the Ocean Science Committee of the National Academy of Sciences, as well as the Marine Division of the National Association of State Universities and Land Grant Colleges, and the Section of Atmospheric and Hydrospheric Sciences of the American Association for the Advancement of Science. Moreover, he has served as president of the national Sea Grant Association, president of the Oceanographic Section of the American Geophysical Union, and a vice president of the Marine Technology Society. He has been elected a fellow of AAAS, AGU, and MTS.

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MARINE RESEARCH~ A CASUALTY OF THE LAW OF THE SEA?

A McKernan Lecture in Marine Affairs

By John A. Knauss

On May 12, 1987

Donald L. McKernan Lectures in Marine Affairs

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Marine Research: A Casualty of the Law of the Sea?

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Contents

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As did many of the previous McKernan lecturers, I knew Don McKernan both as a colleague and as a friend. Our paths crossed on many occasions, but perhaps the longest continuing contact was in the beginning years of the third United Nations Conference on the Law of the Sea when I chaired an informal coalition of U.S. marine scientists whose goal was a law of the sea convention that placed as few restrictions as possible on marine scientific research. Ambassador McKernan was our State Department representative in the early stages of those negotiations.

The topic for this lecture was chosen in large part because of those years of working together with Don McKernan in what became a very long and difficult set of negotiations.

IN THE BEGINNING WAS GROTIUS

International law scholars often begin their historical dissertations with Hugo Grotius, a remarkable Dutchman of the early seventeenth century, whose magnum opus, *The Law of War and Peace*, first published in 1625, is often considered the foundation of international law. Those whose primary interest is the law of the sea, however, generally begin with an earlier and much shorter Grotius work entitled *Mare Liberum* ("freedom of the seas"). In the fifth chapter of that book, which to many is the Bible from which all enlightenment flows, it is written:

> Things which are called "public" are according to the Laws of the law of nations, the common property of all, and the private property of none. The air belongs to this class of things for two reasons. First it is not susceptible of occupation; and second its common use is destined for all men. For the same reasons the sea is common to all because it is so limitless that it cannot become a possession of anyone and because it is adapted for the use of all, whether we consider it from the point of view of navigation or of fisheries.

The Christian Bible is continuously studied in light of modern scholarship, and only a few fundamentalist sects believe in a literal interpretation of what is written in it. So it is with Grotius: modern practice has required new interpretations. However, I must note that until quite recently most marine scientists, although they might hold widely varying theological opinions, were strict fundamentalists when it came to interpreting Grotius; and only recently have some of us, by no means all, been dragged kicking and screaming into a more advanced interpretation of maritime policy.

As with the Bible, one can generally find a sentence or two in Grotius to bolster one's preconceived beliefs if one is prepared to look far enough.

For example, reading a little further in the fifth chapter, we find Grotius stating, "Nevertheless there shall be no prejudice if anyone shall be fencing off with stakes an inlet of the sea make a fish pond for himself and so establish a private preserve."

From the privatization of enclosed inlets to the enclosure of large ocean areas is a simple leap of faith. Some 360 years later we have the "Declaration of Latin American states on the Law of the Sea," which declared the common principles of the law of the sea to include "the rights of the coastal states to establish the limits of their sovereignty or jurisdiction over the sea in conformity with reasonable criteria, taking into account their geographic, geological and biological situation and the need for rational utilization of their resources."

I have no wish to prolong this analogy except to note that science and technology have been largely responsible for the need to reinterpret both Grotius and the Bible. Modern theologians must interpret the Old Testament in light of Darwin, plate tectonics, Middle East archeology, and the big bang theory of cosmology. Similarly, those who look to Grotius as the fundamental source of the law of the sea must cope with offshore oil, highly effective fish harvesting, and deep-diving submarines, technology which calls into question even that most uncontroversial statement of 1609, that the sea "is not susceptible to occupation."

With the addition of a narrow territorial sea, the Grotius doctrine of freedom of the seas prevailed until recent times. The breadth of that territorial sea was generally, but not universally, agreed to be three nautical miles. It was often equated with the distance of a cannon shot. At the time the argument was first made, no cannon could shoot three miles; and long before the three-mile territorial sea was laid to rest, effective protection of one's coastal waters by shoreside military installations extended well beyond a three-mile limit. It is not the only example of marine policy built on misconceptions about technology, but it may have been one of the earliest.

THE ROLE OF FISHERIES

Until quite recently, nearly all attempts to extend national jurisdiction beyond three miles were made because of fisheries. For example, the first international meeting on the law of the sea, the 1930 Hague Codification Conference, attempted to negotiate a universally acceptable breadth of a territorial sea. Its failure to do so can be attributed in part to the desire of many coastal states to protect their fisheries. Although the conference attempted to separate the fisheries issue from its proposed three-mile sea by the neutral statement "Exclusive rights to fisheries [beyond the three-mile territorial sea] continue to be governed by existing practice and convention," it was not sufficient for the coastal states, and the three-mile limit failed to gain acceptance.

To the best of my knowledge, none of those earlier "practices and conventions" included restrictions on scientific research. In fact, the opposite was true. One consequence of the difficult negotiations leading to the North Sea Convention of 1882 (the first attempt to forge an international fisheries convention) was the establishment, ten years later, of the first international organization dedicated to marine scientific research, the International Council for the Exploration of the Sea (ICES). For some sense of the purpose of ICES, I note that ICES immediately established three committees, one of which went for some years by the no-nonsense title "Overfishing."

The need for scientific evidence to better manage disputed fisheries is acknowledged in all international fisheries agreements, including the international whaling convention and the much-maligned fisheries convention of the 1958 United Nations Conference on the Law of the Sea. Article 7 of the fisheries convention states that any conservation measure adopted by the coastal state to justify its fisheries regulations must be based on "appropriate scientific findings."

It is clear that the coastal state does not have exclusive jurisdiction over research in these areas. Article 6 of the 1958 fisheries convention reads in part: "A coastal State is entitled to take part on an equal footing in any system of research and regulation for purposes of conservation of the living resources of the high seas in that area, even though its nationals do not carry on fishing there."

OIL AND MARINE RESEARCH

The question of coastal state jurisdiction over marine scientific research first arose not with fish but with offshore oil. How oil and state jurisdiction over research became linked is a curious story, and I am not certain I fully understand the sequence of events. In particular, I am not certain I understand the role of the United States Navy. My interpretation must still be considered tentative.

What is clear is that the 1958 Law of the Sea conference was much more successful in devising an agreement to regulate offshore oil development than to regulate fishing. The continental shelf convention assigned to each coastal state sovereign rights to the natural resources of its continental shelf and left to the state the decision on how to develop those resources.

The 1958 Law of the Sea conference owed much to the work of the International Law Commission (ILC), which labored for nearly eight years to develop acceptable draft articles. These articles provided the basis for negotiation at the conference, and many of them are nearly identical to those that found their way into the convention.

It is illuminating to review the three successive ILC drafts and commentaries between 1951 and 1956 with respect to their implications for marine scientific research. Article 2 of the first (1951) draft of the

continental shelf articles states: "The continental shelf is subject to the exercise by the coastal state of control and jurisdiction for purposes of exploring it and exploiting its natural resources." In a commentary to a later article, one finds:

> It must be recognized that in exercising control and jurisdiction under Article 2, a coastal State may adopt measures reasonably connected with the exploration and exploitation of the subsoil but it may not exclude the laying of submarine cables by non-nationals.

The second draft was stronger: "The coastal State exercises over the continental shelf sovereign rights for the purpose of exploring and exploiting its natural resources." The draft then defined some limits to those sovereign rights, and again scientific research was not singled out either as an explicit freedom or as an endeavor under coastal state control. However, the accompanying commentary (paragraph 69) caused some concern:

> The text as now adopted leaves no doubt that the rights conferred upon the coastal State cover all rights necessary for and connected with the exploration and exploitation of the natural resources of the continental shelf. These rights comprise full control and jurisdiction and the right to reserve exploitation and exploration for the coastal State or its nationals. Such rights include jurisdiction in connection with suppression of crime.

And more explicitly, in paragraph 74:

> While for the reasons stated, as well as having regard to practical considerations, the Commission has been unable to countenance the idea of internationalization of the submarine areas comprised in the concept of the continental shelf, it has not discarded the idea of an international agency charged with scientific research and guidance with the view of promoting, in the general interest, the most efficient use of submarine areas. It is possible that some such body may be set up within the framework of an existing international organization.

This second draft attracted the attention and concern of the international scientific establishment. Our primary nongovernmental organization, the International Council of Scientific Unions (ICSU), in response to the draft, adopted a resolution in 1954 which expressed the hope that the U.N. General Assembly "will so amend the draft articles before they become law as to ensure that such fundamental research at sea may proceed without vexatious obstruction." An ICSU resolution in 1955 urged, further, that the adhering organizations in countries represented on the International Law Commission (Brazil, Mexico, Netherlands, U.S.A., U.S.S.R., U.K., India, Sweden, France, and Greece) "be instructed to impress upon their representatives on the Commission the urgency of framing and incorporating such a comment in the 1956 report."

I do not know what efforts were made by scientists in ILC states, but the third and final set of draft articles adopted in 1956 are almost identical to those adopted in 1953. The commentary did indeed take note of the concerns of the scientific community, but not as the scientists had hoped. The commentary on Article 68 (which covered the same subject as Article 2 in the earlier drafts) contained the following paragraph 10:

> The proposals made by the Commission in its report for 1953 caused some anxiety in scientific circles, where it was thought that freedom to conduct scientific research in the soil of the continental shelf and in the waters above would be endangered. Insofar as such researches are conducted in the waters above a continental shelf, this anxiety seems to be unjustified since the freedom to conduct research in these waters—which still form part of the high seas—is in no way affected. The coastal State will not have the right to prohibit scientific research, in particular research on the conservation of the living resources of the sea. The consent of the State will only be required for research relating to the exploration or exploitation of the seabed or subsoil. It is to be expected that the coastal State will only refuse its consent exceptionally, and in cases in which it fears an impediment to its exclusive rights to explore and exploit the seabed and subsoil.

Clearly, the international scientific community had good reason for concern. Marine scientific research on the continental shelf was not to be distinguished from exploration of resources; and since the coastal state exercised sovereign rights over the continental shelf for purposes of exploring and exploiting its natural resources, it therefore exercised similar rights over marine scientific research.

Still, the draft text the International Law Commission brought to the 1958 conference was not explicit; only by reading the commentary could one determine the ILC's intent. The U.N. conference, by contrast, left nothing to chance. At the urging of France and with the support of the United States, India, and Indonesia—and over the objections of other states, including Denmark, Portugal, Belgium, Great Britain, Yugoslavia, and Panama—the infamous paragraph 8 was added to Article 5 of the ILC draft by a vote of 30 to 17. It reads in part: "The consent of the coastal State shall be obtained in respect of any research concerning the continental shelf and undertaken there. Nevertheless the coastal State shall not normally withhold its consent if the request is submitted by a qualified institution with a view to purely scientific research."

It is difficult to sense how strongly held the state positions were by reading the summary records of the debate, but I doubt that paragraph 8 would have won acceptance if the United States had come out strongly against the French proposal. At most there would have been a requirement to notify the coastal state of a planned research program and to publish the results.

Such a compromise was in fact proposed by Iran:

> Notwithstanding the provisions of Article 68 and in the interests of scientific progress, the coastal State shall, at the request of appropriate and qualified institutions, permit them to carry out on continental shelf any kind of fundamental research having a purely scientific objective, provided that: (a) The institution concerned shall in its application to the coastal State give a full description of the nature and scope of the research contemplated, that (b) The coastal State may choose to participate in such research work or to nominate observers to follow such work, and that (c) The observations made, and the data obtained and all conclusions derived therefrom shall be published.

The Iranian compromise was voted down. Since there was no roll call vote, there is no way to tell from the summary record who voted for what, but from the debate it would appear that the United States did not vote for this compromise "notification" regime. Those involved in the most recent negotiations know that the United States expended considerable effort in the mid-seventies at the third U.N. Law of the Sea conference (UNCLOS 3) to achieve a notification regime that was less forthcoming than that proposed by Iran. We lost.

Presumably, the U.S. position in 1958 was determined by the views of the oil industry and the Department of the Interior. Both equated marine scientific research with research necessary for the exploration of oil. As most know, oil exploration, at least in the United States, is a secretive business. An oil company is prepared to spend significant money to gain an exclusive right to explore for oil on the continental shelf of a coastal state. Having bought the right to explore, it does not want to share that right with a competitor. Unless the coastal state can control who does and who does not explore, an oil company has no way to ensure its exclusive rights.

This explanation is a bit oversimplified, but it was the basis for the oil industry position. I believe it was also the basis for the U.S. position on marine scientific research in drafting the 1958 LOS convention.

THE ROLE OF THE NAVY

What has long puzzled me is why the U.S. Navy did not object in 1958 to giving to the coastal states the jurisdiction over marine scientific research on the continental shelf. The U.S. science community may not have had sufficient influence to be heard, but U.S. defense interests were paramount in the 1958 negotiations, as they were in the 1930 Hague Convention before and the 1982 LOS convention afterwards. I believe that if in 1958 the Navy had strongly opposed control of marine scientific research we would not have ended up with paragraph 8.

At first reading it would seem the Navy should have been opposed. It is an axiom of military strategy that those states with the strongest naval forces advocate maximum freedom of the sea. With the freedom to dispatch ships, submarines, and aircraft quickly to any part of the world's oceans, they can take maximum advantage of their strength. The U.S. Navy has long advocated narrow territorial seas. It made free transit through international straits a make-or-break issue in the 1982 LOS convention, and it fought hard to ensure full navigational freedom in the exclusive economic zone. One might assume, therefore, that the U.S. military would be a strong advocate of freedom of scientific research in the oceans.

Apparently it was not, and I can only speculate as to why. Our Navy has taken the high-tech approach to achieving military superiority as distinguished from a high-numbers approach. We rely on the quality of our systems and the training of our personnel more than on the quantity of either. Such a strategy requires a continuing technological advantage. One can never be satisfied with the present system, because it is only a matter of time before the other side catches up. The military understands this very clearly and invests heavily in research. Yet maximum freedom for marine scientific research apparently was not a high priority in 1958. If it had been, I expect we would not have had paragraph 8 of Article 5 in the continental shelf convention.

My guess, and at this point it is only a guess, is based on the fact that the military has long held an ambivalent attitude about keeping marine research secret. For those who argue that one continually needs new and better science and technology to maintain a technological lead, there is a counterargument: if you deny that information to others, you slow the pace of the race and reduce your own need for better information. The military has always kept secret a certain amount of information. Surprise is an important element in war, and so one attempts to conceal the position, numbers, and intentions of one's forces, including ships. One also attempts to restrict information on the strengths (and weaknesses) of weapon systems for as long as possible. Few can quarrel with that kind of secrecy.

However, experts can and do disagree about the extension of secrecy further afield. Secrecy inevitably delays scientific and technological progress. The recent extraordinary breakthroughs in superconductivity being announced all over the world would have been much slower in coming if knowledge and discussion of that first announcement from Houston had been limited to a select group supported by a classified military contract. The military is continually faced with a Hobson's choice when it comes to supporting science and technology. Is military security ultimately enhanced by limiting classification to only the details of the final system? Such a policy probably guarantees a better product in less time. By keeping everything secret the development will take longer and the resulting system will probably be less satisfactory. However, the technological lead may be lengthened by a policy of secrecy because a potential enemy has been denied scientific and technological information.

To paraphrase an old military adage, it is not necessary to have a good navy, it is only necessary to have the best navy.

There is no simple answer to this policy question, and over the years the military position on security has stiffened and relaxed, but there has always been an underlying belief that one should not give away information unnecessarily. Restricting access to certain parts of the ocean is one way of keeping it.

The continental shelf convention negotiations in 1958 coincided with the beginning of the Navy's SOSUS network, whose vast listening arrays we use to track Russian submarines. In 1958 we were beginning to install these arrays, and we had a big lead over the Russians. Although the listening arrays themselves were in water deeper than 200 meters, they were at the edge of the continental shelf. Keeping Soviet research vessels from working close to these arrays could have been a military priority at the time. Perhaps the Navy was prepared to let the U.S. oil industry erode a bit of the freedom of the seas, since in balance they believed the nation's best interests were so served.

THE THIRD U.N. LAW OF THE SEA CONFERENCE

By the time the negotiations for UNCLOS 3 began in 1970, the U.S. scientific community was much better organized. The National Science Foundation, the President's science adviser, and the president of the National Academy of Sciences all weighed in with letters to the Secretary of State and others. In time the science community was able to make them advocates of maximizing freedom of research.

But the problems of the seventies were different from those of the fifties. By 1970 the interest on the part of coastal states in extending their national jurisdiction seaward was much stronger than in 1958 and more states were involved. It was a force that the advocates of freedom of scientific research could not stem. Elliot Richardson, who headed the U.S. delegation to the LOS conference for a number of years and took a personal interest in the scientific research issue, has stated that our problems at UNCLOS 3 stemmed from decisions made in 1958. There was to be no turning back of the clock. There was to be no Iranian-style compromise on a notification regime, let alone complete freedom, at least not without a stronger political force than the science community appeared to be able to summon.

The campaign we were able to mount was surprisingly weak. Although the U.S. science community was well organized, scientists from other states had either little interest or little success in generating official concern about the issue. Again the International Council for Scientific Unions came forward with an endorsement, but the ringing words of 1954 were missing; there was no call for the General Assembly to amend draft articles to ensure that fundamental research at sea could proceed "without vexatious obstruction." The best ICSU could agree on in 1973 was a

statement in which it urged "that every Nation concerned with developing the law of the sea give special consideration to the need for facilitating the conduct of open research in the ocean—research which is intended for everyone's benefit and is characterized by full and timely availability of research plans and results."

A full discussion of the forces, interactions, and negotiations that led to the marine scientific research provisions in the current LOS convention requires more time than is available, although I would like to take a moment to consider two factors. One is the concern, shared by many, that oceanography is sometimes a cover for other activities. The second is, once more, the role of the Navy in developing the U.S. position on this issue.

Many nations, including the United States, actively collect intelligence information under various kinds of cover. For years the U.S.S.R. used thinly disguised fishing trawlers to collect information outside harbors and off foreign coasts. I would be surprised if their oceanographic research vessels do not have an intelligence-gathering function at times. Perhaps the two best known examples of U.S. ships that were not what they pretended to be were *Glomar Explorer* and the U.S.S. *Pueblo*.

Glomar Explorer was a Howard Hughes vessel built ostensibly to mine the manganese nodules of the sea floor but in fact designed to retrieve a sunken Russian submarine from the bottom of the Pacific. The news of the true mission of *Glomar Explorer* broke during a session of the Law of the Sea conference in Geneva in 1975. To the best of my knowledge, the news had no direct impact on marine scientific research negotiations; however, it was a spectacular example of an ocean-going vessel having a mission different from its stated one.

The *Pueblo* incident is another matter. I believe it did hurt the cause of the science community. *Pueblo* was a converted World War II freighter, 176 feet long, 960 tons, nearly identical to three research ships then in use in the academic fleet, including our own University of Rhode Island research vessel, *Trident*. *Pueblo* was outfitted with electronic listening devices and deployed off the coast of North Korea in January 1968, one of a small group of ELINT vessels the Navy used for electronic surveillance. Her classification was AGER (Auxiliary, General, Environmental Research). Among the 83 persons assigned to *Pueblo* were two civilian oceanographers who every few hours during daylight paid out their bathythermograph and Nansen bottles.

In recounting the incident leading to his capture by the North Koreans, Commander Butcher in his book, *Butcher: My Story*, noted that when the North Korean sub chaser first appeared he "decided to make sure we looked in every respect what we wanted to appear to be—an oceanographic research vessel [and called the] oceanographers from their meal to put on an extra Nansen cast for the benefit of our visitors." Later, Butcher told his captors that his vessel was conducting "oceanographic research in international

waters," and assured them that *Pueblo* was "a research ship that has nothing to do with the CIA or any kind of armed aggression."

Although the ship was 16 miles from the nearest island, well beyond the 12-mile territorial sea claimed by North Korea, the water depth was less than 60 meters. I am not aware that the North Koreans ever made such an argument, but I have long assumed that although *Pueblo*'s electronic eavesdropping activities were perfectly legal under international law, there might be some question concerning the legality of her cover since *Pueblo* had not asked permission to conduct marine scientific research on the continental shelf of North Korea.

If the United States used oceanographic research as a disguise for intelligence-gathering activities, then coastal states had reason to be concerned about free access of research vessels to their waters. I think that the foreign ministries of many less developed countries find it difficult to accept that the United States, rich as it is, would send ships halfway around the world, loaded with expensive equipment, simply to learn more about the ocean. If it was not military intelligence they were after, perhaps it was information about natural resources. Whatever the reason, the coastal states could best protect themselves by insisting on controlling as much as possible those wishing to do research. Incidents such as *Pueblo* reinforced their unease.

The Navy role in the marine scientific research issue during the negotiations leading to the 1982 LOS convention appeared to me somewhat complicated. As a fairly close observer to those negotiations, I was able to gain some sense of which issues were important to the different players. For example, the Navy apparently did not throw its considerable weight behind the U.S. effort to roll back the consent requirement during the negotiations for the exclusive economic zone. On the other hand, the Navy did make known its displeasure about any possible restrictions on marine scientific research on the deep seabed beyond national jurisdiction, and Article 143 of the 1982 treaty, which addresses marine scientific research in the deep seabed, clearly provides complete freedom for states to conduct marine scientific research there. I doubt that the article would have been so explicit without Navy support.

I also believe that the Navy is at least partly responsible for the fact that the 1982 LOS convention carries no definition of marine scientific research. Although the definition found in Article 1 of the 1975 Single Negotiating Text ("any study or related experimental work designed to increase humankind's knowledge of the marine environment") also appeared in the 1976 Revised Single Negotiating Text, it was dropped a year later from the Informal Consolidated Negotiating Text and did not reappear during the negotiations.

I expect one reason the military does not feel threatened by coastal state jurisdiction over increasingly large parts of the ocean is that it believes it can conduct its research in other ways. The LOS convention does not restrict freedom of navigation within the EEZ, and I assume that if necessary the military could find a way to carry out its studies and tests from warships and similar vessels that enjoy sovereign immunity. What some might call marine scientific research the Navy might argue is simply exercising its right to navigate freely. The lack of a definition of marine scientific research in the 1982 LOS convention makes this an easier argument to sustain.

EFFECT OF THE LOS TREATY

Finally, I would like to review some of the effects of the 1982 LOS convention on marine scientific research. Putting aside a number of details, let me remind you of the rules. Marine scientific research within a coastal state's territorial sea, within its archipelagic waters, on its continental shelf, and within its exclusive economic zone, shall only be conducted with the consent of the coastal state. For research on the continental shelf or within the 200-mile EEZ, this consent shall be granted in normal circumstances. Article 246 lists conditions under which consent may be withheld. A coastal state may withhold approval, for example, if obligations are outstanding from a previous research program in the EEZ or continental shelf. The condition open to the widest range of interpretation relates to research that is "of direct significance for the exploration and exploitation of natural resources, whether living or nonliving."

The LOS convention has a number of additional requirements, some of them relating to providing information about the program, and sharing data and findings resulting from the program, as well as providing opportunities for participation by coastal state scientists. None of these requirements has proven particularly difficult to U.S. scientists except the requirement that requests be filed six months in advance. Such notice may be reasonable for major expeditions that plan to go halfway around the world; but it is often difficult if, for example, you are from Seattle and are planning a small research program off British Columbia. Luckily for the University of Washington, Canada does not enforce the six-month advance notice requirement. Mexico does, and this has caused problems at times.

Because the convention requires that all requests for research within a coastal state EEZ go through official channels, one can gain some sense of the effect of the LOS treaty on U.S. marine research enterprise by examining the State Department files. Professor Warren Wooster, of the University of Washington, did this for the years 1972-1978, and I built on his effort by covering the years 1979-1985. As shown in Table 1, the number of requests has risen dramatically. The increase reflects not a growth in U.S. research but an increase in the number of coastal states that have claimed the 200-mile EEZ allowed under the treaty.

The area of the ocean covered by territorial seas, archipelagic waters, continental shelves, and EEZs is quite large. For example, every inhabitable island has its own 200-mile EEZ. When all states have

Year	Requests	States
1972	37	23
1973	62	39
1974	50	21
1975	59	26
1976	60	27
1977	92	31
1978	81	36
1979	100	34
1980	67	18
1981	78	24
1982	72	25
1983	109	31
1984	162	47
1985	276	59

Table 1. Impact of the Law of the Sea treaty on U.S. marine research, as indicated by number of U.S. requests to conduct marine research off other coastal states and number of states to which proposals were submitted.

claimed their allowed 200-mile exclusive economic zones, the area of the ocean covered will be upwards of 40 percent.

Though the treaty is not yet in force, more and more coastal states are claiming 200-mile EEZs. I am told that the number of State Department requests for 1986 was greater than for 1985 and that 1987 requests were running ahead of 1986, but I expect we will soon see a leveling off as all states claim 200-mile EEZs, and year-to-year changes in the number of requests in the future will more accurately reflect changes in the size and scale of the U.S. oceanographic effort.

On the average, about 8 percent of the research programs proposed during 1979-1985 were not carried out, with the failure rate being lower in recent years than in earlier ones. I have divided these "lost opportunities" into four categories. Table 2 shows their distribution.

In the terms of Table 2, a denial is just that: the coastal state turns down the request for some reason. Sometimes the coastal state does not reply at all. This does not happen often, and as the new treaty becomes more firmly established such failures to respond are likely to become rare. Sometimes permission is granted, but the consent arrives so late that the research programs has already been abandoned. Finally, a state may impose conditions that are unacceptable to the researcher. For example, the coastal state may give permission but insist on an additional port stop, or on prior approval of publication of results, or on maintaining control of the collected sediment samples.

Table 2. Lost opportunities for United States to carry out proposed marine scientific research off other coastal states.

	1979	1980	1981	1982	1983	1984	1985
Requests submitted	100	67	78	72	109	162	276
Lost opportunities	12	10	9	4	7	11	12
Failure rate	12%	15%	12%	6%	6%	7%	4%
Lost opportunities, by type:							
Request denied	5	1	6	3	4	5	7
No response	2	4	0	0	2	2	7
Late response	4	5	1	1	1	2	1
Unacceptable conditions	1	0	2	0	0	2	3

Frankly, a lost opportunity rate of less than 10 percent is better than I expected, particularly since among these lost opportunities are a number of events in which the United States could be faulted for the manner of its request. I must also emphasize that the results shown in Table 2 reflect U.S. experiences only. I am not aware of any quantitative information from other researching states.

Before one presumes that the problem for U.S. researchers is minor (and I am not prepared to accept an 8 percent failure rate as minor) one needs to consider the missing requests. Most of my information on self-selection is anecdotal, but a few inferences can be drawn. For example, there have been only four requests from the United States to work off Cuba since 1979. All have been denied. Given the state of U.S.-Cuban relations, the 100 percent denial rate is not surprising. But Cuba is less than 200 miles away, and the Gulf Stream runs close to Cuba. By comparison, since 1979 there have been 11 requests to work off Jamaica, 20 off the Dominican Republic, 21 off Haiti, 38 off the Bahamas, and 134 off Mexico. One might assume that if U.S.-Cuban relations were such that permission to do research off Cuba could be as reasonably assured as are requests to work off most other nearby Caribbean states, the number of requests to work off Cuba would be closer to 25 than to 4. Thus, at least another 20 denials are missing from this figure because researchers knew it was futile to design a program that required Cuban authorization.

Self-selection takes place in other ways, too. The plan of the Subtropical Atlantic Climate Study requires returning to the same area season after season. Of the dozen Caribbean states off which it had planned its program, it had difficulty with two. As a result, subsequent requests have omitted those two states.

Fred Spiess, the preceding McKernan lecturer, has designed a program to study ridge crest processes off the western coast of the United States. He would prefer to work off Mexico or Ecuador for scientific reasons and because the weather is better. He has no reason to believe he would be refused by those coastal states today, but his program is for five years, and he is not prepared to assume a trouble-free future.

Finally, there are the problems of confused jurisdiction. The Ocean Drilling Program's new large drilling ship, *JOIDES Resolution*, has recently completed a program off the Falklands. Because of the recent history of the area, all sites were drilled more than 200 miles from the Falklands, even though one of the preferred sites was within 200 miles of South Georgia Island and the United Kingdom had granted permission for the program. A similar problem may arise in another year if *JOIDES Resolution* should attempt to drill in a disputed area in the Sea of Japan. Given the number of EEZ boundaries around the world yet to be resolved, the disputed area problem is not a trivial one.

SUMMARY

In answer to the question posed in the title of this lecture — "Marine Scientific Research: A Casualty of the Law of the Sea?" — I believe marine research has been hurt, but I would not characterize it as a casualty, and the evidence to date suggests that it will not be one in the future. There are a number of problem areas, but most oceanographers have learned to cope with administrative problems whether they arise from the funding agency or from their own organization. Coastal state clearance is simply one more subset of the bureaucratic problems that must be resolved to conduct a successful open ocean science program. These problems can be minimized by carefully following the rules and carefully selecting where one works.

I admit to being surprised that the problems have been so few and the need for self-selection apparently so limited. I hope that, as we learn to cope with the new rules, our success rate will improve and the need reduced for factoring law of the sea considerations into site and program selection.

However, one cannot trace this record without wondering if it had to be this way. Was the present requirement of coastal state consent for marine scientific research predestined? As science and technology stripped away one by one the assumptions of Grotius and privatization of the ocean increased, was it obvious that coastal state consent for marine scientific research followed naturally? Perhaps, but when I read the history of the subject, particularly that leading up to the 1958 continental shelf convention, I wonder if it could have been different. It is not obvious to me that the forces of creeping jurisdiction predetermined which fork in the road we took in 1958, which in turn determined the rules under which we live in 1987.

The McKernan Lectures

This lecture series was created to honor the memory of Donald L. McKernan, who died in Beijing, May 9, 1979, while participating in a U.S. trade delegation. Professor McKernan's last job was that of Director of the Institute for Marine Studies, University of Washington. Before that, he had several distinguished careers—as fishery scientist, fisheries administrator, Director of the Bureau of Commercial Fisheries, and special assistant to the Secretary of State for fisheries and wildlife in the U.S. Department of State.

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