Historic Shipwreck Management:

Meeting of Experts II

Final Report*

August 1993

Porter Hoagland

Marine Policy Center
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543 U.S.A.

* This Final Report is a result of research sponsored by NOAA National Sea Grant College Program Office, Department of Commerce, under Grant No. NA90-AA-D-SG480, Woods Hole Oceanographic Institution Sea Grant project No. E/L-7-PD and the National Science Foundation, under Grant No. DIR-9114699. The U.S Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

$3.00

Table of Contents

Introduction

There has been recent spectacular growth in the demand for and resource value of submerged cultural resources such as historic shipwrecks. (We define "historic shipwrecks" broadly to include any submerged shipwreck that has value--tangible or intangible--in addition to or instead of commercial salvage value.) Rapid advances in marine exploration technologies are revolutionizing capabilities to find and use these resources. The pace at which technology is expanding the discovery of and access to submerged cultural resources appears to have outstripped institutional abilities to ensure resource conservation.

These events present a dilemma for marine scientists and engineers who develop advanced marine technologies and who may be involved in value conflicts over the conservation of historic shipwrecks. This dilemma cannot be resolved or even examined properly without a clear understanding of the following factors: the effects of technology development, the influence of legal rules and ethical norms, and the structure of institutions, such as markets, through which the valuable attributes of submerged cultural resources are allocated.

With sponsorship from the National Science Foundation (NSF), an interdisciplinary research team led by scientists at the Woods Hole Oceanographic Institution (WHOI) has begun to examine these

factors and value conflicts. The project is entitled: "Advanced Marine Technology and Historic Shipwrecks: Conflicting Values and Principles of Professional Responsibility" [NSF Grant No. DIR-9114699].

In order to plan the research, a one day Meeting of Experts was convened at WHOI in January 1992. At that meeting, participants helped to develop a set of "working premises" and a list of prospective research topics based upon abstracts submitted by the meeting participants.[1] Research teams were then organized to draft discussion papers on each of the research topics.

In April 1993, a Mid-Course Planning Meeting was organized to report on research in progress, to get feedback from the project advisors and other participants, to discuss useful mid-course corrections, and to begin planning project outreach.

This publication reports on the results of the April 1993 meeting. The report is organized into five sections. The first section presents the set of "working premises" that were revised as a result of discussions at the mid-course meeting. The second section contains reports of two panel discussions which were held

---

[1] Descriptions of the "working premises", a list of the research topics and teams, and the abstracts were published in a final report of the planning meeting. P. Hoagland, Historic shipwreck management: meeting of experts, Woods Hole, Mass.: Marine Policy Center, Woods Hole Oceanographic Institution, 24 March 1992, 23 pp.

at the annual meeting of the Society for Historical Archaeology (SHA) and the Archaeological Institute of America (AIA). The third section contains an annotated list of draft working papers, which were presented and discussed at the April 1993 meeting.[2] The fourth section contains three "case studies" that formed a basis for some of the discussions at the mid-course meeting. The fifth section includes a list of future research issues that were identified at the April 1993 meeting.

The Mid-Course Planning Meeting was sponsored with funds from the National Science Foundation [NSF Grant No. DIR-9114699] and "new initiative" funds from the National Sea Grant College Program [NOAA Grant No. NA90-AA-D-SG480]. I would like to thank David Ross, Director of the WHOI Sea Grant Program, the Principal Investigators and other researchers on the NSF project, the participants at the planning meeting, and Ellen Gately and Suzanne Demisch for their assistance.

I. Working Premises and Fundamental Issues

Working premises were described in detail in the Final Report of the January 1992 Planning Meeting. These premises were discussed and revised, in part, during the April 1993 Mid-Course

---

[2] These working papers are in draft form and are expected to be revised. In some cases, copies are available from the authors.

Planning Meeting.[3] The revised versions are presented here.

1. Historic shipwrecks are multiple-value resources. Historic shipwrecks are resources which may be valued for many different purposes and uses. Depending upon the context in which it is used, the term "resource" often is associated with objects that are subject to commercial exploitation. But we make no a priori presumption that any particular use will always take priority over all other uses. In defining historic shipwrecks as a kind of resource, it is important to identify the interest groups and other stakeholders who attach a value to different uses of the resource. It is further important for the purposes of our research to identify the special interests or stakes held by marine scientists and engineers.

The sources of historic shipwreck value range from their uses as purely public goods (to derive archaeological or historic information, as a memorial, or as recreational sites) to their uses as private goods (commercial salvage, treasure hunting, pot hunting). Under the "liberal conception of value" employed by some social scientists, it may be possible, in theory, to measure these kinds of values to help guide "optimal" social choice about how best to use historic shipwrecks. An interesting question

---

[3] Special thanks go to Jim Broadus for organizing the discussion concerning the working premises (and for keeping detailed notes!).

concerns the potential existence of a "marine premium" on artifacts that help to distinguish historic shipwreck resources from cultural resources found on land.

A separate issue concerns the legal status of "marine" resources as distinct from other kinds of resources. In some cases, the special status given to marine resources may result in unwanted side-effects. (These side-effects could be either unintended or purposeful.) For example, there is the potential that actions taken by governments to protect historic shipwrecks might at the same time put constraints on the conduct of legitimate marine scientific research.

For some shipwrecks, a dynamic transition may occur that converts the wreck from a commercially-important salvage resource into an archaeologically-important cultural resource. Characterizing the forces behind this transition is important to understanding the nature of historic shipwrecks as multiple value resources.

Notwithstanding the above, there may be additional sources of historic shipwreck resource value, such as cultural, political, or social "identity", that are not fully captured within the scope of the liberal conception of value. In particular, human remains and effects would typically fall outside of the common definition of "resource." The extent to which these sources of value in fact exist, their relevance if

they do exist, and the extent to which they should be incorporated into decisions about the use of historic shipwrecks are subjects that deserve further research. The participants at the planning meeting agreed that both the utilitarian concepts of economists and the broader concerns of ethicists and other social scientists are relevant inputs into the decisionmaking process.

2. Pragmatism versus doctrine in marine archaeology. There is a division within the field of marine archaeology with respect to the ways in which historic shipwreck research projects should be conducted. This division reflects a larger debate within the profession of archaeology itself, as exemplified by the varying degrees of strictness regarding trade in artifacts found in the codes of conduct of the different professional societies.

The field of marine archaeology might be characterized as divided into two camps: pragmatist and doctrinaire. Most archaeologists would agree that archaeologically or historically important sites could be compromised or destroyed by unrestrained or unguided commercial exploitation or by random or systematic depredations (looting). But some pragmatists believe that professional archaeologists should be involved in commercial projects so that there is some hope of conserving archaeological or historical data and information. The doctrinaire eschews commercial projects because of the potential (no matter how

small) of compromising the scientific standards of archaeology. The doctrinaire would seek to leave historic shipwrecks untouched until archaeological research can be conducted in a manner that is unaffected by commercial influences. The pragmatist recognizes the inevitability of illicit "plunder" and that the discovery of shipwreck locations may render the doctrinaire's position untenable, even with strict prohibitions on commercial recovery.

In fact, this conception may be too abstract. It is more likely that the positions outlined here are opposite ends of a spectrum of positions taken by archaeologists in their work. In some cases, the position taken by an archaeologist may depend upon the particular circumstances of each historic shipwreck.

Furthermore, a debate over the correct professional responsibilities of an archaeologist is far from resolved in the broader archaeological community itself.

The participants at the Mid-Course Planning meeting agreed that the issue of pragmatism versus doctrine is relevant to the problem being addressed by our research. But there was not clear agreement over the precise nature of the connection to the problem of the marine engineer. Further research is necessary to understand this connection more completely.

3. Guildism. Groups of individuals, such as professional archaeologists, engineers, lawyers, and scientists, or institutions, such as museums, have established their own standards or codes of conduct ("ethical rules") to govern intra-group professional conduct. These standards help to define a group, to facilitate the cohesion of its members, and to maintain its continuity. Standards might also serve to educate individuals and groups outside the confines of a particular profession.

Standards also may promote "elitism" by serving the narrow self-interests of the members of a profession in a way that could be costly to the more general interests of society. For example, the activities of underwater archaeolgists may be regulated by the ethical norms of professional societies. But some archaeological practices can be destructive of the resource itself (some archaeologists now argue for returning recovered artifacts to their original locations). The fundamental question concerns the extent to which such ethical norms might preclude other beneficial uses of the resource (see, for example, the case study on the River Plate Wrecks).

An additional important question for further research is: Do technological advances have an effect (and if so, by how much and in what ways) on the evolution of group standards?

4. Distinction between professional codes and ethics. A big distinction exists between the philosophical field of ethics and professional codes of conduct (sometimes called "ethical rules"). Codes of conduct can take on a "quasi-legal" status. Ethics has a logical priority over legal institutions, implying that ethical issues cannot be resolved by reference to the legal institutions.[4] Laws and codes of conduct must be examined carefully for features affecting the resolution of ethical issues.

An important focus of our study is on problems of "moral responsibility". Moral responsibilities may arise from special knowledge or resources held by an individual, a group, or an institution that, if utilized, may have an effect on the welfare of others. For example, scientists or engineers may have a moral responsibility to conduct research with integrity in part because the results could be used by policymakers in a way that affects the welfare of society.

Differences in power between interested parties might also imply that more powerful parties have a moral responsibility not to exploit adversely the welfare of the less powerful. A natural focus for further research is to identify and characterize the relevant moral responsibilities of the different historic

[4] This is the view expressed by Professor John Ladd in his paper "Ethical Comments", Mimeo, Providence R.I.: Department of Philosophy, Brown University (22 April 1993).

shipwreck interest groups.

Some of the Mid-Course planning meeting participants felt that ocean engineers may have a responsibility to inform archaeologists about the uses of the technologies that they develop. In particular, they felt that as developers and users of advanced marine technologies, engineers may have a responsiblity to consult with archaeologists and historians.

In her paper[5], Professor Caroline Whitbeck points out that "there is no good alternative to having professionals exercise discretion when they synthesize a variety of factors in making a professional judgement." Moreover, she explains that "there is no way of reducing desirable professional behavior to a specification of the acts that a professional must perform or must refrain from performing so that non-professionals can simply check to see that the professionals have behaved properly."

Drawing by analogy on examples from other fields of technology, Whitbeck argues that a person cannot be morally responsible for outcomes that cannot be both forseen and influenced by that person. If engineering knowledge is irrelevant to foresight or remedy, then engineers have no responsibilities in addition to the average citizen to prevent the misuse of technology.

---

[5] C. Whitbeck, Engineering responsibility and new marine detection technolohy, mimeo, Department of Mechanical Engineering, MIT, Cambridge, Mass.

Many uses of advanced marine technologies to salvage historic shipwrecks have been identified by our research project, so it is likely that marine engineers can forsee outcomes (disregarding the issue of how distinctions are made between good or bad outcomes). But Whitbeck concludes that marine engineers have little opportunity to control access to advanced marine detection technologies, because most of it is already on the market. Furthermore, it is generally not true that marine engineers have special opportunities to speak out and help guide marine salvage practices--even if desirable practices are known.

5. Involvement of archaeologists at the outset of a project. In many cases, advanced marine technologies may substantially reduce the time, effort, and other costs associated with mapping, data collection, and selective recovery. These advantages are particularly manifest in the case of deep water archaeology.

Some archaeologists have concerns about the potential for advanced marine technologies to affect adversely the integrity of archaeological science. Such concerns may arise in part from a lack of experience with the use of these technologies or unfamiliarity with their capabilities. Training and early involvement of archaeologists on projects concerning the exploration or recovery of historic shipwrecks with advanced

marine technolgies can reduce or eliminate these kinds of concerns.

The Mid-Course Planning Meeting participants identified a number of questions. How can involvement of archaeologists be accomplished? How extensive might the effects of such involvement be? Should involvement take place on any project? What might be the effects of the pace of archaeological research on the realization of other beneficial attributes from an historic shipwreck? What are the kinds of criteria that should be employed in a determination of the need for archaeological involvement, and who should make a decision using these criteria?

6. Fostering interaction between engineers and archaeologists. Many advanced marine technologies are produced for end uses (defense needs, mineral exploration and development) other than for marine archaeology. But these technologies may also be available for some marine salvage and archaeological applications.

"Non-invasive" technologies (Exact-Tracking, SHARPS, underwater photography, remote sensing tools, seabed penetrating sonars, others) may be able to meet the stringent archaeological requirements of precision mapping, measurement, and studying cultural resources without disturbing the location of artifacts or limiting knowledge about their provenance. In order for these

technologies to be useful tools for marine archaeologists, interactions between archaeologists and engineers should be fostered.

At present, archaeologists do not make widespread use of the technologies that have been developed. This is due in part to a lack of awareness of the technologies, insufficient training for the use of the technologies (there may be a traditional resistance in the field to the adoption of new technologies), and insufficient financial resources. Some of the meeting participants felt that graduate educational programs in underwater archaeology should focus on training in the use of advanced marine technologies.

7. Project transparency. A fundamental objective of professional archaeologists is to uncover and share new knowledge. If this objective is obscured or undermined by projects, commercial or otherwise, that are conducted under a veil of secrecy, then ethical issues are likely to be raised.

The extent to which (a) historic shipwreck projects are open to scrutiny and (b) provisions for archaeological quality control are made clear at the outset may help to alleviate or eliminate ethical concerns.

Special consideration must be given to projects in which secrecy is regarded as an important method of preventing the

depredation of an archaeological site (e.g., the Bismarck). Attempts should be made to identify enforcement or monitoring methods (possibly involving advanced marine technologies) that are as effective as secrecy in preventing depredation.

8. Distinction between what is right and wrong and how you control behavior. Separate reflection and analyses are required to determine and ensure proper conduct. The extent to which "irresponsible" behavior can be controlled through changes in public policy or technological advancements could influence the size and nature of any ethical issues. It may be possible to examine the history of public policy in this field to determine its effect on human behavior.

For historic shipwrecks conservation, how can the right/wrong question(s) be answered, and to what extent does the design of control mechanisms depend on the answer(s)?

Participants at the Mid-Course Planning Meeting noted that there may be limitations to the resource management ("calculus of value") approach to making the distinction between what is right and wrong. An extensive literature on cultural, scholarly, and other "value" types exists, which may aid in decisionmaking. Management decisions can be made more acceptable through a "dialogue" among the stakeholders. It is important to experiment and collect information useful for decisionmaking in the face of

uncertainty.

9. Structure of incentives is critical. The manner in which exploration and recovery activities are regulated (by government owners of historic shipwrecks or by the government in the public trust) affects the incentives faced by users of the resource.

In some cases, overly strict regulation may lead to perverse results, such as increases in bribery or in the level of illegal activity. (For example, in developing countries, it is possible that universities and nonprofit organizations are burdened to a greater extent by strict regulations than are commercial treasure hunting firms, because the nonprofits may not have the resources to "bribe" their way out of the regime as effectively.)

Calls for a "public response" may be made to serve the underlying self-serving motivations of special interests (e.g., "luddites" concerned about the effects of technological advances, firms establishing anticompetitive combinations, coastal states seeking expansions of jurisdiction and control, or others). One participant felt that much evil had been done by regulators fearing "gold-rush" behavior in the absence of any evidence of the potential for such behavior. Moreover, the main result of many laws that were designed to protect archaeological resources has been the intentional destruction of the resource to protect

other commercial uses.

It may be the case that shaping public attitudes (e.g., through the use of educational programs) can be an effective substitute for regulation.

10. Use technology for solutions. It may be possible to resolve ethical problems through the following technological advances: nonintrusive exploration; increased speed of mapping and recording; in situ visitation (Lusitania); software controls; selective retrieval; remote peer review. An important question is: which sources of value conflict are mitigated by which technological applications?

It is important to recognize that underwater archaeology does not seem to drive the pace of technological advance at all. Rather, this fact may make it more difficult to use technology for solutions. But technological changes may change the questions addressed by archaeologists and also change research priorities.

In understanding the influence of technology, it may be useful to distinguish between disreputable archaeology and illicit plunder. Is the technological connection the same for both problems? Can technology be used to solve both problems or only the first?

11. Better information is needed on the extent of the depredation problem. It is clear that "the access barrier has been shattered" with the application of deep sea technologies to underwater exploration and salvage efforts (n.b., there exists a 20-50m depth threshold beyond which quality archaeological manipulation is limited). But, there is little data and mostly heresay regarding the extent of the depredation of submerged cultural sites. An inventory of historic shipwrecks (discoveries and excavations) and their depth distribution is needed.[6] It might be feasible to construct a model (based upon sampling and controlling for effort) of historic shipwreck distributions.

An important (but unanswered) question concerns the degree to which technological advances may have led to increased depredation of these sites. If technological advances lead to increased depredation, then this effect counteracts the beneficial effect of improvements in the field of archaeology through the application of new technologies. What is the net effect of advancements in marine technologies in the field of marine archaeology?

---

[6] The National Park Service does maintain a list of pillaged sites.

II. Professional Societies Panel Discussion Summaries

1. Society for Historical Archaeology (SHA)[7]

Introduction

This document summarizes the main issues raised during a panel discussion among five professionals from the fields of underwater archaeology, maritime history, public policy, and philosophy (Table 1) held at the 1993 Annual Meeting of the Society for Historical Archaeology. The panel discussion focused on three questions (Table 2) relevant to a project funded by the National Science Foundation and currently being conducted by scientists at the Woods Hole Oceanographic Institution (WHOI). The project is directed at gaining a clearer understanding of the influences of the development of advanced marine technologies on the conservation of cultural values of archaeological resources such as historic shipwrecks.

More specifically, rapid advances in marine technologies useful for search, survey, navigation, exploration, and recovery have begun to revolutionize the capabilities to discover and exploit marine resources. In the past, access has been the

---

[7] This document is a summary of a Panel Discussion held at the annual meeting of the Society for Historical Archaeology, Kansas City, Missouri (7 January 1993). It was prepared by Victor Mastone and Porter Hoagland.

primary factor limiting the exploitation of underwater cultural resources, such as historic shipwrecks. The current pace of the application of new marine technologies toward the discovery and recovery of historic shipwrecks has effectively shattered the access barrier. Furthermore, these technological advances may have outstripped institutional abilities to ensure the appropriate management of the resource.

Marine scientists and engineers who have been involved in the development of these technologies may now face a dilemma. The development and application of advanced marine technologies may lead to the destruction of the important archaeological and historical attributes of historic shipwrecks. However, if marine scientists and engineers begin to assume additional professional responsibilities in order to protect historic shipwrecks, then there may be some retarding effect on the pace of development of advanced marine technologies. Do such professional responsibilities exist, and, if so, how might they be characterized?

Several issues emerged from the panel discussion. The issues are summarized below. In some cases, there was incomplete agreement among the panelists on the issues, and we identify these cases. Comments contributed by individuals in the audience have been included where they can be considered relevant and useful to the discussion. For the most part, the issues

identified here can be considered as part of a continuing discussion. The authors encourage constructive criticisms and suggestions from interested readers. The issues follow.

Distinguish technology developers from technology users. Significant overlaps exist among groups that develop advanced marine technologies and groups that actually use these technologies to study or exploit historic shipwrecks. Nevertheless, a subset of the panelists felt that, in considering the scope of professional responsibilities faced by marine scientists and engineers, it is important to distinguish between the two groups. One basic reason for making the distinction is that many of these technologies have been developed initially for other purposes such as marine hydrocarbon exploration and development or defense applications. The use of these technologies to explore for and to recover historic shipwrecks is a spinoff application developed by users. (However, one example was cited of the development of a side-scan sonar specifically for underwater archaeology applications--but it was never actually used by the archaeologist.)

Responsibilities of users. Users of advanced marine technologies (including technology developers if they are also users) may have a responsibility to employ technologies in a

manner that does not damage or destroy the archaeological or historic attributes of shipwrecks. One panelist felt that marine archaeologists may have an "ethical responsibility" to use advanced marine technologies more effectively in their work.

It should be noted that, even among archaeologists, there is no clear consensus on nondamaging or nondestructive use. One panelist asked whether marine archaeologists could legitimately ask professionals in other fields to adopt an archaeological perspective.

Moreover, in many cases there is no legal framework to restrict the activities of private treasure hunting and salvage firms who use advanced marine technologies. These private users may have their own "value system" through which they believe that their activities provide benefits (including archaeological and historical benefits) to society. What are the responsibilities of these private users to protect archaeological or historic values as perceived by other groups in society?

Is there a "kill switch"? As suggested in a draft paper[8] by Professor Caroline Whitbeck, the professional (and legal) responsibilities of engineers may require the design of a "kill switch" to preclude the possibility of harm caused by a

[8] C. Whitbeck, Engineering technology as it bears on new marine detection technology, mimeo, Department of Mechanical Engineering, MIT, Cambridge, Mass., (23 April 1993).

technology to a user if such harm is reasonably foreseeable by the engineer.

However, the professional responsibilities of engineers in the development and application of advanced marine technologies to historic shipwrecks can be distinguished from the kill switch concept on several bases. First, it is not the user that is harmed (at least not directly) but the resource itself. More specifically, the harm falls on those who individuals or groups in society who might benefit from the realization of the cultural attributes of an historic shipwreck (archaeological or historical knowledge, recreation, museum exhibition) and who might experience a welfare loss from the destruction of a wreck for treasure salvage. In other words, it is the users (not the engineers) who are taking actions to affect the welfare of other individuals or groups in society.

Developers may have a professional responsibility. There may be circumstances where technology developers have a professional responsibility to protect the cultural significance of historic shipwrecks. This might occur when the technology developer has either some "privileged" or special knowledge about the resource or some level of expertise, status, or authority with respect to the application of the technology and is circumstantially in a position to act with some effect. Perhaps

the most obvious example is the case in which the technology developer is at the same time the technology user.

The professional responsibility could also take the form of educating the public or "whistleblowing" so that the resource's special characteristics are protected. However, it is not clear that this responsibility is necessarily different from the responsibilities of any educated, clear-thinking member of society who is aware of the issues involved.

In addition there is an unanswered question concerning when and in what manner the "whistle" should be blown.

One member of the panel felt that there is a sincere and growing level of concern among some (a subset) of oceanographers regarding the "correct" ways in which they should approach the application of their technologies to underwater cultural resources. However, this concern among some oceanographers is not necessarily derived from any existing or assumed professional responsibilities as designer, developer, or retailer of advanced marine technologies.

One member of the panel asked whether the professional responsibilities of technology developers might include the design of technologies--such as remote visitation--to serve preservation interests. Another panelist wondered whether such technologies might be used to advance the purposes of treasure salvors (by enhancing the commercial value of recovered

artifacts) instead of advancing the goals of archaeologists.

What is the welfare effect? A member of the audience raised the point that the problem that the panel was addressing was precisely the same as the problem faced by scientists who designed the atom bomb--and that this type of problem is widespread in society. While this statement is true, problems of professional responsibility in the management of historic shipwrecks clearly are not of the same import. The question arises as to what is the welfare effect that results from the destruction of archaeological values? Is it on the same level as problems of health and safety or environmental pollution?

Education across disciplines. Although there exist examples of technology developers who have attempted to collaborate with marine archaeologists, such examples are rare. The panelists felt that there is a need for closer links to be forged and communication to take place between the marine archaeological community and the community of oceanographers. Some marine archaeologists (especially recent students) have been trained to use advanced marine technologies, but many have not. Thus some marine archaeologists exhibit a level of "standoffishness" regarding the developers and users of advanced marine technologies.

A member of the audience voiced the concern that advanced marine technologies are too costly for archaeologists to employ. Several members of the panel expressed the views that costs have dropped dramatically, that it is often the case that the benefits of using new technologies are not fully recognized, and that the adoption of new technologies could lead to new insights in archaeological research. One member described the advances in marine technologies as a "boon" to marine archaeology.

Table 1: SHA Panel Discussion Participants

Dr. Ervan Garrison
Assistant Professor
Department of Anthropology
University of Georgia
Athens, Georgia

Mr. Porter Hoagland
Research Associate
Marine Policy Center
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. Paul Johnston
Curator of Maritime History
National Museum of American History
Smithsonian Institution
Washington, D.C.

Mr. Victor Mastone, Panel Chair
Director
Board of Underwater Archaeological Resources
Commonwealth of Massachusetts
Boston, Massachusetts

Dr. Alison Wylie
Assistant Professor
Department of Philosophy
University of Western Ontario
London, Ontario

Table 2: SHA Panel Discussion Questions

1. Do marine scientists and engineers have a professional responsibility to ensure that the technologies they develop are used in a manner that protects the archaeological and historical attributes of submerged cultural resources? Assuming the answer is yes, does this responsibility differ from other legal or moral responsibilities faced by scientists and engineers (i.e., promoting health and safety, environmental protection)?

2. Does this responsibility differ from the professional responsibilities of users of technologies, such as marine archaeologists>?

3. What are the ways in which advances in the development of marine technologies might contribute to the goals of marine archaeologists? the management of submerged cultural resources? Looking more broadly, what actions can be taken to stimulate more interactive and multidisciplinary research and management efforts?

2. Archaeological Institute of America (AIA)[9]

Dr. Anna McCann opened by reporting about the Marine Policy Center/NSF project and the issues now being discussed. The archaeology community was very interested and also concerned about similar ethical issues. The discussion that followed was far-ranging. Some of the questions considered were:

1. The challenge faced by the professional archaeologist when working with or trying to affect the values of large technically complex and expensive commercial teams engaged in the exploration and exploitation of the deep sea floor [is significant].

Some felt that collaboration with the salvage teams was justifiable if the alternative was total, undocumented destruction of archaeological data. Others felt that such collaboration would be interpreted by the public as justification for a purely salvage approach. It was agreed that more education of the public as to the goals of archaeology underwater and the need for protection and controlled excavation of ancient and historical wrecks is needed.

2. Should archaeological artifacts be sold that are

---

[9] This document is a summary of a discussion entitled "Professional Ethics and the Exploration of the Deep Sea Bed" hosted by the Committee for Underwater Archaeology of the AIA and hosted by Professor John Oleson and Dr. Anna McCann. Dr. McCann prepared this report on 10 April 1993.

recovered from the sea?

There was much difference of opinion on this thorny issue. Some of the professional group expressed the opinion that not all archaeological material need be saved if documented and the archaeologist [is left] in charge of what is saved. Others among the professional group are strongly against the sale of artifacts, feeling this is where the archaeologist parts ways with those exploring the sea for commercial gain only.

The hope to influence possible commercial backers of deep sea exploration to make archaeological documentation and educational goals part of the financial plan was expressed.

3. There is a real need to educate the archaeological community about the developing robotic technology. Very few have used it and understand how it can [be used] effectively. The need for interaction between the technical and the archaeological communities is imperative. Training seminars, joint conferences, and opportunities also for the archaeologist to interact with those designing the software would be most productive. The JASON project, of course, is a model for educating the young, but the mature archaeologist needs education as well. The Museum of Science, Boston, is planning an exhibition using the JASON 1989 archaeological material on "Exploring the Deep Frontier: New Directions in Underwater Archaeology for the fall of 1994. This show would be a useful forum for the issues now under discussion.

IV. Draft Working Papers (Annotated)

Broadus, J.M. and P. Hoagland. 1993. **Dynamic issues in archaeological resource management.** Mimeo. Woods Hole, Mass.: Marine Policy Center, WHOI (April). [An analysis of the changing value of an historic shipwreck resource as a function of time, including issues surrounding the optimal timing of recovery or archaeological research on the resource.]

Cohn, A.B. 1993. **The federal Abandoned Shipwreck Act of 1987 and its implications for state submerged cultural resource programs.** Mimeo. Basin Harbor, Vt.: Lake Champlain Maritime Museum (21 April). [A preliminary report on the origins of the U.S. Abandoned Shipwreck Act of 1987 and its effect on state historic shipwreck management programs.]

Demisch, S. 1993. **Ethical codes as a means to control illicit trade: a memorandum.** Mimeo. Woods Hole, Mass.: Marine Policy Center, WHOI (April). [A determination of the extent to which professional museum and archaeological associations and societies dealing with historic shipwreck artifacts regulate their members against illicit trade, destruction of cultural resources, and commercialism.]

Hoagland, P. 1993. **Shipwrecks and public policies: an annotated compendium.** Mimeo. Woods Hole, Mass.: Marine Policy Center, WHOI (April). [An annotated compendium of important public polices in the field of historic shipwreck management including: U.S. court decisions; U.S. legislation; U.S. administrative actions; international policies and statements; and codes of conduct for professional societies.]

Hoagland, P. and J. Kraska. 1993. **The effects of unclear title in historic shipwrecks: a legal and public policy analysis.** Mimeo. Woods Hole, Mass.: Marine Policy Center, WHOI (April). [An analysis of the different kinds of historic shipwreck ownership status and the economic incentives created by ownership status.]

Kaoru, Y. and P. Hoagland. 1993. **The value of historic shipwrecks: conflicts and management.** Coastal Management (submitted). [Because of difficulties in accounting for "nonmarket" benefits, in the past the allocation of historic shipwreck resources may have been unnecessarily costly in terms of lost opportunities. In this article, we develop a

conceptual framework for underwater cultural resource management. We characterize historic shipwrecks as "quasi-natural resources", and we argue that methods of estimating nonmarket values in environmental and natural resource management can be applied to improve decisionmaking in cultural resource management.]

Kite-Powell, H.L. and W.K. Stewart. 1993. **Technological trends and implications for the location, identification, and manipulation of historic shipwrecks.** Mimeo. Woods Hole, Mass.: Marine Policy Center and Department of Applied Ocean Physics and Engineering, WHOI (15 April). [Changes in technologies that are used by those engaged in locating, studying, and salvaging historic shipwrecks are identified. The potential impact of these changes within three basic depth regimes on the accessibility and vulnerability of historic shipwrecks is characterized.]

Ladd, J. 1993. **Ethical comments.** Mimeo. Providence, R.I.: Department of Philosophy, Brown University. [In problems of social control, legal institutions are a fallacious source of answers for ethical questions. There are serious theoretical ethical difficulties with the resource management "calculus of values" approach. Democratic participation has both practical and theoretical ethical (e.g., moral participation, accountability, and responsibility) benefits as a management principle.]

Whitbeck, C. 1993. **Engineering responsibility and new marine detection technology.** Mimeo. Cambridge, Mass.: Department of Mechanical Engineering, MIT (April). [This paper addresses issues of moral responsibility as they relate to the activities of professional ocean engineers in the design and manufacture of advanced marine technologies used to explore for and to recover historic shipwrecks.]

Zhao, H. 1993. **International law and extraterritorial jurisdiction over historic shipwrecks.** Mimeo. Woods Hole, Mass.: Marine Policy Center, WHOI (April). [This paper addresses the legal question of whether or not it is proper for a U.S. District Court to assert in rem jurisdiction over an historic shipwreck beyond the U.S. territorial sea in accordance with admiralty and international law. The case of the Central America is used as an example.]

IV. Historic Shipwreck Case Studies

The River Plate Wrecks: Case Study

In April of 1992, the first South American find of "major" amounts of gold on a shipwreck was discovered in the Rio de la Plata (River Plate). The wreck itself remains unidentified; it is possibly the Spanish galleon El Preciado which sank in 1792, the Portugese vessel Nuestra Senora de la Luz, which sank in 1752, or several wrecks mixed together. A News Release explains that "since no object bearing the name of the vessel has so far been discovered, the matter may well remain a mystery and a subject for speculation."*

The "treasure" was recovered by an Argentine salvor, Snr. Ruben Collado, under license from the Uruguayan Government. The Uruguayan Government offered the treasure for public auction (see attachment) and was to split the proceeds 50-50 with the salvor, Collado Rescates S.A. According to news reports, some Uruguayan officials expected a major portion of the Uruguayan foreign debt (which currently stands at $3.4 billion) to be paid off with the Uruguayan government's share.

On 24-25 March 1993, an auction of "shipwrecked" gold ingots, bars, discs, and coins, two gold boxes, and silver coins took place at Sotheby's auction house in New York. Sotheby's pre-auction estimate of the auction value of the recovered items was between $2.5-3.0 million. The items sold at auction earned $2.9 million.

Over 1200 ships have been wrecked in the River Plate since the 16th century. The river has a high sediment load, requiring the use of "electronic technologies" and divers to recover artifacts form the wreck. It is unknown whether or not any archaeological studies were conducted on the wrecksite.

Discussion Issue:

The Uruguayan Minister of Education and Culture has expressed his intention to use the auction proceeds for "social programs, health, education and social security." Assuming that this happens, what can be said about the social welfare effects that result from the use of advanced marine technologies to recover and sell treasure from the River Plate?

* Sotheby's (1992), Sotheby's to auction an 18th century gold treasure recovered from a mystery shipwreck in the Rio de la Plata in Uruguay on March 24 and 25, 1993, News Release, New York (December).

Presidente de la República Oriental del Uruguay

It is with great pleasure that the Government of the Republica Oriental del Uruguay offers the "Tesoro Uruguayo del Rio de la Plata" for public auction through Sotheby's.

Many of the coins which have remained in the waters off the coast of our country for about 250 years are in a splendid state of preservation and the discovery has caused great excitement in our Republic.

We hope that coin collectors and all who are interested in treasure will enjoy this remarkable opportunity to purchase a piece of our history.

Luis Alberto Lacalle Herrera

Montevideo, november 11th., 1992

The S.S. Central America: Case Study

On 27 May 1987, a salvage company, Columbus-America Discovery Group, believed that it had discovered the wreck of the S.S. Central America, a black-hulled, three-masted, three-decked, coal-fired, sidewheel steamer which sank in the Atlantic Ocean in a hurricane on 12 September 1857. Although the initial discovery proved to be false, in 1988 Columbus-America eventually discovered the wreck 160 miles off the coast of South Carolina at a depth of 8000 feet. The salvage company initiated recovery operations in 1989 using a specially built remotely operated vehicle (ROV) called Nemo. The company sought full ownership of the wreck as an "abandoned" property in U.S. District Court.

On 22 March 1993, the U.S. Supreme Court denied a petition for "writ of certiorari" in the case of Columbus-America Discovery Group, Inc. v. Atlantic Mutual Insurance Company. By refusing to hear the case, a decision of the U.S. 4th Circuit Court of Appeals will be allowed to stand. The 4th Circuit's decision confirms the ownership rights of several insurance companies in a portion of the cargo of the S.S. Central America shipwreck. Because a portion of the shipwreck and its cargo is still "owned" and not "abandoned", the U.S. District Court for the Eastern District of Virginia (sitting as an admiralty court) must apply the law of salvage instead of the maritime law of finds.

Following some earlier court decisions, the 4th Circuit added an "ingredient" to the list of criteria that U.S. admiralty courts use in determining the size of a salvage award: "the degree to which the salvors have worked to protect the historical and archaeological value of the wreck and items salved." Because an application of the maritime law of finds would have established Columbus-America as owner of the wreck, no such criterion to protect archaeological or historic values would be employed.* Columbus-America has claimed to have conducted historical** and oceanographic research on the shipwreck.

Discussion Issue:

Assuming that U.S. admiralty courts must now evaluate the degree to which archaeological and historic values have been protected in the salvage of historic shipwrecks, what standards should the courts use for evidence? (Please see attachment for a discussion of this issue more generally.) Do marine scientists and technology developers have a role to play here?

---

* Interestingly, in the preliminary injunction issued by the District Court granting exclusive rights to Columbus-America as finder/salvor, the Court stated that only an application of the maritime law of finds would protect these values. It is believed that this statement is inaccurate.

** This research includes a recent article published in the journal Sea History, a quarterly published by the National Maritime Historical Society.

COLUMBUS-AMERICA DISCOVERY GROUP, INC., PETITIONER
v.
ATLANTIC MUTUAL INSURANCE COMPANY, ET AL.

92-1189

SUPREME COURT OF THE UNITED STATES

1993 U.S. LEXIS 2392; 61 U.S.L.W. 3652

March 22, 1993

PRIOR HISTORY: ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES OF APPEALS FOR THE FOURTH CIRCUIT

JUDGES: [*1] Rehnquist, White, Blackmun, Stevens, O'Connor, Scalia, Kennedy, Souter, Thomas.

OPINION: The motion of National Association of Academies of Science for leave to file a brief as amicus curiae is granted. The motion of Florida Bar Admiralty Law Committee for leave to file a brief as amicus curiae is granted. The motion of Ohio State University for leave to file a brief as amicus curiae is granted. The motion of Columbus Museum of Art for leave to file a brief as amicus curiae is granted. The motion of Ohio Academy of Science for leave to file a brief as amicus curiae is granted. The motion of Teachers and Administrators of Secondary Schools, et al. for leave to file a brief as amici curiae is granted. The motion of Explorers Club for leave to file a brief as amicus curiae is granted. The motion of Battelle Memorial Institute for leave to file a brief as amicus curiae is granted. The motion of Marine Technology Society for leave to file a brief as amicus curiae is granted. The motion of Ohio Historical Society for leave to file a brief as amicus curiae is granted. The motion of National Maritime Historical Society for leave to file a brief as amicus curiae [*2] is granted. The motion of Titanic International, Inc., et al. for leave to file a brief as amici curiae is granted. The motion of Adjunct Science and Education Association for leave to file a brief as amicus curiae is granted.

The petition for a writ of certiorari is denied.

NATURE · VOL 362 nature 8 APRIL 1993

Criteria for science in the courts

The US Supreme Court may produce new criteria for the admissibility of scientific evidence in the courts on the basis of a suit now being heard.

THE question of what constitutes valid scientific data, suitable for admission as evidence in court, has plagued judges for decades. Generally unschooled in the scientific method, judges have the legal duty of deciding what may or may not be presented to a jury. For years, US judges have relied on a standard, dating back to 1923 and too often honoured in the breach, defining admissible evidence as that which derives from methods of inquiry that are 'generally accepted' by the scientific community. Frequently, courts have interpreted that to mean 'published in the peer-reviewed literature'.

A more lenient standard, set out in legislation in 1975, permits judges (at their discretion) to admit as evidence almost any opinion from an 'expert witness', defined as someone who is qualified "by knowledge, skill, experience, training or education" to speak to a given subject. Each standard is in some way deficient.

First, it is (or should be) well known that the peer review system is not infallible and, further, that the best journals openly acknowledge that editorial judgement on the importance of a paper and its estimated interest to readers play an important role in deciding which papers to publish and which to reject. And even this journal has rejected papers that subsequently proved to be of exceptional significance. Thus to bar from the courts data that have not appeared in a peer reviewed journal could be foolhardy. But it is also well known that the so-called expert witness in court may be a hired gun, willing to testify to anything for a fee, or a crackpot whose unsupportable ideas are masked by an advanced degree — often from a respectable university.

The issue of standards of evidence arises now because of a case just argued before the US Supreme Court over whether data do or do not support the allegation that a drug called Bendectin, once widely prescribed to prevent morning sickness in pregnant women, causes limb deformities in newborn babies. The manufacturer and the defendant in the case, Merrell Dow (now Marion Merrell Dow of Kansas City), has consistently won its case in some 200 lawsuits brought by parents who claim that Bendectin is a teratogen. The company can cite more than 25 published epidemiological studies indicating no correlation between Bendectin (which was taken by more than 30 million women worldwide) and limb deformities. (Nevertheless, because of the high cost of litigation, the company withdrew Bendectin from the market in 1983, leaving women to rely on old-fashioned remedies to prevent what is, in some instances, a serious complication of pregnancy.)

The plaintiffs in earlier cases and that now before the Supreme Court, known as *Daubert* v. *Merrell Dow Pharmaceuticals*, have relied largely on the testimony of expert witnesses, some of whom have reached conclusions by analogy rather than direct experiment. Most of the time, the courts have ruled their testimony inadmissible. The issue has been cast in scientific circles and the press as a clash between 'good' science and what is scornfully described as 'junk' science because it fails to meet tests of scientific legitimacy. For instance, much of the case against Bendectin in *Daubert* rests on testimony by a Berkeley-trained epidemiologist, now affiliated with the California state health department, who claims that her "reanalysis" of the published epidemiological data shows a one in 1,000 incidence of limb deformities caused by Bendectin. She has not written up her data for publication.

What should the court do? Reflecting a befuddlement judges often express when dealing with science (and revealing again that science is not yet part of the mainstream of education) one of the justices said: "There are Harvard law professors on both sides of this case; I had hoped you could get together and lead us out of the wilderness." But it is not really a wilderness, as many of the 'friend of the court' briefs filed by scientific bodies suggest. One in particular (from the not-for-profit Carnegie Commission on Science, Technology and Government) offers a clear way out. The commission urges the justices to adopt a new standard for evidence that would require judges not to resolve scientific controversy but only to ask three pertinent questions in weighing admissibility of evidence: is the claim testable? Has it been tested? And is the methodology sound?

Courts should not exclude evidence just because it is not accepted wisdom; nor should they allow plaintiffs to be held liable on the basis of mere hypothesis or speculation. While it is true that speculation is an essential part of science, and true that new ideas may have a hard time gaining acceptance, it does not follow that untested science belongs in court. That would be bad public policy.

An influential fellow

The death two weeks ago of Lord Zuckerman will leave a sad gap in public life in Britain and elsewhere.

SOLLY (as even his enemies called him) Zuckerman, more formally Lord Zuckerman, OM, was an iconoclast by

The R.M.S. Titanic: Case Study

On 1 September 1985, a joint U.S.-French expedition headed by Dr. Robert Ballard (WHOI) located the wreck of the R.M.S. Titanic, which sank in 1912 approximately 325nmi from the coast of Newfoundland to a depth of 3800m. In July of 1986, a U.S. team headed by Dr. Ballard returned to the wreck and attached bronze plaques dedicating the shipwreck as a memorial and requesting that the shipwreck remain unsalvaged.

On 27 October 1986, the U.S. "R.M.S. Titanic Maritime Memorial Act" [P.L. 99-513] was signed into law. Using "hortatory" language, the law was intended to discourage--but did not prohibit--U.S. persons from salvaging the R.M.S. Titanic. From the legislative history, it is clear that the U.S. Congress was concerned that an outright prohibition would discriminate against U.S. citizens in the absence of similar restrictions faced by the citizens of other countries. The law also urged the executive to seek international agreement to protect the shipwreck.

In 1987, the French Government, financed by Titanic ventures of Southport, Connecticut, returned to the shipwreck and salvaged 1800 artifacts.* In December of 1992, as required by French law, the French government offered some of the artifacts for sale to survivors or relatives of survivors of the shipwreck.

Customary international law, which is reflected in the U.N. Convention on the Law of the Sea, is general and vague with respect to the disposition of historic shipwrecks like the R.M.S. Titanic (see attachment). Current efforts are being undertaken under UNESCO auspices to draft an international convention governing historic shipwrecks within the EEZ or on the continental shelf of coastal nations. (The R.M.S. Titanic is arguably on the "juridical" continental shelf of Canada.)

Discussion Issue:

What are the responsibilities or roles of marine scientists and technology developers with regard to the development of public policies governing the disposition of historic shipwrecks beyond the contiguous zones of coastal nations?

---

* Titanic Ventures' salvage rights were recently confirmed. On 12 November 1992, The U.S. District Court for the Eastern District of Virginia denied a motion made by Marex Titanic, Inc., a salvage company headed by Texas oilman Jack Grimm. Grimm had looked for the wreck unsuccessfully in 1980 and 1981. Grimm was claiming that Titanic Ventures' claim had lapsed through lack of diligence.

hnology to the Enterprise
d to activities in the Area,
access of the Enterprise
vant technology, under fair
s,
cement of the technology
technology of developing
rtunities to personnel from
tates for training in marine
ll participation in activities

vironment

dance with this Convention
nsure effective protection
ects which may arise from
ll adopt appropriate rules,

ol of pollution and other
cluding the coastline, and
lance of the marine envi-
to the need for protection
ies as drilling, dredging,
ruction and operation or
and other devices related

natural resources of the
o the flora and fauna of

ife

ssary measures shall be
an life. To this end the
ulations and procedures
odied in relevant treaties.

Area and in the

with reasonable regard
t.

2. Installations used for carrying out activities in the Area shall be subject to the following conditions:

(a) such installations shall be erected, emplaced and removed solely in accordance with this Part and subject to the rules, regulations and procedures of the Authority. Due notice must be given of the erection, emplacement and removal of such installations, and permanent means for giving warning of their presence must be maintained;

(b) such installations may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation or in areas of intense fishing activity;

(c) safety zones shall be established around such installations with appropriate markings to ensure the safety of both navigation and the installations. The configuration and location of such safety zones shall not be such as to form a belt impeding the lawful access of shipping to particular maritime zones or navigation along international sea lanes;

(d) such installations shall be used exclusively for peaceful purposes;

(e) such installations do not possess the status of islands. They have no territorial sea of their own, and their presence does not affect the delimitation of the territorial sea, the exclusive economic zone or the continental shelf.

3. Other activities in the marine environment shall be conducted with reasonable regard for activities in the Area.

Article 148
Participation of developing States in activities in the Area

The effective participation of developing States in activities in the Area shall be promoted as specifically provided for in this Part, having due regard to their special interests and needs, and in particular to the special need of the land-locked and geographically disadvantaged among them to overcome obstacles arising from their disadvantaged location, including remoteness from the Area and difficulty of access to and from it.

Article 149
Archaeological and historical objects

All objects of an archaeological and historical nature found in the Area shall be preserved or disposed of for the benefit of mankind as a whole, particular regard being paid to the preferential rights of the State or country of origin, or the State of cultural origin, or the State of historical and archaeological origin.

Source: NORQUIST ~~Nordhaug~~, ed. (1985).

Source: Ruffman, Gault and Vanderzwaag (1988).

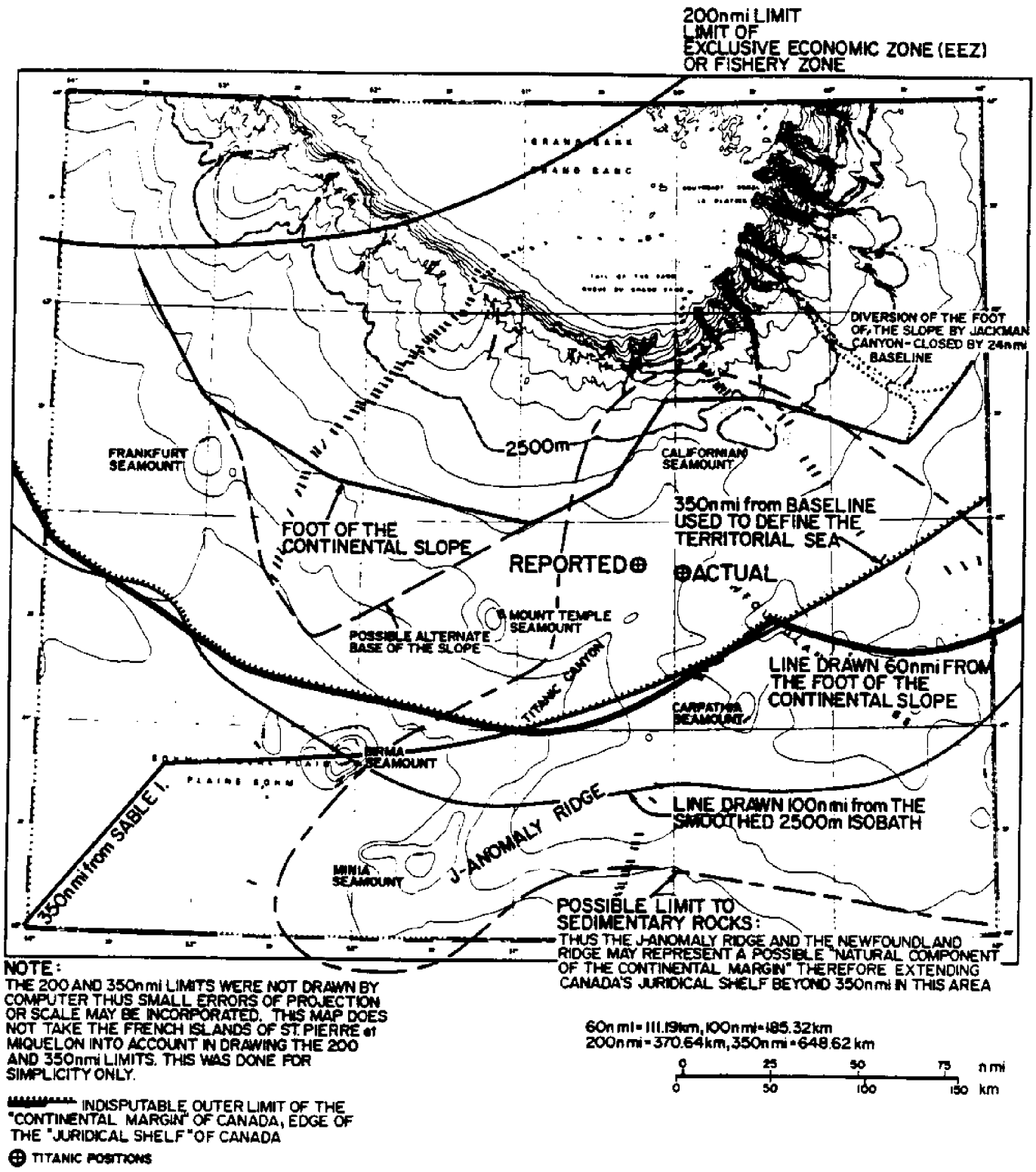

Figure 7: Interpreted Bathymetry Map Showing Lines Defined in Article 76 of Law of the Sea Treaty

V. Future Research Issues

Future efforts will focus on revisions of the working papers including attention to several issues that have not been fully addressed by the research project. For the most part, these issues arose during discussions at the two planning meetings and were identified as important areas for additional further research. These issues include:

- developing a more complete understanding of the relationship between the spatial distribution of historic shipwrecks and water depth to improve understanding about the impacts of technological advances;

- identifying and documenting sources of demand for advanced marine technologies and characterizing the scope and rate of spinoffs into underwater archaeology and commercial exploration and recovery activities;

- estimating the extent and severity of the problem of the "depredation" of historic shipwrecks (to date the evidence is mostly anecdotal and incompletely substantiated);

- increasing the involvement of representatives from the treasure salvage industry in the discussions to gain a

greater understanding of the nature of their activities, their use of advanced technologies, and the extent to which their technological sophistication may differ from that of the underwater archaeological community;

- characterizing more completely the ethical norms set forth in professional codes of conduct, especially those of the engineering societies;

- developing an expanded set of "case studies" examining some of the most important public policy issues in historic shipwrecks management that have arisen as a result of advances in marine technological capabilities;

- examining the cultural resource management literature to enhance the relevance of our work on applying methods of economic valuation to evaluate the nonmarket attributes of historic shipwrecks;

- characterize more completely the broadly-defined "industrial organization" in this field;

- clarify the critical issues surrounding legal title to historic shipwrecks and the ability of the state to regulate

their use without invoking principles of title law;

- explicate the positive and negative aspects of emerging international legal institutions (e.g., the convention on underwater cultural resources currently being developed under the auspices of UNESCO), such as effects on international trade, expansion of geographic jurisdictions, among others;

- expand project outreach in one or more of the following ways: scholarly articles, articles in topical literature, a traveling museum exhibit, educational materials distributed through the JASON project, presentations at meetings of professional organizations, and public information through the media;

- organize a "Major Workshop" at which polished versions of the research papers and case studies will be presented formally (the workshop would include representation from all of the major interest groups).

Appendix 1: **PARTICIPANTS LIST**

Mid-Course Planning Meeting 23-24 April 1993

(* = unable to attend)

Participant	Project Role (Discipline)
Dr. Robert D. Ballard Department of Applied Ocean Physics & Engineering Woods Hole Oceanographic Institution Woods Hole, MA 02543	Principal investigator & Project advisor (Marine Technology)
Dr. Noel Broadbent Arctic Social Science Program Director Polar Programs Division National Science Foundation 1800 G Street, N.W. Washington, D.C. 20550	NSF Sponsor (Archaeology)
Dr. James M. Broadus Marine Policy Center Woods Hole Oceanographic Institution Woods Hole, MA 02543	Principal investigator & Project advisor (Economics)
Mr. Arthur B. Cohn Director Lake Champlain Maritime Museum Basin Harbor, Vermont 05491	Project consultant (Law)
Dr. William Dudley* Senior Historian Naval Historical Center, Bldg. 57 Washington Navy Yard Washington, D.C. 20374-0571	Invited participant (Naval History)
Mr. John P. Fish* Oceanstar Systems Incorporated P.O. Box 768 Cataumet, MA 02534	Invited participant (Search and Survey)
Mr. Kevin Foster Historical Division National Park Service Washington, D.C. 20013-7127	Invited participant (Maritime History)

Participant	Project Role (Discipline)
Professor Ervan G. Garrison Department of Anthropology Baldwin Hall University of Georgia Athens, GA 30602	Project advisor (Archaeology)
Professor Richard Gould Department of Anthropology Box 1921 Brown University Providence, RI 02912	Invited participant (Archaeology)
Dr. Christopher Hamilton* Atlanta, GA	Invited participant (Archaeology)
Mr. Porter Hoagland Marine Policy Center Woods Hole Oceanographic Institution Woods Hole, MA 02543	Research Associate (Public Policy)
Mr. and Mrs. Frank W. Hoch* Matthiessen Park 39 North Broadway Irvington-on-the-Hudson, NY 10533	Invited participants (WHOI Trustees and Sponsors)
Dr. Rachelle D. Hollander* Studies in Science, Technology and Society National Science Foundation 1800 G Street, N.W. Washington, D.C. 20550	NSF Sponsor
Dr. Paul F. Johnston* Curator of Maritime History Smithsonian Institution Washington, DC 20560	Project advisor (Archaeology)
Dr. Yoshiaki Kaoru Marine Policy Center Woods Hole Oceanographic Institution Woods Hole, MA 02543	Asst. Social Scientist (Economics)
Dr. Hauke L. Kite-Powell Marine Policy Center Woods Hole Oceanogrphic Institution Woods Hole, MA 02543	Research associate (Ocean Systems Management)

Participant	Project Role (Discipline)
Lt.J.G. James C. Kraska Marine Policy Center Woods Hole Oceanographic Institution Woods Hole, MA 02543	Research fellow (Maritime law)
Professor John Ladd Dept. of Philosophy, Box 1918 Brown University Providence, RI 02912	Project advisor (Philosophy)
Mr. Victor T. Mastone Executive Office of Environmental Affairs 100 Cambridge Street, 20th Floor Boston, MA 02202	Project consultant (Archaeology)
Dr. Anna McCann* Apartment B-2104 200 East 66th Street New York, NY 10021	Visiting investigator (Archaeology)
Lt. Cmdr. Craig N. McLean 155 Knapps Highway Fairfield, CT 06340	Invited participant (Ocean law)
Professor Bernard Oxman University of Miami School of Law P.O. Box 248087 Coral Gables, FL 33124	Project advisor (Law)
Dr. David A. Ross Department of Geology & Geophysics Woods Hole Oceanographic Institution Woods Hole, MA 02543	Sea Grant Sponsor (Marine Geology)
Dr. W. Kenneth Stewart Jr. Department of Applied Ocean Physics and Engineering Woods Hole Oceanographic Institution Woods Hole, MA 02543	Principal investigator & Project advisor (Ocean engineering)
Mr. Ken Vrana Michigan Sea Grant Extension Michigan State University East Lansing, MI	Invited participant (Sea Grant)

Participant	Project Role (Discipline)
Dr. Caroline Whitbeck Department of Mechanical Engineering Massachusetts Institute of Technology 3-158 Cambridge, MA 02139	Project consultant (Philosophy)
Prof. Alison Wylie Department of Philosophy University of Western Ontario London, Ontario, Canada N6A 3K7	Project advisor (Philosophy)
Mr. Hongye Zhao* Rubin, Rubin, Malgren, Kaplan & Kuhn 501 Hoes Lane Piscataway, NJ 08854-5000	Research fellow (Public Int'l Law)

Appendix 2: **AGENDA**

Advanced Marine Technology and Historic Shipwrecks:
Conflicting Values and Principles of Professional Responsibility

Mid-Course Planning Meeting
Carriage House, Quissett Campus
Woods Hole Oceanographic Institution

23-24 April 1993

Friday 23 April

10:00-10:30	Introductions
10:30-10:45	The development of advanced marine technologies (Kite-Powell and Stewart)
10:45-11:15	Open Discussion
11:15-11:30	Shipwrecks and public policies: an annotated compendium (Hoagland and Cohn)
11:30-11:45	Case Studies (Hoagland)
11:45-12:00	Ethical codes as a form of self regulation against trade: a memorandum (Hoagland)
12:00-12:30	Open Discussion
12:30-1:00	LUNCH BREAK (Continued Discussion)
1:00-1:15	1992 Archaeological Institute of America (AIA) panel discussion summary (Hoagland)
	1993 Society for Historical Archaeology (SHA) panel discussion summary (Mastone)
1:15-1:30	Open Discussion
1:30-3:30	Engineering responsibility and new marine detection technology (Whitbeck)

3:30-3:45	COFFEE BREAK
3:45-5:00	Discussion and Wrap-up (Broadus)
	DINNER (NO HOST)

Saturday 24 April

8:30-9:00	The value of historic shipwrecks: conflicts and management (Kaoru)
9:00-9:30	Dynamic issues in archaeological resource management (Hoagland)
9:30-9:45	Open Discussion
9:45-10:15	The effects of unclear title in historic shipwrecks: a legal and public policy analysis (Kraska & Hoagland)
10:15-10:45	International law and extraterritorial jurisdiction over historic shipwrecks (Oxnam remarks [for Zhao])
10:45-11:00	COFFEE BREAK
11:15-12:00	Planning Discussion (Broadus)
12:00-1:00	LUNCH BREAK (MEETING ADJOURNMENT)