

State of the Oceans: Our Planet's Underserved Frontier

by Admiral James D. Watkins, U.S. Navy
(Retired) President, Joint Oceanographic Institutions,
Inc. before the National Press Club

September 28, 2000 WASHINGTON, DC The most precious and greatest of nature's resources are the oceans. This is so because: three-quarters of the Earth is water; because vast oceans circulate the energy and water that control our climate and weather; because oceans are the fundamental source of water vapor in the atmosphere that keeps our planet from being frozen like Mars; because life most likely started in the oceans and previously unknown forms are now being found at hot volcanic vents on the deep sea floor; because the world's population will increase from 6 billion today to about 10 billion in only 50 more years, with well over half of these people inhabiting the coastal zone; and because the near-shore region is particularly affected by the consequences of intense human use, i.e. water and air pollution, habitat degradation and loss, hypoxia, harmful algal blooms, and over-fishing; and because of many other compelling reasons.

Despite all the aforementioned natural powers of and human-generated vulnerabilities imposed upon the oceans, however, it may shock you that we know very little about the ocean system that underpins our life on Earth. So, prudence demands that we start now, before it's too late, to gain the necessary fundamental understanding of both natural and human-generated processes. To gain this understanding, then, we must give our 21st century Earth scientists all necessary tools to help them better decipher the Earth as a system. We are not doing so today. Yet, if we do so tomorrow, then we have a chance to design and build the related understanding and predictive models to help optimize the use and sustainability of this greatest natural resource for the good of our Nation and, in fact, all humankind.

Let me give you one excellent example of an integrated

international research program, one that is mature, well-tested, highly productive, and fully integrated with over 20 international partners. It is ready to "plug in" to the much larger system I am about to address. This program is called the Ocean Drilling Program, a program that studies the oceans of the world and taps the wealth of information they hold about the Earth's past, present and future. Scientists working on the program's unique research ship, the *JOIDES Resolution*, have drilled more than 2,000 holes into the Earth's crust in the last 30 years to learn what goes on in the interior of our planet. Beneath the deep ocean seafloor, scientists have uncovered a previously unsuspected world of microscopic creatures living in the seafloor biosphere. Two years ago, they found life farther down than ever -- millions of bacteria teeming in sediments more than half a mile below the ocean floor off New Guinea. Scientists expect that more life will be found at even deeper levels.

By analyzing such rocky cores, Ocean Drilling Program scientists have established a remarkable series of scientific achievements. In addition to finding subterranean life, they have:

- Proved the once controversial theory of "plate tectonics" as the mechanism to explain movements of the continents and creation of ocean basins.
- Confirmed evidence indicating that a giant meteorite slammed into Earth 65 million years ago, wiping out the dinosaurs and three-fourths of all species living on Earth at that time.
- Tracked the historical cycles of climate change, consisting of stable periods lasting thousands of years, but followed by abrupt changes to new, very different conditions when the Earth repeatedly went from an icehouse to a greenhouse and back again.
- There are vast and mysterious places remaining to be investigated under Earth's oceans and within Earth's interior.

One example is the new research planned to explore ways to safely harvest gas hydrates which have the potential to become a major new world-wide energy resource. The Ocean Drilling Program is also working with other international institutions and nations to form the first expedition to drill in the floor of the Arctic Ocean, at the North Pole, where a mother lode of information about the Earth's past, present and future awaits scientists. We know so little about the Arctic Ocean which some have called "the heart pump of the world." Further, in a few years the ocean drilling program will expand to include a second drilling vessel to explore regions previously inaccessible because of safety considerations in the Continental Shelf areas of the world which are so vital to understanding the oceans as a system. This new program will be lead by the U.S. and Japan, as equal partners, along with significant international participation.

But, unfortunately, programs like the Ocean Drilling Program are the exception, not the rule; yet they can serve as models for management and conduct of much larger, needed, and internationally-collaborated work in the oceans. Let me give you an example of "the rule" as opposed to "the exception." As Secretary of Energy when the Cold War ended, I was a member of the Committee on Earth and Environmental Sciences, then a subcommittee of the White House Office of Science and Technology Policy. We were tasked to prepare for U.S. participation in the United Nations Conference on Climate Change, held in 1992 in Rio de Janeiro. It may not surprise you, but during the entire 18 months which led up to that conference, marine and ocean issues were rarely mentioned. I was amazed at the general lack of interest by national and international environmental policy-makers in the overwhelming role of the oceans. The vital role oceans play as the thermal and geochemical flywheel of our planetary environment had, somehow, not been communicated effectively to decision-makers. Advocacy alone, both then and now, seems always to drive these environmental debates. A serious ocean science and technology agenda to enhance understanding and parallel advocacy never seems to be in the cards; it wasn't either at Rio or its follow-on conference on climate change at Kyoto.

On the flip side, the U.S. National Academy of Sciences has long since understood this need for connectivity between scientific understanding and public policy-setting. The Academy's Ocean Studies Board of the National Research Council produced a major report about eight years ago entitled "Oceanography in the Next Decade: Building New Partnerships." In their report, the National Research Council sought to galvanize the many public and private institutions that have direct responsibility for the health and welfare of ocean sciences through new partnerships. A sense of urgency about ocean research is precipitated, according to that report, by human impacts on oceanic systems and the need for better understanding of the ocean's role in affecting global climate and biological processes. Since that report in 1992, the National Academy of Sciences has published 38 superb reports on ocean science needs. These reports address a wide range of ocean-related issues of vital importance to the nation.

But, this incredibly valuable library of closely-related scientific issues related to the oceans and recommendations for improvement in their management will surely be lost in the confusion of today's highly-compartmented government bureaucracy if past is allowed to be prologue. So, it's up to many of us closely associated with science and technology to help both the public and private sectors straighten this out. We are doing so now, at least as far as the oceans are concerned. Let me explain.

In 1993 with support of ten premier academic Joint Oceanographic Institutions (JOI), (a corporation of which I became President and which runs the Ocean Drilling Program for the National Science Foundation that I discussed earlier) I helped lead the effort to establish a second corporation called the Consortium for Oceanographic Research and Education (CORE) of which I also became President. Now over 60 institutions strong, embodying virtually all of the Nation's oceanographic community, CORE has risen to the challenge over the ensuing years in close partnership with the nine Federal agencies involved, in varying degrees, with ocean science and technology. One of the first efforts we undertook was the development and implementation of the National Oceanographic

Partnership Program. To do this, and based on recommendations of the 1992 National Academy report, CORE took the lead and worked with Congressional and agency leadership to establish, for the first time, a formal program to coordinate cross-cutting science and technology requirements among these same nine Federal agencies and their researchers in academia. This program was established by an act of Congress in 1996. Program oversight is provided by a National Ocean Research Leadership Council, currently chaired by the Secretary of the Navy, and includes a top official of each participating agency as well as the Director of the Office of Management and Budget and the President's Science Advisor. The Partnership Program has already proven itself to be a successful and innovative way of conducting the business of ocean science and technology.

To date, the partnership program has funded 39 innovative research partnerships for \$160 million, including \$72 million in non-Federal matching funds. But, far more important than this injection of new funds into one vital area of national interest is the new paradigm being established that can mutually benefit multiple-participating Federal agencies and their public and private partners. This new paradigm facilitates moving all stakeholders together productively and efficiently from research to downstream development and integration of derived operational systems for the societal good. Operational systems heretofore only dreamed about can now be achieved realistically through modern technology. As a result, they can provide essential data for use in constructing badly-needed predictive models to help assure sustained economic development, quality of life and national security for the Nation.

One promising area in which the Partnership Program is taking the lead is development of a long-overdue integrated ocean observing and predictive system. The equivalent system for understanding, monitoring, and predicting atmospheric conditions has long-since been built on both national and international levels, producing great value to Nation and world. Meanwhile, our understanding of the oceans and their integral role in resource development, climate, weather, human health, economic development, and so forth has crept along at a pace that is far short of the relative importance to national concerns.

Let's just examine one area mentioned here wherein ocean observing and predictive systems have exciting potential -- that is, understanding the oceans' role in human health. The National Research Council released an excellent report last year, entitled "From Monsoons to Microbes," outlining the various ways in which the oceans impact human health. The report offered recommendations on promising new areas of cooperative research between oceanographers and health researchers. It also discussed how a better understanding of the ocean environment -- particularly through enhancing observational capabilities and the development of predictive models -- can mitigate the effects of climate, weather and coastal hazards. Further, the impact of waterborne infectious disease was examined, whether from exposure to contaminated waters, seafood poisoning, or hepatitis and cholera. Also pointed out were opportunities to examine the incredible diversity of ocean life for new pharmaceuticals and materials; and the examination of marine organisms for use as medical models was highlighted as being very promising. We hope this report will mark the beginning of a serious effort between the oceanographers and medical research community to pursue a productive cooperative research program.

Similarly, in other areas besides human health, if we are to predict and respond to harmful and expanding algal blooms like "red tides," we must be able to "see" their early indications in individual estuaries and near shore environments. If we are to understand the dynamics of commercial fish species and better predict their future sustainability, we must be able to "see" the regional ecosystem and gain the in-depth knowledge of how it is affected by physical and chemical variability. If we are to provide better climate forecasts, we must first have in place the eyes to "see" those elements that can fill today's all too-empty oceanic data base, on both regional and global scales. In fact all those challenges I outlined at the outset of my talk today can be addressed through the scientific and technical "eyes" of an integrated ocean observing and predictive system. The applications are many, the potential payoffs great. Just last year, over 1800 members of the ocean community signed a letter to the Congressional and Administration leadership expressing their support and asking for immediate action. The

letter urged the U.S. Government to commit to, plan, and implement a sustained national program of ocean observations, with funding and resources supplemental to those currently available.

As a result of all of these initiatives, there is now a plan on the table that provides an excellent road map to developing an internationally-integrated observing and predictive system. In fact, the nine partnership Federal agencies have recently agreed to establish a joint program office to develop and construct this system for the U.S. Now, we need to bring the oceanographic community, the Administration, and the Congress together in even closer partnership to ensure that the plan is implemented and sustained from one administration to the next. And we are indeed fortunate today to have with us leaders from both legislative and administrative branches who have been key to doing just that. Further, our international partners are waiting for the U.S. To make such a commitment and take the lead. We're long overdue.

Another landmark event took place about six weeks ago, when the President signed into law "the Oceans Act of 2000 (Public Law 106-256)." Senator Hollings who could not be with us today but sends his greetings was key to effecting this legislation in the Senate along with his twenty bipartisan co-sponsors. Representative Tom Allen here on the dais with us played a similar leadership role in the House as one of the co-chairs of a newly-created, energetic and growing House Ocean Caucus, now fifty members strong and expected to grow to more than 100 early in the next Congress. The Oceans Act is the culmination of years of dedicated work by the Senate and House sponsors and is urgently needed to increase public awareness of the importance of the oceans to our Nation. The legislation establishes a bipartisan 16-member National Ocean Commission for the next Administration to undertake a comprehensive review of U.S. ocean and coastal activities. That review will serve as the foundation for the next President to develop and implement a badly-needed comprehensive long-range national ocean and coastal policy. We have not had such a review for over thirty years.

So, in summary, I would say that the state of ocean and marine

science is coming out of its post-Cold War slump. There are exciting opportunities on the horizon and there is a growing awareness of the contributions that we can and will make to society. While momentum today is positive and strong, we still have a long way to go in the further development and growth of key programs such as those I merely touched on today. The good news, however, is that we not only know what to do, we know how to do it with the more and more sophisticated and heretofore unavailable tools of modern technology now getting to market.

It will remain the principal job of our sixty CORE oceanographic institutions to continue to be a strong voice here in Washington and to work with all ocean partners to stay involved and motivated so as to help bring to fruition new knowledge of our oceans and their derived predictive systems which will benefit Americans and all others around the world.