

A brief look at mechanisms for support of oceanographic research in the United States

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Introduction

The primary source of financial support for ocean sciences in the United States is the federal government. Three agencies provide the major part - the National Science Foundation (NSF), the United States Navy's Office of Naval Research (ONR), and the National Oceanic and Atmospheric Administration (NOAA). Each of these plays a distinct role, given that their missions differ. The National Science Foundation is responsible for basic research, whereas ONR has defense-related obligations. Nevertheless, ONR supports much basic research, since oceanographic knowledge clearly has strategic value. NOAA supports research which contributes to its mission, and also has some specialized programs for research support. It is not possible to address all the many and varied programs which are included within the federal agencies. The aim of this discussion is to provide an

idea of how the system works in the United States, from the perspective of a scientist independent of agency affiliation.

Primary Funding Agencies

The mechanisms for financial support of marine sciences in the United States are diverse and complex. However, the commonly accepted assumption among academic oceanographers is that the system used by NSF is effective and fair, and on the whole, results in support for the highest quality research. The process involves open competition based on research proposals, which may be submitted in response to a Program Announcement or may be unsolicited. Proposals are submitted according to an advertised schedule for each Program, and each is sent to a number of carefully selected scientists knowledgeable in the research area for peer review. The process also

may include convening either a standing or an *ad hoc* panel to assist in ranking the proposals. The final scientific/technical decision lies with the Program Manager, within the constraints of the available funds. Although the Ocean Science Division of NSF is the primary source of marine science funds, other disciplinary Divisions also provide funds for marine research. The Office of Polar Programs supports most of the Southern Ocean research and a large proportion of the arctic oceanographic research.

The National Science Foundation maintains a balance between “big science” and small individual-investigator projects. This has been the case since the International Decade of Ocean Exploration launched the tradition of large, planned, multi-disciplinary, multi-investigator research. Following the end of the Decade, the Ocean Sciences Division of NSF developed a long-range plan which provided for global-scale ocean studies, recognizing the timeliness of and need for such approaches. The technological capabilities for conducting such work, in the form of satellite remote sensing, drifting buoys and moored instrumentation, had become available. There was, however, concern that such programs not overshadow and squeeze out the smaller projects. The Ocean Sciences Division of NSF has continued its periodic update of the plan, and remains the primary source for marine science support for academic institutions in the United States, with a budget exceeding \$200 million. Today, some major large programs are in their final stages the World Circulation Experiment (WOCE) is one such. The competition for NSF funds is extremely rigorous, and many excellent proposals must be declined for lack of funds. Although the funds available have increased over the years, the number of scientists competing for them has increased at a higher rate.

The National Science Foundation coordinates and supports the United States academic fleet through the University National Oceanographic Laboratory System (UNOLS). Some of the university-based vessels are owned by the Navy, some by NSF, and some by the academic institutions themselves. Support for time at sea is requested in the scientific proposals, and the operational survival of a vessel ultimately depends on the number of successful proposals requiring its use.

The Office of Naval Research has a strong oceanography program and also an arctic program. Most of the support until recently was dedicated to deep water oceanography, with little attention to the coastal areas. With a new emphasis on “littoral oceanography”, broadly defined as continental shelf

areas, ONR is supporting additional work in near shore areas. Several large international projects supported in the past focused on physical oceanography and marine geology and geophysics. Some academic oceanographic institutions receive major funding through this agency. A new expansion of the Navy/Academic relationship has emerged as a result of the passage of the National Oceanographic Partnership Program in 1997. Although this is to be a multi-agency program, at present only the Navy is initiating support for projects under the act. A Broad Agency Announcement requested pre-proposals this spring, and those that fit the criteria for funding were developed into full proposals for further consideration. The guidelines are clearly designated, and require partnerships among federal, academic, and private entities. Here again, a peer review process is used to evaluate proposals.

The National Oceanographic and Atmospheric Administration has a complex mission, since it has the mandate to provide meteorological services, geodetic mapping services, as well as fisheries assessment and management. A strong in-house program in marine sciences exists through the NOAA Environmental Research Laboratories. For example, the Pacific Marine Environmental Laboratory in Seattle is a major player in oceanographic research in the North Pacific. The National Marine Fisheries Service conducts fisheries research and assessment, and also work on marine mammals; much of this is in response to federal legal mandates. Some external work is supported in conjunction with these programs. However, the major part of the funds currently provided to the academic marine sciences comes through two programs within NOAA - the Sea Grant College Program and the Coastal Ocean Program. NOAA's extramural funding appears to be increasing, primarily through partnerships with Academia through cooperative institutes.

Large programs benefit from multiple funding sources, since all agencies have severe budget constraints. NOAA was a major supporter of the Tropical Oceans and Global Atmosphere (TOGA) program, a ten-year international effort to study short-term climate change. From its inception in 1985, the program included studies of the atmosphere, the oceans, and their interactions, leading to a greatly-improved understanding of the El Nino and Southern Oscillation phenomena. This project is a good example of interdisciplinary work with university and

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government scientists working together. The research was coordinated by an external advisory panel, and in addition to NOAA support, NSF, the National Aeronautics and Space Administration (NASA), and ONR supported components of the work.

The National Oceanographic and Atmospheric Administration's Coastal Ocean Program is supporting a series of focused, ecologically-based regional studies to improve predictive ability for fisheries management. The same Program supports the U.S. GLOBEC program, in consort with NSF. Initiated in the Georges Bank area, the work has moved into the Antarctic regions and now GLOBEC is planning a Pacific Ocean program. GLOBEC involves a national steering committee. These programs also involve scientists from several sectors and disciplines, and funding is based on competitive proposals and peer review. Such cooperative efforts among agencies are likely to be the mechanism for U.S. participation

in much of the international research evolving from the PICES planning project.

Other Agencies

The Department of Energy has a small marine research program primarily dealing with shelf-basin interactions and with carbon dioxide. The Environmental Protection Agency likewise has a small, but decreasing marine effort, and the Department of State has, at times, had funds to support specific areas of research. However, in developing PICES research programs, it is likely that the three major agencies, NSF, NOAA and ONR, will be the primary funding sources for any United States component. Given the process involved in developing programs, it is important to initiate planning well in advance so that either a national steering committee can be established through the appropriate channels, or the program can be attached to an existing initiative which has a steering mechanism in place.

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