Testimony
by
Otis B. Brown, Dean
Rosenstiel School of Marine and Atmospheric Science
University of Miami
to
U.S. Commission on Ocean Policy
St. Petersburg, FL
February 22, 2002

Mr. Chairman, I thank you and the Members of the Commission for this opportunity to present testimony today on behalf of my colleagues at the University of Miami and its Rosenstiel School of Marine and Atmospheric Science. Also I wish to thank the University of South Florida's new College of Marine Science and the Florida Marine Research Institute for providing this excellent venue for today's meeting.

I have been asked to testify on "Funding and Prioritizing Ocean Science". This testimony could have been a general lament about decreasing grant and contract sizes, needs for facilities, and so on. We stand at a point in time where ocean R&D directed budgets are approximately what they were 30 years ago. ONR's 6.1 funding is under severe pressure with the result that a multi-decadal partnership with NSF is at risk, NASA is seeking partners to operate long-term ocean observing sensors, and NSF ocean science grants are fewer and smaller than needed. But enhanced support levels alone will not provide what is needed for ocean science, rather we must look at the underlying framework of policy that controls investment and coordination of marine research and development. Thus, I will discusses opportunities, analyze the current ocean sciences support environment, and makes recommendations for structural change.

Science, technology, and our understanding and ability to model ocean processes have progressed remarkably over the past 30 years. Information and computational technology have driven the advance of global numerical ocean models, now used routinely. The current and forecasted needs are for integrated land, ocean, atmosphere and cryosphere models at 1-20KM resolution on a time horizon of 5-10 years. The ability to sense ocean processes and variability from autonomous floats, satellite platforms in space, and low frequency acoustics is established and growing towards operational utility. The biological and nanoscale revolutions are providing innovative approaches to the measurement of biological and chemical parameters at time and space scales similar to more traditional physical parameters. National demographic trends suggest that more than 75% of the population will live within 100KM of the coast in the near future, with a concomitant increased use of coastal resources for commercial and recreational purposes, and, burgeoning needs for coastal zone observations, forecasting and management. We have a cornucopia of needs as well as unprecedented opportunity, but no clear strategy for investment or implementation. Why is this?

Historically ocean science has relied on federal, state and local governmental funding sources rather than the commercial marketplace, save for very targeted opportunities, *e.g.*, resource exploration and exploitation. Hence our science has become a remarkably "soft" science. ONR 6.1 investments in ocean science and technology are approximately double those of the Air Force or the Army research organizations in atmospheric and terrestrial research: this is thought to be a result of the lack of commercial interest and infrastructure in the marine environment. Similarly, NSF OCE has a much higher human support percentage than other parts of NSF relative to grant funding (2-3 summer months is the norm in many parts of the Foundation while the norm in OCE can be double this amount). So, the ratio of governmental R&D investment in ocean science to other sources is much higher than is found in land or atmospheric regimes. High costs for ocean science research, technology development and operations are driven by a difficult environment, a traditionally greater need for labor investment, and the price of dedicated platforms for access. Unfortunately, percentage-wise, federal investments in ocean science R&D are half of what they were 30 years ago.

From a high level, I would characterize the structural problems that have led to these problems as being in the following areas: end-to-end responsibility, agency-to-agency coordination, and programs at the agency and/or discipline interfaces, linking of research to applications to operations, and congressional review and oversight.

There are more than 10 agencies with significant interest in the ocean environment; ranging from research and development, to resource monitoring and management, to law enforcement. Authorization and funding for this multiplicity of agencies passes through more than 40 congressional committees, which again span a wide gamut of responsibilities. Mechanisms for interagency coordination have become driven more by agency and personal interests, rather than by national needs, significant investment or statutory mandates. While this diverse support framework provides a resilient funding matrix, it has made it very difficult to leverage multi- and inter-agency programs. There have been some notable successes, for example, the first several years of the Global Change Research Program, a presidential initiative under President George H. W. Bush. The Office of Management and Budget was able to focus agency specific funding allotments on inter-agency goals, but successes such as this have been rare. The programmatic norm is a strong agency led program with (sometimes) minor participation from other agencies. This model rewards the lead agency but can be a disincentive to their partners.

Plans were laid for the Global Change Research Program in the mid 80s. This program includes the Earth Science Enterprise (NASA), Global Geosciences (NSF), Global Programs (NOAA), Atmospheric Radiation Program (DOE), *etc.* It marked the beginning of increasing tensions between focused programs and 'core' support in NSF, intra- and extra-mural programs in NOAA and community-based versus center-based programs in NASA. The Program brought increased resources into academic ocean science and policy research, but was focused on research on the Earth system, not long-term infrastructure enhancement. As various aspects of the GCRP have wound down, ships have been laid

up, field-going research groups disbanded, facilities dissolved, systems that could have been moved into operational scenarios have languished, research at discipline boundaries and on interdisciplinary systems is more difficult, and so on. Conversely, much needed resources have been channeled into 'core' disciplinary research, new programs have been initiated and innovation has been supported.

More recently, with the passage of the National Ocean Partnership Act into law, there is a formal mechanism for inter-agency programs in the oceans. The National Ocean Partnership Program (NOPP) has injected new ideas and directions into ocean science research and education. However, it too is affected by the strong-agency lead tendency: note the many programs with specific ONR funding, or, in more recent years, NOAA support, but the very few with broad multi-agency support.

What should be done to improve the current situation?

Improved NOPP coordination: The current NOPP has greatly increased inter-agency interactions and is a good start towards improving coordination. The inter-agency partnership dimension should be enhanced – should OMB and/or OSTP become more visible? That is, maybe something along the original GCRP model might be considered. Should there be a specific budgetary dimension at the agency level for each NOPP agency participant?, *i.e.*, a price of admission to the club?

Linking of research and development to operations: The NPOESS Joint Program Office is an excellent example of a successful mechanism – it links NASA to NOAA to USAF programs for civil and DOD operational earth observing satellite systems. In general, however, there are no inter-agency mechanisms which link research earth observing satellite sensors and missions to operational systems, as there was between NASA and NOAA in the 80s. Similar challenges are apparent in ocean observing systems, but this area requires the specific inclusion of academic efforts and has a more diverse set of stakeholders. There is also a part of the research and development spectrum which needs "operational research" activities, *e.g.*, in coastal ocean observing systems, satellite data collection and processing, hydrographic surveys, *etc.*, where there is a lack of standard processes to "canonize" these efforts as critical national resources (and please note that this need spans agency boundaries).

Congressional review and oversight: The Ocean Caucus, NOPP and CORE are substantive changes in this area. More are needed. From several perspectives, while this is the most challenging area, provision of full-time staff for The Ocean Caucus would facilitate joint committee hearings and enhance the committee review and oversight process.