

Testimony of
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On behalf of the 103 member institutions of the Consortium for Ocean Leadership, I appreciate the opportunity to discuss the FY13 federal science budget for the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). Several recent tragedies including the Tohoku Tsunami, the BP Gulf oil spill and Hurricane Katrina have all come from the ocean and highlight the need for better technologies and research to observe, understand, predict and ultimately mitigate economic damage and human suffering. We respectfully request \$6.6 billion for the NSF Research and Related Accounts as authorized in the America's COMPETES Act; \$2 billion for Earth Sciences at NASA as authorized by the NASA Reauthorization Act of 2010; and FY2010 levels for extramural research and education programs at NOAA.

Our nation has led the world in research and technology since World War II, in part because our nation adopted an academic, university-based research enterprise partnering with the federal government as opposed to a European-style centralized system. A remarkably high return on investment for federally supported research is due to the fact that the best science and its application to the nation's problems rise to the top in our system, which continuously challenges the best minds through open competition and peer-review protocols. Furthermore, the political independence of academic researchers has also engendered trust from the public. For instance, during the *Deepwater Horizon* disaster, the public had far more belief in the estimates and projections from academic scientists than they did from either industry or federal agencies. Thanks to wise leadership of this committee providing strong bipartisan federal research investments, the academic community was prepared to answer the call through the NSF RAPID grants program.

While the ocean may seclude and separate nations, it also links us together. Nature ignores political boundaries as the ocean absorbs and transfers immense amounts of carbon, heat, food and water across the globe and it is the dominant pathway for global trade. The ocean offers unique opportunities to collaborate with the international science community to advance understanding of earth systems while strengthening diplomatic ties. NSF supports many such programs, as the ocean science community has bred a culture of international collaboration through joint expeditions, shared vessels and equipment that provide access to the sea.

However, better collaboration internationally as well as within the federal system is much needed in satellite design and procurement. Unfortunately, NOAA has struggled to manage the requirements, cost, schedule and performance of its earth observing satellites and the budget overruns have effectively been paid for by cuts to NOAA's extramural research and ocean and coastal programs. The present estimate is that JPSS will cost nearly \$13B to build, launch and operate through 2028. Even more disturbing is the fact that the NESDIS budget more than

double over the past five years (growing from \$950 million to above \$2 billion), the ocean sciences are expected to have significant remote sensing data gaps in essential areas, such as sea surface wind speed and direction (important for storm and hurricane forecasting) and ocean topography (ocean currents and sea-level rise). In addition, we continue to be concerned about the quality of ocean color data (a measure of productivity and an indicator of health and changes in the ocean). The current system is failing and we are losing critical information as well as support for science to utilize the data generated from space.

We desperately need a more robust federal system to define Earth observing requirements that take into account realistic budgets for design and construction as well as a commitment to operate and maintain these observations into the future. We should not be adding or subtracting sensors at the 11th hour due to budget considerations. We hope you can find a mechanism to require all of our earth observing agencies (NOAA, NASA, DOD, Interior) to better collaborate and develop a more transparent and accountable system to manage and maintain our Earth observing capabilities. Another option is to consolidate the budget, design, procurement and operation of these satellites within NASA, while the other mission agencies manage the data, although there would need to be robust processes to ensure that science-based satellite missions do not suffer at the expense of growing appetites for operational satellite missions. Moreover, NASA would need to be given the authority to manage the requirements within well-defined and achievable budget and schedule envelopes.

We also need research and development for the next generation of satellite constellations comprised of smaller, more focused platforms as the current delivery systems are too costly and thus, too risky. Moreover, we need to ensure that the nation has a reliable and cost-effective suite of launch vehicles that can accommodate a wide spectrum of satellite sizes. We also need to be developing and deploying the next generation of in situ ocean sensors so that we can be better prepared to respond to the next oil spill or better manage fisheries through acoustic or optical stock assessments, which will ultimately be less invasive and less expensive. We need to have eyes out there 24/7 to observe the changes that are occurring in our oceans and affecting our health, security and resources.

Despite the funding increases Congress has provided to NOAA to address its satellite program shortfalls, the agency's commitment to their personnel has resulted in consistent cuts to academic extramural programs over the past several years. This is eroding not only stakeholder support for the agency, but also NOAA's access to the best minds in the nation. For an entity that considers itself a science agency, NOAA research relies too heavily on intramural programs and thus does not take advantage of the flexibility and cost effective opportunities to leverage the academic research community. If NOAA is to be a truly effective science agency, it needs to address its redundant and underproductive facilities and programs and fundamentally rethink its relationship with the academic sector and reevaluate how it conducts and supports research. A more balanced approach will require the agency to pursue actions to reduce its personnel overhead via Reduction in Force (RIF), Voluntary Early Retirement Authority (VERA), and/or Voluntary Separation Incentive Payments (VSIP). This would help NOAA accomplish its science mission more efficiently and with high quality input while also achieving Congressional efforts to reduce the size of the federal government.

Not only is the climate changing rapidly, but the field of science is maturing and evolving rapidly as well. Thus, the skills, expertise and training required of today's workforce may be very different in the next few years. We strongly support education and training programs at NSF, NOAA and NASA. Oceanography is a great discipline to attract young people to the sciences, and given changing ocean temperatures, chemistry and sea-level, we need a more ocean and science literate workforce now. The type of science training sponsored by these mission agencies, which is highly research oriented, is not supported by the Department of Education and thus needs to remain and be a high priority within the agencies.

The world's economy is changing rapidly and we have new challenges and challengers from across the ocean. Nations such as India and China are making tremendous investments in science infrastructure and intellectual capital. Many of the best young minds in the world who have come to the United States to study and train in our universities are now being lured back to their home nations where they become our competitors in the world marketplace. These new challenges led to the bipartisan effort during the Bush Administration's second term to double the nation's investment in basic research over ten years. Unfortunately, our nation has fallen off that path. Meanwhile, our competitors are investing more and closing the innovation gap. While I understand and appreciate the economic crisis our nation is facing; I fear that the long-term consequences of abandoning the goals of the America COMPETES Act will far outweigh any short-term benefits in reducing the deficit through science savings. When one has to reduce health insurance because of cost, it is not wise to reduce the cardiac part of the program.

Let me close by thanking the Subcommittee for its continued support for the National Science Foundation in this difficult budget environment. Yet, despite this support, the Foundation's new cross-directorate initiatives and change in policy for funding operations and maintenance of facilities means that there will be less core ocean science and infrastructure funded in the next few years. We hope that the Subcommittee will support the highest budget possible for NSF to ensure that our nation continues to attract, support and retain the best minds in the world.

Mr. Chairman, I hope that you will continue this Subcommittee's long-standing bi-partisan support for science funding in the FY13 budget and into the future. Below is a list of the ocean science community's program priorities and recommended funding levels for your consideration.

Recommended Funding Levels:

- National Science Foundation - \$6.6 billion for Research and Related Activities as authorized by the America COMPETES Reauthorization Act of 2010 (PL 111-358)
- National Aeronautics and Space Administration - \$2 billion for Earth Sciences as authorized by the NASA Reauthorization Act of 2010 (PL 111-267)
- NOAA Extramural Research:
 - Competitive Climate Change Research - \$150 million
 - Integrated Ocean Observing System grants and sensors - \$30 million
 - Ocean Exploration and the National Undersea Research Program- \$30 million
 - Sea Grant College Program - \$63 million
 - National Centers for Coastal and Ocean Sciences Extramural Research - \$16 million
- NOAA Education programs - \$40 million