

**Testimony of Robert B. Gagosian**  
**President and CEO of the Consortium for Ocean Leadership**  
**Before the U.S. Senate Committee on Appropriations**  
**April 24, 2014**

On behalf of the Consortium for Ocean Leadership, I appreciate the opportunity to discuss the important role that federal research has played in American innovation, prosperity and competitiveness.

The world does indeed appear to be getting smaller. Thanks to the internet and satellite communications, the farthest reaches of the planet are just a click away. Almost a decade ago, Thomas Freidman dexterously placed the word “competitiveness” on the tip of the tongues of almost everyone inside the Capital Beltway. Subsequently, overseas engineers and cyber experts replaced foreign troops as the greatest threat to America. When Congress set aside partisanship to support the America COMPETES Act, our nation embarked on an effort to double federal investment in basic research. Unfortunately, that goal was abandoned with the recession, and we now find ourselves in a world where science is needed more than ever, yet political wrangling has threatened the public’s trust in science. While our research budgets languish, our international competitors are moving full speed ahead in building science infrastructure and human capital. Despite these challenges, the ocean research community remains committed to helping maintain America’s position as the world’s technology leader and poised to address the economic, social and national security threats in a rapidly changing world.

Our seas were once great obstacles, yet modern humans can now easily traverse, trade, and communicate across them. While the impact of the ocean on our lives is great, our knowledge of the sea is still relatively minimal. The most tragic examples of the impact the ocean can have on society are the 283,000 people who lost their lives to the Indian Ocean tsunami; the 18,000 who perished in Japan after the Tohoku tsunami; the 2,000 people who died from Hurricane Katrina; the \$50 billion in damages from Superstorm Sandy; and the 4.9 million barrels of oil spilled into the Gulf of Mexico during the *Deepwater Horizon* disaster. Each of these catastrophes originated at sea and with greater scientific understanding of our ocean the devastation of each could have been mitigated significantly.

While we know a great deal about our ocean and the marine life that resides in it, there is far more that we don’t yet understand. In the 1990’s the federal government invested heavily (\$3.8 billion) in the Human Genome Project, which successfully published the human genetic code. Knowing the sequence of the human genome revolutionized biomedical research, leading to a more comprehensive understanding of human biology. The federal government invested an additional \$7 billion in follow-on spending, which has led to approximately \$800 billion in economic impact and created over 300,000 jobs. Most importantly, now in the public domain, this knowledge has effectively paved the way for research into disease prevention and cures.

Much in the same way that lack of understanding the human genetic code impeded biomedical research, the bottleneck in marine research is the lack of real-time data about the physical, chemical and biological properties of our ocean. A coordinated and comprehensive Earth and ocean observing system would fundamentally change the manner in which marine science is

conducted and ultimately enhance weather and natural disaster predictions, increase homeland security, protect coastal marine ecosystems, discover new life and potential medicines, and facilitate the management of sustainable fisheries. New hypotheses suggest that recent extreme weather events may be attributed to a persistent shift in the jet stream due to a rapidly melting polar region and a warmer North Pacific Ocean. Unfortunately, as the demand for more and better data and information to understand oceanic and atmospheric trends increases, we are losing our capabilities to collect data at sea and from space. For instance, the Pacific Tropical Atmosphere Ocean (TAO) Array is operating at only 40% capacity, which greatly reduces our ability to accurately forecast El Niño and La Niña strengths, thus risking proper timely preparation to deal with episodes of droughts and flooding. Our nation has similar problems in space as impending gaps in our polar orbiting satellite data will impact our ability to make long-term (7-10 day) weather forecasts. If we cannot maintain observational assets at sea and space, then we will not lead the world in weather and climate predictions. And, the negative economic impacts of not being able to predict accurately will be great.

Of course, the ocean also impacts life beyond weather, climate and extreme events. The *Deepwater Horizon* oil spill was a tragedy with loss of life, economic impacts and long-term ecological implications for the Gulf region. The fact that it took so long to identify and track the location of the massive subsurface oil plume or forecast its trajectory in the water column highlights the significant shortcomings of the existing ocean and coastal observing systems. Consequently, we need to ensure that we are better prepared for the next spill, especially given the potential for offshore oil exploration in the Arctic and the Atlantic.

It should not be forgotten that a great deal of the field of oceanography evolved and matured through the anti-submarine warfare effort that helped end the Cold War. Support from the Office of Naval Research (ONR) was essential for developing the experts and technologies necessary to give the United States a vital competitive advantage at sea through a superior understanding of what was occurring above, below, and on the surface of the ocean. ONR has supported more than fifty Nobel laureates, as well as breakthrough discoveries in areas such as lasers, precision timekeeping, and molecular biology not only ensuring our military supremacy at sea, but also advancing our nation's innovation economy. This successful relationship between ONR and the academic research community must be nurtured if our nation is to successfully address the emerging threats in a rapidly changing planet. These threats have enormous geopolitical consequences across the globe including the potential for conflict over resources in the Arctic, food and fresh water in developing nations, and habitable land due to sea-level rise.

As Congress prioritizes federal investments in the face of constrained budgets, it is important to recognize and maintain support for basic research as a core federal responsibility. Increasing this investment should be a priority given the shift to a science and technology based economy whose foundation is built on scientific advances, both within specific disciplines as well as across disciplines. We encourage you to support growth for our science agencies at rates of 5-7% so that NSF will have the resources necessary to fund the best minds in the nation through competitive research grants, while mission agencies such as NOAA, NASA and the Navy can support applied research and observational requirements to ensure our nation has the intellectual capacity to develop and deal with the next generation of challenges.

So as the debate begins as to how we can maintain our nation's preeminence in innovation through scientific research, I encourage you to not only look to the sky and the stars for answers but also look to the ocean that surround us all and makes life on the planet possible.

Below is a list of the institutions that are represented by the Consortium for Ocean Leadership.

### **Alabama**

- Dauphin Island Sea Lab

### **Alaska**

- University of Alaska Fairbanks
- Alaska Ocean Observing System
- North Pacific Research Board

### **California**

- Bodega Marine Lab
- Monterey Bay Aquarium Research Institute
- Moss Landing Marine Laboratory
- Naval Postgraduate School
- Stanford University
- University of California, Santa Barbara
- University of California, Santa Cruz
- University of California, San Diego (Scripps Institution of Oceanography)
- University of Southern California
- Aquarium of the Pacific
- Hubbs-SeaWorld Research Institute
- Romberg Tiburon Center for Environmental Studies
- Esri
- L-3 MariPro, Inc.
- Liquid Robotics, Inc.
- Teledyne RD Instruments

### **Colorado**

- Cooperative Institute for Research in Environmental Sciences

### **Connecticut**

- University of Connecticut
- Mystic Aquarium & Institute for Exploration

### **Delaware**

- University of Delaware
- Mid-Atlantic Regional Association Coastal Ocean Observing System

### **Florida**

- Florida State University
- Harbor Branch Oceanographic Institute at FAU
- University of Florida
- University of Miami
- University of South Florida
- Earth2Ocean, Inc.
- Florida Institute of Oceanography
- Nova Southeastern University

### **Georgia**

- Skidaway Institute of Oceanography of the University of Georgia
- Savannah State University

### **Hawaii**

- University of Hawaii

### **Illinois**

- John G. Shedd Aquarium

### **Louisiana**

- Louisiana Universities Marine Consortium
- Louisiana State University

### **Maine**

- Bigelow Laboratory for Ocean Sciences
- University of Maine
- The IOOS Association

**Maryland**

- University of Maryland Center for Environmental Science
- Johns Hopkins University
- Marine Technology Society
- National Aquarium

**Massachusetts**

- Massachusetts Institute of Technology
- University of Massachusetts, Dartmouth
- University of Massachusetts, Lowell
- Woods Hole Oceanographic Institution
- Battelle

**Michigan**

- University of Michigan

**Mississippi**

- Mississippi State University
- University of Mississippi
- University of Southern Mississippi

**Nebraska**

- University of Nebraska, Lincoln

**New Hampshire**

- University of New Hampshire

**New Jersey**

- Rutgers University

**New York**

- Columbia University (LDEO)
- Stony Brook University

**North Carolina**

- Duke University Marine Laboratory
- East Carolina University
- University of North Carolina, Chapel Hill
- University of North Carolina, Wilmington
- North Carolina State University

**Oregon**

- Oregon State University

**Pennsylvania**

- Pennsylvania State University

**Rhode Island**

- University of Rhode Island

**South Carolina**

- Belle W. Baruch Institute for Marine and Coastal Sciences
- South Carolina Sea Grant Consortium

**Texas**

- Harte Research Institute
- Texas A&M University
- University of Texas, Austin
- Fugro
- Sonardyne, Inc.

**Virginia**

- College of William and Mary (VIMS)
- Old Dominion University
- CNA
- Institute for Global Environmental Strategies
- U.S. Arctic Research Commission
- CARIS, USA
- SAIC

**Washington**

- University of Washington
- Sea-Bird Scientific

**Washington, DC**

- Southeastern Universities Research Association

**Wisconsin**

- University of Wisconsin-Milwaukee Great Lakes WATER Institute

**Australia**

- Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania

**Bermuda**

- Bermuda Institute of Ocean Sciences

**Canada**

- Dalhousie University
- University of Victoria