Summary

NOAA's Office of Oceanic and Atmospheric Research
Advanced Undersea Technology Roundtable

On Tuesday, March 13, 2007, Dr. Richard W. Spinrad, Assistant Administrator for Oceanic and Atmospheric Research (OAR), hosted an OAR Constituent Roundtable on Advanced Undersea Technologies at NOAA's Pacific Marine Environmental Laboratory in Seattle, WA. Constituents representing academia, state government, and private industry joined Dr. Spinrad. Following is a summary of the major points discussed at the roundtable.

Opening Remarks

In his opening remarks, Dr. Spinrad welcomed the group and underscored the important role NOAA Research plays in NOAA achieving its mission and goals. He stressed three messages – OAR supports preeminent research at all levels of the organization; OAR research provides value to society; and OAR operates in a culture of transparency, reaching out to constituents for input on research priorities and planning.

Before turning the floor over to the constituents, Dr. Spinrad discussed some key topics for OAR including the budget; demonstrating the need for advanced technology; the need for scientific openness, and the ability to support high-risk/high-payoff transformational research; to attract and sustain a preeminent scientific workforce; and to strengthen the public-private partnership.

Constituent Observations

Participants addressed how OAR can best serve the current and future advanced undersea technology needs of its partners and customers. Balance was the overarching theme of participants' remarks. In addition to identifying needed advanced ocean observing technologies, participants encouraged NOAA and the federal government to focus on sustaining capabilities by balancing (1) funding for new research with infrastructure costs; (2) partnerships and investment; (3) benefit-driven research and transformational research; and (4) human resources.

Observation Technologies

Participants welcomed increased investment in new observational systems, and readily identified areas where expansion and improvement of ocean and coastal observing systems would enhance their ability to conduct preeminent research and inform policy decisions. Understanding the impacts of global climate change on our oceans and ecosystems was repeatedly raised as an important research area in need of improved observation technologies. One participant noted that if we are going to transform our understanding of these issues, we need to transform our ability to collect the necessary data sets. We need to move beyond fixed observatories to develop fast, efficient mobile platforms to build the data sets.

Participants stressed the importance of more real-time data collection, improved quality assurance/quality control, real-time data assimilation, and increased accessibility of data - perhaps through a nationwide database. They also recognized the need for both wired and RF/cellular technologies.

The cost of getting science to sea is increasing faster than the discretionary budget for research, and participants expressed concerned about the impact this will have on the balance of research. Participants suggested improving the robustness of systems – lower power, higher bandwidth, reduced service requirements and improved moorings – may help address this concern. Participants discussed the need to look for greater energy efficiency in platforms and sensors and were excited by discussions of biofuel development.

Participants noted the need for more near-shore observations, particularly in estuaries, to assist coastal managers and educators. Undersea video was identified as a possible tool for improving our understanding of ecosystems and habitat. Participants also recognized the continued need for vertical profiling, which is in danger of losing funding in a couple of years.

Improved sea ice observations were identified as important to understanding climate change. Participants recommended improving observations both from above and below using lidar profilers, and autonomous underwater vehicles (AUV) with upward looking sonar. The challenge of deploying AUV and Unmanned Aerial Systems (UAS) in concert so they inform each other was also discussed. Another challenge identified was the development of sensors for varying conditions such as large sediment loads, pH, and noise.

Participants highlighted an increase in interdisciplinary science as a byproduct of new and innovative technologies. For example, remotely operated vehicles (ROVs) facilitate an integrated approach to science by increasing the number and types of scientists viewing the same data simultaneously – allowing for new and exciting conversations and discoveries.

Participants acknowledged that deploying new and innovative systems in a cost-effective manner that facilitates scientific discovery is a daunting task. They stressed the need for partnerships to integrate the work and resources of state and federal agencies, academia, the private sector, and the international community.

Sustaining Capabilities

Balancing Research Funding with Infrastructure Costs

While participants welcomed increased investment in new observational systems, they expressed concern about the government's ability to sustain basic research in the face of increasing operation and maintenance costs of new systems. In addition, they recognized the challenges federal agencies face in planning long-term technology development projects because of the limitations of the federal budgeting process.

Recognizing the Ocean Research Priorities Plan's (ORPP) definition of infrastructure encompasses "bricks and mortar," technology, and operations and maintenance, one participant noted this construct is breathtaking in its requirements and that it may be difficult to manage the budgeting and expenditure process across federal agencies while still keeping the systems available.

For example, participants pointed out that the federal government's largest investment in ocean research is through satellites. Just when oceanographers are able to access satellite winds globally along with ocean color and altimetry, these capabilities are threatened because there is no clear mechanism or funding for transitioning these capabilities from NASA to NOAA.

Balancing Partnerships and Investment

Participants stressed that the success of ocean and coastal research and the development of advanced ocean and undersea technologies depends on partnerships across government, academia, and industry. They suggested focusing scarce public dollars on high-risk technologies that require boldness in research and development.

Participants recommended that those who fund and perform ocean and undersea science research resist designing and building in-house technologies when current state-of-the-art technologies are available commercially. Representatives of commercial technology providers indicated that they are able to provide a variety of platforms (ROVs, AUVs, submersibles) to the scientific community with almost any sensor.

The private sector posed broad questions to the researchers including, "Is industry developing the right technologies for the research needs of the scientific community?" And, "What are your problems and what do you believe AUVs or ROVs can do for you?" Private sector representatives stressed their need to understand researchers' specific requirements to direct their commercial research and development activities.

They also believe many researchers are not aware of what AUVs can do and what financial resources are required to purchase and maintain them. Educating the research community on existing commercial capabilities was identified as a positive step the private sector could undertake.

Participants also acknowledged some existing technologies seem to have been forgotten as evidenced by Small Business Innovation Research Program grants requesting technologies developed a decade ago. Participants suggested that there may be a role for the Department of Commerce in identifying and cataloging existing technologies.

Participants stressed the importance of partnerships, particularly when separate missions may have similar technology requirements. For example, much of the technology developed by the private sector for the Navy is applicable to NOAA's needs and challenges. The key is to leverage this existing technology and transition it so that NOAA does not have to recreate existing technologies. Participants suggested developing and strengthening partnerships between NOAA and the Office of Naval Research.

Multiple partnerships were suggested, noting that no one partnership arrangement can cover all of NOAA's challenges. For example, partnerships between NOAA, academia and the private sector – utilizing NOAA's regional expertise – were discussed. Participants noted that regionalization creates a

unique dynamic. When there is no money at stake, everyone works together; however, when resources are at stake, competition begins.

Washington Sea Grant noted that regional partnerships can help solve regional problems, citing the example of a three-state ocean health initiative developed by Sea Grant and adopted by the states. The states will continue to look to NOAA and Sea Grant for the research, creating transition challenges for the Sea Grant Program.

Balancing Benefit-driven Research & Transformation Research

One participant summed up the challenge of balancing benefit-driven research and transformative research this way, "It used to be a photo of a new organism got you a cover photo for *Nature* or *Science;* now the peer reviewers and program managers are looking for you to solve problems."

The heavy focus in the increasingly competitive fight for research dollars on benefit-driven research concerned participants. Participants noted there is value in the Ocean Research Priorities Plan's tying research needs to societal value; however they also believe such ties can be a constraint. They also noted the ORPP's heavy emphasis on observational science over exploration science.

Researchers are now under pressure to show immediate return on investment – to translate observations into services society can use. While participants recognized the importance of solution-focused research, they encouraged NOAA to find a balance that also promotes high-risk, high-payoff research.

Human Resources

Dr. Spinrad challenged participants to think about succession planning and the balance of human resources. Using spread spectrum as an example – noting scientists ability to adapt the technology for underwater applications - he challenged participant to examine if NOAA and the ocean research community have the right people/structure to recognize these developments on an institutional basis?

Participants expressed concern that the cadre of bright young scientists entering the field was diminishing. They acknowledged the graying of the industry – with an average age of 50-54 – and a growing generation gap. They noted that this was another area where the focus on benefits-driven research could adversely impact recruitment, recognizing that undersea technology and ocean exploration are what get K-12 students excited about learning math and science.

Some industry representatives expressed concern about the impression that jobs in the ocean community are undesirable because of the low turnover, impacting promotion potential, and low pay. However, other industry representatives were quick to note that while young Americans are going to the sexy techs like robotics, they receive resumes daily from other countries.

On the federal side, Dr. Spinrad noted that while OAR has available FTEs, the resources to fill those positions are not currently available. Dr. Spinrad noted that he would like to have the resources to be able to challenge scientists to look

outside their disciplines – to attend meetings of professional societies they have not previously attended and subscribe to new journals. Dr. Eddie Bernard, the Director of OAR's Pacific Marine Environmental Laboratory, noted that the lab uses their joint institute as a training ground to fill in behind retirees, funding 90 positions at Joint Institute for the Study of Atmosphere and Ocean (JISAO).

Participants stressed the importance of succession planning for the federal government; the importance of capturing students' attention while they are young; and the need to minimize stove piping of the scientific disciplines.

Closing Remarks

Dr. Spinrad thanked the participants for their insights. He also stressed the importance of communicating the preeminence and value of ocean research and advanced undersea technologies. He noted that while the ocean community strives to convince the government to maintain ocean observing systems, no one questions whether the government will maintain meteorological observations into the future – rather the question for the meteorological community is what observational technologies come next.