

*NOAA Science Advisory Board December 2006 Meeting FINAL*  
**NOAA Science Advisory Board**  
**27<sup>th</sup> Meeting**  
**5-6 December, 2006, Silver Spring, Maryland**

Presentations for this meeting will be posted on the SAB website at  
<http://www.sab.noaa.gov/Meetings/meetings.html>

Meeting Attendees

SAB members in attendance: Dr. David Fluharty, Chair, and Wakefield Professor of Ocean and Fishery Sciences, School of Marine Affairs, University of Washington; Dr. Robert Ballard, President, Institute for Exploration at Mystic Aquarium; Mr. David Blaskovich, Program Director, Deep Computing, WW Government/Research Segment, IBM Corporation; Mr. Michael Keebaugh, Vice President, Raytheon Company; Dr. James Mahoney, Environmental Consultant; Dr. John Snow, Dean, College of Atmospheric and Geographic Sciences, University of Oklahoma; Dr. Carolyn Thoroughgood, Vice Provost for Research, University of Delaware

NOAA senior management and line office representatives in attendance: Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.), Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator; Brigadier General John (Jack) J. Kelly, Jr., USAF (ret.), Deputy Undersecretary for Oceans and Atmosphere; Dr. Richard Spinrad, Assistant Administrator, Office of Oceanic and Atmospheric Research; Mr. Craig McLean, Deputy Assistant Administrator for Programs and Administration, Office of Oceanic and Atmospheric Research; Dr. Alexander MacDonald, Deputy Assistant Administrator for Laboratories and Cooperative Institutes and Director, Earth System Research Laboratory, Office of Oceanic and Atmospheric Research; Ms. Mary Kicza, Assistant Administrator, National Environmental Satellite, Data and Information Service; Dr. William Hogarth, Assistant Administrator, National Marine Fisheries Service; Mr. John Oliver, Deputy Assistant Administrator for Operations, National Marine Fisheries Service; Dr. Steven Murawski, Director of Scientific Programs and Chief Science Advisor, National Marine Fisheries Service; Brigadier General David L. (DL) Johnson, USAF (Ret.), Assistant Administrator for Weather Services and Director, National Weather Service; Mr. John Jones, Deputy Assistant Administrator, National Weather Service; Ms. Mary M. Glackin, Assistant Administrator, Office of Program Planning and Integration; Dr. Paul Doremus, Deputy Assistant Administrator, Office of Program Planning and Integration; Mr. John H. Dunnigan, Assistant Administrator, National Ocean Service; Dr. William Corso, Deputy Assistant Administrator, National Ocean Service; Rear Admiral Samuel P. DeBow, Jr., Director, Office of Marine and Aviation Operations; Geoffrey Fuller, Deputy Director, Office of Marine and Aviation Operations.

Staff for the Science Advisory Board in attendance: Dr. Cynthia J. Decker, Executive Director; Kristen Laursen; Laura Letson; Susan Pultz.

*NOAA Science Advisory Board December 2006 Meeting FINAL*  
**Tuesday, 5 December 2006**

Official Call to Order and Welcome

Dr. David Fluharty, Chair of the NOAA Science Advisory Board (SAB), called the meeting to order. The members of the SAB introduced themselves, and Dr. James Mahoney was welcomed as the newest member of the SAB.

Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.), Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator welcomed the NOAA Science Advisory Board members and meeting attendees. He discussed changes to NOAA leadership and noted that the budget continues to be on an upward trend. However that when converted to constant dollars NOAA's purchasing power has remained roughly constant over the past few years.

Current events in NOAA were addressed, including progress in the Group on Earth Observations (GEO) and steps towards implementing GEONetCast, which will allow open exchange of earth observing data and information worldwide. He noted the shift from regional coordination to regional collaboration as the full suite of NOAA activities and information becomes focused in the regions rather than in the separate Line Offices. This will help all of NOAA to work in an integrated manner to solve issues.

Hurricane activity during the 2006 season was lower than expected due to rapid development of the El Niño-Southern Oscillation and other factors. The combined factors affecting the season highlights NOAA's need to continue improvements in hurricane track and intensity forecasts and models, as noted in the reports from the SAB Hurricane Intensity Research Working Group (HIRWG) and the National Science Board. Hurricanes also point to the need for whole-Earth observations and predictions because they can have significant impact on infrastructure and communities in many countries.

VADM Lautenbacher reaffirmed NOAA's commitment to the open communication of science. The agency is dedicated to open, peer-reviewed publication and to respecting and seeking to understand each other's work. The agency's media standards reflect this open policy.

Discussion:

A member asked whether NOAA received many media questions about the low number of hurricanes. VADM Lautenbacher replied that there were many questions; a couple of people were answering them full-time for a while. It was also noted that focusing on a decadal pattern could account for year-to-year variation, and a SAB member mentioned that in a relative sense it could be argued that it was an active year because prior El Niño years were less stormy than 2006.

**Revision of NOAA Information Quality Guidelines to Conform with OMB Peer Review Bulletin** - *Carla Steinborn - Office of the Chief Information Officer*

The purpose of the briefing was to provide the SAB information on revision of the NOAA Information Quality (IQ) Guidelines to incorporate the new Conflict of Interest (COI) Policy adopted in conformance with the Office of Management and Budget's (OMB) Peer Review Bulletin. The Peer Review Bulletin requires federal agencies to adopt or adapt the National Academy of Sciences (NAS) conflict of interest policy for non-governmental peer reviewers. It includes key definitions that are incorporated into the revision of NOAA's IQ Guidelines in order to maintain consistency across all NOAA information types. The NOAA COI Policy is similar to that for the NAS in that the same conflicts are disallowed but the disclosure burden is reduced. There are two disclosure forms: one is for general science and another is for work that relates to government regulation. It was noted that, in general, agency employees cannot be peer reviewers of "highly influential scientific assessments" disseminated by their agency; this may occur only in extremely unusual circumstances. The specific changes to the NOAA IQ Guidelines were discussed, as were how the effort was coordinated across NOAA. The revisions were approved on November 6, 2006.

Discussion:

A member noted that he was working for NOAA when most of the revisions to the IQ Guidelines were being addressed and that a large amount of effort was dedicated to the revision. A key tenet of the revision, in particular with regard to climate science, was transparency of reviews and conduct of good science. The process could lead to interesting challenges in cases where scientific information is merged with a policy viewpoint, in which case it is important in a litigious society to distinguish between scientific and policy components on the basis of the information. It was emphasized that all but a very few reports will pass through the process without a challenge. Going forward, NOAA's scientific enterprise is likely to face more scrutiny. Though it is important to anticipate problems in the process, it also important to ensure that it remains transparent and does not unduly increase the demands on NOAA's scientists or hamper scientific work.

It was further noted that there is a need to ensure a reasonable standard for the adequacy of peer review. For example, in the climate area there are 21 reports being drafted and judged to be highly significant. The intent is to make review of these a transparent process, though this may be slowed down by the process to establish and define what is and who does the peer review. There can also be delays in the review system due to the need to address large numbers of external public comments before publication. The Information Quality Act gives more visibility to demands and constraints, though it is possible to lose productivity in the clearance process. The SAB was encouraged to continue to monitor developments in this area.

Carla Steinborn agreed with the comments and in particular noted that science should not be mired in process other than the scientific process itself. The peer review reports are available online through the information quality link on the DOC site. This information is now also available from the NOAA CIO website (<http://www.cio.noaa.gov>) via the "Information Quality"

link. It was noted that although peer review plans and IQ guidelines are not judicially reviewable, peer review reports do become part of the government administrative record.

As documents are not admissible unless they are in the public record a member asked if this changes things to allow retroactive accountability. A member also asked what was defined as “influential” in reference to a scientific report and if the term had a dollar threshold. The response to the first question noted that the Peer Review Bulletin applies to subsequent (new) dissemination of scientific information, regardless of when it was originally created, but that that should not be interpreted to bar use of the best available science, even where it predates the Bulletin. There is no grandfather provision, per se, in the Bulletin. For the latter question, “influential scientific information” is defined as scientific information the agency reasonably can determine will have or does have a clear and substantial impact on important public policies or private sector decisions. This definition is rather broad in itself, but the category of “highly influential scientific assessments” also includes items that are novel, precedent-setting, interagency, or controversial, as well as other OMB-determined items. Although a dollar threshold (\$500M in any year) does also exist for this category, it has not proved determinative in any case, as the subjective tests are always reached first. Essentially, scientists are asked to follow applicable guidelines if they feel that their work will cause significant interest and scrutiny. A member noted that a large number of activities in fisheries management and climate sciences may be impacted by these IQ guidelines.

It was noted by a NOAA representative that the adequacy of peer review is an open question, even with respect to influential journals. For example, there were more than 700 articles published in response to a *Science* article by Worm et al. stating that global fisheries will collapse by 2048. In this and similar cases, the use of peer review by these journals is open to question; there were many technical flaws in the fish abundance article. *Science* will publish the critique of the flaws as well as a NMFS rejoinder to the article. A National Research Council study noted that peer review is especially significant when it comes to high profile journals such as *Science*. A member wondered if there was a way to better entrain the authors of such articles in this discussion. Many such scientists receive funding from both NOAA and NSF, which could also be good sources of information on peer review.

Action:

- NOAA will send the SAB members the NOAA rejoinder to the *Science* magazine article by Worm et al. about loss of world marine fish populations by 2048.

### **Miscellaneous topics**

*David Fluharty – Chair of the NOAA SAB and Wakefield Professor of Ocean and Fishery Sciences, School of Marine Affairs, University of Washington*

Next SAB Meeting:

*NOAA Science Advisory Board December 2006 Meeting FINAL*

Dr. Robert Ballard, noting that the NOAA ocean exploration ship *OKEANOS EXPLORER* is due for completion by summer 2007 before sea trials, stated that his institute was preparing for telepresence capabilities linked to the ship. This will allow land-side research direction, greater interface opportunities with the broader scientific community, and remote mission command centers. Dr. Ballard will direct a test of this system on a Byzantine ship excavation from the command center in Mystic, CT during the week of August 20<sup>th</sup>, 2007. He offered to host the next SAB meeting in order to take advantage of this opportunity. VADM Lautenbacher noted that telepresence capabilities allow an extraordinary and compelling learning opportunity, especially when multiple locations are connected at once.

Action:

The SAB office will poll the SAB members regarding their availability and interest in holding the Summer 2007 meeting in Mystic, CT during the week of 20 August.

NOAA SAB and NOAA Research Council Interactions:

Dr. Fluharty discussed a meeting with Dr. Richard Spinrad, who chairs the NOAA Research Council, on how the SAB and Research Council could better interact. The SAB office can build a linkage to provide the SAB with updates on essential activities in the Research Council as well as information on progress in parallel efforts, such as in the social sciences. He proposed holding a one to two hour joint meeting of the two groups to allow a more free-flowing discussion of common issues.

Dr. Fluharty also noted that it might be beneficial for the SAB to interact more with the other NOAA Federal Advisory Committees to improve integration of work in the various groups. He emphasized that this was not to create an overarching layer of interactions, but rather to allow the groups to better know the activities and areas of concern in the different groups. He will continue to consider ideas on how to best accomplish this interaction.

Actions:

- SAB will reserve time on the March 2007 agenda for a discussion between the Board and the NOAA Research Council of potential interactions.
- The SAB will explore connections between the Board and other NOAA federal advisory committees

SAB Updates:

Dr. Fluharty acknowledged that much occurs at NOAA between SAB meetings and that more regular updates may help the SAB to keep apprised of activities in the agency. He proposed that such news be collected and distributed periodically to the SAB through email or an internet site. This would help the SAB members to consider topics relevant for discussion at coming meetings as well as help them to ask the right questions and guide their own activities. In addition, Dr. Fluharty proposed developing schedules and agendas for meetings three sessions out, placing long-term items in the agenda and maintaining space for more immediate discussion topics.

**Wildland Fire Research to Improve Operational Fire Management: NOAA's Role -**

*Elliott Jacks – Chief, Fire and Public Services Branch, NOAA NWS*

*Al Riebau – Program Leader, Atmospheric Sciences Research, USDA Forest Service*

The purpose of the presentation was to inform the SAB of NOAA's role and activities in fire weather-related research as well as to request the SAB's advice on the coordination of such activities and how NOAA's fire weather research priorities could better complement those of its interagency partners. Such advice would be timely given the increased number, severity, and impact of wildland fires in recent years due to improved suppression efforts and increased building in areas where the wildland forecast meets planned communities (called the Wildland-Urban Interface – WUI).

NOAA is the primary source of operational weather information for land management agencies that respond to fires and as such, conducts internal and collaborative research to improve products and services. NOAA partners with many groups in this effort, including but not limited to members of the National Interagency Fire Center (NIFC), universities, the private sector, and several wildland fire research groups.

Research in several critical areas is needed to support operational improvement. These areas include:

- Improved smoke dispersion and air quality forecasting.
- Advanced modeling and prediction efforts to improve short- and long- range forecasts as well as probabilistic and ensemble forecasts.
- Accelerated coupled modeling for Wildland-Urban Interface.
- Improved “Dry Lightning” guidance.
- Enhanced focus and coordination on local research efforts.
- Full utilization of high-resolution, Unmanned Aerial System (UAS)-obtained data.

Considering the increasing importance, breadth, and scope of fire weather research, external guidance is needed to ensure NOAA's corporate research priorities in this area match those of its land management partners. The SAB was requested to charter a fire weather research working group that will provide advice on options to attain the Western Governors' Association (WGA) observation that “an integrated fire weather and fire environment research program is critical for the effective management and health of U.S. forests and rangelands.”

Discussion:

A SAB member asked whether NOAA's fire weather program is working on dispersion modeling with Homeland Security. Another member emphasized the need to work with all homeland security issues and recognize all efforts in place related to this, including the IMETs. Mr. Jacks responded that NOAA's Incident Meteorologists (IMETs) have increasingly been called upon to respond to non-fire hazards and that this need is expected to increase in the post 9/11 world.

A member asked whether there was any current cross-cutting effort in NOAA or cross-talk with other agencies, and if so would an SAB working group be redundant. Mr. Jacks responded that there are many agencies involved with fire, and the SAB could leverage its work with others. Mr. Riebau added that the Joint Fire Science Program funds fire research activities but is geared to the Department of the Interior. The SAB piece would provide the NOAA aspect and can be complementary of other efforts. If the SAB sponsors a working group, it must rationalize where other parts of NOAA fit with this effort in order to best use experience and capabilities that are already developed.

NOAA is participating (or has the potential to participate) in a number of efforts with other federal agencies. For example, the National Institute of Standards and Technology (NIST) develops combustion models which examine burn speed and how long combustion takes in the build environment (although it does not necessarily support research on combustion in wild lands). NOAA has worked with USGS at the site of last year's "Day Fire" in southern California to assess debris flow potential as a result of burn scarring. NOAA is also working with EPA to develop Air Quality and Smoke forecast guidance which can be of use to fire managers. Finally, NOAA Research has the potential to work with the National Centers for Atmospheric Research and other university-based entities to explore improvements in fire weather modeling and scale to scale coupling, which is of critical importance to accurately specifying atmosphere/fire interactions.

NOAA does not have a significant investment in wildland fire weather and there are many agencies involved in this issue. As such, the request to the SAB requires further clarification. Mr. Jacks suggested that rather than recommending specific answers, the SAB could begin the dialogue between NOAA and land management and help to initiate further work in the area that combines physical and biological processes.

If a fire weather working group is formed under the SAB, it could be a way to bring other agencies into the discussion of NOAA's role in the area, including cross-cutting benefits among multiple agencies. A member asked whether the SAB is the proper convener of such a group or if it should be the fire weather people within NOAA, the National Interagency Fire Center (NIFC) or the Office of the Federal Coordinator for Meteorology (OFCM). OFCM is involved with applied research and so is not designed as a forum to coordinate an interagency basic research agenda. There is no good federal interagency venue for this. NOAA could play a part in this, but ownership must be spread across all involved agencies. The SAB would strive to ensure that NOAA's research priorities match those of its land management partners.

A concern was raised that taking on this responsibility would further stretch NOAA's budget. It is important to advertise such requirements so that they are funded, but NOAA needs to ensure efficiency in the broader realm of societal needs for its products. It would be a stretch to fully attain the vision of the Western Governors Association, which states "an integrated fire weather and fire environment research program is critical for the effective management and health of U.S. forests and rangelands." However, it is useful to examine how NOAA's fire weather work

*NOAA Science Advisory Board December 2006 Meeting FINAL*

is integrated as well as examine how other agencies work, and make suggestions on how NOAA can make improvements in this area.

An SAB working group on this topic would have much in common with the HIRWG. Though combustion modeling is separate from weather models, the question lies in how they interface. Many potential tools exist, including small UASs that can take measurements over the fire. The connections between fire weather and fire climate were mentioned and it was asked if the group should potentially consider that too. It would be useful to survey NOAA's activities, identify the potential benefits from these, and prioritize them in recognition of the needs of other partner agencies.

Action:

- The SAB will explore the possibility for establishing an ad hoc working group on fire weather. SAB members will work with NOAA staff to develop draft terms of reference for consideration by the full SAB before deciding whether to form a working group.

**Mitigating the Loss of Sensors on NPOESS and GOES-R** -*Mary Kicza, Assistant Administrator, NESDIS*

Ms. Kicza presented an informational briefing to provide the SAB members with current and accurate information about recent NOAA sensor decisions involving the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and the Geostationary Operational Environmental Satellite R Series (GOES-R). This presentation also included information on resulting data gaps and mitigation options.

Both systems have shown increased cost, technical complexity and technical risk, leading to the removal of sensors. NPOESS went through the Nunn-McCurdy oversight and restructuring process, and the resulting triagency (NOAA, Department of Defense, and NASA) priorities focus on operational weather capabilities rather than climate sensors. Six satellites and three orbits were originally planned; now four satellites and two orbits are certified in the restructured NPOESS Program. The third orbit will be served by the European MetOp system.

The cost estimates for GOES-R potential architectures exceed the budget limit. To align the scope and budget, the Hyperspectral Environmental Suite (HES), which provides advanced sounder and coastal waters imaging, is being removed. A complex mix of strategies has been put in place to make up for the loss of information that will occur as a result of the downsizing of both systems. It was noted that space will be maintained on the NPOESS satellite bus for the sensors removed; it may be possible to return them to the satellites if funding is provided. However, some decisions must be made relatively soon to remain on a feasible schedule.

The need to work closely with NASA on these issues was recognized, as was the transition from research to operations between NASA and NOAA. VADM Lautenbacher has met with the head of NASA to discuss this.



*NOAA Science Advisory Board December 2006 Meeting FINAL*  
Discussion:

A member asked if it was possible to gain access to Chinese satellite data. Dr. Kicza replied that the Chinese government meteorological organization will provide information, but NOAA is still working to gain access to ocean data. Obtaining similar data from India is also problematic.

A member noted that the removal of HES has significant effects on imaging in coastal waters, which is of concern to ocean scientists. Similar to NASA's prioritized list for sensors to return to the satellites, NOAA should also have a prioritized list, including climate sensors. It was suggested that perhaps HES could be flown separately from the GOES system.

Three mitigation possibilities for the lost altimeter were discussed. There is an implementation strategy in development to create a JASON 3 altimeter; NOAA and EUMETSAT will have to be responsible for funding this because it would be an operational mission. The Navy is also interested in altimetry. Advanced altimetry work with Navy and NASA could cover the gap, but will be in a research rather than operational mode. There is a potential for some gaps in altimetry capability. A couple of potential international options are in development as well. Implications of a lack in altimetry data include impacts on implementation of the HIRWG recommendations, because they partly hinge on altimetry data to be provided in the next two to three years. If it is not available, then those recommendations may need to be pursued at a later date.

It was noted that NASA, NOAA, and USGS have funded the National Research Council to conduct a decadal survey of priorities for earth observations. This is scheduled for release by December 31, 2006 and will influence how federal agencies allocate funding in this area.

Several observations regarding satellite acquisitions were made. It was noted that all activities carried out in space are expensive and it is difficult to estimate costs for these. Because NOAA is an operational agency, it launches operational satellites when possible. If launch dates are held up due to delays in development of high-risk tools, these tools are not at the right level for operational purposes; this is an issue for geostationary satellites. In addition, meteorologists know what they require from satellite information, but this is a developing area in oceanography so there is more uncertainty in that realm. If this is not addressed in the decadal survey, then the ocean sensors will continue to be problematic. Satellite decisions made in the next 1.5 years will affect results for years to come; once tools are in orbit they often last for a long time. For many reasons the costs are rising so high that it is difficult to go beyond the core mission of individual satellites. One potential cause of the cost increase is that the demand does not exist in industry for the information, so much commercial development is lacking. Polar satellites have a better research basis than geostationary satellites, so there is lower risk with these.

It was asked where a coastal ocean imager would fly if it is still in the research and development phase. Commercial satellites are being considered for this, but the sensor must first be proven to work. Some options exist for using platforms of opportunity.

*NOAA Science Advisory Board December 2006 Meeting FINAL*  
**Public Comment Period**

No public comments were received.

**Working Group Updates**

The Extension, Outreach, and Education Working Group (EOEWG) has been established, chaired by Frank Kudrna and Gerry Wheeler. The group will meet on January 8-9. The Social Science Working Group (SSWG) has formed a list of nominees. It aims to hold an organizational meeting in March, a second meeting to review draft report sections in midsummer and then a fall meeting to finalize the report for SAB consideration. The Data Archive and Access Requirements Working Group (DAARWG) will hold its first meeting on December 7-8, 2006. Dr. Decker offered to distribute the agenda to SAB members.

The next SAB meeting will be held in the Washington, D.C. area on March 6-7, 2007. It will include discussions of interactions with the Research Council and updates on the NOAA responses to the HIRWG and External Ecosystem Task Team reports. It may also include a discussion of ocean acidification, and it may be appropriate for SAB members to try to meet new Congressional staff during this week. It will be a good week for this, as the Coastal States Organization and Sea Grant Association will also be meeting that week and there will be many opportunities for linking with these organizations.

**Wednesday, December 6, 2006**

**Sound in the Marine Environment: Science Challenges and Opportunities for NOAA**  
*Brandon Southall – Office of Science and Technology, NOAA NMFS*

This presentation provided information to the SAB on the interaction between ocean sound and marine life, with particular emphasis on ongoing NOAA research and management efforts and science opportunities/challenges. Dr. Southall discussed the scope of marine acoustics issues including the effects of sound and its use in sensors, on-going research, regulatory issues, and research requirements and collaboration opportunities. A response was not required of the SAB, but their thoughts on NOAA's approach and science priorities were welcomed. Humans produce sound in marine environments both intentionally and incidentally at various frequencies, strengths, and directionality in ways that are often critical to economic and national security. Marine animals use sound for communication. There is potential for anthropogenic sound to affect marine organisms, but the scope of the effect under different conditions is still being studied. A key issue is when anthropogenic sound masks the ability for an animal to use sound. NOAA is looking at what scientific capabilities are required to address questions about these concerns and how various acoustic tools can be used to characterize marine animals and ecosystems.

A member of the SAB asked what federal legislation is a driver to NOAA in this area. The legislation includes the Marine Mammal Protection Act, the Endangered Species Act and the National Environmental Policy Act.

There are similar scientific and regulatory efforts in other countries, particularly Europe. Wind farms, pile driving, and fishing effects are key issues in Europe, and there was a NATO-sponsored meeting in Italy between several countries to discuss the impact of military acoustic activities on marine mammals. It was noted that the International Whaling Commission is becoming more involved, particularly with respect to Russian offshore oil and gas activities around Sakhalin Island. The oil and gas industry is starting to see it as more of an issue as they use sound to locate reserves. Oil and gas companies are examining how to change their acoustic tools to reduce potential impacts, but it has been somewhat difficult to get them to work together to spend money on research with competitors. New seismic technology available in the near future could be of help in reducing potential impacts. Additionally, a number of oil and gas companies have recently formed a “Joint Industry Program” to support science and technology efforts on issues related to exploration and production sounds and marine life.

A member noted that what is known versus what is not known seems to be a significant issue in the field, asking what sort of peer review has been used for the research. Many activities are conducted with academic partners via the National Oceanographic Partnership Program (NOPP), which involves an extensive peer review process.

It was noted that much of the research regarding sound effects on animals seemed proprietary, and that there may be a lot of data available, potentially in naval declassified documents, from 15 to 20 years ago. A member asked to what extent the learning curve could be accelerated by talking to experts in those areas. NOAA is working with the Navy directly as well as the Office of Naval Research. The Navy’s acoustic sensing activities are focused on specific bandwidths and signals, so the data are of limited use for biology. There may be more information available, however. Another issue is what Navy data are saved; much of it is not archived in a useful format. Many acoustic research locations closed after the Cold War. The information retained is largely archived at the Applied Research Laboratory, University of Texas at Austin. An effort has been undertaken jointly by NOAA and Navy in which some of these data are being digitized and backed up for use in assessing longitudinal trends in marine ambient noise.

It was asked if anyone working on this topic in NOAA has security clearance, as this would be helpful for access to information. Dr. Southall is in the process of getting a security clearance for this purpose.

**The NOAA HIRWG and NSF National Science Board Hurricane Reports**

*John Snow – Chair, NOAA SAB Hurricane Intensity Research Working Group and SAB Member*  
*Eric Webster – Director, NOAA Legislative Affairs*

*NOAA Science Advisory Board December 2006 Meeting FINAL*

The portion of the presentation from Dr. Snow provided an overview of the National Science Board (NSB) report “Hurricane Warning: The Critical Need for a National Hurricane Research Initiative.” Dr. Snow also provided a foundation for SAB discussion regarding possible suggested responses by NOAA to the NSB report and suggested options for proceeding. Mr. Webster’s presentation focused on legislative initiatives related to hurricane issues in the broader context of NOAA’s legislative priorities.

Dr. Snow stated that the NSB report was posted to the internet that morning, noting that the report strongly recommends NOAA participation in any hurricane research initiative. He reviewed the motivation of the NSB report, which sees hurricanes as a major integrative problem for multidisciplinary research. The NSB report provided an overarching, comprehensive review of this topic. The NSB working group included input from the NOAA SAB HIRWG in their deliberations.

The NSB report recommends a National Hurricane Research Initiative (NHRI), which would require \$300M/year in new funding across topics and agencies, frames the study of hurricanes as an integrative problem, and highlights the importance of transitioning research to practice. The latter area is of great significance to NOAA. Three investment categories as well as high and medium priority topics in each area were discussed; these were 1) understanding and prediction; 2) impacts; and 3) preparedness and response measures. NOAA would have most interest in the first category. Regarding impacts, NOAA would likely have interest in impacts on natural ecosystems. Involvement in the third category could allow NOAA to better connect with its customers; another consideration may be how to best use the nation’s computer capability in emergency prediction situations.

Implementing recommendations were discussed by the SAB. The HIRWG would likely agree with the need to unify national hurricane research capabilities. Dr. Snow noted that NOAA should be involved in finding a home for the NHRI and encouraged the agency to continue involvement with the National Hurricane Research Test Bed (NHRTB).

There are several implications and opportunities for NOAA. Dr. Snow provided some opinions on the NSB report, noting that it underplays tropical system impacts after landfall and the need to understand the fundamental predictability of tropical systems. He also noted that the report could better acknowledge the challenges involved in moving research results to operations, and that there was potential inherent in existing or planned observing and forecasting systems that could help. It was noted that there was overlap with the HIRWG reports and that the NSB report validates the HIRWG recommendations. Dr. Snow proposed several recommendations from the SAB to NOAA on how to respond to the NSB report.

Discussion:

It was noted that people are coming to realize that a hurricane model cannot be spun up easily. The commenter was interested in the idea of a hurricane test bed and building on previous

*NOAA Science Advisory Board December 2006 Meeting FINAL*

success rather than starting anew. Also important is to maintain the flow of research to operations. If NOAA is not strongly involved, there is a risk that much good research may not be integrated into operations.

Regarding computation, discussion of working with the Office of Naval Research (ONR) was noted, but it was asked how much discussion existed on working with operational research. Little discussion has occurred; NOAA could bring its breadth of experience to leverage new research dollars in this area.

A proposed interagency governance structure for wind impact was mentioned; this would be a joint public private mechanism. The method of its proposal created some concerns with NSF management and the US Office of Science and Technology Policy (OSTP); this may have not been mentioned in the final draft of the NSB report.

Referring to Ms. Kicza's earlier presentation, there have been difficulties with involving NESDIS in ocean and hurricane observations. With regard to this initiative, NESDIS would likely be interested in being involved with transferring research to operational ocean observations.

A member of the SAB proposed that the SAB write a letter to the NSB complimenting its report and noting that the members look forward to working with the NSB on this area. It also could provide mutual reinforcement of each board's work.

Actions:

- The SAB will forward its recommendations with respect to the NSF National Science Board Hurricane report to NOAA, including language from the presentation by John Snow, with recommendations that the two agencies work together on formulating their research plans.
- The SAB will write to the National Science Board, applauding its effort. It will note the coherence and common concerns and recommendations indicated by both the NSB Hurricane report and the SAB Hurricane Intensity Research Working Group reports. SAB will express its interest in maintaining contact and help in moving forward these recommendations.
- NOAA will keep SAB informed on development of its position on needs for hurricane research and operations so that the SAB can help with the external community.

Legislative Section:

This portion of the presentation focused on the NOAA priorities for 110<sup>th</sup> Congress, and hurricane research legislation. Democrats will be in control of the House of Representatives and the Senate, guiding message and operations of Congress. This will lead to dramatic differences in many respects. It may not impact much in terms of budgets and appropriations for NOAA. The House may provide a bit more in the budget, but resources remain scarce. However, there may be greater opportunities to speak productively about oceans in terms of authorizing legislation and oversight.

*NOAA Science Advisory Board December 2006 Meeting FINAL*

Mr. Webster discussed who would become Chair and Ranking members of Committees relevant to NOAA. It was noted that connections could be strengthened with some of the offices involved, and that some Republican leadership seats remain open. Some oceans caucus members who have wanted more impact on NOAA policies and budgets will have that opportunity. On the House side, it was noted that the House Science Committee will likely be very active and may wish to ensure that NOAA is going in the right direction regarding topics such as climate change, its satellites, and the communications policy. The House Resources Committee will likely retain a focus on topics such as the Dept. of the Interior but ocean members will be able to guide more hearings than before. There may be potential for NOAA in this area.

Mr. Webster listed NOAA's legislative priorities; many of which were previously considered by the agency. The White House specifically asked NOAA to work on the Cooperative Conservation of Marine, Estuarine, Coastal, and Riverine Habitat Act. The Coastal Zone Management Act (CZMA) is another item that the Congress and Administration can address beyond the Magnuson-Stevens Fishery Conservation and Management Act (MSA). MSA may still pass in the 109<sup>th</sup> Congress, but it is becoming less likely. Some smaller and less complex bills, such as the Marine Mammal Protection Act, may have a greater chance of passing. Congress has interest in the NOAA Organic Act, but many issues surround it. NOAA is also examining policy and legislative issues from its Line Offices to see what else may be addressed in Congress. The Democrats have excitement and energy to move immediately, so NOAA must be prepared in January.

Regarding hurricane legislation, it was noted that because there were few major hurricanes this year, the issue may have less interest, making it difficult for related legislation and funding to advance. There are however, reports such as the NSB report, the Hurricane Intensity and Forecast Improvement (HiFi) bill, and the HIRWG report. The HiFi bill would use revenue from offshore drilling to conduct hurricane research in Florida, but Florida is not involved in offshore drilling. Congress is asking for NOAA and NSF's Administration position on hurricane issues. As such, NOAA needs to further develop its goals and plans for hurricane research and operational activities. This consensus will help NOAA's and the Administration's stance when multiple bills come up for consideration by Congress. A further concern is if the NHRI gets far less than what is requested, priorities must be in place for where best to spend the money.

Discussion:

A member asked if a consensus position on hurricanes was emerging in NOAA and how the SAB may contribute. This process of developing an overall approach to hurricane research and prediction in NOAA has begun. A single position on priorities is needed in order to inform the Administration's Position on hurricane research, which then must be circulated extensively on the Hill to emphasize the need for hurricane activities and products in the budget. NOAA's efforts must reach beyond intensity to also address the recommendations of the NSB report, though intensity will remain a high priority.

*NOAA Science Advisory Board December 2006 Meeting FINAL*

The SAB stated that it was willing to provide more assistance as needed. They asked that the NOAA legislative affairs office keep them informed; OLA should let the SAB know what it, the SAB, can do to help. It was noted that climate and the communication of scientific research will be key issues. Mr. Webster indicated the SAB members should contact him if they had any questions.

### **NOAA High Performance (HPC) Computing Needs**

*Kevin Cooley - Chief Information Officer*

*Fred Toepfer - Environmental Modeling Program Manager, Office of the Chief Information Officer*

The purpose of this presentation was to provide an assessment of the NOAA High Performance Computing (HPC) requirements and convey the importance of improving NOAA's mission performance through increasing HPC resources. Mr. Cooley asked the SAB for advice on how to address the gap between available HPC resources and the resources required to carry out NOAA's mission. This presentation was a follow-up to an HPC presentation at the March 2006 SAB meeting. The general issue is that the combination of current and future mission goal requirements for HPC exceeds the resources available. These requirements include items such as ecosystem forecasting and improved hurricane intensity forecasts.

Part of NOAA's approach to increased HPC requirements relies on improvements in technology. However, needs may exceed the rate of improvement in the future, especially as models are increasingly used to inform decisions. Models are constrained by computing power and the development and application of NOAA's models drives the HPC requirement. More powerful computers are required for research and development than for operational activities. In order for the research models to drive decision-making, an organization needs 1) the scientific skill and background to execute research; 2) a computing infrastructure to run the models in both research and operational modes; and 3) systems engineering placed as a core area.

Currently, NOAA's operational production suite is full; with the current budget new activities will require existing activities to end. The production suite is also driven by time requirements on product delivery. For example, some activities require models to be run and forecasts produced in a short window. Ensemble models may help with difficulties in scaling across processors. This is important because operational requirements make real the value of research in forecasts and other information.

In summary, new activities within mission goal requirements are major drivers for new computing needs. These new requirements need more space in the system to become operational. Also, data assimilation and analysis of the record with value require additional computing. NOAA needs a strategy to scale the computing problem so that external partnerships and limited new funding will advance NOAA Mission capabilities. The agency also needs a better understanding of the best use for incremental investment in HPC. This would address where NOAA would get the most return on any new HPC funding, e.g., ensemble modeling versus greater model resolution. Advice was requested from the SAB on how to address the gap

*NOAA Science Advisory Board December 2006 Meeting FINAL*

between available HPC resources and NOAA's mission requirements, preferably before the Summer 2007 SAB meeting to allow the advice to be considered in FY 2010 Planning and Programming.

Discussion:

A member asked if there was a group of people that do systems engineering in NOAA. Some parts of NOAA have some capability; this is growing in an *ad hoc* fashion. However, as the size of infrastructure grows, the engineering component must grow too. A member also asked if the data and observation analysis or if it was just the model environment. Mr. Cooley responded that all aspects have been factored in.

A member of the SAB asked about the status of dialogue with other agencies to see if it is possible to use other agencies' excess capability. NOAA has spoken extensively with the Department of Energy (DoE), which is interested in collaborating with NOAA. NOAA cannot ask for free computing cycles, but collaboration on joint work addressing national issues using such computing cycles would be good. The member noted that DoD may be a good partner; it need weather forecasts as well. NOAA has been working with DoD as well. It was noted that, when partnering with other agencies, the differing goals of research and operational missions was also something that must be considered.

A member noted that the example of hurricane intensity forecast improvements and its massive need for computing power would also be paralleled by fire weather forecasts, as the latter requires microscale to mesoscale modeling in complex terrain with 1km resolution. The HIRWG recognized that these needs do not fit well with a large centralized modeling system; it was also noted that customers would likely want this information before the 28 years currently expected to be required to achieve these models. It was agreed that long-term philosophical thinking and an outyear strategy on how to accomplish these computing goals is required.

One member noted that competition is a good driver of technology. Japan has spent considerable money to develop its computing capacity, and other countries such as China and France as well as two US companies show similar interest. As such, capacity worldwide will increase soon. NOAA needs to track these technologies and take advantage of the skill sets becoming available. Partnering is critical in this effort. Mr. Cooley noted that Oak Ridge is addressing issues that require applications modeling and that NOAA wants to have peer relationships with groups that are developing such new ideas.

A member of the SAB asked whether the Office of the Chief Information Officer also handles high bandwidth communications. It does and there was a graphic which showed this capability. Relatively low bandwidth is used, but operational nodes with latency requirements are commercially provisioned to provide redundancy. Currently, information is processed locally and information is shared between nodes, whereas shared processing across a network would improve computing.



*NOAA Science Advisory Board December 2006 Meeting FINAL*

It was noted that it would be useful to ask what particular priorities to address when seeking guidance on addressing the HPC shortfall. This would help to evaluate whether the model, observations, or structure is limited so that the end product leads to balanced investment to optimize each function.

A member asked if there was physical infrastructure to house the 5x increment in computing power as currently required to model abrupt climate change. There is currently not sufficient space for it. Though it does not have to be in a specific location, getting the space is challenging because of environmental controls related to waste heat as well as the needs for power and cooling capacity in such facilities.

A member of the SAB noted that the SAB needs to address how to properly respond to this request. NOAA is identifying what needs to be done and assessing the necessary technology. David Blaskovich volunteered to work with NOAA on this issue. It was noted that the issue goes beyond hardware to the paradigm shift to best deal with the problem. Another consideration is that some modeled phenomena are episodic, so the ability to partition labor to reach common NOAA goals is necessary. NOAA needs to see alternative methods to deal with its HPC needs.

Action:

- A subgroup of the SAB will discuss how best to move forward on an SAB working group on high performance computing and email their recommendations to the full SAB for consideration.

**NOAA Planning for Science and Technology: 5-Year Research Plan**

*Richard Spinrad – Assistant Administrator, OAR and Chair, NOAA Research Council*

The purpose of the presentation was to discuss the revision of the NOAA Five-Year Research Plan, major components of the document, and significant changes since the previous version. NOAA aims to make this more of a living document containing strong guidance on research priorities that can be used as a foundational document for research in NOAA. It should also be useful to external agencies and partners in finding connections to research within NOAA. The SAB members were requested to provide immediate verbal comments and guidance on the major concepts and ideas in the 5-Year Research Plan to be followed by subsequent written comments on the draft Five-Year Research Plan.

A brief overview of the 20-Year Research Vision was provided, along with the summarized contents of the Five-Year Research Plan, which is being revised with the 20-Year Vision in mind. The first few chapters of the plan address topics applicable across NOAA, while specific details are outlined in chapters devoted to individual Goals.

Connections to the 20-Year Research Vision include emphasis of societal drivers. There is a greater emphasis on integrated research; the Global Earth Observation System of Systems (GEOSS) in particular shows the value of integrated research and observations. The importance

*NOAA Science Advisory Board December 2006 Meeting FINAL*

of transformational research that may be high risk but can yield great benefits is also highlighted. Further connectivity between the Research Plan and Vision is highlighted through a new section on “NOAA Next.”

In addition, the beginning of the Research Plan now highlights six major questions that reflect the breadth of research NOAA, though they do not align with individual Goals.

As a whole, these questions emphasize what is unique about NOAA’s capabilities. Key research tools and their use are captured as an overarching thread through the Mission Goal chapters. Research milestones and their links to NOAA’s strategic plan objectives are highlighted through the Mission Goal chapters in order to better track the progress and responsibilities for research activities. Also, the Research Plan now places more emphasis on the transition of research to applications, including operations, informational, and regulatory responsibilities. A new chapter discusses technology and the Mission Support Goal.

The Research Council is responsible for overseeing the revision of the Five-Year Research Plan; it has also been distributed to the Line Offices, Goal Teams, and Staff Offices for comments within NOAA. The comments of the SAB are much appreciated, after which the document will go for review by the NOAA leadership. The Research Plan will also be discussed with external partners through Town Hall meetings at conventions and through a later public review period.

Discussion:

One SAB member noted that the revised document contained more substantive content connecting to the NOAA Mission, but was disappointed in the lack of connections to universities as external partners. The member sought more discussion of connections to the National Academy of Sciences and consistent engagement of the academic community. In response, Dr. Spinrad noted that the section on NOAA capabilities does show how external partners can connect with the agency. Connections to academia are there, but could be further highlighted. Another member noted as an example that upcoming hurricane research in academia could potentially compete with NOAA activities and that it would be appropriate to state in the plan the steps to instead involve the university community as activities proceed. The member noted that NOAA could improve its level of trust in the universities by overtly stating how it plans to work with academia, preferably through open competition. Dr. Spinrad responded that the document concentrates more on what needs to be done rather than how, but he understood that it would be useful to include more on the relationship to academia. To emphasize this, a member stated that universities needed a motivation to trust that money that they lobby to enter NOAA comes out through the grant process as well. Dr. Spinrad asked the members to indicate where and how in the document to best include these thoughts.

It was further noted that Sea Grant is a national network that includes the transition of research to operations as well as outreach. It has an extramural component due to its common requirement for matching funds on projects. Especially in light of regionalization, this can be an example of effective collaboration. Knowledge and data transfer between NOAA and universities also could be better emphasized and improved for external data mining including both research and

*NOAA Science Advisory Board December 2006 Meeting FINAL*

operational data streams. It was noted that there are many ways to address this, likely by building the concept of improving data availability into the section on research tools, particularly in relation to observations. These comments are similar to others received from the external community; the gulf in trust must be bridged by showing specifics on how NOAA endeavors to be more accessible.

A member stated that this is much better than the prior plan and was glad to see societal aspects. The identified milestones and outcomes are beneficial in tracking the attainment of goals. NOAA was encouraged to ensure that the milestones are measurable; this is being examined within the Research Council.

A member asked where disaster research occurs in the federal government; some appears to be within NOAA. This topic is overseen by the Office of Science and Technology Policy (OSTP), Subcommittee on Disaster Reduction, in the White House structure. Hazard resilience is different from disaster reduction, but much of the research is related.

Dr Spinrad noted that there was a question of whether to maintain a Goal arrangement to the document. NOAA decided to highlight the intersections in the overarching questions section. The next version of the Research Plan may emphasize alignment by societal needs and downplay the Goals. A member noted that this alignment may be more of interest to external parties. The document must balance as useful both within and outside NOAA.

A member stated that a summary must be available to present to Congress and others, including a succinct list of priorities and milestones. Dr. Spinrad agreed that a 2-3 page document showing milestones linked to outcomes would be useful. This raised the broader question of whether the Research Plan reaches well beyond NOAA. It was asked if it could be both NOAA's Plan and a marketing tool to a broader group of people. It must clarify who NOAA defines as partners and include links to other agencies. A potential addition could be a diagram of links with other agencies. This could help people realize the ubiquity of NOAA's products and services. Dr. Spinrad replied that there are approximately 22 Federal agencies with environmental responsibility and that it would be great for all of them to have linked Five-Year Research Plans. In terms of other agencies, NOAA wants their comments on the Research Plan. He was not sure about including the suggested figure, as it could lead to people wondering why one project was highlighted over others. In addition to other agencies, groups such as the Coastal States Organization are also critical.

A member noted that though research tools were highlighted through the document, the information on how NOAA gathers data on humans and society in the environment is not as clear as how NOAA gathers data on the physical environment. It was agreed that if NOAA is serious about social sciences then this information must be added to the research tools in some way. The question of whether NOAA applies social science or also does social science research was also noted.

Action:

*NOAA Science Advisory Board December 2006 Meeting FINAL*

- The SAB will submit written comments on the NOAA 5-Year Research Plan to Cynthia Decker, Kristen Laursen, and Dave Fluharty. SAB Chair will synthesize these comments and send them to Richard Spinrad and the NOAA Research Council for incorporation into the final 5-Year Research Plan.

**Cooperative/ Joint Institute Reviews and the Future Role of the SAB**

*John Cortinas – Cooperative/Joint Institute Program, NOAA OAR*

The briefing provided information on NOAA's new Cooperative Institute (CI) policy and CI transition plan, the SAB reviews of CIs, and the future role of the SAB in the new CI policy and reviews. It requested SAB feedback on its involvement in the CI program and the future CI review process. Dr. Cortinas noted that the SAB was involved in developing this new policy originally and that this update was to keep the group informed on its implementation and to bring new members up to date.

Dr. Cortinas provided background on the new CI policy, which is based on Research Review Team recommendations to standardize CI treatment across NOAA. He discussed the timeline for the policy's development and summarized the policy for the group.

The SAB has a direct role in the policy by being "the official reviewing authority that approves science reviewers and makes recommendations(s) regarding the quality of science and management of the CI to the Under Secretary and the responsible Line Office Assistant Administrator after the review." Indirectly it is also involved through input to NOAA planning documents, which influence research activities supported at CIs. A member asked about the mechanics of the SAB's direct role. Dr. Cortinas replied that it is to provide the fourth year science review.

Details of the CI review process under the new policy were discussed at length. The transition process is going smoothly and the SAB involvement has been valuable. The next set of NOAA SAB reviews will occur in 2010. The SAB was asked if it had further feedback on its role in the CI program in and in conducting future CI reviews.

Discussion:

A member noted that the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) was not listed. This is because it is one of the institutes established through earmarks, which fall into a separate category. NOAA recognizes the importance of their contributions and is examining how best to address such non-competitive institutes. It was also noted that CICEET is working to comply with the policy to the best of its ability.

A member asked if there are other reviews in the five-year period beyond the SAB review, as much can happen in five years. Many reviews occur cooperatively as NOAA works with the institute on issues that arise in yearly and *ad hoc* reviews. There is also the prospective review leading to the original award. This structure parallels the NSF structure in developing its

Engineering Centers. Another member did note that the reviews conducted by NSF staff have become burdensome and so care should be exercised so that this does not happen with the CI reviews.

Another member asked if there was a limit to what topics could be funded through a CI. Dr. Cortinas noted that CIs serve as a way to engage partners in research. Further, it was mentioned that there is no firm answer to this question, as this is addressed by defining the role of CIs and their portfolios. This relates to assessment of research, within NOAA through the Research Council activity as well as through assessments of the CIs themselves.

Dr. Cortinas asked if the SAB was interested in participation beyond the science reviews. A member responded that when there is an anomaly in industry, an external group is often brought in to examine it; this may be a way to use the SAB as well. It was proposed that after all of the annual reports are complete, Dr. Cortinas could provide an informal review of these reports to the SAB, highlighting good and bad points and alerting the SAB if it can help with an *ad hoc* remedy.

A member asked about how the recompetition process works; how does NOAA ensure that it is an open competition with more than one applicant? Dr. Cortinas replied that every effort is made to advertise the call for proposals but can't guarantee that more than one proposal will be received.

Another member asked Dr. Alexander MacDonald (Deputy Assistant Administrator for Laboratories and Cooperative Institutes and Director in OAR) if he was comfortable with the CI policy. Dr. MacDonald stated that it was a significant improvement over the previous situation and a long-overdue revision of the process. He agreed with the idea of a yearly report from each CI.

An issue with the SAB review process is that most current members will not be involved in the next review. For that reason, the Cooperative/Joint Institutes Program should review this topic with the SAB in 2009. It was noted that the CIs should know what will be addressed in the fourth year science review by the SAB so that it is prepared. It was noted that the review template remains in the CI Handbook and in the materials given to the SAB and these seem to have been fairly useful. There will be a chance to evaluate the benefit of the review template during the March SAB meeting when two CIs are reviewed. It was noted that conducting the reviews by phone proved awkward and difficult, limiting the SAB's ability to provide adequate feedback. It was requested that future review presentations be done in person.

A member asked if the SAB would play a role in establishing new CIs prior to 2010. The SAB is not involved in the selection process. It was however noted that when RFP's are published for new CIs the SAB could look at them and let NOAA know if it disagreed with or questioned the rationale for the CI. Further, it was noted that there is a fine line between management and oversight versus providing advice, the latter being the SAB's role.

Actions:

- The Cooperative/Joint Institute Program will provide annual updates to the SAB on the process for recompetition and transition to new system for SAB advice.

**Ocean Exploration Advisory Working Group (OEAWG) Update**

*Dr. Robert Ballard, President, Institute for Exploration at Mystic Aquarium and SAB member*

Dr. Ballard noted that the Ocean Exploration program was exciting because it implements a new way to work in the ocean, with research being driven outside of the aims of a single Primary Investigator. The *OKEANOS EXPLORER* is due for sea trials in early 2008 before a voyage of marine discovery. This ship will provide opportunities to explore the Exclusive Economic Zones (EEZs) of largely unexplored US Territories, especially those in the Southern Hemisphere. A group of experts is working to recommend where the ship should go. It is not possible to carry all of the required exploratory expertise on the ship. As such, it will operate similarly to doctors-on-call, with a command control center operating onshore at all times and working with remote command centers connected to subject matter experts who can take control as different situations arise. This will allow an initial short quantitative assessment of discoveries, and then the ship will continue on its path. This works through Internet 2 (I2) capabilities, allowing hundreds of experts to be on call. The University of Rhode Island, which will hold the command and control center, will work with a television production center to develop education and outreach programs. This can help develop a prototype future classroom, creating an educational curriculum that follows the ship all year and integrates the necessary testing requirements into learning about the ship's progress.

NOAA will be practicing with this system in the Flower Garden Banks National Marine Sanctuary next year. This expedition will install permanent cameras and vehicle systems, allowing people to remotely explore what is happening in a sanctuary.

The OEAWG was asked to comment on the NOAA Ocean Exploration (OE) and NOAA's Undersea Research Program (NURP) merger. The committee had concerns and recommendations, including the disconnection between blue-water ocean exploration at a national level carried out by OE and the more coastal, regionally-based, and distributed NURP focus. Reconstituting the programs as NURP would be a concern, though the NURP centers may be helpful with the sanctuary program. The group was also concerned that the merger should not affect OE in its effectiveness to attract Congressional interest and funding.

Among other points, the group also stressed that Ocean Exploration should not be called research. The merger should not be seen as a way to protect NURP and should not negatively influence or dilute the OE program activities. The OEAWG also requested continued information on the merger as it progresses. At its next meeting, the OEAWG will work to identify technical gaps in OE programs.

Discussion:

*NOAA Science Advisory Board December 2006 Meeting FINAL*

A member supported the idea of maintaining the exploration focus of the OE/NURP Program and noted that technology development could be done in a distributed way in various centers as long as significant centralized coordination exist. Dr. Ballard concurred, stressing that deepwater exploratory technology must be developed.

It was noted that ocean exploration is similar to exploratory projects in the Defense Advanced Research Project Agency (DARPA). This is exciting and the concept needs to be communicated so that undersea exploration activities can grow.

Very exciting developments can stem from such exploration but the ship only stays in place briefly. As such, a member asked how follow-up work was conducted on the initial discovery. Dr. Ballard noted that the NSF or private companies could follow up because exploration will occur in the US territorial EEZ. It was noted that NOAA should be involved in the follow-up on ocean exploration, which is part of the reason for NURP. NURP could grow by following up on OE activities. NOAA labs will be involved in this effort. It was also asked if the ship would be involved with International Polar Year. The ship is not hardened for ice and is too small to handle winter conditions, so it will not be able to conduct polar research.

A member noted that the telecommunications capability at the University of Rhode Island can be an asset for NOAA use. The remote viewing capabilities in the marine sanctuaries provide a good way to study near-pristine marine systems in a non-intrusive way and allow researchers to collect data at little cost.

OE activities also play into the Ocean Research Priorities Plan (ORPP), which will be released soon. It has a near-term priority on comparing marine areas which fits with OE activities. In addition, the State Department has interest in exploring the extended continental shelf as a step towards submitting a claim under the UN Law of the Sea. Ocean exploration capabilities discussed here would be helpful in such activities.

OE activities also have a relationship with the Boys and Girls Clubs of America and similar programs, which can excite many children across the country about the ocean. This can strengthen the NOAA message in many Congressional districts, especially in non-coastal states.

A member of the SAB asked if these activities would be seen if the SAB meets in Mystic, Connecticut in August 2007. Dr. Ballard welcomed the group to meet there. In reference to the planned August expedition to the Black Sea, Dr. Ballard noted that the Black Sea is always anoxic at depth, allowing preservation of organic material which makes the exploration especially interesting. Dr. Ballard's Institute intends to establish underwater museums that are wired for virtual access to the public, and provide a good way to leverage ocean exploration activities with other countries.

**Recap of Meeting Decisions and Actions**

*Cynthia Decker – Executive Director, NOAA Science Advisory Board*

*NOAA Science Advisory Board December 2006 Meeting FINAL*

Dr. Decker reviewed actions assigned during the SAB meeting. One was added that after the Cooperative Institute reviews in March 2007, the SAB needed to discuss whether they wish to maintain the same process for later reviews.

Summary of Actions

1. The SAB will reserve time on the March 2007 agenda for a discussion between the Board and the NOAA Research Council of potential interactions.
2. The SAB will explore connections between the Board and other NOAA federal advisory committees, such as the Marine Protected Areas Advisory Committee and the Marine Fisheries Advisory Committee
3. The SAB will explore the possibility for establishing an ad hoc working group on fire weather. SAB members will work with NOAA staff to develop draft terms of reference for consideration by the full SAB
4. The SAB will forward its recommendations with respect to the National Science Board Hurricane report to NOAA, including language from the presentation by John Snow, with recommendations that the two agencies work together on formulating their research plans.
5. The SAB will write to the National Science Board, applauding its effort. It will note the coherence and common concerns and recommendations indicated by both the NSB Hurricane report and the SAB Hurricane Intensity Research Working Group report. SAB will express its interest in maintaining contact and help in moving forward these recommendations.
6. NOAA will keep SAB informed on development of its position on needs for hurricane research and operations so that the SAB can help with the external community.
7. The SAB will discuss how best to move forward on a working group on high performance computing and email its recommendations to the SAB for consideration.
8. The SAB will submit written comments on the NOAA 5-Year Research Plan to Cynthia Decker, Kristen Laursen, and Dave Fluharty. SAB Chair will synthesize these comments and send them to Richard Spinrad and the NOAA Research Council for incorporation into the final 5-Year Research Plan.
9. The Cooperative/Joint Institute Program will provide annual updates to the SAB on the process for recompetition and transition to new system for SAB advice.
10. NOAA will send the SAB members the NOAA rejoinder to the Science magazine article by Worm et al. about loss of world marine fish populations by 2048.

The actions were approved by the SAB and the meeting was adjourned.