

**APPROVED MINUTES¹
OPEN SESSION
396TH MEETING
NATIONAL SCIENCE BOARD**

Oregon State University
Corvallis, Oregon
February 8, 2007

Members Present:

Steven C. Beering, Chairman
Kathryn D. Sullivan, Vice Chairman
Mark R. Abbott
Dan E. Arvizu
Camilla P. Benbow
Ray M. Bowen
John T. Bruer
Kelvin K. Droegemeier
Patricia D. Galloway
José-Marie Griffiths
Daniel E. Hastings
Elizabeth Hoffman
Louis J. Lanzerotti
Alan I. Leshner
Douglas D. Randall
Arthur K. Reilly
Jon C. Strauss
Thomas N. Taylor
Jo Anne Vasquez

Arden L. Bement, Jr., *ex officio*

Members Absent:

Barry C. Barish
G. Wayne Clough
Kenneth M. Ford
Karl Hess
Richard F. Thompson

¹ The minutes of the 397th meeting were approved by the Board at the March 2007 meeting.

The National Science Board (Board) convened in Open Session at 2:25 p.m. on Thursday, February 8, 2007 with Dr. Steven Beering, Chairman, presiding (Agenda NSB-07-1, Board Book Tab 7). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

Dr. Beering thanked the staff, faculty, and students of Oregon State University (OSU), especially Ms. Kay Yates, Executive Assistant to the Dean of the College of Oceanic and Atmospheric Sciences, and the Board Office staff for all efforts to arrange the visit, retreat, and Board meeting.

The Chairman reported that on Wednesday, February 7, 2007, the Board learned about NSF-sponsored research and education at OSU. The Board also toured the Network for Earthquake Engineering Simulation (NEES) Wave Research Lab, which was followed by the annual Board retreat. The morning events of Thursday, February 8, 2007 included a breakfast with OSU leadership, followed by an OSU poster session of student NSF-supported research. The Board was especially pleased to be able to meet and talk with some of the OSU students who presented their challenging and innovative research.

Before introducing Dr. Edward Ray, OSU President, Dr. Beering stated that the Board was impressed with OSU's science and engineering research and education endeavors. Dr. Ray began his comments on the topic of science, technology, engineering, and mathematics (STEM) education. He reported that OSU has three initiatives that have made a substantial impact on K-20 education and the ability of students to move seamlessly through the educational system.

The first initiative is an innovative collaboration with Oregon's community colleges, the Degree Partnership Program (Partnership). The program creates new opportunities for students, making it easier for them to pursue a college degree and reducing their educational cost and time to graduation. As of last month, 16 of the 17 Oregon community colleges have signed agreements with OSU.

Dr. Ray's goal is to assist the other six universities in the Oregon university system in developing similar partnerships with each of the community colleges. OSU recently broke new ground by signing agreements with two of Hawaii's seven community colleges as OSU enrolls many students from Hawaii and the Pacific Rim. Also, several other states are interested in adopting the Partnership program for their community colleges and universities.

Some 5,500 students have enrolled in the program since its inception, and more than 1,600 since 1998 have graduated from OSU. Students who come to OSU through the Partnership program graduate at a rate that is 10 percent higher and with higher grade point averages than traditional transfer students. Of particular interest is the preponderance of science majors among the Partnership program students. Over 10 percent of the entire cohort is enrolled in pre-engineering. General science, exercise, and sports science and biology also rank in the top five of the Partnership program majors. As a complement to this effort, OSU has long maintained one of the most highly regarded academic programs in the west for community college teachers and administrators.

OSU's second initiative is in teacher education. In the next decade, the Nation is going to need 2.2 million new teachers in K-12 schools and community education settings. The greatest need now and into the future is for teachers in the STEM areas. OSU's double-degree program to the College of Education was a response. The double-degree program enables students to earn two undergraduate degrees concurrently - one in their discipline and one in education. It is a new pathway for the preparation of teachers, expands the pool of potential teachers, and ensures their disciplinary depth. OSU started the program in 2003, and in the last year, enrollment in the program nearly doubled to 900 students. Remarkably, the greatest growth is in the area of greatest need - teachers for the STEM subjects.

Dr. Ray reported that OSU currently has 100 double-degree students in the College of Science, including 23 from mathematics, 25 from general science, 18 from biology, and 5 from physics. Last year there were 18 double-degree students from the College of Engineering. This year there are 49, including 11 from computer science, 10 each from mechanical engineering and manufacturing engineering, and 9 from civil engineering. OSU engineering students consistently test at or near the top of the national engineering exam, and shine in national competitions. OSU is more encouraged by the following: 7 of the 49 double-degree students from engineering (over 14 percent) are African-American, Latino, or Native American, which is more than triple the percentage in the College of Engineering. Of the engineering students, 10 are women, reflecting the fact that OSU is among the top two or three engineering colleges nationally for the percentage of women engineering professors.

A third OSU program focuses on K-20 education, Science Math Investigative Learning Experiences Program (SMILE). Since the program started, there have been 4,990 SMILE students, the majority of them Native American and Hispanic, and almost all of them in poor, rural, educationally underserved communities. Students who participate in the SMILE program for at least 2 years graduate at an 84 percent rate, and students who participate for 4 years or more, the high school graduation rate is 95 percent. This is a program that has contributed greatly to Oregon and to Oregon state universities. Last week, a National Oceanic and Atmospheric Administration (NOAA) external review board came to OSU to examine an on-campus SMILE sponsor, the Cooperative Institute for Oceanographic Satellite Studies, and reported that "NOAA should consider the K-12 program as a prototype for broad NOAA and national implementation."

In closing, Dr. Ray thanked Dr. Beering and Board Members for their willingness to engage with OSU faculty and students. He also thanked Dr. Michael Crosby, the Board's Executive Officer and Board Office Director, for his invaluable guidance on event preparation. Dr. Ray also acknowledged OSU colleagues and, especially Dr. Mark Abbott, OSU Dean of Oceanic and Atmospheric Sciences, who were helpful in preparing for this event. Dr. Ray stated that OSU enjoyed the Board's visit, and appreciates the Board's advocacy and support for STEM education.

Dr. Beering thanked Dr. Ray and noted that the successful OSU programs should serve as national examples.

AGENDA ITEM 5: Approval of Open Session Minutes, November 2006

The Board unanimously APPROVED the Open Session minutes of the November 2006 Board meeting (NSB-06-130, Board Book Tab 7C).

AGENDA ITEM 6: Closed Session Items for March 2007

The Board unanimously APPROVED the Closed Session items for the March 29-30, 2007 meeting (NSB-07-10, Board Book Tab 7D).

AGENDA ITEM 7: Chairman's Report

Dr. Beering, Board Chairman, reported on several issues.

a. Approval of Honorary Awards

In the Executive Closed Session, the Board approved honorary awards for the Vannevar Bush Award and the NSB Public Service Awards. The awards will be presented at the annual awards dinner on May 14, 2007 at the Department of State's Diplomatic Reception Rooms.

b. 2008 Board Meeting Dates

Dr. Beering announced that, after this meeting, the Board Office will begin working on the 2008 calendar for Board meeting dates. All Board Members will be polled to ensure attendance by the highest number of voting Members possible. The poll will include those Board Members whose terms expire in May 2008, but could continue as Board Consultants. The Board will vote on the meeting schedule as part of the annual business at the May 2007 meeting.

c. Hurricane Warning Report

The Chairman presented the latest Board report: *Hurricane Warning: The Critical Need for a National Hurricane Research Initiative* (NSB-06-115). On September 28, 2006, the Board approved the "Draft Report for Public Comment." The following day, this report was presented to the President and Congress and released to the public for comment. The "Final Draft of the Report" was approved at the November 30, 2006 Board meeting, subject to final editing. Finally, the "Published Copy" was presented at the February 2007 Board meeting and will be distributed to Congress, workshop participants, NSF advisory committees, and others. Dr. Beering congratulated the Task Force on Hurricane Science and Engineering for its fine work.

d. Board Commission on 21st Century Education in STEM

The Commission on 21st Century Education in Science, Technology, Engineering, and Mathematics (STEM) continued to make progress. Dr. Beering called on Dr. Jo Anne Vasquez, a Board Member and Commission Vice Chairman, to report.

She reminded the Board that Congress urged the Board to establish a Commission to make recommendations for NSF and the Federal Government to achieve measurable improvement in the Nation's science education at all levels. Commission members were chosen after three hearings across the Nation, and each member brings to the Commission a special expertise. The Commission formed seven working groups. The Commission is charged with making recommendations for a new action plan to address the Nation's need for STEM education to include specific mechanisms to implement an effective, realistic, affordable, and politically acceptable long-term approach to U.S. pre-K-16 STEM education.

Dr. Vasquez reported that, since the November 2006 Board meeting, the Commission held teleconferences on December 22, 2006 and January 10, 2007, and met on January 18, 2007 in Phoenix, Arizona to consider the "Proposed Draft Action Plan Section," which was provided to Board Members (Board Book Tab 7E).

Dr. Vasquez further stated that the Commission agrees that a coherent national education system requires horizontal coordination within and among the states, and vertical alignment from pre-K to graduate education with teachers fully integrated into the system. First, the "Proposed Draft Action Plan Section," which is only a draft portion of the report, addresses an overarching recommendation for Congress to charter a national body. It would be similar to the National Academies, and would work in partnership with the National Governors Association to ensure coordination of STEM education among states. The coordinating body would allow for the coordination of STEM education among states while maintaining control of education at a state and local level. Second, the Commission will also recommend that states use P-20 councils as a key mechanism for ensuring vertical alignment of STEM education from pre-K through college in a state or region. These P-20 councils, which 28 states already have, would be composed of members such as those in the Commission and have significant leadership from the governor of each state. The Action Plan would be a way of changing the system. The Commission is also reviewing the National Science Education Standards, taking a broad, high level view.

Dr. Shirley Malcom, co-chairman of the Commission and former Board Member, stated that the action plan will require a large public campaign to sell the idea. The Board will need a level of action that is more aggressive than in the past to make this plan more visible and identify the danger of inaction.

Dr. Jon Strauss, who had attended most of the Commission meetings and the Board's pre-Commission hearings, stated that he was impressed with the commitment of the Commission members and expressed the opinion that that the Commission has responded well to its charge. The proposed work with the National Governors Association will be very effective.

Dr. Louis Lanzerotti stated that some fundamental societal and fiscal issues related to science and math education were not recognized in the draft action plan. One serious issue in the Nation is the hiring and retention of science and mathematics educators, and the disparity of the salary levels between those educators and professionals of comparable educational attainment in other economic sectors. He stated that the Board addressed this issue in the *Science and Engineering Indicators 2006 – Companion Piece*, and that American society recognizes and accepts salary differentials and pay-for-performance on the basis of supply and demand. Dr. Lanzerotti also noted that school Boards should be more prominently featured. Dr. Elizabeth Hoffman agreed with Dr. Lanzerotti's recommendations for more emphasis on comparable pay for STEM educators and on school boards.

Dr. Ray Bowen asked for clarification of the role of the "national coordinating body" and its boundaries on authority and responsibility. Dr. Vasquez stated that money invested in STEM education in the Federal Government is duplicated in many places, and that state and local levels often do not know about the scattered Federal STEM education programs, both formal and informal. Dr. Malcom commented that most of the money in STEM education is at the state and local levels; therefore, the work that has to be done is at those levels. She suggested that problems in the states need to be identified, research agendas developed, and information and findings distributed.

Dr. Beerling requested that Board Members review the STEM education draft plan and forward comments to Dr. Crosby, who will compile and forward Board comments to the Commission. The Commission will address these comments as it prepares a revised full report for the March 2007 Board meeting. He thanked members of the Commission for their tireless efforts in providing advice to the Board on this matter, and assured them that their work will significantly contribute the Board's ability to respond to Congress in a timely manner.

AGENDA ITEM 8: Director's Report

Dr. Arden Bement, Jr., NSF Director, reported on the following items.

a. NSF Staff Announcements

Dr. Cora Marrett joined NSF as Assistant Director, Directorate for Education and Human Resources (EHR) on February 1, 2007. She served as a consultant for several months prior to joining NSF full time. Dr. Wanda Ward served as Acting Assistant Director for EHR during the interim.

Dr. Margaret Leinen, Assistant Director, Directorate for Geosciences (GEO) retired in January 2007. A nation-wide search was being conducted for this position, under the chairmanship of Dr. Jane Lubchenco, a former Board Member. In the interim, Dr. Jarvis Moyers, Division Director, Atmospheric Sciences (GEO/ATM), would serve as Acting Assistant Director for that directorate.

Dr. Jeanette Wing began serving as a consultant for the Directorate for Computer and Information Sciences and Engineering (CISE), and will join NSF full time in June 2007. In the interim, Dr. Deborah Crawford, would serve as Acting Assistant Director for CISE.

b. NSF – Best Places to Work in Federal Government

Dr. Kathie Olsen, NSF Deputy Director, reported on the outcome of a 2006 Federal Human Capital Survey conducted by the Office of Personnel Management (OPM). NSF was ranked again as the second best place to work in the Federal Government by the Partnership for Public Service and American University's Institute for the Study of Public Policy Implementation. NSF was one of only three agencies to be ranked in the top five in each of the four key human capital management categories: Leadership and Knowledge Management, Performance Culture, Talent Management, and Job Satisfaction. NSF was ranked no lower than Number 4 in any of the categories. OPM identified 41 items as NSF strengths. There was only one weakness, which related to steps to deal with poor performance that cannot or will not improve. To the question about satisfaction with the organization, 72 percent answered favorably, while the average in Government was about 55 percent.

d. Congressional Update

In the congressional update, Dr. Bement reported on appropriations. He stated that the House of Representatives passed a year-long continuing resolution (CR) on January 31, 2007 that would provide NSF with the requested 7.7 percent increase for the research and related activities account. If agreed by the Senate, other NSF accounts – salaries and expenses, education and human resources, major research equipment and facilities construction (MREFC), National Science Board, and Office of the Inspector General (OIG) – would be frozen at the FY 2006 level. Overall this CR provided a \$334 million increase over last year, and represented an affirmation of support for NSF by the House. The Senate action on the CR would occur before February 15, 2007 to avoid an additional short-term CR. The NSF FY 2008 budget request was formally released on February 5, 2007.

NSF was scheduled for hearings by the House Appropriations Committee's Subcommittee on Commerce, Justice, and Science on February 28 and March 1, 2007. The Senate Appropriations Committee counterpart will hold its hearing on March 15, 2007. The House Science Committee scheduled a hearing on the NSF budget request for March 20, 2007. Since the November 2006 Board meeting, six bills were introduced in Congress that would have significant implications for NSF. A listing of those bills was provided to Board Members (Board Book Tab 7F).

AGENDA ITEM 9: Open Committee Reports

a. Audit and Oversight (A&O) Committee

Dr. Dan Arvizu, A&O chairman, reported that the committee addressed the reportable conditions that had been identified by NSF financial auditors, Clifton Gunderson LLP.

Dr. Olsen reported on NSF's Corrective Action Plan (CAP) for reportable conditions. The committee also heard from Ms. Deborah Cureton, Associate Inspector General for Audit, on NSF's CAP. Dr. Arvizu stated that NSF is resolving the reportable condition on grant monitoring, with four of the recommendations that were identified appropriately agreed to by NSF and being addressed appropriately toward resolution. As to the other reportable condition on contract monitoring, there are still three recommendations that are in various stages. One recommendation has been reconciled, and moving toward implementation. Another of the recommendations is partially agreed to and still in progress, and a third recommendation is still pending. Dr. Arvizu stated that there is a positive commitment from NSF management and OIG to work in concert with the auditor to ensure closure on the remaining items, as well as open elements of the one major reported condition by the end of the fiscal year.

b. Education and Human Resources (EHR) Committee

Dr. Hoffman, EHR chairman, reported that the committee dedicated the meeting to topics for future activities. The committee identified several items for discussion at the March 2007 meeting: the follow-up to the Engineering Education workshops; the follow-up on the report to Congressman Rush Holt on evaluation, procedures, and results for the EHR Directorate programs; and a discussion on the Academies' report, *Beyond Bias and Barriers*, and the Board's report, *Broadening Participation in Science and Engineering Faculty* (NSB-04-41), distributed to Board Members at the November 2006 meeting. The committee also asked Dr. Bement to discuss some of the changes of the NSF Directorate for HER at the March 2007 meeting.

Dr. Lanzerotti, chairman of the Subcommittee on Science and Engineering Indicators, distributed a matrix showing the chapters of *Science and Engineering Indicators 2008* that Board Members have volunteered to review, and asked all Members to finalize their choices of chapters for review and especially to consider taking the lead for the chapter on the science and engineering workforce.

Topics identified for possible inclusion in the EHR agenda during the next year include the following. (1) A discussion on NSF responsibilities in Math and Science Partnership program and interagency issues worthy of Board attention. (2) A discussion on informal science education, at the August 2007 or September 2007 meeting, including what NSF is funding in informal science, strategies employed, how NSF integrates formal and informal science, and how the European experience can inform the NSF. (3) A discussion on how the U.S. can bring along both a generally STEM-literate workforce and fund the next generation of STEM innovators. Both need to be addressed but require very different intervention strategies. (4) A more in-depth conversation with staff and Board Members so the Board can fully understand larger, longer-term objectives that propel and are formative for staff and their programs. The committee looks forward to receiving a copy of a white paper prepared by Dr. Bement and Dr. Elias Zerhouni, Director, National Institutes of Health, in response to the Academic Competitiveness Council report. The committee also asked for a briefing from the new NSF EHR Assistant Director, Dr. Marrett, at the August 2007 meeting. (5) The issue of science faculty who want to work in the professional development of teachers, but are not rewarded for it in the current higher education system.

c. Committee on Programs and Plans (CPP)

On behalf of Dr. Kenneth Ford, CPP chairman, Dr. Beering reported that the committee is interested in impacts to the MREFC program by the realities of the 2007 budget and the impact on the 2008 budget. The committee asked for a comprehensive discussion of these issues at the March 2007 meeting. The NSF *Facilities Plan* was released on Monday, February 5, 2007, and copies were provided to Board Members.

The committee considered the draft report of the Task Force on Transformative Research. The chairman of the Task Force on Transformative Research, Dr. Douglas Randall, presented the draft report, *Enhancing Support of Transformative Research at the National Science Foundation* (NSB-07-6) (Board Book Tab 5B). Based on the recommendation made by CPP:

The Board unanimously APPROVED the draft report *Enhancing Support of Transformative Research at the National Science Foundation* (NSB-07-6) for release to the public for review and comment.

d. Committee on Strategy and Budget (CSB)

Dr. Ray Bowen, CSB chairman, reported that he raised the question about the 2004 policy to eliminate required cost sharing on NSF awards, except for the mandatory 1 percent. Some Board Members were concerned that there were some unintended consequences of the implementation of NSF and Board cost sharing policies at universities. Dr. Bement agreed to review that issue within NSF, and report back to CSB at the March 2007 meeting.

CSB also discussed the status of the FY 2007 and FY 2008 budget requests. He stated that the committee was pleased with the recommendation of the House Joint Resolution to the Senate on the research and related activities account. Dr. Bowen recommended a communication from the Board to the Senate leadership to express the Board's endorsement of the FY 2007 Joint Resolution, and indicate that additional funding to EHR would be beneficial as well. Based on the CSB recommendation:

The full Board AUTHORIZED the Board Chairman to send a letter to the U.S. Senate expressing the Board's full endorsement to the FY 2007 Joint Resolution of Congress for the NSF research and related activities account, but also strongly encourage congressional approval of a similar budget increase for the NSF education and EHR budget account.

Before adjourning, Dr. Abbott thanked Dr. Crosby and the Board Office staff, Ms. Yates, and the OSU conference services for all their efforts for the successful events at OSU.

Dr. Abbott addressed the issue between the Nation's universities and the Federal Government in terms of conducting research and development. This issue revolves around the notion of indirect costs, which go to build infrastructure, as well as more directed funding for community-based facilities. The universities are faced with many pressures: the cost for both the infrastructure and the equipment has gone up enormously; and for some projects, the equipment has an effective scientific lifetime of about 2 years. He stated that this is an important issue, which the Board should consider given the renewed interest in the Nation's competitiveness.

Dr. Beering adjourned the Open Session at 3:30 p.m.

A handwritten signature in cursive script that reads "Ann A. Ferrante".

Ann A. Ferrante
Writer-Editor
National Science Board Office