

**APPROVED MINUTES¹
OPEN SESSION
403RD MEETING
NATIONAL SCIENCE BOARD**

National Science Foundation
Arlington, Virginia
March 26-27, 2008

Members Present:

Steven C. Beering, Chairman
Kathryn D. Sullivan, Vice Chairman
Mark R. Abbott
Dan E. Arvizu
Barry C. Barish
Camilla P. Benbow
Ray M. Bowen
Kelvin K. Droegemeier
Kenneth M. Ford
Patricia D. Galloway
Daniel Hastings
Elizabeth Hoffman
Louis J. Lanzerotti
Douglas D. Randall
Arthur K. Reilly
Jon C. Strauss
Richard F. Thompson

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

Members Absent:

John T. Bruer
G. Wayne Clough
José-Marie Griffiths
Karl Hess
Alan I. Leshner
Thomas N. Taylor
Jo Anne Vasquez

¹ The minutes of the 403rd meeting were approved by the Board at the May 2008 meeting.

The National Science Board (Board, NSB) convened in Open Session at 1:45 p.m. on Thursday, March 27, 2007 with Dr. Steven Beering, Chairman, presiding (Agenda NSB-08-24, Board Book Tab 12). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 7: Approval of Open Session Minutes, February 2008

The Board unanimously APPROVED the Open Session minutes of the February 2008 Board meeting (NSB-08-23, Board Book Tab 12G).

AGENDA ITEM 8: Closed Session Items for May 2008

The Board unanimously APPROVED the Closed Session items for the May 6-7, 2008 meeting (NSB-08-27, Board Book Tab 12H).

AGENDA ITEM 9: Chairman's Report

Dr. Beering reported on several issues:

a. Approval of Honorary Award

In Executive Closed Session, the Board approved the 2008 Alan T. Waterman Award recipient. This award, along with the Vannevar Bush Award and the NSB Public Service Awards, will be presented at the Board's annual awards dinner on May 6, 2008 at the Department of State's Diplomatic Reception Rooms. [The recipient's name would be announced after he/she was notified.]

b. *ad hoc* Committee on Nominating for NSB Elections

Also in Executive Closed Session, the following Board Members were elected to the *ad hoc* Committee on Nominating for NSB Elections, otherwise known as the Elections Committee, Drs. Ray Bowen, Elizabeth Hoffman, Douglas Randall, and Jo Anne Vasquez.

c. Congressional Testimony

During February 2008, Dr. Beering, along with Dr. Arden Bement, NSF Director, participated in two congressional hearings back-to-back. On February 26, 2008, they testified before the House Science and Technology Committee, Subcommittee on Research and Science Education. Dr. Beering's written testimony (Board Book Tab 12I) discusses the FY 2009 budget request for NSF. The statement also includes an overview of Board activities during the past year and summarized the Board's oversight and policy direction for NSF and advice to the President and Congress.

The following day, on February 27, 2008, both Drs. Beering and Bement testified before the House Appropriations Committee, Subcommittee on Commerce, Justice, and Science. Information on the FY 2009 budget request and Board activities was also presented.

d. Rescheduled Board Meeting

Dr. Beering asked the Board Office to poll Board Members regarding a change in the date for the October 2008 off-site meeting and retreat. The scheduled October 1-2, 2008 date conflicted with a religious holiday and could cause problems for travel funding if NSF would be funded under a Continuing Resolution for the new fiscal year starting on October 1, which would follow the pattern of recent years. The Board Office asked the University of Alaska, Fairbanks about a date change and the university recommended the week of September 22 as the best of the suggested dates. The new dates were the best alternative for the following reasons: most Board Members could accommodate this shift in their schedules, the rescheduled dates provide the best alternative from the budget perspective, and would be 5 weeks from the August Board meeting. The off-site Board meeting and retreat at the University of Alaska, Fairbanks was rescheduled for September 22-23, 2008.

e. NSB Publication on International Science

The Chairman announced the latest Board publication, *International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovation Enterprise* (NSB-08-4). (Available on the NSB Web site: www.nsf.gov/pubs/2008/nsb084/index.jsp.) The public release of this report took place after the Board meeting on March 27, 2008.

f. Recognition of AAAS Fellows

Dr. Beering announced that seven NSF individuals were honorably recognized at the American Association for the Advancement of Science (AAAS) annual meeting in February 2008. The following were elected by their peers as AAAS Fellows for meritorious efforts to advance science and technology: Dr. Arden Bement; Dr. Tony Chan, Assistant Director, Directorate for Mathematical and Physical Sciences (MPS); Dr. Machi Dilworth, Head, NSF Tokyo Office; Dr. Zakaya Kafafi, Division Director, MPS; Dr. Joan Maling, Program Director, Directorate for Social, Behavioral, and Economic Sciences (SBE); Ms. Marilyn Suiter, Program Director, Directorate for Education and Human Resources (NSF EHR); and Dr. Jeannette Wing, Assistant Director, Directorate for Computer Information Sciences and Engineering (CISE).

g. Board Member Recognition

Dr. Beering announced that Mr. Arthur Reilly would speak on April 8, 2008 at the meeting of the President's Council of Advisors on Science and Technology (PCAST) at the National Academies in Washington, DC, where he would present highlights from the *Science and Engineering Indicators 2008*.

Dr. Beerling also recognized Dr. G. Wayne Clough, President of Georgia Institute of Technology, who was selected to be the 12th Secretary of the Smithsonian Institution. Dr. Clough was selected because of his unique combination of academic achievement, talent, leadership skills, and experience in public service, science, management, and development. He was slated to assume this post on July 1, 2008 and would continue to serve as a Member of the Board.

AGENDA ITEM 10: Director's Report

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

a. NSF Staff Announcement

Dr. Bement announced that two staff searches were underway for key positions within NSF. The first search was for the Director of the Office of Cyberinfrastructure (OCI) to find a replacement for Dr. Daniel Atkins. NSF established a search committee, chaired by Dr. Priscilla Nelson, Provost and Senior Vice President for Academic Affairs, New Jersey Institute of Technology. The committee completed its work during the week of the March 2008 Board meeting, and would establish a short list of candidates the following week and begin the interview process.

The second search was for Assistant Director, Directorate of Engineering (ENG), to replace Dr. Richard Buckius. Dr. Linda Katehi, Provost of the University of Illinois, Urbana-Champaign, agreed to serve as chairman. "Dear Colleague" letters were broadly distributed to over 4,500 individuals. NSF was already receiving nominations and would continue to accept nominations through April 14, 2008.

b. Congressional Update

Hearings

In addition to the hearings on February 27 and 28, 2008, where Dr. Bement testified with Dr. Beerling, Dr. Bement reported that the Senate Appropriations Subcommittee on Commerce, Justice, and Science hearing scheduled for March 13, 2008 on NSF's FY 2009 budget request to Congress was cancelled because of the heavy voting schedule. NSF submitted written and oral testimony to the subcommittee and, after the questions for the record are submitted, will become a virtual hearing and part of the official record of the subcommittee. On April 2, 2008, Dr. Bement will testify in the House Science and Technology Committee's Subcommittee on Research and Science Education on the topic of scientific diplomacy.

Letter to Chairman Byrd

Senators sent a Dear Colleague letter to the Chairman Robert Byrd and Ranking Member Thad Cochran of the Senate Committee on Appropriations concerning an additional funding supplement, an emergency funding to be included in the FY 2008 Supplemental Appropriations bill. This bill requested that \$250 million be allocated to the Office of Science and Department of Energy, and \$100 million be allocated to NSF. Much of the funding for the Office of Science will help keep the U.S. commitment to the International Thermonuclear Experimental Reactor

(ITER) project, to ensure that the Fermi Laboratory is retained as the Nation's premier high physics facility, and to provide funding necessary to ensure that other major Department of Energy facilities in California, Illinois, New Mexico, New York, Tennessee, and Virginia can continue to meet the Nation's needs. The \$100 million for NSF will provide additional graduate fellowships and research grants at the Nation's universities while helping them maintain new initiatives in supercomputing and high-speed networking. This letter was signed by Senators Lamar Alexander and Bob Corker (both from Tennessee), Senators Jeff Bingaman and Pete Dominici (both from New Mexico), Richard Durbin from Illinois, Dianne Feinstein from California, Edward Kennedy from Massachusetts, and Charles Schumer from New York. The letter was publicly released on March 27, 2008.

AGENDA ITEM 11: Open Committee Reports

Note: The Executive Committee did not meet in March 2008.

a. Audit and Oversight (A&O) Committee

Dr. Dan Arvizu, A&O chairman, reported that he and Dr. Beering received a report from the Office of Inspector General (OIG) on January 25, 2008 regarding the "Assessment of the Joint Statement of Understanding between the Governor of Hawaii and the Chairman of the National Science Board," as requested by the Board (Supplemental Board Book Tab 4). The OIG report concluded that there were no actual conflicts of interest or violations of the Government in the Sunshine Act, and offered some recommendations for mitigating future misunderstandings. The Board Office acted on the OIG report recommendations, and the OIG has informed the Board that it "considers the matter to be completed."

Dr. Arvizu also reported that the Inspector General Reform Act of 2008 was being considered by Congress and would affect NSF, if passed. The Board will be updated as this issue develops.

Dr. Kathie Olsen, NSF Deputy Director, gave a presentation on the newly issued NSF Human Capital Strategic Plan and the issues that face NSF in sustaining a high quality workforce against an array of challenges. Dr. Olsen will continue to use the working group as a resource and will keep the Board informed as it moves ahead. Dr. Bowen noted that the findings about workload and the need to sustain the quality of the merit review process have implications that should be included in the Board's assessment to Congress under the America COMPETES Act. (COMPETES: Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science.)

Mr. Thomas Cooley, NSF Chief Financial Officer, discussed the status of corrective action plans in response to the 2007 Financial Statement Audit and the work undertaken to meet the requirements of Office of Management and Budget (OMB) Circular A-123, Management Responsibility for Internal Control, subject to audit this year. Ms. Marie Maguire, the OIG Senior Audit Manager, discussed how OIG oversees the Financial Statement Audit by ensuring that the auditors comply with audit standards and OMB guidance pertaining to planning, support, and communicating its work. She also explained that the OIG's oversight is subject to review by the U.S. General Accounting Office (GAO) and the external peer review process.

b. Education and Human Resources Committee (EHR)

Dr. Elizabeth Hoffman, EHR chairman, reported that guest speaker, Dr. Rose Tseng, Chancellor of the University of Hawaii - Hilo (UHH) gave a presentation on the educational activities at UHH, which has been recognized as one of the most ethnically diverse public liberal arts programs. The committee thanked Dr. Tseng for her excellent presentation and for the comments provided by her student, Ms. Toni Gregg.

At the December 2007 meeting, EHR reminded the Board of its commitment to provide a follow up report to the Board's preliminary response in January 2007 to Congressman Rush Holt's request of September 2006. The committee prepared a draft letter with an attached evaluation summary prepared by Dr. Cora Marrett, Assistant Director, Directorate for Education and Human Resources. This follow up report should be helpful in the context of the national need to reform science, technology, engineering, and mathematics (STEM) education. The draft cover letter to Congressman Holt and evaluation summary (NSB/EHR-08-2, Board Book Tab 7B) were approved by EHR and submitted to the full Board for approval.

The Board unanimously APPROVED the cover letter to Congressman Rush Holt and the "NSF Directorate for Education and Human Resources, NSB Summary, Evaluation of Programs, Follow up to Congressman Rush Holt on EHR Evaluation, February 28, 2008," subject to edits approved by the Board Chairman and EHR chairman.

Dr. Hoffman further reported that Dr. Camilla Benbow briefed the committee on two topics. First, on the National Math Panel, of which she has been a member, that reported to the Department of Education Secretary, Margaret Spellings in March 2008. The panel covered a broad range of questions on how to prepare children for algebra. She noted several areas studied by the panel, and will provide the committee with more details at the May 2008 meeting.

Dr. Benbow also introduced a discussion draft document, "Preparing the Next Generation of STEM Innovators" dated March 26, 2008 (NSB/EHR 08-3, Supplemental Board Book Tab 3), which includes a proposal prepared by Dr. Benbow with the help committee members Drs. Louis Lanzerotti, José-Marie Griffiths, and Jo Anne Vasquez. The topic of this draft document was not addressed by the STEM Commission and would complement the National Action Plan report to the Board. Specifically, the draft document proposes that, through an EHR working group, the committee develop recommendations to the Board for how NSF, and possibly other agencies, might engage the agenda of fostering the development of the next generation of innovators and for conducting rigorous research to better understand this process. The committee voted to approve the motion that an NSB-EHR working group be established to hold a 1-day meeting to develop a white paper with recommendations for the committee to offer to the Board. Further details on this item will be discussed at the May 2008 meeting.

c. EHR Subcommittee on Science and Engineering Indicators (SEI)

Dr. Louis Lanzerotti, SEI chairman, reported that he and Mr. Arthur Reilly participated in the Government-University-Industry Research Roundtable on February 13, 2008. Both Dr. Lanzerotti and Mr. Reilly made a formal presentation at a luncheon meeting, which focused on the Board's *Research and Development: Essential Foundation for U.S. Competitiveness in a Global Economy – A Companion to Science and Engineering Indicators 2008*. Dr. Lanzerotti and Mr. Reilly provided data to support the three recommendations included in the report: enhancing Federal funding for transformational basic research, encouraging greater intellectual exchange between industry and academia, and developing data to track the implications of globalization of high tech industries for the Nation's competitiveness in terms of research and development (R&D) and education.

As indicated in the Chairman's Report, Dr. Lanzerotti reported that Mr. Reilly would give a presentation on *Science and Engineering Indicators 2008* and the Companion Piece at the PCAST meeting on April 8, 2008. Additionally, several weeks earlier, Dr. Lanzerotti had the opportunity to use points from the *Science and Engineering Indicators 2008* Digest and Companion Piece in discussions with industrial R&D leaders, academics, department heads, and deans at a meeting of the American Physical Society and American Institute of Physics at their Industry Physics meeting in New Orleans.

The subcommittee heard a presentation by Dr. Lynda Carlson, Division Director, SBE, on efforts to develop new data and indicators for *Science and Engineering Indicators 2010* and beyond. Dr. Carlson focused on many of the data needs, which the subcommittee and other Board Members identified during discussions over the last 2 years. Within 6 months, the subcommittee will launch *Science and Engineering Indicators 2010* on the next cycle.

Dr. Lanzerotti reminded Board Members that the subcommittee needed to finalize any significant changes for *Science and Engineering Indicators 2010* by the May 2008 meeting. Ms. Jean Pomeroy, Board Office staff, indicated that she continued to contact representatives of organizations for potential input to the subcommittee on their interests in the content of future *Indicators*.

d. Committee on Programs and Plans (CPP)

Dr. Kenneth Ford, CPP chairman, reported that the committee reviewed a revised FY 2008 Schedule of Action and Information Items for Board Review (Board Book Tab 8B), which indicates that the meetings in May and August 2008 will have a number of action and information items.

Dr. Daniel Atkins, Director, Office of Cyberinfrastructure (OCI), presented an information item on Sustainable Digital Data Preservation and Access Network Partners (DataNet). Dr. Atkins outlined the OCI data strategy and the primary goals of DataNet partners, approach and investment levels. NSF expects to bring two DataNet award actions to the Board for review at the August 2008 meeting. Also, three DataNet awards are planned for round two and those award actions are expected to come before the Board in the summer of 2009.

Dr. David Lightfoot, Assistant Director, SBE, presented an information item on the Science of Learning Centers (SLC). This is a multi-directorate program managed for NSF by SBE with six centers; three that began in 2004 and three began in 2006. At the August 2008 meeting, action items for the 2006 cohort will be presented to the Board to increase award sizes. The Board will be asked to take action on renewal awards for the 2004 cohort centers for second 5-year periods at the December 2008 meeting.

Dr. Edward Hackett, Division Director, SBE, presented an information item on the General Social Survey (GSS), which is a major long-term research instrument for the behavioral and social sciences and has been conducted 27 times since 1972. GSS is currently in recompetition, and, if the proposal reaches the high end of its expected range, it will require Board approval in August 2008.

Dr. Clifford Jacobs, Program Officer, Directorate for Geosciences (GEO), presented an update on the competition for management and operation of the National Center for Atmospheric Research, (NCAR) (NSB/CPP-08-10, Board Book Tab 8C). NCAR is a Federally Funded Research and Development Center (FFRDC), which NSF has funded for about the last 40 years, and NSF is the primary sponsor providing about 70 percent of NCAR support. NSF presented a timeline to the Board in November 2005 and has followed that timeline closely. NSF issued a solicitation for this competition in January of 2007. The merit review was held in October 2007, and NSF expects to bring a recommended funding action to the Board at the May 2008 meeting.

In February 2008, the Board submitted the “NSB Report to Congress on Preconstruction Funding and Maintenance and Operations Costs Associated with Major Research Equipment and Facilities (MREFC) at NSF,” which was required by the America COMPETES Act. In that report, the Board committed to provide a follow up report to Congress later in 2008, and the report stated that the Board would consider and approve detailed modifications to the MREFC project planning, prioritizing and funding process, and define the role of the Board throughout this new process. Since the February 2008 meeting, Dr. Mark Abbott had ongoing discussions with NSF management to identify and address specific critical issues. Dr. Abbott briefed the committee on these issues and will continue to update CPP and the Board as these discussions progress.

Dr. Kesh Narayanan, Division Director, Industrial Engineering and Partnerships, ENG, and Dr. Clifford Gabriel, Senior Advisor, Office of Integrative Activities (OIA), presented an update on the Working Group on Facilitating Transformative and Interdisciplinary Research (FacTIR). Drs. Narayanan and Gabriel described NSF's evolving response to the Board report, *Enhancing Support of Transformative Research at the National Science Foundation* (NSB-07-32), first slightly revising the Board's definition of transformative research to create a “working definition” to cover the full range of NSF's activities. Dr. Gabriel provided an outline of the revision to the Small Grants for Exploratory Research (SGER) program. NSF proposes to create two programs to replace SGER: EARly-concept Grants for Exploratory Research (EAGER), which will support high risk/high payoff proposals formerly supported by SGER; and Grants for Rapid Response Research (RAPID), which is essentially unchanged from the rapid response portion of SGER. Dr. Douglas Randall, former chairman of the Task Force on Transformative Research, commended NSF on their progress and their approach and suggested that the Board consider a bolder experiment at some point as recommended in the report.

Dr. Lanzerotti provided a brief report to the committee on the progress toward preparing a report to Congress on the interdisciplinary research issue, which is required by the America COMPETES Act (Supplemental Board Book Tab 9). The Board's report on this issue must be submitted by the August 8, 2008, which is before the August 2008 Board meeting. The committee agreed to continue to work to refine the definition of "interdisciplinary" and that establishing a fixed proportion of research and related activities (R&RA) funds to be allocated for interdisciplinary research would not be in the best interests of NSF or the Nation as a whole. To meet the August 2008 deadline, the committee intends to distribute a draft report to the Board for discussion at the May 2008 Board meeting.

Lastly, Dr. Tony Chan, Assistant Director, MPS, gave a presentation, "The Breadth of NSF Mathematical and Physical Sciences." In this presentation, Dr. Chan also described educational activities within MPS and several of the major facilities that involve MPS participation. Dr. Chan's talk included presentations from his staff, Dr. Beverly Berger; Dr. Charles Conover; and Dr. Andrew Lovinger.

Task Force on Sustainable Energy (SE)

Drs. Dan Arvizu and Jon Strauss, SE co-chairmen, provided a status report on SE. The task force reviewed the first roundtable discussion, which was held on February 8, 2008, and discussed the upcoming roundtable, which will be held on June 19, 2008 at the Visitors Center of the National Renewable Energy Laboratory in Golden, Colorado (Supplemental Board Book Tab 8).

e. Committee on Strategy and Budget (CSB)

Dr. Ray Bowen, CSB chairman, reported that the committee discussed NSF policies regarding limitations on the number of proposal submissions by a single institution. The America COMPETES Act directed the Board to review and assess the effects of NSF policies that limit the number of proposals that may be submitted by a single institution. The report must be submitted to Congress by August 9, 2008, and CSB plans to have a draft at the May 2008 meeting followed by a period in early summer for editing and finalizing that report.

The committee reviewed the background material on NSF policies on limitations on the number of proposal submissions by a single institution (Supplemental Board Book Tab 2), which included a chart that shows a slight increase in the proposal limitation practice since FY 2002, along with a table that gives an inventory by year of programs where this practice is in place.

Mr. Thomas Cooley, NSF Chief Financial Officer, gave presentation, which described the role of proposal limitations within NSF. He explained that institutional limits are primarily used for solicitations focused on infrastructure and instrumentation, centers and facilities, and on education and training proposals. The rationale for the practice within NSF is to address concerns about community investment in time and proposal writing, reviewer workloads, and quality of the review process. He pointed out that 90 percent of the program solicitations do not have limitations so that this practice impacts approximately 10 percent of those programs. Mr. Cooley also discussed the desired outcomes of the practice, namely, long-term institutional

commitment to the project by the institution receiving the award, consistency of the award with the goals of that institution, and broadening participation by non-traditional and diverse institutions. NSF plans to conduct a set of case studies to determine institutional experiences with this practice, and the findings will be available for inclusion in the report to Congress. The Board staff will also be in the process of soliciting opinions from NSF advisory committees on this practice.

Task Force on Cost Sharing (CS)

Dr. Kelvin Droegemeier, CS chairman, provided a status report on CS. The task force plans to hold a roundtable on July 9, 2008. The topic for this roundtable will be “voluntary cost sharing,” with the objective to better understand how voluntary cost sharing is specified, tracked, and its role in the merit review and the NSF decision process. Another roundtable will be held the following day on July 10, 2008. The topic for this roundtable will address the implications of mandatory and voluntary cost sharing for broadening participation in science and engineering research and education (Supplemental Board Book Tab 1). The task force plans to solicit advice and opinions on cost sharing from the various NSF advisory committees

Dr. Beerling adjourned the Open Session at 2:20 p.m.

[signed]
Ann A. Ferrante
Writer-Editor
National Science Board Office