

**APPROVED MINUTES¹
OPEN SESSION
394TH MEETING
NATIONAL SCIENCE BOARD**

The National Science Foundation
Arlington, Virginia
September 27-28, 2006

Members Present:

Steven C. Beering, Chairman
Mark R. Abbott
Dan E. Arvizu
Barry C. Barish
Camilla P. Benbow
Ray M. Bowen
John T. Bruer
Kelvin K. Droegemeier
Kenneth M. Ford
Patricia D. Galloway
José-Marie Griffiths
Karl Hess
Elizabeth Hoffman
Alan I. Leshner
Douglas D. Randall
Jon C. Strauss
Thomas N. Taylor
Richard F. Thompson
Jo Anne Vasquez

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

Consultant* Present

Arthur K. Reilly

Members Absent:

Kathryn D. Sullivan, Vice Chairman
G. Wayne Clough
Daniel E. Hastings
Louis J. Lanzerotti

¹ The minutes of the 395th meeting were approved by the Board at the November 2006 meeting.

* Consultant pending delivery of Presidential commission.

The National Science Board (Board) convened in Open Session at 1:25 p.m. on Thursday, September 28, 2006 with Dr. Steven Beering, Chairman, presiding (Agenda NSB-06-100, Board Book Tab 13). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM: (unnumbered) Oath of Office

Dr. Beering introduced Dr. John Marburger, Senior Advisor to the President and Director of the Office of Science and Technology Policy for the Executive Office of the President. Dr. Marburger stated that it was an honor to administer the Oath of Office to the new Board Members.

Dr. Marburger administered the Oath of Office to nine Board Members: Drs. Mark Abbott, Camilla Benbow, John Bruer, Patricia Galloway, José-Marie Griffiths, Karl Hess, Arthur Reilly, Thomas Taylor, and Richard Thompson. Dr. Marburger congratulated the new Board Members, and on behalf of the President, he thanked them for their willingness to devote the time and energy required for their jobs.

Dr. Marburger stated that he would like a chance to talk with the new Members in the future, as he has in the past, about issues that are important for the Board and the Nation. He stated that President George Bush takes science very seriously and is convinced that investments in basic research are an important foundation for our Nation's future strength in every aspect; specifically: economic competitiveness, homeland security, national security, and the quality of life for all people.

Dr. Marburger added that President Bush had been willing to invest his time and energy in science, especially during the past year since launching the American Competitiveness Initiative (ACI) in his State of the Union speech. The President has spoken numerous times about the Initiative in various parts of the country, an extraordinary and probably unprecedented investment of time for a U.S. President. The President has always stressed the importance of basic research and spoken with pride of the agencies that are prioritized in this Initiative, of which the National Science Foundation (NSF) is one. This important commitment expresses the President's desire that NSF continue to pursue excellence. NSF is the only agency in the Executive Branch that is exclusively devoted to science, basic research, and higher education. Most of the science budget, the research and development budget of the U.S., is disbursed among agencies that have other missions, and consequently, NSF is special in that it provides leadership and examples to the agencies as they pursue their own basic research objectives. NSF has truly been a leader in finding ways to identify priorities and evaluate proposals. The agency makes its operation transparent and easy for constituents' interaction. The use of electronic media and the way that work is evaluated are models for other agencies.

Dr. Marburger stated that the Board by its charge is expected to provide advice to Government at a high level. There are some routine functions that it performs and products that it produces, for example the *Science and Engineering Indicators* report, that have become an authoritative source of information for many other countries as well as the U.S. The Board also produces periodic

white papers on topics that it deems to be of importance to the Nation. He thanked the Board for its past products and stated that he looked forward to good interaction with the Board and his office and other branches, departments, and agencies within the Executive Branch.

AGENDA ITEM 4: Approval of Open Session Minutes, August 2006

The Board unanimously APPROVED the Open Session minutes of the August 2006 Board meeting (NSB-06-93, Board Book Tab 13C).

AGENDA ITEM 5: Closed Session Items for November 2006

The Board unanimously APPROVED the Closed Session items for the November 29-30, 2006 meeting (NSB-06-97, Board Book Tab 13D).

AGENDA ITEM 6: Chairman's Report

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

a. NSF Authorization Act of 2002, Delegation of Authority for MREFC

The NSF Authorization Act of 2002 requires the Board to report to Congress, not later than September 15 of each fiscal year, any delegations of authority related to funds appropriated for any project in the Major Research Equipment and Facilities Construction (MREFC) account. In his letter of September 11, 2006, Dr. Beering reported to Congress that there had been no delegation of authority related to MREFC during the past year.

b. Dr. Hoffman Named Executive Vice President and Provost, Iowa State University

Dr. Elizabeth Hoffman was named the Executive Vice President and Provost at Iowa State University, effective January 1, 2007. The President of Iowa State University, Dr. Gregory Geoffroy, selected Dr. Hoffman following a nationwide search. Dr. Geoffroy is quoted as saying that: "Dr. Elizabeth Hoffman is an exceptionally talented and experienced academic leader, and we are excited that she is returning home to Iowa State."

c. Annual Board Retreat, Visit, and Meeting

The annual retreat, visit, and meeting will take place at Oregon State University, Corvallis, Oregon, on February 7-8, 2007. Dr. Michael Crosby, Board Executive Officer and Board Office Director reported that he and the Board Office staff were working on the logistics and agenda. Dr. Crosby stated that he had been in contact with Dr. Mark Abbott, Board Member and Dean and Professor at Oregon State University (OSU), as well as Dr. Edward Ray, OSU President. Dr. Crosby stated that he would be visiting Corvallis in early October 2006 to meet with Drs. Abbott and Ray and others at OSU. At the Board meeting in November 2006, he plans to provide a draft agenda and details of the February activities.

d. *ad hoc* Committee for the Vannevar Bush Award

Dr. Beering established the *ad hoc* Committee for the Vannevar Bush Award. He invited Board Members interested in serving on the committee to contact Dr. Crosby. The Chairman would later confirm appointments to this committee and schedule a meeting.

e. Board Committee Membership

An updated list of Board committee memberships (NSB-06-105) was distributed to Board Members with their supplemental Board Book materials. The list was complete except for new Board Member, Mr. Arthur Reilly, who agreed to serve on the following committees: EHR Subcommittee on Science and Engineering Indicators; Committee on Programs and Plans; and the Task Force on International Science. Dr. Beering also mentioned that all Board Members were welcome to attend all committee meetings and to participate fully in deliberations. He thanked Board Members for agreeing to serve on committees.

f. Board Commission on 21st Century Education in STEM

Dr. Beering invited Dr. Jo Anne Vasquez, a Board Member and Commission Vice Chairman, to report on the Commission on 21st Century Education in Science, Technology, Engineering and Mathematics (STEM). She reported that the Commission met for the first time August 3-4, 2006 at the National Science Foundation and will meet again November 20-21, 2006 in Chicago. The Commission established working groups to formulate recommendations for consideration by the full Commission at their November meeting. Each working group chairman is a member of the Commission, and each working group recruited several additional experts. Dr. Vasquez is the chairman of the working group focusing on STEM curriculum. The Commission expects to provide a draft report to the Board at the meeting in February 2007.

AGENDA ITEM 7: Director's Report

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

a. NSF Staff Announcements

Dr. Edward Hackett joined NSF as Director of the Division of Social and Economic Sciences, Directorate for Social, Behavioral, and Economic Sciences (SBE), on July 14, 2006 from Arizona State University, where he serves as Professor for the School of Human Evolution and Social Change and School of Life Sciences, and the Consortium for Science Policy and Outcomes. He received his Ph.D. in Sociology in 1979 from Cornell University.

Dr. Peter March began serving as Director of Division of Mathematical Sciences, Directorate for Mathematical and Physical Sciences, on September 1, 2006. Dr. March came to NSF from Ohio State University where he serves as Chairman of the Mathematics Department and Professor of Mathematics. He received his Ph.D. in Mathematics in 1983 from the University of Minnesota.

Dr. Tony Chan will join NSF as Assistant Director, Directorate for Mathematical and Physical Sciences on October 1, 2006. Dr. Chan presently serves as Dean of Physical Sciences at the University of California at Los Angeles. He received his Ph.D. in Computer Science in 1978 from Stanford University.

Dr. Cora Marrett agreed to join NSF as Assistant Director, Directorate for Education and Human Resources on February 1, 2007. Dr. Marrett currently serves as Senior Vice President for Academic Affairs for the University of Wisconsin System. She served as NSF's first Assistant Director for Social and Behavioral Sciences in the early 1990s.

b. Congressional Update

The NSF Director reported that the Government anticipated a continuing resolution, enacted prior to the congressional recess, and effective through mid-November 2006. He also reported that he had testified at the following hearings:

- September 20, 2006, testified before the Research Subcommittee of the House Science Committee on the International Polar Year;
- September 21, 2006, before the House Science Committee on Nanotechnology Research, Environmental, Health, and Safety Impacts; and
- September 26, 2006, Dr. Bement testified before three congressional committees: House Transportation and Infrastructure Committee on the National Academy's Report on Icebreaking; a joint hearing of the Senate Commerce, Science, and Transportation Committee; as well as the Senate Foreign Relations Committee on the International Polar Year.

He further reported on several pieces of pending legislation affecting NSF:

- S. 3790 was introduced by Senator Hillary Clinton (D-NY) on August 3, 2006, entitled "National Mathematics and Science Consistency Act," and referred to the Committee on Health, Education, Labor and Pensions. This legislation authorizes the Secretary of Education to convene a panel to produce voluntary national expectations for mathematics and science education accompanied by a sample curriculum for grades K-12; and
- S. 2802, introduced by Senator John Ensign (R-NV) entitled "National Competitiveness Investment Act" was being revised. The circulated discussion draft would authorize a 5-year doubling of the NSF budget.

AGENDA ITEM 8: Committee Reports

a. Executive Committee (EC)

Dr. Bement, EC chairman, stated that Dr. Beering reported to Congress on September 11, 2006 that there had been no delegation of authority related to funds appropriated for any project in the MREFC account during the past year.

Dr. Crosby updated the committee on the subject of substitute negotiators for Board Member proposals and presented information on the process and regulations relating to this area.

Dr. Bement also reported on NSF personnel updates and the status of an executive staff search.

b. Audit and Oversight (A&O) Committee

Dr. Dan Arvizu, A&O chairman, reported on three primary agenda items. Ms. Jill Schamberger, Office of Inspector General (OIG) Audit Manager, presented the results of her audit on the level of interest among NSF stakeholders in providing more research results directly to the public. In its report, the OIG cites Government surveys and their own interviews with NSF constituent organizations, which indicated a broad interest in more research results available, mainly in the form of brief summaries and publication citations. The report recommends that NSF: (1) consider posting final project reports, conference proceedings, and/or journal article abstracts; and (2) advocate in its role as a participant on the Government-wide committee for including brief summaries as part of a standardized format. Ms. Schamberger also briefed the committee about two related audit reports that OIG has issued in the past 2 years.

Dr. George Strawn, NSF Chief Information Officer, gave a brief history of NSF's ongoing leadership in making research information accessible. He reported on plans to enhance the award search function this year so that publication references to the results of NSF-funded projects are available to the public on the NSF Web site. Dr. Kathie Olsen, NSF Deputy Director, affirmed the agency's participation in the effort of the National Science and Technology Council's Research Business Model to develop a Government-wide research progress report format. A subsequent meeting will include a report on these efforts.

Mr. William Harrison, OIG Deputy Associate for Audit, presented the FY 2007 Annual Audit Plan. Mr. Harrison explained the risk analysis that serves as the basis for the audits that are selected by OIG. However, approximately 47 percent of the audits are either required by law, such as financial statements and information technology security audits, or are requested by NSF. Included among the OIG-initiated audits for this coming year are a study of time and effort reporting, audits related to the merit review process, audit resolution, and emergency preparedness.

In a follow-up discussion, A&O focused on one aspect of the audit plan, which was the planned audit that will look at NSF's oversight of Science and Technology Centers. There was concern about the importance of clearly framing review criteria for this type of audit activity around compliance, with existing policy and areas for employment, and not a subjective judgmental

framework. According to Ms. Schamberger, the audit is still in survey phase and the criteria are being developed. She emphasized that the audit would focus on NSF's oversight of science and technology centers (STCs) and not the practice of STCs themselves.

Mr. Thomas Cooley, NSF Chief Financial Officer, reported on the status of the agency's efforts to address the FY 2005 financial statement audit reportable conditions. Although the plans have been implemented, final information will be available late in the cycle, but too late for the auditors to close on the reportable conditions for FY 2006. Specific to post-award monitoring, NSF has demonstrated ongoing progress over the past 5 years, implementing an extensive risk-based grants post-award business monitoring program that includes risk assessments, structured site visits, voucher reviews and - new this year - contractor supported desk reviews. Progress was also being made on contract monitoring, however, work remains and the committee will closely monitor progress to help ensure resolution of this condition in a timely fashion.

Mr. Salvatore Ercolano, with the accounting firm Clifton Gunderson LLP (NSF's financial auditors), indicated that Mr. Cooley's slides, as presented, accurately represented the current status of the financial statement audit. His full report will be provided at the November 2006 A&O meeting.

Mr. Cooley also provided an update on NSF's progress for implementing new Government-wide internal controls requirements. He also provided the committee with a synopsis of the rules governing agency audit cognizance in response to a discussion at the May 2006 meeting of the Board.

c. Education and Human Resources (EHR) Committee

Dr. Elizabeth Hoffman, EHR chairman, reported that the committee heard from two guest speakers. Dr. William Rees, Jr., Deputy Under Secretary of Defense for Laboratories and Basic Sciences provided the committee with a comprehensive overview of the Department of Defense (DoD) civilian and science and engineering (S&E) workforce and the DoD STEM workforce education efforts as well as the needs for cutting-edge talent in S&E across the disciplines, especially for engineering. He reviewed the DoD program intended to improve STEM education: the Science, Mathematics and Research for Transformation (SMART) program, which is a reincarnation of the 1960s National Defense Education Act program. The SMART program, open to only U.S. citizens, requires high quality performance in defense-critical disciplines and offers scholarships and fellowships through the Ph.D. level as well as employment while enrolled. SMART is intended to provide comprehensive education and training to shape the workforce.

The committee also heard from guest speaker, Dr. Daniel Denecke, Director of Best Practices Initiatives at the Council of Graduate Schools (CGS), which serves the graduate community through a variety of initiatives focusing on issues affecting all areas of graduate education. Best practice initiatives test solutions to important issues and offer recommendations to improve the quality of graduate education. Dr. Denecke presented preliminary results for the Ph.D. Completion Project, which is a 3-year grant-funded project designed to address issues surrounding Ph.D. completion and attrition. The Ph.D. Completion Project aims to produce the

most comprehensive and useful data on attrition from doctoral study and completion of Ph.D. programs. He described the measurement challenges and completion rate for data being collected, and explained the second phase that will test interventions for improving completion.

Dr. Wanda Ward, Acting Assistant Director of the EHR Directorate, provided the committee with a presentation on the role of NSF in STEM education relative to the Academic Competitiveness Initiative (ACI). Dr. Ward identified current drivers that shape the future of STEM education, NSF projects linked to those drivers, and NSF's leadership role in STEM education. Key drivers shaping the future include external global competition, and several key reports that have led to the American Competitiveness Council (ACC) and ACI. NSF is the principal source of Federal support for strengthening STEM education across all levels and is uniquely positioned to lead the Nation in STEM education. Dr. Ward also described the current status of NSF STEM education programs, noting that NSF received the highest rating possible for 27 STEM education programs assessed under the Office of Management and Budget (OMB) Program Assessment Rating Tool (PART). PART looks at all factors that affect and reflect program performance, including program purpose and design, performance measurement, evaluations and strategic planning, program management, and program results.

The committee also reviewed the recent congressional request from Congressman Rush Holt to Board Chairman, Dr. Beering. Congressman Holt requested that the Board provide a summary of its review of the NSF EHR Directorate programs, with respect to evaluation procedures and results, to include information on how the findings have enhanced the education portfolio. Dr. Hoffman stated that a draft Board response will be prepared, based in part on the information mentioned by Dr. Bement, and that more discussion on this issue will occur at the November 2006 meeting of the committee. Dr. Bement informed the Board that NSF had already compiled a summary similar to what Congressman Holt requested and would provide the summary to the Board.

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

Dr. Hoffman reported for Dr. Louis Lanzerotti, SEI chairman. She stated that Dr. Lanzerotti reminded the Board that SEI is an important Board product and emphasized that Board Members have a key role in the development of both the Board's Companion Piece and "Digest" (condensed) version of *Science and Engineering Indicators (Indicators) 2008*. At the SEI meeting, the chapter authors for the 2008 volume of *Indicators* were introduced to the subcommittee and other Board Members present. The subcommittee discussed the eight chapter outlines, which were sent to both the subcommittee and the full Board prior to the meeting. For each of the chapters, one of the authors presented a 2- to 3-minute introduction to the chapter highlighting the main topics to be covered and any major changes from the previous edition of *Indicators*, which was followed by a discussion of the chapter with Board Members offering comments and suggestions. All Board Members were asked to write their comments and suggestions and to send them to Dr. Lanzerotti and Dr. Alan Rapoport, SEI Executive Secretary. The authors were asked to revise their outlines based on the suggestions and comments, and the revised outlines will be sent to SEI members.

Dr. David Lightfoot, Assistant Director, Directorate for Social, Behavioral, and Economic Sciences, gave a presentation on NSF plans for an effort on the Science of Science and Innovation Policy.

Time limitations precluded a parallel discussion of *Indicators 2010*, which was rescheduled for the November 2006 meeting. Dr. Lanzerotti suggested that the subcommittee consider inviting a number of key state users of S&E indicator data to a future meeting, or to a special meeting, to discuss the state chapter in order to determine the usefulness of the data and to obtain suggestions for additional state coverage. Dr. Lanzerotti also asked Board Members for possible topics for the Companion Piece to *Indicators 2008* and requested that the titles and abstracts of the last four Companion Pieces be sent to subcommittee members. He concluded the meeting with a reminder that all Board Members are expected to review at least one chapter and that a review matrix for each chapter will be compiled in November 2006.

e. *ad hoc* Engineering Education Group

Dr. Hoffman also reported on behalf of *ad hoc* group lead, Dr. Daniel Hastings. The *ad hoc* group, composed of Drs. Daniel Hastings, Louis Lanzerotti, and Wayne Clough, continued to move forward with plans to hold a second workshop on engineering education entitled, "Moving Forward to Improve Engineering Education," scheduled for November 7, 2006 at Georgia Institute of Technology with leading deans of engineering. The purpose of the workshop is to discuss how NSF programs and activities can contribute to the Engineer 2020 efforts of the National Academy of Engineering and specifically address some of the major issues raised during the previous workshop at the Massachusetts Institute of Technology, October 20, 2005. In particular, the workshop will focus on: NSF's understanding of issues associated with retention of undergraduate engineering students, ways NSF could enhance the educational experience of engineering students, and how NSF could contribute to an understanding of the societal trends and industrial practices that may discourage students from pursuing engineering. The *ad hoc* group invited all Board Members to participate in the workshop and roundtable discussion. Interested Board Members were asked to contact Dr. Crosby. Following the second workshop, the *ad hoc* group plans to prepare a draft report synthesizing findings and recommendations of both workshops.

f. Committee on Programs and Plans (CPP)

Dr. Kenneth Ford, CPP chairman, reported on the status of several task forces and a subcommittee.

Dr. Douglas Randall, chairman of the Task Force on Transformative Research (TR), reported that a draft report is expected in the next few weeks and a final report is anticipated by the November 2006 meeting.

Dr. Kelvin Droegemeier, co-chairman of the Task Force on Hurricane Science and Engineering (HSE) with Dr. Ford, reported on the status of the draft report, and thanked task force members, NSB staff, and NSF staff for their hard work on this project. The committee recommended forwarding the draft report to the full Board for approval.

The Board unanimously APPROVED the draft report, *Hurricane Warning: The Critical Need for a National Hurricane Research Initiative* (NSB-06-104) for release for public comment.

On September 29, 2006, the approved draft report for public comment would be transmitted to the President and Congress, and released to the public for comment. The committee expects to bring the final report to the Board meeting in November 2006.

Dr. Barry Barish, chairman of the Subcommittee on Polar Issues (SOPI), reported that the subcommittee heard extensive updates on activities related to the International Polar Year, including education and outreach activities and international coordination. Dr. Karl Erb, NSF Director of the Office of Polar Programs, briefed the subcommittee on several issues related to icebreaking, including investments in the *Polar Sea*, which is ready for service, and the Swedish vessel, *Odin*.

Dr. Jon Strauss, chairman of the Task Force on International Science (INT), reported that the task force completed a productive roundtable in Singapore on September 25, 2006. The task force is considering future international meetings and sites.

CPP discussed the timing and circumstances of the annual Board reexamination of priority order for MREFC candidates. The committee approved a revision to the timing for annual reexamination of the priority order of MREFC candidates for new start projects to coincide with the approval of the NSF budget in August. A full Board review of the MREFC Facilities Plan will take place every third year with annual updates. In addition, the release of the NSF Facility Plan will be delayed until the release of the President's Budget each February.

Finally, the committee reviewed a summary of the process for developing the annual schedule for action and information items from the NSF Director's Review Board to be brought before the Board, with an overview of the past year. NSF is in the process of developing a tentative calendar for FY 2007. Dr. Olsen will be meeting with Dr. Crosby to discuss the calendar in November 2006. CPP anticipates that this annual schedule will be presented during the November 2006 meeting.

g Committee on Strategy and Budget (CSB)

Dr. Ray Bowen, CSB chairman, reported that the committee had three information items. The first item was a continuation of discussions of the related issues of award size, duration, and success rates. The committee heard an update on the work of the NSF Task Force on Impact of Proposals and Award Management Mechanisms by Dr. Joanne Tornow, Senior Advisor, (Planning, Policy, and Analysis), Office of the Deputy Director. This task force has the charge to identify best practices to achieve an appropriate balance between the proposals' success rates, award size and duration with an emphasis on individual investigator initiated grants. CSB will hear an extended report from this task force at the November 2006 meeting.

Dr. Bement gave the committee an update on the 2007 budget request, and he reminded CSB that this budget had been approved but with small, yet significant, differences by both the House and Senate. The conference committee had not yet met and the committee speculates that NSF will

operate on a Continuing Resolution at least until November 2006 and possibly longer. He indicated that the budgets for both the House and the Senate, although representing healthy increases overall, do contain reductions in the S&E portion of the NSF budget.

Lastly, the committee had an update on the status of the *NSF Strategic Plan FY2006 – 2011* from Dr. Olsen. She stated that, with minor changes by OMB, this plan had been adopted and approved and was proceeding with the next step - to be presented to the House and Senate. The committee members were provided copies of that final version of the Strategic Plan.

Dr. Beering adjourned the Open Session at 2:10 p.m.

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

Ann A. Ferrante
Writer-Editor
National Science Board Office