

**APPROVED MINUTES¹
OPEN SESSION
417TH MEETING
NATIONAL SCIENCE BOARD**

National Science Foundation
Arlington, Virginia
December 1-2, 2010

Members Present:

Ray M. Bowen, Chairman
Esin Gulari, Vice Chairman
Mark R. Abbott
Barry C. Barish*
Steven C. Beering*
Camilla P. Benbow
France A. Córdova **
Kelvin K. Droegemeier*
José-Marie Griffiths**
Elizabeth Hoffman*
Alan I. Leshner*
Douglas D. Randall
Arthur K. Reilly
Diane L. Souvaine
Jon C. Strauss*
Kathryn D. Sullivan*
Richard F. Thompson

Subra Suresh, *ex officio*

Members Absent:

John T. Bruer
Patricia D. Galloway
G.P. “Bud” Peterson
Thomas N. Taylor

¹ The minutes of the 417th meeting were approved by the Board at the February 2011 meeting.

* Consultant

** Participated by telephone

The National Science Board (Board, NSB) convened in Open Session at 1:00 p.m. on Thursday, December 2, 2010 with Dr. Ray Bowen, Chairman, presiding (Agenda NSB-10-77, Board Book page 179). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 7: Presentation by the 60th Anniversary “Voices From the Future”
Distinguished Speaker, Dr. Emily Brodsky

In commemoration of the Board’s 60th Anniversary this year, the Board had the third [and final] Distinguished Speaker in the “Voices from the Future” lecture series.

Dr. Kathryn Sullivan, a member of the Task Force on the NSB 60th Anniversary [and alumni of the University of Santa Cruz], stated that the Distinguished Lecture Series was made possible through the efforts of the Board’s Task Force on the NSB 60th Anniversary with the help of NSF’s 60th Anniversary Working Group. Speaker nominations were based on the following criteria for individuals who: are early in their careers with potential for making an impact on science education, have made stunning discoveries that have influenced the direction of science, are notable as the “best minds in science,” have contributed to research that benefits society, and display a passion about their research.

Dr. Sullivan introduced Dr. Emily Brodsky, an earthquake physicist and Associate Professor of Earth and Planetary Sciences at the University of California, Santa Cruz. Dr. Brodsky’s research primarily focuses on identifying the processes that trigger earthquakes. She is best known for quantifying the role of seismic waves in earthquake triggering and constraining the role of lubrication in fault slip. Professor Brodsky has also worked on the interactions between seismic waves and hydrological systems, and she studies other rapid geological processes such as landslides and glacial slip. She earned her B.A. degree from Harvard, and holds a Ph.D. from the California Institute of Technology. She has been honored with awards from the Seismological Society of America and the American Geophysical Union, where she is a Fellow. (Brief Biography, Board Book page 228)

Dr. Brodsky gave a presentation on “Earthquakes Triggered by Seismic Waves,” and explained why earthquakes happen and what happens when earthquakes start. She described how seismic waves trigger earthquakes, how calibrating triggering rate changes, and various technologies used to calculate earthquakes. (Slides, Board Book Addendum)

Dr. Sullivan thanked Dr. Brodsky for her presentation, and then gave an historical perspective on the 60th Anniversary, reflecting on the beginnings of NSF and the Board. On May 10, 1950, President Truman signed a new law, P.L. 81-507, that “established in the executive branch of government an independent agency to be known as the National Science Foundation.” Seven months later, on December 12, 1950, a distinguished group gathered at the White House for the first meeting of the National Science Board.

Dr. Sullivan was pleased to announce that President Obama sent a letter to honor the 60th Anniversary. The letter read as follows:

“I send greetings to those celebrating the 60th anniversary of the National Science Foundation (NSF).

When President Harry S. Truman signed legislation creating the NSF in 1950, he acknowledged the tremendous role of scientific advancement in the growth and progress of our Nation. President Truman sought to deepen our understanding in each branch of science and utilize this knowledge to maintain America’s leadership in the world.

Over the past 60 years, the NSF has made immeasurable contributions to our Nation through its work to support gold-standard scientific research; provide impartial advice to Presidents and Congress; and cultivate science, technology, engineering, and mathematics education in our schools. These efforts have not only promoted American innovation, but also driven our economic progress and enhanced our national security.

Today, the NSF continues its critical mission by working to advance the frontiers of knowledge; cultivate a world-class, broadly inclusive science and engineering workforce; and expand the scientific literacy of all our citizens. By building on the ingenuity of our people, the NSF is helping ensure we succeed in the next century and lead the world in developing the technologies, businesses, and industries of the future.

As you reflect upon six decades of service to our Nation, I hope you take pride in your accomplishments. I wish you all the best.”

Signed: Barack Obama. (Letter, Board Book Addendum)

Dr. Sullivan shared the following Anniversary highlights in honor of the 2010 milestone year.

- A Symposium was held at the American Association for the Advancement of Science (AAAS) Annual Meeting in February 2010. Called “The Future of NSF on Its 60th Anniversary,” it brought together a distinguished panel of five former NSF Directors as well as the current NSF Director, who gave enlightening presentations.
- With the 60th Anniversary Distinguished Speakers Series, “Voices From the Future,” three notable “best minds in science” gave presentations to the Board and the public during the February, August, and December 2010 meetings.
- The Symposium and Distinguished Speaker presentations and interviews were video-taped and edited, and placed on the NSF and NSB Web sites.
- Also available on the NSF Web site is the “Sensational 60,” which is a compilation of 60 discoveries and advances that NSF believes have had a large impact or influence on every American’s life.
- A logo for “Celebrating 60 Years of Discovery” was created and used in various presentations, publications, and events throughout the year, as well as on NSF apparel offered for purchase through the NSF Employee Association.
- Among the congressional activities in honor of the 60th Anniversary are House Resolution 1307 honoring NSF for 60 years of service to the Nation, and a U.S. flag flown over the U.S. Capitol to commemorate NSF’s 60th Anniversary on May 10, 2010.
- Lastly, banners with the Anniversary logo were hung in both Stafford I and II buildings, and a nostalgic “Golden Oldies” video series of NSF staffers presented during lunchtime sessions.

Dr. Sullivan stated that these accomplishments would not have been possible without the hard-working efforts of all the units in the Office of Legislative and Public Affairs (OLPA), which provided significant contributions; the various directorates that provided input to the “Sensational 60;” and the NSF 60th Anniversary Working Group. Dr. Sullivan thanked all the NSF staff who contributed to the 60th Anniversary accomplishments.

On behalf of Dr. Patricia Galloway, chairman of the Task Force on the NSB 60th Anniversary, Dr. Sullivan also thanked the members of the task force - Drs. Camilla Benbow, John Bruer, José-Marie Griffiths, Douglas Randall, and Thomas Taylor - for their service during the past 2 and-a-half years. Dr. Bowen also extended the Board’s appreciation and thanks to the task force, especially Dr. Galloway, for their work to make this a successful activity. Finally, Dr. Sullivan thanked the two task force Executive Secretaries, Ms. Ann Ferrante and Ms. Karen Sandberg, who worked diligently behind the scenes to achieve the Anniversary activity and project goals.

[In honor of the 60th Anniversary of NSF and NSB, Dr. Galloway wrote and presented “The Birth of NSF and NSB” at the NSB Holiday Reception on December 1, 2010. (Appendix A)]

AGENDA ITEM 8: Presentation on “NSF Open Government,” Dr. José Muñoz

Dr. José Muñoz, Chief Technology Officer, Office of the Director, spoke on “NSF Open Government.” Dr. Muñoz reported that the Transparency and Open Government memo was signed by President Obama on January 21, 2009, followed by a Directive on Open Government from the Office of Management and Budget (OMB) 12 months later to implement three goals: transparency, participation, and collaboration. Each agency is required to develop an Open Government and an Implementation Plan. He explained that the Directive identifies milestones and actions for each agency to meet, and presented the government’s interest in the use of challenges and prizes to engage the public. Executive departments and agencies are required to identify a series of data sets, publish Open Government information online in a machine-readable format, and assure the quality of the published data. Each department and agency is required to report monthly on progress on their plan. NSF is currently working on a “flagship” initiative lead by the Directorate for Social, Behavioral, and Economic Sciences (SBE) and in discussion with the Office of Science and Technology Policy (OSTP). Dr. Muñoz also provided Web sites of interest, along with prizes and challenges for this initiative. Several Board Members noted with concern that, by requiring that all published data be machine-readable, data can be revised and potentially modified slightly and plagiarized. (Slides, Presentation Book page 74)

AGENDA ITEM 9: Presentation on “NSF Response to Oil Spill Research,” Dr. Timothy Killeen

Dr. Timothy Killeen, Assistant Director, Directorate for Geosciences (GEO), gave a presentation entitled, “Deepwater Horizon Gulf of Mexico Oil Spill NSF Response Support.” Dr. Killeen described the location of the accident, well design issues, and what went wrong on April 20, 2010 that allowed for the explosion on the Deepwater Horizon drilling rig and subsequent oil spill in the Gulf of Mexico. He also illustrated the NSF rapid response research effort, which included a total of \$19,432,224 in 166 NSF awards, and gave specific examples of the various rapid awards (an

award category invented to create a fast response capability for NSF). (Slides, Presentation Book page 81)

AGENDA ITEM 10: Presentation on “Update on Science, Engineering, and Education for Sustainability (SEES),” Dr. Timothy Killeen

Dr. Killeen also gave a presentation on SEES. He explained the goals of SEES – which include the advancement of environmental and energy science, engineering and education, and education to inform societal actions. Secondly, SEES’ goal is to develop the technical workforce and the informed society that is needed to understand these complex issues of sustainability. Further, he described the NSF SEES organization overview and SEES focal points for FY 2011, which include responding to the NSB report, *Building a Sustainable Energy Future: U.S. Actions for an Effective Energy Economy Transformation (NSB-09-55)*. The SEES initiative is planned to continue through FY 2015, and involves all NSF research and education units. Responding to questions from Dr. Douglas Randall, Dr. Killeen stated that SEES has a 12 to 15 percent proposal success rate, and that many proposals were for transformative research. (Slides, Presentation Book page 98)

AGENDA ITEM 11: Approval of Open Session Minutes, August 2010

The Board unanimously APPROVED the Open Session minutes of the August 2010 Board meeting (NSB-10-58, Board Book page 194).

AGENDA ITEM 12: Approval of Open Session Minutes, September 2010

The Board unanimously APPROVED the Open Session minutes of the September 2010 Board meeting (NSB-10-73, Board Book page 221).

AGENDA ITEM 13: Chairman’s Report

Dr. Bowen announced and reported on several items:

a. NSB Outreach

On October 6, 2010, Dr. Bowen participated in a day-long symposium in Japan in honor of the 50th Anniversary of NSF’s Tokyo Regional Office, and he was able to observe the enormous success of that international program. The U.S.-Japanese cooperation is a significant result of the efforts of that office. Dr. Bowen gave a presentation on the impact of 50 years of U.S.-Japan science and technology cooperation on advances in science and engineering research and education through a U.S. perspective. (Board Book page 229)

Also, on October 10, 2010, Dr. Bowen was the keynote speaker at the Richard E. Smalley Institute for Nanoscale Science and Technology at Rice University, which was in honor of the discovery of buckyballs some 25 years ago and the subsequent rise of the nanotechnology industry. Dr. Bowen

thanked Ms. Jennie Moehlmann, Board Office staff, and Dr. Mihail Roco, NSF Senior Advisor for Nanotechnology, Directorate for Engineering (ENG), for assistance with the speech. (Board Book page 236)

Additionally, Dr. Bowen worked with Board Members to prepare a response to a National Research Council (NRC) study that focused on the health and competitiveness of our Nation's research universities, which was submitted to the NRC Committee on Research Universities on November 23, 2010. (Letter, Board Book Addendum)

b. Committee Announcement

Dr. Bowen discharged the Task Force on the NSB 60th Anniversary, with thanks to Dr. Patricia Galloway, chairman, and Drs. Camilla Benbow, John Bruer, José-Marie Griffiths, Douglas Randall, Kathryn Sullivan, and Thomas Taylor, members.

c. Board Member Recognition

Dr. Elizabeth Hoffman was recently named the recipient of the 2010 Carolyn Shaw Bell Award. This award by the American Economic Association (AEA) recognizes her achievements which, by example, have furthered the status of women in the economics profession. The award will be presented at the annual meeting of the AEA in Denver, Colorado, in January 2011. Dr. Hoffman then recognized Dr. Rachel Croson, who she mentored. Dr. Croson recently joined the NSF staff (See: Director's Report).

d. Welcome to NSF Director

On behalf of the entire Board, Dr. Bowen welcomed Dr. Subra Suresh, the 13th NSF Director. Dr. Suresh came to NSF from the Massachusetts Institute of Technology (MIT) where he most recently served as the Dean of the Engineering School and the Vannevar Bush Professor of Engineering. The U.S. Senate confirmed Dr. Suresh for the 6-year term on September 29, 2010, and he was sworn-in on October 18, 2010. Dr. Suresh succeeded Dr. Arden Bement, who led the agency for 6 years, from November 2004 until May 2010. He also thanked Dr. Cora Marrett, Acting NSF Deputy Director, for her service as Acting NSF Director from June to October 2010.

AGENDA ITEM 14: Director's Report

Dr. Subra Suresh, NSF Director, reported on the following items:

a. NSF Staff Introductions

Dr. Rachel Croson joined NSF as Division Director, Division of Social and Economic Sciences (SES), Directorate for Social, Behavioral, and Economic Sciences (SBE), on September 7, 2010. She came to NSF from the Negotiations Center, School of Economic, Political and Policy Sciences and School of Management at the University of Texas at Dallas where she served as the Director. Dr. Croson received her Ph.D. in Economics from Harvard University in 1994.

Dr. Keith Marzullo joined NSF as Division Director, Division of Computer and Network Systems (CNS), Directorate for Computer and Information Science and Engineering (CISE), on September 20, 2010. He came to NSF from the University of California, San Diego, where he served as the Chairman for the Department of Computer Science and Engineering. Dr. Marzullo received his Ph.D. in Electrical Engineering from Stanford University in 1984.

Dr. Matthew Platz joined NSF as Division Director, Division of Chemistry (CHE), Directorate for Mathematical and Physical Sciences (MPS), on September 27, 2010. Dr. Platz came to NSF from The Ohio State University where he served as the Distinguished University Professor of Chemistry and the Interim Dean of the College of Biological Sciences. Dr. Platz received his Ph.D. in Chemistry from Yale University in 1977.

Dr. John C. Wingfield joined NSF as Division Director, Division of Integrative Organismal Systems (IOS), Directorate for Biological Sciences (BIO), on September 29, 2010. He came to NSF from the University of California, Davis where he served as a Professor in the Department of Neurobiology, Physiology, and Behavior. Dr. Wingfield received his Ph.D. in Zoology and Comparative Endocrinology from the University College of North Wales in 1970.

Dr. Farnam Jahanian, Chairman of the Computer Science and Engineering Division at the University of Michigan in Ann Arbor, will join NSF in February 2011 to head CISE.

b. Staff Departures

Dr. Suresh announced the retirement of Dr. Lance Haworth, Director, Office of Integrative Activities (OIA), on December 31, 2010. Dr. Haworth joined NSF in 1984 and worked in the Division of Materials Research (DMR). He served as the first Program Director for Materials Research Groups, then for Materials Research Laboratories, and led planning and implementation for the Materials Research Science and Engineering Centers (MRSEC) Program. Dr. Haworth also served as Executive Officer for DMR from 1996 to 2006, then as Acting Division Director from 2006 to 2007. He was appointed OIA Director in 2008. Dr. Suresh stated that Dr. Haworth's performance has been exemplary, and that NSF owes him a debt of gratitude for his exceptional leadership in many different roles at NSF. He will be sorely missed at NSF, but NSF staff look forward to engaging and interacting with him in the years to come. Dr. Suresh extended his personal congratulations and thanks, both as a personal friend and as a colleague.

c. NSF Congressional Update

For the congressional update, Dr. Suresh reported that since the September NSB meeting, the Senate confirmed his nomination to be NSF Director.

On September 30, 2010, the President signed into law a Continuing Resolution to keep the Federal Government operating at FY 2010 levels through December 3, 2010. On December 1, 2010, the House of Representatives passed another continuing resolution through December 18, 2010, and the Senate was expected to pass it on December 2 or 3. It was unclear what direction Congress would take regarding the FY 2011 Budget beyond December 18, 2010.

Dr. Suresh also reported that there was no further action on the America COMPETES Reauthorization Act, and it was unclear if Congress would make any effort to pass it before adjournment.

d. National Medal of Science Recipients

Dr. Suresh reported that the 2009 National Medal of Science and the National Medal of Technology and Innovation were presented by President Obama on November 17, 2010 at the White House. There were 10 National Medal of Science awardees and 6 National Medal of Technology and Innovation awardees; 3 of the latter received a team award for their work on microchips. Of the 10 Medal of Science laureates, 9 had ties to NSF and some had ties to NSB, which included Dr. Warren Washington, who served on the Board from 1994 to 2006 and was NSB Chairman from 2002 to 2006; and Dr. Marye Anne Fox, who served on the Board from 1990 to 1996, [and was NSB Vice Chairman from 1994 to 1996].

Nine of the 10 Medal of Science laureates received grants from NSF at some point in their careers: Drs. Yakir Aharonov, Stephen Benkovic, Esther Conwell, Marye Anne Fox, Susan Lindquist, David Mumford, Stanley Prusiner, Warren Washington, and Amnon Yariv (who received a grant *this* year). Only Dr. Mortimer Mishkin, a National Institutes of Health (NIH) employee, did not receive NSF funding. These facts highlight the importance of NSF research in the national portfolio and the excellence and potential historical significance of NSF-funded investigators.

The call for nominations for the 2010 National Medals of Science will open in January 2011. NSF is eager to receive nominations from all sources, particularly for underrepresented groups, for this prestigious award.

AGENDA ITEM 15: Open Committee Reports

a. Committee on Audit and Oversight (A&O)

Mr. Arthur Reilly, A&O chairman, reported that the committee acknowledged that the approval process for the transmittal letter and management response for the *Office of Inspector General (OIG) Semiannual Report to Congress, September 2010* took place electronically in advance of the meeting.

Dr. Cora Marrett, Acting NSF Deputy Director, and Dr. Judith Sunley, newly-appointed Interim Chief Human Capital Officer, discussed NSF's efforts to enhance Human Resource Management, which is critical for NSF's ability to meet its mission requirements. NSF is addressing recommendations from a wide-range of sources including OPM, OIG, and staff working groups. First steps are to align over 200 separate recommendations into an integrated priority list. An internal NSF Human Capital Council is being launched and a number of steps are underway already, with top priorities being quality of executive leadership and performance accountability.

Ms. Allison Lerner, Inspector General, announced that indictments were issued in San Diego against a former school superintendent and two college professors for conspiring to divert NSF

and Department of Education grant money to their own benefit. OIG investigators worked to resolve this difficult case and deserve to be commended.

Mr. Sal Ercolano, Clifton Gunderson LLP and Partner-in-Charge of NSF financial statement audit, presented the results of his report. The auditors gave NSF an unqualified opinion, NSF's 13th in a row. They found no material weaknesses, but identified one significant deficiency related to the administration of cost reimbursement contracts that is a repeat from the previous audit. Although the auditors noted improvements made by the agency over the past year, cost surveillance procedures for contracts continue to be inadequate in their opinion. The report recommends that NSF continue to implement corrective actions including improved monitoring procedures and obtaining timely audits of contractor's costs. They also suggested that NSF should immediately begin to meet with OIG to resolve the findings contained in the recent Defense Contract Audit Agency (DCAA) audit report that questioned a proposed \$88 million contingency reserve fund. Regarding the Federal Information Security Management Act (FISMA) report on NSF's IT security program, Mr. Ercolano reported that no significant deficiencies were found. However, seven matters are classified as "other weaknesses," and two have been repeated each year since 2006.

Dr. Brett Baker, Assistant Inspector General for Audit, presented the OIG's FY 2011 Audit Plan. Dr. Baker stated that the audits chosen focus on what is considered by OIG to be the greatest risk to NSF and explained how that is determined. He said that OIG will be implementing a new audit plan methodology next year, which will employ newly developed data analytics. Dr. Baker described the American Recovery and Reinvestment Act (ARRA) related work that OIG is planning to perform over the next year, and also discussed the issue of contingency reserves for major infrastructure projects and why they have attracted the attention of auditors. Finally, he briefed the committee on the agency's new audit resolution policy, jointly developed by OIG and NSF management, and the belief that the policy will help forge a more collaborative working relationship.

Ms. Martha Rubenstein, Chief Financial Officer (CFO), gave an update on a variety of matters. She also discussed the FY 2010 Financial Statement audit and the agency's 13th consecutive, "clean," unqualified audit opinion. NSF continues to address the Significant Deficiency in Contract Monitoring of Cost Reimbursable Contracts. NSF engaged the DCAA for a number of these efforts, as required, and is, as Board Members noted, constrained by the reliance on this external support. She also indicated that NSF will aggressively pursue audit resolution with OIG on the DCAA audit that related to large construction project contingency costs. She noted that in addition to NSF's use of this methodology since 1995, there is precedent with Department of Energy and the National Aeronautics and Space Administration (NASA) in using similar approaches. She also discussed the importance of developing a new agency financial systems (iTRAK). Formal approval from the Office of Management and Budget (OMB) is expected shortly.

Ms. Andrea Norris, Chief Information Officer (CIO), reported on the results of the annual FISMA review. Ms. Norris reported that there were no significant findings in the past 7 years. The FY 2010 FISMA review was positive, and she noted that NSF appreciated the continued coordination between the OIG, Clifton Gunderson, and NSF staff throughout the extensive, 10-month review process. NSF's dynamic, multi-layered, risk-based cyber-security program continues to assure that NSF information and technology assets are appropriately protected while maintaining an open and collaborative environment for scientific research and discovery. In discussions, A&O recognized the challenges faced by the NSF,

and stressed the importance of a risk-based approach for security efforts. The committee commended NSF for its overall approach and the positive results of the FY 2010 FISMA assessment.

Lastly, Dr. Kelvin Droegemeier reported on the CPP discussion held on November 30, 2010 about rethinking NSB's delegation methodology and overall programmatic oversight approaches. There was a consensus that maintaining a single delegation threshold was the best approach. Additional discussion will take place via teleconference before the February 2011 meeting, and the committee expects to address an action item on this topic at the February 2011 meeting.

b. Committee on Education and Human Resources (CEH)

Dr. Elizabeth Hoffman reported on behalf of Dr. Camilla Benbow, CEH chairman. She stated that the committee discussed the recently released report, *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future*, issued by the President's Council of Advisors for Science and Technology (PCAST). A short, written summary of other pertinent reports related to STEM education released in the past few months was provided as additional context for the CEH's discussion.

Dr. S. James Gates, Jr., Professor of Physics at the University of Maryland and a member of PCAST, highlighted the key concerns and recommendations of the report in his presentation. He noted the report's emphasis on the importance of both preparing the future STEM workforce and inspiring students to become engaged in STEM disciplines and education pathways. Dr. Gates emphasized that the motivation for action was not really about increasing the number of scientists and engineers, but about ensuring that our Nation has the skilled workforce to remain competitive. He also stated that the report was intended to provide the President with advice on actions that could be potentially transformative and politically realistic, using the policy tools at his disposal. Dr. Gates summarized the seven main recommendations of the report, with particular emphasis on the implications for NSF. He concluded by reiterating his belief that the American Dream is under threat, that a robust and innovative STEM education "ecology" is essential to long-term innovation and economic prosperity, and that action is needed now.

Dr. Joan Ferrini-Mundy, Acting Assistant Director, Directorate for Education and Human Resources (EHR), briefed the committee on some of EHR's near-term responses to the PCAST recommendations, which included efforts to identify high quality NSF-supported educational resources that can be marshaled to support implementation of common core science standards; assessing current investments, as well as additional needs, in programs related to teacher preparation and education; and developing targeted solicitations that promote innovation in education technology and cyber-learning.

The committee was enthusiastic in its response to both Dr. Gates' presentation and the content of the PCAST report, and expects to continue dialog on this subject at the February 2011 committee meeting.

The remainder of the committee meeting focused on NSF's response to the recently issued reports making recommendations about STEM education, including the report, *Preparing the Next Generation of STEM Innovators: Identifying and Developing Our Nation's Human Capital* (NSB-10-33). Dr. Ferrini-Mundy and Dr. Peter Arzberger, Acting CISE Assistant Director, provided a brief summary of a comprehensive presentation that describes steps being taken by

NSF to date. NSF identified five common themes within these reports that relate to: accelerated course work, educating and informing leaders making policy decisions, innovative and transformative educational practices, partnerships and collaborations, and inspiration. Dr. Ferrini-Mundy noted that her presentation includes examples of projects or programs currently funded by NSF that address these five themes, as well as specific NSF solicitations that can serve as a foundation for expanding these efforts. She asked the committee to provide advice on how to engage both the STEM and STEM education research communities in achieving the goals of the *STEM Innovators* report, and asked for CEH's help in identifying both the challenges to implementation and the potential opportunities for strategic leveraging that could increase the impact of NSF's investments. Dr. Arzberger emphasized the need for better integration of recent advances in computing technology, development of computational thinking skills, and improvements in STEM education. Dr. Suresh further encouraged the committee to recommend specific action items that could be implemented irrespective of the FY 2011 and 2012 budgets.

c. Committee on Science and Engineering Indicators (SEI)

Dr. José-Marie Griffiths, SEI chairman, reported she chaired the meeting by telephone and Mr. Arthur Reilly moderated the discussion portions.

The committee reviewed the schedule for the production of the Digest, and was pleased to hear that it served as a model for some redesigned publications of the Division of Science Resources Statistics (SRS). The committee also approved the outlines for the chapters of *Science and Engineering Indicators 2012*. Prior to the meeting, committee members volunteered to serve as lead reviewers for five of the *Indicators* chapters: K-12 (Dr. Camilla Benbow), higher education (Dr. Richard Thompson), labor force (Dr. Bud Peterson), technology and the global marketplace (Mr. Reilly), and public understanding (Dr. Bruer). At the meeting, Dr. Esin Gulari offered to serve as the lead reviewer for the academic research and development (R&D) chapter, and Dr. Douglas Randall agreed to be the lead for the state chapter. Dr. Griffiths thanked the Board Members for their willingness to take on this important responsibility, and noted that a lead reviewer for Chapter 4, on National Trends and International Linkages in R&D was still needed. The committee also collected chapter review preferences from Board Members who attended the meeting, and agreed that draft chapters should be distributed for review electronically, with paper copies sent to Board Members upon request.

Mr. Rolf Lehming, Director, SRS Science and Engineering Indicators Program, updated the committee on efforts to enlist expert advice on how to improve the graphics and Web functionality of the state chapter. He noted that changes for the 2012 print version are likely to be modest, but that flexibility may be greater for the Web version. He stated that there would be more information available at the February 2011 meeting.

Dr. Myron Gutmann, SBE Assistant Director, updated the committee on SBE's review of the Board's science knowledge indicators. SBE conducted two interconnected workshops, one on conceptualizing knowledge and one on measurement. Dr. Gutmann received the report from the first one, and the second organizer's report is due shortly. Overall, the feedback from the workshops suggests that the current measures do a good job if properly interpreted and put into context, but that some improvements by 2014 appear feasible. Dr. Gutmann plans to present his recommendations to SEI at the February 2011 meeting.

Dr. Lynda Carlson, SRS Division Director, briefed the committee on various data development activities in which SRS was engaged, many that respond to issues of interest to Board Members. In the short run, the committee expects new data on business R&D and innovation, green energy patents, immigrant scientists, and recession-related changes in R&D and the S&E workforce. For the longer run, the committee looks forward to better data on R&D-related costs at universities, microbusinesses and the entrepreneurs who start them, and early career scientists.

Finally, Dr. Griffiths stated that she asked Board Members to think about policy implications of *Indicators* data with reference to a topic for the Companion Piece.

d. Committee on Programs and Plans (CPP)

Dr. Mark Abbott, CPP chairman, reported that the committee conducted all of its Open Session business on Tuesday, November 30, 2010, a day prior to the Board meeting.

In his chairman's remarks, Dr. Abbott reported that he discussed several upcoming important reviews including the Subcommittee on Facilities (SCF) portfolio review in May 2011; the committee is involved and plays an important role in this review. He also mentioned that CPP will hear from NSF on its annual facilities plan at the February 2011 meeting. During January 2011, the committee will schedule a joint CPP/CSB teleconference to work with NSF on planning for High Performance Computing (HPC) including a new solicitation. Finally, in February 2011, the committee asked for a joint meeting to continue the discussion with NSF.

The committee discussed the CY 2011 Schedule of Action and Information Items for NSB Review, which is an annual update provided by NSF to help CPP manage the committee's schedule and agenda. Dr. Abbott noted that the Board received meeting materials late for this meeting, which should not happen in the future. Finally, CPP members noted that having the meeting begin a day before the regular Board meeting enabled more thorough and thoughtful discussions of committee issues.

Discussion Item: Policy Options for NSB Threshold Modification

The committee, led by Dr. Droegemeier, continued an ongoing discussion on the NSB Policy on Thresholds for awards requiring Board approval. Dr. Droegemeier, with the assistance of the Board Office and NSF staff, compiled a thoughtful and detailed analysis of specific policy options and discussion points, "Discussion Document Regarding a Proposed 'Two-Tier' NSB Threshold Policy" (NSB/CPP-10-78, Board Book page 33).

To provide some context from NSF, Dr. Marrett introduced three members of NSF's senior management team: Ms. Rubenstein, CFO; Dr. Killeen, GEO Assistant Director; and Dr. Gutmann, SBE Assistant Director. After input from Board Members and NSF senior management, a single, adjusted threshold was proposed as the best option. Dr. Abbott asked Dr. Droegemeier to continue to work with Board Office staff and NSF on another draft for review at a January 2011 teleconference for both the CPP and A&O committees with final approval at the February 2011 meeting.

Changing the threshold is, however, not the end of the discussion. The committee's oversight role with its current focus on individual awards broadened by the addition of the SCF portfolio review

will be addressed in May 2011. An additional advisory mechanism, the programmatic review, would add a final tool to the committee's oversight responsibilities. Dr. Abbott recommended that the Board work with NSF to organize a joint retreat for the NSF Assistant Directors and the Board Members as a final strategic tool.

Discussion Item: Recompetition Policy Implementation

Dr. Marrett led the discussion on the NSF implementation of the Board's recompetition policy. At the August 2010 meeting, Dr. Abbott asked NSF to bring a list of facilities and an implementation plan in December 2010 to see the larger picture with respect to recompetition. NSF presented a draft implementation document, although an incomplete list of facilities impacted discussions. (NSB/CPP-10-75, Board Book Addendum)

Dr. Mark Coles, Deputy Director for Large Facilities Projects, Dr. Joann Roskoski, Acting BIO Assistant Director, and Dr. Killeen, GEO Assistant Director, offered some NSF viewpoints on recompetition policies. Dr. Roskoski noted that policies for recompetition work best - and are more easily implemented - when they are set from the first day of a project. Dr. Louis Lanzerotti noted that recompetition can sometimes disrupt science, as in the case of the Magnet Lab, but that the benefits ultimately greatly outweighed the risks and potential problems. Dr. Dan Arvizu noted the importance of due diligence, because recompetition can be a political process, and that one model does not fit all cases.

It was clear that the document as presented was a "draft" and needed additional comment from the Board before proceeding. Dr. Abbott requested that committee members send written comments to Ms. Sonya Mallinoff, CPP Executive Secretary, to collate for Dr. Marrett's review and subsequent incorporation into another draft. Dr. Abbott assumed that a new version would be ready for the February 2011 meeting.

NSB Information Item: Decadal Survey and Large Synoptic Survey Telescope (LSST)

Dr. Edward Seidel, MPS Assistant Director, and Dr. James Ulvestad, Director, MPS Division of Astronomical Sciences, gave an update on the status of the recently released Astronomy and Astrophysics Decadal Survey and LSST. Astro2010 listed the LSST as the number one ground-based large-scale priority. LSST is recommended for immediate Preliminary Design Review (PDR). NSF plans to initiate PDR immediately, and will also convene a broad portfolio review in late 2011 or early 2012 to get community input on portfolio balance and priorities for current facilities. More information on LSST will come before the Board at the February 2011 meeting as part of the Facilities Plan. Dr. Abbott indicated that the LSST planning timeline needs to take into account the annual SCF portfolio review.

NSB Information Item: Atacama Large Millimeter Array (ALMA) Operations

Dr. Philip Puxley, MPS Program Manager, presented an information item on the operation of ALMA, and notified the committee of an upcoming action. The current award to Associated Universities, Inc. (AUI) expires in 2011. NSF intends to bring an action item to the Board at the February 2011 meeting that will renew the award to AUI for the North American share of ALMA operations from FY 2012 to FY 2015.

NSB Information Item: DataNet

Dr. Alan Blatecky, Acting Director, Office of Cyberinfrastructure (OCI), provided an update on DataNet. A revised version of DataNet is being incorporated into program plans building on the first two awards made in November 2008. NSF-wide and Directorate working groups have been established to develop plans for 2012. A new solicitation will be issued soon.

CPP Subcommittee on Polar Issues (SOPI)

Dr. Abbott reported that the SOPI meeting was led by Dr. Randall on behalf of Dr. Taylor. Dr. Karl Erb, Director, Office of Polar Programs (OPP), gave an update on the procurement activity for both the Antarctic and Arctic contracts. The Antarctic contract award target date is September 2011, and this issue was further discussed at the A&O meeting. The Arctic contract award came before CPP on November 30, 2010 in closed session.

Dr. Erb also reported on other activities, including icebreakers and the IceCube project. He reminded the committee of the two-phase study of Antarctic Program Review that will be taking place over the next year.

Dr. Martin Jeffries, former OPP Program Director, gave an update on the Arctic ice cover.

In response to a request from Board members, Dr. Alexandra Isern, OPP Program Director, provided an update on polar research vessel support. She summarized the polar research vessel study from 2002 to 2006 that developed a “science requirements list” and plans for meeting long-term needs for a research icebreaker. She also stated that NSF is currently working with the University-National Oceanographic Laboratory System (UNOLS) to conduct a “requirements refresh.” The goal is to bring an information item about a future action to the Board at the August 2011 meeting.

Subsequent Board discussion focused on how NSF should proceed with Board review if it decides to purchase a ship through the Major Research Equipment and Facilities Construction (MREFC) account, and noted that science requirements in the future for both Poles would need careful examination.

CPP Task Force on Unsolicited Mid-Scale Research (MS)

Dr. Abbott reported that the goal of the task force is to address whether unsolicited mid-scale research is effectively supported by NSF. Dr. Diane Souvaine, MS chairman, gave a summary of the task force plans for data and information gathering. This included the use of smaller focus groups; a possible targeted survey; analysis of NSF budget data in the mid-scale range; and workshop of stakeholders from the research community, NSF, and other agencies. It was suggested that a Board Member - instead of an external professional - be asked to serve as facilitator of these focus groups, so that the Board is more closely engaged in the process. The task force is planning to hold a teleconference in January 2011 to assess the status of the focus groups and other data gathering efforts in advance of the February 2011 Board Meeting.

e. Committee on Strategy and Budget (CSB)

Dr. Diane Souvaine, CSB chairman, reported that Dr. Suresh gave an update on FY 2011 appropriations process. He presented both the House and Senate marks, and then compared the FY 2010 enacted level with the FY 2011 request and noted that with a full year Continuing Resolution at the FY 2010 level, NSF would effectively incur a shortfall of \$552 million, or a decrease of 8 percent below the FY 2011 Request. Under this scenario, the major impacts would be to the MREFC account and NSF staffing. The current Continuing Resolution will end on December 3, 2010; however, another Continuing Resolution was anticipated through December 18, 2010.

Dr. Michael Van Woert, Executive Officer and Board Office Director, gave an update on the NSB Budget. He presented the budget by major categories, and noted that it was operating at 90 percent of the FY 2010 budget level. The Board Office is currently digitizing old Board records, and plans to have all past Board Books electronically accessible and searchable by the February 2011 meeting.

Dr. Clifford Gabriel, Senior Advisor, Office of the Director, gave an update on the NSF Strategic Plan, and reviewed the process to date. NSF has been working on addressing OMB issues, including some restructuring of the document, as well as adding targets, actions, and assessments. NSF will continue to work with OMB and anticipates releasing the document in February 2011 along with the FY 2012 budget request.

[Although oral reports on the Subcommittee on Facilities (SCF) and the Task Force on Data Policies (DP) were not included with the CSB report for the December 2010 meeting, summaries of those meetings are provided in Appendix B.]

f. Task Force on Merit Review (MR)

Dr. Douglas Randall reported for Dr. John Bruer, the newly appointed MR chairman. The task force reviewed the progress of plans to elicit input from various stakeholder groups, including NSF senior leaders, university associations, NSF program directors and division directors, NSF Advisory Committee members, as well as NSF principal investigators (PIs) and reviewers. Most of these activities should be complete by spring 2011. The task force also reviewed and approved posting a Web site that will allow all interested members of the community to submit comments to NSF. This Web site will be publicized through the use of a Dear Colleague letter sent from Dr. Bowen. The task force approved a draft of the letter.

MR then discussed the idea of holding a community workshop during the summer of 2011 - an idea that had been suggested at earlier meetings. However, given the extensive data-gathering activities underway, the task force decided to table this proposal until and unless it becomes apparent that it is missing a critical set of perspectives. The task force closed its discussion by reaffirming its commitment to keep all options for potential outcomes on the table, including a complete rewrite of the criteria, and to completing its review in a timely way.

Dr. Bowen adjourned the Open Session at 3:14 p.m.

[signed]

Ann A. Ferrante
Executive Secretary
National Science Board

Attachments:

Appendix A: “The Birth of NSF and NSB” by Dr. Patricia Galloway

Appendix B: Reports of the CSB Subcommittee on Facilities (SCF) and the CSB Task Force on Data Policies (DP)

“The Birth of NSF and NSB”
Written and Presented by Dr. Patricia Galloway
NSB Holiday Reception on December 1, 2010 in Honor of
the 60th Anniversary of NSF and NSB

T’was May 1950 when in the White House
 President Truman pondered on how a nation to rouse
His thoughts of Kilgore and Bush filled the air
 In hopes that a new agency would soon be there
The turmoil of war had been put to bed
 And visions of science and research filled his head
And the Endless Frontier sowed a seed to fill gaps
 That a nation had endured like a long winter’s nap
When all of a sudden he knew what mattered
 Was to make the nation more knowledgeable, not fatter
So away to his desk he rushed like a flash
 To prepare public law 81-507 in a wink of an eyelash
That created an agency that was bound to grow
 As science and engineering would be critical to know
For the nation would prosper and no longer fear
 The Sputniks or A-bombs that were now here
So after five years of thrashing he acted quick
 And formed the National Science Foundation –which was a hit
And he whistled and shouted as he thought of a name
 Alan T. Waterman would go down in fame
But so would Aberle, Barnard, Barnes, Bronk, Conant, Cori, Davis, Dollard, DuBridg, Fred,
Gross, Humphrey, Hyman, Loeb, McLaughlin, Middlebush, Moreland, Morris, Morse, Potter,
Reyniers, Stakman, Wilson and Yancey as NSB members filled the hall
 In December 1950 in answer to the nation’s call
To support fundamental research in reply
 To obstacles that had for so long been so high
So up to the White House to the President they flew
 With a sleigh full of knowledge, and St. Nichols too!
To hold their first meeting under that roof
 Of the most distinguished group that finally gave proof
That science and engineering was turning around
 And would fill that gap with a bound
They were all dressed up, from head to foot
 In discussions of how to promote meaningful output
A bundle of ideas they had brought in their packs
 And would debate and decide as to what to bring back
Their eyes how they twinkled –their dimples how merry
 Their cheeks like roses, their noses like cherries

As they tied up their charter with a bow
 Against a backdrop of a beautiful DC snow
The smiles they shared with shining white teeth
 Were in celebration around the Christmas wreath
Their broad faces and little round bellies
 All shook when they laughed like bowls full of jelly
Cause they knew each one would be as busy as an elf
 But as a board they would accomplish more than one's self
So with a wink of their eyes and a twist of their heads
 The President knew he had nothing to dread
He then spoke not a word-but went back to his work
 To assure the nation would be bettered with this perk
And the Director and the Board quickly rose
 To salute their Commander in Chief- so the story goes
60 years has flown like the down of a thistle
 With successes and triumphs for which we whistle
And so this birthday is ours tonight
 But won't be the last as the next 60 will be bright

**Meeting Summaries for the CSB Subcommittee on Facilities (SCF) and
the CSB Task Force on Data Policies (DP)**

CSB Subcommittee on Facilities (SCF)

The subcommittee discussed the revised the document, *NSF Principles for Managing the Large Facility Investment*. It was agreed that the principles provide a good foundation for the SCF portfolio assessment. SCF members raised some areas that may require further attention in the document, and NSF will revise the principles based on SCF input and recent NSB discussions on recompetition and thresholds.

The subcommittee also discussed an initial Draft Progress Report that documents the process of the SCF fact-finding work and information provided by NSF. It was noted that the subcommittee has developed a better understanding of portfolio assessment through its review of large facilities and will now focus on the overall research infrastructure portfolio.

Dr. Griffiths, SCF chairman, proposed that a timeline be developed from preconceptual design to project decommissioning that identifies decision gates and the information needed at each stage of the process. The meeting ended with a discussion on the next steps for moving forward to the May 2011 meeting.

CSB Task Force on Data Policies (DP)

The task force heard three presentations on Open Access followed by discussion. The presentations were made by: Dr. John Vaughn, Executive Vice President, Association of American Universities, Chairman of the U.S. House Roundtable on Scholarly Publishing; Dr. David Lipman, Director, National Center for Biotechnology Information, U.S. National Library of Medicine, NIH; and Dr. Bernard Schutz, Director, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany.

The task force discussed plans for its upcoming workshop set for March 27-29, 2011, that will take place in Arlington, Virginia. An orientation and dinner will be held at the Arlington Westin Hotel on March 27, and the meetings will be held in the Board Room at NSF on March 28 and 29. The next steps are to review the list of invitees, get feedback from task force members by December 15, 2010, and send invitations before the end of the calendar year.