

**MINUTES¹
OPEN SESSION
385TH MEETING
NATIONAL SCIENCE BOARD**

The National Science Foundation
Arlington, Virginia
March 29-30, 2005

Members Present:

Diana S. Natalicio, Vice Chair
Dan E. Arvizu
Barry C. Barish
Steven C. Beering
Ray M. Bowen
G. Wayne Clough
Kelvin K. Droegemeier
Delores M. Etter
Kenneth M. Ford
Nina V. Fedoroff
Daniel E. Hastings
Elizabeth Hoffman
Louis J. Lanzerotti
Alan I. Leshner
Michael G. Rossmann
Daniel Simberloff
Jon C. Strauss
Kathryn D. Sullivan
John A. White, Jr.
Mark S. Wrighton

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

Members Absent:

Warren M. Washington, Chair
Jane Lubchenco*
Douglas D. Randall
Jo Anne Vasquez

¹ The minutes of the 385th meeting were approved by the Board at the May 2005 meeting.

* Attended Wednesday, March 29, only.

The National Science Board (NSB, the Board) convened in the Open Session at 2:10 p.m. on Wednesday, March 30, with Dr. Diana Natalicio, Vice Chair, presiding (Agenda NSB-05-29). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

Dr. Natalicio was pleased to announce that Dr. John Marburger, Senior Advisor to the President and Director of the Office of Science and Technology Policy (OSTP), administered the oath of office to National Science Board Member, Dr. Kathryn Sullivan, yesterday.

AGENDA ITEM 7: Approval of Open Session Minutes, February 2005

The Board unanimously APPROVED the Open Session minutes of the February 2005 Board meeting (NSB-05-17, Board Book Tab 12 F).

AGENDA ITEM 8: Closed Session Items for May 2005

The Board unanimously APPROVED the Closed Session items for the May 25-26, 2005 meeting (NSB-05-21, Board Book Tab 12 G).

AGENDA ITEM 9: Chairman's Report

On behalf of Dr. Warren Washington, Chairman, Dr. Natalicio reported the following:

a. Dr. D. Allan Bromley

With sadness, Dr. Natalicio noted the passing of Dr. D. Allan Bromley on February 10th. He was a renowned nuclear physicist and Dean of Engineering at Yale. Dr. Bromley was a member of the White House Science Council, President's Science Advisor and Director of OSTP, 1989-1993; and a Member of the National Science Board, 1988-1989.

b. NSB Report Released

The Board publicly released the report, *Broadening Participation in Science and Engineering Faculty* at the American Association for the Advancement of Science (AAAS) annual meeting on February 19th. Dr. Washington and Dr. Michael Crosby, Executive Officer to the Board, gave a panel presentation on the report, *Broadening Participation in Science and Engineering: NSF's Reports, Programs, and Plans* at an AAAS workshop. During the panel discussion, Dr. Washington commented on the Board's commitment to promoting diversity in the science and engineering workforce. Copies of the report had been sent to Congress, Federal agencies, professional societies, presidents of research universities, and NSF advisory committees.

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

Dr. Washington established the *ad hoc* Committee on Nominating for NSB Elections (also known as the *ad hoc* NSB Election Committee). Dr. Daniel Hastings agreed to serve as chairman. Members of the committee would be: Drs. Kenneth Ford, Michael Rossmann, and Jo Anne Vasquez. Two vacancies will be open on the Executive Committee in May of this year as the terms for Drs. Barry Barish and Delores Etter end. The committee will prepare a slate of candidates for consideration and election at the May 2005 meeting.

d. Congratulations to Dr. Alan Leshner

The Board congratulated Dr. Alan Leshner who received a prestigious award for “Distinguished Accomplishment in Social and Behavioral Sciences” from his *alma mater*, the Graduate School of Rutgers University.

e. Lecture by Dr. Nina Fedoroff

Dr. Nina Fedoroff spoke to AAAS during the evening of Tuesday, March 29, 2005. The dinner seminar was entitled, “Genetically Modified Foods: Monsters or Miracles?” Dr. Fedoroff is co-author of a new book, *Mendel in the Kitchen: A Scientist’s View of Genetically Modified Foods*.

f. Board Member Annual Contribution to NSF Trust Fund

Dr. Natalicio gave a reminder from Dr. Washington about the importance of the annual contribution to the Board Trust Fund. She thanked Board Members who have already contributed and mentioned that the Chairman encouraged all Board Members who have not sent in their contributions to do so as soon as possible.

g. Congressional Testimony / *ad hoc* Task Group on Vision

The Board had several actions, which were brought to the attention of Board Members in each of the standing committee meetings by Dr. Natalicio. These actions stemmed from the congressional report language for the FY 2005 NSF budget, discussions among Board Members at the annual retreat that took place in early February at University of Texas at El Paso, and the series of Senate and House hearings in February and March during which the Board provided testimony and engaged in dialog with Members of Congress.

Prior to the March NSB meeting, Dr. Washington had consulted with each of the Board’s standing committees on their respective roles in this process. Although the committee chairs would later report on how they would be implementing these activities, there was one important Board action that was addressed by the full Board.

The Senate had requested that the National Science Board exercise its legislated authority and oversight responsibility by developing and establishing a new vision for the National

Science Foundation for the 21st century. This Senate request was complementary to Board Member discussions at the February 2005 retreat.

Dr. Natalicio proposed an NSB *ad hoc* task group to draft an initial 12 to 15-page document to be finalized and approved by the full Board by the end of 2005. The document would build on the 1998 NSB *Strategic Plan*, the 2003 NSF *Strategic Plan*, and the Board's 2003 report to Congress in response to Section 22 of the NSF Authorization Act of 2002.

The final document would contain the following: long-term vision and goals for NSF in the 21st century, clear statement of NSB roles and responsibilities, characterization of the near-term Federal budget environment and related constraints on Federal investment in science and engineering research and education, and long- and short-term priorities that take into account Federal fiscal realities.

Dr. Delores Etter would chair the task group with task group members Drs. Barry Barish, Douglas Randall, and Kathryn Sullivan. This task group would report directly to the full Board, although it will consult closely with the Committee on Strategy and Budget and receive input on specific areas from the other standing committees.

The NSB Chair, NSB Vice-Chair, NSB Committee on Strategy and Budget chair and NSB Executive Committee chair will all serve in an *ex officio* capacity on this *ad hoc* task group. Through the Executive Committee chair, NSF management will be able to provide input and comments while the vision document is developed by the Board.

The Board unanimously APPROVED the charge for the *ad hoc* task group to conceptualize and draft an initial document to Congress on a new vision for NSF in the 21st century. (NSB-05-42) (Appendix A)

AGENDA ITEM 10: Director's Report

Dr. Arden Bement, NSF Director, reported on new NSF staff positions and congressional items.

a. NSF Staff Announcements

Dr. David Lightfoot, Dean of the Graduate School for Arts and Sciences, Georgetown University, accepted the position of Assistant Director, Directorate for Social, Behavioral, and Economic Sciences, and would join NSF full time in June. Prior to his position at Georgetown, Dr. Lightfoot established a new Department of Linguistics at the University of Maryland and chaired it for 12 years. A Fulbright Scholar, Dr. Lightfoot received his doctoral degree from the University of Michigan.

Dr. Wei Zhao began serving as Director, Division of Computer and Network Systems in the Directorate for Computer and Information Sciences and Engineering on October 16, 2004. Prior to his appointment at NSF, Dr. Zhao served as Head of the Department of Computer Science at Texas A&M University. He received his Ph.D. from the University of Massachusetts at Amherst.

Dr. Michael L. Van Woert began his appointment as Executive Officer, Office of Polar Programs in the Office of the Director on March 20, 2005. Dr. Van Woert previously served as the Chief Scientist for the National Naval Ice Center at the National Oceanic and Atmospheric Administration. He received his Ph.D. from the University of California, San Diego.

Dr. Susan Lolle joined NSF as a visiting Program Director from Purdue University in the Directorate for Biological Sciences, Integrative Organismal Biology Division.

b. Congressional Update

Hearings:

During the last month, the NSF Director made four appearances before Congress regarding the FY 2006 budget request. On February 16, the House Science Committee heard from the Office of Science and Technology Policy (OSTP), National Aeronautics and Space Administration, the Department of Energy, and NSF. On February 17, Dr. Bement appeared with Dr. Washington at the last official hearing of the Senate VA, HUD and Independent Agencies Appropriations Subcommittee. On March 9, Dr. Bement appeared with Dr. Mark Wrighton representing the Board, and Dr. Christine Boesz, NSF Inspector General, before the Research Subcommittee of the House Science Committee. Finally, on March 11, the newly reconstituted House Science, State, Commerce and Justice Appropriations Subcommittee heard testimony from OSTP Director, Dr. John Marburger; Dr. Ray Bowen representing the Board; and Dr. Bement.

Science and Engineering Legislation

For the 109th Congress to date, 23 pieces of legislation were introduced that made particular mention of NSF. A list of the legislation introduced by the 109th Congress and pertinent to NSF would be maintained and updated regularly in the “NSF & Congress” section of the NSF Web site.

Since the last NSB meeting in February, 10 bills were introduced relevant to NSF. The most notable included:

H.R. 759 and S. 142 – the Climate Stewardship Act of 2005. This bill would expand Federal climate change research initiatives. The new chairman of the Senate Commerce Committee, Senator Ted Stevens, was particularly interested in climate change, especially as it relates to Alaska.

H.R.1215 - Green Chemistry Research and Development Act of 2005. The bill authorized, on average, \$7.5 million above and beyond NSF's current levels of spending over the next 3 years on green chemistry research and education programs. This same legislation passed the House last year but was not acted on in the Senate.

S. 432 - Minority Serving Institution Digital and Wireless Technology Opportunity Act of 2005. This legislation, introduced by Senator George Allen, would require NSF to spend \$1.25 billion in digital and wireless infrastructure at minority serving institutions.

Of the other introduced bills, only one was reported out of committee. On March 17, the House Science Committee reported on the High-Performance Computing Revitalization Act of 2005, H.R. 28. This bill authorized NSF to support high-performance computing and networking research, provide information technology infrastructure for the U.S. research community, and support basic high-performance computing and networking research and education.

AGENDA ITEM 11: Committee Reports

a. Executive Committee (EC)

Dr. Bement, EC chairman, reported that in Open Session the committee approved the minutes from its February 2005 meeting and conducted no other business.

b. Audit and Oversight (A&O) Committee

Dr. Mark Wrighton, chairman of the A&O Committee, reported that in response to Dr. Natalicio's request to contribute to development of the vision document, the A&O Committee accepted responsibility to develop a strong and clear statement on the roles and responsibilities of the Board for the vision document requested by Congress. The committee also agreed to: (a) ensure timely NSF implementation of corrective plans to respond to recent audit findings, and (b) examine the NSF merit review system.

Mr. Thomas Cooley, NSF Chief Financial Officer, provided an update on the resolution of the reportable conditions on post-award monitoring in the FY 2004 Financial Statements Audit. He pointed out that NSF's goal is not simply to address the reportable conditions, but to ensure that NSF's post-award monitoring achieves the same "gold standard" recognition for which NSF's pre-award merit review process is noted.

Mr. Felipe Alonso, KPMG auditor, explained that corrective actions proposed by NSF to resolve the two reportable conditions must include: (1) a specific deliverable in response to the recommendation, and (2) an expected target date for its completion.

Mr. Cooley discussed NSF's responses to the FY 2004 audit's Management Letter. This was a supplementary document provided after the audit with additional recommendations for improvement. Mr. Cooley also noted that NSF is developing a new electronic system to improve compliance with annual and final report requirements. Mr. Cooley further

described efforts to meet the requirements of Office of Management and Budget's December 2004 update to Circular A-123 "Management's Responsibility for Internal Control," the Federal Government version of Sarbanes-Oxley.

The committee also heard from Mr. Joel Grover, Office of the Inspector General (OIG), who gave an overview of the contracting process for the financial statement audit, which is up for re-competition. The current NSF contract would expire at the end of FY 2005 and the NSF would be looking to have a new 5-year contract to be issued by July 1, 2005 for the successful competing proposal.

Dr. Fae Korsmo, Staff Associate, Office of Integrative Activities, highlighted the *Report to the National Science Board on the National Science Foundation's Merit Review Process* (NSB-05-12). (http://www.nsf.gov/nsb/documents/2005/MRreport_2004.pdf). She framed her presentation around the congressional report language and pointed out a number of ways that the report would be helpful as the committee moves through the review of the Merit Review System.

Mr. Joseph Burt, Division Director, Division of Human Resource Management, provided an update on NSF business analysis activities related to the Merit Review Programs and included the results of an FY 2003 survey of grant applicants.

In closed session, the committee was provided information about several ongoing investigations.

c. Education and Human Resources (EHR) Committee

Dr. Elizabeth Hoffman, chair of the EHR Committee, reported that the committee was pleased to have Dr. Shirley Malcom and Dr. Daryl Chubin from AAAS give a presentation on the recently published AAAS Guidebook for Science, Technology, Engineering, and Mathematics (STEM) Educators in the Post Michigan Era, *Standing Our Ground*. The importance of STEM fields to the economy and national interest was noted, and the need to broaden involvement to include all groups to develop the workforce was emphasized. Their Guidebook will serve as a resource to a range of groups including consultants, advisors, specialists, institutions of higher education, as well as legal specialists, policy makers, and cultural leaders.

Dr. Natalicio addressed the EHR committee, reporting on congressional requests for Board action. For the EHR Committee there would be two activities: contributing to the creation of a new vision for NSF in the 21st century and evaluating existing pre-college math and science education in the U.S. The role for the EHR Committee in this effort will be to develop overarching goals for the future of science and engineering education, including input regarding long- and near-term NSF education program priorities.

Three NSF directorates (Education and Human Resources; Biological Sciences; and Social, Behavioral, and Economic Sciences) made presentations on the integration of research and education. The presentations highlighted examples of NSF programs that

have specific goals to integrate research with education, the impact of those programs, methods used to evaluate progress, and best practices. The committee was interested in understanding what works, what can be improved, and how activities will be impacted by future budget reductions.

Dr. Daniel Hastings introduced a motion to hold an NSB-sponsored workshop on engineering workforce and engineering education at the undergraduate and graduate levels, and to take into account life-long learning that an engineering education offers. The committee approved a motion to transmit the draft charge, “Workshop on Engineering Workforce Issues and Engineering Education: What are the Linkages?” to the full Board for approval as a Board activity, with oversight by the EHR Committee. Following a discussion at the Board’s Plenary Open Session:

The Board unanimously APPROVED a charge for the NSB-sponsored “Workshop on Engineering Workforce Issues and Engineering Education: What are the Linkages?” (NSB-05-41) (Appendix B)

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

Dr. John White reported for Dr. Steven Beering, chairman of the SEI Subcommittee. Dr. White stated that the subcommittee focused on two draft chapters for *Science and Engineering Indicators 2006*, “Elementary and Secondary Education” and “State Indicators.”

Dr. Jo Anne Vasquez, the lead reviewer for the “Elementary and Secondary Education” chapter, participated by phone. She and Dr. Lawrence Burton of Science Resources Studies (SRS), Directorate for Social, Behavioral, and Economic Sciences, led the subcommittee discussion of comments on that chapter. Following the discussion, the subcommittee determined that the chapter was ready to be processed in final form.

For the “State Indicators” chapter, Mr. Rolf Lehming, SRS Director for the Science and Engineering Indicators Program, led the subcommittee through the reviewer comments. Dr. White was the lead reviewer for that chapter. After discussion, the subcommittee determined that the chapter was also ready to be processed in final form.

The subcommittee also discussed possible topics for the companion piece to *Science and Engineering Indicators 2006*.

e. Committee on Programs and Plans (CPP)

Dr. Daniel Simberloff, CPP chairman, stated that Dr. Michael Rossmann gave a report on the Long-Lived Data Collections draft revised in response to comments received from NSF and NSB Members. Dr. Louis Lanzerotti had provided substantive comments, and the report had been revised to address those comments. The committee voted to forward the report to the full Board, and recommended that the report be accepted with revisions for release for public comment. Following this recommendation:

The Board unanimously APPROVED the release, for public comment, of the draft report, *Long-Lived Digital Data Collections: Enabling Research and Education in the 21st Century* (NSB-05-40)

Following receipt of public comments and revisions as necessary, CPP planned to bring a final draft report to NSB for approval at the May meeting.

Dr. Simberloff also noted that Dr. Nina Fedoroff, Task Force on Transformative Research chair, reported to CPP. The task force heard presentations from Dr. Arthur Ellis, Division Director of Chemistry and Dr. Maria Zemankova, Program Director in the Division of Information and Intelligent Systems, which illustrated programmatic and analytical aspects of transformative research. The task force discussed implementation of an internal workshop with NSF staff, tentatively scheduled for August 2005, and additional external workshops.

Dr. John White, chair of the Subcommittee on Polar Issues (SOPI), reported to CPP. The subcommittee heard an update from Dr. Karl Erb, Director of the Office of Polar Programs on the International Polar Year 2007-2008, envisioned as an intense, coordinated campaign of polar observations, research, and analysis. OSTP designated NSF to coordinate the participation of all U.S. agencies. Dr. White further reported that the Antarctic season's logistical operations were reviewed, focusing on three areas: the OIG's analysis of information security as part of the compliance audit under the Federal Information Security Management Act; the South Pole Traverse team, which advanced the overland trail towards the South Pole across the Ross Ice Shelf and is well positioned to complete the proof-of-concept South Pole Traverse next austral summer (only 298 miles of unproven route left to go); and the South Pole Station modernization accomplishments for the past season (including the completion of the external enclosure of the station).

Additionally, Ms. Renee Crain, Assistant Program Director for Arctic Research in the Office of Polar Programs (OPP), presented an overview of OPP's efforts to integrate arctic research and education through the support of several projects, some of which have joint funding from NSF's Education and Human Resources programs. Finally, Dr. John Lightbody, Executive Officer, Division of Physics, Directorate for Mathematical and Physical Sciences, gave an update on the Ice Cube Neutrino Observatory at the South Pole. The last season saw the successful installation and use of the enhanced hot water drill and the deployment of the first Ice Cube string of 60 digital optical modules.

On behalf of Dr. Washington, Dr. Natalicio read a charge for actions for CPP consideration. The charge consisted of five items: (1) the committee's role in finalizing the new large facilities process, (2) contributing to the creation of a new vision for NSF in the 21st century, (3) NSB policy regarding size and duration of awards, (4) updating the NSB's 2001 report on the role of U.S. Government in international science and engineering, and (5) appropriate program portfolio balance of NSF centers versus smaller individual principle investigator grants.

The committee also discussed the public comments on the joint NSB/NSF draft report, *Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation*. Dr. Crosby reviewed the comments, and stated that the draft report was mailed to 370 members of the scientific and education community in late January 2005. Each mailing included a personalized letter from Dr. Washington that explained the report and requested comments from the addressee and their constituents. The report was also placed on the NSB Web site on January 21, 2005 with a request for public comments by March 4, 2005. NSB received 17 comments from diverse organizations. Most of the responses were very favorable and commended NSB for its efforts to engage the public in the priority-setting process. The committee agreed that Dr. Crosby and Dr. Joseph Bordogna, NSF Deputy Director, would work together on any needed revisions to the document. NSF will have a revised version of the draft report to NSB by early May for discussion at the May meeting.

The committee next reviewed the draft *National Science Foundation Facilities Plan* and continued a discussion that CPP had at the February Board meeting. Dr. Bordogna gave an introduction to this new draft, pointing out that Mr. Curt Suplee, Director, Office of Legislative and Public Affairs, re-wrote chapter one, and the Horizon Projects were re-written more succinctly, as suggested by NSB, with much improvement.

Dr. Simberloff reported that the current NSF Major Research Equipment and Facilities Construction (MREFC) panel dates would be changed from December, March, and May to February, July, and September to comply with the proposed NSB timeline. In response to questions from Dr. Bordogna, CPP stated that it would not revise the report except to update it for ongoing projects. The committee urged, however, that the best quality visuals be incorporated into the report.

In regard to the annual MREFC review, Dr. Bordogna outlined the MREFC account. He reviewed the schedule and the new timeline for the meetings of the NSF's MREFC panel. The panel would be on track for an annual release of a *Facility Plan* in March of next year.

Finally, the committee heard an information item from Dr. Michael Turner, Assistant Director, Directorate for Mathematical and Physical Sciences, on the Rare Symmetry Violating Processes (RSVP). NSB authorized funds for the project, however a possibility of significant cost increases was identified in early baselining activities. NSF immediately notified the Board, OSTP, Office of Management and Budget (OMB), the Department of Energy (DOE), and congressional committees during December 2004, when the possibility was first identified. NSF is working closely with the project and with DOE and the Brookhaven Lab. NSF fully funded the baselining proposal. An NSF-led baseline review would be scheduled for April 20-22. In addition, a blue ribbon subcommittee was convened to assess the science value of the rebaseline project, and that subcommittee met for the first time March 24-25. Dr. Turner reported that NSF was on track for a summer 2005 resolution of these issues. He noted that there were three possible outcomes: re-costing, de-scoping of science, or termination. NSF will make a strategic decision based upon results of the NSF-led baseline review and the blue ribbon

assessment of science, both scheduled for this spring. NSF management plans to bring a recommendation to NSB in September on this issue.

f. Committee on Strategy and Budget (CSB)

Dr. Ray Bowen, CSB chairman, reported that Dr. Natalicio outlined a plan on behalf of Dr. Washington, which would involve CSB as well as other committees: (1) the *ad hoc* task group that has the responsibility for developing the new strategic vision for the NSF, (2) as Dr. Simberloff reported, the issue of balance between center-like grants and smaller, more basic principal investigator grants, and (3) the issue of the possibility that CSB might examine the pros and cons of NSF's focus on rising success rates and related issues of grant size and duration.

The committee also heard a report of the Board's three recent budget testimonies to Congress. Dr. Bowen reminded Board Members that copies of the written statements were included at Tab 12 H of the Board Book.

CSB devoted most of the meeting to an overview of the FY 2007 NSF budget development process, with particular emphasis on NSB action items over the coming year. Dr. Bement reported on the timelines with the NSF leading up to the submission of the budget request to OMB. There would be two specific issues that would affect the committee and the Board: (1) at the May NSB meeting, the committee will discuss long-range planning issues, identify major investment areas, and review NSF's framework for the FY 2007 budget; (2) at the September NSB meeting, the committee will be asked to review and approve NSF's OMB budget submission, which will be due shortly after that meeting. During the summer, CSB may hold teleconference meetings to review NSF's preliminary OMB budget submission. Dr. Bement further reported the timelines for activities that will be followed after the traditional Thanksgiving "passback" by OMB of the budget to NSF in late November. The President will submit NSF's FY 2007 budget request to Congress on February 6, 2006.

In formulating FY 2007 budget priorities, Dr. Bement presented several important considerations. He also gave information on how the current budget is used in various categories and identified various budget issues such as the erosion of the proposal success rate, the balance of investments in centers and single-investigator (and small group) awards, support for cyberinfrastructure, unbudgeted MREFC projects, the polar icebreaker issue, support for the 21st century workforce initiatives, and support for critical NSF staffing needs.

Dr. Bowen encouraged Board Members to review Dr. Bement's briefing to the committee, "Overview of the FY 2007 Budget Process."

NON-AGENDA ITEM

Mr. Lawrence Rudolph, NSF General Counsel, reminded Board Members that Financial Disclosure Form 278 was provided to them earlier in the month. The form is required of all Presidential appointees, and would be due May 16.

Dr. Natalicio adjourned the Open Session at 2:55 p.m.



Ann A. Ferrante
Writer-Editor
National Science Board Office

Appendix A: NSB-05-42

Appendix B: NSB-05-41

National Science Board
“Vision for NSF Science and Engineering Research and Education”

Statutory Basis

"...the Board shall establish the policies of the Foundation, within the framework of applicable national policies as set forth by the President and the Congress." [SEC. 4. (a)]

Action Requested by Congress

The Senate has requested the National Science Board to exercise their legislated authority and responsibility by developing and establishing a new vision for the National Science Foundation for the 21st Century. A succinct (12-15 pages) visionary document is requested to be finalized by the end of 2005 and include overarching goals with both long- and short-term priorities that take into account federal fiscal realities. This Senate request is complementary to Board discussion at the February 2005 Retreat.

Senator Bond, Appropriations Subcommittee, February 17, 2005

“Given the constrained funding environment, it is even more critical that the National Science Board develop a long-term vision for NSF.... This means articulating a vision for the future of science and technology, including the next bold cutting-edge areas of research.... The Board is ideally suited for this responsibility and I believe strongly that it is a core activity of the Board’s mission.”

Approach and Logistics

- NSB Chair will appoint an NSB *ad hoc* task group of three or four dedicated Board Members to focus on conceptualizing and drafting an initial document.
- NSB Chair, NSB Vice-Chair, NSB CSB chair and NSB Executive Committee chair all serve in an *ex officio* capacity on this *ad hoc* task group, participating and providing comments to the degree that they are able. Through the Executive Committee chair, NSF management will have continuous ability to provide comment as the vision document is developed.
- The task group will consult primarily with CSB as it develops a draft document for full Board discussion and approval. However, this activity will be considered an activity of the full Board.
- Starting point will be the 1998 *NSB Strategic Plan* and the 2003 *NSF Strategic Plan*. However, a new vision for the future of science and technology should be established as a bold statement on the cutting edges of research. Need to also articulate priorities and challenges, and how NSF will lead in meeting these challenges.
- A&O Committee will develop and provide *ad hoc* task group with a refined statement on the role and responsibility of the Board, building on the 1998 NSB Strategic Plan statement and follow-up from February 2005 NSB Retreat. CPP and EHR will provide input to the task group regarding long- and near-term NSF program priorities.
- Board Office staff will directly support the *ad hoc* task group effort, augmented by any of their contractor support that is needed.

Final document will contain –

- Long-term vision and goals for the 21st Century
- Clear statement of NSB role and responsibilities
- Characterization of the near-term federal budget environment and related constraints on federal investment in S&E research and education.
- 3, 5, and 10 year priorities, with 3 and 5 year priorities based on current budget realities
- 3, 5 and 10 year “workplan” for the NSB

Example of a Near-Term Action for the Board

“Working with the NSF Director, oversee a comprehensive re-examination of all NSF R&RA and EHR programs in terms of how they meet both the long and short term priorities, overall goals and vision set forth in the NSB “Vision for NSF Science and Engineering Research and Education.”

Milestones

- March 2005 – NSB Chair appoints *ad hoc* Task Group on Vision (Vision TG) and provides it with a general charge that full Board will discuss and refine.
- April 2005 – (half day meeting) Vision TG refines its general charge into a draft outline of the vision document with specific tasks assigned to Vision TG members and NSB Office staff.
- May 2005 – First rough draft of vision document woven together by NSB Office using Vision TG member input; sent to Vision TG and *ex officio*’s for comment.
- May 2005 – (half day meeting) Vision TG refines rough draft based on comments; send to CSB for review and comment at upcoming May 2005 meeting.
- May 2005 – (NSB meeting) CSB discusses rough draft.
- June 2005 – Rough draft revised with initial formatting similar to existing 1998 NSB Strategic Plan; NSB Office contractor who is expert on preparing vision documents is consulted.
- July 2005 – Clean draft document sent to Vision TG and *ex officio*’s for comment.
- July 2005 – (half day meeting) Vision TG refines draft based on comments.
- August 2005 – (NSB meeting) CSB discusses clean draft vision document.
- September 2005 –(half day meeting) Vision TG makes final revisions to draft and document if put into final format.
- September 2005 – (NSB meeting) CSB discusses and make recommendation to full Board that draft vision document be released for public comment.
- November 2005 – (half day meeting) Vision TG makes final revisions based on public comment.
- December 2005 – (NSB meeting) Vision TG presents final document to CSB and the Board for final approval.

Committee on Education and Human Resources
Workshop on Engineering Workforce Issues and Engineering Education:
What are the Linkages?

Purpose

An initial, single day NSB-sponsored workshop is proposed to focus on recent recommendations for changes in engineering education and implications for the engineering workforce. A foundation for workshop discussions will include the cross cutting issues in the recent National Academy of Engineering report, *The Engineer of 2020: Visions of Engineering in the New Century*, as well as the NSB reports that identified troublesome trends in the number of domestic engineering students, with potential impacts to U.S. preeminence in S&E based innovation and discovery. The major workshop objective is to move the national conversation on these issues forward in a productive way by calling attention to how engineering education must change in light of the changing workforce demographics and needs. The National Academy of Engineering (NAE), which sponsored the Engineer of 2020 study, has undertaken a Phase II study. The proposed NSB workshop would be in parallel to these NAE efforts. The NSB workshop would focus more substantially on the issues of the current and desired future engineering workforce in light of the Engineer of 2020 report.

Statutory basis

NATIONAL SCIENCE BOARD (42 U.S.C. Section 1863) SEC. 4 (j) (2) The Board shall render to the President for submission to the Congress reports on specific, individual policy matters related to science and engineering and education in science and engineering, as the Board, the President, or the Congress determines the need for such reports.

Link to National or NSF Policy Objective

It is widely recognized that our economy, national security, and indeed our everyday lives are increasingly dependent on scientific and technical innovation. Changes on a global scale are rapidly occurring for engineering, and Federal leadership is needed to respond quickly and informatively. The Board has issued several reports expressing concern about long-term trends that affect the U.S. workforce capabilities in engineering, including the dependence on international students and workers; the declining interest on the part of U.S. citizens in engineering studies and careers; weakness in the K-12 science, technology, engineering, and mathematics education system; and demographic trends that are unfavorable to increasing citizen participation rates in these fields. Engineers are the largest component of workers with college degrees in S&E occupations, with 39 percent of all S&E occupations in 1999. Almost half of S&Es in the labor force with bachelors' degrees as their highest-level degree are engineers. This field therefore has a huge impact on our national capabilities for S&T and deserves special attention.

There is a current high level of attention to engineering education from a variety of sources that converge to make engineering education an especially timely topic for the Board to address. These include the recent release of the National Academy of Engineering report, *The Engineer of 2020: Visions of Engineering in the New Century*, which calls for reform in engineering education; the National Science Board reports on unfavorable trends affecting long-term U.S. workforce capabilities in science and engineering and the need to address these trends along all

points of the education pipeline; the concern of U.S. industry and the public sector in engineering capabilities in the workforce; and the poor progress in broadening participation in engineering.

Logistics

The NSB Office will be the focal point for providing all aspects of Board support in this NSB activity; coordinating NSF, other agencies and institutions involvement; and utilization of one or more NSB Office contractual agreement(s) to assist with meeting logistics. NSB/EHR will recommend full Board approval of the appointment of an *ad hoc* Task Group of EHR to provide oversight for, and actively engage in, this activity.

An agenda and a comprehensive list of potential participants in the event will be developed with input from Board Members, NSF management, contacts in other agencies, and the broader S&T research and industry community. Invitees would include young recently graduated engineers, more experienced engineers, a range of employers (spanning the range of engineering disciplines), university thought leaders on engineering, and experts on engineering demographics.

Timing: Fall/Winter 2005

Workshop Topics: A workshop on the linkages between workforce issues and engineering education would involve a large range of topics, such as:

- 1) What are different scenarios for engineering workforce development in the U.S.? What are the differences among engineering fields?
- 2) How successful have we been in predicting the engineering workforce needs in the past and what has happened to the engineers when we got it wrong?
- 3) What are the implications of the different scenarios for engineering education?
- 4) What are the roles of the different stakeholders in the development of the engineering workforce, particularly the professional societies, universities, working engineers (of differing ages) and employers?
- 5) What is a typical demographic for an engineer today, and what will it become? How do we broaden participation?
- 6) The past and future role of international students and engineers in the U.S. engineering workforce.
- 7) The changing role of engineering education in preparing for engineering workforce needs for the future, including graduate education and lifelong learning as career shifts occur, and the idea that engineering education might be to prepare students more broadly for employment in the public, nonprofit, academic, and industry sectors.
- 8) How do we ensure that the best and the brightest students pursue engineering studies and careers, and that their education quality, content, and teaching are of the highest caliber?

Workshop Product: The final output from the meeting will be a concise set of Board approved recommendations that tie back to what universities (with employers) and NSF can affect, published in paper and electronic formats.

Audiences: In addition to the President, Congress, and NSF:

- Engineering deans/departments/schools
- ABET
- Engineering thought leaders
- Leaders in technical industry and the public sector that employ engineers.