

**APPROVED MINUTES<sup>1</sup>  
OPEN SESSION  
397TH MEETING  
NATIONAL SCIENCE BOARD**

National Science Foundation  
Arlington, Virginia  
March 30, 2007

Members Present:

Steven C. Beering, Chairman  
Mark R. Abbott  
Dan E. Arvizu  
Barry C. Barish  
Camilla P. Benbow  
John T. Bruer  
G. Wayne Clough  
Kelvin K. Droegemeier  
Kenneth M. Ford  
Patricia D. Galloway  
Elizabeth Hoffman  
Louis J. Lanzerotti  
Alan I. Leshner  
Douglas D. Randall  
Arthur K. Reilly  
Jon C. Strauss  
Thomas N. Taylor  
Richard F. Thompson

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

Members Absent:

Kathryn D. Sullivan, Vice Chairman  
Ray M. Bowen  
José-Marie Griffiths  
Daniel E. Hastings  
Karl Hess  
Jo Anne Vasquez\*

---

<sup>1</sup> The minutes of the 397<sup>th</sup> meeting were approved by the Board at the May 2007 meeting.

\* Participated by telephone for Agenda Item 10: Board Commission on 21<sup>st</sup> Century in Science, Technology, Engineering, and Mathematics.

The National Science Board (Board) convened in Open Session at 1:30 p.m. on Friday, March 30, 2007 with Dr. Steven Beering, Chairman, presiding (Agenda NSB-07-26, Board Book Tab 11). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 7: Approval of Open Session Minutes, February 2007

The Board unanimously APPROVED the Open Session minutes of the February 2007 Board meeting (NSB-07-20, Board Book Tab 11E).

AGENDA ITEM 8: Closed Session Items for May 2007

The Board unanimously APPROVED the Closed Session items for the May 14-15, 2007 meeting (NSB-07-30, Board Book Tab 11F).

AGENDA ITEM 9: Chairman's Report

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

**a. Approval of Honorary Award**

In Executive Closed Session, the Board approved the recipient of the 2007 Alan T. Waterman Award. This award, along with the Vannevar Bush Award and the NSB Public Service Awards, will be presented at the Board's annual awards dinner on May 14, 2007 at the Department of State's Diplomatic Reception Rooms.

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

The Chairman announced the appointment of the following Board Members to the *ad hoc* Committee on Nominating for NSB Elections, informally known as the Elections Committee: Drs. Elizabeth Hoffman, Douglas Randall, Kathryn Sullivan, and Jo Anne Vasquez.

**c. Congressional Testimonies**

Dr. Beering reported that he testified before the House Committee on Appropriations, Subcommittee on Commerce, Justice, and Science on February 28, 2007. His written statement was provided to Board Members. The testimony discusses the FY 2008 NSF budget request and the Board's budget for FY 2008. The statement also includes an overview of Board activities during the past year and summarizes the Board's recent oversight activities and policy directions for NSF, advice to the President and Congress, and outreach and communication to the broader community.

Following this testimony, two specific issues came up during the question and answer period, which required follow up. First, Chairman Alan Mollahan asked Dr. Beering to meet with him

to discuss the potential for the Board to develop an overarching set of principles for the communication of scientific information by Government scientists, policy makers, and managers that should serve as the umbrella under which each agency would develop its specific policies and procedures. Chairman Mollahan raised this issue in the context of the Board's earlier response to Senator John McCain on this topic.

Second, the Board was asked that, should additional funds become available, how the Board would recommend funds be spent in support of education and human resources (EHR) programs that have been shown to be effective through rigorous merit review and assessment. In particular, the Board was asked whether the 3.5 percent increase in Research on Learning in Formal and Informal Settings over the FY 2007 request would be sufficient as a share of the NSF budget. Dr. Beering agreed that the Board would provide a detailed follow up response to Congress.

Also, on March 20, 2007, Dr. Beering testified before the House Subcommittee on Research and Science Education, an authorization subcommittee. His written statement for this hearing was also provided to Board Members. This testimony addresses specific questions from Chairman Brian Baird in his letter of March 7, 2007. The Board responded to the following questions and issue: What NSF can do to nurture young investigators and improve their funding rates? What is the appropriate balance between funding for interdisciplinary and disciplinary research? What is the role for NSF in research driven by national needs? What are NSF's priorities in K-16 STEM education? Issues for consideration in the NSF reauthorization.

#### **d. Improved Board Web Site**

The new public Board Web site, which was discussed at the Board Retreat in February 2007, had many improvements over the current Web site. Dr. Beering requested that Board Members forward comments to Dr. Michael Crosby, Executive Officer and Board Office Director, by mid-April 2007. It was anticipated that the new Web site would be posted and available to the public before the May 2007 Board meeting.

#### **e. Polling for 2008 Board Meeting Dates**

Board Members were asked to respond to the Board Office poll for the 2008 calendar for Board meeting dates. As announced at the February 2007 meeting, Board Members had been polled to ensure attendance by the highest number of voting Members possible. The poll included those Board Members whose terms expire in May 2008, but could continue as Board Consultants. The Board Office will provide a draft 2008 meeting schedule to all Board Members in mid-April 2007, and Board Members will vote on the final 2008 calendar meeting dates at the Board meeting in May 2007.

#### **f. Board Member Honor and Board Staff Recognition**

Dr. Beering announced that Dr. Vasquez would lecture at the New York Academy of Sciences and the Science Education Section meeting in April 2007. She would also be the recipient of the Willard Jacobson Award, an annual award given to a science teacher who has made major contributions to the field of science education.

Dr. Beering also recognized Mrs. Susan Fannoney of the Board Office, who had most recently served as Senior Associate for Operations and Honorary Awards. Mrs. Fannoney was about to retire from more than 26 years of Federal service. For the past 20 years, the Board and Board Office have benefited from her exceptional, dedicated service.

AGENDA ITEM 10: Board Commission on 21<sup>st</sup> Century Education in Science, Technology, Engineering, and Mathematics (STEM)

Dr. Beering stated that, in his testimony on March 20, 2007, Members of the congressional subcommittee expressed their eagerness to receive the Board's final action plan to address the Nation's needs for 21<sup>st</sup> century science, technology, engineering, and mathematics (STEM) education. He thanked and commended all the members of the Commission for their dedicated service and hard work to completely revise the report on a fast timeline, in particular the Commission Co-Chairmen, Drs. Leon Lederman and Shirley Malcom. Dr. Lederman joined the Board for this agenda item.

Dr. Vasquez, Commission Vice Chairman, reported that since the February 2007 Board meeting, the leaders of the Commission worked to incorporate Board suggestions and to provide Board Members with a revised report (Board Book Tab 11G). She thanked all the Board Members who submitted comments, which were useful to the Commission's revisions to the report.

The full Commission held two teleconferences on February 21 and March 8, 2007 to discuss the report revisions, and voted unanimously to approve the revised report, which was provided to Board Members, based on comments from the Board at the February 2007 meeting and other meetings and discussions of the Commission. In the revised report, the overall thrust of the Commission recommendations for a national action plan remained unchanged from the draft report that the Board reviewed at the February 2007 meeting. However, the text describing the recommendations was revised, and introductory material was added to place the Commission's recommendations in context with the complete report.

Dr. Vasquez reported that the key recommendation of the Commission is that STEM education should ideally occur in a coherent system that is horizontally coordinated within and among states, that is vertically aligned from pre-K through graduate education, and have effective teachers fully integrated into the system. The goal of the Commission was to develop recommendations for pieces of a national action plan that would assign responsibilities to various entities. The Commission was hesitant to recommend increasing bureaucracy and tried to assign responsibilities to existing entities.

The Commission identified some needs that could be met through a national, non-Federal coordinating body, and the establishment and expanded use of P-16 (or P-20) councils in states. Dr. Vasquez reported that the Commission had been faithful to its charge to develop findings and recommendations to submit to the Board for a bold new action plan.

Dr. Lederman commented that the revised Commission report was still a draft document. He stated that the report offers an implementation plan for the recommendations of previous education commission recommendations. The Commission's overarching recommendation is intellectual instead of administrative, and requires public support to accomplish the changes that must take place.

Dr. Beering opened comments from the floor, and Dr. Hoffman proposed that the EHR Committee take responsibility for development of the Board's final national action plan, and that Drs. Lederman and Malcom and any other Commission members would be welcome to assist in that action. The advice and recommendations provided to the Board in the Commission report would significantly influence the Board's final national action plan. The Board's preliminary report could be presented to the Board at the May 2007 meeting, and possibly a revised draft plan provided for public review and comment at the August 2007 meeting.

Dr. Beering noted that the Department of Education, as well as other Federal agencies, would need to be engaged to move forward with this Board report. Dr. Hoffman agreed that the support, cooperation, and possibly leadership of the Department of Education would be critical. Dr. Lederman requested that the Commission continue as a formal body for several more months. Dr. Beering stated that the Board felt the Commission fulfilled its charge and all Commission members should be proud of their significant contributions. He further noted that the Board was grateful for their advice and recommendations and encouraged Dr. Lederman to continue to work with the Board in this endeavor.

The Board DETERMINED that the STEM Commission fulfilled its charge to provide the Board with advice and recommendations for a bold new action plan for K-12 STEM education, and discharged the Commission as a Federal advisory committee.

#### AGENDA ITEM 11: Director's Report

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

##### **a. Awards to NSF Staff**

Dr. Bement, announced the following prestigious awards recently presented to NSF staff.

Dr. Karl Erb, Director of the Office of Polar Programs, was awarded the New Zealand Antarctic Medal, Queen Elizabeth II's New Years Honors List, which was inaugurated this year to replace the British Polar Medal. New Zealand Prime Minister Helen Clark presented the Medal to Dr. Erb at Blair House in March 2007. The award commemorates the strong U.S.-New Zealand partnership in Antarctic research, logistics, and environmental stewardship. It was presented in recognition of Dr. Erb's efforts to further the partnership over the last 10 years. Dr. Erb was one of three individuals to receive this honor.

Dr. Wanda Ward was presented the Louttit Award at the annual meeting of the Federation of Behavioral, Cognitive, and Psychological Sciences on December 6, 2006. The Federation bestows only one award, and the goal is to honor scientists in the Federal Government who have advanced the behavioral sciences through their service. Dr. Ward was the sixth recipient of this award. She has served as the Deputy Assistant Director of the Social, Behavioral, and Economic Sciences Directorate and currently serves as Deputy Assistant Director of the Education and Human Resources Directorate. Former Louttit awardees are: Richard Louttit, Stanley Schneider, Alan Leshner, Duane Alexander, and Richard Nakamura.

Mr. Thomas Cooley, NSF Chief Financial Officer, was awarded the Donald L. Scantlebury Memorial Award in financial management, the highest honor bestowed in financial management for service in the public sector. Mr. Cooley received this award that recognizes senior financial management executives who have been principally responsible for significant efficiencies and improvements in Federal, State, and local Government. The award was presented on March 13, 2007 at the annual Conference of the Joint Financial Management Improvement Program, a Government-wide financial management improvement activity led by the Secretary of the Treasury, the Director of the Office of Management and Budget, the Director of the Office of Personnel Management, and the Comptroller of the U.S. Government.

The Office of Legislative and Public Affairs (OLPA) won four, first place awards in the National Association of Government Communicators (NAGC) 2006 professional competency competition. NSF earned more awards than any other agency or department in the annual competition. NAGC is a national not-for-profit professional network of more than 35,000 Federal, State and local government employees who disseminate information within and outside government. Its members are editors, writers, graphic artists, video professionals, broadcasters, photographers, information specialists, and agency spokespersons. OLPA received the following awards: Gold Screen Award for the NSF Web site on "The Secret Lives of Wild Animals;" a second Gold Screen Award for NSF Web site on "South Pole Station;" a third Gold Screen Award for NSF radio presentation "Discovery Files;" and a Blue Pencil Award for NSF press release, "Outbreak: Rapid Appearance of Fungus Devastates Frogs."

OLPA also was selected for the CINE, Golden Eagle *Special Jury Award*, an award for best science documentary for the production of "Einstein's Messengers," an NSF video about Laser Interferometer Gravitational-Wave Observatory (LIGO). Renowned for the Golden Eagles it awards for excellence in documentary and other informational film and video production, CINE was founded in 1957 by a consortium representing business, education, and government to depict American life and thought for a global audience. CINE continues to recognize and foster the highest quality of non-theatrical and non-commercial film and video production. Dr. Bement thanked Mr. Jeffery Nesbitt, OLPA Director, and the OLPA staff.

#### **b. 12th Anniversary of FastLane**

Dr. Bement announced the 12<sup>th</sup> anniversary of FastLane. On March 29, 1995, the vision became a reality for an interactive, 24-hour, real-time grants management application that used the World Wide Web to facilitate business transactions and exchange information between NSF and its client community. On this date 12 years ago, FastLane was used to submit a review, the first of one million that would follow over the next 10 years. Since its inception, FastLane has

grown to support over 7,000 organizations and over 250,000 registered users. To date, NSF has allowed for the submission of over 320,000 proposals; 70,000 post award notifications and requests; and 160,000 project reports via FastLane. Dr. Bement stated that FastLane is an eGovernment success story, and thanked those who have supported it over the past 12 years.

### **c. Congressional Update**

The Director's congressional update, which included information on a number hearings and legislation relating to NSF, was provided to Board Members (Board Book Tab 11H).

## AGENDA ITEM 12: Open Committee Reports

### **a. Audit and Oversight (A&O) Committee**

Dr. Dan Arvizu, A&O chairman, stated that since the February 2007 meeting, he met with the Office of Inspector General (OIG) and NSF staff and was pleased with progress being made as they work together to address the reportable conditions on the FY 2006 financial statement audit. He also followed the negotiations related to the resolution of the Raytheon related audits and noted that progress was being made and that complex issues are being resolved. There will be an update at the May 2007 meeting.

Drs. James Lightbourne and Joanne Tornow, both with the Office of Integrative Activities (OIA), Office of the Director, provided the highlights of the NSF's annual Merit Review Process report as required by Board policy established in 1977 requiring that the NSF Director submit an annual report on the NSF Merit Review Process. This report was provided to Board Members (Board Book Tab 9B). Drs. Lightbourne and Tornow noted the following highlights: funding rate for NSF proposals was 25 percent in FY 2006, up slightly from FY 2005; average and median award size increased steadily from FY 1999 to FY 2005, dropping somewhat in FY 2006; NSF's capacity to fund highly-rated proposals has eroded - in FY 1997, one highly-rated proposal was declined for every three that were funded, in FY 2006, two highly-rated proposals were declined for every three funded; and use of mail-only review decreased while use of panel-only review increased. During discussion, several queries from the Board were raised, and NSF will follow up on gathering data such as geographic patterns and success rates and on statistics regarding unsolicited multiple principal investigator (PI) proposals. There is also a study of small grants for exploratory research (SGER) underway and NSF will report on the results of that study at a future meeting.

Dr. Kathie Olsen, NSF Deputy Director, briefed the Committee on NSF's Framework for Human Capital Management. She showed how the major planning components of this framework - Human Capital Management Planning, Workforce Planning, and Succession Planning - are aligned with the new NSF *Strategic Plan*. She also explained NSF's workforce planning efforts in FY 2006 and 2007, and described the NSF-wide succession planning effort that is just getting underway. NSF established a formal workforce planning process aimed at identifying priority needs in the workforce, action strategies to address those needs, and metrics to evaluate the effectiveness of those strategies. The workforce plan is supplemented by an annual staffing planning process initiated in FY 2006. This activity aims to identify

1-2 year hiring needs in each NSF Directorate and Office. Earlier this year, Dr. Olsen instituted a comprehensive, agency-wide succession planning process. She established a working group of senior executives from across NSF, and they will develop agency-wide succession strategies focused on effective recruitment, development, and orientation of executive-level candidates. In developing these strategies, the group will consider such issues as the appropriate balance of temporary and permanent executives, and recruiting and developing the right leadership competencies and management skills.

Mr. Cooley and his team provided the Chief Financial Officer's update. Ms. Karen Tiplady, Director, Division of Grants and Agreements, Directorate for Budget, Finance, and Award Management (BFA), provided a briefing on how NSF resolves audits of NSF awardees. She explained the rigorous process that is followed in resolving audits, and the checks and balances inherent in the different standards that auditors and those that undertake audit resolution must follow. She noted the close coordination with NSF staff and OIG, the importance of following an equity standard, and the adherence to timeliness. Mr. Cooley gave an update on the progress made on the Corrective Action Plan undertaken in response to the auditor's recommendations, NSF's FY 2006 financial statements, and the FY 2007 financial statement audit process, which included the impact of new and more stringent government-wide audit standards for this next cycle. He also noted that work on post-award monitoring was going well. Contract monitoring was a newer issue and would take longer than this year's cycle to develop and implement an approach to fully resolve the reportable condition.

Dr. Christine Boesz, NSF Inspector General, informed the committee that the OIG is planning to initiate an audit of NSF's audit resolution process later this year. She also noted that the FY 2007 financial statement audit had begun and that it is funded out of OIG appropriations, to assure independence. Mr. Salvadore Ercolano, Partner-in-Charge of NSF's financial statement audit team with Clifton Gunderson LLP, agreed with Mr. Cooley's statements about this year's audit.

Dr. Arvizu also noted that the A&O Committee shares with Dr. Ray Bowen's Committee on Strategy and Budget (CSB) an interest in the impact of, and any potential changes to, the Board's cost sharing policy for NSF grants and contracts. A&O looks forward to working with CSB as they further examine implications of the Board's previous actions on this issue and what might be done to further refine guidance in this area. If there are any formal policy changes in this area, they will come through A&O for approval.

#### **b. Education and Human Resources (EHR) Committee**

Dr. Elizabeth Hoffman, EHR chairman, reported that the committee discussed the Board's recent response to a request from Congressman Rush Holt, for the Board to provide a summary of the review of the NSF's EHR Directorate program evaluations that was undertaken by the EHR Committee on behalf of the Board. The Board responded to Congressman Holt in a preliminary report in January 2007, promising a more thorough report later in 2007. Dr. Hoffman noted that the more thorough report will reflect the impacts of the recommendations of the Board's Commission, the Academic Competitiveness Council's review of evaluation of Federally funded programs and projects in STEM education, the new leadership of the NSF Education and Human Resources Directorate (NSF EHR) under



Dr. Cora Marrett, Assistant Director for the Education and Human Resources Directorate, and the Board's ongoing evaluation of the EHR Directorate's programs in the context of our national need to reform STEM education.

Dr. Marrett presented several items from the February 2007 meeting, where NSF was asked to provide follow up: an update on NSF responsibilities in the Math and Science Partnership program and recent interagency activities related to STEM education; an outline of the larger, longer term objectives that propel and are formative for NSF and STEM Education; and an update on recent and planned NSF EHR organizational changes.

Dr. Marrett also provided the Committee with useful information on a vision for the future of NSF EHR. She outlined the EHR mission and goals, discussed the revised organizational structure, plans to sustain NSF's leadership in STEM education, and enhanced partnerships and linkages through the NSF, other agencies, industry, and international programs. She noted that it is the goal of EHR to cultivate excellence in all endeavors as it strives to enable excellence in U.S. STEM education at all levels and to promote a diverse STEM workforce. She also noted that NSF has a distinct role from other agencies in that it provides educational programs across all areas of science and engineering, at all levels, which can be translated to larger activities. Also as part of the follow up from the February 2007 meeting, Dr. Bement will provide the Board with the Academic Competitiveness Council report at the May 2007 meeting.

Finally, the committee agreed to have a presentation on the National Academy of Sciences (NAS) report, *Beyond Bias and Barriers*, at the May 2007 meeting.

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

Dr. Louis Lanzerotti, SEI chairman, noted that *Science and Engineering Indicators (Indicators)* is an important product of the Board and NSF published every 2 years, and the SEI is preparing the 2008 edition.

Dr. Lanzerotti reported that SEI discussed three major items. (1) the reviewer comments and author responses for two of the chapters that were drafted thus far, the K-12 Education Chapter, and the State Indicators Chapter; (2) key findings in both chapters to determine which ones might be included in a new condensed "Digest" version of the indicators; and (3) preparations for *Science and Engineering Indicators 2010*.

For the draft chapters on K-12 Education and State Indicators, SEI heard a discussion and a summary from the chapter authors as well as the lead Board reviewers for each chapter, Dr. Jo Anne Vasquez for K-12 and Dr. Kelvin Droegemeier for the State Chapter. A number of changes and suggestions were made for modifications of the chapters. There was general agreement that the subcommittee did not need a further iteration of these chapters prior to the appearance of the Orange Book, comprising all the draft chapters, in July 2007, which will be sent to all Board Members for their review prior to the adoption and the agreement on the chapters.

The subcommittee discussed the condensed version of *Indicators*, looking to the key findings from each of the two chapters that were under discussion. Dr. Lanzerotti requested Board

Members suggest alternative formats for the information in the digest version. The key findings could be organized as the chapters currently are, or organized under themes. The subcommittee will continue with that discussion at the May 2007 meeting. A draft statistical tutorial for non-experts will be prepared for possible inclusion in *Indicators* and further discussion at the August 2007 meeting.

Dr. Lanzerotti also reported that SEI discussed *Science and Engineering Indicators 2010*, and identified three areas where the subcommittee will institute preparation actions, beginning this fall: (1) a list of data gaps and data needs that SEI might require and might be able to fulfill for 2010; (2) a meeting with state representatives to discuss the State Chapter and how that chapter could be more useful to the readership in the individual states; and (3) a meeting with industry representatives from one or more organizations to discuss the coverage in *Indicators* of technology industries and other industries that use technologies.

A discussion on the Companion Piece for *Indicators* was deferred until the May 2007 meeting when the remaining chapters are submitted and a number of the key findings are identified.

#### **d. *ad hoc* Engineering Education Group**

Dr. G. Wayne Clough reported on behalf of Drs. Daniel Hastings and Louis Lanzerotti, who were charged by the EHR Committee, to explore the issues of engineering education and U.S. workforce needs in technical areas.

He reported that the *ad hoc* Engineering Education Group had two successful workshops: the first workshop held at the Massachusetts Institute of Technology in October of 2005, and the second workshop held at Georgia Institute of Technology in November 2006. The first workshop was more conceptual in nature, and explored the issues of technical and engineering workforce with industry, government, and universities. Those groups indicated that more engineers were needed, particularly well-rounded engineers who would be adaptable in a “moving-target” economy. About 25 engineering deans from leading U.S. colleges of engineering attended the second workshop, and explored innovations in engineering education that their institutions were implementing or thinking about implementing.

The *ad hoc* group was impressed by the quality of the ideas, the work that was underway or planned, and the willingness to adapt to a new environment for engineering. One topic that received attention was the retention of engineering students because many of the Nation’s bright young people leave the field in the first years of engineering education. The deans had many ideas to encourage students to complete engineering programs.

Summary notes of the two workshops were compiled in two separate documents, and will be combined into one draft document of 3-4 pages addressed to the NSF Engineering Directorate.

The *ad hoc* group was left with a few hanging issues, one of which is the number of engineers really needed. A complex issue, the *ad hoc* group will consider working with NSF to encourage the National Academy of Engineering or a similar group to explore the large differences in perspectives of different groups on this issue.

#### **e. Committee on Programs and Plans (CPP)**

Dr. Kenneth Ford, CPP chairman, reported that the Chairman of the Astronomy and Astrophysics Advisory Committee (AAAC) provided a copy of the committee's annual report to the Board. This report, established in the NSF Authorization Act of 2002, contains some recommendations for modifications to the major research and equipment facilities construction (MREFC) process.

Dr. Strauss raised the issue of whether it might be appropriate for the Board to address scientific challenges in the development of alternative sustainable energy. Dr. Ford asked Dr. Strauss to form an *ad hoc* group to formulate more specific options for the Board to consider at the May 2007 meeting.

At the November 2006 CPP meeting, the Board approved a request for information related to recompetition and operations and management costs for NSF contracts, cooperative agreements and grants. Drs. Louis Lanzerotti and Mark Abbott briefed the committee on their progress and made specific recommendations for next steps. The committee asked that NSF provide additional information – specifically on Federally funded research and development centers (FFRDCs) and large projects such as MREFCs, among others. NSF and the Board Office will work together to clarify the scope and form of information requested, the remaining data gaps, and the timeframe for delivery of the information. The committee will discuss this issue again at the May 2007 meeting.

The committee then discussed the potential impacts to the MREFC program from the realities of the FY 2007 and FY 2008 budget request. This issue was requested at the February 2007 meeting in response to questions raised by Board Members regarding impacts to the MREFC program from the FY 2007 and FY 2008 budgets. In addition, the Chairman of the Board was asked extensive questions at a recent congressional hearing about the role of the Board in approving budgets and priorities for MREFC projects. Dr. Bement briefed the committee on these issues, specifically current Board policies, factors influencing the FY 2007 current plan, the status of new start projects, the impacts for FY 2007 and FY 2008 on construction starts, as well as other considerations. NSF hopes that its FY 2007 current plan will be approved in April 2007, which will alleviate some of the uncertainty surrounding new start projects.

The committee heard an update on the Division of Astronomical Sciences (AST) Senior Review. Dr. Tony Chan, Assistant Director, Directorate for Mathematical and Physical Sciences (MPS), and Dr. G. Wayne Van Citters, AST Division Director, provided the committee with this update to establish a framework for the two action items submitted to the committee for consideration in closed session. In response to the recommendations in the AST Senior Review, NSF is undertaking detailed cost reviews of each observatory in its portfolio, exploring costs and legal issues associated with recommendations, and engaging outside studies over the next year. NSF is also interacting with other agencies and possible partners and consulting extensively with the community on these issues.

Dr. Ford reported on the status of two task forces and a subcommittee:

Task Force on International Science (INT)

Dr. Jon Strauss, INT Chairman, reported the Task Force heard two presentations: one from Dr. Alan Leshner about the Kuwait Conference on Women Leaders in Science, Technology, and Engineering that he attended in January 2007; and one from Dr. Richard Bissell and Ms. Patricia Koshel, NAS, on the NAS report, *The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development*.

The task force also heard an overview of the final Task Force Roundtable Discussion on International Science Partnerships held in Brussels, Belgium on March 9, 2007 and informal discussions held in Trieste, Italy on March 13, 2007, both with science and technology leaders from the European community. Dr. Strauss also informed the committee that the task force expects to present its final report and recommendations to the Board in August 2007.

Task Force on Transformative Research (TR)

Dr. Douglas Randall, TR chairman, submitted the “final for Board approval” TR report, *Enhancing Support of Transformative Research at the National Science Foundation* (Board Book Tab 5B) to the committee, and the committee recommended this report to the Board for approval.

The Board unanimously APPROVED the “final for Board approval” TR report, *Enhancing Support of Transformative Research at the National Science Foundation* (NSB-07-6).

*[Following final editing by the Board Chairman and task force chairman, a “pre-publication copy” of the report (NSB-07-32) was released on March 30, 2007.]*

The committee also recommended an extension of the task force charge for the full 2007 calendar year to lead the Board review of the NSF implementation plan of the Transformative Research Initiative following the recommendations of the TR report.

The Board unanimously APPROVED the extension of the charge to the Task Force on Transformative Research through the end of the 2007 calendar year to review the NSF plan for implementation of the Transformative Research Initiative.

Subcommittee on Polar Issues (SOPI)

Dr. Barry Barish, SOPI chairman, reported that the subcommittee forwarded a proposed U.S. Antarctic Program Icebreaking Resolution to the committee for review, which supports the recommendations of White Paper on Support for Icebreakers in response to the recommendations put forth by the NAS Committee on the Assessment of U.S. Coast Guard

(USCG) Polar Icebreaker Roles and Future Needs. With one minor change, the committee recommended forwarding this resolution to the full Board for approval.

The Board unanimously APPROVED the U.S. Antarctic Program Icebreaking Resolution (NSB-07-35, dated March 23, 2007 and revised March 29, 2007) to support the White Paper on Support for Icebreakers (NSB/SOPI-07-2) (Appendixes A and B).

#### **f. Committee on Strategy and Budget (CSB)**

Dr. Kelvin Droegemeier reported on behalf of Dr. Ray Bowen, CSB chairman. Dr. Bowen noted that, in response to CSB's concern about the lack of increase in the EHR portion of the FY 2007 budget, Dr. Beering wrote to the Chairman (Robert Byrd) and Ranking Member (Thad Cochran) of the Senate Committee on Appropriations explaining the vital importance of their support for increased funding of the NSF EHR account in the FY 2007 budget. Copies of the letters were provided to Board Members.

Dr. Bement presented a status report on the FY 2007 budget. He also reported on recent Congressional hearings, as mentioned in the congressional update provided to Board Members (Board Book Tab 11H). Dr. Bowen asked the NSF Director to brief the committee in August 2007 on how NSF is implementing the NSF *Strategic Plan*. Dr. Bement assured the committee that NSF would be faithful to the *Strategic Plan* and that this will be a topic of discussion at the NSF Senior Management Retreat the next week.

At the February 2007 meeting, CSB expressed concerns about the impacts and unintended consequences of NSF and Board cost sharing policies at universities. Mr. Cooley gave a presentation on the history and current status of cost sharing at NSF. Currently, NSF does not require cost sharing. However, institutions may voluntarily make cost sharing contributions. Some grants that were made before implementation of the no-cost-share policy, such as long-duration centers awards, still have cost-sharing requirements as terms of the original grant or cooperative agreement. But, no new program announcements require cost sharing beyond the statutory 1 percent Federal requirement. NSF appropriations no longer contain a cost sharing requirement and therefore it will be eliminated for awards made on or after June 1, 2007.

In the ensuing discussion, several Board Members raised concerns about an institution's ability to demonstrate their capability to support the proposed work, and the commitment to partnerships for research in the absence of cost sharing. Dr. Bowen noted that the no-cost-share policy has only been in effect for a couple of years and that more information about implementation is needed.

The CSB committee voted to form an *ad hoc* Working Group on Cost Sharing to look more closely at the impacts of cost sharing policies within the research community. Dr. Droegemeier volunteered to lead that working group and welcomed other Board Members to join him.

Dr. Olsen gave an update on the progress from the Working Group on the Impact of Proposal and Award Management Mechanisms (IPAMM). This working group recently conducted a survey of NSF PIs who submitted proposals in the last 3 fiscal years. The survey was designed

to learn more about the motivations and impacts in proposal submissions and PI perceptions of success rates. Nearly 24,500 individuals responded to the survey. Currently, data are being analyzed, along with information from case studies of six NSF programs, to form a draft report that will be presented to CSB at the August 2007 meeting.

Dr. Beering adjourned the Open Session at 2:35 p.m.



Ann A. Ferrante  
Writer-Editor  
National Science Board Office

#### Attachments

Appendix A: NSB-07-35, U.S. Antarctic Program Icebreaking Resolution

Appendix B: NSB/SOPI-07-2, White Paper on Support for Icebreakers

## RESOLUTION

### NATIONAL SCIENCE BOARD

#### U.S. ANTARCTIC PROGRAM ICEBREAKING RESOLUTION

WHEREAS research conducted in the earth's polar regions is critical for understanding phenomena of global importance and polar regions offer unique opportunities for forefront scientific research in a broad range of disciplines; and

WHEREAS the National Science Foundation (NSF) is the principal supporter of research conducted by U.S. scientists in the polar regions; and

WHEREAS the NSF is responsible for implementing U.S. policy calling for an active and influential presence in Antarctica through year-round scientific activity at the south pole and at two coastal research stations; and

WHEREAS the above activities depend critically upon the availability of heavy icebreaking services but two of the three U.S. icebreakers capable of supporting these activities are nearing the end of their design lifetimes, have become expensive to operate and maintain, and cannot be relied on indefinitely; and

WHEREAS Board Resolution (NSB-05-68) and (NSB-05-100) supports the NSF Director taking all necessary steps to meet the requirements for polar icebreaking among available options to best meet the needs of the research community in the most cost effective manner; and

NOTING that pursuant to these National Science Board (Board) Resolutions the Swedish icebreaker *Oden*, with state-of-the art icebreaking capabilities, was able to open the channel to McMurdo without assistance this past season, provided an excellent platform for U.S. research and education activities while en route to McMurdo Station, and was obtained at a fair market price; and

NOTING the recommendations of the National Research Council in *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs*, September 26, 2006;

NOTING the discussion and recommendations in the White Paper on Support for Icebreakers prepared by the Subcommittee on Polar Issues, (NSB/SOPI-07-2), March 29, 2007;

Therefore, be it RESOLVED, that the Board supports the recommendations of (NSB/SOPI-07-2), March 29, 2007.

Moreover, be it RESOLVED that the Board reaffirms its previous Resolutions supporting the NSF Director taking all necessary steps to meet the requirements for polar ice-breaking among available options to best meet the needs of the research community in the most cost-effective manner.

Moreover, be it RESOLVED that the Board urges a national policy review that could lead to recapitalizing the Coast Guard icebreaking fleet, and agrees with the National Research Council recommendation that costs to operate and maintain the fleet should be budgeted for by the Coast Guard and that any fleet usage by NSF should be reimbursed by NSF only at the marginal cost rate. Furthermore, if national policy calls for recapitalization of the Coast Guard fleet, recapitalization costs should not be borne by the NSF.

A handwritten signature in black ink that reads "Steven C. Beering". The signature is written in a cursive style with a large, sweeping flourish at the end of the name.

Steven C. Beering  
Chairman



National Science Board  
Committee on Programs and Plans  
Subcommittee on Polar Issues

## **White Paper on Support for Icebreakers**

Dr. Anita K. Jones, former NSB member and Chair of the National Research Council (NRC) study, *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs*, briefed the Board at its November 2006 meeting on the study and on its conclusions. Following the briefing and subsequent discussion, Dr. Barry Barish, Chair of the NSB Subcommittee on Polar Issues, suggested that the Board review its earlier statements on polar icebreakers in view of the new study report.

The NRC report emphasized that “The United States has enduring national and strategic interests in the Arctic and Antarctic and the importance of these regions is growing with time” and addressed the fact that “... U.S. icebreaking capability is now at risk of being unable to support [those] national interests in the north and the south.”

Among the national interests discussed in the report is long-standing U.S. policy requiring an active and influential presence in Antarctica through year-round occupation of South Pole Station and two coastal stations for scientific research and environmental stewardship. The responsibility for implementing this policy was assigned to NSF in National Security Decision Memorandum 71 (July 1970) and reaffirmed in Presidential Decision Directive 6646 (February, 1982).

NSF’s ability to meet this responsibility has been compromised by the deteriorating condition of the two U.S. icebreakers capable of supporting this activity. The two Coast Guard “polar class” icebreakers are nearing the end of their design lifetimes and have not been well-maintained owing to lack of funds. As a consequence, their reliability has suffered. One has now been placed in caretaker status. NSF has had to contract for non-U.S. icebreakers in order to assure continued re-supply of McMurdo and South Pole Stations.

The NRC report and Dr. Jones, in her briefing, also stressed that climate change in the Arctic is likely to bring increased economic activity and more generally, greater human activity, all of which “will increase the need for the United States to assert a more active and influential presence in the Arctic....” Currently, U.S. presence in the Arctic Ocean is expressed almost completely by research expeditions aboard the Coast Guard cutter HEALY and supported by NSF and to a lesser extent, by NOAA through NSF. Should HEALY be called upon to support a potentially emerging range of additional national missions, the research community could lose access to this scientific frontier.

Against this background the NRC study motivates and provides important input to a future national policy review that would provide the framework for assuring the necessary icebreaker support for achieving key national goals in the Arctic and Antarctic over the long term, including those of the research community. NSF's icebreaking interests center on supporting fundamental research and maintaining the Antarctic research stations. The policy review would assess the full range of national interests in a capable U.S. icebreaker fleet and thus would elicit input from other federal agencies such as DOD, DOC, DOI, and DHS as well as the interests of Alaska residents, the research community and NSF and the Coast Guard. Dr. Jones strongly urged that a policy review be initiated at the earliest possible date.

The NRC committee concluded that "National interests in the polar regions require that the U.S. immediately program, budget, design, and construct two new polar icebreakers to be operated by the U.S. Coast Guard." It further recommended that "...the Coast Guard be provided [with] sufficient operations and maintenance budget to support an increased, regular, and influential presence in the Arctic."

The construction of new U.S. icebreakers would take perhaps eight to ten years after construction funds had been appropriated, and Dr. Jones noted that NSF will need to be creative during the interim in meeting the needs of the community it supports.

In the north even the most robust icebreakers have difficulty in accessing portions of the Arctic Ocean in winter, while scientific interest in this frontier has increased rapidly. This has led to a rapidly growing trend toward multi-ship expeditions, with ships from several countries participating and assisting each other in negotiating heavy ice regions.

In the south, because of concerns about the reliability of the Coast Guard polar class icebreakers NSF has chartered non-U.S. icebreakers during each of the last three years to assist in opening the ice channel that enables re-supply of McMurdo and South Pole Stations. Most recently NSF arranged with Sweden for the ODEN, a research icebreaker, to provide this assistance and arranged for scientific and educational activities aboard ship that involved U.S., Swedish and Chilean researchers and teachers. In the process, ODEN demonstrated the ability to open the supply channel through the ice working alone.

The advent of International Polar Year places extra emphasis on maintaining NSF's ability to provide leadership in polar regions research on behalf of the USG.

In view of these observations the Subcommittee on Polar Issues recommends:

- That the White House Office of Science and Technology Policy conduct a national policy review of the nation's needs for heavy icebreakers;
- That the NSF Director participate in that review;
- That the White House and the Congress decide how best to recapitalize, operate and maintain the Coast Guard icebreaker fleet, but that NSF be given responsibility only for meeting the needs of the research community in the most cost-effective, reliable manner;
- That NSF and the USCG work together to maintain POLAR SEA and HEALY in the interim;

- That NSF explore alternate short- and long-term options for securing USAP re-supply services in order to assess their potential cost-effectiveness and reliability;
- That NSF continue to work to develop durable partnerships with other countries on the basis of mutual scientific interest to augment U.S. capabilities for polar research and for meeting its responsibilities to the U. S. Antarctic Program.