

**APPROVED MINUTES¹
OPEN SESSION
383RD MEETING
NATIONAL SCIENCE BOARD**

The National Science Foundation
Arlington, Virginia
December 15-16, 2004

Members Present:

Warren M. Washington, Chair
Diana S. Natalicio, Vice Chair
Dan E. Arvizu
Barry C. Barish
Steven C. Beering
G. Wayne Clough
Kelvin K. Droegemeier
Delores M. Etter
Kenneth M. Ford
Nina V. Fedoroff
Elizabeth Hoffman
Louis J. Lanzerotti
Alan I. Leshner
Jane Lubchenco
Douglas D. Randall
Daniel Simberloff
Jon C. Strauss
Jo Anne Vasquez
John A. White, Jr.
Mark S. Wrighton

Members Absent:

Ray M. Bowen
Daniel E. Hastings
Michael G. Rossmann
Kathryn D. Sullivan

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

¹ The minutes of the 383rd meeting were approved by the Board at the February 2005 meeting.

The National Science Board (NSB, the Board) convened in the Open Session at 1:15 p.m. on Thursday, December 16, with Dr. Warren Washington, Chair, presiding (Agenda NSB-04-172). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM: (unnumbered) Oath of Office

Dr. Washington introduced Dr. John H. “Jack” Marburger, Senior Advisor to the President and Director of the Office of Science and Technology Policy for the Executive Office of the President, to administer the Oath of Office to Board Members who were recently confirmed by the Senate and appointed by the President. He noted that the NSB was a Congressionally-constituted board that provides advice, guidance, and oversight for the National Science Foundation (NSF) and has additional responsibilities for making recommendations and policy advice to the Present and Congress. He stated that the Board carries the expectations of the American people to fulfill their responsibilities at a high level of integrity and competency. Dr. Washington also recognized Dr. Kathie Olsen, Associate Director for Science at the Office of Science and Technology Policy, who was also present.

Dr. Marburger administered the Oath of Office to seven Board Members: Drs. Dan Arvizu, Steven Beering, G. Wayne Clough, Kelvin Droegemeier, Louis Lanzerotti, Alan Leshner, and Jon Strauss.

Dr. Washington congratulated Dr. Arden Bement, NSF Director, and the new Members of the National Science Board who were sworn-in that day.

AGENDA ITEM 6: Approval of Open Session Minutes, October 2004

The Board APPROVED the minutes of the Open Session of the October 2004 Board Meeting (NSB-04-168), Board Book Tab 11 E.

AGENDA ITEM 7: Closed Session Items for February 2005

The Board APPROVED the Closed Session items for the February 7-8, 2005 meeting (NSB-04-176), Board Book Tab 11 F.

AGENDA ITEM 8: Chairman’s Report

a. Omnibus Appropriations Bill

Dr. Washington stated that Congressman Vernon Ehlers, chairman of the Subcommittee on Environment, Standards, and Technology of the House Science Committee, expressed his

“concern and astonishment” that Congress cut funding for the NSF in the FY 2005 Omnibus Appropriations Bill. He stated that Congressman Ehlers voted in favor of the FY 2005 Omnibus Appropriations Bill “under protest.” The legislation included \$227 million below the President’s request for FY 2005, which was \$60 million lower than last year’s appropriations primarily in the critical areas of research and education. This marked only the third time in the past 20 years that there was a reduction in the NSF budget. Dr. Washington further stated that the Board will be able to make a strong case during the coming year for Congress to return NSF to a path of significant and justified budget increases.

b. *Science and Engineering Indicators 2006*

The Chairman stated that one of the Board’s important responsibilities is the development of *Science and Engineering Indicators 2006*, which is a statutory report that is sent to Congress and the President. In a recent memo from Dr. Beering as acting chairman of the Subcommittee on Science and Engineering Indicators, Board Members were invited to review draft report chapters of their choice. Dr. Washington encouraged Board Members to respond to that request.

c. Vannevar Bush Award Committee

Dr. Washington announced that he would establish the Vannevar Bush Award Committee at the March NSB meeting to review nominations and recommend the recipient of the 2005 Vannevar Bush Award. Board Members willing to devote time to that task were asked to contact Dr. Michael Crosby, NSB Executive Officer.

d. Honorary Doctorate Degree to Dr. Bement

The Chairman reported that the NSF Director, Dr. Arden Bement, was not able to attend the Open Session because he was en route to Colorado to deliver a commencement address at the Colorado School of Mines. Dr. Bement earned his Metallurgical Engineering degree from CSM in 1954. As a distinguished alumnus, he would also receive an honorary Doctor of Engineering degree at the commencement exercises.

AGENDA ITEM 9: Director's Report

Dr. Joseph Bordogna, NSF Deputy Director, reported for Dr. Bement.

a. NSF Staff Announcements

Dr. Sherry Farwell joined NSF on July 1, 2004 as Director of the Experimental Program to Stimulate Competitive Research (EPSCoR). Prior to his appointment to NSF, he served as Dean of Graduate Education and Research at the South Dakota School of Mines and Technology. Dr. Farwell received his Ph.D. in Analytical Chemistry in 1973 from Washington State University.

Mr. Ronald D. Branch joined NSF on November 15, 2004 as the Director of the Office of Equal Opportunity Programs (OEOP). Prior to his appointment at NSF, he served as Deputy Director of Civil Rights for the Agricultural Marketing Service at the U.S. Department of Agriculture. Mr. Branch holds a J.D. degree from Howard University Law School.

b. Congressional Update

Hearings

Dr. Bordogna reported that on November 16, the Senate Commerce, Science and Transportation Committee held a hearing in conjunction with the release of the Arctic Climate and Impact Assessment report. Dr. Scott Borg, Section Head of the Arctic Sciences Program at NSF, testified on the NSF supported research in the Antarctic relevant for understanding climate change.

Appropriations

Congress completed its work on the FY 2005 appropriations by passing an Omnibus Appropriation Bill, which the President signed into law on December 8. In that bill the NSF was funded at \$5.473 billion, or \$105 million less than last year. Of the total, the Research and Related Activities (R&RA) account was funded at \$4.22 billion, a reduction of \$30 million from the previous year. The appropriations report language provides broad discretion in allocating these funds.

The Major Research Equipment and Facilities Construction (MREFC) account was funded at \$173.65 million, down nearly \$40 million from the requested level. Both the Atacama Large Millimeter Array (ALMA) and EarthScope were funded at the requested level (less 0.8 percent recession), and the IceCube project was funded at \$14.2 million above the request. The Scientific Ocean Drilling project was funded at \$14.8 million, \$26.89 million less than requested, and the Rare Symmetry Violating Processes (RSVP) was funded at \$14.8 million, half the requested funding, which was \$30 million. Funding for the National Ecological Observation Network (NEON) was addressed by Congress within the Research and Related Activities (R&RA) account, where it received half of the \$12 million request. The Education and Human Resources (EHR) account received \$841 million, which includes \$79.63 million for Math and Science Partnerships (MSPs). Significant reductions occurred in the Divisions for Elementary, Secondary, and Informal Science Education (-\$30.3 million from FY 2004) and the Division for Research, Evaluation and Communication (-\$6.3 million).

NSF's Salaries and Expenses account is funded at \$223 million, a \$4.5 million increase over the FY 2004 appropriated level. Funding for NSF staff employed under the Intergovernmental Personnel Act (IPA) was maintained in the R&RA and EHR accounts. The NSB and the Office of the Inspector General were funded at the requested levels, minus the 0.8 percent across the board rescission applied to all appropriation accounts.

Science and Engineering Legislation

In a separate section of the Omnibus Appropriation Bill, Congress enacted legislation that would continue to provide H-1B visas to temporary professional workers. NSF will receive 40 percent of the application fees for the 20,000 visas above the normal 65,000. The revenues from those fees will continue support for the Computer Science, Engineering, and Mathematics Scholarships program and the Information Technology Experiences for Students and Teachers (ITEST) program.

Finally, on November 26, 2004 Senator Christopher S. “Kit” Bond introduced S. 3003, the *National Food and Agricultural Science Act of 2004*. The bill would establish a Division of Food and Agricultural Science at NSF, which would coordinate a research agenda with the Department of Agriculture. The new division would have a standing council of advisors and provide research grants. Although the bill expires at the end of the 108th Congress, it will most likely be reintroduced in the 109th Congress.

AGENDA ITEM 10: Committee Reports

Executive Committee (EC)

Dr. Barish reported for the EC chairman, Dr. Bement, and stated that Dr. Washington requested that NSF prepare a report to provide the Board with an overview of existing NSF policies on harassment in the workplace and what training is required of NSF supervisors and managers on this subject. The report will come to the Board Office in advance of the February Board meeting.

Secondly, Dr. Crosby compiled a systematic analysis of the language in the Omnibus Appropriations Bill and the language in the Congressional Appropriations Bills for both the House and Senate and identified items that are either informational or potentially action items for the Board.

Lastly, Dr. Barish reported that EC discussed the next Board meeting, which will include the Board’s annual retreat, February 7-8, 2005 at the University of Texas - El Paso. It will consist of three parts: a site-visit and visit to other relevant places nearby, an annual retreat, and a regular meeting. Dr. Diana Natalicio, NSB Vice Chair and host for the event, noted that in addition to seeing one of the leading Hispanic serving institutions in the United States, Board Members will have an opportunity to be acquainted with immigration and border security policies and applications.

b. Audit and Oversight Committee (A&O)

A&O Open Session

Dr. Wrighton, chairman of the A&O Committee, reported that the Board was asked to respond to questions raised by staff of the House Appropriations Subcommittee for VA,

HUD, and Independent Agencies relating to the use of rotators. The committee developed and approved responses to the IPA-related questions and recommended that the full Board approve the responses.

The Board APPROVED the responses to IPA-related questions from Staff of House Appropriations Subcommittee for VA, HUD, and Independent Agencies (Appendix A).

Dr. Wrighton reported that the committee agreed to request that the NSB Chairman include time at the upcoming NSB retreat for further discussion of the Board positions on two of the National Academy of Public Administration (NAPA) study recommendations that dealt with the role of the Board and the appointment and reporting process for the Inspector General.

The committee heard a report from the external auditor KPMG by Mr. Dan Kovlak, who presented the results of the 2004 financial statement audit. NSF received its seventh consecutive unqualified opinion with no reported noncompliance with laws and regulations. There were, however, two reportable conditions: one related to post-award grant monitoring and the other related to contract monitoring.

Mr. Thomas Cooley, NSF Chief Financial Officer, also discussed post-award grant monitoring. NSF had engaged an outside contractor, IBM, to undertake an analysis of best practices. Copies of that report were made available to Board Members. Mr. Cooley and his team will provide additional guidance and overcome this issue. The other reportable condition will be discussed at the Board's March meeting.

Dr. George Strawn, NSF Chief Information Officer, provided an update on information technology security and other issues related to NSF information infrastructure. Dr. Peggy Fischer, Office of the Inspector General (OIG), provided an overview of the NSF investigative processes and noted that NSF has about 300 allegations (civil, criminal, administrative) of misconduct a year. She noted how evidence is gathered and assessed and how the OIG coordinates with the Department of Justice, the NSF, and other institutions. Similarly, the committee discussed its views with Mr. Bruce Carpel, OIG, on the policy regarding identification of audit subjects in the OIG Semiannual Report. The OIG was considering a change to name the institutions in the report to provide better public accountability. The committee also heard an audit of project reporting of NSF awards by Dr. Jill Schamberger, OIG. The audit found that about 47 percent of final annual project reports were either late or missing. NSF agreed with the recommendations of the report to encourage compliance, and will update the A&O Committee at the May committee meeting.

A&O Closed Session

The committee met in Closed Session and heard updates regarding on-going investigations.

c. Education and Human Resources (EHR)

Dr. Elizabeth Hoffman, chair of the EHR Committee, reported that EHR heard a presentation by Dr. James J. Duderstadt, former NSB Chairman and President Emeritus of the University of Michigan, on the topic of “Human Capital in a Global Knowledge Society: A Challenge for NSF in the 21st Century.” He challenged NSF to take a leadership role in developing human capital with bold actions that would lead to significant change, recognizing new ways of learning that today’s students bring to campuses, and to further use linkages between education and research to broaden NSF to reshape future education.

Dr. Judith Ramaley, Assistant Director to the Education and Human Resources Directorate, presented a summary report to the committee on changes in NSF/EHR that have taken place since her arrival at NSF, including furthering the integration of research and education across NSF, implementation of the portfolio concept for EHR programs, and broadening diversity. The committee thanked her for her contributions to the work of the Board, and for her dedicated service to NSF during her tenure.

The committee discussed the possibility of a future EHR Committee activity that would engage industry leaders in a panel discussion to understand what skills are needed for the 21st Century workforce. Committee members showed significant interest in this activity and several Board Members volunteered to participate in developing a charge and to help with planning for this activity. A teleconference will be scheduled to further craft a charge and discuss details of activity.

Dr. Hoffman reported that Dr. Jo Anne Vasquez led a discussion of the Math and Science Partnerships (MPS) program implementation at NSF, focusing on the balance between mathematics and science education. NSF informed the Board that it had not budgeted for any further MSP components but would honor its commitment to existing MSP sites.

Lastly, the committee heard an update on the status of the NSB report, *Broadening Participation in Science and Engineering Faculty* (NSB-04-41).

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

Dr. Steven Beering, acting chairman of the SEI subcommittee, reminded Board Members to fill out the matrix in the Board Book indicating which chapter or chapters they would like to review for *Science and Engineering Indicators 2006*. Drs. Jo Anne Vasquez and John White agreed to be the lead reviewers for the K-12 and state chapters respectively. Dr. Beering reported that three kinds of reviewers were needed: lead reviewers for each of the chapters, general Board reviewers, and external reviewers. The subcommittee also discussed topics for the companion piece to *Science and Engineering Indicators 2006* and the expedited schedule.

e. Committee on Programs and Plans (CPP)

CPP Open Session

Dr. Daniel Simberloff, CPP chairman, reported that the committee discussed the Long-Lived Data Collections (LLDC) report. He reported on behalf of Dr. Michael Rossmann, who was serving as the CPP lead for finalizing the report. CPP had asked for NSF comments on the draft LLDC report at the October meeting. Dr. Bordogna had subsequently informed Dr. Simberloff that NSF comments were forthcoming and would be substantive. Following a discussion, CPP and Dr. Bordogna agreed that NSF comments would be received by CPP by the end of January 2005. Those comments would be reviewed and incorporated into a revised LLDC, which will be discussed by CPP at the March 2005 NSB meeting and, if provisionally approved, made available for public comment between March and May 2005.

The committee heard a report from Dr. Nina Fedoroff, lead for the *ad hoc* Task Group on High Risk Research. A draft charge for the creation of a CPP Task Force on Transformative Research (TR) was presented, discussed, and approved by CPP for consideration by the full Board. Following the recommendation of CPP:

The Board APPROVED the charge of the CPP Task Force on Transformative Research (TR) (NSB/CPP/TR-04-1) (Appendix B)

Dr. Simberloff reported on a meeting that he, Dr. Bement, and Dr. Crosby had with the National Academies' Committee on Science, Engineering, and Public Policy (COSEPUP) relating to the joint effort of NSF and NSB to develop a new large facility planning (LFP) process. Dr. Simberloff reported that COSEPUP members made two key recommendations, which will be included by CPP in the implementation language, to have a formal and explicit role for the various NSF advisory committees in the new LFP process, and to obtain public comment on the entire process.

Dr. Washington commented that, in early November, he, Drs. Bement, Bordogna, and Crosby met with congressional staff on the joint NSB/NSF management document, "Setting Priorities for Large Research Facility Projects." Hill staff was positive and supportive of steps taken so far.

CPP also discussed the NSF response to the proposed timeline for integrating the new LFP process with the NSB schedule, and decided that the appropriate time for the Board's annual reprioritization of Major Research Equipment and Research Facilities Construction (MREFC) projects would be during the May NSB meeting. The Board would consider NSF proposals for new starts during its March, May, and August meetings. The report will be posted for public comment and the Board Office will act as a focal point for receiving solicited comments from the public.

CPP Closed Session

CPP considered two information items on budgets for existing MREFC projects.

f. Committee on Strategy and Budget (CSB)

CSB Open Session

Dr. Douglas Randall reported for Dr. Ray Bowen, CSB chairman. The committee received a detailed update on the status of the FY 2005 budget, which was summarized in the Director's Report (Item 9b). The committee discussed some of the potential impacts of the FY 2005 budget allocation and possibly revisiting the Board's report responding to Section 22 of the NSF Authorization Act of 2002, *Fulfilling the Promise: A Report to Congress on the Budgetary and Programmatic Expansion of the National Science Foundation* (NSB-03-151).

CSB Closed Session

The CSB Committee heard a report from the NSF Director on the status of the FY 2006 budget, the details of the recent passback from the Office of Management and Budget (OMB), and NSF's appeal.

Dr. Washington adjourned the Open Session at 2:05 p.m.



Ann A. Ferrante
Writer-Editor
National Science Board Office

Attachments

Appendix A: Responses to IPA-Related Questions from Staff of House Appropriations Subcommittee for VA, HUD, and Independent Agencies

Appendix B: CPP Charge to the Task Force on Transformative Research

**RESPONSES TO IPA-RELATED QUESTIONS FROM STAFF OF HOUSE
APPROPRIATIONS SUBCOMMITTEE FOR VA, HUD AND INDEPENDENT
AGENCIES**

- 1. Does the heavy use of IPA's and other temporary employees compromises the quality of the organization in the long run? This really has to do with a basic public administration and organizational management question of the effect of half your professional workforce and almost all of your Directorate heads being temporary employees.***

The National Science Board has concluded that the use of IPAs and other outside rotators constitutes an important contribution to the National Science Foundation and to the community that the Foundation serves. This contribution is valuable on many levels as a bridge to the science and engineering community supported by the Foundation. It is our opinion that the long term quality of the organization is enhanced by the current practice. The Board has reviewed recent reports on IPAs by the U.S. Office of Personnel Management (OPM), the National Academy of Public Administration (NAPA), and the NSF Office of Inspector General, and has heard relevant staff presentations on NSF's workforce and IPAs/rotators in particular. We are confident that the Foundation's use of IPA's and other temporary employees provides a valuable source for science and technology leadership that enhances the quality of the organization in both the long- and short-term.

The Board also concurs with the conclusion of the recent OPM report that found NSF to have appropriate succession planning strategies in place for the overall workforce. We recognize the importance of NSF to produce a leadership cadre that ensures continuity in addition to motivating staff and maintaining high ethical standards. NSF has a Human Capital Management (HCM) Plan aligned to the agency strategic plan and has selected a workforce planning model that meets strategic requirements and incorporates findings from human capital pilot programs.

In response to a recommendation in the OPM report, the Foundation has agreed to review and revise its workforce planning system beginning in FY 2005. As part of this effort, the Board's Audit and Oversight (A&O) Committee has requested NSF Management to annually report to A&O on the filling of its senior management positions at the Assistant Director, Deputy Assistant Director, and Division Director levels.

2. Are some of these staffing and pay tools being used so far beyond what was originally intended that they constitute an inappropriate use of a legitimate tool?

The Board believes that the use of IPAs and other non-federal rotators by the Foundation is consistent with the IPA Act and other hiring authorities; reflects the essential mission of NSF; enhances NSF's ability to attract senior scientists and engineers; and preserves NSF's flexibility to use IPAs to the extent that NSF program staff find most beneficial and meaningful.

The Intergovernmental Personnel Agreement (IPA) Act was intended for the mutual benefit of the loaning and receiving institutions. It enables the exchange of employees between an institution of higher education (or State or local government or other organization) and a Federal agency when the agency head determines the exchange to be of benefit to the receiving and loaning institutions. While IPAs are detailed to NSF, they are performing work of benefit to the Foundation. When they return to their home institutions, they share information and knowledge with their home institutions that is of benefit to the home institutions.

In response to a recommendation in the OPM report, the Foundation has agreed to submit an annual report to OPM on the filling of its senior management positions. As OPM suggests, the report will also reflect NSF's human capital strategy in support of mission accomplishment, in general, and how NSF will make better use of available civil service compensation flexibilities to fill its senior management positions. The Board will request that copies of this annual report be made available to the Board each year for its review.

3. Does compensation significantly exceed what the marketplace requires for the sorts of people NSF needs?

The Board's A&O Committee reviewed data on the costs of IPA salaries, consulting fees and benefits, and has concluded that the annual incremental costs associated with using IPAs are rather modest in comparison to the overall expenditures for research and associated activities; and that these investments do provide commensurate return on that investment. The Board generally agrees with the OPM finding that compensation of IPA assignees for non-managerial positions does not raise concerns. However, OPM findings on the issue of compensation for senior management level IPAs may need further examination by the Director of NSF, working in concert with the Board's A&O Committee.

4. Should anyone in government service be paid above the levels that would be paid to a permanent employee in the same job?

The Board feels that IPA (or other temporary rotator positions) compensation packages in excess of the maximum authorized levels for career SES civil servants must be justified by NSF Management. Justification may include, but not be limited to, the ability for the candidate to bring to NSF, for a specified period of time, experience and expertise simply not available in a pool of career SES applicants, a unique ability to maximize exchange between the scientific community and the Foundation, and/or effectuate NSF outreach in a way that would not otherwise be possible. The Board's own experience in academia, industry, and government indicates that there are many instances where salaries must accommodate the talent being sought and the value assigned by the marketplace. There will be instances where IPAs are paid above the levels that would be paid to a permanent employee in the same job.

The Board is confident that NSF use of IPAs is critical for meeting the mission and goals of the agency. Implementing the combination of Board oversight actions described in the previous responses will also better enable NSF Management to more clearly and convincingly justify occasional IPA compensation packages above the maximum SES level.

**Committee on Programs and Plans
Charge to the Task Force on Transformative Research**

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 Recommended

The National Science Board (NSB, the Board) should consider new policies that would enhance the ability of the National Science Foundation (NSF, the Foundation) to identify, evaluate, and fund innovative, "transformative" research, defined as research that has the potential to revolutionize an existing discipline through a paradigm shift or create a new one.

Background

In July 1999, the NSB noted a need to revitalize a commitment to innovative research (NSB-00-39). In October 2000, the former NSB Chair, stated to the Committee on Science's Subcommittee on Basic Research, "industry is increasingly dependent on the Federal government to support long term and high risk research at the same time that the Federal share of the U.S. R&D enterprise is declining." At the February 2003 retreat, the Board itself discussed ways in which it could help NSF develop new and more effective approaches to reviewing and funding both multidisciplinary and innovative research that has the potential to transform disciplines.

The August 2004 report of the NSF Advisory Committee for Government Performance and Results Act Performance Assessment (AC/GPA) concluded that no obvious formula exists to guide NSF as to the fraction of the portfolio that should be "high risk" (or "bold"). However, the Advisory Committee also stated "... without hesitation that it is vital that the overall portfolio contain an appropriate amount of "bold" research and that the definition of such research must be clear and widely understood by NSF's key stakeholders". They recognized that there is always a tension between funding such research and funding other priorities, and where possible, they suggested that NSF should do more. The Committee concluded by stating that it "...believes that this issue is important enough to warrant attention by the National Science Board".

The Board's *ad hoc* Task Group on High-Risk Research (now referred to as transformative research) has conducted an initial review of current practices that NSF and other funding organizations use to identify and support potentially transformative research. The NSB Office developed a white paper that provided an overview of the variety of current approaches to identify and fund such research. The Task Group also convened a workshop at the Santa Fe Institute in Santa Fe, New Mexico (22-23 September 2004) to solicit the individual views of members of the scientific community on NSF's approaches to funding transformative research and their suggestions for

improvements. Several major issues were identified during the course of the workshop that affect NSF's ability to identify, evaluate, and fund potentially transformative research:

- There is a lack of common definitions of "high-risk" or "transformative" research.
- There is a need to develop criteria within NSF for flagging potentially transformative proposals.
- There is a need to establish appropriately higher failure rates, as well as extended time-frames, for potentially transformative research.
- There is a need to establish a different and possibly higher target funding rate for potentially transformative research than for research with a more certain outcome.
- There is a need to develop ways of tracking potentially transformative research through the NSF system and of evaluating outcomes over an extended period.

Workshop participants also discussed aspects of the peer review process that militate against selection of potentially transformative research and identified key variables in the review and funding processes that could enhance NSF's ability to identify and support truly pioneering researchers at an early stage in the development of transformative concepts:

- A markedly greater emphasis on selection of individuals, rather than projects.
- A different view of panels, including the possible constitution of separate and different panels for evaluating potentially transformative research and researchers.
- Developing mechanisms that would permit applicants to respond to questions during the review process in written form, in real-time electronic form, and in person.
- Expanding funding specifically for the support of transformative research irrespective of discipline to encourage the influx of new ideas.
- Increasing the ability of program officers to identify and champion such research through better training, greater autonomy, and rewards.
- Increasing awareness and confidence in the scientific community that NSF welcomes transformative concepts, research and researchers.
- Establishing ways of measuring and tracking both the success of potentially transformative proposals within the NSF system and the long-term outcome of funding them.

Policy Objectives

The *ad hoc* Task Group recommends that the Board approve the creation of a formal Task Force on Transformative Research under the Committee on Programs and Plans (CPP). The following issues will be analyzed and discussed before constructive policy recommendations are brought to CPP and the full Board.

- Definition of "transformative/high risk" research
- An acceptable "failure" rate for transformative research
- Review process modifications to improve identification of potentially transformative research
- Appropriate funding mechanism amount and duration

- Mechanisms for assessing success in identifying and supporting transformative/high risk research

Logistics

The Task Force will bring together NSF staff, NSB members, and members of the scientific community. The NSB Office will serve as the focal point for coordination and implementation of all Task Force activities, including liaison with NSF staff, Task Force members, and external contractors.

A series of workshops will be held during 2005, some internal and some external, to address the issues identified above. In addition, the Task Force will convene such working groups as it deems necessary to obtain relevant information about the success rate and fate of “transformative” proposals within the current NSF system, using external contractors as appropriate.

It is anticipated that the Task Force will produce a final report that synthesizes the contributions from its own deliberations, workshops and working groups and presents recommendations for the NSB to consider in formulating policy on soliciting, identifying, supporting and tracking potentially transformative research within the NSF framework. Printed copies of an NSB report will be widely distributed and available on the NSB Web site for the public, universities, the Congress, various special interest groups, and the broad scientific community. The Task Force expects to conclude its activities with 2 years from the date that formation of the Task Force is approved.