

**APPROVED MINUTES¹
OPEN SESSION
370th MEETING
NATIONAL SCIENCE BOARD**

The National Science Foundation
Arlington, Virginia
October 10, 2002

Members Present:

Warren M. Washington, Chair
Pamela A. Ferguson
Anita K. Jones
George M. Langford
Jane Lubchenco
Joseph A. Miller, Jr.
Robert C. Richardson
Michael G. Rossmann
Luis Sequeira
Daniel Simberloff
John A. White, Jr.
Mark S. Wrighton

[nine vacancies]

Rita R. Colwell, NSF Director

Members Absent:

Diana S. Natalicio, Vice Chair
Nina V. Fedoroff
Maxine Savitz

Consultants Present:

Mary K. Gaillard
Stanley V. Jaskolski
Bob H. Suzuki

Consultants Absent:

M.R.C. Greenwood
Richard Tapia

¹ The minutes of the 370th meeting were approved at the November 21, 2002 meeting.

The National Science Board (NSB) convened in Open Session at 1:11 p.m. on Thursday, October 10, 2002, with Dr. Warren M. Washington, Chair, presiding (Agenda NSB-02-148). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 4: Presentations

(1) National Nanotechnology Initiative and NSF's NS&E Portfolio

Dr. Colwell introduced Dr. Esin Gulari, Acting Assistant Director for Engineering, to provide an update on the National Nanotechnology Initiative and NSF's nanoscience and engineering portfolio.

Dr. Gulari explained that the Federal interagency National Nanotechnology Initiative (NNI) focuses on three categories: novel phenomena, properties, and functions; the ability to manipulate matter at the nanoscale in order to change those properties and functions; and integration across all length scales from nano and micro to macro. The seven focus areas in NSF's portfolio are biosystems at the nanoscale, nanostructure by design and novel phenomena, device and system architecture, environmental processes, multi-scale and multi-phenomena modeling, manufacturing at the nanoscale, and education and societal implications. Dr. Gulari noted that the President's Budget Request for FY 2003 proposes \$221 million for NSF's portfolio, with \$72 million for a solicitation this year and \$149 million for core activities.

(2) The Power of Genomics: Solving a Biological Mystery

Dr. Colwell introduced Dr. Joanne Roskowski, Executive Officer for the Biosciences, to brief the Board on the power of genomics. To illustrate the richness and creativity of 21st century biology, Dr. Roskowski described the research of Dr. Derek Lovley, a microbiologist with the U.S. Geological Survey, who discovered a new family of bacteria named the Geobacteresei, which are in soils, sediments, and the deep subsurface. Dr. Lovley and his colleagues accessed data on the geobacter's genome using genomic tools and discovered previously unknown characteristics of the microorganism. Their discoveries have important potential for applications in bioremediation and for low-cost energy generation for environmental instrumentation and sensors.

AGENDA ITEM 5: Open Session Minutes, August 2002

The Board APPROVED the Open Session minutes of the August 2002 meeting (NSB-02-143, Board Book Tab C).

AGENDA ITEM 6: Closed Session Items for November 2002

The Board APPROVED the Closed Session items for the November 2002 Board Meeting (NSB-02-153, Board Book Tab D).

AGENDA ITEM 7: Chair's Report

a. Openness Concerns

Dr. Washington reminded Board members that at the August meeting he raised the issue of making Board meetings as open as possible and asked committee chairs to present comprehensive reports during Open Session. He also asked the Executive Officer to work with the Office of General Counsel to ensure that the Board is meeting its legal obligations. Although this effort is in progress, the Executive Officer and General Counsel have established as a first step a more structured process for examining proposed committee agendas, with the intent of moving appropriate items into open discussion.

b. Vannevar Bush Award 2003 Committee

Dr. Washington reminded Board members to submit nominations for the Vannevar Bush Award to the Board Office by the deadline of December 13.

c. Executive Secretaries

Dr. Washington stated that new Executive Secretaries had been named for several committees: Dr. Marvin Goldberg, Program Director for Elementary Particle Physics, for the Education and Human Resources Committee; Ms. Catherine Hines, Operations Officer in the National Science Board Office, for the Science and Engineering Indicators Subcommittee; Ms. Sonya Mallinoff, Senior Advisor for Planning and Operations in the biological Sciences Directorate, and Ms. Tricia Crumley, Program Analyst in the Budget Division, for the Committee on Programs and Plans; and Dr. Fae Korsmo, Program Director, Office of Experimental Programs to Stimulate Competitive Research, for the Polar Issues Subcommittee.

Dr. Washington thanked the outgoing Executive Secretaries: Ms. Pamela Stephens, Senior Science Coordinator in the Atmospheric Sciences Division, for the Education and Human Resources Committee; Ms. Mary Poats, Program Manager for Engineering Education and Centers, for the Science and Engineering Indicators Subcommittee; Mr. Thomas Cooley, Chief Financial Officer and Director of the Office of Budget, Finance and Award Management (BFA), and Ms. Diane Weisz, Senior Associate for Planning, Policy and Operations, BFA, for the Committee on Programs and Plans; and Mr. William Neufeld, Associate Program Director, Evaluation Section, EHR, for the Polar Issues Subcommittee.

d. Board Office Operations

Dr. Washington announced that the Board Office is embarking on an effort to enhance its operations through appropriate information technology and would welcome any Board member willing to serve as an occasional consultant.

AGENDA ITEM 8: Director's Report

a. Congratulatory Remarks

Dr. Colwell noted that

- Dr. Washington has been inducted into the National Academy of Engineers for his pioneering work on the development of coupled climate models, their use on parallel supercomputing architectures, and their interpretation;
- Mr. David Radzanowski, NSF's budget analyst at the Office of Management and Budget (OMB), has been appointed Chief of the Science and Space Programs Branch in the Energy, Science, and Water Division at OMB; and
- Dr. Jane Lubchenco has been designated one of the top fifty women scientists in the November issue of *Discovery Magazine*.

b. Announcement about Nobel Laureates

Dr. Colwell announced that five of the eight recently named Nobel Laureates in physics, chemistry, and economics have been supported in their research by NSF. This year's awards bring to 123 the number of Nobel Laureates funded by NSF: 41 in physics, 33 in chemistry, 22 in physiology and medicine, and 27 in economics.

c. Congressional Update

Dr. Colwell reported that on September 5 the Senate Health, Education, Labor and Pensions Committee passed S. 2817, the NSF Doubling Act. The Senate Committee on Commerce, Science, and Transportation held its markup on the bill on September 19, and pre-conference discussions are being held. On September 17, the Senate Commerce Committee's Subcommittee on Science, Technology, and Space held a hearing on S. 2945, the 21st Century Nanotechnology Research and Development Act. The bill would authorize nanoscale research programs at various agencies, with NSF as the lead agency. On October 3, the Senate Commerce Committee's Subcommittee on Science, Technology, and Space heard testimony from the Department of Education on the application of Title IX to the sciences.

S. 2182, the Senate version of the cyber security bill passed by the House earlier in the year, is expected to be brought to the floor under unanimous consent. These bills would establish a series of grants at NSF and at the National Institute of Standards and Technology to expand basic research in the computer security field and would provide NSF with hundreds of millions of dollars between FY 2003 and FY 2007.

Dr. Colwell reported that the House Appropriations Subcommittee approved the appropriations bill including NSF on October 9. The bill provides NSF with close to a 13 percent increase overall and increases of 15 percent or more for seven directorates in the Research and Related Activities account.

AGENDA ITEM 9: Presentation: Math and Science Partnerships

Dr. Colwell introduced Dr. Susan Sclafani, Counselor to the Secretary of the Department of Education, and Dr. Judith Ramaley, NSF's Assistant Director for Education and Human Resources, to discuss the results of the first competition for the Math and Science Partnerships solicitation and to give a preview of intentions for FY 2003.

Dr. Ramaley reminded the Board that the purpose of the partnership program is to improve K-12 student achievement in math and science. The most significant challenges are the lack of teachers well prepared in math and science; the lack of effective materials and ideas; and an insufficient portion of students participating in advanced study of math and science. The FY 2002 solicitation offered comprehensive projects involving both math and science in K-12, and targeted projects focusing on specific grades and on either math or science. NSF issued 7 awards for comprehensive projects and 17 for targeted projects. In targeted projects, the emphasis is on mathematics in the middle grades. In addition, NSF has begun to develop the Math-Science Partnership Learning Network by issuing 12 awards for new approaches to supporting research, evaluation, and technical assistance. All three award groups (comprehensive, targeted, and new approaches) will be brought together in January 2003 to form the beginning of the learning network.

Dr. Sclafani described plans for FY 2003 solicitation. It will again make clear that this partnership must include mathematicians, scientists, and engineers as well as educators. Comprehensive projects may have the option to focus on math or science for K-12, rather than on both disciplines. Targeted proposals will focus on a particular grade span or a subject at a particular grade span. The Learning Network will provide opportunities for groups to learn from one another. A new element of the solicitation will be Teacher Institutes, similar to those supported by NSF in the 1950s and 1960s, to improve the content knowledge of teachers already in the classroom. The goal is to develop a "trainer of the trainer" model to increase the number of teachers reached. In addition, the FY 2003 program will hold capacity-building workshops to help develop strong partnerships between school districts and universities and to encourage additional school districts and universities to apply for awards. Dr. Sclafani commented that the collaboration between NSF and the Department of Education is itself a model for those agencies and institutions interested in forming partnerships.

In response to Board members' questions, Dr. Sclafani noted that the Department of Education plans to staff up its Math-Science Program Initiative and bring in businesses and professional organizations to work with teachers on the applications of the concepts they are trying to teach. Dr. Ramaley added that the intent of the partnership program is to learn more about how to increase the effectiveness of working with industry partners as well as science museums and after-school programs. She noted that the funding is used for people, materials, research, evaluation strategies, but not for "bricks and

mortar.” Dr. Sclafani stated that the largest proportion of the dollars is spent for professional development of teachers and noted that there has been an infusion of funds from the Department of Education’s regular programs as well as the new partnership program.

AGENDA ITEM 10: Presentation: Facilities Management and Oversight

Dr. Colwell introduced Dr. John Lightbody, Interim Deputy for Large Facility Projects, BFA, to give an update on NSF facilities management and oversight. Dr. Lightbody noted that he chairs a working group that is putting together a manual for management and oversight of large facility projects, mainly Major Research Equipment and Facilities Construction projects. The purpose of the manual is to provide consistency in how NSF deals with large projects and to provide guidance for program officers, business staff, and awardees. The working group has produced a draft that was reviewed by panels of people from other agencies and research offices at universities, as well as by NSF staff. The manual will define the life-cycle of a project, from concept through termination, making clear the essential requirements at each stage and the decision points within NSF. For each stage, there will be a detailed set of procedures and best practices and the responsibilities of each party. An appendix will provide more information on important topics, such as the review and approval process and the Federal budget process.

Dr. Lightbody highlighted key issues in each stage of the life-cycle and gave examples of best practices. He noted the importance of understanding at the outset of a project what its various phases are, analyzing costs and cash flow for each phase, beginning partnerships early, using project management tools, clarifying the responsibilities of program managers and awardees, planning for new technologies during the life of the project, and having tracking systems for each phase.

In response to Board questions, Dr. Lightbody noted that the major users of large facilities were in the physical sciences, although demand is increasing from other fields such as engineering and biology. The major driver for new facilities is the community that perceives an emerging scientific opportunity. The NSF manual is expected to evolve as users and others in the community offer suggestions for improvement. Periodic reports will be made to the Board’s Committee on Programs and Plans.

ADENDA ITEM 11: Committee Reports

a. Audit and Oversight (A&O)

Dr. Mark Wrighton, chair, reported that the committee received several reports. Mr. Cooley provided an update on the NSF response to the 2001 Management Letter stemming from the Office of Inspector General’s (OIG’s) audit. He noted that the majority of recommendations have been accepted, but some will require a government-wide solution and others would create burdens for grantees and NSF. NSF is working with the IG on a risk-acceptance approach to certain findings. Mr. Cooley also reported

on the establishment of an advisory committee to assist with Government Performance and Results Act performance assessment. This approach is believed to be unique among government agencies. Ms. Andrea Norris, Division Director for Information Systems, reported on the response of NSF to the Government Information Security Reform Act. Ms. Martha Rubenstein, Director of the Budget Division, reported on the President's Management Agenda Scorecard, which rates agencies in five areas. NSF is the only agency to have two green scores, one in e-government and one in financial management.

After considering the Board's 1999 policy statement on cost-sharing, the committee agreed to recommend at the November meeting that the Board consider clarifying language, which would provide for cost-sharing as required by law and, in addition, in those cases where there can be a tangible benefit to the science enterprise. Revised wording would make clear that (1) where cost-sharing is required by law, cost-sharing is an eligibility issue and does not contribute to merit evaluation, and (2) if NSF concludes that an award should be made at a dollar level well below the requested level, then there should be an attendant reduction in the scope of the project.

The committee heard several presentations from OIG staff: planning for the FY 2003 audit, how audits are conducted, and an example of an administrative investigation.

b. Committee on Programs and Plans (CPP)

Dr. Richardson reported for Dr. Jones, chair, that the committee met by conference call on September 27, considered additional information on the Extensible Terascale Facility, and voted to recommend the awards to the Board. The Board approved those awards during Closed Session earlier today.

At its meeting today, the committee considered the draft Infrastructure Task Force report and discussed plans to provide the draft report to the Board and subsequently to post on the website for public comment. The committee received two briefings from NSF staff: (1) a recent site visit of the National High Magnetic Field Laboratory and plans for continued operations, and (2) operations support for the GEMINI Observatory, the status of South American partners (Argentina, Brazil, and Chile), and contingency planning. Dr. Joseph Bordogna, Deputy Director, reported on experience with the NSB policy on competition, re-competition, and renewal of awards. The committee discussed a range of examples illustrating how competition is addressed for different kinds of awards. The committee also received a summary of the Committee on Strategy and Budget's discussion of options for improving the Board's guidelines for setting priorities for major research facilities, and a report from the Polar Issues Subcommittee.

c. CPP Subcommittee on Polar Issues

Dr. White, chair, reported that the subcommittee heard presentations on the Western Arctic Shelf Basin interactions, geological drilling to understand paleo climate in Antarctica, and the South Pole Station modernization project.

d. CPP Task Force on Science and Engineering Infrastructure (INF)

Dr. White, chair, reported that the Board would soon receive a copy of the task force's draft report for comment. The report focuses on those fields of science addressed by NSF. The task force believes that the case is compelling that infrastructure needs additional support, and it is recommended that NSF focus on four areas: cyber infrastructure, major facilities, mid-size infrastructure, and research and development of instrumentation. The draft report indicates a need to look more closely at planning and budgeting processes and interagency coordination and strategy. It is the task force's belief that infrastructure needs to be strengthened even in a constrained budget environment.

e. Education and Human Resources Committee (EHR)

Dr. George Langford, chair, reported that the major agenda item was an evaluation of the Education and Human Resources K-16 portfolio based on the policy framework document "The Road to Excellence." Dr. Ramaley presented a plan to begin the review process. She will appoint an external panel of researchers and educators who will conduct two reviews during the year and will present a Portfolio Review Letter Report to the committee. The committee expects to provide recommendations to the Board for program realignment, development of new efforts to address unmet opportunities, revision of existing programs, and elimination or merger of programs that represent duplications.

The committee received reports from the Task Force on National Workforce Policy; the working group on the Workforce for the 21st Century; Dr. Mary Clutter, Assistant Director of Biological Sciences, on education and diversity activities in the Biological Sciences Directorate; and Dr. James Lightbourne, Acting Director for Graduate Education, on Federal policies on the postdoctoral experience across science and engineering disciplines. Two policy issues are the benefits packages for postdocs, which differ by type of appointment, and the increased cost associated with recent Immigration and Naturalization Service rules regarding the tracking of foreign nationals.

f. EHR Task Force on National Workforce Policies for Science and Engineering (NWP)

Dr. Miller, chair, reported that the task force focused on recommendations to be made in its report. The report will address the changing demographics of the student population and the growth in minority students as reported in the 2000 census, and the changing international context for the science and engineering workforce. The task force is

pressing for a full draft report for consideration by the EHR Committee at the November meeting.

g. Science and Engineering Indicators Subcommittee (S&EI)

Dr. Richardson, chair, stated that Science Resources Statistics staff had reported on the traditional chapters planned for the 2004 edition, suggesting updates and improvements. They also presented a planned new chapter on State-level science and engineering, which would include K-12 data, workforce indicators, financial indicators of research and development, and information on publications and patents.

h. Committee on Strategy and Budget (CSB)

Dr. Ferguson, reporting in the absence of Dr. Savitz, chair, stated that the committee discussed three major topics: (1) Dr. Borgodna presented the options developed by an informal group of Board members and NSF staff concerning NSF's guidelines and policies for prioritizing the funding for major research facilities. Dr. Jones also presented options for changing the current guidelines. The committee discussed whether it would be appropriate to set an agreed-upon approximate level of funding for new large facilities, a level that would be known and of interest to the NSF, Office of Management and Budget, and the Congress. (2) Dr. Colwell presented an update on the revision of NSF's Strategic Plan, highlighting an initial set of long-range issues that NSF believes are driving science and engineering research. A more detailed discussion is expected at the November meeting. (3) As part of the committee's process of following up on recommendations in recent NSB reports, Dr. Margaret Leinen, the Associate Director for Geosciences, briefed the committee on NSF's efforts to meet the recommendations in *Environmental Science and Engineering for the 21st Century*, issued in February 2000. Although the environmental portfolio has increased faster than the agency's budget, NSF has not been fully successful in achieving the level of increase called for in the report. The Advisory Committee for Environmental Research and Education will publish a ten-year outlook for the NSF portfolio in January 2003.

AGENDA ITEM 11: Other Business

After thanking the many NSF staff members who helped prepare for and who participated in the meeting, Dr. Washington adjourned the Open Session at 3:24 p.m.

Janice E. Baker
Policy Writer/Editor