

**APPROVED MINUTES<sup>1</sup>  
OPEN SESSION  
368TH MEETING  
NATIONAL SCIENCE BOARD**

The National Science Foundation  
Arlington, Virginia  
May 9, 2002

Members Present:

Anita K. Jones, Vice Chair  
John A. Armstrong  
Nina V. Fedoroff  
Pamela A. Ferguson  
Mary K. Gaillard  
M.R.C. Greenwood  
Stanley V. Jaskolski  
George M. Langford  
Jane Lubchenco  
Joseph A. Miller, Jr.  
Robert C. Richardson  
Michael G. Rossmann  
Maxine Savitz  
Luis Sequeira  
Daniel Simberloff  
Bob H. Suzuki  
Richard Tapia  
Warren M. Washington  
John A. White, Jr.

Rita R. Colwell, NSF Director

Members Absent:

Eamon M. Kelly, Chair  
Diana S. Natalicio  
Vera Rubin  
Mark S. Wrighton

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<sup>1</sup> The minutes of the May, 2002 meeting were approved by the Board at the August, 2002 meeting.

The National Science Board (NSB) convened in Open Session at 10:35 a.m. on Thursday, May 9, 2002, with Dr. Anita Jones, Vice Chair of the Board, presiding (Agenda NSB-02-64). In accordance with the Government in the Sunshine Act, this portion of the meeting was open to the public.

AGENDA ITEM 5: Open Session Minutes, March 2002

The Board APPROVED the Open Session minutes of the March 2002 meeting (NSB-02-53, Board Book Tab D).

AGENDA ITEM 6: Closed Session Items for August 2002

The Board APPROVED the Closed Session items for the August 2002 Board Meeting (NSB-02-57, Board Book Tab E).

AGENDA ITEM 7: Vice Chair's Report

**a. Results of NSB Election**

Dr. Jones reported that the Board has elected Dr. Warren Washington as NSB Chair and Dr. Diana Natalicio as Vice Chair for the 2002-2004 term. They will also serve as members of the Executive Committee for the same term.

**b. Forthcoming Vacancy on Executive Committee**

Dr. Jones noted that the Executive Committee position being vacated by Dr. M.R.C. Greenwood will be filled by election in August. Dr. Jones asked the Nominating Committee to help the Board prepare for that election.

**c. Dr. Miller's Promotion**

Dr. Jones announced that Dr. Joseph Miller has been promoted to Executive Vice President of Corning and will continue as Chief Technology Officer.

**d. Release of *Science and Engineering Indicators***

On April 9, the White House sent *Science and Engineering Indicators 2002* to Congress, and on April 30, the National Science Foundation's (NSF's) Office of Legislative and Public Affairs hosted a roll-out event at the National Press Club. Dr. Jones asked Dr. Richard Tapia, chair of the Subcommittee on Science and Engineering Indicators, to comment on the event.

Dr. Tapia reported that he and Dr. Jones represented the Board at the roll-out event and highlighted issues raised by data in *Indicators 2002*. He noted that *Indicators 2002* has received considerable attention in the science and education press and from radio and television stations. Dr. Jones added that *Indicators* is a unique contribution by NSF and

the Board to reliable data on trends and is useful to policy makers. She congratulated and thanked Board members and NSF staff who devoted their time to preparing *Indicators 2002*.

**e. Annual Awards Dinner**

Dr. Jones reported that at the Board's annual Awards Dinner, held on May 7 at the Department of State, Dr. John Marburger, head of the White House Office of Science and Technology Policy, read a greeting from the President, and honorary awards were presented. Dr. Erich Jarvis received the Alan T. Waterman Award for his use of gene expression as a tool to map brain functional systems and to identify the parts of the brain used in perceiving, learning, and producing vocal communication. Mr. Erich Bloch received the Vannevar Bush Award for his innovations in computing and his many contributions as a statesman for science and engineering policy. Dr. Eugenie Scott received the individual Public Service Award for her promotion of the public understanding of the importance of science, the scientific method and science education as well as the role of evolution in science education. The group Public Service Award was given to the Society for Advancement of Chicanos and Native Americans in Science for its creative approaches encouraging Latinos and Native Americans to pursue graduate education and careers in science, mathematics, technology, and engineering.

**f. Discharge of Committee**

Dr. Eamon Kelly, NSB Chair, has discharged the 2002 Vannevar Bush Award Committee, chaired by Dr. George Langford, with members Drs. Michael Rossmann, Vera Rubin, and Maxine Savitz. Ms. Susan Fannoney served as Executive Secretary. Dr. Jones thanked the committee members for their hard work and excellent award selection.

AGENDA ITEM 8: Director's Report

**a. Award for FastLane**

Dr. Rita Colwell, NSF Director, announced that Dr. Linda Massaro, Director of the Office of Information and Resource Management, and the FastLane team were selected by the Government Solution Center Selection Committee to receive the e-Government 2002 Trailblazer Honorable Mention Award for the FastLane Customer Service Solution. Only 20 awards were given out of 234 applications.

**b. Congressional Update**

Dr. Colwell reported that she and Dr. Kelly testified before the House Subcommittee on Appropriations for VA, HUD, and Independent Agencies on April 11 and that Subcommittee members were supportive of NSF programs. On April 24, Dr. George Strawn, Executive Officer in the Directorate for Computer and Information Science and Engineering, testified before the Senate Commerce, Science, and Transportation

Committee on Senate bill 2182, the Cybersecurity Research and Development Act. The bill is a companion to House bill 3394, which passed the House by a large margin.

On May 9, the House Science Committee will hold a hearing with outside witnesses who will testify on reauthorizing NSF for the next three years. Mark-up by the Research Subcommittee is expected on May 9, as is the mark-up of House bill 3130, the Undergraduate Science, Mathematics, Engineering and Technology Education Act.

On May 15, the Senate Appropriations Subcommittee on VA, HUD, and Independent Agencies will hear testimony from NSF, the NSB Chair, and the Director of the White House Office of Science and Technology Policy on NSF's FY 2003 budget request. On May 22, the Subcommittee on Science, Technology, and Space of the Senate Commerce, Science, and Transportation Committee will hold a hearing on NSF's FY 2003 budget request, and on June 4, the Senate Health, Education, and Pensions Committee has scheduled a hearing on NSF's reauthorization.

#### AGENDA ITEM 9: NSB Annual Business

##### **a. NSB Calendar 2003**

Dr. Jones stated that the proposed calendar for Board meetings in 2003 was developed after looking at dates of other professional meetings and after polling Board members about their availability. The proposed calendar (NSB 02-81, Board Book Tab F) will give the highest potential attendance and is consistent with recent annual calendars based on six meetings.

The Board APPROVED the 2003 meeting calendar as distributed (NSB 02-81).

##### **b. Annual Report of the Executive Committee**

Dr. Jones called on Dr. Colwell, chair of the Executive Committee, to present the annual report of the committee's activities (NSB/EC-02-14, Board Book Tab G), covering the period April 2001 through April 2002.

Dr. Colwell reported that the Executive Committee took four actions on behalf of the Board. It approved (1) an amendment to the existing award for the Atacama Large Millimeter Array to increase current funding for the design, development and construction by \$3.5 million; (2) a change in scope of the South Pole Station Modernization to a 150-person station and authorized the Director to request funding of \$6.54 million in a future budget for enhanced project scope, revised cost to complete the station, and recovery of funds reprogrammed to another Major Research Equipment project; (3) the Math and Science Partnership Program; and (4) a resolution on the election of the NSB Nominating Committee.

## AGENDA ITEM 10: Committee Reports

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

Dr. Stanley Jaskolski, committee chair, reported that the A&O Committee received an update from Mr. Thomas Cooley, Director of the Office of Budget, Finance and Award Management, and Dr. Robert Eisenstein, Assistant Director for Mathematical and Physical Sciences, on actions taken in response to the Gemini audit by NSF's Inspector General. Dr. Deborah Crawford, Staff Associate in the Director's Office, reported on the status of administration and management planning and efforts to address priorities on the President's Management Agenda. The committee also reviewed a case study on NSF's facilities monitoring and oversight from both the NSF and awardee's perspective.

The committee approved for recommendation to the Board the NSB Chair's transmittal letter to Congress for the Office of the Inspector General's (OIG's) *Semiannual Report to the Congress* covering the period October 1, 2001 through March 31, 2002, and the Management Response to the report.

The Board APPROVED the transmittal letter for the OIG's *Semiannual Report to the Congress* and the Management Response.

In the supervisory session, the committee received presentations from OIG staff on results of a review of NSF's workforce planning activities, the content of the *Semiannual Report to the Congress*, and preparations for a peer review of OIG audit and investigative activities.

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

Dr. John Armstrong, committee chair, reported that the committee discussed the review of NSF's high-end computing activities and the proposed expansion of cooperative agreements in the Partnerships for Advanced Computational Infrastructure; management and operations of the National Optical Astronomy Observatories and the National Solar Observatory; review of the management of the National Radio Astronomy Observatory and the National Center for Atmospheric Research; and recent experience related to the NSB/NSF policy on competition, recompetition, and renewal of awards. The committee also had an extensive discussion on Major Research Equipment and Facilities Construction planning with Dr. Joseph Bordogna, NSF Deputy Director. In addition, the committee heard presentations on the South Pole Station Modernization from Mr. Erick Chiang, head of the Polar Research Support Section, Office of Polar Programs, and Mr. Brian Kim, head of the Mechanical Engineering Branch of the Design Division, Pacific Division, Naval Facilities Engineering Command, which is providing engineering oversight of the project.

Dr. John White, chair of the CPP Task Force on Science and Engineering Infrastructure, reported that the task force has reviewed its draft report and expects to bring a document to CPP for consideration at the August meeting.

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

Dr. Bob Suzuki, committee chair, reported that committee heard presentations from Dr. Judith Ramaley, Assistant Director for Education and Human Resources, on NSF's role in graduate and post-doctoral student support; the status of competitions in the Science, Technology, Engineering, and Mathematics Talent Expansion Program, the Noyce Scholarships, and the Math and Science Partnership Program; and interactions with the Department of Education regarding the Math and Science Partnership Program.

The committee discussed and recommended bringing to the Board a statement reaffirming the Board's long-standing commitment to diversity and its support for NSF's commitment to developing and strengthening its programs for that purpose.

The Board APPROVED the Statement Concerning NSF's Continuing Role in Promoting Diversity in Science, Technology, Engineering and Mathematics (NSB 02-75).

Dr. Suzuki stated that Dr. Norman Fortenberry, Director of the Division of Undergraduate Education, recapped the key points in the paper by Dr. Elaine Seymour entitled "Tracking the Processes of Change in U.S. Undergraduate Education in SMET" and discussed how the ideas relate to the current EHR portfolio. Dr. Roosevelt Johnson, Acting Division Director for Human Resource Development, briefed the committee on attempts to identify factors and best practices for retaining both undergraduate and graduate students.

The committee developed five recommendations for the next EHR Committee to consider: (1) examine the question of whether there is a need for a coherent Federal policy regarding postdoctoral appointments, (2) examine the logic underlying successful EHR programs and identify the key factors that have led to their success, (3) examine three-year projections for programs and budgets to assess balance in the portfolio, (4) identify strategies for spreading responsibility for achieving diversity across the directorates while maintaining an identified group that is responsible for monitoring progress, and (5) identify strategies for sustaining successful NSF education and diversity programs.

### **d. EHR Subcommittee on Science and Engineering Indicators**

Dr. Tapia, chair of the EHR Subcommittee on Science and Engineering Indicators, reported that Dr. Lynda Carlson, Director of the Division of Science Resources Statistics (SRS), presented three proposed changes for Indicators 2004: adding a chapter on state-level science, engineering, and research and development; distributing material on information technology throughout the relevant chapters; and making changes to the Public Attitudes chapter to reflect ongoing redesign activities. Dr. Robert Bell, Senior Scientist for Multidisciplinary Reviews, discussed options for covering environmental research and education in the 2004 document.

At the August meeting, SRS staff will provide additional information on the distribution of information technology material throughout the document, suggest overarching themes and a production schedule for Indicators 2004, explore ways for subcommittee members to review chapters online, and report on ways in which the availability and quality of environmental data might be highlighted.

**e. EHR Task Force on National Workforce Policies**

In the absence of Dr. Miller, task force chair, Dr. Langford reported that the task force is nearing the end of its work and intends to make a keystone policy recommendation along with a set of strategies that will have an impact on the growth of a high-quality workforce. The task force approved an exhaustive literature review and annotated bibliography, completed plans for a workshop on June 28 to focus on the international character of the advanced science and engineering workforce, and discussed the framework for its final report. Dr. Langford noted that the entire Board is invited to participate in the June 28 workshop.

**f. Committee on Strategy and Budget**

Dr. Jones, committee chair, reported that the committee discussed two strategic initiatives: how to accommodate within future budget requests the initiative of large research facilities, and the size and duration of grants. Dr. Norman Bradburn, Assistant Director for Social, Behavioral and Economic Sciences, and Ms. Janice Ballou from Mathematica Policy Research, Inc., presented data gathered from a survey of NSF principal investigators on grant issues.

**g. Task Force on the Digital Opportunity Investment Trust**

Dr. Jones reminded Board members that several Senators and Representatives asked the Board to consider the proposed Digital Opportunity Investment Trust as described in *A Digital Gift to the Nation*, by Drs. Lawrence Grossman and Newt Minow. In response to that request, Dr. Kelly established a task force chaired by Dr. Washington, with members Drs. Pamela Ferguson, Diana Natalicio, Robert Richardson, Maxine Savitz, and Daniel Simberloff.

Dr. Washington reported that the task force is enthusiastic about the concept and thinks it is a good use of public funds to support research, education, and cultural projects. In its proposed response to Senators and Representatives, the task force offers observations to be considered, such as the selection of pilot projects based upon a merit review process, a staff capable of dealing with a wide range of topics, and access for underserved groups who have not been able to take advantage of information technology. The task force presented its proposed response to the Board for approval.

The Board APPROVED transmittal of the response, subject to final editorial changes by the task force chair and review by the Executive Committee (NSB 02-94).

## NON-AGENDA ITEM: Recognition of Class of 2002

Dr. Jones recognized and thanked the Class of 2002 (Drs. John Armstrong, Mary K. Gaillard, M.R.C. Greenwood, Stanley Jaskolski, Eamon Kelly, Vera Rubin, Bob Suzuki, and Richard Tapia) for their dedication, hard work, willingness to struggle with complex policy issues, and unfailing humor.

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Dr. Jones recessed the Open Session at 11:30 a.m. for lunch. The Open Session reconvened at 12:35 p.m.

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## AGENDA ITEM 11: NSF Long-Range Planning Environment

- Science and Technology Policy Context

Dr. Colwell introduced the President's Science Adviser, Dr. John Marburger, head of the White House Office of Science and Technology Policy (OSTP).

Dr. Marburger discussed topics that he considers important for strategic science and technology planning: developing and exploiting new knowledge at the frontier of complexity; developing qualitatively different enabling technologies; coordinating science-related planning among many agencies; linking technical capabilities to urgent problems of society; and ensuring that the educational process produces the skilled workforce needed to meet national goals. He updated the Board on the White House process for nominating a new Board class and commented that Board reports have a positive impact on the operations of OSTP, the Congress, and many other agencies.

Dr. Marburger called for science-based science policy to meet the challenges of vast opportunities that have opened on the frontier of complexity and that are enabled by extraordinary advances in computing power and in instrumentation for imaging and manipulating gross matter at the atomic level. He stated that the policy challenge is to develop and exploit these enabling capabilities to ensure national leadership. Because there is not enough money to fund every opportunity, difficult choices must be made. More agencies need to coordinate their science-related planning. Capabilities must be linked to the urgent problems of society, such as national security, health, nutrition, environmental quality, and sustained economic competitiveness. Because the limits of knowledge are defined by the limitations of technology, exploration at the frontiers necessarily entails technological advances that are qualitatively different from the incremental advances usually achieved. In the immediate future, the maintenance of enabling capabilities in computing and instrumentation is a major challenge. Underlying the success of scientific endeavors is the availability of people to do the work. The United States has always relied on imported intellectual capital, but the situation is changing. The research that the Nation relies on for national security is being done around the world, the technical labor force is globalized, and there has been a significant



decline in the numbers of U.S.-born citizens entering the technical labor force. The U.S. educational system needs to be reexamined, and research on how students learn needs to be more closely linked to teacher education and classroom practices. He noted that the Administration and the Congress exhibit strong bipartisan support for science funding.

During discussion, Dr. Marburger expressed his willingness to meet periodically with the Board to discuss science and engineering policy issues, especially those related to the workforce, education, and facilities. He looks forward to receiving the Board's reports and recommendations on infrastructure and workforce policy. He commented that many existing networks can be mobilized to help implement or scale up improvements in math and science education and that the social sciences are being under-used in addressing difficult cultural and societal problems. As part of the homeland security effort, he is working with other policy groups to develop mechanisms for meeting national security concerns without impairing the Nation's technical capabilities or erecting unnecessary barriers to foreign talent. He acknowledged that it will take creative thought to tap into the unexploited talent of underrepresented minorities and women and that the methods for handling capital programs and indirect costs in higher education may need to change. Dr. Marburger stated that he supports increased funding for science and recognizes that funding imbalances exist, but he is not convinced that funding formulas serve as a compelling basis for increases. He would like to see the science community come forward with its rationale for and plans to prioritize increased resources.

- NSF Planning

- (a) Survey on NSF Awards

Dr. Bordogna introduced Ms. Janice Ballou, Vice President and Deputy Director of the Surveys and Information Services Division of Mathematica Policy Research, Inc. Mathematica is an independent research firm that conducts policy research and surveys for government as well as private clients. NSF commissioned Mathematica in July 2001 to conduct a survey of all principal investigators who received NSF awards in fiscal year 2001 and a companion survey of institutional representatives, to help determine the right size and duration for NSF grants and to identify ways to improve NSF award efficiency and effectiveness.

Ms. Ballou summarized the methodology, type of research and funding sources for the principal investigators, and key issues of the study. She reported on quantitative data collected from the web-based survey sent to all recipients (5,221) of a 2001 NSF grant, including first-time submissions, resubmissions and competitive renewals. The response rate was 91 percent. Although most of the survey was designed to gather quantitative data, extensive comments were received in response to a few open-ended questions, and this qualitative information will be presented in a separate report. Both the quantitative and qualitative data indicate that five years would be the appropriate duration for an NSF grant. In the study, three methods were used to consider the appropriate amount for an NSF grant: the mean, the mode, and the median. Principal investigators were asked (1) what is the difference between the NSF amount requested and received (median amount

on an annual basis, about \$21,000); (2) what percent of the research that you would like to accomplish is funded by NSF (median, 30 percent); (3) what additional funding do you need (median, about \$100,000 per year); and (4) what percentage of the additional funding is appropriate for NSF to fund (70 percent, or \$70,000). Principal investigators stated that if they received the additional funding they would be able to pursue innovative ideas, collaborate with other researchers, achieve research objectives within the specified time, obtain quality personnel, and involve more students. Respondents indicated that they spent approximately 20 days, spread over several months, applying for the 2001 grant.

During discussion, Ms. Ballou stated that issues related to diversity were mentioned in the qualitative responses but were not built into the quantitative questions. Dr. Bradburn added that a science writer and policy analyst is preparing a report, due in June, on all the qualitative responses received. Because of confidentiality issues, the raw data may not be released, but permission is being pursued to include extensive quotes in the report.

(b) Decadal Plan for Environmental Activities

Dr. Colwell introduced Dr. Stephanie Pfirman, Chair of the NSF Advisory Committee on Environmental Research and Education and Chair of the Department of Environmental Science at Barnard College, to describe the Advisory Committee's process of developing a ten-year plan for NSF's interdisciplinary environmental activities.

Dr. Pfirman reminded the Board that the Decadal Plan is the next step in implementing the Board's guidance in its report, *Environmental Science and Engineering for the 21<sup>st</sup> Century*. The purpose of the Decadal Plan is to clarify NSF's role in the environmental arena, especially in interdisciplinary areas. The Advisory Committee began its work in October 2000 and is in the process of vetting the draft plan with numerous organizations and experts. In July, a town meeting will be held at NSF to gather direct feedback, and the Advisory Committee will consider the final draft plan at its October 2002 meeting. Because the audience for the Decadal Plan is broad, two versions of the document are planned: the complete version for the environmental science and engineering community, and a shorter version for other technical communities, policy makers, and the public. The draft Decadal Plan focuses on environmental research frontiers and the capacity building needed to address environmental research challenges. Research frontiers include the areas of coupled human and natural systems, people and technology, and institutions and environmental systems. The section on building capacity addresses issues in education, cyberinfrastructure, experimentation and modeling, long-term data archives, and centers to focus on specific problems or place-based questions.

During discussion, Dr. Pfirman clarified that the Decadal Plan will set the framework for more detailed planning. It will identify priority areas and list specific research questions, but it will not address specific funding levels. Although the Decadal Plan will include some aspects of desired outcomes and assessment toward meeting them, assessment will be a future step in the process. Dr. Pfirman noted that diversity concerns are being raised during the vetting process and will be addressed in sections related to decision making

and environmental services and valuation. The Decadal Plan focuses on the NSF portfolio, although environmental activities outside of NSF are mentioned in the partnership section. Dr. Pfirman agreed with a Board member's comment that it would be useful to include more information about the missions and environmental activities of other Federal agencies.

Dr. Margaret Leinen, Assistant Director for Geosciences, commented that NSF is part of the science agency group that is supporting the State Department in preparations for the World Summit on Sustainable Development to be held in Johannesburg in August 2002. The draft Decadal Plan has been discussed with both State Department and Office of Technology Policy staff, and they view it as a useful foundation for basic research that will contribute toward sustainability.

AGENDA ITEM 12: Other Business

Dr. Jones thanked all speakers and adjourned the Open Session at 2:30 p.m.

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Janice E. Baker  
Policy Writer/Editor