

National Science Board

# BROADENING PARTICIPATION IN SCIENCE AND ENGINEERING FACULTY



National Science Foundation

August 14, 2003



National Science Board

**BROADENING PARTICIPATION  
IN SCIENCE AND  
ENGINEERING FACULTY**

National Science Foundation

October 14, 2004



## NATIONAL SCIENCE BOARD

### Terms Expire May 10, 2006

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**Kenneth M. Ford**, Director, Institute for the Interdisciplinary Study of Human and Machine Cognition, University of West Florida

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*The National Science Board consists of 24 members plus the Director of the National Science Foundation. Appointed by the President, the Board serves as the policy-making body of the Foundation and provides advice to the President and the Congress on matters of national science and engineering policy.*

\*NSB Nominee pending U.S. Senate confirmation, as of October 14, 2004.

# NATIONAL SCIENCE BOARD COMMITTEE ON EDUCATION AND HUMAN RESOURCES

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**Diana S. Natalicio, *ex officio*\***

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

Dr. **George Langford**, former chair of the NSB Education and Human Resources (EHR) Committee, deserves special recognition. Dr. Langford provided the initial inspiration, guidance, and leadership for the workshop and report until his term on the Board ended in May 2004.

The Board appreciates the efforts of other Members of the NSB EHR Committee whose term on the Board ended in May 2004: Drs. **Pamela A. Ferguson, Joseph A. Miller, Jr., Maxine Savitz**; and **Luis Sequeira**.

The National Science Board Office was instrumental in organizing the workshop and preparing the report and proceedings. The Board especially appreciates the efforts of Dr. **Robert Webber** for organizing the workshop, preparing the proceedings, and managing various drafts of the report. Other members of the National Science Board Office who were directly involved in various aspects of this effort were: Mr. **Gerard Glaser**, Ms. **Jean Pomeroy**, and Dr. **Michael P. Crosby**.

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\* The NSB Chair, NSB Vice Chair, and NSF Director are members *ex officio* of all NSB committees.

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# NATIONAL SCIENCE BOARD

## BROADENING PARTICIPATION IN SCIENCE AND ENGINEERING FACULTY

### BACKGROUND

Education has always been vital to the success of individuals and the science and engineering enterprise. In the technology- and knowledge-based economy of the 21st century, science, technology, engineering, and mathematics (STEM) education is also an investment in the United States' collective future as a nation and as a society. For decades, the United States has excelled in building and sustaining institutions of higher education that attract science and engineering talent from all over the world. The Nation has done less well in encouraging and developing the mostly untapped potential of underrepresented minorities, women, and persons with disabilities to contribute to STEM research and education. Developing this potential will lead to expanded opportunities for individuals as well as improving national competitiveness and prosperity.

To address these concerns, the National Science Board (NSB, the Board) Committee on Education and Human Resources (EHR) hosted a group of distinguished panelists to participate in a workshop entitled *Broadening Participation in Science and Engineering Research and Education* on August 12, 2003. The workshop was very well attended by people concerned with diversity in U.S. academic institutions and the workforce. The workshop had two objectives: first, to celebrate the progress that American universities have made in bringing diversity to science and engineering; and second, to identify strategies for further increasing the diversity of the nation's science and engineering workforce. The workshop was designed specifically to address U.S. underrepresented minorities. NSB's recent publication, *The Science and Engineering Workforce / Realizing America's Potential* (NSB-03-69), explores science, technology, engineering, and mathematics workforce issues more broadly.

Based on workshop presentations and subsequent discussions by the EHR Committee and the full Board, selected findings from the workshop proceedings and recommendations for action are presented below. While we recognize that there may be many more issues of concern to the public, we focus our recommendations on issues specifically addressed by the speakers at the workshop. Moreover, rather than dwell on the obvious national shortcomings, our objective was to identify “best practices” programs that have been shown to be effective in enhancing diversity.

## **NATIONAL SCIENCE BOARD SELECTED FINDINGS<sup>1</sup>**

- 1.** The percentage of tenure-track faculty from underrepresented minority groups at post-secondary institutions is significantly lower than the percentage of students from underrepresented minority groups at these institutions.
- 2.** Low numbers of underrepresented minority science and engineering faculty impede the recruitment and retention of underrepresented minority students in science and engineering programs.
- 3.** The number of underrepresented minority students who pursue graduate study in science and engineering fields lags significantly behind undergraduate minority participation.
- 4.** Encouraging and facilitating the movement of students from undergraduate to graduate and post-doctorate levels will expand the pool of science and engineering faculty candidates from underrepresented groups.
- 5.** Best practices have been identified for programs that successfully broaden participation at the undergraduate level. Hands-on research experience at the undergraduate level has a positive influence on decisions to pursue a graduate degree in science and engineering.
- 6.** Faculty diversity at post-secondary institutions can be achieved with thoughtfully conceived and executed programs for recruiting and retaining science and engineering faculty from underrepresented minority groups. Target of opportunity faculty search programs are examples that involve the university president, provosts, deans, department heads, and senior faculty who clearly signal that faculty diversity is a high priority and that it must be pursued aggressively with clear expectations and meaningful incentives and rewards.

<sup>1</sup> Specific examples and discussion supporting the findings can be found in the proceedings of the workshop, *Broadening Participation in Science and Engineering Research and Education: Workshop Proceedings (NSB-04-72)*.

## NATIONAL SCIENCE BOARD RECOMMENDATIONS

- A.** Explore the feasibility of establishing a public database identifying recent science and engineering Ph.D. recipients to facilitate the recruiting of minority faculty at post-secondary institutions.
- B.** Explore the feasibility of expanding NSF programs to facilitate the progression of bachelor-level science and engineering students to advanced degrees, post-doctorates, and the professoriate. Examples of NSF programs that address this goal include, but are not limited to, Research Experiences for Undergraduates (REU), Louis Stokes Alliances for Minority Participation (LSAMP), and Research Alliances for Graduate Education and the Professoriate (AGEP). While the workshop did not specifically address K-12 STEM education, the Board reaffirms our commitment that broadening participation in K-12 STEM education is an important part of our mission. Without broadening participation at the K-12 level, the pool from which future faculty will be drawn would be limited.
- C.** Develop NSF programs that provide incentives and rewards to institutions that pursue or have implemented creative organizational strategies to advance underrepresented minorities into the professoriate, using legally permissible strategies.
- D.** Encourage NSF staff to work closely with staff in other research-intensive agencies, such as the National Institutes of Health, to identify and disseminate best practices and effective incentive programs. An example of such cooperation is the Education and Workforce subcommittee of the Committee on Science of the National Science and Technology Council in the White House.
- E.** Disseminate information on research results and experiences with diversity programs through periodic publications.





## APPENDIX I

**PROCESS FOR PRODUCING THE REPORT**

In August 2003, the National Science Board approved publication of a wide-ranging review of the U.S. science and engineering (S&E) workforce, *The Science and Engineering Workforce / Realizing America's Potential* (NSB 03-69). Building on the findings and recommendations of that report, the NSB Committee on Education and Human Resources (EHR), then chaired by Dr. George M. Langford, organized and convened a public workshop of distinguished panelists on August 12, 2003 to identify specific strategies for increasing the diversity of the nation's S&E workforce. The panelists included university presidents who had successfully implemented programs for broadening participation, researchers with expertise in analyzing and reporting demographic trends, program directors and a young faculty member with student/faculty experience, and senior policy executives. A broad range of gender, racial and ethnic backgrounds were represented on the panels and among the public in attendance. The workshop agenda, which includes a list of panelists, is provided in Appendix II.

Based on the workshop presentations and Board discussion, two documents were produced: (1) the proceedings of the workshop and (2) a report of the Board. The workshop proceedings, *Broadening Participation in Science and Engineering Research and Education: Workshop Proceedings* (NSB-04-72), contains each of the panelist's presentations and public discussion at the workshop. References are provided for specific programs and projects mentioned by panelists in their presentations. The workshop proceedings are available upon request (see inside back cover for details).

A draft report of the Board summarized selected findings from the workshop and made recommendations for action. The Board invited public comments on the report in May and June 2004 by posting both the draft report and the proceedings on the NSB Web site and publicizing their availability. The names and affiliations of persons who submitted written comments are provided in Appendix III. The draft report was revised in response to the public comments, NSF staff comments, and subsequent EHR and Board discussion. The report, *Broadening Participation in Science and Engineering Faculty* (NSB 04-41), was approved for publication at the NSB meeting on October 14, 2004.

## APPENDIX II

**WORKSHOP AGENDA****NATIONAL SCIENCE BOARD  
COMMITTEE ON EDUCATION AND HUMAN RESOURCES****BROADENING PARTICIPATION  
IN SCIENCE AND ENGINEERING RESEARCH AND EDUCATION**

August 12, 2003  
National Science Foundation, Room 1235  
Arlington, Virginia

**8:30 Introductions and Opening Remarks**

**George M. Langford** -- Chair, Education and Human Resources Committee, NSB  
**Rita R. Colwell** -- Director, National Science Foundation

**9:00 Models of Success for Broadening Participation**

**Joseph Bordogna** – Deputy Director, National Science Foundation  
**Shirley M. Tilghman** – President, Princeton University  
**Shirley Ann Jackson** – President, Rensselaer Polytechnic Institute  
**Norbert S. Hill, Jr.** – Executive Director, American Indian Graduate Center

**10:30 Changing Demographics and Challenges of the Future**

**Diana S. Natalicio** – President, University of Texas at El Paso, and Vice Chair, NSB  
**Beverly Daniel Tatum** – President, Spelman College  
**Shirley M. Malcom** – Head of Education and Human Resources, American Association for the Advancement of Science,  
**Richard A. Tapia** – Professor, Rice University

**11:30 Working Lunch and Breakout Sessions****1:00 Diversity Gap between Students and Faculty**

**Esin Gulari** – Division Director, National Science Foundation  
**Evelyn Hu-Dehart** – Director, Center for the Study of Race and Ethnicity in America, Brown University  
**Lilian Shiao-Yen Wu** – Program Executive, IBM Corporate Technology  
**Emilio M. Bruna** – Assistant Professor, University of Florida

**2:30 Reports from Breakout Sessions****3:00 Policy Options Development**

**Judith A. Ramaley** – Assistant Director, National Science Foundation  
**Clifton A. Poodry** – Director, Minority Opportunities in Research, National Institute of General Medical Sciences  
**Willie Pearson Jr.** – Chair, School of History, Technology and Society, Georgia Institute of Technology

**4:00 Closing Remarks**

**George M. Langford**, Chair, Education and Human Resources Committee, NSB

## APPENDIX III

**PUBLIC COMMENTS**

In May and June 2004, the Board solicited and received public comments on a draft of the Broadening Participation Report. The final report incorporates the public's comments, as appropriate. Comments were received from the following individuals:

**Ambrose Jearld, Jr.**, Director of Academic Programs, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service

**Harvey F. Ludwig**, Title and affiliation not provided

**Richard McGee**, Director of Graduate Student Affairs, National Institute of Health, Graduate Partnerships Program

**Barbara S. Minsker**, Associate Professor, Department of Civil and Environmental Engineering, University of Illinois

**Lupita D. Montoya**, Assistant Professor, Civil and Environmental Engineering Department, Rensselaer Polytechnic Institute

**Luis Lionel Sánchez**, Hispanic Marketing Coordinator

**Robert Stewart**, Oceanography Department, Texas A&M University

**Bob H. Suzuki**, President Emeritus, Cal Poly Pomona [Former Member, National Science Board and Chair, NSB/EHR Committee]

**Barry White**, Director, Government Performance Projects, The Council for Excellence in Government. [Member, NSF Advisory Committee for Business and Operations]

**Ronald A. Williams**, President, Prince George's Community College [Chair, NSF/EHR Advisory Committee]

**Richard N. Zare**, Stanford University [Former Chair, National Science Board]



### **Obtaining the Board Report and Workshop Proceedings**

*Broadening Participation in Science and Engineering Faculty (NSB-04-41)* is available electronically at:  
<http://www.nsf.gov/cgi-bin/getpub?nsb0441>.

*Broadening Participation in Science and Engineering Research and Education: Workshop Proceedings (NSB-04-72)* is available electronically at:  
<http://www.nsf.gov/cgi-bin/getpub?nsb0472>.

Paper copies of the report and proceedings can be ordered by submitting a Web-based order form at: <http://www.nsf.gov/home/orderpub.htm>, or contacting NSF Publications at 703-292-7827.

Other options for obtaining the documents: TTY: 703-292-5090; FIRS: 800-877-8339.

For special orders or additional information, contact the National Science Board Office: [NSBoffice@nsf.gov](mailto:NSBoffice@nsf.gov) or 703-292-7000.

The background of the page is a microscopic image of plant tissue, showing various cellular structures in shades of green, yellow, and brown. A dark, semi-transparent rectangular box is overlaid in the top-left corner, containing white text. The text provides information about the National Science Foundation and instructions for returning the cover sheet.

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NSB 04-41