



**Written Statement  
of  
Dr. Steven Beering  
Chairman, National Science Board  
Before the  
House of Representatives  
Subcommittee on Research and Science Education  
March 20, 2007  
10:30 am**

Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, I appreciate the opportunity to testify before you. I am Steven Beering, President *Emeritus* of Purdue University, West Lafayette, Indiana and Chairman of the National Science Board (Board). This is my first time testifying before you as Chairman of the Board, a position to which I was elected in May 2006. I am honored to represent the National Science Board before you today.

Since the Board last testified before this Subcommittee, there have been many changes--both in Congress and on the Board. Nine of our 24 Board Members rotated off the Board in 2006 and nine new Board Members have been appointed by the President and confirmed by the Senate. Board members are selected so as to broadly represent the leadership of U.S. science and engineering research and education.

In addition to my being elected as the new Board Chairman, the Board also elected a new Vice-Chairman, Dr. Kathryn Sullivan, Director, Batelle Center for Mathematics and Science Education Policy, John Glenn School of Public Affairs, Ohio State University, Columbus. I have appointed Dr. Kenneth Ford, Director and Chief Executive Officer, Institute for Human and Machine Cognition, Florida, to lead our Committee on Programs and Plans; Dr. Dan Arvizu, Director and Chief Executive of the National Renewable Energy Laboratory (NREL), Colorado, as Chairman of our Committee on Audit and Oversight; Dr. Ray Bowen, President Emeritus of Texas A&M University to lead our Committee on Strategy and Budget; and Dr. Elizabeth Hoffman, Executive Vice President and Provost Iowa State University, Ames, as Chairman for the Committee on Education and Human Resources.

Congress established the National Science Board in 1950 and gave it dual responsibilities:

- Oversee the activities of, and establish the policies for, the National Science Foundation (the Foundation, NSF); and
- Serve as an independent advisory body to the President and the Congress on national policy issues related to science and engineering (S&E) research and education.

On behalf of the entire Board and the widespread and diverse research and education communities that we all serve, I thank the Members of this Subcommittee for your long-term commitment to a broad portfolio of investments in science, technology, engineering, and mathematics (STEM) research and education. While it is critical that our Nation significantly

increase our support for this portfolio, it is also important that these investments be diverse and balanced. The Board greatly appreciates long-term Congressional support of the Board, the Foundation, and their programs and activities. Your continuing bipartisan commitment to excellence in U.S. science and engineering research and education has ensured that the U.S. remains a world leader in the global innovation and discovery enterprise. As you all are well aware, continued investment is required for the U.S. to maintain a global leadership position in science and technology.

I will turn now to answer the specific questions you presented to me, Mr. Chairman, in your letter of March 7, 2007. Following these responses, I will provide a brief overview of Board activities over the last year, forecast activities for the coming year, and then provide you with some specific issues you may wish to consider for inclusion in the re-authorization language.

### QUESTIONS FROM CHAIRMAN BAIRD

Your questions focus on a number of challenging issues that are subject to continual consideration and discussion by the Board, as they are central to fulfilling NSF's mission in research and education under the NSF Act of 1950 (as amended). That mission is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.

#### QUESTION 1: What can NSF do to nurture young investigators and to improve their funding rates?

The Board has consistently expressed our concern that research funding nurture new researchers and sustain excellent researchers throughout their careers. For instance, a National Science Board policy, endorsed in 1977 and amended in 1984, requests that the NSF Director submit an annual report on the NSF merit review process. This report allows us to monitor the funding rates for new principal investigators (PIs) annually. The *FY 2006 Report on the NSF Merit Review Process* [(NSB-07-22) [http://www.nsf.gov/nsb/documents/2007/merit\\_review.pdf](http://www.nsf.gov/nsb/documents/2007/merit_review.pdf), available March 30, 2007] indicates that 18,061 proposals were received from new PIs during FY 2006, of which 18 percent were funded. New PIs are defined as those who have not previously been awarded an NSF grant, and are generally regarded as professionally "young" investigators (less than 5 years from attaining degree). Grant proposal success rate overall is 25 percent, with a 30 percent rate for PIs who received prior awards (prior PIs). The funding rate of new PIs has been two-thirds or less of prior PIs, since 1999. Additional funding for Research and Related Activities (R&RA) under the 2008 request is welcome, to the extent that it can increase the funding rate for grants, so that these gifted new researchers will not become discouraged and leave their careers in research.

As directed by Congress in Section 22 of the Foundation's 2002 Authorization Act, the Board prepared a report, *Fulfilling the Promise* [(NSB-03-151) [www.nsf.gov/nsb/documents/2003/nsb03151](http://www.nsf.gov/nsb/documents/2003/nsb03151)], to outline how additional funding would be spent in the event the NSF budget were doubled over a 5-year period. This report also identifies the need for \$1 billion over the five year period to fund more grants, and \$0.2 billion to expand the

institutions of higher education participating in NSF activities, including funding for start-up awards to new PhDs. The Board supports expansion of the NSF CAREER (faculty early career, [www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5262](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5262)) program, as long as such expansion is funded through additional appropriations, so as not to undercut the Board priority for NSF to also increase the size and duration of awards and increasing funding for novel ideas and approaches.

The Board applauds the recommendations for research in the American Competitiveness Act, reflecting the National Academies report, *Rising Above the Gathering Storm* ([www.nap.edu/catalog.php?record\\_id=11463](http://www.nap.edu/catalog.php?record_id=11463)), to increase federal investment in long-term basic research by 10 percent each year over the next 7 years; and to double the NSF budget in 10 years. We also strongly supported the existing congressionally authorized doubling of the NSF budget to approximately \$10 billion over the five-year period FY 2003 to FY 2007, under the 2002 NSF Authorization. Nevertheless, current funding for NSF falls well short of authorized levels. We would respectfully suggest that the time to implement these admirable authorizations and initiatives through actual appropriations has never been more urgent than now.

We further applaud the additional support appropriated in recent years to physical sciences, engineering, mathematics and computer sciences, which were identified for attention in the Board's 2003 report, *The Science and Engineering Workforce / Realizing America's Potential* [(NSB-03-69) [www.nsf.gov/nsb/documents/2003/nsb0369.pdf](http://www.nsf.gov/nsb/documents/2003/nsb0369.pdf)]. However we caution that increased funding for one area should not be at the expense of other parts of the NSF portfolio that also offer expanding opportunities for discovery, such as the biological sciences at NSF, which have been funded now for a decade below the level of increase of the portfolio as a whole.

QUESTION 2: What is the appropriate balance between funding for interdisciplinary and disciplinary research? What are the best mechanisms for soliciting and funding interdisciplinary research proposals? Is NSF doing a sufficient job of publicizing opportunities for funding of interdisciplinary proposals?

The Board has a long-standing commitment to support for interdisciplinary research. In a 1988 report, *Report of the National Science Board Committee on Centers and Individual Investigator Awards* (NSB-88-35) the Board noted that the use of centers was increasing because centers epitomize the growing complexity, cost, and organization of modern research. The rationale for support for centers was based in large part on their interdisciplinary nature to exploit opportunities in science where the complexity of the research problem can benefit from the sustained interaction among disciplines and/or sub-disciplines, and to stimulate new directions and styles of inquiry in research including collaborative, cross disciplinary, and interdisciplinary approaches.

In the early 1990s, the Board sponsored a review, with the National Academies' Government-University-Industry Research Roundtable, of emerging stresses in the university community [*Stresses on Research and Education at Colleges and Universities: Institutional and Sponsoring Agency Responses* (July 1994)]. Interdisciplinary research was identified as a key issue. Among the concerns were a greater difficulty in assembling and sustaining interdisciplinary teams and the perceived reduced probability for success due to the likelihood that reviewers of an

interdisciplinary proposal would not be expert in all areas covered, and therefore be unlikely to rate fairly an interdisciplinary proposal.

Understanding the important role of individual investigator grants to the U.S. basic research enterprise, and that these types of grants are vital sources of interdisciplinary research, the Board issued guidance (NSB-05-166, Appendix C to NSB-05-166) in December 2005 to NSF on the relative balance of funding for centers, stating that “NSF’s investment in centers should be reported as both a percentage of the R&RA account and as a percentage of the total NSF budget, with the range of support for NSF centers being 6-8 percent of R&RA. However it is important to consider that the relative balance of funding for principal investigators, large facilities, and centers will vary considerably across disciplines”.

The Foundation funded nearly a hundred centers in FY 2006. These centers allow groups of scientists and engineers to address broad scientific and engineering challenges that are of interest to the general public, and to encourage innovation. They are typically interdisciplinary in character and provide opportunities for partnering across institutions, agencies and sectors, and internationally. In addition to centers, the Foundation supports a number of cross disciplinary priority areas that include collaborations across disciplines and agencies to address national research and development (R&D) priorities - currently in nanotechnology, climate change science, networking and information technology, and homeland security.

NSF also supports interdisciplinary proposals through less formal means through collaborations across programs and directorates within the agency. When program officers present their portfolio of proposed awards for review, they must explain what makes the projects exciting, high risk and/or multidisciplinary. Identifying the most innovative proposals is an explicit part of program officers’ responsibilities. Several mechanisms are built into the oversight process to ensure that multidisciplinary proposals are on a fair footing with other proposals in the merit review process, including each program’s Committee of Visitors (COV) and NSF’s Advisory Committee for GPRA Performance Assessment (AC/GPA).

It is important for the merit review process generally, and for interdisciplinary or multidisciplinary proposals in particular, that the process employed for merit review be clearly explained and understood, both by reviewers and program officers and by applicants. Identifying the most innovative and multidisciplinary proposals is an explicit program officer responsibility, but these concepts are difficult to define for the proposal review context. In response to concerns about the uncertainty of what constitutes “multidisciplinary,” NSF is now collecting explanations of projects that program officers identify as multidisciplinary. Clarity in these identifications should result in an improved ability to communicate with the research communities, which should result in more effective outreach.

A large share of NSF proposals is unsolicited. This factor is important in allowing the community to provide grass roots input to identify the most promising areas for discovery, whether disciplinary or interdisciplinary in nature. The correct “balance” at any one time would be difficult to fix in advance. For example, the provision of a new instrument for science or a new discovery that shifts a traditional paradigm would be likely to stimulate new ideas and proposals within the affected scientific research areas. Perhaps subsequent proposals stimulated

by this new impetus would be either interdisciplinary or disciplinary proposals, depending on the nature of the change, which might affect the balance between meritorious interdisciplinary and disciplinary proposals received by particular programs for consideration. In short, the right balance at any time is determined by the opportunities for discovery and the quality of the proposals submitted.

The Board has requested that NSF conduct a review of the impacts of NSF proposal and award management mechanisms. With the information provided from this review, the Board will be better positioned to provide guidance and establish appropriate policy for NSF program portfolio balance across disciplines, to include inter-disciplinary research.

QUESTION 4: NSF, unlike the mission oriented science agencies, is a mainly proposal-driven agency. However, there are significant issues of concern to our nation – competitiveness, security, energy – that can be addressed, at least in part, through technology enabled by solutions or answers to known scientific challenges and questions.

What is the appropriate role for NSF in such research driven by national needs? In fostering industry/university partnerships? Is this a valid application of criterion 2 of NSF's merit review process?

The Foundation was established to serve national needs including promoting the progress of science, advancing the national health, prosperity, and welfare, securing the national defense, and other purposes. National needs, both broadly and more narrowly defined, have always shaped the portfolio of NSF investments, and these investments should continue to address our Nation's needs as they evolve. Criterion 2 includes enhancements to partnerships, and potential benefits to society, and therefore includes contributions to innovation. Although NSF does not directly support technology development or deployment, the research it funds is driven by important national needs, and indeed NSF participates in interagency R&D priorities including the National Nanotechnology Initiative, Climate Change Science Program, Networking and Information Technology R&D, and Homeland Security for the last several years.

One example of NSF participation in cross agency activities to benefit society is membership in the National Science and Technology Council's Subcommittee on Disaster Reduction (SDR) and of the legislatively-created National Earthquake Hazards Reduction Program (NEHRP). NSF's principal contribution to NEHRP is the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), an impressive collection of 15 large-scale experimental sites that feature advanced tools linked to a centralized data pool and earthquake simulation software, all of which is bridged together by the high-speed Internet<sup>2</sup>.

One of the NEES sites is the O.H. Hinsdale Wave Research Laboratory at Oregon State University, which the Board recently visited. Research from Hinsdale and the other NEES facilities will help to advance our understanding and improve seismic performance of civil infrastructure in the US and around the world and will lead to the design of buildings and development of building construction techniques to reduce the potential for damage to structures from tsunamis and other earthquake-related disasters.

Recently, the National Science Board issued its report *Hurricane Warning: The Critical Need for a National Hurricane Research Initiative* [(NSB-06-115) [www.nsf.gov/nsb/committees/hurricane/initiative.pdf](http://www.nsf.gov/nsb/committees/hurricane/initiative.pdf)], recommending the role of NSF and operational agencies like NOAA, NIST, NASA, USDA, and the Navy in the creation of a substantial new federal science and engineering enterprise for benefiting society. This enterprise would undertake a focused, sustained, and multi-agency initiative to improve our understanding of, and ability to predict, mitigate, and respond to, the impacts of hurricanes on the population, the built-infrastructure, and the natural environment.

Another example of meeting national needs is the Foundation's involvement with energy research as a partner in the President's hydrogen fuel initiative through membership in the Interagency Hydrogen and Fuel Cell Technical Task Force. Related to this is the NSF's Energy for Sustainability Program, which will fund basic research and engineering of hydrogen and other alternative fuel systems, and the U.S. Climate Change Technology Program to develop the basic understanding that will facilitate the development of new and advanced technologies to address climate change.

NSF advances national competitiveness through its many educational programs from the grade school to post graduate levels, and by providing essential research infrastructure through its four multi-user Federally-Funded Research and Development Centers, the construction of Major Research Equipment and Facilities, and through its eight Centers programs. The National Science Board's "Science and Engineering Indicators" and the NSF's surveys and reports provide statistics reflecting the condition of important components of U.S. and global science and technology, and provide information to track national competitiveness in science and engineering and to inform future programs to further promote competitiveness.

NSF also helps to promote innovation through individual researchers. For example, Phase I recipients of the Foundation's Small Business Innovation Research Awards (SBIR) are invited to participate in NSF-sponsored business development programs. These programs help our awardees understand the issues associated with technology development and deployment that may be outside the experience of research scientists. NSF has found that these programs significantly increase the quality of commercialization plans and as a result the success rate of advancing to Phase II SBIR funding. Eleven federal agencies fund research through an SBIR program, but NSF is the only one to offer the entrepreneurial training to Phase I funding recipients.

While technology development and deployment are not the direct objectives of the National Science Foundation, the data show our grantees have been successful in combining NSF support with funding from industry and other federal agencies and their own ingenuity to develop useful inventions. For example, 272 United States Patents were granted in 2006 that have acknowledged funding from the National Science Foundation. Analysis of these patents also reveals how NSF funding helps to further the research of the 'mission' agencies. Research for over 44 percent of NSF-related patents in 2006 were co-sponsored by one or more of the 'mission' agencies, including USDA, NIH, NASA, and the Departments of Defense, Education, and Energy. In addition, researchers filed 379 U.S. Patent applications in 2005 for inventions sponsored, at least in part, by NSF. For each the past three calendar years, NSF awardees have

disclosed over 1000 inventions. In fact, the “iEdison.gov” database reports NSF is consistently one of the top two Federal agencies in terms of the number of inventions disclosed by researchers it supports.

Moreover, since CY 2004, NSF has directly funded fundamental research to enhance homeland security. In FY 2006, NSF funding in this area was \$342 million and it has requested \$375 million in FY 2008, to fund research in such areas as information security, understanding vulnerabilities and strengthening U.S. critical infrastructure, and automated understanding of language.

QUESTION 5: What are NSF’s priorities in K-16 science, technology, engineering and mathematics (STEM) education? How does the current budget reflect those priorities? In particular, what is NSF’s role in supporting undergraduate STEM education?

The Board has been especially concerned with a major area of NSF responsibility – education in science, technology, engineering and mathematics (STEM). Education is a core mission of NSF, which not only includes advanced education in connection with funded research, but also responsibility for promoting quality math and science education as intertwining objectives at all levels of education across the United States. NSF’s highly competitive peer-review process is second to none for openly and objectively identifying, reviewing, selecting, funding and providing stewardship for the very best STEM proposals and programs in research and education.

The Board has a long term concern with the condition of STEM education at all levels of the system. Nearly a quarter century ago, the National Science Board’s Commission on Pre-college Education in Mathematics, Science and Technology assessed the state of U.S. pre-college education in the subject fields and found it wanting. At the same time, in 1983 the U.S. Department of Education’s National Commission on Excellence in Education published the report, *A Nation At Risk* ([www.ed.gov/pubs/NatAtRisk/risk.html](http://www.ed.gov/pubs/NatAtRisk/risk.html)). This document stated: “By the year 2000, U.S. students will be the first in the world in mathematics and science achievement,” expressing alarm on the “rising tide of mediocrity [in education] that threatens our very future as a Nation and a people.” Despite these two reports – *A Nation At Risk* sounding the alarm and the Board’s Commission report recommending solutions – and many others since then, we continue to slip further behind. Not only are they not first, but by the time they reach their senior year, even the most advanced U.S. students perform at or near the bottom on international assessments. There is now an even more pressing need to build a new foundation for U.S. STEM education.

The Board has explored in a number of policy reports how the Foundation and other components of the STEM education system in this country can be more effective. Even while U.S. student relative performance in mathematics and science is declining on international assessments, changing workforce requirements mean that new workers will need ever more sophisticated skills in STEM disciplines. This emerging workforce, consisting of degreed and highly skilled technical workers, will need to begin developing their mathematical and science skills early in their educational career. In addition, the rapid advances in technology in all fields mean that even those students who do not pursue professional occupations in technological fields will also

require solid foundations in science and math in order to be productive and capable members of our Nation's society.

As some of you know, the Board established a second Commission on STEM education—the Commission on 21<sup>st</sup> Century Education in Science, Technology, Engineering and Mathematics in March 2006, comprising a wide range of eminent experts representing the broad scope of interests in U.S. STEM education ([www.nsf.gov/nsb/edu\\_com](http://www.nsf.gov/nsb/edu_com)). We have held a number of hearings across the Country - both in the process of considering the charge to such a Commission, and subsequently during several meetings of the new Commission. Science and Technology Committee Chairman Gordon and Vice Chairman Lipinski, and several other Members of the Subcommittee on Research and Science Education - Ranking Member Ehlers and Congresswoman Johnson, and other Members of Congress, including Speaker Pelosi, Congressman Mark Udall, Congressman Wolf and Congressman Culberson, as well as former Science Committee Chairman Boehlert, have attended one of these hearings or otherwise contributed their insights to this process. We look forward to receiving the draft action plan to reform U.S. STEM education from the Commission for discussion at the March 2007 National Science Board meeting. The plan will include STEM education from pre-K through college and beyond, and specific recommendations on the NSF role in STEM education reform at all levels.

The Board has expressed our support for the NSF role in improving the linkage between the K-12 and higher education systems both in the charge to our Commission on 21<sup>st</sup> Century Education in STEM, and in our 2004 Statement in Support of the NSF Mathematics and Science Partnerships (MSPs) ([www.nsf.gov/nsb/documents/2004/nsb\\_msp\\_statement2.pdf](http://www.nsf.gov/nsb/documents/2004/nsb_msp_statement2.pdf)) funded through the NSF Education and Human Resources budget. We are pleased that the MSP experiments are beginning to show early positive results. In part, the NSF MSP Program provides for the collaboration between pre-college and college to promote excellence in teaching and learning, therefore facilitating the transitions for students from kindergarten through the baccalaureate in STEM disciplines. The added benefit for our Nation is those students who do not choose STEM careers become the informed scientifically literate voting citizens we need for the 21<sup>st</sup> Century. Recent assessment data on MSP projects indicate this program has been effective in increasing student performance at all levels assessed - elementary, middle and high school (<http://www.nsf.gov/news>), and promoting collaboration between pre-college and higher education. Therefore, we are pleased that the NSF budget request for FY 2008 will permit funding of new starts in the NSF/MSP program. However, it is again incumbent on the Board to note that the FY 2008 request for NSF EHR remains approximately 10% below the FY 2004 level (*not corrected for inflation*) of funding for this portfolio.

The vertical integration of STEM education from pre-kindergarten through graduate school has also been one of the primary foci of the Board's Commission, and we expect to receive valuable guidance from their report on how the Foundation can contribute to such vertical integration in its programs at the undergraduate, pre-college and advanced levels of STEM education. The Board also has been undertaking, through its Committee on Education and Human Resources, an examination of the NSF EHR Directorate's programs with respect to evaluation procedures and results over the last year. The Board feels strongly that NSF EHR programs not only must be effective in relatively short term evaluations of their success in achieving desired outcomes of individual programs, but that, in combination, these programs must be effective in addressing



U.S. long-term needs to retain its essential global advantage in S&E human resources. We have submitted an initial report on our review to Congress at the request of Congressman Rush Holt, and we will be continuing to apprise you about that review as we take into account the recommendations of the Board's STEM Education Commission, the report of the Academic Competitiveness Council, and the plans for the NSF EHR Directorate under its new leadership.

## **OVERVIEW OF NSB ACTIVITIES DURING THE LAST YEAR**

Now I would like to update you on National Science Board activities over the last year and some of our priorities for the coming year in both a) NSF policy-setting and oversight, and b) advising the President and Congress, our dual responsibilities.

### **NSF Oversight and Policy Direction**

During the last year, the Board accomplished a great deal in terms of its mission to provide oversight and policy direction to the Foundation, including: reviewed and endorsed the OIG Semi-annual Reports to Congress and approved NSF management responses; approved the NSF FY 2008 Budget Submission for transmittal to OMB; approved the Foundation's annual Merit Review Report; and provided review and decisions on major awards or proposal funding requests, including awards totaling \$616 million. These awards will support advanced research, science education, and public understanding of critical issues facing our Nation. The Board also approved a new strategic plan for NSF *Investing in America's Future: Strategic Plan FY 2006-2011* [(NSF-06-48) [www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf0648](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0648)], based on the *National Science Board 2020 Vision for the National Science Foundation* report [(NSB-05-142) [www.nsf.gov/pubs/2006/nsb05142/nsb05142.pdf](http://www.nsf.gov/pubs/2006/nsb05142/nsb05142.pdf)] to Congress. In addition, the Board accepted the Foundation's *2007 Facility Plan* (NSF-07-22) and the Plan was released in conjunction with the President's budget in February 2007. The Facility Plan was mandated by a joint management report of the Foundation and the Board, *Setting Priorities for Large Research Projects Supported by the National Science Foundation* [(NSB-05-77) [www.nsf.gov/pubs/2005/nsb0577/index.jsp](http://www.nsf.gov/pubs/2005/nsb0577/index.jsp)].

The Board has just released our draft report, *Enhancing Support of Transformative Research at the National Science Foundation* ([http://www.nsf.gov/nsb/documents/2007/tr\\_draft.pdf](http://www.nsf.gov/nsb/documents/2007/tr_draft.pdf)) for public comment and review. The Board states in this draft report that we believe it is unreasonable to expect that small adjustments to NSF's existing programs and processes will overcome the perception among much of the external scientific community that iconoclastic ideas are not welcome at NSF. System-wide changes for this purpose are also inappropriate. As noted in the *Report of the National Science Board on the National Science Foundation's Merit Review System* (NSB-05-119) [www.nsf.gov/nsb/documents/2005/0930/merit\\_review.pdf](http://www.nsf.gov/nsb/documents/2005/0930/merit_review.pdf)], NSF's current merit-review system is functioning effectively to support the excellent innovative research that is significantly advancing the frontiers of knowledge and the goals of our Nation. Nonetheless, our Nation cannot afford to miss opportunities, discoveries, and new frontiers that can result from bold, unfettered exploration and freedom of thought that challenges our current understanding of natural processes. The NSF cannot allow the perception by any of the Nation's scientists that it does not welcome or support innovative ideas and potentially transformative research. Public support of and careful investment in paradigm-challenging ideas are critical not

only to continued economic growth, but also to the future welfare of our Nation. In this draft report, therefore, the Board recommends that NSF develop a distinct, Foundation-wide Transformative Research Initiative distinguishable by its potential impact on prevailing paradigms and by the potential to create new fields of science, to develop new technologies, and to open new frontiers. Foundation management will report back to the Board at its August 2007 meeting on its preliminary plan for a simple and transparent process for instituting the Transformative Research Initiative that encourages maximum participation by the community.

In a constrained budget environment, achieving the reasonable balance of award size, and duration, and proposal success rate at the Foundation is an important concern of the Board. We have held several discussions with Foundation management about this issue and are anticipating a comprehensive report later this year that will inform us in establishing appropriate policy guidelines.

A very high priority for the Board has been our continuing work with the NSF Management and the Office of Inspector General to resolve the correction of the existing reportable conditions that have been longstanding in NSF annual audits. We have reviewed the draft Corrective Action Plan for Reportable Conditions in the FY2006 Financial Statement Audit and are confident that we can quickly and effectively resolve outstanding issues. NSF management will report to the Board at our March meeting on the status of their efforts to resolve the reportable conditions, as well as efforts to enhance NSF's business model practices and develop a strategic personnel workforce plan for the 21<sup>st</sup> Century.

### **Advice to the President and Congress**

The Board has undertaken a wide range of activities this year, in our broader role as an independent advisory body to the President and the Congress on national policy issues related to science and engineering (S&E) research and education.

- The Board completed a series of public hearings, in response to a Congressional request that the Board consider reconstituting its 1982 Commission on Pre-college Education in Science, Mathematics, Engineering and Technology, and in March 2006 approved the establishment of the new Commission on 21<sup>st</sup> Century Education in STEM, due to present its draft report to the Board in March 2007;
- The Board published and disseminated an important report, *HURRICANE WARNING: The Critical Need for a National Hurricane Research Initiative (NSB-06-115)*. The report presents an agenda for action that will provide urgently needed hurricane science and engineering research and education that engages relevant agencies across the Federal government; involves industry, academia, and other levels of government; establishes highly focused priorities; strengthens disciplinary research; creates multidisciplinary frameworks; and stimulates the efficient transfer of research outcomes to operational practice.
- The Board responded to a request from Senator John McCain to examine existing policies of Federal science agencies concerning the suppression and distortion of research

findings of scientists employed by Federal agencies and the impact these actions could have on quality and credibility of future Government-sponsored scientific research results. Our central recommendation was that an overarching set of principles for the communication of scientific information by government scientists, policy makers, and managers should be developed and issued by the Administration to serve as the umbrella under which each agency would develop its specific policies and procedures.

- The Board responded to a request from Congressman Rush Holt for a summary of its review of the evaluations and impacts of the programs of the National Science Foundation's Education and Human Resources Directorate's programs in January 2007. We will be providing a more thorough report later in 2007.
- Exercising the Board's obligation to inform and advise on critical issues, the Board sent a letter to congressional leadership on February 13, 2007, expressing its full endorsement and appreciation for the FY 2007 Congressional Joint Budget Resolution funding level increase of the FY 2006 level for the NSF Research and Related Activities account, and encouraging congressional approval of a similar budget increase for the NSF Education and Human Resources account.
- The Board published and disseminated its statutory biennial report, *Science and Engineering Indicators 2006* (NSB-06-01) <http://www.nsf.gov/statistics/seind06> and also prepared and disseminated a Board policy statement Companion Piece to Indicators 2006, *America's Pressing Challenge - Building a Stronger Foundation* [(NSB-06-02) <http://www.nsf.gov/statistics/nsb0602>], February 2006;
- Board Members provided comments to Congressman Bart Gordon on his bill, "10,000 Teachers, 10 Million Minds Science and Math Scholarship Act" in February 2006.

Further, the Board provided testimony to congressional hearings in 2006, and responded to other specific questions and inquiries from Members of Congress and their staffs.

### **Improved Outreach and Communication by the Board**

The Board continues to increase and improve our direct outreach and communication with Congress, other Federal agencies, various interest groups and the external science and engineering research and education community.

For example, the Board sponsored:

- Five public meetings of the Commission on 21st Century Education in Science, Mathematics and Technology (See Commission Webpage at [http://www.nsf.gov/nsb/edu\\_com](http://www.nsf.gov/nsb/edu_com))
- A second and third pre-commission hearing in January and March 2006 in Boulder, Colorado and Los Angeles, California, respectively, seeking input from a cross section of stakeholders in U.S. STEM education on the value of establishing a new STEM

Commission to address this topic for the Board a second time (See: [http://www.nsf.gov/nsb/edu\\_com/hearings.htm](http://www.nsf.gov/nsb/edu_com/hearings.htm))

- A third public workshop on Transformative Research (May 16, 2006 [http://nsf.gov/nsb/committees/tskfrctrans\\_cmt.htm](http://nsf.gov/nsb/committees/tskfrctrans_cmt.htm));
- A second public workshop on engineering education reform, including leading deans of engineering, *Moving Forward to Improve Engineering Education* [http://nsf.gov/nsb/eng\\_edu/start.htm](http://nsf.gov/nsb/eng_edu/start.htm), at the Georgia Institute of Technology in November 2006;
- A public “rollout” event for the Hurricane Science and Engineering report, *Hurricane Warning: The Critical Need for a National Hurricane Research Agenda* ([www.nsf.gov/nsb/committees/hurricane/advisory.pdf](http://www.nsf.gov/nsb/committees/hurricane/advisory.pdf)) in the U.S. Capitol Building in September 2006, with the participation by Senators Mel Martinez and Bill Nelson of Florida, and Senator David Vitter of Louisiana.
- Two public presentations on Capitol Hill on *Science and Engineering Indicators 2006* (NSB 06-02) and its Companion Piece, *America’s Pressing Challenge – Building a Stronger Foundation* (NSB 06-02), February 23, 2006 to the media and general public and April 6, 2006 to the House R&D and STEM Caucuses;
- A presentation to Colorado State legislators at the invitation of the American Electronics Association on both *Science and Engineering Indicators 2006* and the recently completed hearings to consider establishing a new National Science Board Commission on STEM Education for the 21st Century, March 23, 2006;
- Two presentations to the National Science Teachers Association (NSTA) in April in Anaheim, California, on *Science and Engineering Indicators 2006* and its Companion Piece, *America's Pressing Challenge - Building a Stronger Foundation* (NSB 06-02); and
- National Science Board informational booths at the American Association for the Advancement of Science (AAAS) meeting in February in St. Louis, Missouri, the National Science Teachers Association (NSTA) meeting in Anaheim, California in April, and Sigma Xi - the Research Society meeting in Detroit, Michigan in November.

In an effort to facilitate more openness of Board meetings in accord with the Sunshine Act, we expanded our practices for:

- providing public notice of all our meetings on a dedicated NSB Meeting Notice Web site, as a supplement to the kinds of notices regularly published in the *Federal Register*;
- continuing to treat teleconferences of the Board, Board Committees, subcommittees and task forces as ‘meetings,’ subject to the requirements of the Government in the Sunshine Act;

- providing much more information to the public in a more timely manner regarding meeting discussions and decisions; and
- expanding efforts to encourage public comment during the development of Board publications.

### **FY 2008 NSB BUDGET**

The Board has much to do over the next year. Perhaps one of the most important actions is to oversee the implementation of the new NSF Strategic Plan, which addresses the broad priorities established in the Board's 2020 Vision for the Foundation. We will be looking to provide policy direction to the Foundation with respect to recommendations of the newly released Hurricane Research and Transformative Research reports. Both involve broad, multidisciplinary questions on the broad frontiers of science and engineering and across the portfolios of NSF's science, engineering and education directorates.

Our Task Force on International Science Partnerships will complete its international meetings in 2007, and we expect to be providing specific guidance to NSF and broader advice on the role of the Federal Government in supporting international S&E partnerships. Our *ad hoc* Task Group on Engineering Education is poised to present us with recommendations that will impact university engineering programs and the future engineering workforce, reflecting the input from two important workshops, incorporating the ideas of engineers, faculty, administrators, and employers in developing guidance for engineering education for the 21<sup>st</sup> Century that reflects the increasing diversity of the U.S. workforce and growing challenges for engineering from globalization of both science and technology and the engineering workforce. We will be continuing our review of program evaluations and impact in the NSF Education and Human Resources Directorate.

Over the next year, the Board expects to complete our development of a national action plan for 21<sup>st</sup> Century Education in Science, Technology, Engineering and Mathematics by making a formal report to the Congress. While many of these recommendations will be at a national system level, a number will focus specifically on the role NSF can and should play in supporting the development of an adequate and diverse science and engineering workforce. The Board will also continue to review and approve NSF's actions for creating major NSF programs and funding, and expects new efforts to be implemented regarding enhancement of NSF support for potentially transformative research as a result of new Board guidance.

Several endeavors that the Board expects to formally complete by the end of FY 2007 will require significant follow-up outreach efforts by the Board in FY 2008 to ensure the desired impacts are realized. For example, lessons learned by the Board's experience with its 1982 STEM Education Commission report and the 2001 report on the role of the Federal Government in supporting international science, have provided clear and strong lessons on the importance of the Board undertaking significant follow-up efforts to ensure action based on our reports. While the Board's Commission on 21<sup>st</sup> Century Education in Science, Technology, Engineering and Mathematics will complete its work later this year, it is clear that much follow-up outreach by

the Board will be required throughout FY 2008 to ensure the work of the Commission has the highest possible impact. Likewise, the Board's Task Force on International S&E partnerships will complete its work at the end of FY 2007, but will require significant follow-up by the Board in FY 2008.

The Board will be producing a new summary volume to our biennial *S&E Indicators* report in FY 2008 that will require significant new effort on the part of the Board. In addition, the Board will continue to review and approve NSF's actions for creating major new programs and funding large projects in FY 2008, as well as dealing with evolving NSF policy issues. Experience has demonstrated that the Board will receive a number of requests from Congress asking that the Board examine and report quickly on a wide range of national policy topics related to S&E research and education. The Board welcomes such Congressional and Administration requests, and will itself continue to identify high priority topics focused specifically on NSF, or more broadly on national S&E policy issues that it feels it should examine in FY 2008.

By statute the Board is authorized five professional positions and other clerical staff as necessary. The full impact of increasing the number of professional positions to the statutory level will occur in FY 2008 with increased attention to addressing new skill requirements. However, the results of a strategic restructuring of the Board Office management and operations over the last three years has led to more efficient use of appropriated resources while retaining the ability to support an active Board agenda.

#### **ISSUES TO CONSIDER AS PART OF NSF RE-AUTHORIZATION LEGISLATION**

*[Our Board Office Director will be available to work closely with your Subcommittee staff to assist with development of specific legislative text to enact any of the Board's following suggestions for modification to the NSF Re-authorization Act.]*

##### A 2020 Vision for NSF

In September 2006, the National Science Board approved a new Strategic Plan for the National Science Foundation for FY 2006-2011, *Investing In America's Future* [(NSF 06-48) [www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf0648](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0648)], articulating strategic outcome goals of discovery, learning, research infrastructure, and stewardship, and investment priorities in order to accomplish these goals. These reflect the National Science Board's *2020 Vision for NSF* [(NSB-05-142) [www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsb05142](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsb05142)], published in December 2005, establishing specific broad priorities for the National Science Foundation to:

- Drive the cutting edge of fundamental and transformative research;
- Tap the talents of all our citizens, particularly those belonging to groups that are underrepresented in the science and research enterprise, and continue to attract foreign students and scientists to the U.S.;
- Develop and test new approaches to teaching science to elementary and secondary school students and catalyze partnerships among schools, museums, aquariums, and universities to put these techniques into effective practice;

- Provide the bright minds in our research institutions with the tools and instruments needed to probe the frontiers of knowledge and develop ideas that can transform our understanding of the world; and
- Maintain the financial and talent resources to be an effective agent for excellence in the critical national enterprises of learning, discovery, and innovation.

The Board would encourage Congress to factor the priorities of the Board's *2020 Vision for NSF* into consideration as you prepare the NSF Re-authorization Act.

Address and examine potential impacts of a doubling of the NSF budget

In December 2003, and in direct response to congressional guidance in Section 22 of the National Science Foundation Authorization Act of 2002 (Pub. L. 107-368, 42 U.S.C. § 1862n note), the National Science Board prepared a report, *Fulfilling the Promise* [(NSB-03-151) [www.nsf.gov/nsb/documents/2003/nsb03151/coverlink.pdf](http://www.nsf.gov/nsb/documents/2003/nsb03151/coverlink.pdf)], to address and examine the Foundation's budgetary and programmatic growth provided for by the Act, and to outline how additional funding would be spent in the event the NSF budget were doubled. Given recent Administration and Congressional statements and actions related to future doubling of the NSF budget, Congress may wish to consider including legislative language as part of the NSF Re-authorization Act to request the Board to prepare a report to Congress that would provide -

- (1) recommendations on how the increased funding should be utilized;
- (2) an examination of the projected impact that the budgetary increases will have on the Nation's scientific and technological workforce;
- (3) a description of new or expanded programs that will enable institutions of higher education to expand their participation in Foundation-funded activities;
- (4) an estimate of the national scientific and technological research infrastructure needed to adequately support the Foundation's increased funding and additional programs;
- (5) a description of the impact the budgetary increases provided under this Act will have on the size and duration of grants awarded by the Foundation, and
- (6) a description of the impact the budgetary increase provided under this Act will have on the potential to create new fields of science, to develop new technologies and to open new frontiers.

Clear statement on the critical role of NSF in pre-K-12 STEM Education

Education is a core mission of the National Science Foundation (NSF). NSF not only promotes research, but also shares in the responsibility for promoting quality science, technology, engineering and math (STEM) education as intertwining objectives at all levels of education across the United States. NSF's highly competitive peer-review process is second to none for openly and objectively identifying, reviewing, selecting, funding and providing stewardship for the very best STEM proposals and programs in research and education.

As part of our role in providing oversight and guidance to the EHR programs, the Board is assessing how well NSF supports the overall S&E education and training outcomes needed by the U.S. in a changing global environment for science and technology. This on-going review is an important action toward achieving the Board's *2020 Vision for the National Science Foundation*, submitted to Congress in December 2005, which states a near term goal to "...critically evaluate current education investments and develop new strategies to increase their impact on the quality of STEM education." Reflecting our conviction of the importance of the EHR Directorate programs for the Nation, the Board has issued a number of STEM education policy reports recently, including its 2004 statement "In Support of the Math and Science Partnership Program at the National Science Foundation" ([NSB-04-42](#)) that articulates the Board's strong commitment to that NSF EHR Directorate program and its Companion Piece to *Science and Engineering Indicators 2006, America's Pressing Challenge—Building a Stronger Foundation* ([NSB 06-02](#)).

The Board feels strongly that NSF EHR programs not only must be effective in relatively short term evaluations of their success in achieving desired outcomes of individual programs, but that, in combination, these programs must be effective in addressing U.S. long-term needs to retain its essential global advantage in S&E human resources. The NSF must help the U.S. sustain its world leadership in science and technology. Four examples of the many exemplary NSF education programs are: the Math and Science Partnership (MSP), the Louis Stokes Alliances for Minority Participation (LSAMP), Information Technology Experiences for Students and Teachers (ITEST) Program and the Robert Noyce Scholarship Program.

The Board will be continuing our review of NSF EHR program evaluations and results, and the use of findings to enhance EHR programs against the background of growing national needs for skills and knowledge, and the growing international competition for talent and technological leadership. We are deeply concerned that, although the U.S. must continue to attract and welcome the best international STEM talent, we can no longer depend on the global market as we have in the past for the skills and innovative talent needed in our labor force. We are convinced of the central role NSF EHR programs can and must play in preparing our citizens with the knowledge and skills needed for our Nation to remain a global leader in science and technology. We are committed to ensuring that NSF EHR programs and portfolio serve our society effectively in that role.

NSF education programs provide for the collaboration between pre-college and college to promote excellence in teaching and learning, therefore facilitating the transitions for students from kindergarten through the baccalaureate in STEM disciplines. The added benefit for our Nation is those students who do not choose STEM careers become the informed scientifically literate voting citizens we need for the 21<sup>st</sup> Century.

NSF has the mandate, depth of experience, and well-established relationships to build the partnerships for excellence in STEM education. The Board, therefore, strongly urges that NSF education programs be sustained and expanded over the long term as an essential component of a coordinated Federal effort to promote national excellence in STEM education. Congress may wish to address this issue as part of the legislative language in an NSF re-authorization act.



## Role of the Board in approving NSF actions

Current Board policy for NSF (NSF Proposal and Award manual, NSF manual #10, December 31, 2005) requires Board approval for the following NSF actions:

- (1) Large Awards. Proposed awards where the average annual award amount is 1% or more of the awarding Directorate or Office's prior year current plan.
- (2) New Programs. Board approval is required for new Programs that: (1) represent a substantial investment of Program resources (threshold defined as the total annualized awards to be made by the proposed Program exceed 3% of the awarding Directorate's or Office's prior year current plan); or (2) involve sensitive political or policy issues; or (3) are to be funded as an ongoing Foundation-wide activity.
- (3) Major Construction Projects. Board approval is required when the resulting cost is expected to exceed the percentage threshold for Board award approval.
- (4) Awards Involving Policy Issues or Unusual Sensitivity. Board interests may include the establishment of new centers, institutes, or facilities; potential for rapid growth in funding or special budgetary initiatives; research community or political sensitivity; previous expression of Board concern; or items otherwise identified by the Director or Assistant Directors.
- (5) Requests for Proposals (RFPs). RFPs expected to result in contracts exceeding the Board approval thresholds. Release of these RFPs to potential contractors must be approved by the Board.
- (6) Waivers. Requests for exemption from Board review and approval of a continuing project or logistics support arrangement may be requested in routine cases where there are no significant issues or policy implications.

We feel this Board policy has worked fairly well and is at an appropriate macro-level of oversight and policy-setting without having the Board become overly engaged with NSF management and operations. However, Congress previously expressed its desire for the Board to be directly involved with approval of congressional budget requests, priority-setting, and award granting of projects in the NSF Major Research Equipment and Facilities Construction (MREFC) account. In response to Section 14 of the 2002 Authorization Act (42 U.S.C. § 1862n), the Board worked with the Foundation to produce a joint report that clearly describes the process by which priorities are set for selecting and funding large research facilities, *Setting Priorities for Large Research Facilities Supported by the National Science Foundation*, (NSB-05-77). The Board would welcome any additional guidance the Congress may wish to provide regarding this process.

## Role of the Board as Oversight Body for NSF and Advisory Body to Congress and the President

From time to time questions have been raised regarding the Board role as an oversight body for the Foundation. While countless congressional budget and authorization report language, and written communications from both Republican and Democratic members of both authorizing and appropriating committees of Congress over many years have made clear the intent for the Board to serve as the oversight body of the Foundation, NSF authorization legislation does not explicitly state the Board's oversight role. Congress may wish to specifically address this issue to help avoid future debates on this topic that can, at best, be distracting for the Board, NSF Management, and the Congress. In a similar vein, Congress may also consider making more explicit in new authorization legislation the independent advisory role of the Board directly to both the Congress and the President on national policy issues related to science and engineering research and education.

### Sunshine Act Audit of the Board

Audits conducted by the Office of Inspector General over the past three years have found that the National Science Board has been in compliance with the requirements of the Government in the Sunshine Act (Sunshine Act). The audit requirement stems from situations prior to 2003 in which the Board did not provide public access to sessions of its committees, task forces, or other working groups. In response, Congress added language to the NSF Authorization Act of 2002 explicitly subjecting session of the Board's subdivisions to the Sunshine Act. Congress further directed NSF's Inspector General to conduct annual audits of Board compliance with the Sunshine Act and to report audit results to specified congressional committees. Four annual audits have been completed and none has resulted in any significant finding of non-compliance. Extending the audit cycle to three years (and appropriately extending the associated document retention requirements) recognizes this fact, yet provides an efficient and regular check on the Board's continued adherence to the Sunshine Act's requirements. Congress may consider modifying the NSF re-authorization to increase the time period for audits of the National Science Board's compliance with the Government in the Sunshine Act (5 U.S.C. § 552b and 42 U.S.C. § 1862n-5) from every year to every three years.

### Board Budget and Operations

As a result of the National Science Foundation Authorization Act of 2002, the National Science Board was, for the first time, given a separate budget line account in the overall Foundation appropriation. That measure served to increase the Board Office's independence and flexibility in meeting the operating and policy research needs of the Board and Board Office, such as those related to conducting workshops, issuing contracts, travel, training, etc. Increasing the availability of Board appropriated funds beyond a single fiscal year, by providing for a 2-year period of availability for the Board's appropriations under "Authorization of Appropriations" (Section 5 in the 2002 Authorization Act), will provide the Board with an added degree of flexibility and, in turn, with full authority for the independent use of its resources through the Board Office. Congress may wish to consider this change in the NSF re-authorization as a further step in ensuring that the Board has flexible and independent resources to fulfill both its oversight and policy-setting role for the NSF and its role as an independent body of advisors to

the Congress and the President on national policy issues related to science and engineering research and education.

At the urging of Congress, in FY 2003 the Board began examining options for augmenting its professional staffing levels. As an initial step in this process, in August 2003 the Board appointed a new Executive Officer of the Board, who also serves as the Board Office Director. At the direction of the Congress and with full concurrence of the Board, our Executive Officer reports directly to the Chairman of the Board and has been delegated responsibility for the hiring and supervision of all Board Office staff and oversight of all Board Office operations. The Board is very pleased with this arrangement. Essential to the conduct of Board business is a small and independent core of full-time senior policy, clerical, and operations staff. In addition to the Board Office's essential and independent core resources and capabilities, temporary contractual advisory and assistance services continue to be critical to support production of Board reports and supplement the Board Office staff's general research and administration services to the Board. These external services provide the Board and its Office with the flexibility to respond independently, accurately, and quickly to requests from Congress and the President, and to address issues raised by the Board itself. The Board would significantly benefit from modifications to the NSF re-authorization Act that would allow our Board Office to implement funding arrangements to periodically supplement our policy staff with technical and professional personnel on leave of absence from academic, industrial, or research institutions for a limited term. Congress may consider modifying Section 1863 (g), 1873 (a) (3) and other appropriate sections of Title 42 of the U.S. Code in this re-authorization to allow the Board to directly enter into these arrangements.

#### Include NSF under the Program Fraud and Civil Remedies Act (PFCRA)

Congress passed and the President signed PFCRA in 1986 to provide the executive departments, the military, Federal establishments covered by the Inspector General (IG) Act at the time of its enactment, and the United States Postal Service with a mechanism to recover losses of less than \$150,000 resulting from false claims and statements of less than \$150,000, which may not otherwise be prosecuted. The Office of Inspector General (OIG) at NSF, however, (along with other "designated Federal entities") was created after a 1988 amendment to the IG Act. As a result, NSF was not included in the 1986 PFCRA legislation. PFCRA has not been subsequently amended to include agencies, such as NSF, that were provided with OIGs in the 1988 amendments.

Except for NSF, every major agency that funds scientific and engineering research and education, including the National Institutes of Health, National Aeronautics and Space Administration, Department of Energy, and Environmental Protection Agency, are authorized to recover funds and assess penalties under PFCRA. NSF, too, needs to have all available means to take effective action whenever grant funds intended for scientific and engineering research and education are used fraudulently. The NSF Director, the Inspector General, and the National Science Board, all support amending PFCRA to include NSF within its jurisdiction.

Because many NSF-funded projects are relatively small in dollar amounts, PFCRA's mechanisms are well suited for resolving disputes between the Foundation and its grantees or

contractors concerning fraudulent claims. Currently, the Foundation's principal legal recourse is to recommend that the Department of Justice attempt to recover misused funds through civil prosecution under the False Claims Act (31 U.S.C. § 3730). In general, such actions are most practical when the sums involved are very large. Under PFCRA, NSF would be able to impose monetary penalties instead of, or in addition to, debarring or suspending erring individuals and organizations. Congress may wish to consider providing the Foundation with valuable flexibility in protecting the integrity of its programs by creating a section in the Reauthorization Act amending PFCRA to include NSF. This will authorize the agency to recover funds and assess penalties under PFCRA's provisions.

### **CLOSING REMARKS**

This is a challenging time for Federal S&E research and education budgets and the organizations and individuals that rely on Federal support. For over 50 years the Federal government has sustained a continual, visionary investment in the U.S. research and education enterprise in the expectation that such investment would benefit all Americans. That Federal effort has expanded the horizon of scientific discovery and engineering achievements far and wide, leading to the realization of enormous benefits to the Nation's prosperity and security.

We know the expanding frontiers of knowledge offer enormous opportunities for research and innovation. We also know that the education of all our citizens in the fundamentals of math, science and engineering must continue to be enhanced, and more American citizens must pursue science and engineering studies and careers if the U.S. is to remain eminent in critical science and technology disciplines. As other nations ramp up their investment in the infrastructure for S&E research and innovation, we cannot be complacent.

Even in a time of budget constraints, we cannot ignore the Nation's growing dependence on innovation for economic prosperity and the ever-improving quality of life Americans have come to expect. We also must be attentive to the crucial role of Federal investment in science and engineering research and education, especially fundamental research that is not cost effective for private industry to pursue, and the contributions of Federal support to research in universities and colleges to preparing our most advanced students for their future careers. The Board recognizes that competing priorities may impose fiscal constraints that limit the Foundation's, and so the Nation's, aspirations. In weighing these competing priorities, we ask you to keep in mind that in our changing global environment, investments in our national science and technology capabilities - talent, knowledge, and physical infrastructure - are not luxuries but essential to our Nation's long-term prosperity and security. We therefore urge that the Congress take the long view in its annual budget deliberations for funding and re-authorizing U.S. science and engineering research and education through the National Science Foundation.



**Dr. Steven C. Beering**

**Chairman, National Science Board  
Medicine and Higher Education**

B.S., University of Pittsburgh, 1954

M.D., University of Pittsburgh, 1958

Steven C. Beering received B.S. and M.D. degrees and an honorary Doctor of Science degree from the University of Pittsburgh. Before becoming President of Purdue in 1983, he served for a decade as Dean of Medicine and Director of the Indiana University Medical Center. He holds appointments as professor of medicine at Indiana University and professor of pharmacology at Purdue University. He retired from the Purdue presidency in 2000.

He served on active duty with the USAF Medical Corps from May 1957 to June 1969, achieving the rank of lieutenant colonel.

Beering has held numerous national offices, including the chairmanship of the Association of American Medical Colleges and the Association of American Universities. He is a former regent of the National Library of Medicine.

He is also a Fellow of the American College of Physicians and the Royal Society of Medicine, a member of Phi Beta Kappa, the Institute of Medicine of the National Academy of Sciences, and the Indiana Academy.

He serves on a number of national and corporate boards, including NiSource Inc., Central Indiana Corporate Partnership, Inc., Community Foundation of Northern Indiana, CID Corporation, and Marquis Who's Who. He is a Trustee of the University of Pittsburgh, and the Universities Research Association, and is Director Emeritus of the Purdue Research Foundation.

Beering was appointed to the National Science Board in 2002, reappointed in 2004, and elected Chairman in 2006.

August 2006