Order Code 95-307 SPR
Updated September 20, 2000

U.S. National Science Foundation: An Overview

Christine M. Matthews
Specialist in Science and Technology Policy
Resources, Science, and Industry Division

Summary

The National Science Foundation (NSF) was created by the National Science Foundation Act of 1950, as amended (P.L. 81-507). The NSF has the broad mission of supporting science and engineering in general and funding basic research across many disciplines. The majority of the research supported by the NSF is conducted at U.S. colleges and universities. Approximately 81% ($2,149.9 million) of NSF's FY1999 $2,654.8 million research and development (R&D) budget was awarded to U.S. colleges and universities.[1] Preliminary data reveal that for FY1999, the NSF provided approximately 52.5% of all federally funded **basic** research conducted at the nation's colleges and universities, with the exclusion of biomedical research sponsored by the National Institutes of Health. In addition, NSF provides almost 30% of the total federal support for science and mathematics education. For more on NSF, see CRS Issue Brief IB10051, *Research and Development Funding: Fiscal Year 2001,* Michael E. Davey, Coordinator. This report will be updated periodically.

Background. The NSF's primary responsibility is to maintain the health and vitality of the U.S. academic science and engineering enterprise. In addition to ensuring the nation's supply of scientific and engineering personnel, the NSF promotes academic basic research and science and engineering education across many disciplines.[2] Other federal agencies, in contrast, support mission-specific research (i.e., health, agriculture, defense).

The NSF provides support for investigator-initiated, merit-reviewed, competitively selected awards, state-of-the-art tools, instrumentation and facilities. The agency receives approximately 60,000 proposals annually, for research, graduate and postdoctoral fellowships, and science, mathematics, and engineering projects, and funds roughly one-third of them.

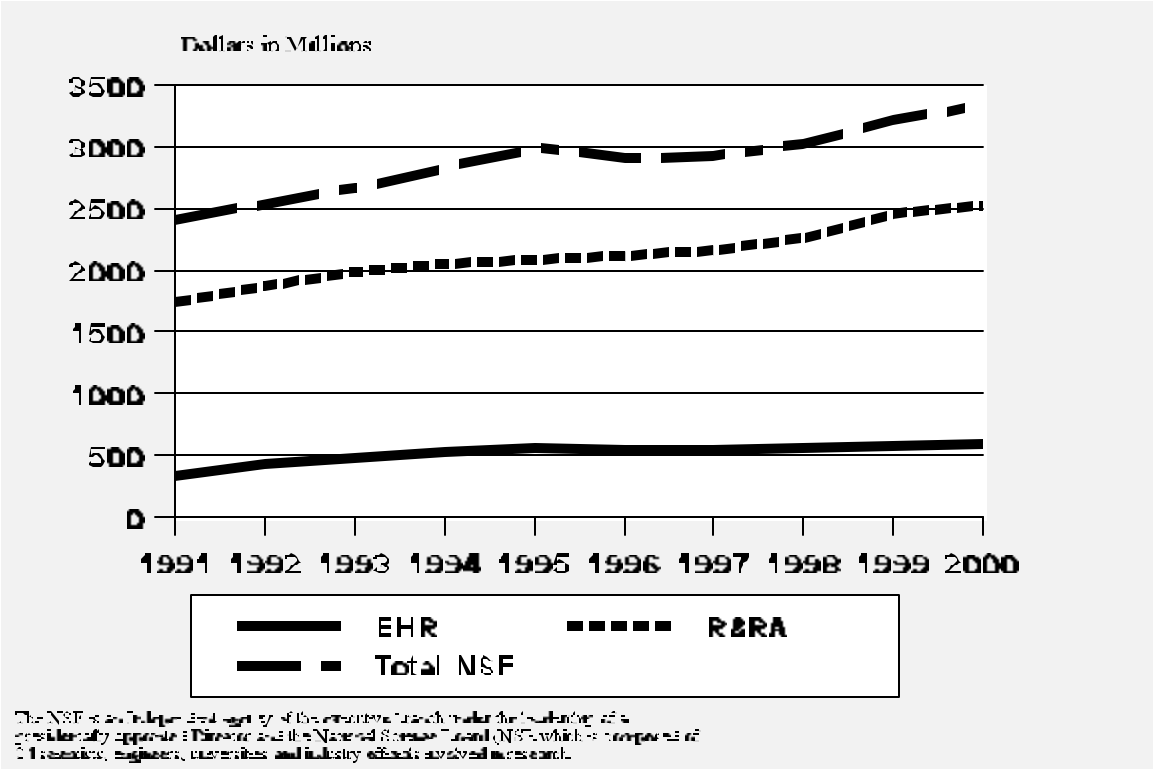
[1]National Science Foundation, *Federal Support for Research and Development: Fiscal Years 1997, 1998, and 1999,* Detailed Statistical Tables, NSF 99-333 (Washington, 1999) p. 57-59.

[2]The NSF does not provide funding for research in clinical medicine, commerce, social work, or the arts and humanities.

Support is provided to academic institutions, industrial laboratories, private research firms, and major research facilities and centers. While the NSF does not operate any laboratories, it does support Antarctic research stations, selected oceanographic vessels, and national research centers. Additionally, the NSF supports university-industry relationships and U.S. participation in international scientific ventures.

Most of the research supported by the NSF is conducted at U.S. colleges and universities. Approximately 81% ($2,149.9 million) of NSF's estimated FY1999 $2,654.8 million research and development (R&D) budget was awarded to U.S. colleges and universities.[3] Preliminary data reveal that in FY1998, the NSF provided approximately 52.5% of all federally funded **basic** research conducted at the Nation's colleges and universities, with the exclusion of biomedical research sponsored by the National Institutes of Health.[4]

Figure 1. NSF R&D Support in Constant 1992 Dollars: 1990-2000



---

[3]*Federal Funds for Research and Development: Fiscal Years 1997, 1998, and 1999*, p. 96-97.

[4]While the FY1999 R&D appropriation of $2,654.8 million was only 3.6 of the FY1999 federal R&D budget, the agency plays an important role in maintaining the university-based research enterprise. The NSF provided 14.4% of all federally supported basic research and 17.6% of federal academic research. Ibid., p. 148. NSF was the second largest federal supporter of academic research in FY1999, eclipsed by the Department of Health and Human Services, which provided 60.4%. The Department of Defense, the third largest supporter of academic research, provided 8.9%.

The NSF is an independent agency in the executive branch and under the leadership of a presidentially appointed Director and a National Science Board (NSB) composed of 24 scientists, engineers, and university and industry officials involved in research and education. The NSB and the Director make policy for the NSF.

Organization and Fiscal Year 2001 Budget Request. The NSF has enjoyed considerable growth during a period of constrained R&D budgets. When measured in current dollars, its total appropriation increased more than 66% in 10 years — FY1991, $2,343.5 million; FY1996, $3,206.3 million; and FY2000, $3,897.2 million. Even when inflation is taken into account, its growth increased (in constant fiscal year 1992 dollars) by 44.3% during this 10-year period. The request provides support for several initiatives, including nanoscale science and engineering ($217 million), biocomplexity in the environment ($136 million), and in education and workforce development ($157 million). At the suggestion of the President's Information Technology Advisory Committee, the NSF has been designated as the lead agency for an initiative on information technology involving seven federal agencies. NSF's FY2001 request provides $327 million for the information technology research (ITR) initiative. The investment in ITR will support research in areas such as computer system architecture, information storage and retrieval, scalable networks, connectivity, and research on the impact of information technology on society. The ITR initiative builds on NSF's current investments, and increases the total support for ITR by approximately 160% over the FY2000 estimate. The NSF continues its involvement in the National Science and Technology Council interagency programs in FY2001, providing $187 million for the U.S. Global Change Research Program, $47 million for a New Generation of Vehicles, and $125 million for Integrated Science for Ecosystems Challenges.

The FY2001 request supports seven major directorates and other programs and activity accounts. The directorates are the Biological Sciences; Computer and Information Science and Engineering; Education and Human Resources; Engineering; Geosciences; Mathematical and Physical Sciences; and Social, Behavioral, and Economic Sciences. Six of the seven directorates are contained in the Research and Related Activities Account (R&RA). In addition to the directorates, the R&RA includes the U.S. Polar Research Programs ($222.8 million), the U.S. Antarctic Logistical Support Activities ($62.6 million), and Integrative Activities ($119.2 million). The seven major directorates are described below.

Biological Sciences (BIO). The FY2001 request of $511.1 million for the BIO Directorate supports programs structured to improve scientific understanding of biological phenomena, ranging from the study of fundamental molecules of living organisms to the complexity of biological systems. Types of support provided include research workshops, symposia, conferences, the improvement of research collections, purchase of scientific equipment, and operation of research facilities.

Computer and Information Science and Engineering (CISE). The CISE Directorate, proposed at $529.1 million in FY2001, supports programs focused on the fundamental understanding of computing and information processing, and the use of state-of-the-art computational techniques in scientific and engineering research. Currently, areas of research emphasized are parallel processing, automation and robotics, large-scale integrated electronic systems, scientific computing, and networking.

Education and Human Resources (EHR). The FY2001 request of $760 million for EHR supports science, engineering, mathematics, and technology education. People receiving support from the EHR include senior researchers, postdoctoral associates, graduate and undergraduate students, and teachers and students at the precollege level. Additional support is provided to individuals through informal science activities. More than 150,000 people are involved in the various activities and programs of the EHR.

Engineering (ENG). The ENG, with a budget request of $456.5 million for FY2001, is directed at enhancing the long-term economic strength and security of the Nation by fostering innovation and excellence in engineering education and research. It focuses on integrating education and research in interdisciplinary areas such as information and communication technologies, design and manufacturing, biotechnology, and environmental research.

Geosciences (GEO). The FY2001 request of $583 million for the GEO Directorate provides support to programs that promote knowledge and discussions concerning earth, including the sun, atmosphere, continents, oceans, and interior, and the linkages among them. One of the objectives of the GEO is to expand the knowledge of the biological, chemical, geological, and physical processes in the ocean, and at its boundaries, with the atmosphere and the earth's crust.

Mathematical and Physical Sciences (MPS). The FY2001 request of $881.2 million for the MPS would fund programs designed to increase the knowledge base in the relevant sciences; improve the quality of educational programs, with emphasis at the undergraduate level; improve the rate at which research efforts are translated into societal benefits; and increase the diversity of approaches and individuals in the mathematical and physical sciences.

Social, Behavioral, and Economic Sciences (SBE.) The SBE Directorate, proposed at $175.1 million in FY2001, supports programs directed at developing basic scientific knowledge about human behavior, culture, interaction, and decisionmaking, and about social, political, and economic systems, organizations, and institutions. The SBE also serves as the nation's primary data source on science and engineering human, institutional, and financial resources.

Other Program Activities and Accounts. The Major Research Equipment (MRE) account is funded at $138.5 million in FY2001, a 48.2% increase ($45 million) over the FY2000 level. The MRE, established in FY1995, supports the construction of major research facilities that are at the "cutting edge of science and engineering." The projects include terascale computing systems ($45 million), construction funds for the Large Hadron Collider ($16.4 million), completion of the design and development phase of the Millimeter Array ($6 million), investments in the Network for Earthquake Engineering Simulation ($28.2 million), construction of the Earthscope: USArray and San Andreas Fault Observatory at Depth ($17.4 million), the modernization of the South Pole Station ($13.5 million), and startup funds for the National Ecological Observatory Network ($12 million).

The science and engineering education activities of the NSF are supported by the EHR Directorate **and** in selected activities in other directorates and programs. Support at the various educational levels in the FY2001 request is as follows: precollege, $267.5 million;

undergraduate, $143.6 million; and graduate, $97 million. Support at the precollege level includes investments in a new activity, Centers for Learning and Teaching (CLT). CLTs will focus on producing the next generation of professionals to manage and direct the development of instructional materials and large scale assessments. Major programs at the undergraduate level are Advanced Technological Education, Louis Stokes Alliances for Minority Participation, Scholarships for Services, Minority-Servicing Institutions, and Distinguished Teaching Scholars. Support at the graduate level has increased slightly in the FY2001 request, with the additional funding directed at the Graduate Teaching Fellows program. The FY2001 request for the Experimental Program to Stimulate Competitive Research is $48.4 million. (An additional $24.6 million from programs in the R&RA will support EPSCoR activities). H-1B nonimmigrant petitioner fees, funded in the EHR, are proposed at $31 million in the FY2001 request.

Policy Issues. In February 2000, the NSF, in compliance with the Government Performance and Results Act (GPRA), released its performance plan for FY2001.[5] The NSF plan presents a set of key investments for each of its programmatic outcome goals. The outcome goals for NSF's investment portfolio are:

- Discovery at and across the frontier of science and engineering, and connections to its use in the service of society;
- A diverse, internally-competitive and globally-engaged workforce of scientists, engineers, and well-prepared citizens; and
- Broadly accessible, state-of-the-art information bases and shared research and education tools.[6]

In presenting the FY2001 budget, Rita R. Colwell, director, NSF, stated that there is concern in the scientific community about the major realignment of federal research support across the scientific disciplines. Data indicate that since 1970 to the present, research support for the life sciences increased from 29% to 43%. During that same time period, support for the physical sciences and engineering decreased from 50% to 33%.[7] Colwell stressed the importance in monitoring the structure of the federal research portfolio in order to determine the priorities that should be assigned the various disciplines.

There is added concern about the trend in federal versus private sector support for research. While total national R&D funding is at a high, the federal government's share of support for R&D has declined, losing ground to industry. The federal government provided 60% of R&D support in 1967, 46.3% in 1987, and 30.5% in 1997.[8] In testimony before the House Subcommittee on Basic Research, Colwell underscored the need for the federal

---

[5]National Science Foundation, *FY2001 GPRA Performance Plan*, February 2000. Electronically available at [http://www.nsf.gov/od/gpraperfplan/fy2001/01perfplan-revfeb2k.htm]. The GPRA performance plan is based on NSF's strategic plan presented to Congress in September 1997 and the FY1999 performance plan. The performance plan was devised by NSF staff.

[6]Ibid., p. 2.

[7]NSF FY2001 Budget Briefing. Rita R. Colwell, Director, NSF. February 7, 2000. Electronically available at [http://www.nsf.gov/od/pa/forum/colwell/rc0027budget.htm].

[8]National Science Board, *Science and Engineering Indicators 1998*, NSB 98-1 (Washington, 1999) p. A122-A123.

government to increase its support for the long-term investment in science and engineering research that the private sector is unwilling to do. She stated that: "It is very clear to me that we are severely and critically underinvesting in basic research. . . . The federal government alone has the ability to make the long-term investments needed to sustain the remarkable growth and progress we are enjoying today as a society."[9]

On July 29, 1999, the NSB released an interim report, *Environmental Science and Engineering for the 21st Century: The Role of the National Science Foundation*.[10] The report details the importance for increased investment in fundamental research in the environmental sciences, and notes that the NSF is "uniquely positioned" to assume leadership in the area. Included in the report are recommendations and policy guidelines for the NSF in environmental research, education, and scientific assessment that are consistent with the environmental research activities of other federal agencies and organizations and the National Science and Technology Council (NSTC). Some of the recommendations outlined in the report are as follows:

- Environmental research, education, and scientific assessment should be one of the highest priorities of the NSF. The current environmental portfolio, an investment of approximately $600 million, represents only about one-third of the resources necessary. An increase of $1 billion for environmental research in the Foundation's budget over the next 5 years is recommended.
- The NSTC, with advice from the President's Committee of Advisors on Science and Technology, reevaluate the national environment R&D portfolio, including identification of research gaps and priorities, and the respective roles of different Federal agencies in fundamental environmental research and education.
- NSF should take the lead in enabling a coordinated, digital, environmental information network.[11]

On June 21, 2000, the House passed the VA, HUD, and Independent Agencies Appropriations Bill, FY2001 (H.R. 4635). The Committee recommended $4,064.3 million for NSF, 11.1% below the Administration's request. The R&RA was proposed at $3,135.7 million, 11.4% below the budget request. The House proposed $694.3 million for EHR in FY2001, 8.6% less than that proposed by the Administration. On September 13, the Senate reported its version of H.R. 4635 (no bill number as yet in the Senate). The Senate provides a total of $4,297.2 million for the NSF in FY2001, $232.9 million above the House allowance, and $275.2 million below the Administration's request. The Senate provides $3,245.6 million for R&RA and $765.4 million for EHR.

---

[9]U.S. Congress. House Committee on Science, Subcommittee on Basic Research, *The Impact of Basic Research on Technological Innovation and National Prosperity*, 106th Cong., 1st sess., September 28, 1999. Testimony of Rita D. Colwell, Director, NSF. Electronically available at [http://www.nsf.gov/od/lpa/congress/106/rc92899basicresearch.htm]. See, also, Washington Fax. "American R&D May Not Be Doing As Well As It Thinks In A Global Context, Competitiveness Council Warns". September 21, 1998. 2 p. and Schulz, William, "R&D Investment Shortfalls May Imperil Economy," *Chemical & Engineering News*, vol. 77, July 5, 1999, p. 7.

[10]National Science Board, Task Force on the Environment, Interim Report, *Environmental Science and Engineering for the 21st Century: The Role of the National Science Foundation*, NSB99-133, July 29, 1999, 80 p.

[11]Ibid., p. 26-33.