

National Science Foundation in the FY 2004 Budget

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HIGHLIGHTS

- The President's FY 2004 request for the National Science Foundation (NSF) is \$5.5 billion (see Table II-7). This represents an increase of \$171 million, or 3.2 percent, over the FY 2003 level of \$5.3 billion. This falls significantly short of the authorized level of \$6.4 billion signed into law late last year.
- Research and Related Activities (R&RA) would increase to \$4.1 billion, a 1.2 percent increase over the FY 2003 level.
- In addition to NSF's "core" research and education activities, six priority areas are highlighted: Nanoscale Science and Engineering; Information Technology Research; Mathematical Sciences; Human and Social Dynamics; Biocomplexity in the Environment; and Workforce for the 21st Century.
- The President is proposing to fund NSF's Education and Human Resources (EHR) programs at \$938 million, a \$35 million or 3.9 percent increase over FY 2003. Within the EHR account, the budget includes funding to increase the annual stipends for NSF fellowship and traineeship recipients from \$27,500 to \$30,000. The Experimental Program to Stimulate Competitive Research (EPSCoR) would be funded at \$75.0 million, a decrease of \$14 million from the enacted FY 2003 level of \$89 million.
- The Major Research Equipment and Facilities Construction (MREFC) account is slated for a sizable increase, going from \$149 million in FY 2003 to \$202 million in FY 2004 with the

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most significant beneficiaries of this increase being the Atacama Large Millimeter Array (ALMA), EarthScope, and the IceCube Neutrino Observatory.

- The budget proposes \$200 million for the third year of a Math and Science Partnership initiative focused on improving K-12 math and science education.

AGENCY OVERVIEW

NSF's Mission: Since its founding in 1950, the Foundation has had an extraordinary impact on American scientific discovery. Despite its small size, it is the only federal agency with responsibility for the overall health of science and engineering across all disciplines. This is in contrast to other federal agencies that support research focused on specific missions, such as health or defense. The NSF is also committed to ensuring the nation's supply of scientists, engineers, and science and engineering educators.

NSF accomplishes its mission with remarkable efficiency. Approximately 95 percent of the agency's total budget goes directly to support the actual conduct of research and education, while less than five percent is spent on administration and management. For the second straight year, the NSF was the only agency in the entire federal government to receive "green lights" for its implementation of the President's management agenda, garnering high marks for both its financial management and E-government.

NSF Support: NSF plays a crucial role in the support of university-based research. Although NSF represents less than four percent of the total federal budget for research and development, it supports roughly 50 percent of all non-medical basic research at colleges and universities. In several fields, it is the leading federal source.

The agency funds approximately 20,000 research, education and training projects through grants, contracts, and cooperative agreements to more than 2,000 colleges, universities, and other research and/or education organizations in all parts of the United States. More than 200,000 people are involved directly in NSF research and education programs and activities. In FY 2004, these are projected to include 43,000 senior researchers and other professionals, 69,000 postdoctoral, graduate and undergraduate students, 15,000 K-12 students and 87,000 K-12 teachers.

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The agency does not operate its own laboratories, but does support national research centers, user facilities, oceanographic vessels and Antarctic research stations. NSF also supports university-industry research partnerships, U.S. participation in international scientific efforts, and efforts to improve K-12 education as well as education in universities and colleges.

Agency Structure: NSF is an independent federal agency run by a presidentially appointed, Senate-confirmed director and deputy director. The agency's policy direction is established by the National Science Board, which consists of 24 scientists, mathematicians, engineers, top university officials, and industry leaders.

NSF has a staff of roughly 1,200 people and is divided into seven directorates. Six of the directorates are directly responsible for funding discipline-oriented basic and applied research: Biological Sciences (BIO); Computer and Information Science and Engineering (CISE); Engineering (ENG); Geosciences (GEO); Mathematical and Physical Sciences (MPS); and Social, Behavioral and Economic Sciences (SBE). The remaining directorate is responsible for overseeing NSF's Education and Human Resources (EHR) activity. The NSF also has an account for Major Research Equipment and Facilities Construction (MREFC).

Congressional Support: NSF has traditionally enjoyed broad Congressional support. While the agency's appropriation dipped slightly between FY 1995 and FY 1996, the total appropriation for the NSF has increased each year since then, even when other agencies under the VA, HUD and Independent Agencies appropriations bill were cut.

Since FY 1999, the Congress has continually provided the NSF with increases to its budget that have been greater than the increases received by any other scientific research agency except the National Institutes of Health (NIH). In FY 2001, Congress provided the largest single increase in both percentage and dollar terms in the history of the NSF, an increase of 13.3 percent over FY 2000. In FY 2002, Congress substantially exceeded the President's request for the NSF, increasing funding by 8.5 percent over FY 2001. And again in FY 2003, the Congress substantially increased funding for the NSF, providing a total of \$5.3 billion for the agency, an increase of \$521 million, or 10.9 percent, over FY 2002.

The high level of Congressional support for the NSF was also demonstrated last year when Congress passed H.R. 4664, the NSF

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Authorization Act of 2002, a bill aimed at putting the NSF on a track to double its budget over five years. This Act (P.L. 107-368), signed into law by President Bush on December 19, 2002, authorized a maximum funding level for the NSF in FY 2004 of \$6.4 billion. When the bill was introduced, House Science Committee Chairman Sherwood Boehlert (R-NY) stated that “In moving toward doubling, we are returning to the vision that Vannevar Bush laid out in the 1940s, when he proposed a science agency that would be the preeminent funder of science for the federal government, with responsibilities across many areas of inquiry and application. Fifty-two years later, NSF is honorably attempting to fulfill that vision. We need to ensure that it succeeds.”

Given the record of recent years and with the newly enacted NSF Authorization Act, it is likely that Congress will again exceed President Bush’s request in FY 2004. NSF has enjoyed strong support by the Chairman and ranking Democrat on the Senate VA, HUD and Independent Agencies Subcommittee, Christopher Bond (R-MO) and Barbara Mikulski (D-MD), who have also spoken out in favor of moving to double the NSF’s budget over five years. House VA, HUD and Independent Agencies Subcommittee Chairman James T. Walsh (R-NY) has also said that NSF is his top priority within the VA-HUD bill.

One of the difficulties always faced by Congressional appropriators in trying to increase funding for the NSF, however, is that it receives its funding from the same appropriations bill that funds other research agencies, *e.g.* NASA and the Environmental Protection Agency (EPA), and the Department of Veterans Affairs (VA) and the Department of Housing and Urban Development (HUD). The significant funding pressures resulting from the VA and HUD alone invariably make it difficult to significantly increase funding for other agencies contained in this bill, including the NSF. These pressures within the VA-HUD bill are likely to be even greater in a year in which the Nation finds itself faced with increasing budget deficits and wartime expenses.

RESEARCH AND RELATED ACTIVITIES (R&RA)

Research and Related Activities (R&RA) would receive \$4.1 billion in the President’s FY 2004 budget, an increase of \$50 million or 1.2 percent above the FY 2003 level (see Table II-7 for R&RA details).

Requests for specific R&RA directorates are as follows:

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Biological Sciences (BIO): \$562 million (down 1.6 percent). Among the activities supported within BIO are Molecular and Cellular Biosciences; Integrative Biology and Neuroscience; Environmental Biology; Biological Infrastructure; Emerging Frontiers; and Plant Genome Research. In FY 2004, BIO expects to make 3,494 awards with an average annualized award size of \$165,200 per year and an average duration of 3.1 years. (For more on BIO programs, see Chapter 19.)

Computer and Information Science and Engineering (CISE): \$584 million (up 1 percent). The FY 2004 request for CISE includes \$218 million as part of NSF's Information Technology Research priority area and \$20 million for Cyberinfrastructure intended to develop the next generation of sensors, storage systems, computers and networks. In FY 2004, CISE expects to make 2,400 awards with an average annualized award size of \$143,000 per year and an average duration of 3 years. (For more information on CISE, please see Chapter 24.)

Engineering (ENG): \$537 million (up 1.1 percent). Activities supported within ENG include Bioengineering and Environmental Systems; Chemical and Transport Systems; Civil and Mechanical Systems; Design, Manufacture and Industrial Innovation; Electrical and Communications Systems; and Engineering Education and Centers. In FY 2004, ENG expects to make 3,550 awards with an average annualized award size of \$107,000 per year and an average duration of 3 years. (For more information, see Chapters 26 and 27.)

Geosciences (GEO): \$688 million (up 0.5 percent). Activities supported within GEO include Atmospheric Sciences; Earth Sciences; and Ocean Sciences. The FY 2003 request for GEO included approximately \$74 million in transferred programs from the U.S. Geological Survey, EPA, and the National Oceanic and Atmospheric Administration (NOAA). The proposed program transfers were not approved for transfer by Congress and are not re-proposed in the FY 2004 request. In FY 2004, GEO expects to make 3,300 awards with an average annualized award size of \$107,000 per year and an average duration of 3 years. (For detailed information on Atmospheric Sciences, see Chapter 16; for Ocean Sciences, see Chapter 17; and for Earth Sciences, see Chapter 18.)

Mathematical and Physical Sciences (MPS): \$1.1 billion (up 2.6 percent). Activities supported within MPS include Astronomical Sciences; Chemistry; Materials Research; Mathematical Sciences;

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Physics; and Multidisciplinary Activities. In FY 2004, MPS expects to make 4,800 awards with an average annualized award size of \$145,000 per year and an average duration of 3.2 years. (For more information on NSF mathematics research, see Chapter 23; for more on physics research, see Chapter 14; and for more on astronomy research, see Chapter 15.)

Social, Behavioral and Economic Science (SBE): \$212 million (up 10.9 percent). SBE is the principal source of federal support for basic research in the social, behavioral and economic sciences. For fields such as anthropology, archaeology and political science, NSF is the sole source of federal research support. In other fields, such as sociology and social psychology, NSF provides more than half of all federal support. NSF provides more than one-third of federal support for basic research in economics. In FY 2004, SBE expects to make 2,230 awards with an average annualized award size of \$80,000 per year and an average duration of 2.7 years. (For more on SBE, please see Chapter 21; for more on Science Resources Statistics within SBE, see Chapter 22.)

U.S. Polar Programs: \$330 million (up 3.4 percent). The FY 2004 request for U.S. Polar Programs includes \$262 million for U.S. Polar Research Programs and \$68 million for U.S. Antarctic Logistical Support. The extreme environments and geographically unique characteristics enable research to be performed in both the Arctic and Antarctic that is not feasible elsewhere.

Each year, about 650 science personnel from institutions in 30 states travel to Antarctica for research purposes. NSF facilities there include the Center for Astrophysical Research at the South Pole and two Antarctic LTER sites, one near Palmer Station that focuses on marine research, and another in the Dry Valleys near McMurdo Station, that studies polar desert oases and permanently ice-covered lakes.

Integrative Activities: \$132 million, (down 9.9 percent). Integrative Activities (IA) was created in FY 1999 within R&RA to support cross-disciplinary research efforts and major research instrumentation. IA also supports the Science and Technology Policy Institute, which provides analytical support to the Office of Science and Technology Policy (OSTP) to identify short-term and long-term objectives for research and development and identify options for achieving those objectives.

In FY 2004, the Major Research Instrumentation program is to receive \$90 million, \$6 million more than the FY 2003 level. The Partnerships for Innovations program, which aims to stimulate the transformation of

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knowledge into innovation through the creation of local and regional technology development strategies, is slated to double to \$10 million.

NSF PRIORITY AREAS

In addition to NSF's "core" research and education activities, six focused areas are highlighted in the agency's request:

Nanoscale Science and Engineering: NSF plans to spend approximately \$249 million in this area in FY 2004 to be used to develop and strengthen promising fields, including nanobiotechnology, manufacturing at the nanoscale, and education. (For more on nanoscale science, see Chapter 25.)

Information Technology Research (ITR): In FY 2004, NSF will continue to lead a multi-agency initiative in ITR. The budget request calls for \$303 million for this initiative, which will address computer system architecture, information storage and retrieval, scalable networks, and connectivity, as well as studies of the impact of information technology on society. The effort also will focus attention on the need for safe, secure, and dependable information infrastructure for national security and consumer protection. (For more on ITR, see Chapter 24.)

Mathematical Sciences: In FY 2004, NSF plans to spend \$89 million on this priority area. Funding will support the integration of mathematics and statistics across the full range of science and engineering disciplines and support educational activities that foster closer connections between research and education in the mathematical sciences (see Chapter 23).

Human and Social Dynamics: NSF's FY 2004 request for this priority area would be \$24 million. This area draws on the convergence of research in biology, engineering, information technology, and cognitive science to investigate the causes and ramifications of change and its complex consequences (see Chapter 21).

Biocomplexity in the Environment: The budget requests \$100 million for this initiative which seeks to bring together environmental knowledge across scientific fields to investigate the interactions among ecological, social, and physical earth systems.

Workforce for the 21st Century: NSF proposes to spend approximately \$9 million on this priority area in FY 2004, which is aimed at

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coordinating NSF's effort to ensure a scientifically literate and technically skilled future workforce.

EDUCATION AND HUMAN RESOURCES (EHR)

The EHR directorate would receive \$938 million in FY 2004, an increase of 3.9 percent over the FY 2003 level.

The Math and Science Partnerships Initiative proposed by President Bush is projected to receive \$200 million, an increase of \$73 million above FY 2003. Now in its third year of funding, this proposed \$1 billion, five-year initiative is intended to link local elementary and secondary schools with colleges and universities to raise the performance of all U.S. students in mathematics and science, train teachers, and create innovative ways to reach underserved students and schools.

The budget request includes funding to increase the annual stipends for NSF fellowships and traineeships recipients from \$27,500 to \$30,000. The Experimental Program to Stimulate Competitive Research (EPSCoR) would receive \$75 million, a decline of 14 percent below FY 2003. (For more on NSF's EHR programs, please see Chapter 5.)

MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION

The Major Research Equipment and Facilities Construction (MREFC) account receives a total of \$202 million in the FY 2004 request, an increase of \$54 million or 36.2 percent over the FY 2003 level. For FY 2004, the highest funding priorities within this account are: construction of the Atacama Large Millimeter Array (ALMA; \$51 million); EarthScope (\$45 million); the IceCube Neutrino Observatory (\$60 million); the Higher Performance Instrumented Airborne Platform for Environmental Research (HIAPER; \$26 million); the George Brown Network for Earthquake Engineering Simulation (\$8 million); the National Ecological Observatory Network (\$12 million); and South Pole Station modernization (\$1 million). The priority for new starts in FY 2005 will be Scientific Ocean Drilling, and Rare Symmetry Violating Processes and Ocean Observatories in FY 2006. (For more information on ALMA, see Chapter 15; for more information on EarthScope, see Chapter 18; for more information on NEON, see Chapter 19.)