

## National Science Foundation in the FY 2006 Budget

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### HIGHLIGHTS

- The FY 2006 request for the National Science Foundation (NSF) is \$5.6 billion. After receiving a cut from Congress in FY 2005, this represents a modest increase of \$132 million, or 2.4 percent, over FY 2005. This falls well short of the \$8.5 billion authorized in the NSF Authorization Act enacted in December 2002 and is less than last year's Presidential budget request of \$5.7 billion (see Table II-7).
- Research and Related Activities (R&RA) would increase to \$4.3 billion, a \$113 million or 2.7 percent increase over the FY 2005 level of \$4.2 billion. Most NSF research directorates receive increases of about 1 percent in 2006, but the increases would still leave many of these research programs at or below their 2004 funding levels.
- Approximately \$48 million of the R&RA increase comes from the transfer of funds previously provided to the U.S. Coast Guard into NSF's Office of Polar Programs to support operation and maintenance of the polar icebreaking fleet. Factoring out the transfer means that the R&RA account receives a real increase of \$64.9 million or 1.5 percent.
- The small increases for the research directorates would squeeze NSF funding of competitive awards and research grants. NSF estimates that it will provide a total 10,010 competitive awards and 6,310 research grants in FY 2006. While the FY 2006 request provides a slight increase over last year in the number of research grants, the total number of competitive awards decreases, and total competitive awards and research grants still remain below 2004 numbers. Thus, competition for grants will remain difficult, with NSF making awards to just one in five applications this year. Even applicants that receive awards may be

disappointed, as the average size of an NSF research grant is slated to fall in FY 2006 for the second year in a row.

- The President is proposing to fund NSF's Education and Human Resources (EHR) programs at \$737 million, a \$104 million or 12.4 percent decrease. This is the second year in a row that a significant reduction in the EHR account has been proposed. When the proposed FY 2006 reduction is combined with the reduction taken in the FY 2005 appropriated level, the EHR account has been reduced by over \$200 million -- or more than 20 percent -- within the last two years.

- Despite no new starts proposed in FY 2006, the Major Research Equipment and Facilities Construction (MREFC) account would see sizable growth to \$250 million, an increase of \$76 million or 44 percent. This supports funding for five continuing projects.

#### **AGENCY OVERVIEW**

***NSF's Mission:*** Since its founding in 1950, the Foundation has had an extraordinary role in American scientific discovery. In contrast to other federal agencies that support research focused on specific missions and despite its small size, it is the only federal agency with responsibility for the health of science and engineering across all disciplines. The NSF is also charged with 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 budget goes to support the actual conduct of research and education, and only about five percent to administration and management. For a fourth consecutive year, NSF received very high marks from the Office of Management and Budget (OMB) for the quality of its overall management. It received three "green lights" on the Executive Branch Management Scorecard and was the only agency to receive the highest rating on every program rated by OMB's Program Assessment Rating Tool (PART) Evaluation.

***NSF Support:*** NSF plays a crucial role in the support of university-based research sending more than 80 percent of its total R&D support to colleges and universities. Although NSF represents less than four percent of the total federal budget for research and development, it is the second largest sponsor of research at colleges and universities, after the National

## NATIONAL SCIENCE FOUNDATION IN THE FY 2006 BUDGET

Institutes of Health (NIH). In several areas, including engineering, physical sciences, and environmental sciences, it is the leading federal source of support of academic research.

The NSF funds approximately 10,000 research, education and training projects through grants, contracts, and cooperative agreements at more than 2,000 colleges, universities, and other research and/or education organizations in all parts of the United States. Currently, more than 194,000 people are involved directly in NSF research and education programs. These include 44,000 senior researchers and other professionals, 65,000 postdoctoral, graduate and undergraduate students, and 84,000 K-12 teachers and students.

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 science, math and engineering education at the K-12 level as well as at colleges and universities.

***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 approximately 1,300 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:*** The NSF has experienced steady budget growth over the past several decades. Moreover, while the NSF has always enjoyed strong Congressional support, this support surged during the late 1990s as key leaders in both the House and Senate began to speak in favor of doubling the NSF's budget over five years.

The growing level of Congressional support for increasing the NSF budget was demonstrated in 2002 when Congress passed the NSF 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 in December 2002, authorized a maximum funding level for the NSF in FY 2005 of \$7.4 billion and up to \$8.5 billion in FY 2006. 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.”

Despite high hopes that passage of the NSF Authorization bill would result in significant funding increases for NSF, a dramatically changed federal fiscal environment—characterized by increasing budget deficits and costs associated with the war on terrorism—has resulted in NSF funding well below the authorized levels. In FY 2004, the first year after the authorization bill passage, the NSF received \$5.6 billion, a 5 percent increase, and in FY 2005 the NSF actually received a cut of \$138 million, or 3.1 percent. This cut marked the first time in ten years that NSF did not see an increase overall and was the first time that the R&RA account was cut in real terms since FY 1986.

The House Science Committee has acknowledged that the authorized levels for NSF are unlikely to be reached given current fiscal restraints. In its Views and Estimates Document to the House Budget Committee concerning the FY 2006 budget for the NSF, the committee states, “While recognizing that budget realities may not allow Congress to fund NSF at the level provided in the current authorization . . . the Committee believes that the FY 2006 request is inadequate. Congress should provide as much funding as possible to strengthen support for core science and education programs, and priority areas such as information technology and nanoscale science and engineering research.”

The FY 2006 budget attempts to meet the Bush Administration’s stated goal of cutting the size of the federal deficit by half over the next five years. What this means is that domestic, non-defense discretionary spending is projected to be cut in real terms in coming years. According

## NATIONAL SCIENCE FOUNDATION IN THE FY 2006 BUDGET

to the projections of the Congressional Budget Office, the Administration's policies, if enacted, would cut domestic non-defense discretionary spending from \$425 billion in FY 2005 to \$404 billion in FY 2006 and remain essentially flat for the next two years. The budget environment is such that any sizable funding increases for the NSF are not in the cards and in fact, NSF advocates are primarily hoping this year to ensure the cuts made to the agency last year are restored and that the NSF experiences real budget growth.

An additional wrinkle has been thrown into this otherwise bleak budgetary picture by the reorganization of the House and Senate Appropriations Committees. A reform proposal first advanced by the House Republican Leadership was to create a stand-alone subcommittee to fund all federal science agencies, in part to focus more congressional attention on science and avoid—as in the old organization—a political dynamic in which any increase in NSF came at the expense of highly popular and sensitive programs such as veterans benefits or federal housing. Although the original House proposal was not implemented, the VA, HUD and Independent Agencies Appropriations Subcommittee previously responsible for funding NSF and NASA has been dismantled in both the House and the Senate. NSF and NASA are now assigned to the jurisdiction of a new Science, State, Justice, and Commerce, and Related Agencies Appropriations Subcommittee in the House and the Commerce, Justice and Science Appropriations Subcommittee in the Senate. It is unclear if this new arrangement will benefit NSF when FY 2006 funding decisions are made.

### **RESEARCH AND RELATED ACTIVITIES (R&RA)**

Research and Related Activities (R&RA) would receive \$4.3 billion in the President's FY 2006 budget, an increase of \$113 million, or 2.7 percent above the FY 2005 level (see Table II-7 for R&RA details). Approximately \$48 million of the R&RA increase comes from a transfer of funds to NSF's Office of Polar Programs to support the operation and maintenance of the polar icebreaking fleet. These icebreaking activities previously were funded by the Coast Guard. Requests for specific R&RA directorates are as follows:

***Biological Sciences (BIO): \$582 million (up \$5 million or 0.9 percent).*** Among the activities supported are Molecular and Cellular Biosciences; Integrative Biology and Neuroscience; Environmental Biology;

*Smith and White*

Biological Infrastructure; Emerging Frontiers; and Plant Genome Research. In FY 2006, BIO expects to make 1,419 competitive awards and 917 research grants. The average award size is \$171,016 per year and an average duration of 3.3 years. (For more on BIO, see Chapter 18.)

***Computer and Information Science and Engineering (CISE): \$621 million (up \$7 million, or 1.1 percent).*** This directorate provides the advanced computing and networking capabilities needed by academic researchers for cutting edge-research in all science and engineering fields. In FY 2006, CISE expects to make 1,050 competitive awards and 905 research grants. The average award size is estimated to be \$165,000 per year and an average duration of 3.0 years. (For more information on CISE, please see Chapter 23.)

***Engineering (ENG): \$581 million (up \$19 million, or 3.5 percent).*** Activities supported 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 2006, ENG expects to make 1,775 competitive awards and 1,032 research grants. The average award size is estimated to be \$119,900 per year for an average of 2.9 years. (For more, see Chapters 25 and 26.)

***Geosciences (GEO): \$709 million (up \$15 million, or 2.2 percent).*** Activities supported include Atmospheric Sciences, Earth Sciences, and Ocean Sciences. In FY 2006, GEO expects to make 1,400 competitive awards and 790 research grants. The average award size is estimated to be \$149,050 per year for 3.0 years. (For more on Atmospheric Sciences, see Chapter 16; for Earth Sciences, see Chapter 17.)

***Mathematical and Physical Sciences (MPS): \$1.1 billion (up \$16 million, or 1.5 percent).*** Activities supported within MPS include Astronomical Sciences; Chemistry; Materials Research; Mathematical Sciences; Physics; and Multidisciplinary Activities. In FY 2006, MPS expects to make 2,110 competitive awards and 1,600 research grants. The average award size is estimated to be \$130,114 per year and an average duration of 3.1 years. (For more information on NSF mathematics research, see Chapter 22; for more on physics research, see Chapter 14; and for more on astronomy research, see Chapter 15.)

***Social, Behavioral and Economic Sciences (SBE): \$199 million (up \$2***

## NATIONAL SCIENCE FOUNDATION IN THE FY 2006 BUDGET

**million, or 1.0 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 2006, SBE expects to make 1,013 competitive awards and 642 research grants. The research awards would have an average award size of \$90,413 per year and an average duration of 2.4 years. (For more on SBE, please see Chapter 20).

**U.S. Polar Programs: \$387 million (up \$43 million, or 12.4 percent).** The FY 2006 request for U.S. Polar Programs includes \$319 million for U.S. Polar Research Programs and \$68 million for U.S. Antarctic Logistical Support. Most of the increase provided to the Polar Programs account comes as the result of the transfer of \$48 million from the Coast Guard to the NSF to fund the operation and maintenance of the nation's three polar icebreakers. While the Coast Guard will continue to operate and maintain these vessels, NSF would provide the funds.

The extreme environments and unique geography found at the earth's poles enable research to be performed in 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 Long Term Ecological Research (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: \$135 million (up \$5 million, or 3.8 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 R&D and identify options for achieving those objectives.

### NSF PRIORITY AREAS

In addition to NSF's "core" research and education activities, the NSF intends to continue its support for four major research initiatives, or

“priority areas.” The specific priority areas highlighted in the NSF’s funding request include:

***Nanoscale Science and Engineering (NS&E):*** NSF plans to spend approximately \$243 million, a decrease of \$53 million or 18.0 percent from FY 2005. This priority area contributes to the multiagency National Nanotechnology Initiative (NNI). In FY 2006, funding would decline as new NNI activities transition from NS&E to NSF core research, consistent with the planned phase-out of the NS&E Priority Area. Funding priorities for the NS&E align with the seven program components outlined in the NNI Strategic Plan: 1) fundamental nanoscale phenomena and processes; 2) nanomaterials; 3) nanoscale devices and systems; 4) instrumentation research for nanotechnology; 5) nanomanufacturing; 6) major research facilities and instrumentation acquisition; and 7) societal dimensions. (See Chapter 24 for more.)

***Mathematical Sciences:*** In FY 2006, NSF plans to spend \$89 million on this priority area, approximately the same as in FY 2005. The goal of this priority area is to advance frontiers in three interlinked areas: 1) fundamental mathematical and statistical sciences; 2) interdisciplinary research connecting the mathematical sciences with science and engineering; and 3) mathematical sciences education (see Chapter 22).

***Human and Social Dynamics (HSD):*** NSF’s FY 2006 request for this priority area would be \$39 million, an increase of approximately \$1 million, or 1.6 percent, over the FY 2005 funding level. HSD research will develop and apply multidisciplinary approaches to answer questions about how people and institutions respond to, and are influenced by, new knowledge and technologies. The goal is to improve our understanding of the dynamics underlying these complex interdependencies. Themes that will continue to be a central focus within this priority area in FY 2006 are: 1) agents of change; 2) dynamics of human behavior; and 3) decision-making, risk, and uncertainty. As part of a five-year investment supporting the Climate Change Research Initiative, \$5.0 million will be devoted specifically to decision making under uncertainty as related to climate change, in the form of continuing support for existing centers.

***Biocomplexity in the Environment (BE):*** The FY 2006 budget requests \$84 million for this initiative, a \$15 million, or 15.5 percent reduction from the funding level provided in FY 2005. This priority research area seeks to bring together environmental knowledge across scientific fields

## NATIONAL SCIENCE FOUNDATION IN THE FY 2006 BUDGET

to investigate the interactions among ecological, social, and physical earth systems. As part of the planned phasing down of this priority area, NSF states in its budget proposal that it will refer to this research portfolio as Complexity in Environmental Systems (CES).

### **EDUCATION AND HUMAN RESOURCES (EHR)**

The budget would fund EHR programs at \$737 million, a reduction of \$104 million or 12.4 percent. Graduate education programs would receive \$155 million, essentially the same as in FY 2005. Also receiving flat funding is the Experimental Program to Stimulate Competitive Research (EPSCoR) which would receive \$94 million.

Major cuts are proposed for the other programs within EHR. Elementary, Secondary, and Informal Education programs are slated to receive \$141 million, a reduction of \$41 million or 22.6 percent. Undergraduate Education programs would receive \$135 million, a cut of \$19 million or 12.1 percent. Funding for Research, Evaluation and Communication (RCE) is \$34 million, a reduction of \$26 million or 43.2 percent. This funding is to support previous RCE awards with no new RCE awards.

***Math and Science Partnerships (MSP):*** For the second straight year, the budget provides no funding for new awards to be made within NSF for the Math and Science Partnerships (MSP). The budget requests \$60 million for MSP, a reduction of \$19 million from the FY 2005 level of \$79 million. According to the request, all FY 2006 MSP funds “support awards made in previous years, plus data collection, evaluation, knowledge management and dissemination.”

The FY 2005 budget proposed transferring the MSP program to the Department of Education, which has long maintained a MSP program of its own. Prior to that, in FY 2004, this program had been proposed for funding at \$200 million by the President and received \$139 from the Congress. Funds for the MSP program at the Department of Education have traditionally been provided to states through block grants while the NSF program has made awards based upon peer review. Despite concern expressed in Congress about the proposed transfer and its impact on the MSP program, tight funding allocations resulted in no funding for new NSF MSP awards in FY 2005.

**Graduate fellowships and stipends:** Within EHR, the budget would fund approximately 4,600 graduate fellowships and traineeships NSF-wide. More specifically, within this amount 2,280 Graduate Research Fellowships (GRF), 935 Graduate Teaching Fellows in K-12 education (GK-12), and 1,385 Integrative Graduate Education and Research Traineeships (IGERT) are proposed for FY 2006. Stipends will be held level at \$30,000. (For more on NSF's EHR programs, see Chapter 5.)

#### **MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION**

The Major Research Equipment (MREFC) account is slated to receive a significant funding increase, despite the fact that no new starts are being proposed in FY 2006. A total of \$250 million, an increase of \$76 million or 44 percent, over FY 2005 is proposed to support five continuing projects. Three of these projects, the Atacama Large Millimeter Array (ALMA); the IceCube Neutrino Observatory; and EarthScope would be funded at the same levels as they were in FY 2005. The two projects within MREFC slated for significant funding increases are the Scientific Ocean Drilling Vessel project which would receive \$58 million, up from \$15 million; the Rare Symmetry Violating Processes (RSVP) project, which would receive \$42 million, also up from \$15 million. Both of these projects are new starts this year. Initial funding for the National Ecological Observatory Network (NEON) is pushed back until FY 2007 despite the fact that the Administration has proposed funding for NEON in past years. Congress has consistently chosen not to fund this new start.

The MREFC appropriation only pays for the construction of major R&D facilities; the \$429 million total facilities investment includes the design and development of future facilities and the operational costs of existing user facilities, which are open to the general scientific and engineering communities for research. Outside the MREFC, the largest part of the facilities investment would be \$114 million for the Partnership for Advanced Computational Infrastructure (PACI) to create and operate a national cyberinfrastructure of state-of-the-art computing, communications, and information resources for research and education.

#### **SALARIES AND EXPENSES**

NSF requests \$269 million for Salaries and Expenses, a \$46.0 million or 20.5 percent increase.