

National Science Foundation in the FY 2007 Budget

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HIGHLIGHTS

- The National Science Foundation (NSF) is one of three agencies targeted for major funding increases as part of the President's American Competitiveness Initiative (ACI). The FY 2007 request for NSF is \$6.0 billion, an increase of \$439 million or 7.9 percent (see [Table II-7](#)).
- Overall NSF R&D funding—excluding education, training, and overhead costs—would rise to \$4.5 billion, an increase of 8.3 percent. This increase comes after several years of flat funding and elevates total NSF R&D funding to an all-time high in real terms.
- Research and Related Activities (R&RA) would increase to \$4.7 billion, a \$334 million or 7.7 percent increase. Most research directorates receive increases of between 5 and 9 percent in FY 2007.
- NSF estimates that it will provide a total 10,310 competitive awards and 6,760 research grants in FY 2007. This represents 670 more competitive awards. Despite this increase, competition for grants will remain difficult, with NSF making awards to just one in four applicants.
- The President is proposing to fund NSF's Education and Human Resources (EHR) programs at \$816 million, a \$20 million or 2.5 percent increase over FY 2006. While the EHR budget increases, it still remains almost \$130 million less than it was in FY 2004.
- The Major Research Equipment and Facilities Construction (MREFC) account would be funded at \$240 million, an increase of \$50 million or 26 percent. This increase includes money for two new starts: the Alaska Region Research Vessel (\$56 million) and the Ocean Observatories Initiative (\$13.5 million).

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 94 percent of the agency's budget goes to support the actual conduct of research and education, and only about six percent to internal operations, administration and management.

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 investments account for only four percent of the total federal budget for research and development, it provides 22 percent of federal support to academic institutions and is the second largest sponsor of research at colleges and universities, after the National Institutes of Health (NIH). In several areas, including engineering, physical sciences, social sciences and environmental sciences, it is the leading federal source of support of academic research. And, while NSF does not directly support medical research, its investments are critical to medical science and related industries because they lead to advances in diagnostics, regenerative medicine, drug delivery, and the design and manufacturing of pharmaceuticals.

Ninety percent of NSF funding is allocated through merit-based competitive awards. On average, NSF receives 40,000 research proposals and makes nearly 10,000 awards to 1,700 colleges, universities, and other non-profit institutions throughout the country annually. Currently, over 170,000 people are involved directly in NSF research and education programs. These include approximately 43,000 senior researchers and other professionals, 60,000 postdoctoral, graduate and undergraduate students, and 68,000 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

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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 supports research activities through its Office of Polar Programs (OPP). This year the NSF has created a new office, the Office of Cyberinfrastructure, specifically to support cyberinfrastructure research activities previously supported by CISE. NSF's large scientific facilities and major research projects are funded in a separate account known as the Major Research Equipment and Facilities Construction (MREFC) account.

Recent NSF Funding History: For the most part, NSF has seen steady growth over the past several decades. After declines in the NSF budget in the mid-1990's which resulted from growing pressure to balance the federal budget, growth began again for NSF in 1998. While the NSF has always enjoyed strong Congressional support, this support surged during the late 1990's 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 support for NSF 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, increased authorized funding for NSF from its FY 2002 level of \$4.8 billion to \$9.8 billion in FY 2007. 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

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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—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. This cut marked the first time in ten years the NSF did not see an increase overall and was the first time since FY 1986 that R&RA was cut in real terms.

Last year things began to look up for the NSF as Representative Frank Wolf (R-VA) assumed the chairmanship of the House Science, State, Justice, and Commerce Appropriations Subcommittee, the newly created subcommittee responsible for NSF funding. The subcommittee was the result of a congressional consolidation of appropriations subcommittees which resulted in the elimination of the VA-HUD subcommittee which previously had responsibility for NSF and NASA funding. As the Chairman of this House subcommittee, Rep. Wolf took a strong interest in NSF. In May 2005, he wrote a letter to President Bush urging a “tripling the innovation budget—federal basic research and development—over the next decade.” He also included language in a supplemental appropriations bill requiring the U.S. Department of Commerce to convene a major conference on U.S. competitiveness. This conference, in November 2005, brought U.S. industry, university and government officials together to speak about their concerns with regards to national competitiveness, innovation, federal research funding and science, technology, engineering and math (STEM) education and workforce.

In the final conference agreement on the appropriations bill, Chairman Wolf fought to increase funding for the NSF, but despite his efforts NSF increased by only 2 percent last year, bringing its final budget back up only to where it had been two years earlier in FY 2004.

Congressional concerns such as those of Chairman Wolf were fueled by a number of reports issued by business, higher education and scientific organizations in 2005 which sounded the alarm that the U.S. might be

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losing its global scientific and technological edge. The most notable of these was the National Academies' "Rising above the Gathering Storm" report. These reports have led to the introduction of major bipartisan innovation and competitiveness legislation in the U.S. Senate including the National Innovation Act (S. 2109) and the Protecting America's Competitive Edge (PACE) legislative acts (S. 2197, S. 2198 and S. 2199). At the same time, House Democrats have announced a major innovation agenda of their own. Like the already approved NSF authorization, all of these proposals call for significant funding increases for the NSF and other federal agencies with a significant role in the support of basic physical sciences and engineering research.

These growing concerns culminated with President Bush announcing the American Competitiveness Initiative (ACI) in his State of the Union address. This new initiative included a commitment to double the federal investment in basic research programs in the physical sciences over the next 10 years. For FY 2007, the ACI proposes \$6.0 billion for NSF, an increase of \$439 million, or 7.8 percent. If adopted, proposal would begin to turn around the downward funding trend for NSF, putting it on a track to potentially double over ten years. While not the 5 year doubling originally proposed in the NSF authorization bill, many NSF advocates are very pleased with and supportive of the increase contained for the NSF in the President's budget proposal.

RESEARCH AND RELATED ACTIVITIES (R&RA)

Research and Related Activities (R&RA) would receive \$4.7 billion in the President's FY 2007 budget, an increase of \$334 million or 7.7 percent above the FY 2006 level (see [Table II-7](#) for R&RA details).

Requests for specific R&RA directorates and offices are as follows:

Biological Sciences (BIO): \$608 million (up \$31 million or 5.4 percent). BIO is the dominant federal supporter of basic research in the non-biomedical biological sciences at academic institutions, providing 66 percent of all support. BIO's contribution to a broad array of biological sciences is critically important, particularly in such areas as environmental biology and plant sciences. BIO-supported research is important to furthering the understanding of how living organisms function and interact with nonliving systems which, in turn, has significant relevance to issues of national importance relating to the

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environment, economy, agriculture, and human welfare. In FY 2007, BIO expects to make 1,450 competitive awards and 986 research grants. The average award size would be \$193,200 per year for an average duration of 3.0 years. (For more on BIO, see [Chapter 18](#).)

Computer and Information Science and Engineering (CISE): \$527 million (up \$30 million, or 6.1 percent). CISE is the principal source of federal funding for university-based basic research in computer science, providing the vast majority (86 percent) of total federal support in this area. CISE provides academic researchers with advanced computing and networking capabilities and fundamental knowledge in computing science and engineering which, in turn, are essential to innovation and effectiveness in many areas, including advanced scientific research, medical care, national and homeland defense, organizational competitiveness, and governmental efficiency. In FY 2007, CISE expects to make 1,200 competitive awards and 905 research grants. The average award size is estimated to be \$158,000 per year and an average duration of 3.0 years. (For more information on CISE, please see [Chapter 23](#).)

Engineering (ENG): \$629 million (up \$48 million, or 8.2 percent). ENG is a major source of federal funding for university-based, fundamental engineering research, providing 46 percent of the total federal support in this area. ENG investments in engineering research and education build and strengthen our Nation's capacity to lead the world in innovation. These investments include such emerging technologies as sensors and sensor systems, molecular electronics, photonics, cyberinfrastructure, metabolic engineering, bioengineering and manufacturing. In FY 2007, ENG expects to make 1,677 competitive awards and 1,020 research grants. The average award size is estimated to be \$119,200 per year for an average of 2.9 years. (For more, see [Chapters 25 and 26](#).)

Geosciences (GEO): \$745 million (up \$42 million, or 6.0 percent). GEO is the principal source of federal funding for university based basic research in the geosciences, providing about 68 percent of total federal support in these areas. GEO plays a critical role in addressing the nation's need to understand, predict, and respond to environmental events and changes. Research supported by GEO also helps to determine the best use of Earth's resources. In FY 2007, GEO expects to make 1,350 competitive awards and 1,050 research grants. The average award

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would be \$149,000 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): \$1.15 billion (up \$65 million, or 6.0 percent). MPS provides about 45 percent of federal funding for basic research at academic institutions in the mathematical and physical sciences and serves as the federal steward for ground-based astronomy. MPS provides about 40 percent of the federal support for academic astronomy; in chemistry, about 38 percent; in physics, approximately 32 percent; in materials research approximately 55 percent; and in mathematics more than 77 percent. In FY 2007, MPS expects to make 2,150 competitive awards and 1,650 research grants. The average award size is estimated to be \$140,000 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): \$214 million (up \$14 million, or 6.9 percent). SBE is a principal source of federal support for fundamental research on human cognition, behavior, social structures, and social interaction, as well as for research on the intellectual and social contexts that govern the development and use of science and technology. Overall, SBE accounts for about half of federal support for basic research in the social sciences at U.S. academic institutions. In some fields, including anthropology, archaeology, political science, linguistics, non-medical sociology, and the social aspects of psychology, SBE is the predominant or exclusive source of federal basic research support. In FY 2007, SBE expects to make 1,050 competitive awards and 680 research grants. The average award size is estimated to be \$110,000 per year and an average duration of 2.5 years. (For more on SBE, please see [Chapter 20](#).)

Office of Polar Programs (OPP): \$438 million (up \$49 million, or 12.5 percent). The FY 2007 request for U.S. Polar Programs includes \$319 million for U.S. Polar Research Programs and \$68 million for U.S. Antarctic Logistical Support. OPP supports research in the extreme environments and unique geography found at the earth's poles. Much of the research performed by the NSF in the Arctic and Antarctic is not feasible elsewhere. Each year, about 650 science personnel from institutions in 30 states travel to Antarctica for research purposes. In FY 2007, OPP expects to make 390 competitive awards and 340 research

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grants. The research awards would have an average award size of \$200,000 per year and an average duration of 3.0 years.

Office of Cyberinfrastructure (OCI): \$182 million (up \$55 million, or 43.5 percent). This year, cyberinfrastructure activities previously conducted within CISE have been transferred to a newly created Office of Cyberinfrastructure (OCI). OCI is slated to receive \$182 million in the FY 2007 budget, a significant funding increase. In FY 2007, OCI expects to make 75 competitive awards and 25 research grants. The research awards would have an average award size of \$410,000 per year and an average duration of 2.7 years.

Office of International Science and Engineering (OISE): \$41 million (up \$6 million, or 17.6 percent). OSIE serves as the focal point, both inside and outside NSF, for international science and engineering activities. Bold exploration at the frontiers of science and engineering increasingly requires international partnerships. OSIE is the lead office in helping to develop such partnerships on behalf of the NSF.

Integrative Activities: \$131 million (down \$6 million, or 4.2 percent). Integrative Activities (IA) was created in FY 1999 within R&RA to support cross-disciplinary research efforts and major research instrumentation.

EDUCATION AND HUMAN RESOURCES (EHR)

NSF, in accordance with the NSF Act of 1950, is the principal federal agency charged with promoting science and engineering (S&E) education. In support of this mission, EHR promotes the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry who have access to the ideas and tools of science and engineering. The budget would fund EHR programs at \$816 million in FY 2007, an increase of \$20 million, or 2.5 percent.

A major reorganization occurred within EHR in FY 2006 with the consolidation of two EHR divisions, Elementary, Secondary, and Informal Education (ESIE) and Research, Evaluation and Communication (REC), into the Division of Research on Learning in Formal and Informal Settings (DRL). This realignment consolidates the existing science, technology, engineering, and mathematics (STEM)

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education research, development, and evaluation programs previously housed within the two divisions into a single entity. The consolidation is aimed at enhancing the management of these activities while building on existing strengths. The focus of DRL will be on basic and applied research on learning at all levels and in both formal and informal settings. DRL will have a strong but not exclusive emphasis on K-12.

Funding for DRL is \$215 million in the FY 2007 budget, essentially flat. The Division of Undergraduate Education (DUE) would receive \$197 million, a reduction of \$15 million or 7.0 percent. This is the second year in which the budget has proposed reductions for DUE. The Division of Graduate Education (DGE) would receive \$161 million, an increase of \$8 million or 4.9 percent. The Experimental Program to Stimulate Competitive Research (EPSCoR) is slated to receive \$100 million, \$1 million or 1.3 percent more than last year.

Graduate fellowships and stipends: Within EHR, the budget would fund an estimated 4,665 graduate fellowships and traineeships NSF-wide, 2,280 Graduate Research Fellowships, 1,000 Graduate Teaching Fellows in K-12 education, and 1,385 Integrative Graduate Education and Research Traineeships. Stipends would be held level at \$30,000.

Math and Science Partnerships (MSP): For the third straight year, the budget provides no funding for new awards within NSF for the Math and Science Partnerships (MSP). This is despite strong language of concern expressed by Congress last year concerning the discontinuation of the MSP program at NSF. The budget requests \$46 million for Math and Science Partnerships, a reduction of \$17 million from last year.

The FY 2005 budget proposed transferring the MSP program to the Department of Education, which has long maintained a MSP program of its own. 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. (For more on NSF's EHR programs, see [Chapter 5](#).)

MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION

The Major Research Equipment and Facilities (MREFC) account is slated to receive a significant funding increase. The MREFC account would be funded at \$240 million, an increase of \$50 million or 26

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percent. This funding would support six ongoing projects: Atacama Large Millimeter Array construction (\$48 million), the IceCube Neutrino Observatory (\$29 million), EarthScope (\$27 million), the Scientific Ocean Drilling Vessel (\$43 million), and the South Pole Station Modernization Project (\$9 million). Also included is funding for the National Ecological Observatory Network (\$12 million). While NEON has not previously been funded within MREFC, the budget claims that this project is not a new start because it has already begun with funding in previous years from R&RA. The FY 2007 request includes money for two new starts: the Alaska Region Research Vessel (\$56 million) and the Ocean Observatories Initiative (\$14 million). No funds are provided for the Rare Symmetry Violating Processes Project, in accordance with the National Science Board's recommendation to terminate the project.

NSF PRIORITIES

The FY 2007 NSF budget emphasizes four priorities aimed at strengthening the science and engineering enterprise. These are: 1) Advancing the Frontier of Knowledge; 2) Broadening Participation in the Science and Engineering Enterprise; 3) Providing World-Class Facilities and Infrastructure; and 4) Bolstering K-12 Education.

NSF appears to be de-emphasizing its support for major cross-cutting agency research initiatives, or "priority areas," this year. Last year's budget highlighted four major priority areas including Nanoscale Science and Engineering, Mathematical Sciences, Biocomplexity in the Environment, and Human and Social Dynamics and phased out the Information Technology Research priority area. This year's NSF budget phases out the Nanoscale Science and Engineering priority area while it proposes \$43 million for Biocomplexity in the Environment (down \$57 million); \$78 million for the Math Sciences (down \$11 million); and \$41 million for Human and Social Dynamics (up \$3 million). The only area slated to be continued in FY 2008 is Human and Social Dynamics.

Meanwhile, NSF support for major National Science and Technology Council (NSTC) crosscutting initiatives grows in the FY 2007 budget with the NSF's portion of the Climate Change Science Program increasing to \$205 million (up \$8 million); the Networking and Information Technology R&D Initiative increasing to \$904 million (up \$93 million); and the National Nanotechnology Initiative increasing to \$373 million (up \$29 million; see Table I-9.)