NATIONAL SCIENCE FOUNDATION

AT A GLANCE:

2006 Discretionary Budget Authority: $5.6 billion
(Increase from 2005: 2 percent)

Major Programs:

- Research and related activities
- Education and human resources
- Major research equipment and facilities construction

MEETING PRESIDENTIAL GOALS

Promoting Economic Opportunity and Ownership

- Fostering innovations that will yield significant long-term economic benefits, especially in areas such as nanotechnology and information technology research and development.

Protecting America

- Supporting research and training in cyber security to respond to threats to information technology systems and infrastructure.

Agency-specific Goals

- Underwriting science and engineering research.
- Strengthening a diverse, competitive U.S. workforce of scientists and engineers.
- Providing broadly accessible, state-of-the-art science and engineering facilities, tools, and other infrastructure.

Making Government More Effective

- Using automated systems to promote effectiveness and efficiency in the agency's grant-making process.
- Promoting the quality, relevance, and performance of research and development programs by maintaining practices that are consistent with the Administration's research and development investment criteria.

PROMOTING ECONOMIC OPPORTUNITY AND OWNERSHIP

The 2006 Budget provides a 2.4-percent increase for the National Science Foundation's (NSF's) investments in science and engineering. Similar investments in the past have yielded important scientific discoveries, which boost economic growth and enhance Americans' quality of life. NSF supports a broad portfolio of fundamental research, ranging from the behavioral and social sciences to mathematics and the physical sciences. This research keeps our Nation at the scientific forefront, providing opportunities for growth in both small and large technologically based companies.

The Administration is reinforcing NSF investment in areas that will link discovery to innovation. NSF leads two Administration priority research areas that are particularly likely to further strengthen the economy: the National Nanotechnology Initiative and the Networking and Information Technology Research and Development (NITRD) program. NSF-funded nanotechnology research, funded at $344 million in 2006, a 1.6-percent increase over 2005, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at $803 million in 2006, a one-percent increase over 2005, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce.

PROTECTING AMERICA

NSF funding for research related to cyber security is critical to staying ahead of threats to IT infrastructure. Growing concerns about the vulnerability of computers, networks, and information systems have prompted increased NSF investments in cyber security research, education, and training. The 2006 Budget provides $94 million for these activities. Basic research in this area is motivated by broad interest in information security and reliability, but it has applications including encryption, intrusion detection, and network security.

Security from Imperfection

Determining whether a given message has originated from a specific computer is an important but difficult security challenge. NSF-funded research at the Massachusetts Institute of Technology (MIT) addresses this challenge by exploiting a device's manufacturing irregularities. Imperfections and minute characteristics of a computer's components can provide a unique "fingerprint" that can be used to let others confirm they are communicating with that computer. MIT researchers have developed protocols that use these fingerprints to establish two-way secure connections between remote computers, an innovation relevant to a wide range of secure applications, such as improving email security and protecting software copyrights.

NSF's Cybercorps program funds grants for graduate and undergraduate education in cyber security that will strengthen the future IT security workforce. Cybercorps' scholarships require commitments for a period of Government service, ensuring that Federal agencies have access to these skilled workers. For Cybercorps, the 2006 Budget provides $10 million, which will support 660 students.

Other areas of NSF research have potential relevance to homeland security, including research on diverse topics such as: microbes and the ecology of infectious diseases; sensor networks; threat anticipation and behavioral response; mathematical algorithms for extracting information from massive data sets; and organization and disruption of social networks.

AGENCY-SPECIFIC GOALS

Underwriting Science and Engineering Research

The 2006 Budget provides $4.3 billion in research and related activities to sustain the Nation's leadership in science and engineering, an increase of $113 million. Increased funding for "core" research will also increase the share of well-rated grant proposals NSF can fund. The agency considers three factors in evaluating the productivity of its research portfolio: award size, award duration, and the share of proposals funded. In 2006, NSF will place greater emphasis on increasing its share of proposals it can fund while striving to maintain recent gains in award size and duration.

NSF provides sustained funding to accelerate progress in areas that hold exceptional promise for advancing knowledge and addressing national interests. In 2006, investments are focused in four interdependent NSF priority areas: Biocomplexity in the Environment; Nanoscale Science and Engineering; Mathematical Sciences; and Human and Social Dynamics.

Strengthening the U.S. Science and Engineering Workforce

The 2006 Budget will continue NSF's efforts to prepare U.S. students for the science and engineering workforce, with a focus on broadening participation in these fields. NSF funding for basic research at U.S. academic institutions supports the education of future U.S. scientists and engineers. NSF also makes strategic investments in K–12, undergraduate, graduate, and postdoctoral education. The President's Budget will fund graduate fellowships and traineeships for approximately 4,600 graduate students across the country.

The Nanobiotechnology Center, an NSF-funded Science and Technology Center led by Cornell University, created a traveling museum exhibition to explain nanotechnology to the public in an interactive and entertaining way. About 800,000 visitors toured the exhibition in its first six months.

NSF's programs support participation in science and engineering by individuals and by institutions that serve significant numbers of underrepresented students and communities. An increasing emphasis on educational programming and outreach by NSF-supported investigators is expanding the resources available to the Nation's K–12 and postsecondary institutions to develop and strengthen programs in science, technology, engineering, and mathematics.

The President's Budget seeks to attract the most promising U.S. students into science and engineering programs by providing more competitive graduate stipends. NSF provides annual stipends of $30,000 for fellowship and trainee programs, which is significantly higher than the average stipend of $18,000 just five years ago.

Producing Tools for Science and Engineering

NSF invests in research tools critical to scientists and engineers, including instruments, equipment, facilities, databases, and large surveys. NSF makes awards primarily to universities and nonprofit organizations to construct, manage, and operate large scientific and engineering facilities. The President's Budget enhances science infrastructure in a wide range of fields, including astronomy, earthquake research, and environmental research.

The Budget provides $509 million for NSF's targeted investments in cyberinfrastructure—the advanced computing, networking, and information tools and resources intended to broadly benefit science and engineering. Examples of these technologies include: supercomputers, advanced networks, techniques to visualize complex phenomena, massive data repositories, modeling and simulation, and advanced digital sensor technologies. Because these investments support science and engineering broadly, rather than a single facility or project, they increase productivity across the Nation's entire science and engineering community.

The Budget continues support for facilities initiated in 2005, including the National Ecological Observatory Network (NEON), the Scientific Ocean Drilling Vessel, and the Rare Symmetry Violating Processes (RSVP) installation. NEON is a proposed national network of observatories that will transform ecological research and environmental forecasting. The Scientific Ocean Drilling Vessel will provide a new resource to examine geological and biological processes beneath the ocean floor. RSVP will address important questions in particle physics that have the potential to transform our basic understanding of the universe, such as the nature of dark matter.

Other continuing facility-construction efforts include the Atacama Large Millimeter Array (ALMA), EarthScope, and the IceCube Neutrino Observatory. ALMA is a telescope composed of as many as 64 antennas, each 12 meters across. ALMA's imaging qualities and its ability to change the configuration of its antennas will make it astronomy's most versatile imaging instrument. EarthScope is planned as a distributed, multi-purpose array of seismic and other geophysical instruments that will allow researchers to make major advances in our knowledge and understanding of the structure and dynamics of the North American continent. IceCube is a neutrino observatory buried in the Antarctic ice sheet that will provide hitherto unseen insights on the most active and energetic astrophysical objects, such as supermassive black holes.

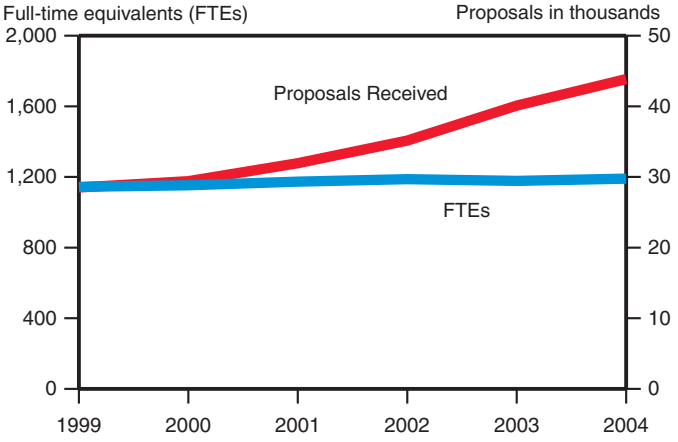
Each year, heavy icebreakers plow through thick ice to provide access to NSF's Antarctic stations, which support research on the continent. NSF also employs research icebreakers such as the Nathaniel B. Palmer (shown here) to support research in Antarctic waters.

In order to most effectively and efficiently support the Nation's polar research activities in Antarctica, funding for three polar icebreakers is being transferred from the U.S. Coast Guard to NSF. In the future, this will permit NSF to define the options for refurbishment or replacement of two of the ships (30-year old heavy icebreakers), which have been critical to maintaining access to NSF's Antarctic research stations, as well as operational options for the third (Arctic) icebreaker.

MAKING GOVERNMENT MORE EFFECTIVE

NSF ensures quality in its funding programs by using a competitive awards process based on the merit of individual grant proposals, coupled with periodic external review of its programs that approve those grants. The President's Management Agenda recognizes the importance of external review and competition for funding; all eight NSF programs assessed using the Program Assessment Rating Tool in the last two years have been rated Effective. These practices also help ensure quality, relevance, and performance, which are key components of the Research and Development (R&D) Investment Criteria.

NSF Proposals Increased 54 Percent in 5 Years



Source: NSF.

The 2006 Budget enhances the tools NSF uses to solicit, process, and review, as well as monitor its awards. The number of research proposals the agency receives has grown significantly in recent years, while the agency's staffing level has remained relatively flat. The agency has accommodated the increase in funding and responsibilities through effective use of information technology. NSF's FastLane grants-processing system enables NSF to electronically process virtually all of the more than 45,000 proposals the agency receives each year. Over 200,000 scientists, engineers, educators, and research administrators use this system to submit and review proposals and report project results. But while the information technology investments of recent years have provided impressive gains in efficiency, dramatic increases in both the number and complexity of proposals submitted to NSF pose increasing administrative challenges. To address these challenges, NSF continues to enhance existing systems, while also rethinking fundamental agency processes to pursue an integrated approach to human capital, competitive sourcing, and E-Government. The 2006 Budget requests funds to improve information technology to further modernize and coordinate the systems and processes NSF uses for merit review and grant management.

Update on the President's Management Agenda

The table that follows provides an update on NSF's implementation of the President's Management Agenda as of December 31, 2004.

	Human Capital	Competitive Sourcing	Financial Performance	E-Government	Budget and Performance Integration
Status					
Progress					

Arrow indicates change in status since evaluation as of September 30, 2004.

NSF continues to improve its management of human capital, recently documenting that it had significantly reduced gaps in skills that are critical to NSF's mission. The agency receives virtually all of its research proposals electronically, has a comprehensive plan for continued improvement of its information technology security program, and continues as an active partner in several interagency E-Gov initiatives, including grants.gov and E-authentication. NSF prepared its 2004 audited financial statements in 45 days and earned an unqualified opinion in its 2004 audits. NSF can report the full cost of achieving its performance goals. NSF delayed developing a competitive sourcing strategy until it completed its human capital plan, but expects to move forward with competitive sourcing in 2006.

Initiative	Status	Progress
Eliminating Improper Payments		

NSF has an improper payment rate of less than one percent to its awardees (typically colleges and universities), but NSF will have to demonstrate that its methods are adequate to ensure that colleges and universities that receive funding exercise fiscal responsibility consistent with Government-wide standards. (Because this is the first quarter that agency efforts in this initiative were rated, progress scores were not given.) NSF is one of 12 major R&D agencies that strive to plan, manage, and assess their R&D programs consistent with the R&D Investment Criteria, which are discussed in detail in the chapter on Research and Development in the Budget's *Analytical Perspectives* volume.

National Science Foundation

(In millions of dollars)

	2004 Actual	Estimate	
		2005	2006
Spending			
Discretionary Budget Authority:			
Research and Related Activities	4,263	4,221	4,334
Education and Human Resources	939	841	737
Major Research Equipment and Facilities Construction	155	174	250
Salaries and Expenses	219	223	269
National Science Board	4	4	4
Inspector General	10	10	12
Total, Discretionary budget authority	5,590	5,473	5,605
Total, Discretionary outlays	5,028	5,492	5,540
Mandatory Outlays:			
H–1B Fee Programs	1	100	100
All other	89	49	26
Total, Mandatory outlays	90	149	126
Total, Outlays	5,118	5,641	5,666