

**Right:** Diverse mixtures of native prairie plant species have emerged as a leader in the quest to identify the best source of biomass for producing sustainable, bio-based fuel to replace petroleum. A new NSF-funded study shows that mixtures of native perennial grasses and other flowering plants provide more usable energy per acre than corn grain ethanol or soybean biodiesel and are far better for the environment. Fuels made from prairie biomass are "carbon negative," which means that producing and using them actually reduces the amount of carbon dioxide (a greenhouse gas) in the atmosphere. Using prairie biomass to make fuel would lead to the long-term removal and storage of from 1.2 to 1.8 U.S. tons of carbon dioxide per acre per year.

For more information:

[www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=108206](http://www.nsf.gov/news/news_summ.jsp?cntn_id=108206)

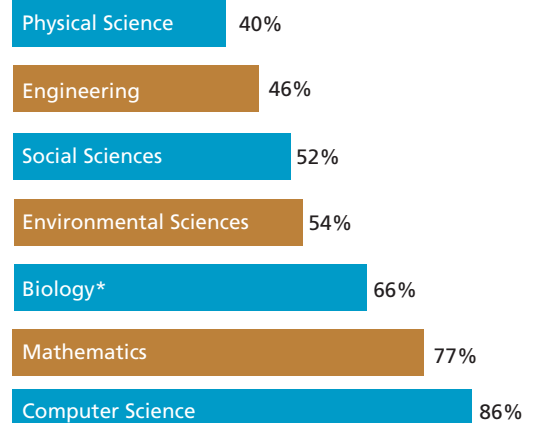


## ADVANCING THE FRONTIER

The National Science Foundation (NSF) was created by Congress in 1950, with a mission of promoting the progress of science and engineering in America. With a budget of about \$6 billion, NSF supports research across all fields of fundamental science and engineering and all levels of science and engineering education. NSF funds the best ideas and most promising people, searching out the frontiers of science and engineering to foster high-risk, potentially transformational research that will generate important discoveries and new technology.

Although NSF's annual budget represents less than 5 percent of the total federal budget for research and development, NSF provides nearly half of the federal support for non-medical basic research at the nation's colleges and universities. In many fields, including computer science, mathematics, environmental sciences, the social sciences, and non-medical biology, NSF is the primary source of federal academic support.

### NSF Support of Academic Basic Research in Selected Fields (as a percentage of total federal support)



\*Excludes the National Institutes of Health

Source: NSF Survey of Federal Funds for Research and Development

For more information:

*American Competitiveness Initiative*

[www.whitehouse.gov/stateoftheunion/2006/aci](http://www.whitehouse.gov/stateoftheunion/2006/aci)

*America COMPETES Act*

[www.whitehouse.gov/news/releases/2007/08/20070809-6.html](http://www.whitehouse.gov/news/releases/2007/08/20070809-6.html)

*Nobel Laureates*

[www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=100683&org=NSF&from=news](http://www.nsf.gov/news/news_summ.jsp?cntn_id=100683&org=NSF&from=news)

*Report to National Science Board on NSF's Merit Review Process, FY 2006*

[www.nsf.gov/nsb/documents/2007/2006\\_merit\\_review.pdf](http://www.nsf.gov/nsb/documents/2007/2006_merit_review.pdf)

*President's Management Agenda*  
[www.Results.gov](http://www.Results.gov)

### Public Benefits of a Strong Science and Technology Enterprise

The results of U.S. investments in science and technology have long driven economic growth and improved the quality of life for successive generations. Science and technology have generated new knowledge and industries, created new jobs, provided new sources of energy, developed new modes of communication and transportation, and improved medical care.

As other countries increase support for science and engineering, the United States must work to maintain its leadership in discovery and innovation in order to remain globally competitive. In

keeping with the President's American Competitiveness Initiative and the America COMPETES Act (P.L. 110-69), NSF invests in fundamental research that helps generate discoveries that spur innovation and lead to new technologies. NSF also supports world-class facilities and tools that are essential for transformational research, and develops students with the science and mathematics skills that will enable them to participate in the 21st century global workplace.

For more than 50 years NSF has had an extraordinary impact on the nation's scientific knowledge and capacity. NSF has funded the groundbreaking research of thousands of distinguished scientists and engineers, including nearly 200 Nobel Prize recipients. NSF-supported research led to an array of important discoveries, among them the Internet, Doppler radar, magnetic resonance imaging, and DNA fingerprinting. Moreover, advances at the frontiers of knowledge are critical for strengthening national security. Advanced capabilities in materials science, sensors and sensor network architecture, cybersecurity, and data mining have a direct impact on our national, homeland, and economic security.

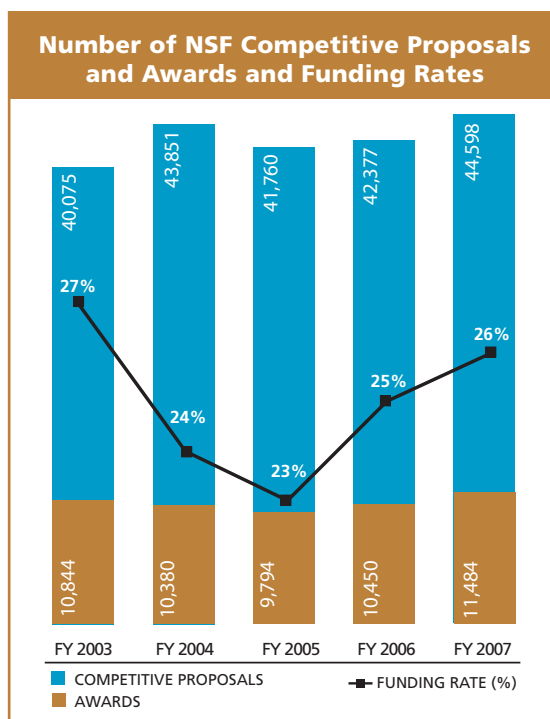
Featured throughout this report are results reported in FY 2007 by researchers funded by the Foundation. Given the nature of basic research, the full impact of many of these discoveries will not be known for years or even decades, but the excitement of their potential is apparent now. As an example, researchers have engineered printable, flexible batteries made from a nanocomposite paper infused with carbon nanotubes. This rechargeable material, which can be cut and folded like paper, could be used in devices ranging from portable electronics to automobiles. With support from NSF, another team of researchers has developed a way to coat surfaces on medical implants and surgical tools with penicillin, creating a life-saving weapon against bacteria-caused infections that can follow surgery.

People Involved in NSF Activities (estimated numbers for FY 2007)	
Senior Researchers	41,000
Other Professionals	13,000
Postdoctoral Associates	6,000
Graduate Students	35,000
Undergraduate Students	23,000
K-12 Students	11,000
K-12 Teachers	61,000
<b>TOTAL</b>	<b>190,000</b>

## A Catalyst for Innovation

NSF is widely recognized as a catalyst for basic research. NSF supports research and education through a competitive, merit-based review process that is recognized throughout government as the exemplar for effective and efficient use of public funds. Some 90 percent of NSF funding is allocated through this process. Each year, approximately 46,000 members of the science and engineering community participate in the merit review process as panelists and proposal reviewers.

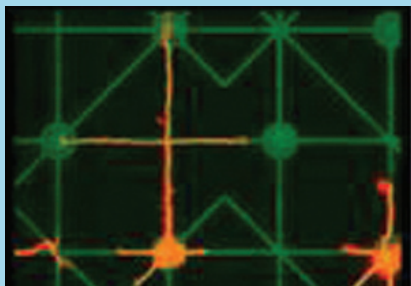
In FY 2007, NSF received nearly 45,000 proposals and awarded 11,484 new grants to individuals or small groups of investigators at nearly 1,900 U.S. colleges, universities, and other public and private institutions. These awards involve an estimated 190,000 people, including researchers, teachers, and students from kindergarten through graduate school.



## Meeting Future Opportunities and Challenges

NSF faces significantly increased responsibilities in light of the President's American Competitiveness Initiative and the recently enacted America COMPETES Act. Both call for expanded federal investment to drive innovation and sharpen the nation's competitive edge. Of highest priority is the support of frontier research that meets pressing national needs in economic and national security, energy, health, and the environment.

NEURONS: FINDING THEIR WAY?



Individual brain cells must make two different kinds of specialized branches, called axons and dendrites, to transmit and receive information respectively. Too few or too many branches or branches in the wrong place can cause serious neurological problems. To observe cell development, NSF-funded researchers at Whitman College constructed patterns of growth-promoting molecules on glass coverslips that act like a micro-trellis to guide cell growth. They combined this approach with live cell imaging to analyze neurons as they grew along the trellis. By observing how growth was altered as branches encountered different patterns, the researchers were able to tease apart the rules that govern cell growth and branch formation, making this the first project to combine nanofabrication, nerve cell culture, and live cell imaging to understand how molecules or geometric patterns guide neuron growth.

For more information:  
[www.whitman.edu/biology/dendrite/grants.html](http://www.whitman.edu/biology/dendrite/grants.html)

CARBON NANOTUBES



By weaving black carbon nanotubes into paper, researchers from NSF's Nanoscience and Engineering Center for Directed Assembly of Nanostructures at Rensselaer Polytechnic Institute have created printable, flexible batteries that are more resilient than many existing batteries, yet can be cut, folded, and worked just like paper. The rechargeable material could find uses in a range of devices from portable electronics to automobiles. These nanotube batteries can withstand extreme temperatures and can be powered by liquid salts, making them ideal for medical applications.

For more information:  
[www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=109868](http://www.nsf.gov/news/news_summ.jsp?cntn_id=109868)

Currently, as the lead federal agency for the International Polar Year, NSF supports research to understand Earth's extreme latitudes at scales from the global to the molecular. In its leadership role in the Networking and Information Technology Research and Development initiative, NSF continues to explore the computing frontier, stimulating research advances in new algorithms, architectures, languages, and systems and in emerging models of computing, paving the way for applications yet to be imagined. NSF also continues to provide critical support for the National Nanotechnology Initiative and for the overall U.S. nanotechnology research effort.

Another area where NSF provides valuable leadership across the government is in e-Government, specifically in advancing systems and solutions for the management of federal grant-making activities. NSF is a co-managing partner and a consortium leader for the Grants Management Line of Business and recently launched a Web portal, Research.gov, to improve service to applicants and grantees by streamlining and standardizing grant business processes among partner agencies.

These activities contribute directly to the President's Management Agenda (PMA), the government-wide effort to improve the management, performance, and accountability of federal agencies. NSF's FY 2007 results are presented to the right. In the fourth quarter of FY 2007, NSF maintained its "Green" status in three of five primary initiatives. In the Human Capital initiative, NSF had maintained "Green" status since 2005 but moved to "Yellow" in the third quarter of 2007. NSF continues to engage the Office of Personnel Management on a number of strategic human capital

initiatives that NSF is undertaking, including an extensive human capital, workforce, and succession planning effort. The "Yellow" progress score on the e-Gov initiative reflects OMB's decision to downgrade all agencies for not being fully compliant with the security and privacy requirements of OMB Memorandum M-07-06. NSF is currently working toward full compliance with these requirements. NSF's "Red" status in Competitive Sourcing remains unchanged. A more detailed discussion of NSF's PMA efforts is included in NSF's FY 2007 *Annual Financial Report*, and related information is available at [www.Results.gov](http://www.Results.gov).

President's Management Agenda Scorecard			
	Baseline	Status	Progress
	9/30/01	9/30/07	
Strategic Management of Human Capital	▲	■	●
Competitive Sourcing	▲	▲	▲
Improving Financial Performance	●	●	●
Expanded Electronic Government	■	●	■
Performance Improvement Initiative	▲	●	●

Note: For the Eliminating Improper Payments Initiative, OMB has moved NSF from an annual to a 3-year reporting cycle because of the agency's low improper payments.

● Indicates success    ■ Indicates mixed results    ▲ Indicates unsatisfactory

Ratings are issued quarterly by OMB.

Management Challenges

NSF has a long record of success in leveraging its workforce, management processes, and technological resources to enhance productivity and effectiveness and in maintaining costs for internal operations at roughly 5 percent of the agency's annual budget. However, the opportunities provided by the America COMPETES Act come at a time when the NSF workforce and infrastructure are being challenged by workload issues. The rise in multidisciplinary collaborative projects, international activities, and major research facility projects has increased the volume as well as the complexity of the Foundation's workload. Both the budget and number of competitive proposals have increased significantly over the past decade, while staffing levels have not kept pace.

To meet this challenge, NSF management is analyzing workload requirements and administrative functions, and a pilot program is currently under way to test the new organizational structure



and operations procedures. A key facet of NSF's current human capital management activities is succession planning. A committee chaired by the Deputy Director was formed to examine current succession planning and define new strategies to enhance NSF's ability to develop and recruit high-quality candidates for critical positions and quickly orient new staff.

The 2007 financial statement audit for NSF found no material weaknesses in the agency's financial statements, but did identify two significant deficiencies—in Contract Monitoring and Property, Plant, and Equipment Accounting and Reporting. In both of these areas, NSF is developing corrective action plans to resolve the deficiencies.

The NSF Office of Inspector General (OIG) submits an annual statement detailing what it considers the most serious management challenges facing NSF in the coming years. Challenges for FY 2007 are categorized in six broad areas: award administration; human capital; budget, cost, and performance integration; information technology; the U.S. Antarctic Program; and merit review. The OIG notes that NSF continues to make significant progress in meeting these challenges. Following is a brief summary of some key accomplishments. The complete statement and a full report can be found in NSF's *FY 2007 Annual Financial Report*.

- **Award Administration.** NSF refined its post-award monitoring program; implemented a requirement to eliminate program-specific cost sharing; enhanced management of large infrastructure projects through increased staff, staff training, tracking and reporting on facility obligations, and creation of guidance manuals; improved monitoring with reviews of quarterly expenditure reports, an update to the contracting manual, and improved training efforts; and promoted the integrity of NSF research through ethics training of future scientists and engineers.
- **Human Capital.** NSF continues to make progress in developing and implementing an effective workforce planning process and establishing a comprehensive succession planning process. NSF has implemented new procedures to hire staff, reducing the time-to-hire by more than 30 percent from 2006 to 2007. NSF also is working with rental management and the Government Services Administration to find new spaces for lease to address the problem of inadequate space for staff and meetings and is improving procedures to enhance ease of use for staff making travel arrangements.
- **Budget, Cost, and Performance Integration.** NSF has revised the performance reporting process to better address the agency's strategic goals. NSF continues to improve its project reporting capabilities through IT and policy document enhancements. To improve cost information, NSF tracks costs of its operations at the highest and lowest levels and has adopted efficiency goals that constantly challenge staff to develop and implement the most efficient work processes.
- **Information Technology.** To enhance the agency's enterprise architecture (EA)—the blueprint for organizational change in operational and technological terms—NSF established an agency policy for EA development, maintenance, and compliance and created a formal advisory group responsible for directing, overseeing, and approving EA. NSF reports progress to this group and has obtained approval of the current EA version. NSF received high ratings from OMB for the quality of its EA efforts.
- **U.S. Antarctic Program.** An external group of experts has provided recommendations on the logistics and infrastructure needed to sustain the high priority research program and to enable research in new regions or on new subjects. NSF has requested funding to begin implementation of these recommendations. Work on these efforts continues.
- **Merit Review.** In FY 2006, proposals received from women and minorities increased by 3.2 percent as compared to the previous year. The 1.6 percent overall increase in submissions suggested that some progress is being made in attracting more applicants from underrepresented groups. Because those who submit proposals tend not to report demographic information, NSF has formed an agency-wide working group to develop a plan for increasing participation among underrepresented groups and broadening the pool of proposal reviewers.