National Science Foundation

NSF • FY 2002

Management and Performance Highlights

About the Cover:
A still photo from an NSF-funded large-format film about exploration and new scientific research aimed at understanding and responding to changes in coral reef ecosystems. The film will feature researchers who are part of the global effort to understand and protect such ecosystems. They will document reef diversity and animal behavior, investigate symptoms of reef degradation, provide information on past change, and explore life in extreme ocean environments. NSF-supported informal science programs such as this film reach a wide and diverse audience of millions.

Statutory Mission

To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.

Vision

Enabling the Nation's future through discovery, learning, and innovation. Realizing the promise of the 21st century depends in large measure on today's investments in science, engineering, and mathematics research and education. NSF's investment—in people, in their ideas, and in the tools they use—will catalyze the strong progress in science and engineering needed to secure the Nation's future.

Our common pursuit of new knowledge is a powerful tool for bringing people together toward the common goal of solving problems and building a world of peace and prosperity.

Rita R. Colwell
Director

Table of Contents

www.nsf.gov/bfa/dfm/docs.htm

February 2003

Rita R. Colwell
Director

Thomas N. Cooley
Chief Financial Officer

The National Science Foundation (NSF) invests in a $5 billion portfolio that keeps the nation at the forefront of discovery, learning, and innovation.

In fiscal year (FY) 2002, for example, an NSF-funded biomedical engineer extended the frontiers of drug delivery technology by developing an implantable microscale device that releases a steady supply of insulin into the bloodstream of people with diabetes. Other NSF-funded researchers have made discoveries that will improve hurricane predictions and enhance our understanding of climate change, while still others have developed a process to control a worldwide crop-killing fungus—a fungus that many consider to be a potential biological weapon for agricultural terrorism. NSF-supported astronomers have reported a newly found planetary system that has a "hometown" look much like our own solar system, and among the 2002 Nobel laureates were four who currently are or have been NSF grant recipients.

Underlying the Foundation's programmatic achievements is administrative excellence and sound financial management. FY 2002 has been a truly impressive year. NSF received its fifth consecutive unqualified audit opinion on our financial statements and third consecutive Certificate of Excellence in Accountability Reporting from the Association of Government Accountants. NSF remained the only federal agency to receive any successful "green" ratings for the President's Management Agenda initiatives, and it received two, one for E-government and one for financial management. Over the past year, the Foundation realized cost savings of over $500,000 as a result of re-engineering a number of business processes and made significant improvements in awards management, customer service, and large facilities management.

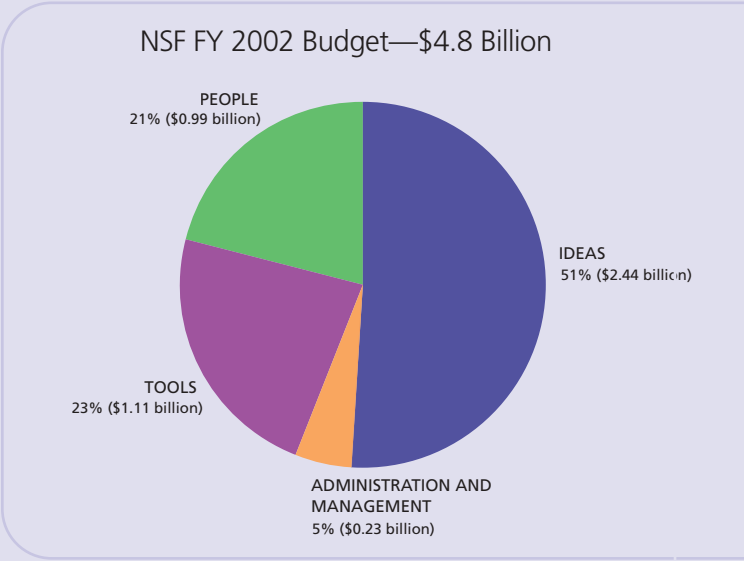
This report, an overview of our core business priorities and programmatic accomplishments of the past year, makes clear that our pursuit of new knowledge, together with our commitment to the highest standards of efficiency and integrity, ensure that the Foundation is delivering the highest return to the American taxpayer.

Rita R. Colwell, Director

Thomas N. Cooley, Chief Financial Officer

Expanding Frontiers

The National Science Foundation (NSF), as steward of America's science and engineering enterprise, promotes and advances the progress of science and engineering in the United States. Although NSF represents only 4 percent of the total federal budget for research and development, it accounts for 20 percent of total federal funding of basic research and 40 percent of federal support for nonmedical basic research at colleges and universities.



For more than 50 years, NSF has had an extraordinary impact on America's scientific and engineering knowledge and capacity. NSF investments have helped train generations of outstanding researchers and educators, among them scores of Nobel laureates; advanced knowledge across the frontiers of all science, mathematics, and engineering disciplines; fueled innovation; contributed to productivity gains and economic growth; and enhanced the quality of the environment as well as the quality of human health and well-being.

Moreover, in the aftermath of the events of September 11, 2001, investments to promote and support research and development are critical for achieving America's highest priority—to reduce vulnerability to terrorism and make the nation safer. Research can lead to better equipment for rescue workers, such as more protective gear and sensors to alert them to chemical or other hazards in disaster areas. Research can also lead to improved critical infrastructures such as city water reservoirs, communications networks, and transportation systems that can better thwart sabotage; and buildings can be re-engineered to be more blast and fire resistant. Not since World War II have NSF's efforts to catalyze progress in science and engineering been more important for securing the nation's future.

People. Ideas. Tools.

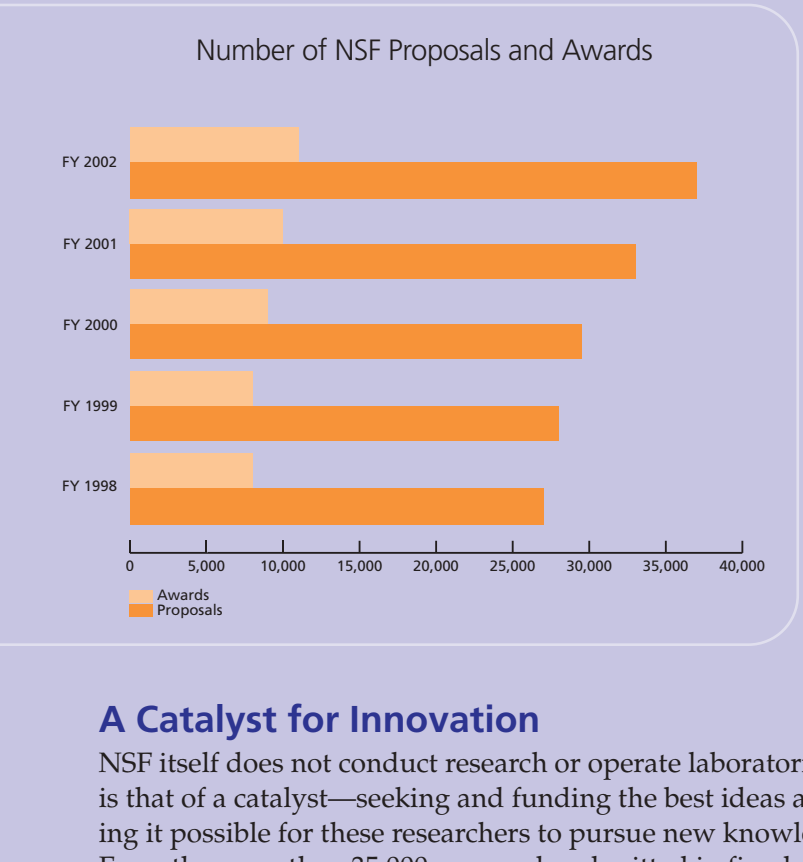
To promote the progress of science, NSF invests in three strategic areas.

People: NSF facilitates the creation of a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well-prepared citizens by supporting efforts to improve formal and informal science, mathematics, engineering, and technology education at all levels.

Estimated Number of People Involved in NSF Activities in FY 2002	
Senior Researchers	28,000
Other Professionals	11,000
Postdoctoral Associates	6,000
Graduate Students	26,000
Undergraduate Students	32,000
K–12 Students	11,000
K–12 Teachers	84,000
TOTAL	198,000

NSF also supports public science literacy projects that engage people of all ages in lifelong learning. NSF investments support nearly 200,000 people, including students, teachers, researchers, postdoctorates, and trainees.

Ideas: Investments in ideas support cutting-edge research and education that yield new and important discoveries and promote the development of new knowledge and techniques within and across traditional boundaries. These investments help ensure that America's academic institutions remain at the forefront of the science and engineering enterprise.



Tools: NSF investments provide state-of-the-art tools for research and education, such as instrumentation and equipment, multiuser facilities, digital libraries, accelerators, telescopes, research vessels and aircraft, and earthquake simulators. NSF also supports large surveys and databases, as well as computation and computing infrastructure for all fields of science, engineering, and education. Support for these unique national facilities is to advancing U.S. research and education.

A Catalyst for Innovation

NSF itself does not conduct research or operate laboratories. Instead, the Foundation's role is that of a catalyst—seeking and funding the best ideas and the most capable people, making it possible for these researchers to pursue new knowledge, discoveries, and innovation. From the more than 35,000 proposals submitted in fiscal year (FY) 2002, more than 10,400 awards were made to about 1,800 colleges, universities, and other public and private institutions throughout the United States.

Nearly 90 percent of NSF funding is allocated through a merit-based competitive process that is critical to fostering the highest standards of excellence and accountability—standards for which NSF is known the world over. Reviewers focus on two primary criteria—the intellectual merit of the proposed activity and its broader impacts, such as on teaching, training, and learning. Reviewers also consider how well the proposed activity fosters the integration of research and education and broadens opportunities to include a diversity of participants, particularly from underrepresented groups.

Doing Business Efficiently and Effectively

NSF is recognized as a well-run agency with a long record of success in managing the resources entrusted to it. Pursuing more effective and efficient core management operations is a long-standing priority for the agency. Although NSF's budget has nearly doubled in the past 10 years, the agency's staffing level has remained relatively constant. Maintaining operations overhead at 5 percent of the agency's budget is an ongoing challenge, as workload has grown more complex with involvement in more multidisciplinary, partnership, and international activities, as well as new large research facility projects. The agency has accommodated its increased funding and programmatic responsibilities by leveraging its agile, motivated workforce and continuing to re-engineer business processes to enhance productivity. NSF is a recognized leader in financial management, particularly in its use of advanced information technologies to improve internal operations and business transactions with the academic research community. Currently, NSF is the only federal research agency routinely receiving and processing virtually all its proposals electronically.

President's Management Agenda Scorecard	Baseline 9/30/2001	Status 9/30/2002	Progress FY 2003 Qtr 1
Human Capital	R	R	G
Competitive Sourcing	R	R	R
Financial Management	G	G	G
Expanding E-Government	Y	G	G
Budget and Performance Integration	R	R	Y

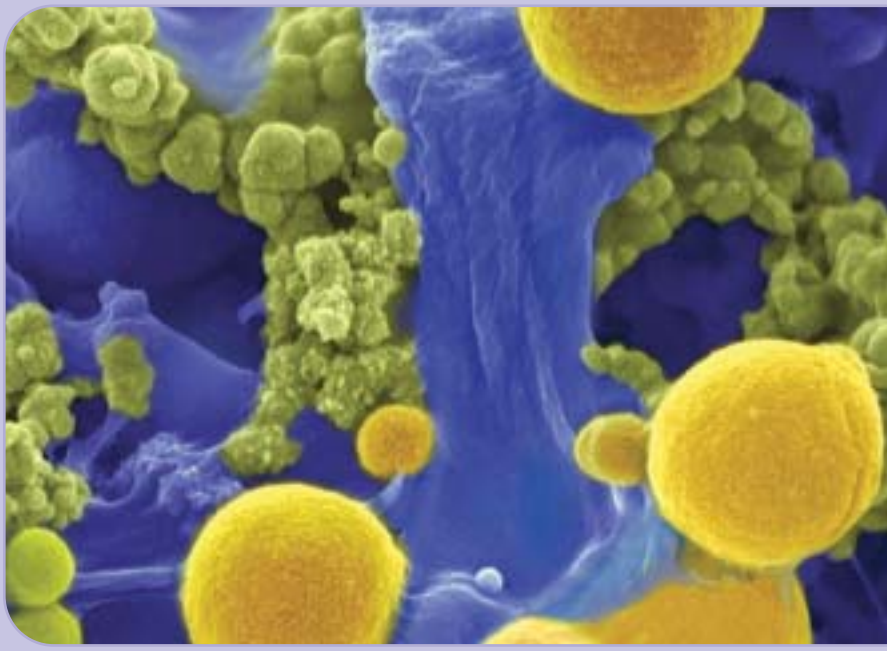
Note: Green represents success; yellow is for mixed results; and red means unsatisfactory. Ratings were issued by the Office of Management and Budget. For more detailed information on the standards of success for each of the President's Management Agenda initiatives, see *www.whitehouse.gov/omb/budget/fy2003/msr06.html*.

Last year, the President's Management Agenda (PMA) launched a government-wide effort to improve the management, performance, and accountability of federal agencies. An Executive Management Scorecard is now issued quarterly by the Office of Management and Budget (OMB) to track the progress of agencies in meeting specific criteria under the initiatives that constitute the PMA. At year-end, NSF maintained its "green" successful status for Financial Performance and received a second "green" for E-Government. For the second consecutive year, NSF remains the only federal agency to receive a green rating for any of the PMA initiatives. Although NSF did not fully meet the standards for success for the Strategic Management of Human Capital, Competitive Sourcing, and Budget and Performance Integration initiatives, it has made progress and has worked with OMB to develop a framework for "getting to green" in future years. NSF's newly developed *Strategic Plan for Administration and Management* will serve as the blueprint for achieving success in all five PMA initiatives.

Doing more with less and working smarter by instituting more efficient and cost-effective business processes have always been hallmarks of the Foundation. In FY 2002, NSF retooled a number of business processes, which yielded significant cost savings. Conservative estimates put the savings from these cost efficiencies at more than $500,000. These new business processes included electronic dissemination of information, which resulted in significant savings in both printing and mailing costs. The use of electronic signatures, videoconferencing, and implementation of an online self-booking travel tool resulted in considerable savings as well.

NSF also focused considerable efforts on enhancing customer service. In FY 2002, 94 percent of all NSF program announcements were available at least three months before the proposal due date and 74 percent of proposals were processed within six months of submission. Both results were significant accomplishments that represented a yearlong focused effort by staff across the Foundation.

In FY 2002, NSF also made significant progress in awards management and in the management and oversight of large facilities. NSF developed a risk-based awards monitoring program and a best practices guide for managing and overseeing large facilities projects. Also, in anticipation of upcoming accelerated reporting requirements, NSF re-engineered its GPRA (Government Performance and Results Act) reporting and assessment process. A new Advisory Committee for GPRA Performance Assessment was established and met in the fall to evaluate FY 2002 strategic outcomes. The committee's final report called the new process "a positive and welcome change," suggested improvements in the process, and recommended that the committee continue to evaluate the results of NSF's investments.



Biofilms of sulfate-reducing bacteria (blue) growing in dilute groundwater (~ 1 ppm dissolved zinc) produce ZnS nanoparticles that aggregate to form micron-diameter spheres (green and gold). This process contributes to groundwater remediation and may play a role in ore deposit formation. This research is funded by NSF and the U.S. Department of Energy.

Photo courtesy of *Science*, Volume 290, Number 5497 (December 1, 2000) and J.F. Banfield, S.A. Welch, M. Diman, and M. Labrenz

Performance Results

In assessing the return on NSF's investments, the Foundation is guided by the *NSF GPRA (Government Performance and Results Act of 1993) Strategic Plan FY 2001–2006* (*www.nsf.gov/od/gpra*). In this plan, NSF seeks to clearly communicate its vision and ideals and to provide a framework for the future. This framework is informed by NSF's mission, as set out by Congress in the National Science Foundation Act of 1950, and by the Foundation's unique role as the only federal agency charged with strengthening the overall health of U.S. science and engineering across a broad and expanding frontier.

NSF's Strategic Plan emphasizes three areas of focus—People, Ideas, and Tools. It describes the three core strategies—developing intellectual capital, integrating research and education, and promoting partnerships—that, together with its core values, guide NSF in achieving its mission. The Strategic Plan provides the basis for both NSF's FY 2002 Annual Performance Plan and NSF's FY 2002 Budget, which were developed concurrently to ensure a direct link between programmatic activities and achievement of strategic goals.[1]

GPRA implementation has been a particular challenge for agencies like NSF, whose mission involves research activities. This is primarily due to (1) the difficulty of linking research outcomes to annual investments and the agency's annual budget, because it is not unusual for research outcomes to appear years or decades after the initial investment and (2) the fact that assessing the results of research is inherently retrospective and requires the qualitative judgment of experts. NSF developed an alternative format, approved by OMB, using external expert review panels to assess research results qualitatively. The use of external expert panels to review research results and outcomes is a common, long-standing practice used by the academic research community.

This photograph of Kitt Peak National Observatory shows the southern latitudes of the United States being treated to a bright and colorful auroral display. This display was related to the height of the 11-year solar cycle, which occurred in 2001 and created intense magnetic storms. NSF-supported scientists are working to better understand such eruptions, which can cause significant disturbances in Earth's own magnetic field and wreak havoc with telecommunications and satellite systems.

[1] NSF's FY 2002 Annual Performance Plan (*www.nsf.gov/od/gpra*) and NSF's FY 2002 Budget Request (*www.nsf.gov/bfa/*) are available on NSF's website.

NSF's FY 2002 Performance Scorecard

For FY 2002, NSF's annual performance goals are organized into two categories—Strategic Outcome Goals and Management Goals. The Strategic Outcome Goals focus on the long-term results of NSF grants and programs. They represent what the agency seeks to accomplish with the investments that are made in science and engineering research and education. To accomplish the NSF mission of promoting the progress of science, NSF invests in the best people with the best ideas and provides them with the tools they need. NSF's outcomes from its awards provide evidence of the success of those investments. NSF's Management Goals focus on the factors and strategies that enable the Foundation to successfully implement and attain its strategic outcomes. They relate to the procedures that the agency uses to make awards, fund and manage capital projects, and otherwise serve its customers. The Management Goals also address the internal management of the organization.

The Volume Phase Holographic (VPH) grism pictured above is a combination of a diffraction grating and a prism. This advanced optical technology is used in the new Multi-Aperture Red Spectrometer (MARS) at Kitt Peak National Observatory near Tucson, Arizona. The grism gives astronomers an even clearer picture of the universe. Kitt Peak, part of the NSF-funded National Optical Astronomy Observatory, supports the most diverse collection of astronomical observatories on Earth for nighttime optical and infrared astronomy and daytime study of the sun.

In FY 2002, NSF was successful for 78 percent (18 out of 23) of its GPRA performance goals. There was a notable improvement in the agency's performance; in the prior two years, NSF achieved about 65 percent of its GPRA goals. NSF successfully achieved all four of its strategic outcome goals focused on People, Ideas, and Tools. The Management Goals that NSF was not successful in achieving were related to broadening participation in the review process, the proposal process, award duration, and facilities oversight. Plans are already under way to address how each can be successfully achieved in FY 2003. For a comprehensive discussion of NSF's performance goals, results, and related issues, see NSF's *FY 2002 Performance and Accountability Report* (*www.nsf.gov/od/gpra*).

STRATEGIC OUTCOME GOALS

Strategic Outcome	Performance Goal	Result
PEOPLE Develop a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well-prepared citizens.		
Workforce, Student and Teacher Development	Demonstrate significant achievement in the majority (4 of 7) of the following indicators: • Development of well-prepared scientists, engineers, or educators whose participation in NSF activities provides them with the capability to explore frontiers and challenges of the future. • Improved science and mathematics performance for U.S. K–12 students involved in NSF activities. • Professional development of the science, mathematics, engineering, and technology (SMET) instructional workforce involved in NSF activities. • Contributions to the development of a diverse workforce hrough participation of underrepresented groups (women, under-represented minorities, persons with disabilities) in NSF activities. • Participation of NSF-supported scientists and engineers in international studies, collaborations, or partnerships. • Enhancement of undergraduate curricular, laboratory, or instructional infrastructure. • Awardee communication with the public in order to provide information about the process and benefits of NSF-supported science and engineering activities. Result: Reports prepared by external experts provide assessments and retrospective examples of NSF-supported projects that document significant achievement in all the indicators.	
K–12 Education Reform	After three years of NSF support, more than 80 percent of schools participating in Systemic Initiative (SI) programs will (1) implement a standards-based curriculum in science and mathematics with at least one-third of their teachers; (2) provide professional development for at least one-third of their teachers; and (3) improve student achievement on a selected battery of math and science tests at one or more of three educational levels (elementary, middle, and high school). Result: SI projects reported that 93 percent of their schools met the GPRA goal for mathematics curriculum implementation and 91 percent met the goal for science curriculum implementation. For professional development, 96 percent of the SI schools reported meeting the goal for mathematics professional development and 95 percent met the goal for science professional development. Finally, SI projects reported that at the middle school level, 87 percent of participating schools met the goal of improved student achievement in math, and 86 percent met the goal of improved student achievement in science.	

KEY:
- Indicates goal was achieved in FY 2002.
- Indicates goal was not achieved in FY 2002.

STRATEGIC OUTCOME GOALS

Strategic Outcome	Performance Goal	Result
IDEAS Enable discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.		
	Demonstrate significant achievement in the majority (4 of 6) of the following indicators: • Discoveries that expand the frontiers of science, engineering, or technology. • Discoveries that contribute to the fundamental knowledge base. • Leadership in fostering newly developing or emerging areas. • Connections between discoveries and their use in service to society. • Connections between discovery and learning or innovation. • Partnerships that enable the flow of ideas among the academic, public, or private sectors. Result: Reports prepared by external experts provide assessments and retrospective examples of NSF-supported projects that document significant achievement in all the indicators.	●
TOOLS Provide broadly accessible, state-of-the art, and shared research and education tools.		
	Demonstrate significant achievement in one or more of the following indicators: • Provision of facilities, databases, or other infrastructure that enable discoveries or enhance productivity by NSF research or education communities. • Provision of broadly accessible facilities, databases, or other infrastructure that are widely shared by NSF research or education communities. • Partnerships, e.g., with other federal agencies, national laboratories, or other nations, to support and enable development of large facilities and infrastructure projects. • Use of the Internet to make SMET information available to the NSF research or education communities. • Development, management, or utilization of very large data sets and information bases. • Development of information and policy analyses that contribute to the effective use of science and engineering resources. Result: Reports prepared by external experts provide assessments and retrospective examples of NSF-supported projects that document significant achievement in all the indicators.	●
	KEY: ● Indicates goal was achieved in FY 2002. ● Indicates goal was not achieved in FY 2002.	

MANAGEMENT GOALS[2]

Performance Area	Performance Goal	Result
PROPOSAL AND AWARD PROCESS		
Merit Review	Allocate at least 85 percent of basic and applied research funds to projects that undergo merit review.	
Implementation of Merit Review Criteria: Reviewers	Reviewers address the elements of both generic review criteria—intellectual impact and broader impact—at a level above that of FY 2001.	
Implementation of Merit Review Criteria: Program Officers	Consider elements of both generic review criteria in making funding decisions.	
Customer Service: Time to Prepare Proposals	Ninety-five percent of NSF program announcements available to relevant individuals and organizations at least three months prior to the proposal deadline or target date. Result: In FY 2002, 94 percent (111 of 118) of program announcements and solicitations were made available at least 90 days before the proposal deadline or target date. In FY 2003, NSF will work toward this goal by planning for competitions requiring individual announcements and solicitations as far in advance as possible and initiating the clearance processes in a timely manner. In addition, NSF has recently implemented the electronic Program Information Management System (PIMS), which is expected to improve the efficiency of announcement preparation.	
Customer Service: Time to Decision	For 70 percent of proposals, inform applicants about funding decision within six months of receipt.	

KEY:
- Indicates goal was achieved in FY 2002.
- Indicates goal was not achieved in FY 2002.

[2] The Investment Process Goals of previous years have been subsumed within the Managment Goals.

MANAGEMENT GOALS

Performance Area	Performance Goal	Result
PROPOSAL AND AWARD PROCESS (continued)		
Diversity-Reviewer Pool	Establish a baseline for participation of members of underrepresented groups in NSF proposal review activities. Result: NSF cannot legally require reviewers to provide demographic information. Provision of such data is voluntary. NSF requested and collected demographic data from reviewers but given the low response rate, there is not enough information to establish a baseline. A total of 37,943 distinct reviewers returned their reviews on proposals decided upon in FY 2002. Demographic information is available for 3,507 of these reviewers and 1,168 (33 percent) of these 3,507 reviewers are members of an underrepresented group. In FY 2003, NSF will continue to request demographic information from reviewers.	●
AWARD PORTFOLIO		
Award Size	Increase average annualized award size for research projects to a level of $113,000, compared with a goal of $110,000 in FY 2001.	●
Award Duration	Maintain the FY 2001 goal of 3.0 years' duration for research projects. Result: Achieved 2.9 years; resource limitations negatively impacted NSF's ability to achieve both the award size and award duration goals. NSF focused its efforts on increasing average annualized award size. In FY 2003, NSF will continue to focus on increasing award size and duration in order to improve the efficiency of the research process.	●
AWARD OVERSIGHT AND MANAGEMENT		
Award Oversight	Develop and initiate a risk assessment/risk management plan for awards.	●

KEY:
● Indicates goal was achieved in FY 2002.
● Indicates goal was not achieved in FY 2002.

MANAGEMENT GOALS

Performance Area	Performance Goal	Result
FACILITIES OVERSIGHT		
Construction and Upgrade of Facilities: Annual Expenditure	Keep construction and upgrades for 90 percent of facilities within the annual expenditure plan, not to exceed 110 percent of estimates.	
Construction and Upgrade of Facilities: Scheduling	Meet all annual scheduled milestones for 90 percent of facilities. Result: Of the 27 construction and upgrade projects, 13 (48 percent) met all annual schedule milestones. In FY 2001, milestones reached at any time within the fiscal year were considered successful. In FY 2002, milestones had to be reached by the specified date determined during project development. In some instances, contract negotiations caused project delays. In FY 2003, NSF will continue to work with awardees to identify obstacles to successful performance and implement plans to avoid or mitigate their consequences in the future. NSF is also modifying goal statements to more accurately address these measures.	
Construction and Upgrade of Facilities: Cost	Keep total cost within 110 percent of estimates made at the initiation of construction for all projects initiated after 1996.	
Operations and Management of Facilities	Keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time for 90 percent of facilities. Result: Of the 31 reporting facilities, 26 (84 percent) met the goal of keeping unscheduled downtime to below 10 percent of the total scheduled operating time. Some causes of failure were outside the control of the facility, such as unfavorable weather or interruption of the electric power supply. Other causes of failure were related to technical problems such as sub-par performance of new instrumentation early in its commissioning stage. In FY 2003, NSF will continue to work with awardees to identify obstacles to successful performance and develop plans to avoid or mitigate their consequences in the future. NSF is also modifying goal statements to more accurately address these measures.	

KEY:
- Indicates goal was achieved in FY 2002.
- Indicates goal was not achieved in FY 2002.

MANAGEMENT GOALS

Performance Area	Performance Goal	Result
BUSINESS PRACTICES		
Electronic Business	Continue to advance the role of "E-business" in review, award, and management processes, by doubling the FY 2001 number of paperless projects that manage the competitive review process in an electronic environment.	●
Security Program	Implement an agency-wide security program in response to the Government Information Security Reform Act.	●
HUMAN RESOURCES AND WORKPLACE		
Staff Diversity	Increase the total number of hires to NSF science and engineering positions from underrepresented groups.	●
Workforce Training	Establish an internal NSF Academy to promote continuous learning for NSF staff.	●
Business Analysis	Initiate a strategic business analysis to provide a comprehensive perspective on its future workforce requirements.	●
Work Environment	Establish various baselines to enable management to better assess the quality of work life and environment by developing an employee survey.	●

KEY:
● Indicates goal was achieved in FY 2002.
● Indicates goal was not achieved in FY 2002.

Where Discoveries Begin

NSF supports cutting-edge research that yields new discoveries over time. These discoveries are essential for maintaining the nation's capacity to excel in science and engineering and lead to new and innovative technologies that benefit society. The following examples illustrate the impact and success of NSF's programs in achieving important discoveries and supporting education efforts. Because many research results appear long after an investment is made, these discoveries are the outcome and results of long-term support of research and education projects that emerged and were reported in FY 2002. Other examples of NSF-supported discoveries are available from NSF's Public Affairs Website (*www.nsf.gov/od/lpa/*).

Understanding A Crop Killer

In July 2002, the first draft sequence of a worldwide crop-killing fungus genome was completed by researchers in the joint NSF–U.S. Department of Agriculture Microbial Genome Sequencing Project.

The fungus *Magnaporthe grisea* causes rice blast disease, which is estimated to destroy annually enough rice to feed more than 60 million people. The fungus was recently recognized by the U.S. Centers for Disease Control and Prevention as a potentially significant biological weapon that could be used for agricultural terrorism.

Certain strains of the fungus can attack domesticated grasses such as barley, wheat, pearl millet, and even turf grasses. Rice blast disease, once thought to be confined to developing nations, has emerged in the United States over the past decade with the widespread introduction of rice as a crop in the South. In the Midwest, golf courses also have been devastated by the disease's attack on cool-season grasses.

Previously, rice blast outbreaks were controlled through the application of costly and potentially hazardous chemicals. Genome sequencing will allow scientists to understand the interactions between the fungus and grasses, and identify the mechanisms that regulate infection of a host plant. This knowledge could help scientists discover new ways to prevent fungal crop infection and the spread of rice blast disease.

Researchers in a joint NSF–U.S. Department of Agriculture project have made significant progress towards controlling a worldwide crop-killing fungus—a fungus that many consider to be a potential biological weapon for agricultural terrorism. Shown here are rice terraces in Indonesia.

Completing the first draft sequence is an important first step toward understanding how this fungus attacks the rice plant. The scientific community needs this information to fill long-standing gaps in understanding the disease and to develop new strategies for controlling this destructive pathogen.

Searching for Clues to Climate Change

The 6,000-square-mile Innoko National Wildlife Refuge near McGrath, Alaska, is home to a tremendous array of wildlife and diverse habitats. The goal of the NSF Arctic Research Program is to gain a better understanding of such wildlife and habitats by funding studies of Earth's biological, geophysical, chemical, and sociocultural processes, and the interactions of ocean, land, atmosphere, biological, and human systems.

In March and April 2002, a group of NSF-funded scientists scoured the Alaskan tundra for clues to the role snow cover plays in climate change. The six-member Snow Science Traverse—Alaska Region (SnowSTAR 2002) expedition used snowmobiles to cover 1,000 miles—from Nome through the Brooks mountain range to Barrow.

The team was following up on previous research, which indicated that climate change is likely to be amplified in the arctic and, therefore, easier to detect. Air temperatures in the Alaskan arctic have increased 2 to 4º Celsius in the past 30 years, and evidence suggests changes are already occurring in terrestrial ecosystems. Snow covers the arctic for 7 to 10 months of the year and is thought to play a key role in this process of change.

During the 36-day traverse, the team braved temperatures of 0º Fahrenheit (–17º Celsius) to take 33,000 measurements and to conduct several hundred experiments on snow strength.

Chemical sampling of the snow will help determine whether there is a difference between the source of winter precipitation in the arctic slope and the area south of the Brooks Range and if the precipitation source changes as the Chukchi, Beaufort, and Bering Seas freeze. By tracing the snow's chemicals, such as calcium, magnesium, and various isotopes such as boron and deuterium, the team hopes to pinpoint where the snow originated and its atmospheric history. The data gathered will help show how key meteorological events determine the characteristics of the snow.

The researchers also studied the relationship of snow and vegetation to test previous findings, which indicated that the presence of vegetation may promote further shrub growth by increasing the amount of snow on the ground. Climate warming also promotes increased plant production, so the two processes may interact in complex ways.

The snowmobile traverse is part of ATLAS (Arctic Transitions in Land Atmosphere System), a larger project to understand climate change in the Arctic.

Sustainable Mobility

According to the Alliance to Save Energy, we Americans spend more than $500 million a day to fuel our cars, SUVs, and light trucks. These vehicles account for 40 percent of U.S. oil consumption—8 million barrels a day. More than half of the oil we use is imported. In addition to the potential problems associated with dependence on foreign sources of crude oil, gasoline is a major contributor to greenhouse gas emissions and smog.

NSF is one of several federal government agencies funding research on the development of fuel-cell technologies. Fuel cells are energy conversion devices that use hydrogen to power clean-running vehicles, whose only emission is water. Over the next decade, scientists will continue to perfect the technology and develop a nationwide hydrogen distribution system that will make fuel-cell vehicles a sustainable alternative to the gasoline-powered engine.

Engineering Marvels

Building Bones

NSF-funded materials scientists at Northwestern University have used nanoscale self-assembly to create a composite material very similar to bone tissue. Their research could be the first step in creating better material for bone repair.

The discovery of a composite material similar to bone tissue may lead to a better material for repairing bone. NSF-funded materials scientists at Northwestern University used nanoscale self-assembly to create the material. Such techniques may lead to the development of artificial bone.

Samuel Stupp and his colleagues synthesized new polymeric molecules that self-assemble to form cylindrical nano-sized fibers. When a reinforcing mineral is added, the fibers direct the growth of the mineral's crystals into an alignment very similar to that around the collagen fibers in natural bone.

Developing bone repair materials, especially for load-bearing bones, is a continuing challenge for bioengineers and biomaterials researchers. Current technology usually relies on solid metallic implants that are coated to minimize rejection by the body.

The self-assembly techniques not only hold promise for development of artificial bone but are also expected to be useful for a wide variety of other applications, such as repairing nerve fibers, creating nanoelectronic wires, or preparing high-strength polymeric composites.

Researchers Find Trigger for Devastating Digestive Disease

NSF-funded scientists found a peptide molecule that triggers celiac sprue—a severe inflammation of the intestine that affects as many as 1 in every 200 Americans—and proposed a treatment that relies on bacterial enzymes to break down the offending molecule in the digestive tract.

Researchers were able to disassemble the large, complex mixture of gluten proteins and identify a single component that triggers the autoimmune response to wheat and related grains characteristic of the disease. The technology used to isolate and identify the peptide trigger and the enzymology used to neutralize the disease are marvelous examples of how research into the fundamental understanding of life processes can directly influence human health.

Chaitan Khosla and his colleagues at Stanford University and the University of Norway in Oslo determined that the autoimmune response in people with celiac sprue can be traced to an unusually long molecule—a chain of 33 amino acids—that cannot be broken down by the human digestive system. Khosla, who received NSF's Alan T. Waterman Award in 1999, used the award to pursue research on the disease after learning that a member of his family had the disease.

In the roughly 1 in 200 Americans with celiac sprue, gluten, which is found in wheat, rye, and barley, can trigger a severe intestinal inflammation. NSF-funded scientists have discovered the peptide molecule responsible for this inflammation. They believe that the bacterial enzymes may lead to the development of an oral supplement that can eliminate the harmful effects of gluten.

Celiac sprue is often diagnosed only after years of painful symptoms. Presently, there is no cure. The only treatment is to completely avoid grains that contain gluten, such as wheat, rye, and barley. The disease usually surfaces in early childhood. Symptoms include chronic diarrhea and an inability to gain weight or grow normally. When the disease arises in adulthood, symptoms can also include fatigue, weight loss, anemia, and neurological symptoms. Over time, celiac sprue can lead to overall sickness and even intestinal cancer.

In people with celiac sprue, the stable 33-amino acid peptide molecule is seen as a threat to the immune system. The researchers believe that the bacterial enzymes may result in a simple, oral supplement that can eliminate the harmful effects of gluten. The treatment approach would be similar to enzyme supplements taken by people who cannot digest lactose, a sugar found in milk. An approved therapy could be as many as 5 to 8 years away, although research is already under way and the treatment should be available for clinical trials within 2 to 3 years.

page 19

Potential Diabetes Breakthrough

Pushing the frontiers of drug delivery technology, an NSF-funded biomedical engineer at the University of Illinois at Chicago has developed an implantable capsule that releases a steady supply of insulin into the bloodstream of people with diabetes.

The biocapsule, developed by Tejal Desai, features two innovations designed to overcome previous obstacles. A biological process allows the capsule to continuously produce insulin, rather than using up a limited supply. The capsule is made of a material designed to overcome the problem of implant rejection.

The capsule acts as a bioreactor; it contains insulin-secreting cells that borrow nutrients from the body to keep producing insulin indefinitely. As long as the body produces glucose, the cells will respond with insulin.

Desai has also broken new ground by developing a successfully implantable microscale device. Tiny devices made with microchip technology have been researched extensively for implantable medical applications, but biocompatibility has been a continuing problem.

To prevent the capsule from being attacked and destroyed by the immune system, Desai developed a silicon membrane covered with tiny uniform pores, each seven nanometers across. The membrane acts as a microfilter, allowing the secretion of insulin from the capsule but blocking the entrance of antibodies. The membrane is fabricated with photolithographic techniques commonly used for manufacturing silicon microchips. The next step in Desai's research is to test long-term usage and evaluate dosage levels.

Improving Hurricane Prediction

In a key step toward improving hurricane prediction, NSF-funded scientists at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, have reproduced in a computer model the fine-scale structure that drives the birth and strengthening of tropical cyclones. NCAR scientists Jordan Powers and Christopher Davis used the NCAR/Pennsylvania State University Mesoscale Model, Version 5 (MM5), to create their simulation. This marks the first time a cloud-resolving simulation has been able to reproduce the formation of a tropical cyclone, given only information about atmospheric conditions on a scale much larger than that of the cyclone. The breakthrough points toward future forecasting power that will soon be available.

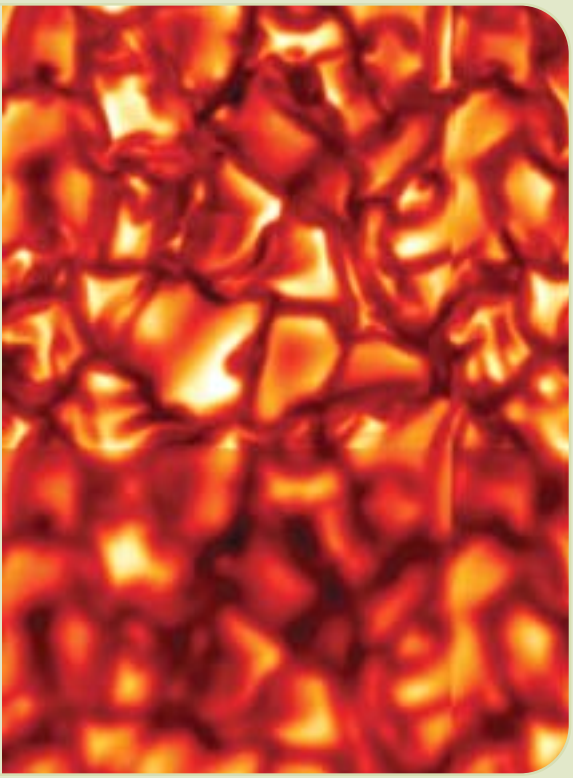
For their MM5 experiment, Davis and Powers studied Hurricane Diana, which struck North Carolina in 1984. Diana was chosen because of ample surface data and because a well-defined nontropical low preceded its formation. The MM5 successfully reproduced several stages in Diana's development, from its original state as a nontropical low to its intensification to hurricane status more than a day later.

One of the remaining mysteries about hurricanes is how they form, especially when they are influenced by midlatitude weather systems that move into the subtropics and tropics. The researchers hope that by analyzing the mechanisms behind storm formation in these simulations, they can make hypotheses of tropical cyclone formation that can be tested using aircraft, radar, and satellite data. They also hope to understand what is needed to predict storm formation in operational weather forecast models.

Computer models used for day-to-day weather prediction have become increasingly adept at projecting a hurricane's motion. Yet even the best models have little skill in predicting intensity, especially the rapid strengthening often noted in the most powerful hurricanes. Part of the problem is that the compact core of a hurricane, including the spiral bands of showers and thunderstorms that gather and focus energy, cannot be modeled in sufficient detail on the computers and models used for everyday forecasting.

The flying scientists from the National Oceanic and Atmospheric Administration (NOAA) found beauty in the eye of this hurricane. Data gathered by NOAA are helping NSF-funded researchers at the National Center for Atmospheric Research in Boulder, Colorado, create computer models to improve the prediction of severe storms.

Newfound Planetary System Has "Hometown" Look



This simulation depicts solar granulation as seen in radiation emerging from the surface of the sun. NSF-funded scientist Robert Stein, a physics and astronomy professor at Michigan State University, and Aake Nordlund of Copenhagen University Observatory in Denmark, used the National Computational Science Alliance's SGI Origin2000 supercomputer, located at the National Center for Supercomputing Applications, to create massive models of portions of the sun to simulate the processes behind its smaller-scale features. Using these models, the team focused on understanding convection and magnetic flux near the solar surface. Stein and Nordlund have used supercomputers to study the nature of the sun for more than 15 years.

After 15 years of observation and a lot of patience, the world's premier planet-hunting team found a planetary system that reminds them of our home solar system.

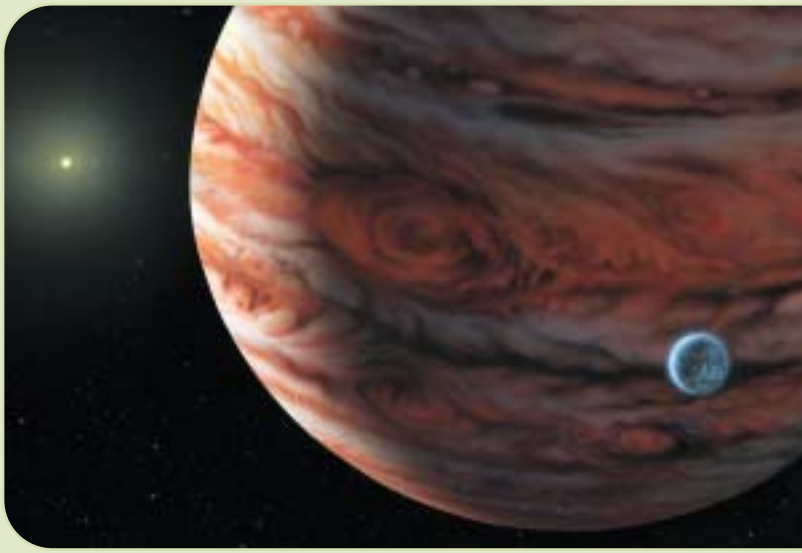
With funding from NSF and the National Aeronautics and Space Administration, Geoffrey Marcy, astronomy professor at the University of California, Berkeley, and astronomer Paul Butler of the Carnegie Institution of Washington, announced in June 2002 the discovery of a Jupiter-like planet orbiting a sun-like star at nearly the same distance as the Jovian system that orbits our sun.

All other extrasolar planets discovered up to now orbit closer to the parent star, and most of them have had elongated, eccentric orbits. This new planet orbits as far from its star as our own Jupiter orbits the sun.

The star, 55 Cancri in the constellation Cancer, was already known to have one planet. That planet is a gas giant slightly smaller than the mass of Jupiter and whips around 55 Cancri in 14.6 days at a distance only one-tenth that from Earth to the sun. The newfound star is 41 light years from Earth and is about 5 billion years old. Further data are needed to determine whether yet other planets are orbiting it.

page 21

In addition to the discovery of 55 Cancri, Marcy, Butler, and their team also announced a total of 15 new planets, including the smallest ever detected: a planet circling the star HD49674 in the constellation Auriga at a distance of .05 AU, one-twentieth the distance from Earth to the sun. Its mass is about 15 percent that of Jupiter and 40 times that of Earth. This brings the total number of known planets outside our solar system to 91.



This illustration shows a newly discovered Jupiter-like planet and its hypothetical moon (blue orb) circling the star 55 Cancri. Copyright 2002 Lynette Cook.

TEACHING EXCELLENCE

Early Career Support for Teachers a Success

To address the need for more science and mathematics teachers, the Montana Systemic Teacher Excellence Preparation (STEP) project has connected state universities and colleges with Tribal Colleges and has combined distance education courses with onsite courses. In Years 3–5 of the project, investigators developed an "early career support program" that served 127 beginning teachers and continues to serve about 60 new teachers per year. To date, there is a 95 percent retention rate in the profession for teachers who participated in the program.

In addition to providing professional development for new teachers, the Montana STEP project has established an M.S. in Science Education program, which is an interdisciplinary program involving both on-campus and distance learning. It is the only intercollege program for science education in the United States with a 65 percent distance education component. To date, over 100 teachers have been admitted to the program, 42 have received graduate degrees, and 77 are currently enrolled.

Early Exposure to Physics Boosts Student Performance

What would happen if you introduced physics into the curriculum in ninth grade before chemistry and biology? Active Physics, an innovative curriculum supported by the Instructional Materials Development program, is expanding the number of students taking physics and strengthening conceptual learning and inquiry skills using themes surrounding communication, home, medicine, predictions, sports, and transportation. Since 1998, more than 500,000 students have completed units, and market potential is expected to reach millions.

A growing number of the 322 implementing districts already show gains in student performance using the Stanford Achievement Test (SAT–9). In addition, University of California faculty recently approved the curriculum as meeting the "d-laboratory science" requirement, finding that it provides a solid foundation for college-level work and a deeper conceptual understanding than is achieved through traditional approaches emphasizing number problems. The U.S. Department of Energy has adopted the Active Physics model in content, design, and pedagogical format.

Second graders at Hartford Avenue University School in Milwaukee, Wisconsin, invent their own math games. The school is a participant in the Milwaukee Urban Systemic Initiative (MUSI), an NSF-funded program. MUSI seeks to create fundamental changes in the way math and science are taught in the Milwaukee public schools by setting curriculum standards and providing teachers with continuing education on inquiry-based teaching methods. One of the most successful components of MUSI involves identifying lead teachers—those whose teaching methods are especially interactive and exciting—and providing them with in-depth training on how to use an inquiry-based curriculum. The teachers will take this knowledge back to their schools and classrooms and share it with their colleagues.

International Research Gains From Optical Networking

The next generation of global scientific research will require networking services that are significantly more sophisticated, with much higher-capacity potential and substantially higher performance, than the services available today. NSF-funded researchers Thomas DeFanti, Maxine Brown, and colleagues from the Electronic Visualization Laboratory at the University of Illinois at Chicago are developing StarLight, an advanced optical infrastructure and proving ground for network services optimized for high-performance applications. Pictured above is some of the fiber at StarLight's Chicago-based co-location facility. StarLight provides space and collaboration opportunities for advanced data mining, video streaming, caches, and network monitoring and analysis, as well as optical switching and, eventually, optical routing.

The StarLight network-research facility opened for business in December 2001, providing high-speed connections for U.S. researchers to communicate with colleagues abroad. Short for "Science Technology and Research Light-Illuminated Gigabit High-performance Transit," StarLight uses the latest optical technology to achieve speeds of 2.5 billion bits per second (gigabits). StarLight uses both electronic and optical switches to manage the individual wavelengths (called "lambdas") of existing local, national, and international fiber-optic bandwidth. The resulting optical connection is a stable resource for far-flung scientists and engineers, while also presenting a unique "laboratory" for researchers who study advanced networking itself.

StarLight is an NSF-funded project of the University of Illinois at Chicago, Northwestern University, and the Argonne National Laboratory. The facility is an important part of the growing "cyber-infrastructure" that supports applications such as real-time, multisite virtual reality presentations, advanced interactive data mining, and remote control of large-scale instrumentation (including telescopes and microscopes). StarLight will also host connections to the world's most-advanced multisite supercomputing system, the TeraGrid.

NSF supports StarLight for numerous reasons—as an experimental testbed for new networking technologies and a tool that provides scientists and engineers with ultra-fast access to online resources across the world. By stretching the boundaries of what is feasible, StarLight helps envision the future of global networking while helping to solve today's pressing scientific problems.

page 23

Center for Spatially Integrated Social Science

Over recent decades, major advances in three sets of technologies (geographic information systems, the Global Positioning System, and remote sensing) have provided dramatic new insights into patterns, processes, and changes on the Earth's surface. Although many disciplines have adopted these technologies and use them successfully for a variety of inquiries, few social and behavioral scientists have begun to use them on a significant scale. To accelerate the adoption and use of these technologies, a national center based at the University of California–Santa Barbara is focusing on the methods, tools, techniques, software, data access, and other services needed to promote and facilitate a novel and integrating spatially enabled approach to the social and behavioral sciences. The center builds on the efforts of the National Center for Geographic Information and Analysis, engaging in six core programs that are targeted across the full spectrum from inductive, exploratory science to theory-based, confirmatory science. Among major research areas that are benefiting as a result of these efforts are human environmental interactions, urban studies, social and economic inequality, social and business networks, health and disease, criminal justice, and community-based grassroots organizations.

Financials

The National Science Foundation is committed to providing quality financial management to all our stakeholders. We honor that commitment by preparing annual financial statements in conformity with generally accepted accounting principles in the United States and then subjecting the statements to an independent audit to ensure their reliability in assessing the performance of NSF. Our unqualified audit opinion is a measure of the fair presentation of our financial statements. A complete set of NSF's financial statements, accompanying notes and audit opinions can be found in the *NSF FY 2002 Performance and Accountability Report* (*www.nsf.gov/od/bfa*). Included here are three of those statements: the Balance Sheet, the Statement of Net Cost, and the Statement of Stewardship Investments.


AGA

CERTIFICATE OF EXCELLENCE IN ACCOUNTABILITY REPORTING

Presented to the

National Science Foundation

In recognition of your outstanding efforts in preparing NSF's Accountability Report for the fiscal year ended September 30, 2001.

The Balance Sheet presents the funding that is available for use by NSF (assets) against the amounts owed (liabilities) and amounts that comprise the difference (net position).

The Statement of Net Cost presents the annual cost of operating NSF programs. The gross cost less any offsetting revenue for each NSF program is used to arrive at the net cost of specific program operations.

Stewardship Investments are NSF-funded investments that yield long-term benefits to the general public. NSF investments in research and education yield quantifiable outputs shown in this statement as the number of awards made and the number of researchers and students supported in the pursuit of discoveries in science and engineering and in science and math education.

National Science Foundation
Balance Sheet
As of September 30, 2002
(Amounts in Thousands)

ASSETS		
Intragovernmental		
Fund Balance With Treasury	$	6,419,700
Accounts Receivable		185
Advances		8,309
Total Intragovernmental Assets		6,428,194
Cash		7,766
Accounts Receivable, Net		571
Advances		52,479
General Property, Plant and Equipment, Net		224,141
Total Assets	$	6,713,151
LIABILITIES		
Intragovernmental Liabilities		
Advances From Others	$	100,531
Other Intragovernmental Liabilities		321
FECA Employee Benefits		254
Total Intragovernmental Liabilities		101,106
Accounts Payable		38,370
Other Liabilities		214,266
FECA Employee Benefits		1,637
Lease Liabilities		60
Accrued Annual Leave		10,567
Total Liabilities		366,006
NET POSITION		
Unexpended Appropriations		6,089,118
Cumulative Results of Operations		258,027
Total Net Position		6,347,145
Total Liabilities and Net Position	$	6,713,151

Notes to the Balance Sheet are available in NSF's *FY 2002 Performance and Accountability Report (www.nsf.gov/bfa/dfm/docs.htm).*

National Science Foundation
Statement of Net Cost
For the Year Ended September 30, 2002
(Amounts in Thousands)

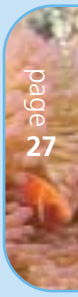
People	
Intragovernmental	
Program Cost	$ 1,714
Salary & Expense and Inspector General Cost	678
Total Intragovernmental Cost	2,392
With the Public	
Program Cost	766,020
Salary & Expense and Inspector General Cost	28,732
Total Public Cost	794,752
Total People Program Cost	797,144
Less: Intragovernmental Earned Revenues	17,903
Net People Program Cost	779,241
Ideas	
Intragovernmental	
Program Cost	13,293
Salary & Expense and Inspector General Cost	5,305
Total Intragovernmental Cost	18,598
With the Public	
Program Cost	2,166,046
Salary & Expense and Inspector General Cost	79,095
Total Public Cost	2,245,141
Total Ideas Program Cost	2,263,739
Less: Intragovernmental Earned Revenues	60,979
Net Ideas Program Cost	2,202,760
Tools	
Intragovernmental	
Program Cost	63,131
Salary & Expense and Inspector General Cost	30,860
Total Intragovernmental Cost	93,991
With the Public	
Program Cost	1,043,378
Salary & Expense and Inspector General Cost	39,216
Total Public Cost	1,082,594
Total Tools Program Cost	1,176,585
Less: Intragovernmental Earned Revenues	26,320
Net Tools Program Cost	1,150,265
Net Cost of Operations	$ 4,132,266

Notes to the Statement of Net Cost are available in NSF's *FY 2002 Performance and Accountability Report (www.nsf.gov/bfa/dfm/docs.htm).*

National Science Foundation
Stewardship Investments
Research and Human Capital
(Amounts in Thousands)
(Unaudited)

		2002
Research and Human Capital Activities		
Basic Research	$	3,092,060
Applied Research		193,788
Education and Training		767,734
Non-Investing Activities		183,887
Total Research and Human Capital Activities	$	4,237,469
Inputs, Outputs, and/or Outcomes		
Research and Human Capital Activities		
Investments In		
Universities	$	2,919,897
Industry		185,062
Federal Agencies		106,458
Small Businesses		144,844
Others		881,208
	$	4,237,469
Support to		
Scientists	$	394,144
Postdoctoral Programs		148,334
Graduate Students		402,620
	$	945,098
Outputs & Outcomes		
Number of:		
Awards		21,182
Years of Senior Research Support		5,582
Senior Researchers Supported		28,005
Other Professionals		11,000
Postdoctorals Supported		5,563
Graduate Students Supported		25,965
Undergraduate Students		32,000
K–12 Students		11,000
K–12 Teachers		84,000

NSF's role in achieving performance goals in science and engineering leads to investments in integrative research and human capital activities to enhance the potential for important discoveries or new knowledge with expected future benefits to our society. Because of the close connections between the investments in performing research and building a research base of skilled scientists and engineers through academic and training opportunities, expenses incurred by NSF are presented as overall stewardship investments for NSF for performance measurement. The outputs and outcomes of NSF investments in the research and academic community resulted in a number of grants awarded, and scientists and students supported.



APPENDIX A

NSF Directorates and Management Offices

The Directorate for Biological Sciences (BIO) supports research programs ranging from the study of the structure and dynamics of biological molecules, such as proteins and nucleic acids, through cells, organs and organisms, to studies of populations and ecosystems. It encompasses processes that are internal to the organism as well as those that are external, and includes temporal frameworks ranging from measurements in real time through individual life spans, to the full scope of evolutionary times. Among the research programs BIO supports is fundamental academic research on biodiversity, environmental biology, and plant biology, including providing leadership for the Multinational Coordinated Arabidopsis Genome Project.

The Directorate for Computer and Information Sciences and Engineering (CISE) supports research on the theory and foundations of computing, system software and computer system design, human-computer interaction, as well as prototyping, testing and development of cutting-edge computing and communications systems to address complex research problems. CISE also provides the advanced computing and networking capabilities needed by academic researchers for cutting-edge research in all science and engineering fields.

The Directorate for Education and Human Resources (EHR) supports a cohesive and comprehensive set of activities that encompass every level of education and every region of the country. EHR promotes public science literacy and plays a major role in the Foundation's long-standing commitment to developing our nation's human resources for the science and engineering workforce of the future. Focus is placed on programs that encourage the participation and achievement of groups underrepresented in science and engineering. NSF-supported education and training programs cover a broad spectrum—from supporting students and teachers to creating new ways of teaching and learning to assisting school districts and other systems forge greater gains in learning.

The Directorate for Engineering (ENG) supports research and education activities contributing to technological innovation that is vital to the nation's economic strength, security, and quality of life. ENG invests in fundamental research on engineering systems, devices, and materials, and the underpinning processes and methodologies that support them. Emerging technologies—nanotechnology, information technology and biotechnology—comprise a major focus of ENG research investments. ENG also makes critical investments in facilities, networks, and people to ensure diversity and quality in the nation's infrastructure for engineering education and research.

The Directorate for Geosciences (GEO) supports research in the atmospheric, Earth, and ocean sciences. Basic research in the geosciences advances our scientific knowledge of the Earth, and advances our ability to predict natural phenomena of economic and human significance, such as climate change, weather, earthquakes, fish-stock fluctuations, and disruptive events in the solar-terrestrial environment. GEO also supports the operation of national user facilities.

The Directorate for Mathematical and Physical Sciences (MPS) supports research and education in astronomical sciences, chemistry, materials research, mathematical sciences and physics. Major equipment and instrumentation such as telescopes and particle accelerators are provided to support the needs of individual investigators. MPS also supports state-of-the-art facilities that enable research at the cutting edge of science and research opportunities in totally new directions.

The Directorate for Social, Behavioral, and Economic Sciences (SBE) supports research to build fundamental scientific knowledge about human behavior, interaction, and social and economic systems, organizations, and institutions. SBE also facilitates NSF's international activities by promoting partnerships between U.S. and foreign researchers, enhancing access to critical research conducted outside the United States and increasing knowledge of mutually beneficial research opportunities abroad. To improve understanding of the science and engineering enterprise, SBE also supports science resources studies that are the nation's primary source of data on the science and engineering enterprise.

The Office of Polar Programs (OPP), which includes the U.S. Polar Research Programs and U.S. Antarctic Logistical Support Activities, supports multidisciplinary research in arctic and antarctic regions. These geographic frontiers—premier natural laboratories—are the areas predicted to be the first affected by global change. They are vital to understanding the past, present, and future responses of Earth systems to natural and man-made changes. OPP support provides unique research opportunities ranging from studies of the Earth ice and oceans to research in atmospheric sciences and astronomy.

The Office of Budget, Finance, and Award Management (BFA) is headed by the Chief Financial Officer, who has responsibility for budget, financial management, grants administration, and procurement operations and related policy. Budget responsibilities include the development of the Foundation's annual budget, long-range planning, and budget operations and control. BFA's financial, grants, and other administrative management systems ensure that the Foundation's resources are well managed and that efficient, streamlined business and management practices are in place. NSF has been acknowledged as a leader in the federal research administration community, especially in its pursuit of a paperless environment that provides more timely, efficient awards administration.

The Office of Information and Resource Management (OIRM) provides information systems, human resource management, and general administrative and logistic support functions to the NSF community of scientists, engineers, and educators, as well as to the general public. OIRM is responsible for supporting staffing and personnel service requirements for staff members including visiting scientists; NSF's physical infrastructure; dissemination of information about NSF programs to the external community; and administration of NSF's sophisticated technological infrastructure, providing the hardware, software and support systems necessary to manage the Foundation's grant-making process and to maintain advance financial and accounting systems.

APPENDIX B

NSF Executive Staff and Officers

Office of the Director
Rita R. Colwell, Director
Joseph Bordogna, Deputy Director

National Science Board
Warren M. Washington, Chair
Gerard R. Glaser, Acting Executive Officer

Office of Equal Opportunity Programs
Ana A. Ortiz, Program Manager

Office of the General Counsel
Lawrence Rudolph, General Counsel

Office of the Inspector General
Christine C. Boesz, Inspector General

Office of Integrative Activities
Nathaniel G. Pitts, Director

Office of Legislative and Public Affairs
Curtis Suplee, Director

Office of Polar Programs
Karl A. Erb, Director

Directorate for Biological Sciences
Mary E. Clutter, Assistant Director

Directorate for Computer and Information Sciences and Engineering
Peter A. Freeman, Assistant Director

Directorate for Education and Human Resources
Judith A. Ramaley, Assistant Director

Directorate for Engineering
Esin Gulari, Acting Assistant Director

Directorate for Geosciences
Margaret S. Leinen, Assistant Director

Directorate for Mathematical and Physical Sciences
John B. Hunt, Acting Assistant Director

Directorate for Social, Behavioral, and Economic Sciences
Norman M. Bradburn, Assistant Director

Office of Budget, Finance, and Award Management
Thomas N. Cooley, Director

Office of Information and Resource Management
Nathaniel G. Pitts, Acting Director

NSF Officers

Chief Financial Officer
Thomas N. Cooley, Office of Budget, Finance, and Award Management

Chief Information Officer
Linda P. Massaro, Office of Information and Resource Management

Affirmative Action Officer
Ana A. Ortiz, Office of Equal Opportunity Programs

APPENDIX C

National Science Board Members During FY 2002

Eamon M. Kelly (Chair[1])
President Emeritus
Professor
Payson Center for International Development and Technology Transfer
Tulane University

Warren M. Washington (Chair[2])
Senior Scientist and Head, Climate Change Research Section
National Center for Atmospheric Research

Anita K. Jones (Vice Chair[1])
Quarles Professor of Engineering and Applied Science
Department of Computer Science
University of Virginia

Diana S. Natalicio (Vice Chair[2])
President
The University of Texas at El Paso

John A. Armstrong
Vice President for Science and Technology
IBM (Retired)

Nina V. Fedoroff
Willaman Professor of Life Sciences
Director, Life Sciences Consortium
Director, Biotechnology Institute
The Pennsylvania State University

Pamela A. Ferguson
Professor of Mathematics
Former President
Grinnell College

Mary K. Gaillard
Professor of Physics
Lawrence Berkeley National Laboratory
University of California–Berkeley

M.R.C. Greenwood
Chancellor-
University of California–Santa Cruz-

Stanley V. Jaskolski
Vice President-
Eaton Corporation (Retired)-

George M. Langford
Professor-
Department of Biological Science-
Dartmouth College-

Jane Lubchenco
Wayne and Gladys Valley Professor of -
Marine Biology-
Distinguished Professor of Zoology-
Oregon State University-

Joseph A. Miller, Jr.
Executive Vice President
Chief Technology Officer
Corning, Inc.

Robert C. Richardson
Vice Provost for Research
Professor of Physics
Department of Physics
Cornell University

Michael G. Rossmann
Hanley Distinguished Professor of-
Biological Sciences-
Department of Biological Sciences-
Purdue University-

Vera C. Rubin
Research Staff, Astronomy
Department of Terrestrial Magnetism
Carnegie Institution of Washington

Maxine Savitz
General Manager-
Technology Partnerships-
Honeywell Corporation (Retired)-

Luis Sequeira
J.C. Walker Professor Emeritus-
Departments of Bacteriology and Plant-
Pathology-
University of Wisconsin–Madison-

Daniel Simberloff
Nancy Gore Hunger Professor of-
Environmental Science-
Department of Ecology and Evolutionary-
Biology-
University of Tennessee-

Bob H. Suzuki
President-
California State Polytechnic University-

Richard Tapia
Noah Harding Professor of Computational-
and Applied Mathematics-
Department of Computational and Applied-
Mathematics-
Rice University-

Chang-Lin Tien[3]
NEC Distinguished Professor of
Engineering
Department of Mechanical Engineering
University of California–Berkeley

John A. White, Jr.
Chancellor-
University of Arkanasas–Fayetteville-

Mark S. Wrighton
Chancellor
Washington University

Rita R. Colwell (Member Ex Officio)
Director-
National Science Foundation-

Marta Cehelsky[4]
Executive Officer
National Science Board

Gerard R. Glaser[5]
Acting Executive Officer
National Science Board

[1] Till May 8, 2002
[2] From May 8, 2002
[3] Deceased October 29, 2002
[4] Through July 13, 2002
[5] From July 14, 2002

PHOTO CREDITS

On the Cover — MacGillivray Freeman Films

Page 1 — MacGillivray Freeman Films

Page 2 — MacGillivray Freeman Films

Page 3 — Sam Kittner

Page 7 — Labrenz/NSF Collection

Page 8 — Adam Block/National Optical Astronomy Observatory/Association of Universities for Research in Astronomy/National Science Foundation

Page 9 — National Optical Astronomy Observatory/Association of Universities for Research in Astronomy/National Science Foundation

Page 16 — PhotoDisc

Page 17 — U.S. Fish and Wildlife Service

Page 18 — PhotoDisc

Page 19 — DigitalVision

Page 20 — National Oceanic and Atmospheric Administration

Page 21, top — Robert Stein, Michigan State University, and Aake Nordlund, Astronomy Observatory, Copenhagen University. Calculations performed at the National Center for Supercomputing Applications, Michigan State University, and the University of Denmark

Page 21, bottom — Illustration copyright 2002 Lynette Cook

Page 22 — Sam Castro, University of Wisconsin–Milwaukee

Page 23 — Maxine Brown, Electronic Visualization Laboratory, University of Illinois at Chicago

Page 32, left — Arizona State University

Page 32, right — Aaron Spitzer/RPSC

Filtered sunlight gives off a blue aura inside a fumarole (an ice tube formed around a volcanic steam vent) atop Mt. Erebus, the Earth's southernmost active volcano, in Antarctica. The United States maintains three research stations on Antarctica. Since 1956, NSF has supported American scientists in their research on the Antarctic and its interactions with the rest of the planet. These investigators and supporting personnel make up the U.S. Antarctic Program, which carries forward the nation's goals of supporting the Antarctic Treaty, fostering cooperative research with other nations, protecting the Antarctic environment, and developing measures to ensure only equitable and wise use of resources.

Pictured above is a tiny, hollow iridium wire used as a reaction vessel for materials research. The wire is only a single millimeter in diameter, the hollow just over half a millimeter. Inside is yttrium aluminum garnet (YAG), an important component of lasers. NSF-supported researcher, Paul McMillan and members of the Arizona State University's Materials Research Group are using the wire in their research into new chemistry processes that involve the use of immense amounts of pressure to compress materials and alter their molecular structure. McMillan hopes that his research will lead to a better understanding of these processes, which are similar to those occurring in rocks and minerals deep within the Earth and other planets.

Recent Trends

The following table summarizes several of NSF's key workload and financial indicators. For the period FY 1999–2002, NSF's expenses, administrative and management costs, and competitive proposals and awards all increased, reflecting the increase in NSF's budget. However, over this period, the increase in staffing has been minimal. NSF property increased substantially because of the Antarctic South Pole Station modernization multiyear project that is under way. NSF's total assets increased mainly because of a larger cash balance with Treasury, which is also related to NSF's budget increase.

	FY 1999	FY 2000	FY 2001	FY 2002	% Change FY 1999–2002
Budget (Obligations)	$3,690.54 M	$3,948.43 M	$4,532.32 M	$4,774.06 M	29.4%
NSF Expenses (Net of Reimbursements)	$3,366.42 M	$3,484.51 M	$3.698.14 M	$4,132.27 M	22.7%
Administration & Management (Obligations)	$177.05 M	$189.32 M	$213.72 M	$230.58 M	30.2%
Number of Employees (Full-time equivalent, includes OIG)	1,189	1,200	1,220	1,242	4.5%
Competitive Proposals	28,578	29,508	31,942	35,164	23.0%
Competitive Awards	9,189	9,850	9,925	10,406	13.2%
Average Annual Award Size	$94,000	$105,800	$113,601	$115,666	23.0%
Average Annual Award Duration (In Years)	2.8	2.8	2.9	2.9	3.6%
Property (PP&E, Net of Depreciation)	$101.47 M	$167.36 M	$203.24 M	$224.14 M	120.9%
Total Assets	$4,573.00 M	$5,140.31 M	$6,001.90 M	$6,713.15 M	46.8%

Note: FY 2002 budget obligation of $4,774.06M does not include Trust Funds, H–1B Nonimmigrant Petitioner Receipts, and upward adjustments of undelivered orders.

4201 Wilson Boulevard
Arlington, VA 22230
Phone (703) 292–5111
TDD (703) 292–5090

www.nsf.gov

For additional copies of this publication, please send an e-mail request to Accountability@nsf.gov.

NSF 03–024

Design:
Eagle Design & Management, Inc.