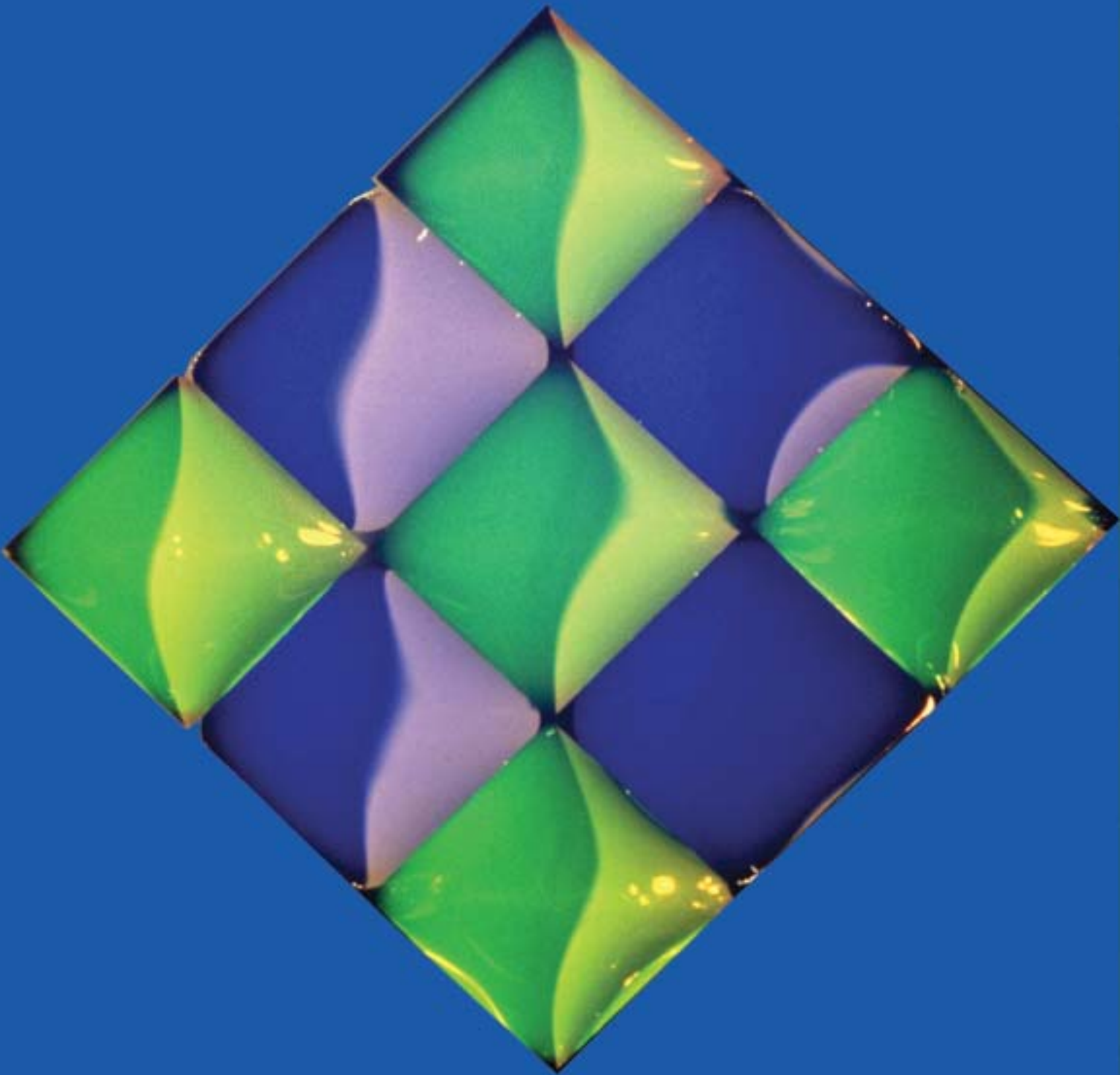


National Science Foundation



FY 2003
Performance **HIGHLIGHTS**

On the Cover. Felice Frankel photographed colored drops of water in the laboratory of Harvard chemist and National Medal of Science winner Professor George Whitesides. The water drops are responding to a grid of hydrophobic and hydrophilic materials on a flat surface. The water drops take squarish shapes by spreading across the hydrophilic surface and stopping at hydrophobic gridlines etched at 3 mm intervals. The hydrophilic surface is a self-assembled monolayer.

Frankel is a research scientist in the School of Science at the Massachusetts Institute of Technology (MIT). In 1997, she was awarded an NSF grant for “Envisioning Science,” a project in which she works with students and researchers to raise the standards in scientific imaging and visual expression of data. In March 2002, the MIT Press published her book, *Envisioning Science: The Design and Craft of the Science Image*. *Envisioning Science* provides a guide to creating compelling photographs that illuminate science and make research more accessible.

© Felice Frankel, from *Envisioning Science: The Design and Craft of the Science Image* (The MIT Press).

Table of Contents

1 From the Director

3 From the Chief Financial Officer

4 Expanding Frontiers

8 Performance Results

14 Where Discoveries Begin

18 Financial Highlights

22 Appendixes

*“The value of science in our society today
is beyond calculation because it is so
intricately and pervasively
woven into the nation’s
fabric.”*

Dr. Rita R. Colwell
NSF Director

FROM THE DIRECTOR

I am pleased to present the National Science Foundation's (NSF's) fiscal year (FY) 2003 *Performance Highlights*, the third annual summary report on the Foundation's financial condition, core business activities, and primary programmatic accomplishments over the past year.

For more than 50 years, NSF has invested in a wide range of research and education programs in fundamental science and engineering. These investments have generated discoveries and advances in science and engineering that have enhanced every facet of our lives—from computing and communications to transportation, national security, the arts, architecture, design, and countless other areas.

Today, the progress of science and engineering is not only more central to our lives, but it has also taken on new dimensions of complexity and integration, making NSF's role both more vital and more challenging. Advances in science and engineering are integral to strengthening the nation's economic future and meeting the challenge of securing the homeland and reducing international threats of all types. As an example, computer researchers around the Pacific Rim were mobilized in May 2003 to fight the SARS (Severe Acute Respiratory Syndrome) epidemic, helping to establish a cutting-edge communication grid among quarantined hospitals across Taiwan. In addition to linking the hospitals to each other, the grid connected doctors to global sources of health information. NSF's support for the PRAGMA (Pacific Rim Applications and Grid Middleware Assembly) partnership that responded to this call for help from Taiwan's National Center for High-Performance Computing has fostered a spirit of trust and cooperation among the sites. Clearly, NSF investments transform not only scientific research and learning, but the handling of critical global events as well.

Underlying the Foundation's programmatic achievements is NSF's commitment to organizational excellence and sound financial management. In FY 2003, NSF received an unqualified "clean" audit opinion on its financial statements for the sixth consecutive year. The Foundation also continued to provide leadership in achieving government-wide goals under the President's Management Agenda. NSF remains the only agency to achieve two "green" successful ratings—for financial management and E-government—and this year advanced to "yellow" status for budget and performance integration. Last spring the U.S. General Accounting Office identified the Foundation as one of five exemplary federal agencies that successfully demonstrated evaluation capacity in their performance reports due to its evaluation culture, data quality, analytical expertise, and collaborative partnerships.

Here at NSF, it is our job to ensure that U.S. capabilities are the best in the world and that the returns meet the highest expectations of the American people, who support these activities with their tax dollars. The dedication of the outstanding staff at NSF makes achieving this goal possible.



Rita R. Colwell
Director

Dr. Rita R. Colwell
December 2003



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.

NSF investments—in people, in their ideas, and in the tools they use—will catalyze the strong progress in science and engineering needed to establish world leadership and secure the nation's security, prosperity, and well-being.

NSF

FROM THE CHIEF FINANCIAL OFFICER

FY 2003 was a successful and very busy one for the Foundation. I am pleased to report that for the sixth consecutive year, NSF's financial statements received an unqualified "clean" opinion from an independent auditor. Moreover, NSF prepared its 2003 statements in 45 days—meeting the government-wide deadline a year earlier than required. Sound financial management is critical for any organization; for NSF, it underlies and enables the programmatic achievements essential to ensuring that America remains at the frontier of science and engineering research and education.

NSF is committed to the highest standards of management efficiency and integrity. Our goals are to make transactions with our stakeholders more user-friendly, increase the efficiency of our internal operations, and provide real-time financial and management information and reporting for decision-making purposes. Among our achievements this year are the following:

- NSF remained the only federal agency to process all of its proposals electronically.
- With respect to customer service, despite a record 14 percent increase in the number of proposals received—over 40,000 of them—nearly 80 percent of award decisions were made within six months of receipt.
- Nearly 90 percent of the Foundation's funds support projects reviewed by external peers and selected through a merit-based competition.
- The re-engineered business practices implemented in recent years continued to yield cost efficiencies for the Foundation in FY 2003.
- Accountability to the taxpaying public is a responsibility that ranks among the most important here at the Foundation. For the second consecutive year, our annual *Highlights* report was rated as among the top 10 in a national review that included most of the Fortune 500 companies.

Thanks to sound financial management, a commitment to continuous improvement in business practices, and, most important, the extraordinary talent and commitment of our staff, NSF continues to face the future in a position of operational strength. Rather than reacting to change, we are committed to leading change and setting new standards of excellence for the federal financial community. We look forward to achieving many more milestones in the years ahead.



Thomas N. Cooley
Chief Financial Officer

A handwritten signature in black ink that reads "Thomas N. Cooley". The signature is written in a cursive, flowing style.

Thomas N. Cooley
December 2003

EXPANDING FRONTIERS

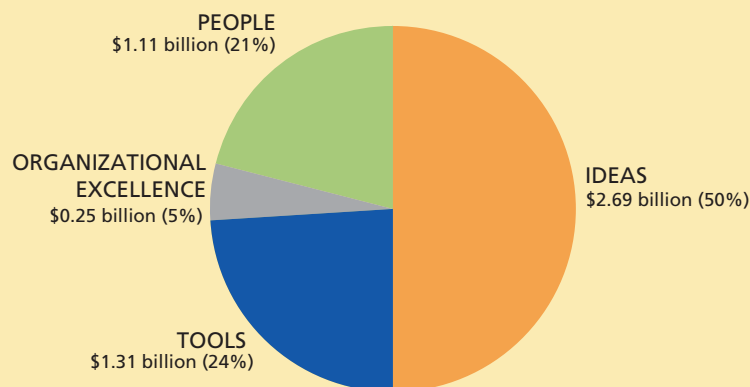


The bioglyphs painting depicts petri dishes coated with agar, which support colonies of bioluminescent bacteria. This piece was created by Angela Bowlds, a student at the Montana State University-Bozeman School of Art.

As steward of America's science and engineering enterprise, the National Science Foundation promotes and advances the progress of science and engineering in the United States. With a budget of about \$5 billion, NSF represents only 4 percent of the total federal funding for research and development. However, the Foundation accounts for one-fifth of the federally funded basic research conducted by America's colleges and universities, and in many fields such as math, computer science, and the social sciences, NSF is the major source of federal funding for academic research.

For more than 50 years, NSF has had an extraordinary impact on America's scientific and engineering knowledge and capacity. The Foundation's investments have helped train generations of outstanding researchers and educators—including many Nobel laureates—and the world has received a continuous stream of benefits from the technologies and capabilities emerging from these investments. Advances in science and engineering have enhanced every facet of our lives, from computing and communications to transportation, national security, the arts, architecture, design, and countless other areas.

NSF FY 2003 Budget Obligations—\$5.37 Billion



Note: Totals may not add because of rounding.

Moreover, not since World War II has progress in science and engineering been more important for ensuring our security, both at home and abroad. Research on the ecology of infectious diseases and microbial genome sequencing can contribute to a better understanding of potential bioterrorism threats and how to combat them. Identifying vulnerabilities in the nation's critical infrastructure—power grids, communications and transportation networks, and water supply systems—will allow us to better protect them. Today, in a society defined by and dependent on science and technology, advances in science and engineering are integral to meeting the challenge of securing the homeland and reducing international threats.

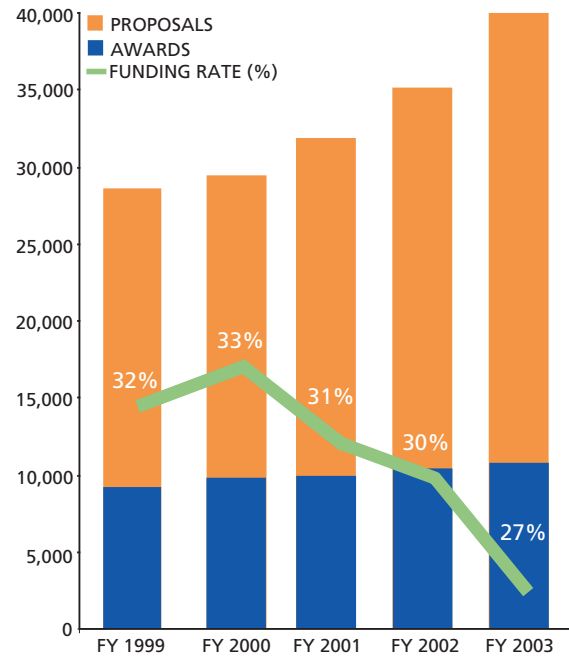
People. Ideas. Tools. Excellence.

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

People: Leadership in today's knowledge economy requires world-class scientists and engineers and a national workforce that is scientifically, technically, and mathematically strong. Investments in people aim to improve the quality and reach of science, engineering, and mathematics education and enhance student achievement. NSF investments support over 200,000 people, including researchers, postdoctoral associates, teachers, and students at every level across all the science and engineering disciplines. Embedded in all NSF programs are efforts to build a more inclusive, globally engaged workforce that reflects the strength of the nation's diverse population.

Estimated Number of People Involved in Foundation Activities in FY 2003	
Senior Researchers	30,000
Other Professionals	12,000
Postdoctoral Associates	6,000
Graduate Students	27,000
Undergraduate Students	32,000
K-12 Students	14,000
K-12 Teachers	85,000
TOTAL	206,000

Number of NSF Competitive Proposals, Awards, and Funding Rates



Ideas: Investments in ideas are aimed at the frontiers of science and engineering, to ensure that America maintains its global leadership. They build the intellectual capital and fundamental knowledge that drive technological innovation, spur economic growth, and increase national security and welfare. They also seek answers to fundamental questions about the origin and nature of the universe and humankind.

Tools: NSF investments provide state-of-the-art tools and facilities that boost the overall productivity of the research and education enterprise. The strategy is to invest in a wide range of instrumentation, multiuser facilities, distributed networks, digital libraries, and computational infrastructure that adds unique value to research and are accessible and widely shared among researchers across the nation.

Organizational Excellence: Excellence in management underpins all of the Foundation's activities. NSF strives to maintain an agile, innovative organization with a results-oriented workforce that operates in a continuous learning environment.

Catalyst for Innovation

NSF does not itself conduct research or operate laboratories. Instead, its role is that of a catalyst, seeking and funding the best ideas and the most capable people, making it possible for them to pursue new knowledge, discoveries, and innovation. In FY 2003, NSF received over 40,000 proposals—a record—and made 10,844 new awards to nearly 2,000 colleges, universities, and other public and private institutions throughout the country.

About 90 percent of the Foundation's 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. Each year, about 50,000 members of the science, engineering, and mathematics research and education community serve as external reviewers, helping NSF conduct more than 200,000 merit-based reviews. Reviewers focus on two primary criteria: the intellectual merit of the proposed activity and its broader impacts on teaching, training, learning, and potential benefits to society. Reviewers also consider how well the proposed activity fosters the integration of research and education and broadens opportunities to include diverse participants, particularly those from underrepresented groups.

Commitment to Excellence

With the inclusion of Organizational Excellence as one of NSF's strategic goals, the Foundation's long-standing commitment to leadership in business processes is brought into sharper focus. One major emphasis is the President's Management Agenda (PMA), a government-wide effort that was launched in FY 2001 to improve the management, performance, and accountability of federal agencies. An Executive Management Scorecard is issued quarterly by the White House Office of Management and Budget (OMB) to track agencies' progress in meeting specific criteria under the government-wide initiatives that constitute the PMA.

For the second consecutive year, NSF remains the only federal agency to earn two "green" successful ratings: one for financial management and the other for advancing electronic government (E-Gov). On the Integration of Budget and Performance initiative, NSF progressed to "yellow" status in FY 2003. Although the Foundation has not fully met the success standards for the Strategic Management of Human Capital and Competitive Sourcing initiatives, a Human

Capital Management Plan has been developed; it will provide a roadmap to help NSF strategically manage its workforce—improve succession planning, recruitment and employee development, retention and recognition—to ensure the high quality of the NSF workforce. The Human Capital Management Plan will also allow NSF to make more informed decisions concerning competitive outsourcing in FY 2004.

FY 2003 saw a number of notable management accomplishments. In a recent congressional report on federal cybersecurity, NSF was one of only two agencies receiving the highest rating ("A"). NSF was also recently recognized for its achievements in E-Gov with a Presidential Award for Management Excellence. NSF receives virtually all of its research proposals electronically, has a comprehensive plan for continued improvement of its information technology security program, and continues as an active partner in several interagency E-Gov initiatives, including Grants.gov and E-authentication. NSF prepared its 2003 audited financial statements in 45 days, meeting the government-wide deadline a year earlier than required, and earned an unqualified opinion in its 2003 audit. In a survey of all federal employees conducted last spring by the Office of Personnel Management, NSF ranked second on the list of "Best Places to Work in the Federal Government." With respect to customer service, nearly 80 percent of award decisions were made within six months of receipt, despite a record 14 percent increase in the number of proposals received in FY 2003.

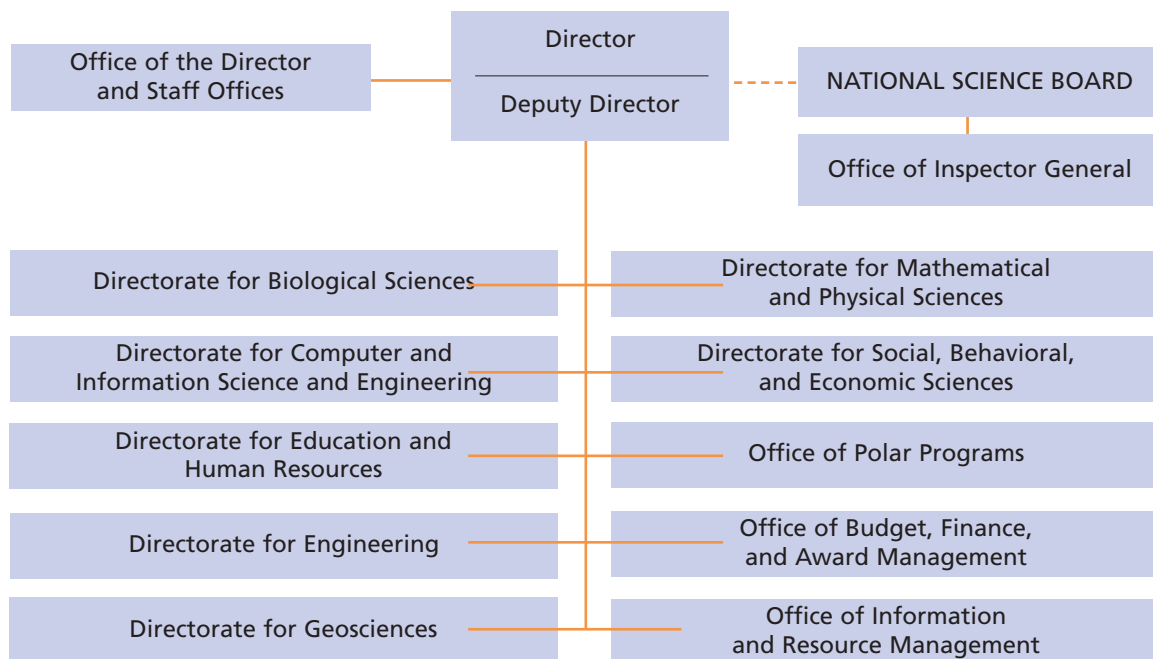
However, these accomplishments notwithstanding, challenges lie ahead. Although NSF's budget has nearly doubled in the past 10 years, staffing has increased by only 4 percent. Maintaining high standards of quality and customer service requires new strategies. In addition, the workload has grown more complex with NSF's involvement in more multidisciplinary, partnership, and international activities and large new research facility projects, while new accountability requirements have increased the workload as well. NSF is engaged in a major multiyear comprehensive business analysis that is being conducted in partnership with an external management consulting firm. In addition, other studies by the National Association of Public Administration and the National Academy of Science will help position NSF for future challenges. The results from these reviews will help guide the Foundation's long-term administration and management investments.

EXPANDING FRONTIERS

President's Management Agenda Scorecard	Baseline 9/30/2001	Status 9/30/2002	Status 9/30/2003
Strategic Management of Human Capital: Build, sustain, and deploy a skilled, knowledgeable, diverse, and high-performing workforce; develop human capital strategies that are linked to agency mission and goals; develop a vision and roadmap for strategically managing the agency workforce to better accomplish the agency's mission.	Red Diamond	Red Diamond	Red Diamond
Competitive Sourcing: Use competitive sourcing to perform commercial functions more efficiently.	Red Diamond	Red Diamond	Red Diamond
Improving Financial Performance: Provide accurate and timely financial information that will enable better management decisions, integrate financial and performance management systems that support daily operations, maintain financial systems that meet federal requirements, prepare clean and timely financial statements with no material weaknesses.	Green Diamond	Green Diamond	Green Diamond
Expanded Electronic Government: Use technology to the fullest to provide services and information focused on citizens.	Yellow Diamond	Green Diamond	Green Diamond
Budget and Performance Integration: Align planning, budgeting, and performance in order to develop an integrated process in which strategic planning drives budgetary decisions and tracks accountability for performance and cost.	Red Diamond	Red Diamond	Yellow Diamond

Note: Green represents success; yellow is for mixed results; and red is for unsatisfactory. Ratings are issued quarterly by the Office of Management and Budget. For more information on the President's Management Agenda, see www.results.gov/agenda/scorecard.html.

NSF Organizational Chart



NSF is headed by a Director, who is appointed by the President and confirmed by the Senate. The current director, distinguished biologist Dr. Rita R. Colwell, was appointed in 1998 and holds the distinction of being the first woman to head the Foundation. See Appendix 1 and 2 for a detailed description of each directorate and management office and for a list of NSF Executive Staff and NSF Officers. A 24-member National Science Board (NSB) oversees the policies and programs of the Foundation. NSB members—prominent contributors to the science, mathematics, engineering, and education communities—are appointed by the President with the consent of the Senate. The Board also serves the President and the Congress as an independent advisory body on policies related to the U.S. science and engineering enterprise. See Appendix 3 for a list of NSB members.

PERFORMANCE RESULTS



This scanning electron micrograph of tree rings from an ancient Siberian pine show the effects of catastrophic summer cooling that froze sap in the tree's cells. Magnification 35x.

In assessing the return on its investments, NSF is guided by its GPRA (Government Performance and Results Act of 1993) Strategic Plan and Annual Performance Plan. The Foundation's Strategic Plan provides the framework for and establishes NSF's long term strategic outcome goals. The Foundation's Annual Performance Plan establishes the annual goals for the programmatic and management activities that enable the agency to accomplish its mission. The FY 2003 Annual Performance Plan and the FY 2003 Budget Request were developed concurrently to ensure a direct link between programmatic activities, strategic goals, and resources.¹

GPRA performance assessment has been a particular challenge for NSF and other agencies whose mission involves long-term investments in research and education. This is primarily due to (1) the difficulty of linking research outcomes to annual investments and the annual budget, since outcomes often appear years or decades after the initial investment, and (2) the fact that assessing research results is inherently retrospective and requires the qualitative judgment of experts.

NSF has developed and OMB has approved an alternative format: using external expert review panels to assess research results and reporting research outcome goals on a qualitative rather than a quantitative basis. The academic research community has used external expert panels to review research results and outcomes for many years. In a report issued in May 2003, the General Accounting Office identified NSF as one of five exemplary federal agencies that have successfully conducted evaluative activities and incorporated an evaluation culture.

FY 2003 Performance Scorecard

For FY 2003, NSF's annual performance goals are divided into Strategic Outcome Goals and Management Goals.

- **Strategic Outcome Goals** focus on the long-term results of NSF grants and programs. They represent what the Foundation seeks to accomplish with its investments in science and engineering research and education. To accomplish its mission to promote scientific progress, NSF invests in the best people with the best ideas and provides them with the tools they need. The outcomes from these awards illustrate the success of such investments.

¹ For a comprehensive discussion of NSF's performance goals, results, and related issues, see the *FY 2003 Performance and Accountability Report* at www.nsf.gov/pubs/ods/getpub.cfm?par. NSF's GPRA Strategic Plan, FY 2003 Annual Performance Plan, and FY 2003 Budget Request are available on the Foundation's website (www.nsf.gov).

- **Management Goals** relate to the effectiveness and efficiency of NSF’s activities and how well we serve our customers. NSF’s management goals address the proposal and award process, the award portfolio, award oversights, and facilities management. They also address NSF’s business practices and human resources and workforce issues.

In FY 2003, NSF achieved 70 percent of its annual performance goals. It was successful in achieving all four annual performance goals associated with the Strategic Outcome Goals of People, Ideas, and Tools and 10 of 16 Management Goals.

FY 1999 to FY 2003 Performance Results					
Percentage of GPRA Goals Achieved					
	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Annual Strategic Outcome Goals	100% (5 of 5)	75% (6 of 8)	80% (4 of 5)	100% (4 of 4)	100% (4 of 4)
Management Goals	67% (10 of 15)	60% (12 of 20)	61% (11 of 18)	74% (14 of 19)	63% (10 of 16)
Total	75% (15 of 20)	64% (18 of 28)	65% (15 of 23)	78% (18 of 23)	70% (14 of 20)



Note: Management Goals include goals that have been identified in prior years as Investment Process Goals.

FY 2003 STRATEGIC OUTCOME GOALS AND RESULTS

Strategic Outcome	Performance Goal ²	RESULT
PEOPLE: Developing a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well-prepared citizens.		
Workforce Development	<p>Demonstrate significant achievement in the majority of the following indicators:</p> <p><i>Performance Indicators:</i></p> <ul style="list-style-type: none"> • Development of well-prepared researchers, educators, or students whose participation in NSF activities provides experiences that enable them to explore frontiers or challenges of the future. • Contributions to development of a diverse workforce through participation of underrepresented groups in NSF activities. • Development or implementation of other notable approaches/new paradigms that promote progress toward the People outcome goal. <p>Result: External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.</p>	
K-12 Education Reform	<p>Significantly enhance the quality of K-12 mathematics and science education available to all students in Math and Science Partnership schools.</p> <p><i>Performance Indicators:</i></p> <ul style="list-style-type: none"> • Provide support for high quality programs addressing issues related to teacher workforce capacity. • Document evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement. <p>Result: Significant achievement was demonstrated in both indicators.</p>	
<p>KEY:</p> <ul style="list-style-type: none"> Indicates goal was achieved in FY 2003. Indicates goal was not achieved in FY 2003. 		

² These performance goals are stated in the alternate form provided for in GPRA legislation.

FY 2003 **STRATEGIC OUTCOME** GOALS AND RESULTS

Strategic Outcome	Performance Goal ²	RESULT
<p>IDEAS: Enabling discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.</p>	<p>Demonstrate significant achievement in the majority of the following indicators:</p> <p><i>Performance Indicators:</i></p> <ul style="list-style-type: none"> • Discoveries that expand the frontiers of science, engineering, or technology. • Connections between discoveries and their use in service to society. • Partnerships that enable the flow of ideas among the academic, public, or private sectors. • Leadership in fostering newly developing or emerging areas. <p>Result: External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.</p>	
<p>TOOLS: Providing broadly accessible, state-of-the-art, and shared research and education tools.</p>	<p>Demonstrate significant achievement in the majority of the following indicators:</p> <p><i>Performance Indicators:</i></p> <ul style="list-style-type: none"> • Develop or provide tools that enable discoveries or enhance the productivity of research or education communities. • Partnerships with local, state, or federal agencies, national laboratories, industry, or other nations to support and enable the development of large facilities or other infrastructure. • Develop or implement other notable approaches/new paradigms that promote progress toward the Tools outcome goal. <p>Result: External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.</p>	






² These performance goals are stated in the alternate form provided for in GPRA legislation.

PERFORMANCE RESULTS

FY 2003 MANAGEMENT GOALS AND RESULTS







	Performance Goal	RESULT
PROPOSALS AND AWARDS PROCESSES		
Use of 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	Have at least 70 percent of reviews with written comments address aspects of both generic review criteria.	
Implementation of Merit Review Criteria: Program Officers	Have at least 80 percent of program officers' funding decisions comment on aspects of both generic review criteria. Explanation: An evaluation of a statistically determined sample of FY 2003 review analyses was undertaken to determine the extent to which program officers used both review criteria. The study determined that approximately 53 percent of review analyses commented on aspects of both merit review criteria. To improve performance, the issue of what constitutes comments on aspects of both generic review criteria will be clarified.	
Customer Service: Time to Prepare Proposals	Make 95 percent of program announcements publicly available at least three months before the proposal deadline or target date.	
Customer Service: Time to Decision	Inform applicants about funding decisions within six months of receipt for 70 percent of the proposals.	
AWARD PORTFOLIO		
Award Size	Increase the average annualized award size for research grants to \$125,000, compared with the goal of \$113,000 in FY 2002.	
Award Duration	Maintain the FY 2002 award duration goal of 3.0 years for research grants. Explanation: Progress toward this goal depends on the Foundation's budgetary resources. Program directors must balance competing requirements: increasing award size, increasing the duration of awards, and making more awards. The Foundation will continue to focus on increasing award size and duration in order to improve the efficiency of the research process.	
KEY:  Indicates goal was achieved in FY 2003.  Indicates goal was not achieved in FY 2003.		

FY 2003 **MANAGEMENT GOALS AND RESULTS**

	Performance Goal	RESULT
AWARD OVERSIGHT AND FACILITIES MANAGEMENT		
Construction and Upgrade of Facilities	<p>Keep negative cost/schedule variances within 10 percent of the approved project plan for 90 percent of construction, acquisition, and upgrade projects.</p> <p>Explanation: 88 percent of the projects (30 out of 34) successfully kept negative cost/schedule variances to less than 10 percent of approved project plans. The Foundation will continue to work with facility managers to improve performance in this area.</p>	
Operations and Management of Facilities	<p>Keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time for 90 percent of operational facilities.</p> <p>Explanation: 87 percent of facilities (26 out of 30) successfully kept unscheduled downtime to less than 10 percent. The Foundation will continue to work with on-site facility managers to improve performance in this area.</p>	
BUSINESS PRACTICES		
Electronic Business: Award Transfers	<p>Have 90 percent of award transfers for principal investigators received through FastLane and processed electronically.</p>	
Electronic Business: E-Jackets	<p>Continue to advance “E-business” by implementing Phase III of the Electronic Jacket application.</p> <p><i>Performance Indicator:</i> Implement the electronic capability for assigning proposal processing tasks, forwarding proposals to other programs as necessary, and delegating proposal action authority.</p> <p>Explanation: Phase III capabilities were developed as planned but implementation was delayed to ensure that staff was properly trained and ready to use the new capabilities. Phase III was available for staff to use in November 2003.</p>	
Information Technology Security	<p>Maintain and enhance the agency-wide security program to ensure adequate protection of the Foundation’s information technology infrastructure and critical assets.</p> <p><i>Performance Indicators:</i></p> <ul style="list-style-type: none"> • Have approved security plans on file for 95 percent of major systems. • Document certification and accreditation of 95 percent of major systems. 	

PERFORMANCE RESULTS

FY 2003 MANAGEMENT GOALS AND RESULTS

	Performance Goal	RESULT
HUMAN RESOURCES/WORKPLACE/WORKFORCE		
NSF Staff Diversity: Planning	Ensure that diversity considerations are embedded in activities related to agency staffing of scientists and engineers. <i>Performance Indicator:</i> Initiate development of an agency diversity plan for scientists and engineers.	
NSF Staff Diversity: Appointments	Increase the number of staff science and engineering and management appointments from underrepresented groups from the FY 2000 base. Explanation: While the goal of hiring more women was achieved, the Foundation was not successful in increasing the number of minorities hired. FY 2003 results were identical to the FY 2000 baseline for minority hires. In FY 2004, additional emphasis will be placed on hiring female and minority employees. An additional staff member will be hired to specifically address diversity issues. In addition, the Diversity Plan, which is under development, will help provide strategies for recruiting and retaining a diverse staff.	
Workforce Learning	Align or develop through the National Science Foundation Academy, competency-based curricula that provide cross-functional, work-based, team-learning opportunities. <i>Performance Indicator:</i> Initiate development of new courses or revision of existing ones to address program management, leadership development, and technology and business process training.	
Workforce Planning	Develop competency-based, occupation classification alternatives that support the Foundation's strategic business processes and capitalize on its technology-enabled business systems. <i>Performance Indicators:</i> <ul style="list-style-type: none"> Identify workforce competencies for all current NSF job families. Initiate identification of competency-based classification alternatives. 	
KEY:  Indicates goal was achieved in FY 2003.  Indicates goal was not achieved in FY 2003.		



WHERE DISCOVERIES BEGIN



NSF-funded astronomers are studying the Owl Nebula, the well-known planetary nebula in the Ursa Major constellation.

Mobilizing to Fight SARS

This spring, grid-computing researchers around the Pacific Rim mobilized to fight the SARS (Severe Acute Respiratory Syndrome) epidemic, helping to establish a cutting-edge communications grid among quarantined hospitals across Taiwan. In addition to linking the hospitals to one another, the grid connected doctors to global sources of health information.

In May 2003, Taiwan's National Center for High-Performance Computing requested help from the members of the Pacific Rim Applications and Grid Middleware Assembly (PRAGMA). Led by the San Diego Supercomputer Center at the University of California–San Diego, offers of assistance poured in within hours from all PRAGMA sites, including Argonne National Laboratory, where the Access Grid was developed.

NSF support for the PRAGMA partnership has led to the development of trust and a cooperative spirit. PRAGMA demonstrated that NSF's investment in cyberinfrastructure will transform not only scientific research and learning, but also the handling of global events such as SARS.

Because quarantine and isolation are the primary means of slowing the spread of the disease, Taiwan's hospitals faced a communications logjam. Physicians in quarantined hospitals could not consult with specialists at other institutions, and on a more personal level, staff and patients had only limited contact with their families.

The Access Grid, a network-based collaboration that goes beyond standard video- and teleconferencing, allowed physicians to share detailed x-ray images, patient data, and other information in online meetings involving several sites.

During a speech given at the Central Intelligence Agency's Strategic Assessments Group workshop in June 2003, NSF Director Rita Colwell said, "SARS is a vivid reminder of the dangers posed by infectious agents in our increasingly interconnected world. At the same time, our capacity to anticipate and prevent harm has never been greater than it is today."

Cleaner Fuel One Step Closer

NSF-funded scientists working on extracting hydrogen from common renewable plant sources have developed a hydrogen-making catalyst that uses cheaper materials and yields fewer contaminants than current processes do. Further, this catalyst lies at the heart of a chemical process that is said to constitute a significant advance in producing alternate fuels from domestic sources.

Researchers from the University of Wisconsin–Madison created the catalyst from nickel, tin, and aluminum and used it in a process called aqueous-phase reforming (APR), which converts plant byproducts into hydrogen. Although this process is as effective as current methods that use precious metals such as platinum, it is less expensive, runs at lower temperatures, and is much cleaner.

Hydrogen is a “clean” fuel because unlike fossil fuels, it combines with oxygen when it burns to form water instead of toxic byproducts or greenhouse gases. The APR process extracts hydrogen from a variety of biological sources, especially simple carbohydrates and sugars produced by common plants.

This process can be used on a small scale to generate fuel for portable devices such as cars, batteries, and military equipment. It can also be scaled up to provide a hydrogen source for industrial applications such as manufacturing fertilizers or to remove sulfur from petroleum products.

According to the U.S. Environmental Protection Agency, the fossil fuels that are burned to run cars and trucks, to heat homes and businesses, and to power factories are responsible for about 98 percent of carbon dioxide emissions, 24 percent of methane emissions, and 18 percent of nitrous oxide emissions in the United States. Hydrogen-based fuels may eventually reduce the use of these fuels, thus lowering the emissions linked to greenhouse gases and global climate change.

Breathing Easier

Asthma is a major public health problem that affects some 15 million people in the United States, nearly 5 million of them under 18. It is estimated that people with asthma experience well over 100 million days of restricted activity every year.

To address the growing epidemic of asthma in this country, NSF-supported researchers at the University of Oklahoma have found a novel way of using a laser to analyze exhalations, thus opening the door to more accurate diagnosis and treatment of asthma.

Scientist Patrick McCann coupled a laser spectroscopy system to a tunable laser to create a device that accurately and simultaneously measures both carbon dioxide and nitric oxide levels in a single exhalation

of breath. The precise measurements provided by McCann’s instrument could help doctors evaluate airway inflammation and target medications to reduce inflammation and enable patients to breathe easier.

The device, which is undergoing clinical trials, promises more accurate diagnosis, which can lead to more effective treatment and reduce medical costs and lost productivity.

Chasing Storms

Sailplane pilot Bruce Miller guides the National Center for Atmospheric Research (NCAR)-operated Schweizer SGS 2-32 aircraft in search of storm electricity. NSF-funded researchers at NCAR are using the sailplane and other equipment to study and better predict events such as tropical cyclones, hurricanes, flash floods, tornadoes, and thunderstorms.

Zeroing In on Microbes

Although we live in the age of biotechnology, certain basic questions remain unanswered. For example, which microbes live in lakes and can they benefit humanity? In probing lakes in Wisconsin, researchers are discovering new organisms with as yet unknown traits and learning how microbe communities react to changes in their environment.

These discoveries could be invaluable, since microbes have provided us with important drugs like streptomycin (the first antibiotic to successfully treat tuberculosis), as well as the polymerase chain reaction, a technique critical for studying DNA.

According to Eric Triplett, a biologist at the University of Wisconsin–Madison, scientists understand very little about the bacteria that play a major role in lake processes such as nutrient and carbon cycling. Scientists would like to know how bacterial communities in lakes respond to changes in the environment, including water chemistry and weather. Recent changes in Earth’s climate and the invasion of exotic species such as the zebra mussel make this a very interesting time to study a lake’s microbial community.

Triplett’s research, which is part of the NSF Microbial Observatories program, involves studies of Crystal Bog and Crystal Lake in northern Wisconsin, and Lake Mendota in Madison. Water samples he and his colleagues have collected



“Discovery and innovation will be twin pillars of 21st century progress.”

Dr. Joseph Bordogna
Deputy Director

from these lakes contain dozens of new species of bacteria. Even over as short a period as a week, Triplett and his colleagues have observed significant changes in these microbe communities related to changes in their environment.

Preliminary findings show that water temperature plays a role in determining the structure of a bacterial community and that changes correspond to changes in other communities such as algae. Findings also suggest that geographic location and water chemistry lead to significant differences among the bacterial communities in specific lakes.

Panda Challenges



A panda walks through the China Research and Conservation Center for the Giant Panda in the Wolong Nature Reserve in Sichuan Province in southwest China. Pandas are rare in the wild; it is estimated that less than 1,000 of them live in China's shrinking and fragmented habitats. NSF-funded researchers like Jack Liu, assistant professor of fisheries and wildlife at Michigan State University, work in conjunction with the Chinese to better understand challenges to the pandas' habitat and the impact of human interaction on biodiverse areas such as Wolong.

Building Mountains

From volcanic eruptions to earthquakes to catastrophic mudslides, the geologic processes active in mountain belts affect people every day. However, even though mountains are found on every continent and in every ocean basin, scientists still understand relatively little about the forces that interact to form and destroy mountains, the ways they change over time, and the relationship between mountains and climate.

To better understand these dynamics, scientists are now integrating studies across traditional disciplines. In NSF-funded research on a mountain belt located in Fiordland, South Island, New Zealand, a team of scientists has demonstrated a new way to integrate results from observations collected in the field with laboratory and experimental techniques.

This integrated approach has allowed us to better understand the processes behind mountain building. In Fiordland, where rocks from early mountain-building are exposed at the Earth's surface, research has revealed the mechanisms by which magma was generated and transported through the lower

continental crust and the ways these processes affected the formation of mountains over millions of years.

Mountains are the surface expression of plate tectonic forces, which constitute the dynamic link between processes active in the deep Earth, processes that change Earth's surface, and the atmosphere that drives the hydrologic cycle and fosters life. Tectonic forces make our planet different from the others in the solar system. Towering mountain ranges such as the Himalayas exist because rock is uplifted so quickly that erosion cannot strip it away fast enough. Understanding tectonic forces is important, say geologists, because ultimately it will allow us to more accurately predict the Earth's behavior and prepare for natural disasters such as volcanoes and earthquakes.

Vivísimo Delivers Outstanding Results

Vivísimo—a meta-search engine with the potential to revolutionize the way we obtain information from the World Wide Web—was recently recognized by industry experts at Search Engine Watch for its outstanding performance in providing a single source for gathering results from many search engines.

The software that powers Vivísimo filters and automatically categorizes responses to search requests. Getting answers to broad, exploratory questions can leave searchers, especially searchers whose knowledge about a topic is limited, slogging through a morass of information. For example, searching for “Iraq” among the stories on any Web news source will result in a long list of articles on global politics. Searching the entire Web can produce a similar, mostly undifferentiated list of sites about Iraq.

Vivísimo's Clustering Engine does a quick statistical, linguistic, and knowledge-based analysis of the search results, which it then clusters into themes. For example, using Vivísimo to search news sites for “Iraq” might produce clusters of articles under categories such as “weapons inspectors” and “missiles.” Vivísimo thereby helps identify trends and fine-tune searches without requiring users to know the correct terminology.

Vivísimo is supported by NSF's Small Business Innovation Research (SBIR) program, which emphasizes high-risk, high-payback innovations that are tied to NSF's mission. All research and development proposals are evaluated on their technical merit, as well as their impact on technology. NSF was the first of 10 federal agencies required to reserve a portion of their research and development funds for the SBIR program.

Lighting Up the Nanoscale

Researchers at the University of Rochester, Portland State University, and Harvard University have recently created the highest resolution optical image ever, revealing structures as small as carbon nanotubes just a few billionths of an inch across.

This new technique, called near-field Raman microscopy, will shed light on previously inaccessible chemical and structural information in samples as small as the proteins in a cell's membrane. Other ultra-high-resolution imaging techniques, such as atomic force microscopes, detect the presence of objects and image them but cannot directly view the light bouncing off them.

Using this technique, researchers can determine a material's composition as well as its structure. The ultimate aim is to use light to gather information on the proteins on a membrane; such information opens the door to designer drugs that could kill harmful cells or repair damaged cells, or even identify strains of disease never imagined before.

To light up the nanoscale, scientists sharpen a gold wire to a point just a few billionths of an inch across. A laser then shines against the side of the gold tip, creating a tiny bubble of electromagnetic energy that interacts with the vibrations of the atoms in the sample. This interaction, called Raman scattering, releases packets of light that can be used to identify the chemical composition of the sample.

The NSF-funded researchers anticipate that they will soon be able to refine the system, which already has a resolution of 20 nanometers (billionths of a meter), to image proteins, which are only 5 to 20 nanometers wide, with eventual resolutions revealing much smaller molecules.

Tiny But Powerful

A team led by NSF-funded researcher Vincent Crespi, professor of physics and materials science and engineering at Pennsylvania State University, has simulated carbon nanotubes that are smaller and stronger than any other nanotube. Using supercomputers to model the electronic states and total energies of various carbon molecules, Crespi and his colleagues discovered a tetrahedral carbon atom that creates tight, stable bonds to form tiny tubes only six atoms across—the smallest diameter theoretically possible. Crespi believes that these tubes may prove very useful in a variety of nanotechnology applications.

Understanding Earthquakes

To improve our understanding of earthquakes and their effects on structures such as the Golden Gate Bridge, NSF is funding the development and operation of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES). This is a shared national network of experimental equipment sites and tools, a centralized data repository, and an archive of earthquake engineering simulation software, all linked together by ultra-high-speed Internet2 connections. When NEES becomes fully operational in 2004, these resources will provide the means for collaboration and discovery in the form of more advanced research based on experimentation and computational simulations of earthquakes and the way buildings, bridges, infrastructure, coastal regions, and geologic materials perform during seismic events.

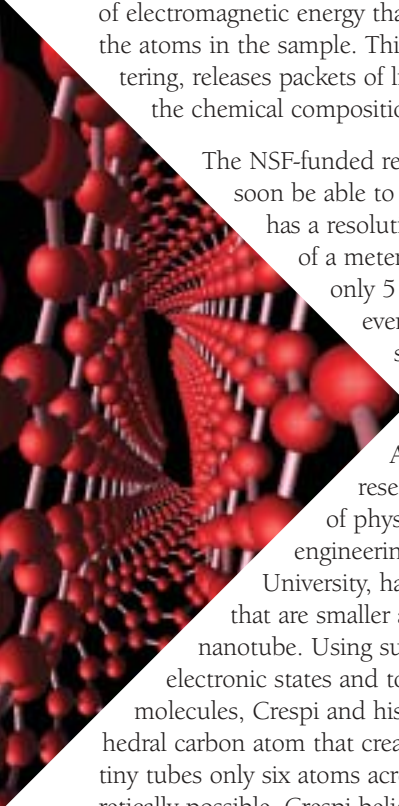
Finding the Abyss

Marine scientists are taking students and the general public deep into the Pacific Ocean as part of "Extreme 2002: Mission to the Abyss," a research expedition that doubles as a virtual field trip to hydrothermal vents at the bottom of the sea.

Led by University of Delaware marine biologist Craig Cary, the 23-member team sailed to the site along the East Pacific Rise, more than 1,000 miles west of Costa Rica. There, scientists used the submersible *Alvin* to descend nearly two miles to one of the most demanding environments on Earth. In addition to studying hydrothermal vents, researchers also studied the creatures that inhabit them, including the Pompeii worm, known as the world's hottest animal for its ability to withstand temperatures up to 176° Fahrenheit (80° Celsius).

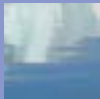
Participating in Extreme 2002 were 41,000 students from more than 500 schools, representing 49 states as well as countries such as England, South Africa, Canada, Australia, and New Zealand. Students were kept abreast of scientists' progress by video clips, photos, interviews, and journals relayed back to shore every day.

This project yielded more than new knowledge about extreme ocean environments. It also succeeded in getting students excited about science. Extreme 2002 may have created future scientists by introducing students to one of the most fascinating habitats on the planet and engaging them in the process of scientific research and discovery.





FINANCIAL HIGHLIGHTS



NSF funds studies in ice dynamics, paleoenvironments (deduced from ice cores), numerical modeling, glacial geology, and remote sensing.

NSF is a recognized leader in federal financial management. Since inception of the President's Management Agenda in 2001, NSF is the only federal agency to have successfully met the Administration's core criteria for a "green" financial performance rating (see page 7). NSF provides accurate and timely financial information to enhance management decisions. The Foundation uses a data warehousing environment to produce automated financial statements and close its books and maintains an integrated financial system that supports daily operations and meets all federal requirements.

As a federal agency, the Foundation prepares the following annual financial statements: Balance Sheet, Statement of Net Cost, Statement of Changes in Net Position, Statement of Budgetary Resources, and Statement of Financing. Supplementary statements are also prepared including Budgetary Resources by Major Budgetary Accounts, Intragovernmental Balances, Deferred Maintenance, and Stewardship Investments. The statement on Stewardship Investments is shown on page 21.

This chapter presents highlights of NSF's FY 2003 financial condition. A more detailed discussion of financial performance and a complete set of financial statements, accompanying notes and the audit opinion can be found in NSF's *FY 2003 Performance and Accountability Report*.

Audit Results. The Foundation is committed to providing quality financial management to all of our stakeholders. We honor that commitment by preparing annual financial statements in conformity with generally accepted U.S. accounting principles and then subjecting these statements to an independent audit to ensure their reliability in assessing NSF's performance. An unqualified audit opinion is a measure of the fair presentation of our financial statements; for the sixth consecutive year, NSF received an unqualified "clean" audit opinion in FY 2003.

Operating Results. The following table summarizes NSF's key workload and financial indicators. For fiscal years 1999 to 2003, NSF's programmatic expenses (budget obligations), administrative and management costs, competitive proposals, and competitive awards all increased, reflecting the increase in the budget. However, over this period, there has been only a small increase in NSF staff.

NSF Recent Trends, FY 1999 to FY 2003

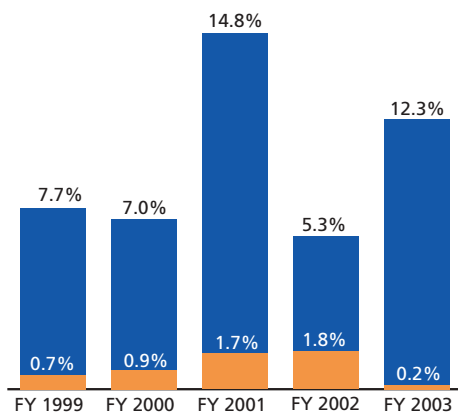
	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Change from FY 1999 to FY 2003
Budget Obligations (Millions of Dollars)	\$3,691	\$3,948	\$4,532	\$4,774	\$5,369	45%
Administration and Management (Millions of Dollars)	\$177	\$189	\$214	\$231	\$251	42%
Number of Employees (Full-Time Equivalent) ¹	1,189	1,200	1,220	1,242	1,244	5%
Number of Competitive Proposals	28,578	29,508	31,942	35,164	40,075	40%
Number of Competitive Awards	9,189	9,850	9,925	10,406	10,844	18%
Average Annual Research Grant Size	\$94,000	\$105,800	\$113,601	\$115,666	\$135,609	44%
Average Research Grant Duration (Years)	2.8	2.8	2.9	2.9	2.9	0.1
Total Assets (Millions of Dollars)	\$4,573	\$5,140	\$6,002	\$6,713	\$7,425	62%
Total Liabilities (Millions of Dollars)	\$332	\$380	\$415	\$366	\$380	14%
Net Position (Millions of Dollars)	\$4,241	\$4,760	\$5,587	\$6,347	\$7,045	66%

¹ Includes Office of Inspector General and National Science Board staff.

Budget and Staffing, FY 1999 to FY 2003

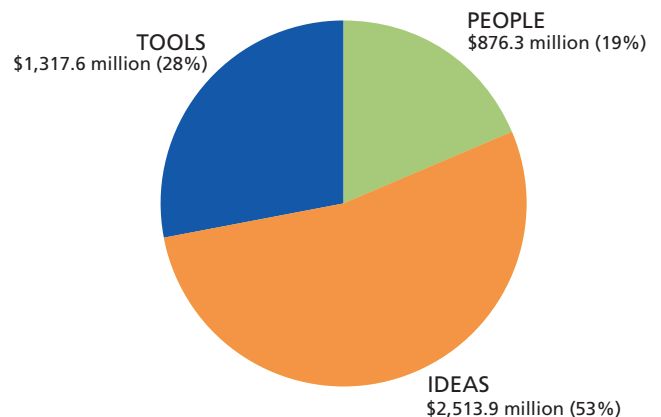
In the past five years, the growth in NSF's budget has significantly outpaced the growth in staffing.

■ % CHANGE IN BUDGET (obligations)
■ % CHANGE IN EMPLOYEES



NSF FY 2003 Net Program Cost—\$4.7 Billion

About 96% of costs are derived from direct support of program activities; the balance represents costs for staffing and support of the National Science Board and the Office of Inspector General.



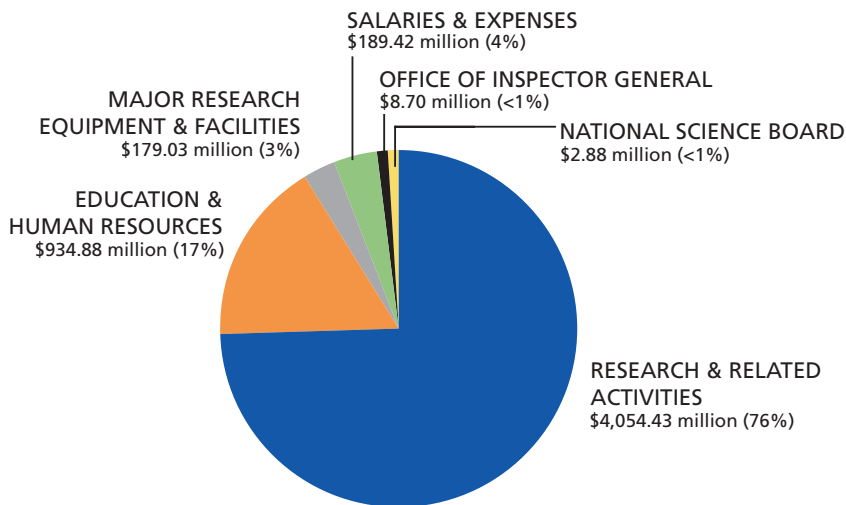
Funding and Net Costs. NSF is funded through six congressional appropriations, including Research and Related Activities; Major Research Equipment and Facilities Construction; Education and Human Resources; and Salaries and Expenses. A fifth appropriation funds the Office of Inspector General. In FY 2003, Congress authorized and provided a sixth appropriation to fund the National Science Board. Other revenue sources, such as reimbursable authority, transfers from other federal agencies, donations and H1-B Nonimmigrant Petitioner receipts account for a minor portion of NSF's budget.

NSF incurs costs from the programmatic activities in which it engages to accomplish its Strategic Outcome Goals of *People*, *Ideas*, and *Tools*. About 96 percent of costs derive from direct support of these activities. The balance of the costs incurred—about 4 percent—includes (staff) salaries and expenses and support for the activities of the National Science Board and the Office of Inspector General. As indicated in the chart on page 19, more than half of NSF's FY 2003 costs were incurred from activities associated with the *Ideas* goal, 28 percent from the *Tools* goal, and 19 percent from the *People* goal.

NSF BY THE NUMBERS	
\$5.37 billion	FY 2003 Budget (obligations)
4%	NSF share of total annual federal spending for research and development
22%	NSF share of federal funding for nonmedical basic research at academic institutions
40,000	Proposals evaluated in FY 2003 through a competitive process of merit review
11,000	New awards funded in FY 2003
54,000	Scientists and engineers who evaluate proposals for NSF each year
213,000	Proposal reviews done each year
39,000	Students supported by NSF Graduate Research Fellowships since 1952
200,000	People (researchers, postdoctoral fellows, trainees, students) NSF directly supports

NSF FY 2003 Budget by Appropriation Account—\$5.37 Billion
(Obligations in Millions of Dollars)

NSF is funded primarily through six congressional appropriations. Other revenue sources such as transfers from other agencies, donations, and H1-B receipts account for a minor portion of the Foundation's resources.



Note: Totals may not add because of rounding.

FINANCIAL HIGHLIGHTS

Stewardship Investments Research and Human Capital

(Thousands of Dollars)
(Unaudited)

	2003	2002	2001	2000	1999
Research and Human Capital Activities					
Basic Research	\$ 3,519,159	\$ 3,092,060	\$ 2,692,243	\$ 2,636,518	\$ 2,507,569
Applied Research	218,152	193,788	211,421	173,670	188,742
Education and Training	867,489	767,734	704,949	596,517	599,323
Non-Investing Activities	<u>196,363</u>	<u>183,887</u>	<u>170,757</u>	<u>162,021</u>	<u>143,980</u>
Total Research and Human Capital Activities	<u>\$ 4,801,163</u>	<u>\$ 4,237,469</u>	<u>\$ 3,779,370</u>	<u>\$ 3,568,726</u>	<u>\$ 3,439,614</u>
Inputs, Outputs, and/or Outcomes					
Research and Human Capital Activities					
<u>Investments in</u>					
Universities	\$ 3,310,365	\$ 2,919,897	\$ 2,631,405	\$ 2,470,300	\$ 2,385,492
Industry	178,000	185,062	162,176	160,573	154,555
Federal Agencies	144,792	106,458	125,823	132,790	150,959
Small Businesses	186,400	144,844	130,977	119,345	110,884
Federal Research and Development Centers and others	<u>981,606</u>	<u>881,208</u>	<u>728,989</u>	<u>685,718</u>	<u>637,724</u>
	<u>\$ 4,801,163</u>	<u>\$ 4,237,469</u>	<u>\$ 3,779,370</u>	<u>\$ 3,568,726</u>	<u>\$ 3,439,614</u>
Support to					
Scientists	\$ 427,304	\$ 394,144	\$ 355,261	\$ 359,228	\$ 350,841
Postdoctoral Programs	163,239	148,334	128,499	117,504	120,386
Graduate Students	<u>475,315</u>	<u>402,620</u>	<u>362,820</u>	<u>315,583</u>	<u>323,324</u>
	<u>\$ 1,065,858</u>	<u>\$ 945,098</u>	<u>\$ 846,580</u>	<u>\$ 792,315</u>	<u>\$ 794,551</u>
Outputs and Outcomes					
Number of					
Awards Actions	23,000	21,000	20,000	20,000	20,000
Senior Researchers	30,000	28,000	27,000	24,000	23,000
Other Professionals	12,000	11,000	10,000	8,000	9,000
Postdoctoral Associates	6,000	6,000	6,000	5,000	4,000
Graduate Students	27,000	26,000	25,000	22,000	20,000
Undergraduate Students	32,000	32,000	31,000	30,000	29,000
K-12 Students	14,000	11,000	11,000	12,000	12,000
K-12 Teachers	85,000	84,000	83,000	83,000	90,000

Statement of Stewardship Investments. This statement shows NSF's investments in research and education activities and primary output over the past five years. In FY 2003, NSF invested \$4.8 billion in research and human capital at universities, through industry, at other federal agencies, and at small businesses, as well as at Federal Research and Development Centers. NSF's FY 2003 portfolio included approximately 23,000 active awards that supported over 200,000 researchers, postdoctoral associates, teachers, and students from kindergarten to graduate school.

APPENDIXES



Galileo's Battle for the Heavens, produced for public television by WGBH Boston and funded by NSF, won a Emmy award for Outstanding Historical Programming.

Appendix 1

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 as well as external to the organism 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 Science and Engineering (CISE)** supports research on the foundations of computing and communications devices and their use, research on computing and networking technologies and software, and research to increase the capabilities of humans and machines to create, discover, and reason with knowledge by advancing the ability to represent, collect, store, organize, locate, visualize, and communicate information. CISE also supports the planning and operations of centers and facilities that provide national cyberinfrastructure supporting science and engineering research and education. CISE supports a range of education and workforce activities that complement these efforts.

The **Directorate for Education and Human Resources (EHR)** supports activities that promote excellence in U.S. science, technology, engineering, and mathematics (STEM) education at all levels and in all settings (both formal and informal). The goal of these

activities is to develop a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians, and educators, as well as a well-informed citizenry with access to the ideas and tools of science and engineering. Support is provided for individuals to pursue advanced study, for institutions to build their capacity to provide excellent STEM education, and for collaborations to strengthen STEM education at all levels by fostering partnerships among colleges, universities, school districts, and other institutions in the public and private sectors.

The **Directorate for Engineering (ENG)** supports research and education activities contributing to technological innovation 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 processes and methodologies that provide the underpinning to support them. Emerging technologies—nanotechnology, information technology, and biotechnology—comprise a major focus of 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 knowledge of Earth and our ability to predict natural phenomena of economic and human significance, such as climate change, weather, earthquakes, fluctuations in fish stock, 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 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 facilitates the Foundation's international activities by promoting partnerships between U.S. and foreign researchers, thereby enhancing access to critical research conducted outside the United States and increasing knowledge of mutually beneficial research opportunities abroad. SBE also supports science resources studies that constitute 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 the 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 human changes. OPP support provides unique research opportunities ranging from studies of Earth's ice and oceans to research in atmospheric sciences and astronomy.

The **Office of International Science and Engineering (OISE)** serves as the focal point, both inside and outside the Foundation, for international science and engineering activities and manages international programs that are innovative, catalytic, and responsive to its broad range of interests. OISE supports international collaborative research that provides U.S. scientists and engineers with access to the world's top researchers, institutions, and facilities. It also supports several programs that provide international research experiences to students and young investigators, preparing them for full participation in the global research enterprise.

The **Office of Budget, Finance, and Award Management (BFA)** is headed by the Chief Financial Officer, who is responsible 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. The Foundation has been acknowledged as a leader in federal research administration, particularly for 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 logistical support functions to the Foundation's community of scientists, engineers, and educators, as well as to the general public. OIRM is responsible for staffing and service requirements for personnel, including visiting scientists; the physical infrastructure; the dissemination of program information from NSF to the external community; and the administration of the sophisticated technological infrastructure that provides the hardware, software, and support systems to manage the Foundation's grant-making process and to maintain advanced financial and accounting systems.

Appendix 2

EXECUTIVE STAFF AND OFFICERS

Executive Staff

Office of the Director

Rita R. Colwell, Director
Joseph Bordogna, Deputy Director

National Science Board

Warren M. Washington, Chair
Michael P. Crosby, Executive Officer

Office of Equal Opportunity Programs

Ana A. Ortiz, Program Manager

Office of the General Counsel

Lawrence Rudolph, General Counsel

Office of 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 Science and Engineering

Peter A. Freeman, Assistant Director

Directorate for Education and Human Resources

Judith A. Ramaley, Assistant Director

Directorate for Engineering

John A. Brighton, 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

Anthony A. Arnolie, Director

Officers

Chief Financial Officer

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

Chief Information Officer

George Strawn
(Office of Information and Resource Management)

Affirmative Action Officer

Ana A. Ortiz
(Office of Equal Opportunity Programs)

Appendix 3

NATIONAL SCIENCE BOARD FY 2003

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

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

Diana S. Natalicio (Vice Chair)
President
University of Texas—El Paso

Barry C. Barish
Linde Professor of Physics
California Institute of Technology

Ray Bowen
Former President
Texas A&M University

Delores M. Etter
Professor, Electrical Engineering
U. S. Naval Academy

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

Pamela A. Ferguson
Professor of Mathematics
Former President
Grinnell College

Kenneth M. Ford
Director
Institute for Human and Machine Cognition
University of West Florida

Daniel E. Hastings
Associate Director
Engineering Systems Division
Massachusetts Institute of Technology

Elizabeth Hoffman
President
University of Colorado System

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.

Douglas D. Randall
Professor of Biochemistry
Director, Interdisciplinary Program on
Plant Biochemistry—Physiology
University of Missouri

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

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

JoAnne Vasquez
Past President, National Science
Teachers' Association
Consultant, McGraw-Hill Companies

John A. White, Jr.
Chancellor
University of Arkansas—Fayetteville

Mark S. Wrighton
Chancellor
Washington University

Rita R. Colwell (*member ex officio*)
Director
National Science Foundation

Michael P. Crosby¹
Executive Officer
National Science Board

Gerard R. Glaser
Acting Executive Officer
National Science Board

¹ From July 28, 2003

Photo Credits and Captions



Bioglyph

Turning on the lights reveals the secret behind the bioglyphs painting depicted here: Petri dishes coated with agar support colonies of bioluminescent bacteria. This piece was created by Angela Bowlds, a student at the Montana State University-Bozeman (MSU) School of Art. Bioglyphs—an exhibition of living bioluminescent paintings—brings science and art together in a collaborative project involving art students from the MSU School of Art and science and engineering students from the MSU Center for Biofilm Engineering, which was established in 1990 as an NSF Engineering Research Center to foster a new approach to university engineering and science education.

©2002 MSU-Bozeman Bioglyphs Project



Mongolian Frost Rings

Dee Breger's colorized scanning electron micrograph of cored tree rings from a Siberian pine in Mongolia won first place in the photography category of the NSF-*Science* Magazine 2003 Science and Engineering Visualization Challenge. The image spans the years 534-539 C.E, in which the central narrow, deformed rings corresponding to 536 and 537 graphically represent a catastrophic summer cooling in the Northern Hemisphere that froze sap in the tree's cells. This abrupt climate change has been attributed to a massive eruption of the volcanic precursor to Krakatoa, a cosmic impact, or possibly both.

Sample courtesy of Gordon Jacoby, Lamont-Doherty Earth Observatory
Dee Breger, Lamont-Doherty Earth Observatory



Owl Nebula

NSF-funded astronomers have assembled the first effective model for both the shape and evolutionary history of the Owl Nebula, the well-known planetary nebula in the Ursa Major constellation. Named for its ghostly similarity to an owl's face, the nebula boasts a faint outer halo, a circular middle shell, and a roughly elliptical inner shell. Using observations made with the William Herschel Telescope in La Palma, Spain, and the 0.6-meter Burrell Schmidt telescope at Kitt Peak National Observatory, researchers concluded that the halo was formed when the parent star first lost significant mass after fusion ceased in its core.

Karen Kwitter, Williams College; Ron Downes, STScI; You-Hua Chu, University of Illinois; the National Optical Astronomy Observatory, the Association of Universities for Research in Astronomy, and NSF



Antarctic Iceberg

Icebergs such as this one near the Antarctic Peninsula are being studied in research supported by NSF's Antarctic Glaciology Program. The program is concerned with the history and dynamics of the antarctic ice sheets, including near-surface snow and firn, floating ice shelves, glaciers, ice streams, and continental and marine ice sheets. NSF funds studies in ice dynamics, paleoenvironments (deduced from ice cores), numerical modeling, glacial geology, and remote sensing.

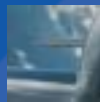
Jeffrey Kietzmann, National Science Foundation



Galileo and the Life of the Brain

At the 24th Annual News and Documentary Emmy Awards in September 2003, two NSF-funded television programs were awarded Emmys by the National Television Academy. WGBH Boston's *Galileo's Battle for the Heavens* was selected for one of two Emmys given for Outstanding Historical Programming. Thirteen/WNET New York's five-part series, *The Secret Life of the Brain*, also funded by NSF, was chosen as best program in the Outstanding Science, Technology, and Nature Programming category. Both programs succeeded in telling unique scientific stories that would otherwise have taken volumes of text and years of study to understand.

Galileo Project at Rice University
(http://es.rice.edu/ES/humsoc/Galileo/Villa/galileo_pictures.html)



Stormchasers Sail Plane

Sailplane pilot Bruce Miller guides the National Center for Atmospheric Research (NCAR)-operated Schweizer SGS 2-32 aircraft in search of storm electricity. NSF-funded researchers at NCAR are using the sailplane and other equipment to study and better predict events such as tropical cyclones, hurricanes, flash floods, tornadoes, and thunderstorms.

Photo courtesy of MacGillivray Freeman Films and NOVA/WGBH Boston



Giant Panda

A panda walks through the China Research and Conservation Center for the Giant Panda in the Wolong Nature Reserve in Sichuan Province in southwest China. Pandas are rare in the wild; it is estimated that less than 1,000 of them live in China's shrinking and fragmented habitats. NSF-funded researchers like Jack Liu, assistant professor of fisheries and wildlife at Michigan State University, work in conjunction with the Chinese to better understand challenges to the pandas' habitat and the impact of human interaction on biodiverse areas such as Wolong.

Sue Nichols, Michigan State University



Flattened Carbon Nanotube

A team led by NSF-funded researcher Vincent Crespi, professor of physics and materials science and engineering at Pennsylvania State University, has simulated carbon nanotubes that are smaller and stronger than any other nanotube. Using supercomputers to model the electronic states and total energies of various carbon molecules, Crespi and his colleagues discovered a tetrahedral carbon atom that creates tight, stable bonds to form tiny tubes only six atoms across—the smallest diameter theoretically possible. Crespi believes that these tubes may prove very useful in a variety of nanotechnology applications.

Vincent H. Crespi, Pennsylvania State University



Golden Gate Bridge

To improve our understanding of earthquakes and their effects on structures such as the Golden Gate Bridge, NSF is funding the development and operation of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES). This is a shared national network of experimental equipment sites and tools, a centralized data repository, and an archive of earthquake engineering simulation software, all linked together by ultra-high-speed Internet2 connections. When NEES becomes fully operational in October 2004, these resources will provide the means for collaboration and discovery in the form of more advanced research based on experimentation and computational simulations of earthquakes and the way buildings, bridges, infrastructure, coastal regions, and geologic materials perform during seismic events.

National Information Service for Earthquake Engineering, William Godden
Structural Engineering Slide Library

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-04-011