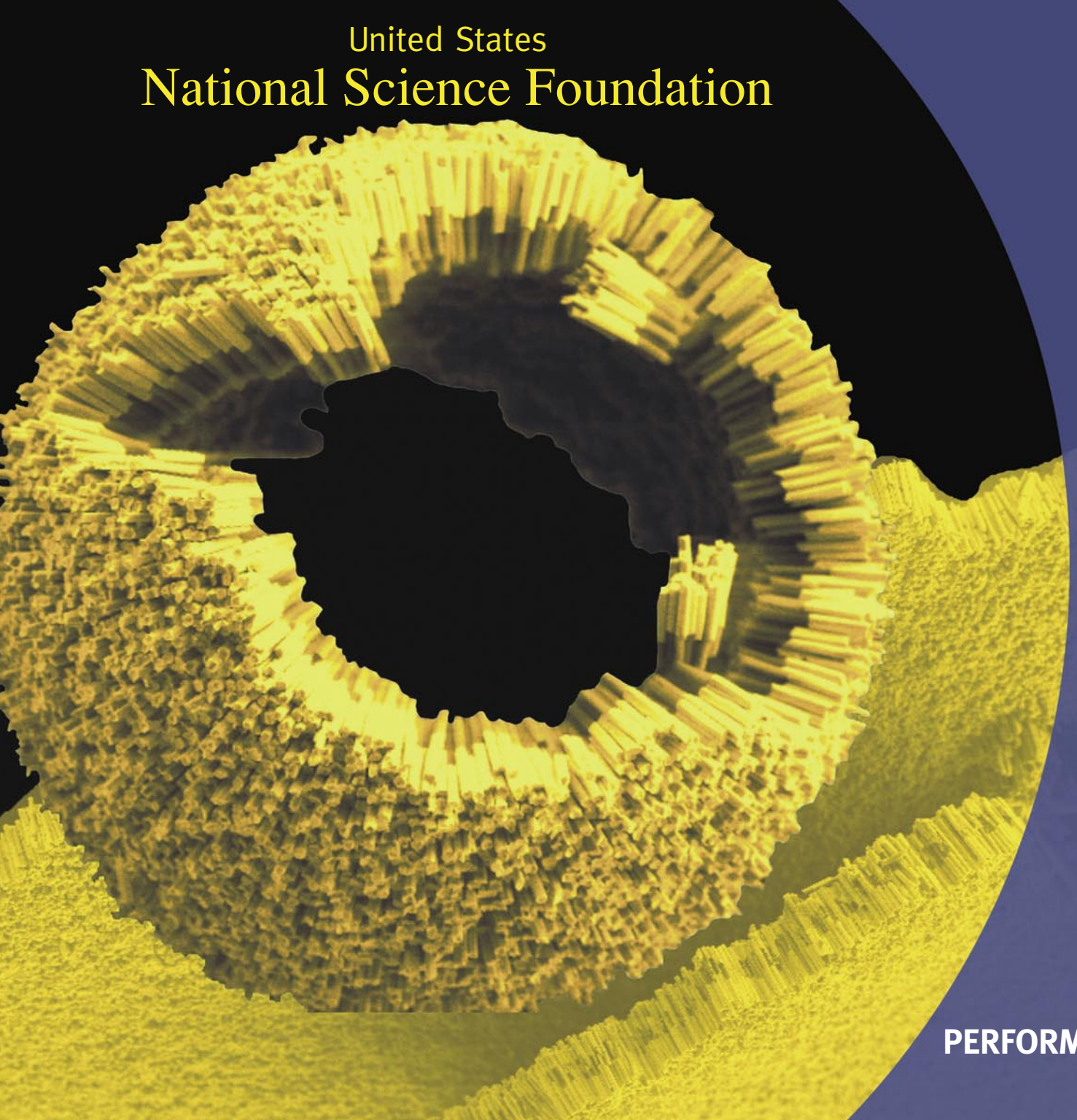
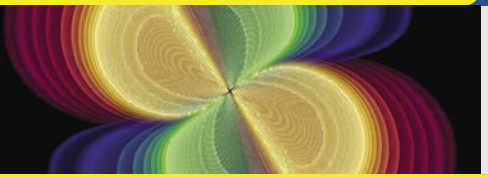
United States
National Science Foundation



FY 2004
PERFORMANCE HIGHLIGHTS



Gravitational Field from In-spiralling Black Holes
This simulation of orbiting black holes was created on the Itanium Linux Cluster supercomputer at the National Center for Supercomputing Applications (NCSA) at the University of Illinois, Champaign–Urbana. The ripples shown are known as gravitational waves, which result from the merging of two black holes. NCSA, which receives major support from the National Science Foundation, has an international reputation for high-performance computing, networking, storage, and data mining. It is the recognized leader in developing innovative systems and software for science and engineering.
Credit: Edward Seidel, Albert Einstein Institute (AEI); Max Planck Institute for Gravitational Physics; Visualization: Werner Benger, Zse Institute Berlin and AEI

On the Cover: This image depicts the self-assembly of gold-polymer nanorods into a curved structure. National Science Foundation (NSF)–supported research by Chad Mirkin at Northwestern University has generated nanostructures with the ability to curve. These are the first nanostructures to exhibit this ability—a critical requirement for the utility of nanomaterials in further applications including drug-delivery systems, nanoscale electronics, catalysts, and light-harvesting materials. NSF is the lead agency for the National Nanotechnology Initiative, a multi-agency network working to bolster nanotechnology and ensure U.S. dominance in this emerging field. Strong research efforts are critical to capitalize on nanotechnology's potential to revolutionize science and engineering and to harness all that it offers.
Credit: Chad Mirkin, Northwestern University

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.

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NSF URLs included in this report reference the new NSF website which is scheduled to go online by the end of January 2005.

Gold-ion Burst
This image shows a shower of particles from a gold-ion collision in the STAR (Solenoidal Tracker at RHIC) detector at the U.S. Department of Energy's (DOE's) Brookhaven National Laboratory. Scientists there have begun detecting head-on collisions between gold nuclei in the Relativistic Heavy Ion Collider (RHIC), the world's newest and biggest particle accelerator for studying in nuclear physics. The collider aims to re-create the conditions of the early universe to gain insights into the fundamental nature of matter and extend the boundaries of scientific understanding. STAR specializes in tracking the thousands of particles produced by each ion collision at RHIC. Scientists funded by the National Science Foundation and DOE will use data collected during the collisions to explore the particles known as quarks and gluons, which make up protons and neutrons. The high temperatures and densities achieved in the collisions should, for a fleeting moment, allow the quarks and gluons to exist "freely" in a soup-like plasma, a state of matter that is believed to have last existed millionths of a second after the Big Bang, when the universe first formed.
Credit: Brookhaven National Laboratory/RHIC–STAR

FROM THE DIRECTOR

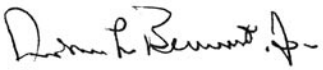
I am pleased to have this opportunity to present the National Science Foundation's (NSF's) *Performance Highlights* for fiscal year (FY) 2004. My first 10 months here at the Foundation have confirmed my prior impressions and what I think you, too, will conclude from reading this report: NSF is a well-managed and effective organization with an outstanding staff dedicated to ensuring that America's future is secure and prosperous.

NSF's "business" is fundamental research and education. By their very nature, these are long-term investments. The pay-offs from these investments do not become apparent for years and often decades. Yet we are certain of their outcome. Advances in science and engineering—such as development of the next generation of medical devices that incorporate nanoscale engineering and technology, the development of new sensors and filters that will protect buildings against chemical attack, supercomputing systems with the capability to process trillions of calculations per second—are critical for securing the homeland, sustaining economic prosperity, and advancing the quality of life for society as a whole.

FY 2004 was a busy and productive year for the agency. A record 43,817 proposals were received, and nearly 10,400 awards were made. The agency successfully achieved 27 of 30 performance goals, again exceeding its principal customer service goal of informing at least 70 percent of applicants about funding decisions within 6 months. Underlying the Foundation's programmatic achievements is NSF's commitment to organizational excellence and sound financial management. For the seventh consecutive year, NSF has received an unqualified audit opinion on its financial statements.

NSF's ongoing achievements were underscored by a number of noteworthy commendations, including the President's Quality Award for Management Excellence for exemplary performance in implementing the President's Management Agenda initiative to expand electronic government. Perhaps the most notable recognition was NSF's receiving the second highest ranking among all federal agencies on the list of "Best Place to Work" in the government. This was based on the first-ever government-wide survey of federal employees by the Office of Personnel Management—and it clearly reflects the commitment and innovation that define both the staff and the management at NSF.

Thank you for your interest in the Foundation. I invite you to visit our website (www.nsf.gov) to learn about the latest discoveries in fundamental science and engineering.



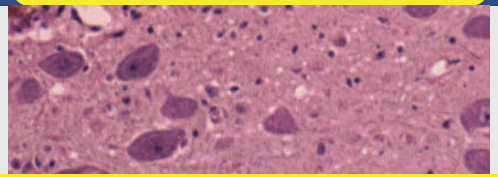
Arden L. Bement, Jr.
December 2004

"The fundamental building blocks produced by federally funded scientists, engineers, mathematicians, and technology gurus improve lives and address national challenges. They contribute to economic growth, measures to fight terrorism, energy-efficient manufacturing, environmental strategies, and medical therapies."

Arden L. Bement, Jr.
Director

For more information:

NSF Director: http://www.nsf.gov/news/news_summ.jsp?cntn_id=100560&org=NSF&from=news



Chronic Wasting Disease in Mule Deer
This photograph shows tissue from the brain of a healthy mule deer. It does not show lesions from chronic wasting disease (CWD), a group of infectious diseases caused by transmissible proteins called prions. Prion proteins accumulate in the brain of affected individuals, causing neural degeneration and, inevitably, death. Similar diseases include scrapie in sheep and goats, bovine spongiform encephalopathy in cattle ("mad cow disease"), and Creutzfeldt-Jacob disease in humans. CWD poses a potentially major threat to members of the deer family throughout Western North America, and although current evidence suggests that the transmission of CWD to people is unlikely, this possibility cannot be ruled out. The only place in the world where these infectious diseases are known to occur in free-ranging wildlife is in northeastern Colorado and southeastern Wyoming, where an epidemic of CWD has been ongoing in populations of mule deer and elk for at least two decades. In their National Science Foundation–supported research, researchers from Colorado State University are studying the CWD epidemic to learn how the disease is transmitted and whether it can be transmitted from animal residues that accumulate in the environment. These scientists hope to develop mathematical models that will predict the spread of the disease and evaluate ways to contain it.
Credit: Elizabeth Williams, Colorado State University

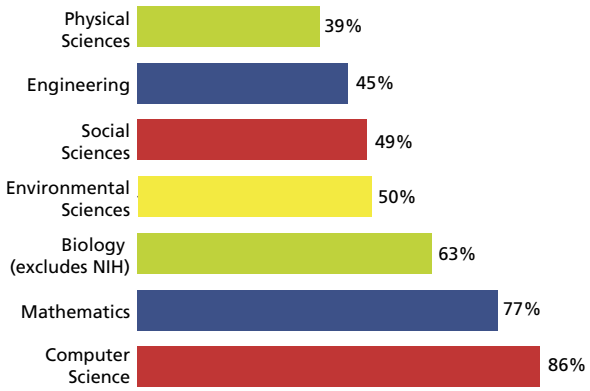
INVESTING IN THE FUTURE

The National Science Foundation (NSF) is the steward of America's science and engineering enterprise. Its mission is to promote and advance the progress of research and education in science and engineering in the United States. While the agency's $5.65 billion budget accounts for only 4 percent of the total federal investment in research and development, NSF provides half of the federal support for nonmedical basic research at the nation's academic institutions. In many fields, including computer science, mathematics, and the environmental sciences, NSF is the primary source of federal funding at America's colleges and universities.

NSF is often called "America's investment in the future." During its 54-year history, NSF has had a transformative effect on the nation's overall capability in science, engineering, and technology. Discoveries and innovations emerging from NSF-supported activities have contributed directly to U.S. productivity and competitiveness in the global marketplace, helping to sustain the high quality of life we enjoy while at the same time promoting sound environmental stewardship. NSF investments over the years have also advanced math and science education at all levels. The agency has supported generations of outstanding researchers and educators, including more than 150 of the U.S. and U.S.-based recipients of the Nobel Prize.

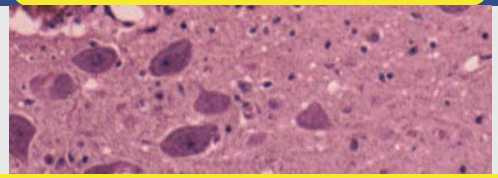
Moreover, not since World War II have advances in science and technology been more critical for ensuring our national security and combating terrorism at home and abroad. A host of advances are helping to increase safety and security. New technologies now monitor and protect the food supply against intentional contamination; new sensors and filters protect buildings against chemical attack; new techniques sniff out biological infections before symptoms appear; and improved security architectures and cryptographic techniques are adding new levels of protection to the nation's critical infrastructure, from telecommunication systems to water supplies.

NSF Support as a Percentage of Total Federal Support of Academic Basic Research in Selected Fields



For more information:

America's Investment in the Future: NSF Celebrating 50 Years: http://www.nsf.gov/about/history/nsf0050/index.jsp



People. Ideas. Tools. Organizational Excellence.

To achieve its mission to promote the progress of science and engineering, NSF invests in four strategic areas: People, Ideas, Tools, and Organizational Excellence.

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

Ideas: Investments in ideas are aimed at the frontiers of science and engineering to ensure that America maintains its global leadership. These investments 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 add unique value to research and are accessible and widely shared among researchers across the nation.

Organizational Excellence: Excellence in management underpins all NSF activities. The Foundation strives to maintain an agile, innovative organization that fulfills its mission through leadership in core business processes such as financial management and electronic government with a results-oriented workforce that operates in a continuous learning environment.

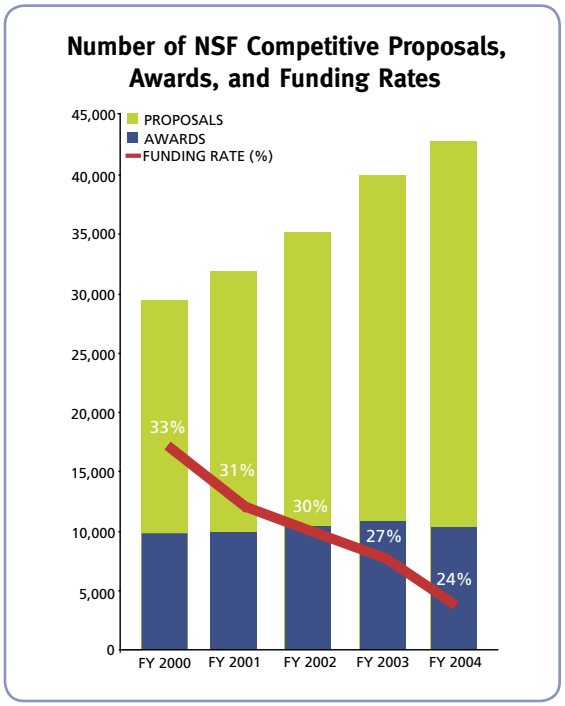
Estimated Number of People Involved in NSF Activities in fiscal year (FY) 2004	
Senior Researchers	31,000
Other Professionals	15,000
Postdoctoral Associates	6,000
Graduate Students	29,000
Undergraduate Students	35,000
K–12 Students	14,000
K–12 Teachers	86,000
TOTAL	216,000

A Catalyst for Innovation

NSF has a broad impact on the nation's science and engineering enterprise. Its role in discovery, learning, and innovation is that of a catalyst, seeking out and funding the best ideas and the most capable people and making it possible for them to pursue new knowledge, discoveries, and innovation. The agency does not itself conduct research and operates only those laboratories or facilities associated with the U.S. Antarctic Program. In fiscal year (FY) 2004, NSF received a record 43,817 proposals and funded 10,380 new awards to nearly 2,000 colleges, universities, and other public institutions throughout the country.

About 90 percent of NSF funding is allocated through a merit-based competitive process that is critical to fostering the highest standards of excellence. NSF's merit review is recognized throughout the federal government and by other nations as the gold standard of public investments in learning and discovery. Each year, about 50,000 members of the science and engineering research and education community volunteer their time to serve as external reviewers and help 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 impact—how well it promotes teaching, training, and learning and what the potential benefit to society is.

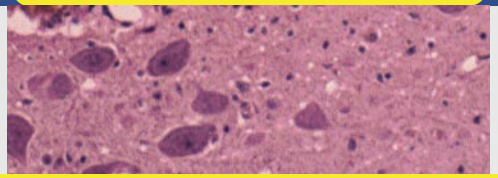
Reviewers also consider how well the proposed activity fosters the integration of research and education and attracts a diverse set of participants, particularly those from underrepresented groups.



In the past 5 years, proposals have increased at an average annual rate of over 10 percent.

For more information:

Merit Review: www.nsf.gov/nsb/documents/2004/MRreport_2003_final.pdf



Commitment to Excellence

NSF is recognized as a well-managed agency with a long record of success in leveraging its agile and motivated workforce, its management processes, and its technological resources to enhance productivity and effectiveness. 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 Office of Management and Budget (OMB) to track agencies' progress in meeting specific criteria for each of the initiatives that constitute the PMA.

NSF is the only agency to have achieved a "green" successful rating for financial performance for 4 consecutive years and a "green" successful rating for electronic government for 3 consecutive years. In FY 2004, NSF progressed to "yellow" status on the Human Capital Initiative. Efforts currently under way will facilitate achievement of both the Human Capital and Budget and Performance Integration Initiatives in FY 2005.

Looking ahead, the agency faces budgetary and workload challenges. Historically, administrative overhead has accounted for only about 5 percent of the agency's total budget. NSF recognizes that modest increases will likely be necessary, given the dramatic increase in its workload. In the past 4 years, the number of proposals submitted to NSF has increased at an average annual rate of over 10 percent. In addition to this increase, the complexity of the task has grown significantly with the rise in multidisciplinary, collaborative projects and international activities, as well as new investments in major research facility projects and the continuing need for increased accountability and transparency.

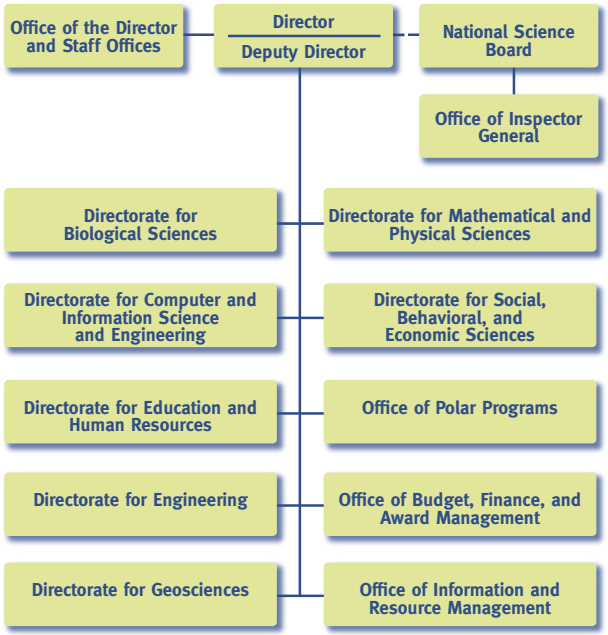
President's Management Agenda Scorecard	Baseline 9/30/2001	Status 9/30/2002	Status 9/30/2003	Status 9/30/2004
Strategic Management of Human Capital	Red	Red	Red	Yellow
Competitive Sourcing	Red	Red	Red	Red
Improving Financial Performance	Green	Green	Green	Green
Expanded Electronic Government	Yellow	Green	Green	Green
Budget and Performance Integration	Red	Red	Yellow	Yellow

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.

To better prepare and position itself to meet these challenges, NSF, in partnership with an external management consultant firm, is engaged in a multiyear comprehensive Business Analysis to examine its core business processes, human capital management, and information technology (IT) architecture. The Business Analysis focuses on the needs and opportunities that will help guide NSF's long-term investments in administration and management.

In FY 2004, the Business Analysis team completed a number of major projects, including assessments of external merit review practices and award management and oversight (AM&O) practices in both government and private industry; improvements to core merit review and AM&O processes; an agency-wide workload analysis; a plan to streamline human resource management; an examination of change management processes, with a particular emphasis on technology implementation; a Technology Governance Framework; and a long-term IT implementation plan.

FY 2004 Organization Chart

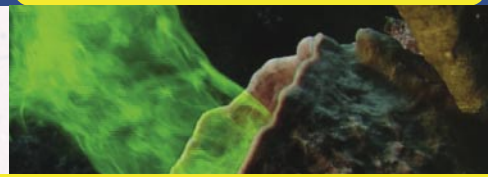


The National Science Foundation is headed by a Director who is appointed by the President and confirmed by the U.S. Senate. A description of each directorate and management office and a listing of NSF's executive staff and officers can be found in Appendixes 1 and 2, respectively. A 24-member National Science Board (NSB) oversees the policies and programs of the Foundation. The Board is appointed by the President with the consent of the Senate and consists of prominent members of the science, mathematics, engineering, and education communities. The NSB also serves the President and Congress as an independent advisory body on policies related to the U.S. science and engineering enterprise. A listing of the NSB members for FY 2004 can be found in Appendix 3.

For more information:

Administration and Management Strategic Plan: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf03012

President's Management Agenda: www.results.gov/agenda/scorecard.html



Pumping Sea Sponge
A sea sponge extracts water from the ocean. Though often mistaken for plants, sea sponges are in fact dynamic, industrious animals that pump thousands of liters of water through their bodies in a single day. Found in the tropical waters of Indonesia, these simple creatures are believed to possess the genetic blueprint that led to all of the animal kingdom.
Credit: Sea Studios Foundation

PERFORMANCE RESULTS

NSF's leadership in advancing the frontiers of science and engineering research and education is demonstrated, in part, through internal and external performance assessments. The results of our performance assessment process provide our stakeholders and the American taxpayer with vital information about our return on these investments.

The Government Performance and Results Act of 1993 (GPRA) requires federal agencies to develop a strategic plan, establish annual performance goals, and report on the progress made toward achieving these annual performance goals. Performance assessment at NSF is guided by GPRA and NSF's *FY 2003–2008 Strategic Plan*. For FY 2004, the Strategic Plan established a new programmatic framework and goal structure, which are depicted in the Goal Structure chart on page 13.

NSF has four overarching Strategic Outcome Goals—People, Ideas, Tools, and Organizational Excellence—and a set of programmatic objectives. The People, Ideas, and Tools goals are aligned with a set of "investment categories." The Organizational Excellence Goal focuses on NSF's administrative and management activities and the PMA initiatives (see page 8).

Every NSF program activity is associated with an investment category. Together with NSF's priority areas, the investment categories constitute the set of programs that are evaluated by the Program Assessment Rating Tool (PART).

PART is a systematic method for assessing program performance developed by OMB in 2002. Every year, about 20 percent of an agency's programs must undergo PART review. In FY 2004, OMB reported on four NSF programs: Facilities, Individuals, Informational Technology Research, and Nanoscale Science and Engineering. All received the highest possible overall rating of "Effective." Of the 399 federal government programs that underwent PART evaluation during the summer of 2003, only 11 percent were rated "Effective."

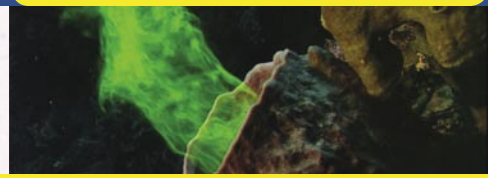
Assessing Performance

As with all basic research, outcomes of NSF investments can be unpredictable. Research results can take years to emerge. Because of that unpredictability, NSF has developed an alternative OMB-approved assessment process based on external expert evaluation. The academic research community has used external expert evaluation for many years. NSF itself has used external expert panels for decades and, over time, has developed a comprehensive process for conducting external evaluations.

NSF has integrated the GPRA and PART processes with its long-standing external expert evaluation process, through Advisory Committees (ACs) and Committees of Visitors (COVs). NSF relies on the judgment of these external experts to maintain high standards of program management, to provide advice for continuous improvement of performance, and to ensure openness to the

For more information:

- *FY 2003–2008 Strategic Plan*: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf04201
- *FY 2004 Performance and Accountability Report*: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0501
- *Performance Assessment:* http://www.nsf.gov/about/performance/
- *Committees of Visitors:* http://www.nsf.gov/od/oia/activities/cov/
- *Advisory Committee for GPRA Performance Assessment:* www.nsf.gov/about/performance/acgpa/
- *Priority Areas:* http://www.nsf.gov/news/priority_areas/
- *PART:* http://www.whitehouse.gov/omb/part/ and http://www.whitehouse.gov/omb/budget/fy2005/part.html



research and education community served by the Foundation.

COVs are responsible for evaluating one-third of NSF programs each year. OMB and the White House Office of Science and Technology Policy also established the Research and Development (R&D) Investment Criteria for federal research agencies. COV reports address many aspects of the administration's R&D Investment Criteria and serve as important input for the Advisory Committee for GPRA Performance Assessment (AC/GPA), which is responsible for conducting an annual evaluation of NSF's Strategic Outcome Goals. In addition, COV reports provide critical information for evaluation of NSF's PART programs.

NSF's program assessment process is depicted in the chart on page 14.

FY 2004 Performance Scorecard

For FY 2004, NSF's performance goals fall into two broad areas: Strategic Outcome Goals and Other Performance Goals.

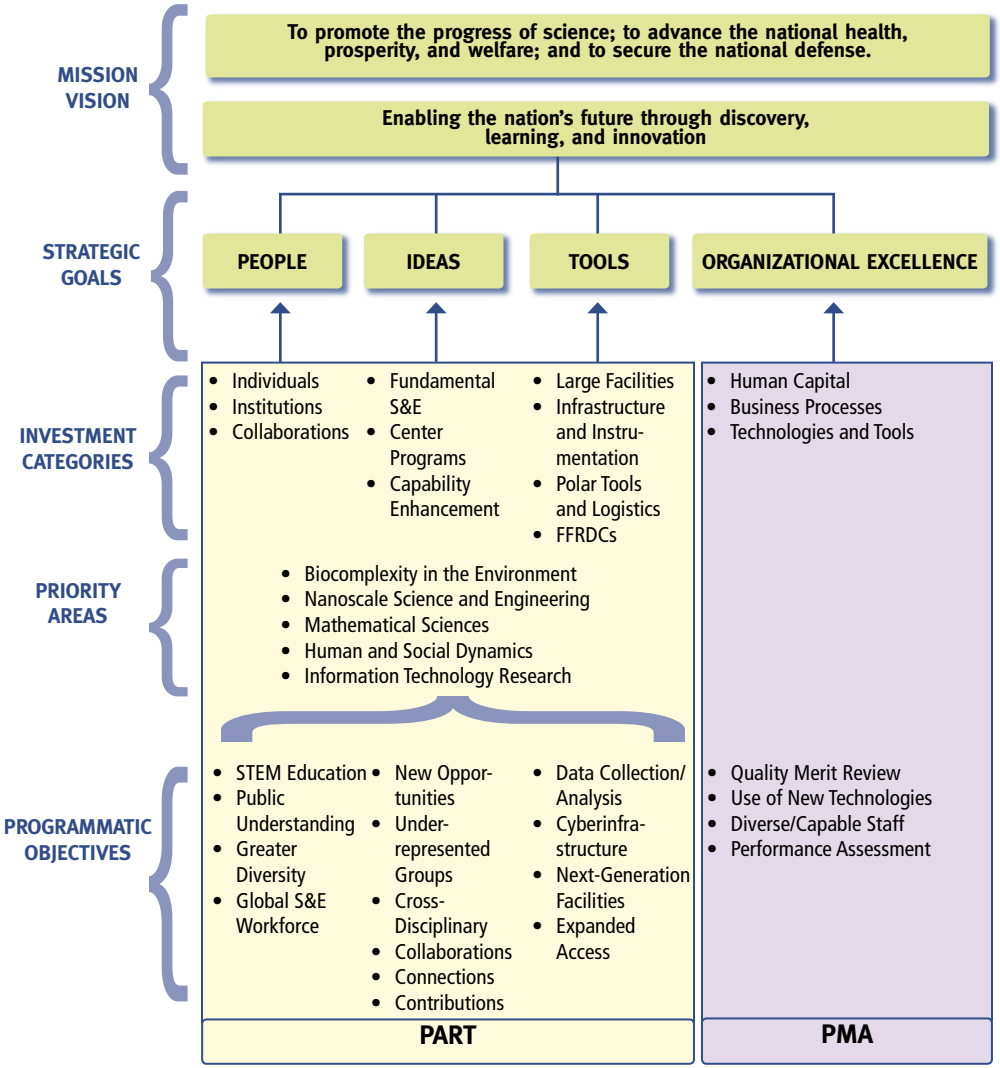
- **Strategic Outcome Goals** focus on the long-term results of NSF grants and programs. They represent what the Foundation seeks to accomplish with its investments in science and engineering research and education. The results from NSF awards illustrate the success of the Foundation's investments. In a transparent public process, the AC/GPA uses input from grantee project reports, COV reports, and highlights from NSF-funded research to assess the Foundation's annual progress toward achieving each of the long-term Strategic Outcome Goals.
- **Other Performance Goals** consist of the performance measures included in NSF's PART evaluations, as well as goals that address award size, award duration, and time-to-decision, NSF's primary customer service indicator.

In FY 2004, NSF achieved 27 of 30 performance goals (90 percent), including all four Strategic Outcome Goals. A listing of NSF's FY 2004 performance goals and results begins on page 15. For a more comprehensive discussion, see NSF's *FY 2004 Performance and Accountability Report*.

FY 2000 to FY 2004 Performance Results: Number of Goals Achieved

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Strategic Outcome Goals	6 of 8 (75%)	4 of 5 (80%)	4 of 4 (100%)	4 of 4 (100%)	4 of 4 (100%)
Other Performance Goals	12 of 20 (60%)	11 of 18 (61%)	14 of 19 (74%)	10 of 16 (63%)	23 of 26 (88%)
TOTAL	18 of 28 (64%)	15 of 23 (65%)	18 of 23 (78%)	14 of 20 (70%)	27 of 30 (90%)

GPRA Goal Structure



Abbreviations/Acronyms:

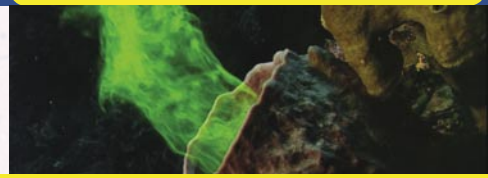
S&E: Science and Engineering

FFRDCs: Federally Funded Research and Development Centers

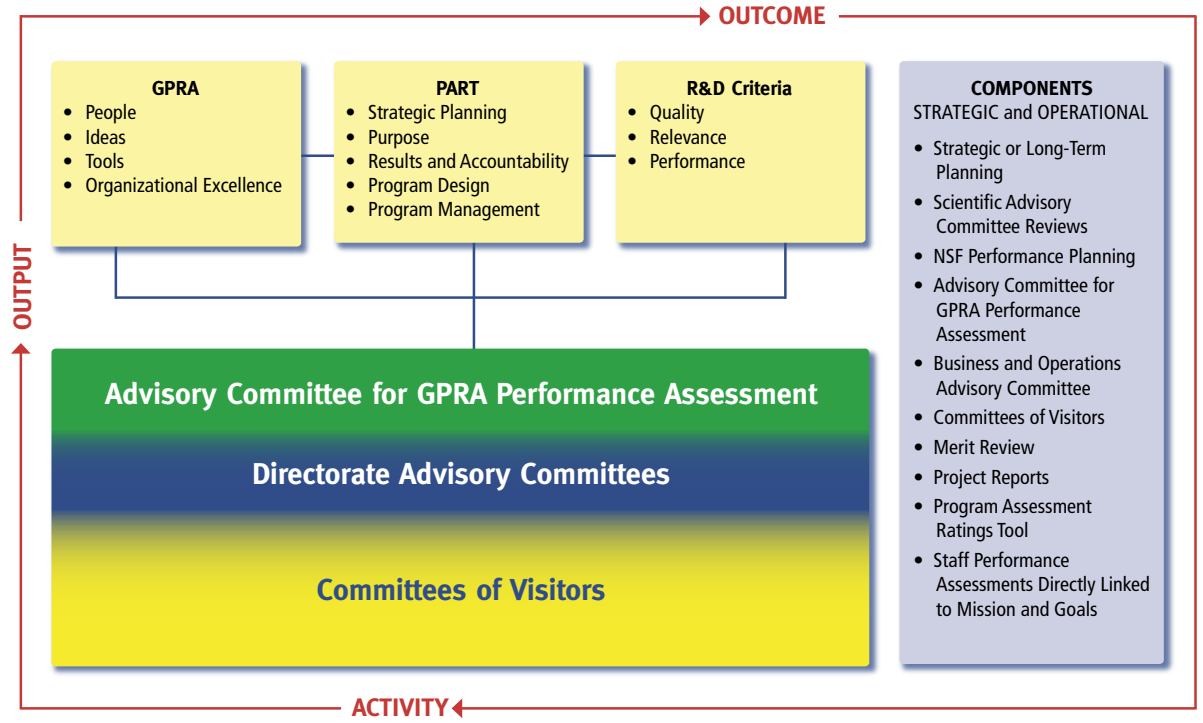
STEM: Science, Technology, Engineering, and Mathematics

PART: Program Assessment Rating Tool

PMA: President's Management Agenda



Performance Assessment Process



GPRA: The Government Performance and Results Act of 1993

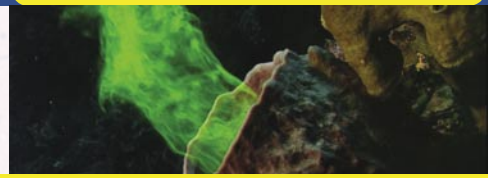
PART: Program Assessment Rating Tool

R&D: Research and Development

FY 2004 PERFORMANCE GOALS AND RESULTS

PERFORMANCE AREA	PERFORMANCE GOAL/INDICATOR	RESULT
STRATEGIC OUTCOME GOAL 1: PEOPLE—A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologists, and well-prepared citizens.		
PEOPLE Strategic Outcome Goal	**1:** NSF will demonstrate significant achievement in the majority of the following indicators: • Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities. • Support programs that attract and prepare U.S. students to be highly qualified members of the global science and engineering workforce; programs should include opportunities for international study, collaborations, and partnerships. • Develop the nation's capability to provide K–12 and higher education faculty with opportunities for continuous learning and career development in science, technology, engineering, and mathematics. • Promote public understanding and appreciation of science, technology, engineering, and mathematics and build bridges between formal and informal science education. • Support innovative research on learning, teaching, and mentoring that provides a scientific basis for improving science, technology, engineering, and mathematics education at all levels. *Explanation:* Assessments by external experts determined that NSF has demonstrated significant achievement in each of the performance indicators associated with this goal.	
U.S. Students Receiving Fellowships	**2:** Increase the number of recipients of Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT) from the FY 2003 level of 3,328.	
Graduate Stipend Level	**3:** Increase the stipend for GRF and IGERT from $27,500 in FY 2003 to $30,000 in FY 2004.	
Graduate Fellowship: Broadening Participation	**4:** Increase the number of GRF applicants from groups that are underrepresented in the science and engineering workforce from the FY 2003 level of 820.	
CAREER Award: Broadening Participation	**5:** Increase the number of applicants for CAREER (Faculty Early Career Development Program) awards from minority-serving institutions from the FY 2003 level of 67.	
Nanoscale Proposals with Female Principal Investigators	**6:** Increase the percentage of Nanoscale Science and Engineering proposals with at least one female principal or co-principal investigator from 22 percent in FY 2003 to 25 percent in FY 2004.	

Indicates that the goal was achieved in FY 2004.
Indicates that the goal was not achieved in FY 2004.



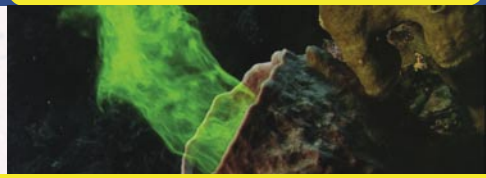
FY 2004 PERFORMANCE GOALS AND RESULTS

PERFORMANCE AREA	PERFORMANCE GOAL/INDICATOR	RESULT
Information Technology Research (ITR) Proposals with Female Principal Investigators	**7:** Increase the percentage of ITR proposals with at least one female principal or co-principal investigator from 24 percent in FY 2003 to 25 percent in FY 2004.	
Nanoscale Proposals with Minority Investigators	**8:** Maintain or increase the percentage of Nanoscale Science and Engineering proposals with at least one minority principal or co-principal investigator from the FY 2003 level of 13 percent. (Minority is defined as Hispanic/Latino, African American, Native Hawaiian and other Pacific Islander, and American Indian and Alaska Native.) *Explanation:* The FY 2004 result was 12 percent.	
ITR Proposals with Minority Investigators	**9:** Maintain or increase the percentage of ITR proposals with at least one minority principal or co-principal investigator from the FY 2003 level of 7 percent.	
Multidisciplinary: Multi-Investigator Nanoscale Proposals	**10:** Increase the percentage of multi-investigator Nanoscale Science and Engineering proposals to 75 percent.	
Multidisciplinary: Multi-Investigator ITR Proposals	**11:** Maintain the percentage of multi-investigator ITR proposals above 50 percent.	
Nanoscale: Workforce Development	**12:** Develop a Nanoscale Science and Engineering workforce to meet industry's future needs. *Explanation:* Progress was determined through evaluation by external experts.	
STRATEGIC OUTCOME GOAL 2: IDEAS—Discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.		
IDEAS Strategic Outcome Goal	**13:** NSF will demonstrate significant achievement in the majority of the following indicators: • Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge. • Encourage collaborative research and education efforts across organizations, disciplines, sectors, and international boundaries. • Foster connections between discoveries and their use in service to society. • Increase opportunities for underrepresented individuals and institutions to conduct high-quality, competitive research and education. • Provide leadership in identifying and developing new research and education opportunities within and across science and engineering fields. • Accelerate progress in selected high-priority science and engineering areas by creating new integrative and cross-disciplinary knowledge and tools and by providing people with new skills and perspectives. *Explanation:* Assessments by external experts determined that NSF has demonstrated significant achievement in each of the performance indicators associated with this goal.	

FY 2004 PERFORMANCE GOALS AND RESULTS

PERFORMANCE AREA	PERFORMANCE GOAL/INDICATOR	RESULT
Interdisciplinary Nanotechnology	**14:** Ensure that NSF's Nanoscale Science and Engineering Program is responsible for a broad-based and capable interdisciplinary research community that advances fundamental knowledge in nanotechnology, with impact on other disciplinary fields. *Explanation:* Progress was determined through evaluation by external experts.	
Nanotechnology Knowledge Base	**15:** Develop a knowledge base for systematic control of matter at the nanoscale level that will enable the next industrial revolution for the benefit of society. *Explanation:* Progress was determined through evaluation by external experts.	
Research Award Size	**16:** Increase the average annual size of new research grants from $125,000 in FY 2003 to $139,000 in FY 2004.	
Nanoscale Interdisciplinary Award Size	**17:** Maintain the average annual size of new research grants for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering solicitation at $330,000.	
ITR Award Size	**18:** Maintain the average annual size of new ITR grants at $230,000.	
Research Award Duration	**19:** Increase the average duration of new research grants to 3.0 years. *Explanation:* The FY 2004 result was 2.96 years.	
ITR Award Duration	**20:** Maintain the average duration of new ITR grants at 3.8 years.	
Nanoscale Interdisciplinary Award Duration	**21:** Maintain the average duration of new research grants made for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering solicitation at 3.8 years.	

Indicates that the goal was achieved in FY 2004.
Indicates that the goal was not achieved in FY 2004.



FY 2004 PERFORMANCE GOALS AND RESULTS

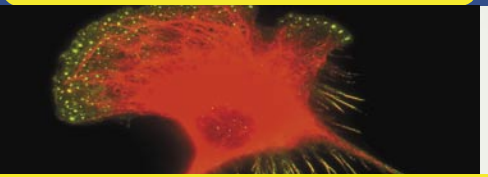
PERFORMANCE AREA	PERFORMANCE GOAL/INDICATOR	RESULT
STRATEGIC OUTCOME GOAL 3: TOOLS—Broadly accessible, state-of-the-art science and engineering facilities, tools, and other infrastructure that enable discovery, learning, and innovation.		
TOOLS Strategic Outcome Goal	22: NSF will demonstrate significant achievement in the majority of the following indicators: • Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of-the-art science and engineering facilities, tools, databases, and other infrastructure. • Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms. • Develop and deploy an advanced cyberinfrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation. • Provide for the collection and analysis of the scientific and technical resources of the United States and other nations to inform policy formulation and resource allocation. • Support research that advances instrument technology and leads to the development of next-generation research and education tools. *Explanation:* Assessments by external experts determined that NSF has demonstrated significant achievement in each of the performance indicators associated with this goal.	
Construction and Upgrading of Facilities	**23:** Keep negative cost and schedule variances at less than 10 percent of the approved project plan for 90 percent of construction, acquisition, and upgrading projects.	
Operations and Management of Facilities	24: 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. *Explanation:* In FY 2004, 89.7 percent of facilities achieved this goal.	
Nanotechnology Network Users	**25:** Increase the number of users accessing the National Nanofabrication Users Network/ National Nanotechnology Infrastructure Network (NNUN/NNIN) and the Network for Computational Nanotechnology (NCN) sites from 3,000 in FY 2003 to 4,000 in FY 2004.	
NNIN Nodes	**26:** Increase the number of NNIN nodes from 12 in FY 2003 to 14 in FY 2004.	
Scientific Computing	**27:** Increase the peak availability of teraflops (trillions of operations per second) for scientific computation at terascale computing facilities from 12 in FY 2003 to 20 in FY 2004.	
Nanotechnology Research Infrastructure	**28:** Ensure that the U.S. research infrastructure is appropriate to enable major discoveries in Nanoscale Science and Engineering. *Explanation:* Progress was determined through evaluation by external experts.	

FY 2004 PERFORMANCE GOALS AND RESULTS

PERFORMANCE AREA	PERFORMANCE GOAL/INDICATOR	RESULT
STRATEGIC OUTCOME GOAL 4: ORGANIZATIONAL EXCELLENCE—An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.		
ORGANIZATIONAL EXCELLENCE Strategic Outcome Goal	**29:** NSF will demonstrate significant achievement in the majority of the following indicators: • Operate a credible, efficient merit review system. • Develop a diverse, capable, and motivated staff that operates with efficiency and integrity. • Use and sustain broad access to new and emerging technologies for business applications. • Develop and use performance assessment tools and measures to provide a continuous improvement environment in NSF's intellectual investments as well as its management effectiveness. *Explanation:* Assessments by external experts determined that NSF has demonstrated significant achievement in each of the performance indicators associated with this goal.	
Time-to-Decision	**30:** Inform applicants about funding decisions within 6 months of receipt for 70 percent of proposals.	

Indicates that the goal was achieved in FY 2004.
Indicates that the goal was not achieved in FY 2004.

Microphage Moving Along Surface
This photograph shows a macrophage—one of the body's sanitation engineers—at work. Macrophages engulf and remove tissue debris after an injury, foreign particles from bodily fluids, bacteria, and dead cells.
Credit: Ivan Correia, Whitehead Institute for Biomedical Research

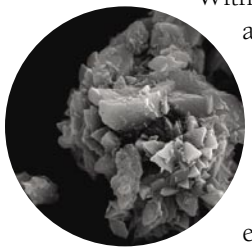


WHERE DISCOVERIES BEGIN

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 of long-term support of research and education projects that emerged and were reported in FY 2004.

Making the World a Safer Place

Advanced Nano-Engineered Products



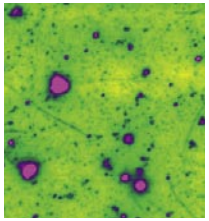
With support from NSF, researchers at NanoScale Materials, Inc., developed scaled-up production processes for FAST–ACT (First Applied Sorbent Treatment Against Chemical Threats), an advanced nano-engineered family of products designed to provide first responders, hazmat teams, and other emergency personnel with a single technology to counteract a variety of chemical warfare agents and toxic industrial chemicals.

Nontoxic, noncorrosive, and nonflammable, FAST–ACT is particularly useful when response personnel are confronted with a chemical spill of an unknown nature. While substances such as activated carbon can physically absorb toxic substances, FAST–ACT neutralizes, destroys, and renders them harmless. Independent testing by chemical warfare experts showed that FAST–ACT removed more than 99 percent of such agents as VX, soman, and mustard gas from surfaces in less than 90 seconds.

NSF-funded researcher Kenneth Klabunde at Kansas State University conducted the initial research that led to the development of FAST–ACT. NSF's Small Business Innovation Research (SBIR) program supported NanoScale's research to make production commercially viable.

Human Breathing Monitor

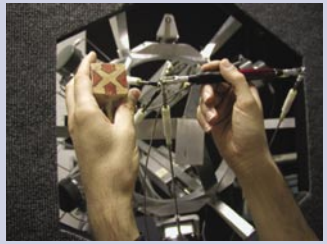
NSF's SBIR program also funded researchers at Nanomix, Inc., who created a tiny device that can monitor a victim's breathing in emergency situations by effectively shrinking an operating room machine into a small, disposable tool that can be carried to a disaster site. Nanomix scientists developed a transistor that fuses carbon nanotubes, polymers, and silicon into a capnography sensor—a human breathing monitor. Capnography sensors detect subtle changes in the concentration of carbon dioxide gas in a person's breath, revealing respiratory diseases in children and adults, and allowing anesthesiologists to monitor a patient's breathing during surgery.



For more information:

NSF Nifty Fifty: http://www.nsf.gov/about/history/nifty50/index.jsp

Other examples of NSF-supported discoveries: http://www.nsf.gov/discoveries/



A bimanual haptic interface developed at the University of Colorado at Boulder enables users to move and manipulate virtual objects easily with both hands. The "cube" has a 6-degree-of-freedom position sensor that allows the user to position virtual objects precisely so that he or she can then "operate" them with the actively force-controlled 6-degree-of-freedom "stylus." *Credit:* Jeff Fehring; courtesy of Dr. Lucy Pao, University of Colorado

The new South Pole Station replaces a 30-year-old facility that was no longer adequate in terms of capacity, efficiency, and safety. The new station is an elevated complex with two connected buildings that can support 150 people in the summer and 50 people in the winter. More than 40 engineering studies and reports were required for development and construction of the new station—including snowdrift minimization modeling, detailed analysis of power and heating requirements, preparation of an Environmental Impact Statement, energy conservation measures, fuel storage support system evaluation, and gray-water system evaluation. NSF has responsibility for overall funding and management of U.S. activities in Antarctica. *Credit:* NSF

In the field, emergency responders may be able to use the new sensor to verify the proper placement of a breathing tube, monitor the patient's respiratory patterns, and assess the effect of life support measures. While the device is already capable of monitoring human breathing in laboratory settings, the researchers are collaborating with anesthesiologists and other specialists at the University of California, San Francisco, to design and test a field-ready medical device.

Finding Cures from Corals

A chemical that protects a rare type of marine coral from predators may also prove to be a potent medicine for humans in the fight against cancer.

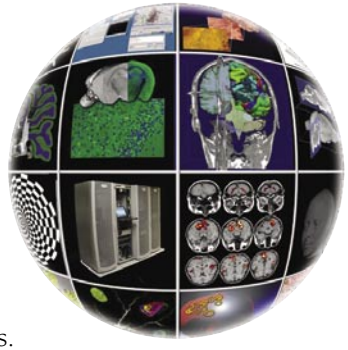
Surrounded by countless predators, many of the ocean's sedentary animals rely on powerful toxins for defense. NSF-funded researcher William Fenical and his colleagues have shown that in addition to defeating hungry sea creatures, these potent chemicals can actually help defeat disease.

While diving off the coast of Australia, Fenical, director of the Center for Marine Biotechnology and Biomedicine at the Institute of Oceanography, discovered a small yellow coral now called *Eleutherobia*. Eleutherobin—the chemical extracted from the coral—behaves like the anticancer drug taxol. Both chemicals bind to cellular microtubules, preventing cancer cell division. Eleutherobin may prove to have advantages over taxol, perhaps causing fewer side effects—including immune system suppression, nausea, and hair loss.

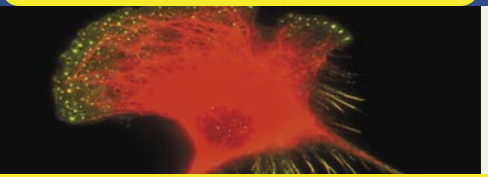
Fenical and his colleagues are now studying the myriad bacteria and fungi that live in the sea and the potentially revolutionary chemicals that these microorganisms produce. He and his colleagues recently identified two new compounds that are being developed for cancer treatments and one antiviral compound that may help patients with *Herpes simplex*. Fenical believes that microbes in the oceans may prove to be the most important new source for pharmaceuticals on the planet.

Facilitating Health Care Research

The study of Alzheimer's disease and the analysis of particle collisions may not appear to have much in common, but behind the scenes, middleware being developed with support from NSF is helping groups of researchers in neuroscience, physics, and other fields apply the power of grid-based computational resources.



Spanning 14 universities and 22 research groups, the growing Biomedical Informatics Research Network (BIRN) is establishing the cyberinfrastructure needed to facilitate health care research for large-scale data sharing and analysis. The ability to share and compare massive data sets such as magnetic resonance imaging brain scans or high-resolution electron microscopy images is essential to participants' research into Alzheimer's disease, depression, schizophrenia, multiple sclerosis, and other disorders.



With the participating laboratories connected by the Internet2 high-performance network, the BIRN cyberinfrastructure uses software from the NSF Middleware Initiative (NMI) to harness grid-based services and resources for the demanding computational tasks of data mining, analysis, and visualization. The BIRN is sponsored by the National Center for Research Resources at the National Institutes of Health.

By emphasizing open-source solutions that simplify resource sharing, NMI is making it easier for scientists, engineers, and educators to work with colleagues on a worldwide scale through high-speed networks. The integrated tools from NMI facilitate collaborations across organizations, information technology architectures, operating systems, and security policies.

Before NMI, many research communities were developing independent—and often incompatible—middleware solutions. The successful use of NMI releases by BIRN shows that NMI's open-source and open-standards approaches can help scientists avoid "reinventing the wheel" and provide a common foundation for building customized applications.

Discoveries on Two Continents

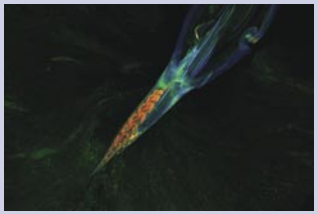
A Lost World

Against incredible odds, researchers working in separate sites thousands of miles apart in Antarctica have found what they believe are the fossilized remains of two species of previously unknown dinosaurs. One of the two finds, which took place less than a week apart, is an early carnivore that would have lived many millions of years after the other, a plant-eating beast, roamed the Earth. One was found at the bottom of the sea, the other on a mountaintop.

Working on James Ross Island off the coast of the Antarctic Peninsula, veteran NSF-funded dinosaur hunters Judd Case, James Martin, and their research team found the fossilized bones of an entirely new species of carnivorous dinosaur related to the enormous meat-eating tyrannosaurs and the equally voracious, but smaller and swifter velociraptors that terrified movie-goers in the film *Jurassic Park*.

The remains include fragments of an upper jaw with teeth, isolated individual teeth, and most of the bones from the animal's lower legs and feet. The creature likely inhabited the area millions of years ago, when the climate and terrain were similar to conditions in today's Pacific Northwest and radically different from the way they are today.

And the Winner Is . . .



On September 24, 2004, NSF and the American Association for the Advancement of Science announced the results of the second annual Science and Engineering Visualization Challenge. This annual international competition is designed to showcase and encourage an increasingly important aspect of science: the ability to convey the essence and excitement of research in digitized images, color diagrams, and multimedia presentations. The contest recognizes outstanding achievements by scientists, engineers, visualization specialists, and artists in the use of visual media to promote understanding of research results and scientific phenomena.
Credit: Marna E. Ericson, University of Minnesota, Minneapolis

2004 Visualization Results:
www.sciencemag.org/sciext/vis2004

Middle school students have fun building radios in a RASEM^2 mentoring project. RASEM^2 is an NSF-supported program whose mission is to level the playing field for students with disabilities.

RASEM^2 provides the means, support, and encouragement for students with disabilities to overcome the educational barriers they face in considering careers in science, technology, engineering, and math. These programs instill an appreciation of the excitement for discovery and the satisfaction of achievement in fields generally perceived to be beyond the reach of these students. For more information, visit http://rasem.nmsu.edu.
Credit: Photo courtesy of Dr. Ed Misquez, RASEM^2

At the same time, thousands of miles away, an NSF-funded research team led by William Hammer was working in the Antarctic interior on a mountaintop roughly 3,900 meters (13,000 feet) high near the Beardmore Glacier. They found embedded in solid rock what they believe to be the pelvis of a primitive sauropod, a four-legged, plant-eating dinosaur similar to better-known creatures such as brachiosaurus and diplodocus.

Field analysis of the bones has led Hammer and his fellow researchers to believe that the pelvis—roughly 1 meter (3 feet) across—represents one of the earliest forms of the emerging dinosaur lineage that eventually produced animals more than 30 meters (100 feet) long. The researchers estimate that the new, and as-yet-unnamed creature was between 1.8 and 2.1 meters (6 and 7 feet) tall and up to 9 meters (30 feet) long and lived roughly 200 million years ago.

Earlier Ancestors

NSF-funded scientists discovered that early humans lived in northern China about 1.66 million years ago. The finding suggests that humans—characterized by their fabrication and use of stone tools—inhabited the hostile environment of upper Asia almost 340,000 years before previous estimates placed them there.

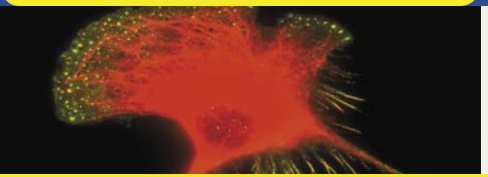
The research team excavated four layers of sediment at Majuangou in northern China. All the layers contained indisputable stone tools apparently made by early humans known to researchers as "hominins." The top layer, located about 145 to 148 feet deep, contains the oldest known record of hominin stone tools, dating back to 1.32 million years ago. But the fourth and deepest layer, in which the team also found stone tools, is about 340,000 years older than that.

All four sediment layers the researchers examined contained evidence that early humans used stone tools to strike other stones, most likely to fashion chopping and scraping tools. In the three deepest layers, the stone tools are made of rocks unlike those in the surrounding sediment, indicating that these Asian humans transported the rocks from another place. It also appears that these humans used their tools on the bones of deer- and horse-sized mammals, perhaps to butcher them for food.

These findings, which suggest that humans reached northeast Asia earlier than scientists had previously thought, demonstrate the adaptability of humans as they evolved and moved out of the tropics and into other environments. Furthermore, the evidence from the Majuangou site is only slightly older than evidence found at the same latitude in western Eurasia and about the same age as the earliest known human fossils found in southeast Asia. This implies that human populations came to Asia from Africa and spread rapidly to many areas.

New Planets Outside the Solar System

A team of astronomers has announced the discovery of some of the smallest planets yet detected



beyond our solar system: two worlds that represent a new category of extrasolar planets, as well as a significant and much-anticipated advance in the hunt for such objects.

Each of the newly discovered planets is roughly comparable to the planet Neptune in our own solar system, according to Geoffrey Marcy of the University of California, Berkeley, a veteran planet-hunter and a co-discoverer of this pair.

Although small in comparison to the largest planets in our solar system, these new planets are big on a terrestrial scale. They are, however, tiny compared the 120-plus extrasolar planets that have been discovered to date. Virtually all of those objects are considerably heftier than our own solar system heavyweights, Jupiter and Saturn, which have 318 times and 95 times the mass of the Earth, respectively.

In addition, these newly discovered Neptunes may well be the harbingers of many more (and smaller) things to come. Although lower-mass planets like these tend to be harder to detect than their higher-mass cousins, the statistics to date suggest that we may soon be seeing many more Neptunes—and that Earth-sized planets, if we can ever detect them, may be downright abundant. The discovery team was supported jointly by the NSF and the National Aeronautics and Space Administration (NASA).

Viruses on the Attack

Using a combination of imaging techniques, researchers have determined the mechanics that allow some viruses to invade cells by piercing their outer membranes and digesting their cell walls. The researchers combined their findings with earlier studies to create a near-complete scenario for this form of viral assault.

The results have a dual benefit: They show the inner workings of complex, viral nanomachines infecting cells (in a process nearly identical to some viral infections of human cells), and the images provide tips for engineers to design and build the gene delivery devices of the future.

Led by Michael Rossmann of Purdue University and Vadim Mesyanzhinov of the Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry in Moscow, the team added its findings to several decades of research into the structure of bacteriophage T4—a virus that attacks the familiar pathogen *Escherichia coli* (*E.coli*). Although some strains of *E. coli* can cause food poisoning, others supply essential products to the human gut. It is possible that studies of viruses could one day help biologists develop strategies to fight deadly bacterial infections. Similar efforts targeting antibiotic-resistant bacteria are already under way in other laboratories.

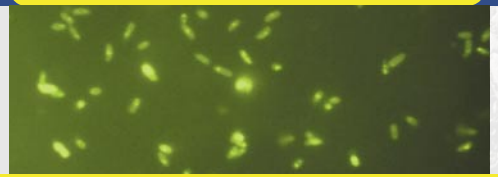
By combining thousands of images of the virus viewed from different directions, the researchers were able to create a model of how bacteriophage T4 infects cells. This work was supported by grants from NSF and the Howard Hughes Medical Institute.

EarthScope

EarthScope is a scientific exploration of the structure and evolution of the North American continent and the physical processes controlling its earthquakes and volcanic eruptions. The project will not only help reveal how the North American continent formed, but it will also make possible the mapping of the continent's changing structure. Using new broadband seismic sensors, developments in global positioning system technologies, and a data distribution infrastructure, scientists will collect and integrate scientific information derived from geology, seismology, remote sensing, and geodesy, the science of measuring the Earth's surface features.

EarthScope is a national multi-agency program that partners NSF, the U.S. Geological Survey, NASA, and other federal agencies. The program will also develop partnerships with state agencies, regional seismic networks, organizations in Mexico and Canada, and the International Continental Drilling Program. All EarthScope data will be available to the public in real-time to maximize participation from the scientific community and to provide on-going educational opportunities for students of all ages.

Biosurfactant Green Fluorescent Protein
The photograph shows a biosurfactant green fluorescent protein (GFP) reporter organism fluorescing as biosurfactant is produced. Surfactants—or surface-active agents—are substances that lower the surface tension, a membrane-like barrier between different liquid phases that affects the ability of molecules to move from one phase to another. In addition to synthetically produced surfactants, these substances are also produced by a wide diversity of microorganisms. Some types of biosurfactants can bind tightly to toxic metals such as lead and cadmium. Some types can adhere strongly to surfaces, sometimes completely changing the properties of the surface. NSF-funded researchers Raina Maier and Jean Pemberton of the University of Arizona are investigating how biosurfactant production in soil systems influences the behavior of toxic metal contaminants. This information is a critical piece of the puzzle required to understand how metals are mobilized and immobilized under both natural and engineered conditions.
Credit: Raina Maier and Jean Pemberton, University of Arizona



FROM THE CHIEF FINANCIAL OFFICER

I am delighted to join our new Director, Dr. Arden L. Bement, Jr., in presenting the NSF's *Performance Highlights* for FY 2004.

NSF's continuing quest to provide the highest quality business services to our customers, stakeholders, and staff is evident in our commitment to effective internal controls, prompt and streamlined award processes, and reliable and timely financial data to support good management decisions. In FY 2004,

- On the Department of Treasury's inaugural Financial Management Services Scorecard, NSF received "green" successful ratings for the two performance indicators that applied to the agency—Timeliness and Accuracy.
- For the second consecutive year, NSF successfully met the accelerated financial reporting requirements, producing a year-end report 45 days after the close of the fiscal year. The agency received its seventh consecutive unqualified audit opinion and was commended for exemplary public accountability reporting in several external independent reviews.
- NSF automated preparation of the new government-wide financial statements so that they are now systematically produced in conjunction with preparation of the agency's financial statements. The Department of Treasury has recognized this achievement as a federal agency best practice.
- NSF again received two "green" ratings, for successful achievement in the financial performance and electronic government initiatives of the PMA. NSF is the only federal agency to have maintained a "green" rating in financial performance for 4 consecutive years.

NSF continues to face the future in a position of operational strength, thanks to our sound financial management, our commitment to continuous improvement in business practices, and, most important, the extraordinary talent and commitment of our staff. For NSF, excellence in financial management has enabled the agency to pursue critical investments in science and engineering research and education that will ensure a secure homeland, continued prosperity, and a high quality of life for our children.

Thomas N. Cooley
December 2004

Thomas N. Cooley
Chief Financial Officer

For more information:
www.nsf.gov/bfa

NSF is a recognized leader in federal financial management. The Foundation's high-quality responsive electronic communications and processing systems are the backbone of our operations and the key to our success in interacting and servicing our research and education communities efficiently and effectively. An agency priority is providing reliable, timely, and useful financial management information.

In 2004, NSF launched a web-based "Report.Web" database that allows management and staff "24/7" direct accessibility to accurate and current financial information at their workstations. The addition of "Report.Web" to NSF's existing Executive Information System and Financial Accounting System provides comprehensive financial, budgetary, merit review, and awards management information to all levels of the Foundation's decision makers.

As a federal agency, NSF prepares annual financial statements in conformity with U.S. generally accepted accounting principles and then subjects them 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; in FY 2004, NSF received its seventh unqualified "clean" audit opinion.

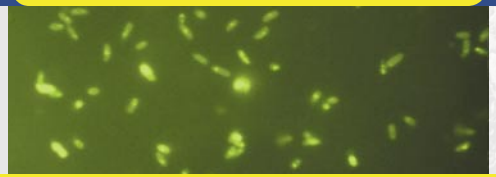
As a federal agency, the Foundation prepares the following annual financial statements: Balance Sheet, Statement of Net Cost, Statement of Changes in Net Position, Statement of Budgetary Resources, and Statement of Financing. Supplementary statements prepared include Budgetary Resources by Major Budgetary Accounts, Intragovernmental Balances, Deferred Maintenance, and Stewardship Investments. The statement on Stewardship Investments appears on page 31.

The following pages feature highlights of NSF's FY 2004 financial condition. A more detailed discussion of financial performance and a complete set of the agency's financial statements, accompanying notes, and the audit opinion can be found in NSF's *FY 2004 Performance and Accountability Report*.

NSF is funded primarily through 6 congressional appropriations totaling $5.6 billion in FY 2004, a 5 percent increase from the previous year (see Figure 1 on page 30). NSF appropriations funded 4 Strategic Outcome Goals: People, Ideas, Tools,

Net Financial Condition

	FY 2004	FY 2003	Increase/ Decrease	% Change
Assets	$7,929,034	$7,424,919	$504,115	7%
Liabilities	$396,113	$379,705	$16,408	4%
Net Position	$7,532,921	$7,045,214	$487,707	7%

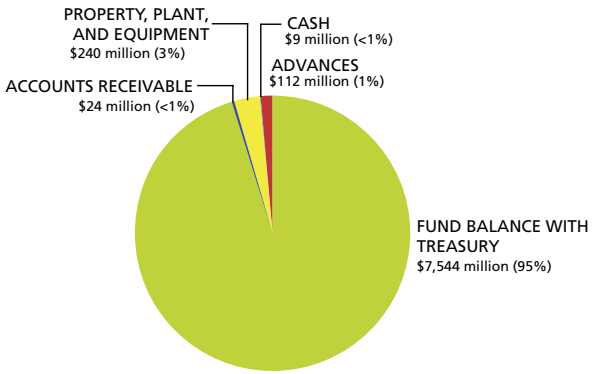


FINANCIAL HIGHLIGHTS

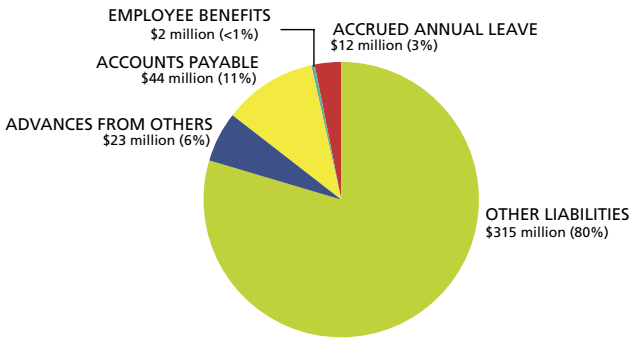
and Organizational Excellence (see Figure 2 on page 30). Organizational Excellence focuses on the business and management activities that the agency supports in order to accomplish its programmatic activities and mission. Thus in Figure 3 on page 30, funding for Organizational Excellence has been allocated among People, Ideas, and Tools, to capture the (net) cost of each. Figure 3 also shows the net cost of NSF's investment categories.

NSF by the Numbers	
$5.65 billion	FY 2004 budget (obligations)
4%	NSF's share of total annual federal spending for research and development
50%	NSF's share of federal funding for nonmedical basic research at academic institutions
40,000	Proposals evaluated in FY 2004 through a competitive merit review process
10,400	New awards funded in FY 2004
50,000	Scientists and engineers who evaluate proposals for NSF each year
200,000	Proposal reviews done each year
40,000	Students supported by NSF Graduate Research Fellowships since 1952
216,000	People (researchers, postdoctoral fellows, trainees, teachers, and students) NSF supports directly

FY 2004 Assets



FY 2004 Liabilities



FY 2005 Budget Request to Congress: http://www.nsf.gov/about/budget/fy2005/

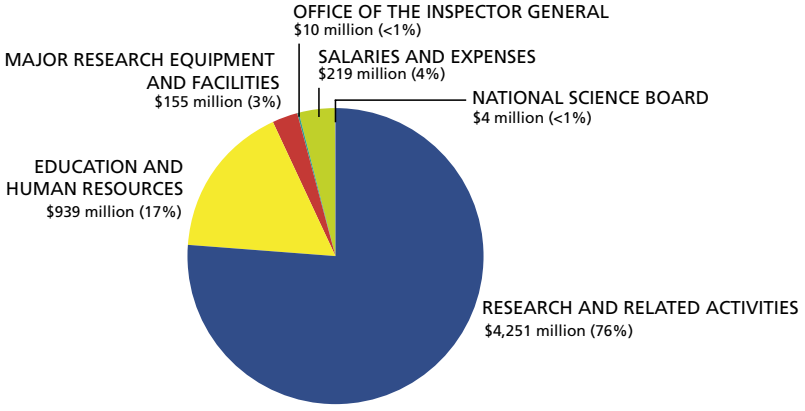
FY 2004 Assets and Liabilities

Fund Balance with Treasury; Property, Plant, and Equipment (PP&E); and Advances represent 99 percent of NSF's current-year assets. *Fund Balance With Treasury* is funding available through the Department of Treasury accounts from which NSF is authorized to make expenditures and pay amounts due. *PP&E* is capitalized property located at NSF headquarters and NSF-owned property that supports the U.S. Antarctic Program. *Advances* are funds advanced to NSF grantees, contractors, and other government agencies.

Advances From Others, *Accounts Payable,* and *Accrued Liabilities (Other Liabilities)* represent 96 percent of NSF's liabilities. *Advances From Others* are remaining prior year amounts advanced to NSF from other federal entities for the administration of grants on their behalf. *Accounts Payable* includes liabilities to NSF vendors for unpaid goods and services received. *Accrued Liabilities* are amounts recorded for NSF's grants and contracts for which work has been completed, although payment has not been rendered.

NSF's Net Position increased to $7.5 million in FY 2004 due to an increase in *Unexpended Appropriations*. *Unexpended Appropriations* is affected mainly by *Appropriations Received* and *Appropriations Used*, with minor impact from *Appropriation Transfers* from the U.S. Agency for International Development and *Other Adjustments*, which include appropriation rescissions and cancellations.

Figure 1: FY 2004 Appropriations by Account (Budget Authority)
$5,578 Million



Note: Other revenue sources such as transfers from other agencies, and donations account for a minor portion of the Foundation's resources.

Figure 2: FY 2004 Budget Obligations
$5,652 Million

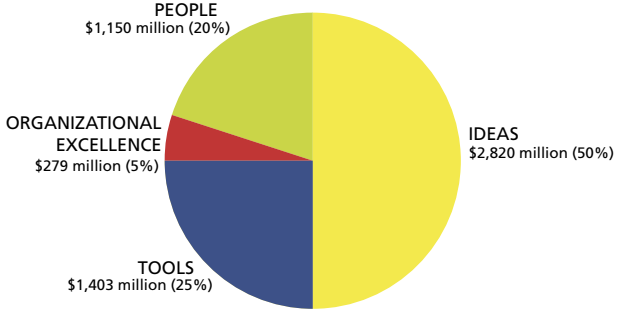
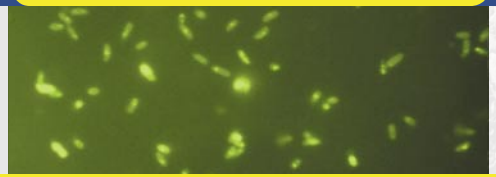


Figure 3: FY 2004 Net Cost of Investment Categories
(Millions of Dollars)

PEOPLE	
Individuals	$ 651
Institutions	202
Collaborations	428
	$ 1,281
Less Earned Revenue	20
Net People	$ 1,261
IDEAS	
Fundamental Science and Engineering	$ 2,121
Centers	298
Capability Enhancements	221
	$ 2,640
Less Earned Revenue	62
Net Ideas	$ 2,578
TOOLS	
Large Facilities	$ 536
Infrastructure and Instrumentation	281
Polar Tools, Facilities, and Logistics	245
Federally Funded Research and Development Centers	212
	$ 1,274
Less Earned Revenue	13
Net Tools	$ 1,261
NET COST OF OPERATIONS	**$ 5,100**



Stewardship Investments
Research and Human Capital

(Amounts in Thousands)
(Unaudited)

	2004	2003	2002	2001	2000
Research and Human Capital Activities					
Basic Research	$ 3,494,302	$ 3,519,159	$ 3,092,060	$ 2,692,243	$ 2,636,518
Applied Research	209,225	218,152	193,788	211,421	173,670
Education and Training	1,224,058	867,489	767,734	704,949	596,517
Non-Investing Activities	268,298	196,363	183,887	170,757	162,021
Total Research and Human Capital Activities	$ 5,195,883	$ 4,801,163	$ 4,237,469	$ 3,779,370	$ 3,568,726
Inputs, Outputs, and/or Outcomes					
Research and Human Capital Activities					
Investments In					
Universities	$ 3,705,751	$ 3,310,365	$ 2,919,897	$ 2,631,405	$ 2,470,300
Industry	196,260	178,000	185,062	162,176	160,573
Federal Agencies	107,212	144,792	106,458	125,823	132,790
Small Business	200,995	186,400	144,844	130,977	119,345
Federally Funded Research and Development Centers	985,665	981,606	881,208	728,989	685,718
	$ 5,195,883	$ 4,801,163	$ 4,237,469	$ 3,779,370	$ 3,568,726
Support To					
Scientists	$ 477,970	$ 427,304	$ 394,144	$ 355,261	$ 359,228
Postdoctoral Programs	175,680	163,239	148,334	128,499	117,504
Graduate Students	546,084	475,315	402,620	362,820	315,583
	$ 1,199,734	$ 1,065,858	$ 945,098	$ 846,580	$ 792,315
Outputs and Outcomes					
Number of					
Awards Actions	23,000	23,000	21,000	20,000	20,000
Senior Researchers	31,000	30,000	28,000	27,000	24,000
Other Professionals	15,000	12,000	11,000	10,000	8,000
Postdoctoral Associates	6,000	6,000	6,000	6,000	5,000
Graduate Students	29,000	27,000	26,000	25,000	22,000
Undergraduate Students	35,000	32,000	32,000	31,000	30,000
K–12 Students	14,000	14,000	11,000	11,000	12,000
K–12 Teachers	86,000	85,000	84,000	83,000	83,000

This statement shows NSF's investment in research and education activities and primary output over the past 5 years. In FY 2004, NSF invested $5.2 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 2004 portfolio included approximately 23,000 active awards. It is estimated that FY 2004 awards directly involved over 200,000 researchers, postdoctoral associates, teachers, and students from kindergarten to the graduate level.

Appendix 1:

DESCRIPTION OF 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 and 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 Science and Engineering (CISE)** supports research on the foundations of computing and communications devices and their usage, 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 operation of 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, 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 alliances and 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 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 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

APPENDIXES

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 and education to build fundamental scientific knowledge about human cognition, language, social behavior, and culture, and on economic, legal, political, and social systems, organizations, and institutions. 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 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 past, present, and future responses of Earth systems to natural and antropogenic changes. Polar Programs 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 NSF, for international science and engineering activities and manages international programs that are innovative, catalytic, and responsive to the broad range of NSF interests. OISE supports international collaborative research that provides U.S. scientists and engineers with access to the world's top researchers, institutions, and facilities. OISE 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. 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 human capital management, information technology solutions, continuous learning opportunities, and general administrative services to the NSF community of scientists, engineers, and educators. OIRM also provides logistical support functions for NSF staff as well as the general public. It is responsible for recruiting, staffing, and other human resource service requirements for all NSF staff and visiting personnel. OIRM is also responsible for the management of NSF's physical infrastructure and conference facilities, the administration of its sophisticated technology infrastructure, and the dissemination of information about NSF programs to the external community through the agency's website. In addition, it is responsible for delivery of the hardware, software, and support systems necessary to manage the Foundation's grant-making process and to maintain advanced financial and accounting systems.

For more information:

Office of the Director:
www.nsf.gov/od/

National Science Board:
www.nsf.gov/nsb/

Appendix 2:

NSF EXECUTIVE STAFF AND NSF OFFICERS

NSF Executive Staff

Office of the Director
Arden L. Bement, Jr., Director
Joseph Bordogna, Deputy Director

National Science Board
Warren M. Washington, Chair
Michael P. Crosby, Executive Officer

Office of Equal Opportunity Programs
John F. Wilkinson, Acting Director*

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
Michael S. Turner, Assistant Director

Directorate for Social, Behavioral, and Economic Sciences
Wanda E. Ward, Acting Assistant Director

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

Office of Information and Resource Management
Anthony A. Arnolie, Director

NSF 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)

*Appointed June 2004, following the retirement of Ana A. Ortiz.

Appendix 3:

NATIONAL SCIENCE BOARD MEMBERS DURING FY 2004

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

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

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

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

Steven Beering
President Emeritus
Purdue University

Ray Bowen
Former President
Texas A&M University

Delores M. Etter
Professor, Electrical Engineering
United States Naval Academy

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

Pamela A. Ferguson[2]
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[1]
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.[1]
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[1]
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[1]
General Manager
Technology Partnerships
Honeywell Corporation (Retired)

Luis Sequeira[1]
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 Arkanasas–Fayetteville

Mark S. Wrighton
Chancellor
Washington University

Rita R. Colwell *(Member Ex Officio)* [3]
Director
National Science Foundation

Arden L. Bement, Jr.
(Member Ex Officio)[4]
Director
National Science Foundation

Michael P. Crosby
Executive Officer
National Science Board

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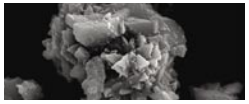
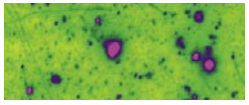
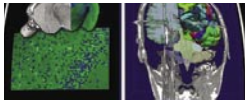
[1] Term expired May 2004.
[2] Deceased May 2004.
[3] Resigned February 2004.
[4] Appointed February 2004.



Scanning electron micrograph of NanoActive Magnesium Oxide Plus. The material's large surface area gives it the ability to capture and destroy toxic chemicals. Just 25 grams (a little less than an ounce) has the surface area of almost three football fields.
Credit: NanoScale Materials, Inc.



Atomic force microscopy image of the carbon nanotube network device coated with polyethylene imine and starch polymer layer for detection of carbon dioxide gas.
Credit: Vikram Joshi, Nanomix, Inc.



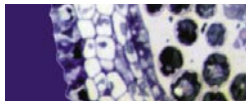
The Biomedical Informatics Research Network promotes advances in biomedical and health care research through the development and support of a cyberinfrastructure that facilitates data sharing and multi-institutional collaboration.
Credit: Biomedical Informatics Research Network

A group of tents pitched in the shadow of the Transantarctic Mountains.
Credit: NSF

The bacteriophage T4 is preparing to infect its host cell. The structure is derived from three-dimensional cryo-electron microscopy reconstructions of the baseplate, tail sheath, and head capsid, as well as from crystallographic analyses of various phage components. The baseplate and tail proteins are shown in distinct colors.
Credit: Purdue University and Seyet LLC. The animation is based on both recent discoveries and extensive earlier work by a large number of investigators.

PHOTO CAPTIONS AND CREDITS

The pelvis of what researchers believe is a previously unknown plant-eating dinosaur exposed on the rock where it was preserved.
Credit: William Hammer/NSF



NSF-funded researcher Karen Renzaglkia of Southern Illinois University is leading a team that is investigating the evolution of green plants such as the moss *Takakia ceratophylla*. Humans rely on green plants for food, shelter, and clothing and for providing the oxygen that is essential to life. From a biological perspective and as one of the oldest and most diverse branches of the tree of life, green plants provide an unparalleled system in which to explore interrelationships of living organisms and to approach some of the most significant and intriguing questions concerning the diversification of life on earth. Many of these questions relate to fundamental evolutionary events, such as the transition of organisms from single-celled to multicellular body plans, the colonization of land, and the derivation of different life-cycle modes.
Credit: Karen Renzaglkia, Southern Illinois University

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NSF–05–02