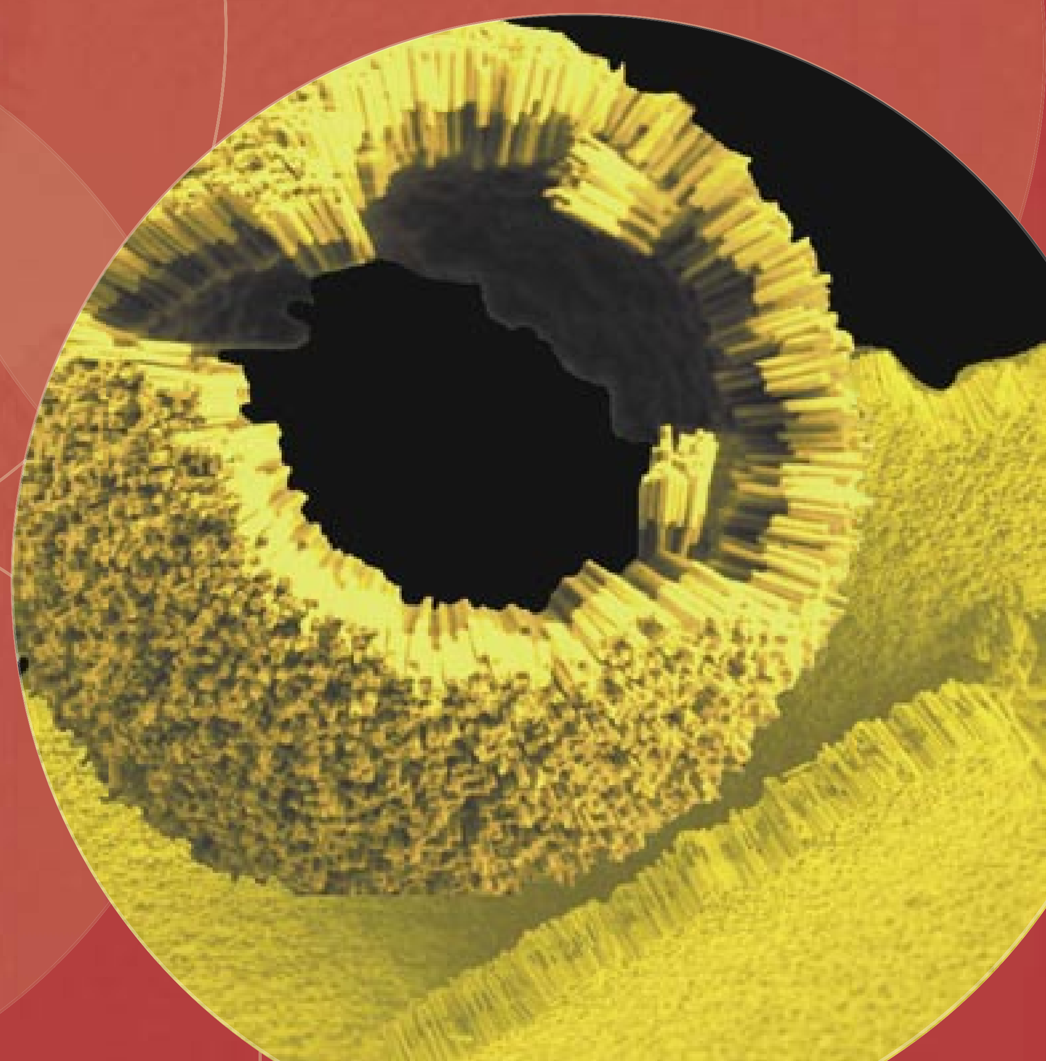
United States

National Science Foundation



FY 2004 PERFORMANCE and ACCOUNTABILITY REPORT

NATIONAL SCIENCE FOUNDATION

FY 2004 Performance and Accountability Report

http://www.nsf.gov/pubsys/ods/getpub.cfm?par

November 15, 2004

The NSF Statutory Mission

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

The NSF Vision

Enabling the Nation's future through discovery, learning and innovation.

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

On the cover: *This image depicts the self-assembly of gold-polymer nanorods into a curved structure. 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 in nanotechnology are critical in order to capitalize on nanotechnology's potential to revolutionize science and engineering and to harness all that it offers.*

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V. Appendixes

For more information about the National Science Foundation, see NSF's website at ***www.nsf.gov****. For copies of this report please send your request to Accountability@nsf.gov. We welcome your comments; please contact John Lynskey, Deputy Director, Division of Financial Management, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230 (jlynske@nsf.gov).*

I. MANAGEMENT'S DISCUSSION AND ANALYSIS

A MESSAGE FROM THE DIRECTOR

I am pleased to have this opportunity to present the National Science Foundation's (NSF) *FY 2004 Performance and Accountability Report.* My first nine months as Acting Director have confirmed my prior impressions of the Foundation – and what I think you too will conclude from reading this report: NSF excels in managing and overseeing the $5.65 billion in taxpayer funding entrusted to it, just as it excels in advancing the frontiers of research and education in science and engineering. The information provided in this report documents that 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 ten trillion 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 six months. These 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 OPM government-wide survey of federal employees – and it clearly reflects the level of commitment and innovation that defines both the staff and management at NSF.

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 opinion on its financial statements. As required by section 1116(e) of title 31 of the United States Code, I am pleased to report that the financial and performance information contained in this report is complete and reliable. I am also pleased to report that NSF is in substantial compliance with the requirements of the Federal Managers' Financial Integrity Act of 1982 (FMFIA) and the Federal Financial Management Improvement Act of 1996 (FFMIA), and that there are no material weaknesses in the agency's management controls. My assessment is based on an independent external consulting firm's recent verification and validation review of the agency's GPRA performance results; NSF Management Controls Committee's organizational review conducted in late summer; and the Independent Auditor's Report received on November 5, 2004.

Thank you for your interest in the National Science Foundation. I invite you to visit NSF's new web site (www.nsf.gov) to learn about the latest discoveries in fundamental science and engineering.

Arden L. Bement, Jr.
Acting Director

November 8, 2004

THE NATIONAL SCIENCE FOUNDATION

I. AGENCY PROFILE

The NSF Mission

As steward of America's science and engineering enterprise, the National Science Foundation (NSF) supports advancements in science and engineering research and education to ensure that the United States maintains leadership in scientific discovery and the development of new technologies. Congress established NSF in 1950 as an independent agency of the federal government "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense."[1] Over the years, NSF acquired additional responsibilities including fostering and supporting the development and use of computers and other scientific methods and technologies; providing Antarctic research, facilities and logistics support; and addressing issues of equal opportunity in science and engineering. NSF is the only federal government agency dedicated to supporting fundamental research and education in <u>all</u> scientific and engineering disciplines. With an annual budget of about $5.6 billion, NSF represents only four percent of the total federal support of research and development (Figure 1) but accounts for 20 percent of federal support for basic research conducted at colleges and universities. In many fields, including computer science, mathematics and the social sciences, NSF is the primary source of federal academic funding (Figure 2).

Figure 1

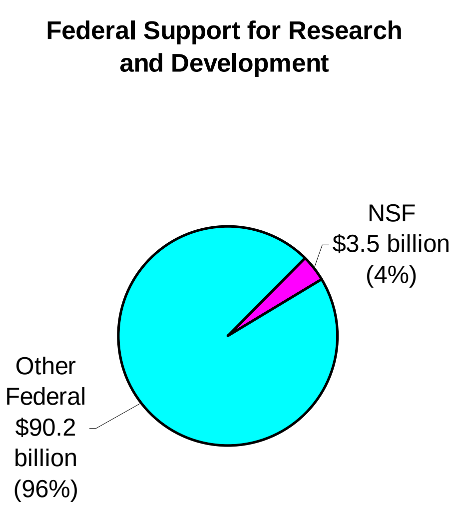
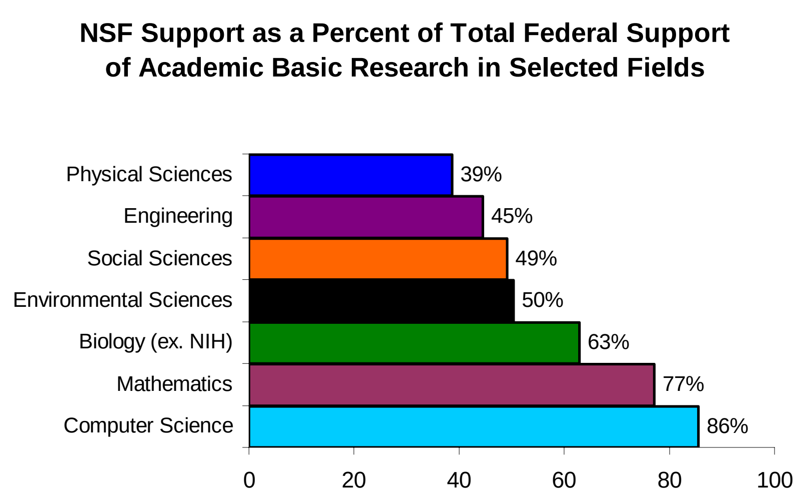


Figure 2.



Source: NSF/SRS/R&D Statistics Program, Survey of Federal Funds for Research and Development: Fiscal Years 2002-04

[1] The National Science Foundation Act of 1950 (P.L. 81-507).

The NSF Vision: Enabling the Nation's Future through Discovery, Learning and Innovation

NSF supports research on nano-engineered products that can neutralize chemical hazards, providing useful tools to promote security. Photo courtesy of NanoScale Materials, Inc.

Despite its small size, NSF is widely recognized as the catalyst for the advancement of basic research in America. NSF funds research that opens new frontiers of scientific inquiry and contributes to developing a competitive workforce in science and engineering. During the Foundation's more than 50 years of leadership, groundbreaking advances in science and technology have enabled the United States to become the most productive nation in history. Economic growth for the last decade has been driven by high technology industries and raised the quality of life across society. Most importantly, not since World War II have advances in science and technology been more critical for ensuring our national security and combating terrorism here at home and abroad, today and for the future. A host of advances are helping to increase safety and security: technologies to protect and monitor the food supply against intentional contamination; new sensors and filters to protect buildings against chemical attack; new techniques to detect biological infections prior to clinical symptoms; and improved security architecture and cryptography to protect critical infrastructure such as telecommunication and water supply systems. Clearly, the surest way to keep our nation prosperous and secure is to keep it at the forefront of learning, discovery and innovation in science and engineering.

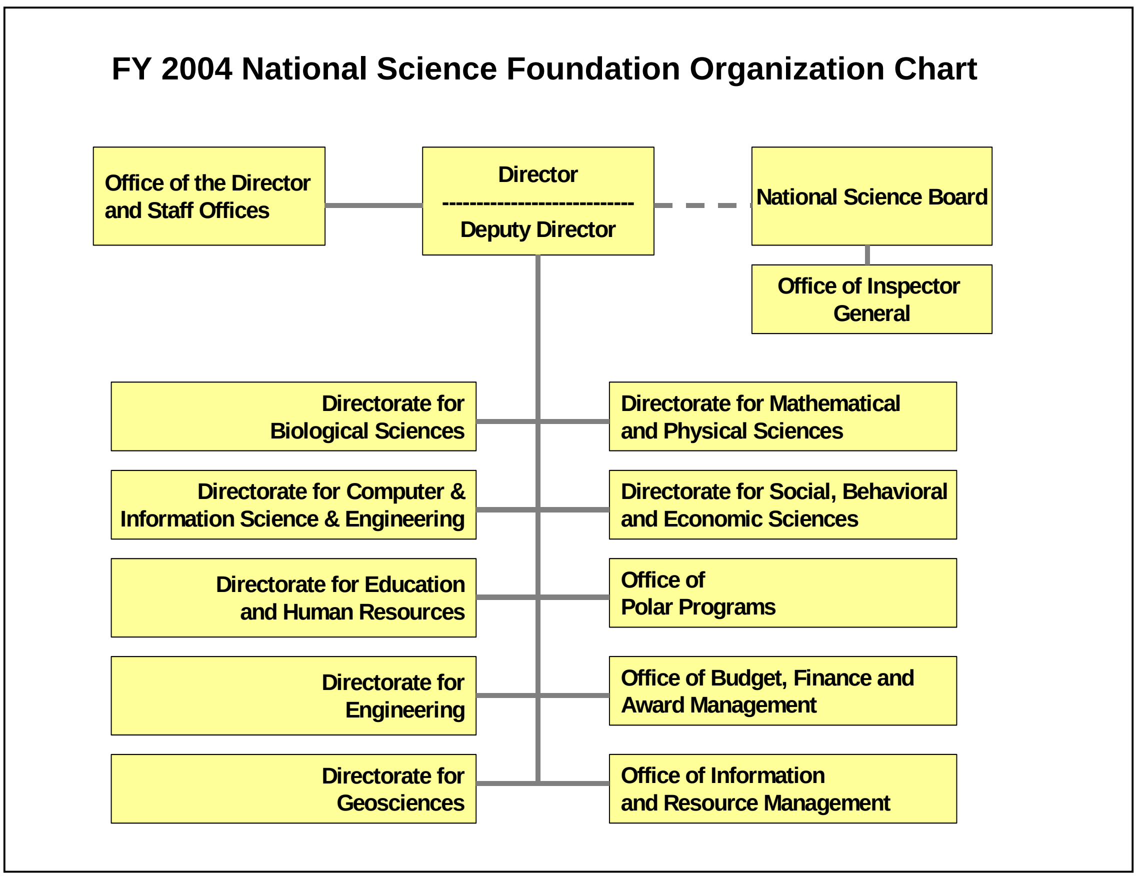
Organizational Structure

A Director who is appointed by the President and confirmed by the U.S. Senate to serve a six-year term heads NSF. A 24-member National Science Board (NSB) establishes policies and reviews programs of the Foundation. NSB members, prominent contributors to the science, mathematics, engineering and education communities, are also appointed by the President and confirmed by the Senate for a six-year term. The Board, of which the NSF director is a member *ex officio*, also serves the President and Congress as an independent advisory body on policies related to the U.S. science and engineering enterprise. NSF is structured much like an academic institution, with directorates organized by discipline and fields of science and engineering, and for science, technology, engineering and math (STEM) education. There are seven program directorates, an Office of Polar Programs and two business offices (Figure 3). Appendix 1 provides a description of each directorate and business office.

NSF is funded primarily by congressional appropriations and maintains a staff of about 1,300 (FTEs). NSF also employs about 200 contractors who are engaged in commercial administrative activities. Additionally, about 50,000 members of the scientific community donate time each year to review proposals and serve in a variety of advisory capacities. To complement the permanent workforce, NSF regularly recruits visiting scientists, engineers, and educators who are at the forefront of their fields to spend one to three years with the agency.[2] Recruiting active researchers and educators to fill rotating assignments infuses new talent and expertise into NSF, while also providing these "rotators" with valuable information and knowledge to take back to their home institutions. The contributions made by rotators are integral to the Foundation's mission of supporting the entire spectrum of science and engineering research and education and help ensure that NSF maintains a close association with the nation's colleges and universities.

A recent report on NSF management by the National Academy of Public Administration (NAPA)[3] called NSF's workforce "its most distinctive organizational characteristic." The NAPA study recognized a "clear need for a mix of rotators and permanent employees." In addition, "Rotators strengthen NSF with fresh academic based research experiences and perspectives." The study also noted "NSF's success in bringing very specialized scientific expertise to support its merit review process is contemporary, as the work-force is self-renewing and cost effective due to its on-demand design."

Figure 3.

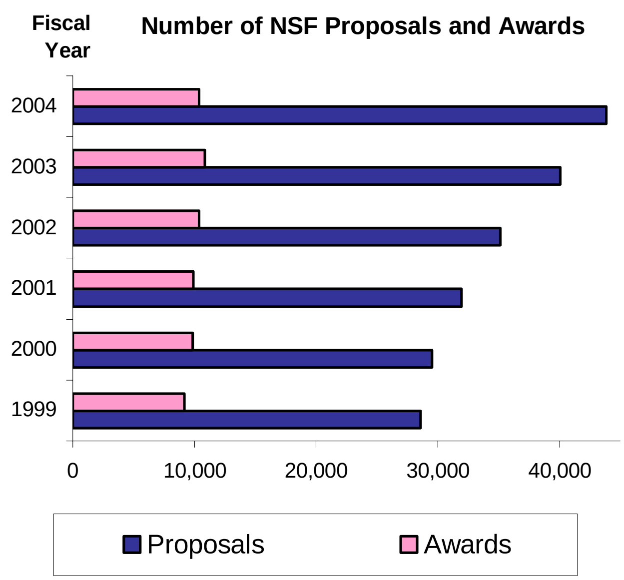


[2] These are appointments made under the Intergovernmental Personnel Act (IPA) or are Visiting Scientists, Engineers and Educators (VSEEs). IPAs are funded through program accounts. As of September 30, 2004, there were 140 IPAs and 33 VSEEs.

How NSF Does Business: Merit-based Grants and the S&E Investment Portfolio

NSF carries out its mission primarily by making merit-based grants and cooperative agreements to support individual researchers and groups, in partnership with over 2,000 universities and other institutions throughout the nation. In fact, except for the South Pole Station and other Antarctic Program facilities, NSF does not conduct research or operate laboratories or facilities. In FY 2004, NSF funded 10,380 new awards from nearly 44,000 proposals submitted by the science and engineering (S&E) research and education communities (Figure 4).[4] It is estimated that these projects directly involve nearly 200,000 people, including senior researchers, post-doctoral associates, teachers and students ranging from kindergarten to graduate level. In FY 2004, the number of proposals submitted to NSF increased 9.2 percent; over the past five years proposals have increased 54 percent.

Figure 4.



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 process is recognized throughout the government as the gold standard for responsible use of public funds. Reviewers focus on two primary criteria – the intellectual merit of the proposed activity and the broader impacts of the proposed activity, e.g., how well the activity promotes teaching, training, and learning and the potential benefits of the proposed activity to society. Reviewers also consider how well the proposed activity fosters the integration of research and education and attracts a diverse set of participants, particularly from underrepresented groups in science and engineering. To achieve its mission to promote the progress of science and engineering, NSF invests in three strategic areas – *People, Ideas and Tools* – each of which translates to an agency strategic

[3] *National Science Foundation: Governance and Management for the Future*, National Academy of Public Administration, April 2004.
[4] In FY 2004, NSF's total investment portfolio included about 30,000 active awards.

outcome goal.[5] NSF's fourth strategic goal, *Organizational Excellence*, supports the achievement of *People*, *Ideas and Tools*. A discussion of NSF's FY 2004 performance goals, measures and results can be found on page I-14.

Meeting Future Challenges

NSF is often called "America's investment in the future." New discoveries and technological innovations allow the U.S. to remain competitive in the global marketplace, help sustain a high quality of life, protect the environment, counter terrorist threats and secure the homeland. Underpinning all NSF's activities is a commitment to excellence in management and stewardship of the public's investment. NSF has always set the highest standards for results-oriented management and stewardship, and it is recognized as a well-managed agency with a long record of success in leveraging its agile, motivated workforce, management processes and technological resources to enhance productivity and effectiveness.

NSF supports research into new teaching approaches that make use of cutting-edge technology to improve learning. Shown here are hearing-impaired students using the Signing-Avatar® accessibility software to access science content on the Web. Photo courtesy of Dr. Judy Vesel – TERC, Cambridge, MA.

In FY 2004, NSF received a number of notable commendations. The President's Quality Award for Management Excellence was awarded to NSF for exemplary performance in implementing the President's Management Agenda (PMA) initiative to expand electronic government.[6] The award recognized NSF's FastLane system, an interactive, real-time web-based system used by the nation's extensive science and engineering communities to conduct NSF business over the Internet. The House Committee on Government Reform commended NSF's significant progress on information security with an "A-" on their Federal Computer Security Report Card for FY 2003.[7] In a joint study by the Partnership for Public Service and The American University Institute for the Study of Public Policy Implementation, NSF ranked second out of 28 federal agencies on a list of "Best Place to Work." The ranking was based on results from the first-ever government-wide survey of federal employees conducted by the Office of Personnel Management (OPM) in 2002.[8] In an independent study from IBM's Center for the Business of Government, NSF was one of two agencies rated an "A+" for outstanding public accountability reporting.[9] For the past three years, NSF's annual *Performance Highlights* reports have been rated among the Top 10 in a national review of annual reports by the League of American Communications Professionals and this past spring it received a Blue Pencil Award of Excellence from the National Association of Government Communicators.

[5] NSF Strategic Plan, FY 2003-2008 can be found at http://www.nsf.gov/od/gpra/Strategic_Plan/FY2003-2008.pdf .

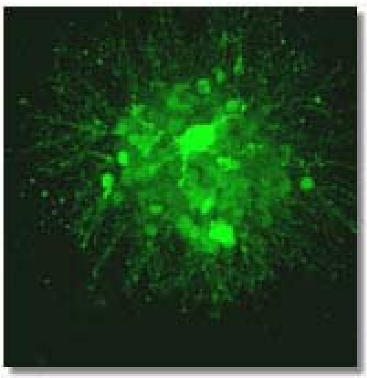
[6] Complete results of the 2003 President's Quality Award for Management Excellence can be found at http://www.opm.gov/pqa/2003winners.asp .

[7] Subcommittee on Technology, Information Policy, Intergovernmental Relation and the Census, http://reform.house.gov/TIPRC/News/DocumentSingle.aspx?DocumentID=2025

[8] The study is available at: http://spa.american.edu/bestplacestowork/content/pdf/BPTW-Rankings.pdf .

[9] *E-Reporting: Strengthening Democratic Accountability*, by Mordecai Lee (IBM Center for The Business of Government), February 2004, http://www.businessofgovernment.org/pdfs/Lee_Report.pdf .

This tradition of success will be vital to meeting future challenges. Historically, administrative overhead has accounted for only around five percent of the agency's total budget; NSF recognizes that modest increases are likely necessary given the dramatically increased workload. In addition to the increase in the volume of the workload, complexity has also increased significantly with the rise in multi-disciplinary, collaborative projects and international activities, as well as new investments in major research facility projects and the continuing need for increased accountability and transparency. The Foundation continually strives to do more with less and work smarter by instituting more efficient and cost-effective business processes. The technological and business practices implemented in past years continue to yield cost efficiencies for the agency; as an example, printing and postage costs are about one-third of what they were five years ago because virtually all NSF publications are now available online.



Shown here is a cluster of cells found in the developing nervous system growing in a controlled environment. NSF-supported tissue engineers at the University of Colorado at Boulder work to control how cells grow and communicate. Their techniques may be used someday in procedures to heal injuries and treat diseases, such as Parkinson's. Photo courtesy of Melissa Mahoney of Dr. Kristi Anseth's Lab.

To better prepare and position itself to meet these challenges, NSF, in partnership with an external management consultant firm, is currently engaged in a multi-year comprehensive business analysis to examine the agency's core business processes, human capital management, and information technology architecture. The business analysis focuses on the needs and opportunities that will help guide NSF's long-term administration and management investments. In FY 2004, the business analysis team undertook and completed a number of major reviews: an external effective practices review of merit review (MR) and award management and oversight (AM&O) practices in both government and private industry; developing process improvements to NSF's MR and AM&O core processes; an agency-wide workload analysis; a plan to streamline major business processes in human resource management; a review of NSF change management processes with particular emphasis on technology implementations; a Technology Governance Framework; a long-term IT implementation plan; an initial NSF-wide Enterprise Architecture; FY 2006 IT Business Cases; and NSF knowledge management pilot projects for design and implementation.

II. PRESIDENT'S MANAGEMENT AGENDA

The President's Management Agenda (PMA) was launched in August 2001 as a government-wide strategy to improve the management, performance and accountability of federal agencies.[10] The PMA consists of management initiatives in five areas: Strategic Management of Human Capital; Competitive Sourcing; Improved Financial Performance; Expanded Electronic Government (E-Gov); and Budget and Performance Integration. The White House Office of Management and Budget (OMB) tracks the progress of agencies in meeting specific criteria under each of the PMA initiatives by issuing a quarterly scorecard. NSF is the only agency to have achieved a "green" successful rating for financial performance for four consecutive years and a "green" successful rating for E-Gov for three consecutive years (Figure 6).

In the fall of 2003, NSF updated its strategic plan to include *Organizational Excellence (OE)* as an agency strategic goal. The inclusion of *OE* as a strategic goal on par with NSF's three mission goals of *People, Ideas and Tools* recognizes that excellence in management is critical to the success of the other three mission goals and allows NSF to sharpen its focus on the agency's PMA efforts and efforts to meet the agency's management challenges.

In FY 2004, NSF successfully maintained its "green" ratings for the E-Gov and financial management initiatives and progressed from "red" to "yellow" status for the Human Capital initiative. NSF staff will continue to work closely with OMB to clarify specific management improvements, establish accountability and develop useful management tools and a set of milestones for each initiative in an effort to achieve success in the upcoming year. A more detailed discussion of the progress made on each PMA initiative in the past year follows.

Figure 5.

President's Management Agenda Scorecard

	9/30/01	9/30/02	9/30/03	9/30/04	
	Baseline	Status	Status	Status	Progress
Strategic Management of Human Capital	R	R	R	Y	G
Competitive Sourcing	R	R	R	R	R
Improving Financial Performance	G	G	G	G	G
Expanded E-Gov't.	Y	G	G	G	G
Budget and Performance Integration	R	R	Y	Y	G

Note: Green (G) represents success; yellow (Y) for mixed results; and red (R) 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.

[10] Further information about the PMA is available at www.whitehouse.gov/omb/budget/fy2002/mgmt.pdf .

PMA Initiative	Progress in FY 2004
Strategic Management of Human Capital **<u>As of 9/30/04</u>** Status:  Progress: 	NSF has developed a comprehensive Human Capital Management Plan (HCMP) that links human capital activities to the NSF Business Plan and to the Human Capital Assessment and Accountability Framework provided by the Office of Personnel Management (OPM). The HCMP also provides NSF with a framework for achieving the PMA Human Capital initiative. NSF utilized the HCMP in FY 2004 to make considerable progress towards "green" by implementing priority action items identified in the plan. Progress has included organizational restructuring in response to changes in business needs; expansion of succession strategies and executive development programs; introduction of performance appraisal plans linked to agency mission, goals and outcomes; verifiable results from efforts to reduce under-representation at the Foundation; integration of competitive sourcing efforts and e-Gov solutions into strategies aimed at the reduction of skill gaps in job families most closely related to the core business processes of the Foundation; and the deployment of human capital metrics to drive human capital decisions and exhibit results. Key portions of the Human Capital Management Plan planned to be undertaken or continued in FY 2005 include the introduction of an Administrative Functions Study; development of a comprehensive workforce planning system; acquisition and development of a Learning Management System (LMS); utilization of competency-based job families to create career pathing and career management opportunities for staff; and development of a competency-based performance management assessment system tied to mission accomplishment. Success in these human capital initiatives and others articulated in the HCMP will facilitate NSF's efforts to make progress and hopefully obtain "green" on the PMA scorecard in FY 2005.

PMA Initiative	Progress in FY 2004
Competitive Sourcing **<u>As of 9/30/04</u>** Status: Progress:	NSF's strategic approach to workforce planning and deployment requires consideration of Competitive Sourcing as a tool for effecting changes suggested by the business analysis findings. Initial results from the NSF Business Analysis led to the development of a job family framework for assembling the 2004 FAIR Act Inventory. The job family framework, the 2004 Inventory, and other reports to OMB articulating the Foundation's consideration of Competitive Sourcing have been accepted in FY 2004, as has its participation in the Competitive Sourcing Civilian Agency Workgroup. In FY 2005, NSF will maintain its benchmarking activities and participation in the Workgroup, and will continue to integrate findings from the Business Analysis to refine its strategy for addressing the competitive sourcing initiative of the President's Management Agenda.
Improved Financial Performance **<u>As of 9/30/04</u>** Status: Progress:	NSF has received a clean audit opinion for seven consecutive years. NSF maintains financial systems that meet federal requirements and prepares clean and timely financial statements. Each quarter, senior management review, as a group, financial and performance information to inform management decisions. NSF's Enterprise Information System and ReportWeb tool currently provide financial and performance information that is easily accessed, distributed and stored. NSF was one of only eight agencies to successfully prepare its FY 2003 PAR report 45 days after the close of the fiscal year, a full year ahead of OMB requirements. NSF automatically prepares its quarterly financial statements and simultaneously produces its Treasury government-wide statements and year-end agency financial statements using an automated closing and data-warehousing environment. In February 2004, in an independent report issued by IBM's Center for the Business of Government's report, *E-reporting: Strengthening Democratic Accountability*, NSF was commended for excellence in public accountability reporting by receiving an "A+" rating. In May 2004, NSF implemented E-Payroll, successfully converting to DOI's Federal Personnel and Payroll System (FPPS). NSF has maintained a "green" status in financial performance since establishment of the PMA initiative. NSF's Five-Year Financial Management Plan (Fiscal Years 2001-2005) supports the PMA by establishing key components to accomplish our financial management strategic vision. These components are: Accountability and Stewardship of the resources provided to NSF; Top Quality Business Services to our external and internal customers (E-travel, E-payroll and

PMA Initiative	Progress in FY 2004
	panel travel); Electronic Delivery Systems for operations, transactions and outreach (Fast Lane and Financial System grant financial functions); and Constructive Partnerships to pilot new practices and to provide specialized services (Grants.gov, Lines of Business).
Expanded Electronic Government (E-Gov) **<u>As of 9/30/04</u>** Status: ● Progress: ●	NSF has maintained a "green" status in electronic government since FY 2002. NSF has a long and distinguished history of electronic grants management efforts; since October 2000 NSF has conducted virtually all business interactions electronically with its external grantee community. NSF has implemented e-Payroll transfer to the DOI system and its conversion has been cited as a planning model by DOI. NSF is actively engaged in supporting numerous other E-Gov initiatives such as the E-Human Resources Initiatives, E-Travel, Integrated Acquisition Environment, E-Authentication, new lines of business initiatives and is integrating existing systems into government-wide capabilities when they become available. The Foundation is a full-fledged Grants.gov Partner Agency, contributing both financial and staff support to participate in technology evaluations, technical panels, steering committees, stakeholder committees, and working groups and has led the Grants Line of Business initiative. NSF is continuing to evolve FastLane, the agency's interactive real-time system that is used to conduct business with the grantee community over the Internet, to seamlessly integrate with Grants.gov. In addition, a new Electronic Jacket System (E-Jacket) is being developed and released in phases as a path-finding effort for NSF's comprehensive proposal review and grants management functions. The implementation of E-Jacket is improving business processes while significantly reducing paper documents by maintaining proposal and award records electronically and allowing the electronic signing of official documents by staff. In addition, NSF has an Enterprise Architecture that is consistent with the Federal Enterprise Architecture, and used it along with the Business Analysis results to develop a phased IT plan consistent with government-wide E-Gov efforts. Security of information technology (IT) systems is a management issue of the highest priority for NSF. In FY 2004, the Foundation made significant investments to enhance an already strong security program and produced remarkable results. At the close of FY 2004, NSF had completed all 52 program and system milestones on the FY 2004 Plan of Actions and Milestones (POAM). Equally important, 19 of 21 have current certification and accreditation status (C&A); C&A for two systems added to the Foundation's inventory in FY 2004 was begun in the fourth quarter and is expected to be completed by January 2005. NSF Security awareness training, now in its third year, was taken by over 96% percent of NSF staff and contractors. Based on an audit and review of the Foundation's IT security program, the NSF Office of Inspector General (OIG) closed

PMA Initiative	Progress in FY 2004
	three prior year findings, reissued two findings as "other weaknesses" and one as a "reportable condition," and issued two new findings categorized as "other weaknesses." All of NSF's investments in information technology are guided by and consistent with the Federal Enterprise Architecture. NSF continues to ensure that its five-year IT Plan is consistent with government-wide E-Gov efforts. NSF will continue to focus its efforts on planning and integrating next generation technology initiatives with E-Gov initiatives and implementation of initiatives to address security needs. Recognizing there are always risks that must be appropriately assessed and mitigated, NSF's overall security program and posture continues to be positive and reflects a commitment to continuous and sustained improvement to what will remain complex and challenging issues in the years ahead.
Budget and Performance Integration **<u>As of 9/30/04</u>** Status: (yellow) Progress: (green)	In FY 2004, NSF aligned planning, budgeting, performance and cost to establish an integrated process in which strategic planning drives budgetary decisions and tracks accountability for performance and identifies full cost. NSF's new Strategic Plan, adopted in the fall of 2003, established a new budget and GPRA* framework that aligned all NSF's programmatic activities to one of ten Investment Categories and align to NSF's strategic outcome goals. This mapping of all program activities to performance goals also allows NSF to identify budgetary costs and track obligations and expenditures to determine full program cost. The Financial Accounting System is currently being updated to enable systematic tracking of program expenditures and the Statement of Net Cost has been revised to reflect NSF's new program structure. Four NSF Investment Categories underwent OMB PART* review in the summer of 2003; all received an "Effective" rating. All PART reviews have been completed for FY 2006 and efficiency measures that apply to all programs have been established. NSF's FY 2005 performance budget incorporated performance information, including PART ratings, into the formulation process to inform budgetary planning and resource allocation decisions. NSF senior management meets at least every quarter to review financial and performance information. In addition, all NSF employee performance appraisal plans are now linked to agency mission, goals and outcomes. * *A more detailed discussion of The Government Performance and Results Act of 1993 (GPRA) and the Program Assessment Rating Tool (PART) can be found on page I-14.*

III. PERFORMANCE HIGHLIGHTS

This discussion features highlights of the NSF's FY 2004 GPRA[11] and PART[12] results. Pertinent background information and a brief discussion of several relevant GPRA performance issues are included to help put NSF's performance results in proper context for those who may not be familiar with the GPRA process or with evaluating research and development programs. For a comprehensive discussion of each of NSF's FY 2004 GPRA performance goals see Chapter II, "Detailed Performance Information."

NSF Assessment Activities, PART Results and the R&D Criteria

NSF has a long-standing practice of conducting a wide range of assessment activities. Committees of Visitors (COVs) and Advisory Committees (AC) reporting on Directorates/Offices are two external reviews that the Foundation has used for over 20 years to conduct independent assessments of the quality and integrity of NSF's investments. On broader issues, NSF often uses external third parties such as the National Academies of Sciences for outside review. NSF may also convene external panels of experts for special studies. A schedule of NSF's program evaluations can be found in Appendix 5 and a list of the external evaluations completed in FY 2004 can be found in Appendix 6.

In FY 1999, NSF began reporting on the agency's annual GPRA performance goals. In FY 2002, NSF began using the Program Assessment Rating Tool (PART), a systematic method for assessing program performance developed by the White House Office of Management and Budget (OMB). During the summer of 2003, four NSF programs underwent PART evaluation: Facilities, Individuals, Informational Technology Research and Nanoscale Science and Engineering. All received the highest possible overall rating of "Effective."[13] Of the 399 federal programs that underwent OMB evaluation in the summer of 2003, only 11 percent were rated "Effective." Others were rated as "Moderately Effective," "Adequate" or "Ineffective," and about 40 percent of programs across the government were unable to demonstrate results.

In addition to the five cross-government PMA initiatives, OMB and the White House Office of Science and Technology Policy (OSTP) also established a research and development (R&D) initiative focused on improving the management and effectiveness of federal R&D programs. Federal agency R&D programs are assessed to meet three primary criteria: Relevance, Quality and Performance.[14] Aspects of the criteria were modeled after existing effective NSF practices; NSF has received feedback that it is doing well with respect to the criteria. NSF senior managers meet at least quarterly to plan, coordinate, assess and redirect the agency's R&D activities as appropriate, based on factors including the R&D criteria, program priorities, potential benefits

[11] For more information about the Government Performance and Results Act of 1993 (GPRA), see http://www.whitehouse.gov/omb/legislative/testimony/cjohnson/030918_cjohnson.html.
[12] For more information about OMB's Program Assessment Rating Tool (PART) see http://www.whitehouse.gov/omb/part/2004_program_eval.pdf.
[13] NSF is not reporting the results of the programs that underwent PART assessment in 2002 for the FY 2004 Budget because they are no longer relevant in the updated strategic plan framework. Thus we are reporting results from the PART assessments completed in the summer of 2003. For more detailed information on NSF's FY 2003 PART results see http://www.whitehouse.gov/omb/budget/fy2005/pma/nsf.pdf .
[14] http://www.ostp.gov/html/ombguidmemo.pdf

and past performance of agency R&D programs. NSF has demonstrated the high quality of its programs in its PART reviews, and in the recently completed FY 2006 OMB Budget Request, NSF placed special emphasis on the R&D investment criteria, integrating specific information on each R&D criteria throughout the Budget.

A New Strategic Plan and the Integration of GPRA and PART

In the fall of 2003, as required by GPRA, NSF updated its Strategic Plan[15] and added a new strategic outcome goal, *Organizational Excellence (OE)*. OE puts excellence in NSF's administration and management activities on par with the Foundation's mission-oriented goals of *People, Ideas and Tools,* recognizing its critical role in the achievement of all NSF goals. As noted in NSF's Strategic Plan, the OE goal focuses on the strategies and resources that enable NSF to be a leader among federal agencies in implementing state-of-the art business and management practices. Moreover, NSF's commitment to OE furthers its efforts under the President's Management Agenda as well as enables the agency to focus more sharply on efforts to meet its management challenges.

Also, for FY 2004, NSF worked with OMB to better integrate its GPRA and PART performance measures.[16] NSF's FY 2004 performance goals include four overarching strategic outcome goals – *People, Ideas, Tools and Organizational Excellence (PITO)* – and 26 other performance goals and PART programmatic measures, all of which align with the overarching strategic PITO framework defined in NSF's new strategic plan. (See Figure 6 on page I-23.)

Some NSF GPRA Issues

GPRA implementation has been a particular challenge for agencies like NSF whose mission involves long-term investments in research and education programs. This is primarily due to: (1) the difficulty of linking outcomes to annual investments and the agency's annual budget; it is not unusual for the benefits of research to appear years or even decades after the initial investment, and (2) the fact that assessing the impact of advances in science and engineering is inherently retrospective and is best performed through the qualitative judgment of experts. These issues required NSF to develop an alternative GPRA reporting format that has been approved by OMB. This alternative reporting format uses an external expert review panel to assess program results and achievement with respect to research outcome goals on a qualitative rather than a quantitative basis. The use of external expert panels to review results and outcomes is a common, long-standing practice used by the academic research and education community.

In FY 2002, in response to the Administration's mandate to accelerate the reporting of agency performance results, NSF established an Advisory Committee for GPRA Performance Assessment (AC/GPA). This Committee includes experts from various disciplines and fields of science, engineering, mathematics and education. In June 2004, the AC/GPA convened to assess

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[15] NSF Strategic Plan, FY 2003-2008 is available at http://www.nsf.gov/od/gpra/Strategic_Plan/FY2003-2008.pdf

[16] This integration is reflected in NSF's FY 2005 performance budget, which was prepared February 2004. NSF no longer prepares a separate annual performance plan; both the FY 2004 and FY 2005 performance goals appear in NSF's FY 2005 Budget Request to Congress (http://www.nsf.gov/bfa/bud/fy2005/toc.htm).

results for the strategic outcome goals of *People, Ideas, Tools* and *Organizational Excellence*.[17] However, as the reporting and determination of results for performance goals are inherently governmental functions, NSF makes the final determination on achievement using the Advisory Committee as one critical input.

Collections of outstanding accomplishments from awards obtained from NSF Program Officers, together with COV reports, award abstracts and investigator project reports formed the basis for determining, through the recommendations of the external AC/GPA, whether NSF demonstrated significant achievement with respect to its FY 2004 *People, Ideas and Tools* strategic outcome goals. In prior years, the Committee, which includes experts in statistics and performance assessment, had thorough discussions about the sampling technique used for the "nuggets" (notable outcomes). The approach to nugget collection is a type of non-probabilistic sampling, commonly referred to as "judgmental" or "purposeful" sampling, that is best designed to identify notable examples and outcomes resulting from NSF's investments. It is the aggregate of collections of notable examples and outcomes that can, by themselves, demonstrate significant agency-wide achievement in the strategic outcome goals.

It is possible, although unlikely, that the Committee could incorrectly conclude that NSF failed to show significant achievement, due to the limited set, when it actually achieved the goals. That is, the Committee could conclude that NSF did not show sufficient achievements based upon over 800 distinct accomplishments of results while, if time permitted, reviewing hundreds or thousands more would add enough to show sufficient total results. The inverse, however, could not occur. If a subset were sufficient to show significant achievement, then adding more results would not change that outcome. Therefore, the limitation imposed by using a "judgmental" sample is that there is a possibility, though likely small given hundreds of examples, that significant achievement would not be sufficiently demonstrated while a larger sample would show otherwise.[18]

The Committee had access to over 50,000 project reports and three years of COV reports (COV reviews are done on a three year cycle) in addition to nuggets, ensuring coverage of the NSF portfolio. While it is correct that some COV reports do not address all of the strategic outcome goals, the volume of information covering the NSF portfolio from these various sources vastly overshadows these minor gaps. The work of COVs is well known to the Committee membership as most currently and formerly served as COV members. Moreover, the process of assessment by NSF's external advisory committee is itself assessed by an independent, external management consulting firm. See data verification and validation discussion on page I-21.

[17] The AC/GPA assessed results for indicators associated with the strategic outcome goals of *People, Ideas, Tools* and with the merit review indicator for the *Organizational Excellence* goal. The Advisory Committee on Business and Operations assessed the other three indicators for OE.

[18] Regarding sampling, the Committee noted in their FY 2003 report that "The Committee believes that a purposeful sampling technique, i.e., one that relies on the judgment of internal experts (NSF program staff) combined with review by an external group of experts, is appropriate, reasonable and useful for GPRA reporting purposes. Such a technique will provide adequate data on which to base conclusions about performance relative to NSF's outcome goals."

Select Performance Goals and Results

The following table presents the results of NSF's four strategic outcome goals and three management efficiency goals. For a more detailed discussion of all of the Foundation's FY 2004 GPRA goals, see Chapter II. Examples that illustrate the impact and success of NSF's investments in *People, Ideas, Tools* and *Organizational Excellence* are also included in Chapter II. Overall, in FY 2004, NSF achieved all four of its strategic outcome goals and 23 of 26 other management and programmatic measures. NSF's annual success rate in achieving its goals have ranged from 64 percent in FY 2000 to 90 percent in 2004.

Strategic Outcome	FY 2004 Performance Goal/Indicators	Results
PEOPLE: A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologist and well-prepared citizens	***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 S&E workforce, including providing 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.	FY 2001: Successful FY 2002: Successful FY 2003: Successful FY 2004: Successful External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.

Strategic Outcome	FY 2004 Performance Goal/Indicators	Results
IDEAS: Discovery across the frontier of science and engineering, connected to learning, innovation and service to society	***Strategic Outcome Goal 2:*** 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 the service of society. -Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities. -Provide leadership in identifying and developing new research and education opportunities within and across science and engineering fields. -Accelerate progress in selected science and engineering areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives.	FY 2001: Successful FY 2002: Successful FY 2003: Successful FY 2004: Successful External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.
TOOLS: Broadly accessible, state-of-the-art science and engineering facilities, tools and other infrastructure that enable discovery, learning and innovation.	***Strategic Outcome Goal 3:*** NSF will demonstrate significant achievement for the majority of the following performance indicators related to the Tools outcome goal: -Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of-the-art S&E 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 U.S. 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.	FY 2001: Successful FY 2002: Successful FY 2003: Successful FY 2004: Successful External expert assessment determined that the Foundation has demonstrated significant achievement in each of the performance indicators associated with this goal.

Strategic Outcome	FY 2004 Performance Goal/Indicators	Results
ORGANIZATIONAL EXCELLENCE: An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.	***Strategic Outcome Goal 4 (new goal):*** NSF will demonstrate significant achievement for the majority of the following performance indicators related to the *Organizational Excellence* outcome goal: - Operate a credible, efficient merit review system. - Utilize and sustain broad access to new and emerging technologies for business application. - Develop a diverse, capable, motivated staff that operates with efficiency and integrity. - Develop and use performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.	FY 2004: Successful External expert assessment determined that NSF has demonstrated significant achievement in each of the performance indicators associated with this goal.

Other Performance Goals

Performance Area	Performance Goal/Measure	Result
Award Size	NSF will increase the average annualized award size for research grants to $139,000. FY 2000 Result $106,000 FY 2001 Goal $110,000 FY 2001 Result $114,000 FY 2002 Goal $113,000 FY 2002 Result $116,000 FY 2003 Goal $125,000 FY 2003 Result $136,000 FY 2004 Goal $139,000 FY 2004 Result $140,000	FY 2004: Successful

Performance Area	Performance Goal/Measure	Result
Award Duration	The average duration of awards for research grants will be 3.0 years. FY 2000 Result 2.8 years FY 2001 Goal 3.0 years FY 2001 Result 2.9 years FY 2002 Goal 3.0 years FY 2002 Result 2.9 years FY 2003 Goal 3.0 years FY 2003 Result 2.9 years FY 2004 Goal 3.0 years FY 2004 Result 2.96 years	FY 2004: Not Successful Progress on this goal is budget dependent. Program Directors must balance competing requirements: increasing award size, increasing duration of awards, and success rates. NSF will continue to focus in FY 2005 on increasing award size and duration. However, due to the decreasing success rate for NSF investigators, this goal is being re-evaluated.
Customer Service: **Time to Decision**	For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of deadline or target date, or receipt date, whichever is later. FY 2000 Goal 70% FY 2000 Result 54% FY 2001 Goal 70% FY 2001 Result 62% FY 2002 Goal 70% FY 2002 Result 74% FY 2003 Goal 70% FY 2003 Result 77% FY 2004 Goal 70% FY 2004 Result 77%	FY 2004: Successful

Data Verification and Validation

For the fifth consecutive year, NSF has engaged an independent, external consulting firm, IBM Business Consulting Services (IBMBCS), to verify and validate the reported results of the agency's annual performance goals. The assessment is based on criteria established by the General Accounting Office's *Guide to Assessing Agency Annual Performance Plans (GAO/GCD-10.1.20)*. IBMBCS assessed the accuracy of NSF's performance data and reported outcomes of performance goals and indicators; described the reliability of the processes used to collect, process, maintain and report data; reviewed system controls to confirm that quality input resulted in quality output; created detailed process descriptions and process maps for those goals being reviewed for the first time; and identified changes to processes and data for those goals undergoing an updated review. IBMBCS' final report included the following statement:

> *Once again, we commend NSF for undertaking this fifth-year effort to verify the reliability of its processes to collect, process, maintain, and report data for its performance goals and the validity of its reported results. NSF reaffirmed its commitment to reporting accurate and reliable performance results by incorporating its PART process into our verification and validation review for the first time this year. The relative infancy and unique nature of the PART process presented some new challenges to the Foundation in collecting data and developing processes in a relatively short period of time for our review. To address these challenges, NSF staff worked and collaborated extensively to provide us with the necessary data, documentation and access to staff and systems to complete our review. We commend the Foundation for this effort.*
>
> *Based on our third quarter and fiscal year-end review, we were able to verify the reliability of the processes and validate the accuracy of all 30 GPRA and PART goals under review. Overall, we conclude that NSF has made a concerted effort to report its performance results accurately and has effective systems, policies and procedures to promote data quality. We verify that NSF relies on sound business policies, internal controls, and manual checks of system queries to report performance. Finally, NSF maintains adequate documentation of its processes and data to allow for an effective verification and validation review.*[19]

The IBMBCS team also reviewed the work of the AC/GPA and verified that the Committee's process of evaluating NSF's achievements against its strategic outcome goals involved a robust collection of performance information. IBMBCS also verified that this performance information was reviewed qualitatively by a highly qualified and diverse committee of science experts with sufficient documentation and transparency to assure accountability and confidence in the AC/GPA's assessments. IBMBCS' final verification and validation review report included the following statement:

> *We did not directly evaluate the AC/GPA's conclusions, as the Committee's review is inherently subjective and independent. However, we did assess the*

[19] *NSF GPRA and PART Performance Measurement Validation and Verification Report on FY 2004 Results*, IBM Business Consulting Services, October 2004.

process NSF used to provide information and guidance to the Committee; the quality of the performance information; the Committee's qualifications and independence; and how the Committee performed its work. Based on our observations, we verify that this process is appropriate and leads to a proper determination of results by the Committee. In summary, the Foundation's processes related to its strategic outcome goals are sufficiently robust and reliable to yield a valid conclusion by the AC/GPA. A number of challenges and areas for improvement still exist for NSF as it seeks to improve this process in future years. However, NSF continues to position itself to address these challenges and remain at the forefront of evaluating federally funded scientific research and development programs.[20]

The Linkage Between Budget, Performance and Costs

Beginning with FY 2004, NSF's updated strategic plan established a new programmatic framework for the budget and GPRA. As shown in Figure 6, every agency programmatic activity is now assigned to an "Investment Category" that aligns with a strategic outcome goal.[21] NSF's new programmatic framework required updating the FY 2004 Statement of Net Cost to include the investment categories that align to *People, Ideas and Tools*. NSF's new *Organization Excellence (OE)* strategic goal focuses on NSF's administrative and management activities so its portfolio supports operational costs such as staff compensation and benefits, administrative travel, training, rent, IT business systems, the Office of the Inspector General and the National Science Board. In the Statement of Net Cost, these *OE* operational costs have been allocated to the ten investment categories aligned to *People, Ideas and Tools*, in order to identify the full cost of NSF's primary programs. Figure 8 (on page I-24) shows the FY 2004 obligations for *People, Ideas and Tools*, also with *OE* allocated to the ten investment categories.

NSF's new programmatic framework allows for a complete alignment and integration of NSF's performance goals, budgetary resources, obligations and expenditures. NSF's strategic plan drives budget allocation decisions that are clearly identified with performance goals and outcomes; obligations and expenditures are tracked so that the full costing of programs can be identified. Figure 6 is a schematic presentation of NSF's new programmatic framework.

NSF's budget is funded though six congressional appropriations: Research and Related Activities (R&RA); Major Research Equipment and Facilities Construction (MREFC); Education and Human Resources (EHR); and Salaries and Expenses (S&E). [22] The National Science Board and the Office of the Inspector General are each funded under its own separate appropriation. Approximately 95 percent of NSF's budget goes directly to the investments it makes in support of its mission-related strategic outcome goals of *People*, *Ideas and Tools*. The remaining five percent of the budget funds *Organizational Excellence.* As shown in Figure 7, NSF's strategic outcome goals were supported at the following levels: $1.15 billion for *People*, $2.82 billion for *Ideas* and $1.40 billion for *Tools* and $0.28 billion for *Organizational Excellence.*

[20] *NSF GPRA and PART Performance Measurement Validation and Verification Report on FY 2004 Results*, IBM Business Consulting Services, October 2004.
[21] The Investment Categories associated with *People, Ideas and Tools* are also NSF's PART programs.
[22] Other revenue sources such as reimbursable authority, appropriations transfers from other federal agencies, donations and H-1B Nonimmigrant Petitioner receipts account for a minor portion of NSF's budget.

Figure 6.

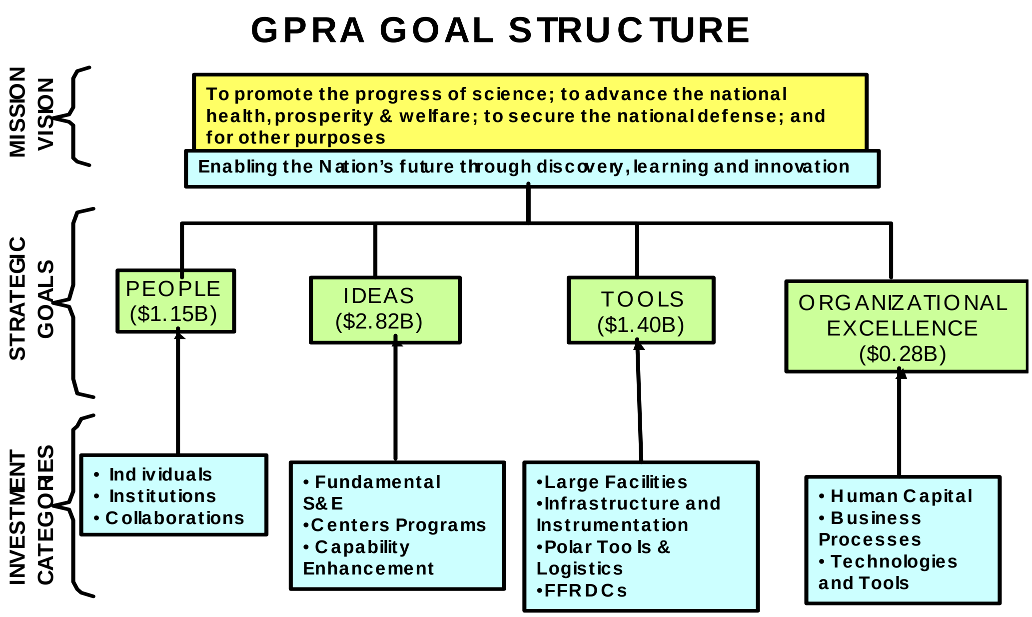
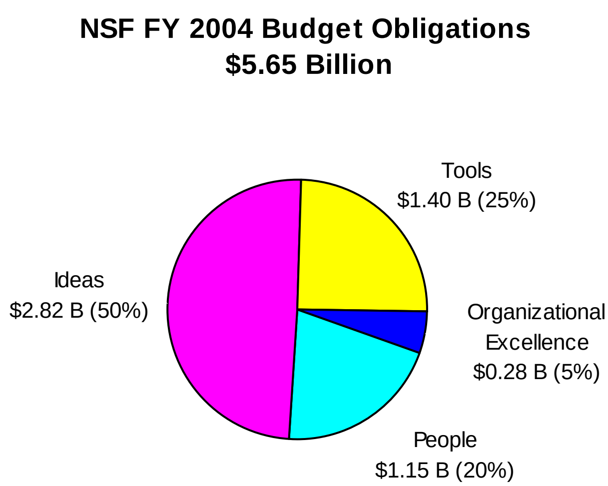


Figure 7.



The table below (Figure 8) shows how funds from each NSF appropriation were obligated by strategic goal and investment category. However, this view of how NSF deploys its budget does not reflect the fact that NSF investments often serve multiple purposes. For example, research projects in programs categorized under Ideas commonly provide funds that involve graduate students. They contribute, therefore, to the *People* strategic outcome goal. These indirect investments are important to the attainment of the Foundation's goals and NSF program officers are expected to take such potential contributions into account when making awards. The synergy attained across the four strategic goals attests to the real strength of the NSF process.

Figure 8.

FY 2004 Support of NSF's Strategic Outcome Goals and Investment Categories

(Obligations in Millions of Dollars)

	R&RA*	EHR*	MREFC*	S&E*	NSB*	OIG*	**TOTAL**
PEOPLE							
Individuals	319.7	204.8	0.0	21.2	0.2	0.9	546.9
Institutions	41.4	142.2	0.0	7.4	0.1	0.3	191.4
Collaborations	42.9	413.7	0.0	18.4	0.2	0.8	476.0
IDEAS							
Fundamental Science & Engineering	2,166.6	50.9	0.0	89.5	0.9	3.9	2,311.8
Centers	365.9	0.0	0.0	14.8	0.2	0.6	381.5
Capability Enhancements	145.9	114.4	0.0	10.5	0.1	0.5	271.4
TOOLS							
Large Facilities	406.0	0.0	162.9	23.8	0.2	1.0	594.0
Infrastructure & Instrumentation	349.4	18.0	0.0	14.8	0.2	0.6	383.0
Polar Tools, Facilities & Logistics	258.2	0.0	21.0	10.4	0.1	0.5	290.2
FFRDC's	197.2	0.0	0.0	8.0	0.1	0.3	205.6
TOTAL	4,293.3	944.1	184.0	218.9	2.2	9.5	5,652.0 **

Notes:

** R&RA=Research & Related Activities; EHR=Education and Human Resources; MREFC=Major Research Equipment and Facilities Construction; S&E=Salaries and Expenses; OIG=Office of Inspector General; and NSB=National Science Board.*

*** Base obligation of $5,652.0M plus Trust Funds ($29.7M), H1-B Nonimmigrant Petitioner Receipts ($57.3M), Reimbursable Authority ($111.6M), and appropriation with expired obligation authority in FY 2004 ($20.1M) equals total obligations incurred as shown on the Statement of Budgetary Resources ($5,870.7M).*

Totals may not add due to rounding.

IV. MANAGEMENT INTEGRITY: CONTROLS, COMPLIANCE AND CHALLENGES

The Federal Managers' Financial Integrity Act of 1982 (FMFIA) requires annual review of an agency's internal accounting and administrative controls. The results of NSF's assessment are reported here in the agency's *FY 2004 Performance and Accountability Report*, consistent with the provisions of the Reports Consolidation Act of 2000.

The National Science Foundation's Management Controls Committee (MCC), chaired by the Chief Financial Officer, is responsible for coordinating the annual review and reporting process. NSF Assistant Directors and Staff Office Directors provide annual statements on FMFIA reviews and the status of management controls within their organizations. These statements serve as the primary basis for the Foundation's assurance that management controls are adequate and effective. Together, these statements cover programmatic, administrative, IT and financial functions, including assessments from the Chief Financial Officer and the Chief Information Officer. The statements are consolidated and reviewed by MCC and, in turn, by the agency Senior Management Integration Group (SMIG). The individual organizational reviews, together with the consolidated summary assessments, are reported to the Acting Director via the Deputy Director (and Chief Operating Officer), who chairs SMIG.

Based on the organizational reviews conducted June-August 2004, and the consideration by MCC and SMIG, it was reported to the Acting Director, NSF, that the agency's management controls and financial management systems, taken as a whole, provide reasonable assurance that provisions of FMFIA Section 2 (internal and administrative controls) and Section 4 (financial systems) were achieved for FY 2004, as well as requirements of the Federal Financial Management Improvement Act (FFMIA). NSF systems are in compliance with applicable laws and administrative requirements, including OMB Circular A-123: Management Accountability and Controls and OMB Circular A-127: Financial Management Systems.

During the FY 2004 management controls evaluation process, no material weaknesses were identified, as defined by OMB guidance. As in previous years senior management identified issues that, while not management control deficiencies, could be potential impediments to effective controls in the future if not addressed. Challenges were identified, in particular, at the intersection between people, processes and systems: administrative resources and staffing have not kept pace with the volume and complexity of the Foundation's workload; the move toward fully electronic business processes has yielded efficiencies, but has also resulted in a need to redefine duties and responsibilities. NSF gives high priority to these issues – many are being addressed through activities already underway.

In the FY 2004 Independent Auditors' Report NSF received an unqualified opinion on its financial condition, with no material weaknesses and two reportable conditions: post-award administration and contract monitoring. NSF management believes that the Auditors' Report does not contain findings sufficient to support reportable conditions. In addition, management disagrees with the characterization of post-award administration – identified in three prior audits – as a repeat finding. Post-award administration is appropriately classified as a management challenge. NSF management's position is fully discussed in the response to the Auditors' Report.

The Acting Director of NSF has determined that the National Science Foundation is in substantial compliance with FMFIA and FFMIA. His statement of assurance is included in the Director's letter, on page I-1.

V. DISCUSSION AND ANALYSIS OF THE FINANCIAL STATEMENTS

The National Science Foundation is committed to excellence in financial management and providing the highest quality of business services to its stakeholders. It honors that commitment by preparing annual financial statements in conformity with Generally Accepted Accounting Principles (GAAP) in the United States and then subjecting the statements to an independent audit to ensure their integrity and reliability in assessing the performance of NSF. For FY 2004, NSF received an unqualified opinion that the financial statements were fairly stated in all material respects. The Auditors' Report also conveyed two reportable conditions, post-award administration and contract monitoring. NSF management believes that the Auditors' Report does not contain findings sufficient to support reportable conditions. For further discussion, see management's response on page III-55.

NSF's Five-Year Financial Management Plan (Fiscal Years 2001-2005) supports the President's Management Agenda by establishing key components to accomplish our financial management strategic vision. They are Accountability and Stewardship of the resources provided to NSF; Top Quality Business Services to our external and internal customers (E-travel, panel travel, and E-payroll); Electronic Delivery Systems for operations, transactions and outreach (related to Fastlane and the Financial System); and Constructive Partnerships to pilot new practices and to provide specialized services (Grants.gov, Lines of Business).

NSF's Financial Accounting System (FAS) provides the full spectrum of financial transaction-based functionality required for a federal agency. FAS processes financial transactions on a real time basis providing NSF decision makers with accurate and up-to-date information. The FAS is extensively integrated with our FastLane and other award systems to create an optimal end-to-end electronic grant process. Grant cash drawdown payments and expenditure reporting are both processed electronically. The FAS system is currently in a steady state requiring only maintenance and modification, due to new guidance requirement. NSF is participating in the Financial Management and Grants Management Lines of Business initiatives that will determine the next generation of NSF's financial system.

Understanding the Financial Statements

NSF's FY 2004 financial statements and notes are presented in the format required for the current year by OMB Bulletin No. 01-09, *Form and Content of Agency Financial Statements*, dated September 25, 2001, and OMB Memorandums specifically M-04-20, *FY 2004 Performance and Accountability Reports and Reporting*, dated July 22, 2004. NSF's current year financial statements and notes are presented in a comparative format, except for the Statement of Net Cost, providing financial information for FY 2004 as well as for FY 2003. The Stewardship Investment Statement presents information over the past five years. The following table (Figure 9) summarizes the significant changes in NSF's financial position during FY 2004.

Figure 9.

Significant Changes in NSF's Financial Position in FY 2004

(Dollars in thousands)

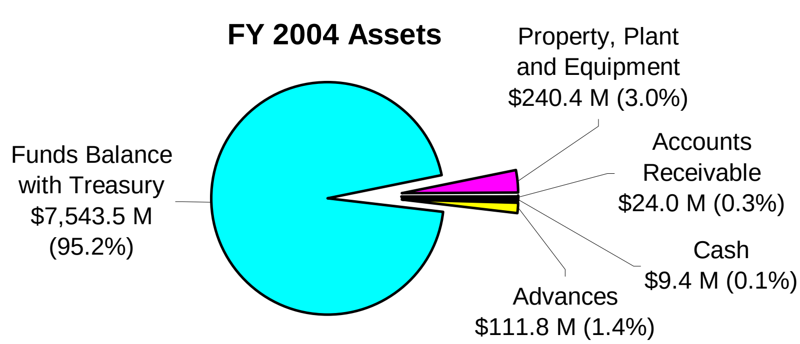
Net Financial Condition	FY 2004	FY 2003	Increase/ (Decrease)	% Change
Assets	$7,929,034	$7,424,919	$504,115	7%
Liabilities	$396,113	$379,705	$16,408	4%
Net Position	$7,532,921	$7,045,214	$487,707	7%
Net Cost	$5,100,143	$4,707,771	$392,372	8%

The following is a brief description of the nature of each required financial statement and its relevance to NSF. Some significant balances or conditions are explained to help clarify their link to NSF operations.

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

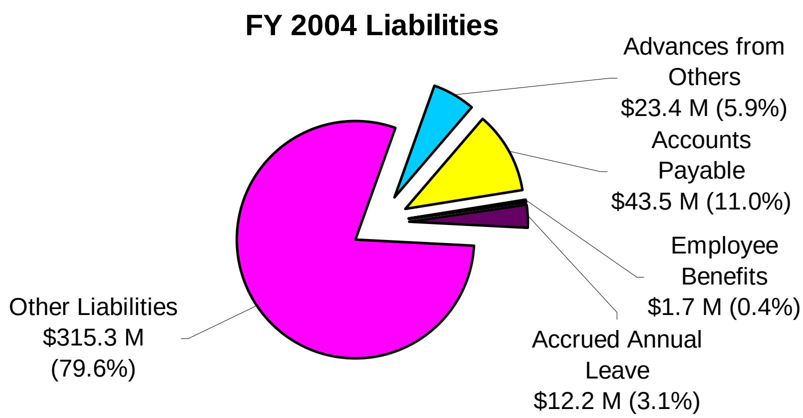
Three line items consisting of *Fund Balance with Treasury; Property, Plant and Equipment;* and *Advances* represent 99 percent of NSF's current year assets (Figure 10). *Fund Balance With Treasury* is funding available through the Department of Treasury accounts from which NSF is authorized to make expenditures and pay amounts due. *Property, Plant and Equipment* comprises capitalized property located at NSF headquarters and NSF-owned property in New Zealand and Antarctica that support the United States Antarctic Program (USAP). *Advances* are funds advanced to NSF grantees, contractors, and other government agencies. NSF's FY 2003 net position shown on the balance sheet was restated due to reclassifying balances from *Unexpended Appropriations* to *Cumulative Results of Operations*. The reclassification was to correct H-1B Nonimmigrant Petitioner Fees that were reported as appropriated funds rather than Earmarked Receipts in prior years. See footnote 14 in the financial statement for further details.

Figure 10.



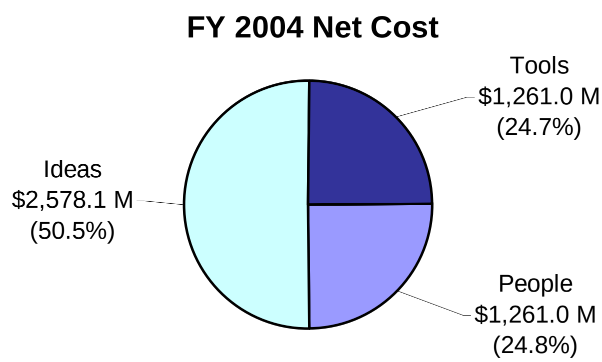
Three line items, *Advances From Others*, *Accounts Payable* and *Accrued Liabilities* (*Other Liabilities)* represent 96 percent of NSF's current year liabilities (Figure 11). *Advances From Others* are prior year amounts remaining advanced to NSF from other federal entities for the administration of grants on their behalf. NSF maintains the expertise and automated systems for the administration of research grants upon which other federal entities rely to assist in the administering of their grants. *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.

Figure 11.



Statement of Net Cost: This statement presents the annual cost of operating NSF programs. The gross cost less any offsetting revenue for each NSF program is used to arrive at the net cost of specific program operations. *Intragovernmental Earned Revenues* are recognized when the related program or administrative expenses are incurred and are deducted from the full cost of the programs to arrive at the net cost of operating NSF's programs. In FY 2004 the Statement of Net Cost has been revised to reflect NSF's new programmatic framework; a discussion of NSF's new Investment Categories can be found on page I-22.

Figure 12.



Note: Included in People, Ideas and Tools is approximately 5 percent of Salaries & Expenses, National Science Board and OIG costs that are the administration and management costs addressed by NSF's new Organizational Excellence strategic goal.

Approximately 95 percent of all current year NSF costs incurred were directly related to the support of NSF *People, Ideas and Tools* programs (Figure 12). Costs were incurred for indirect general operation activities – e.g., as salaries, training, activities related to the advancement of NSF information systems technology, and the activities of the National Science Board and the Office of Inspector General. These costs were allocated to NSF's investment categories under *People, Ideas,* and *Tools* and account for slightly more than five percent of the total current year NSF Net Cost of Operations. These administration and management activities are the focus of NSF's new *Organizational Excellence* strategic goal.

<u>Statement of Changes in Net Position</u>: This statement presents those accounting items that caused the net position section of the Balance Sheet to change from the beginning to the end of the reporting period. NSF's Net Position increased to $7.5 million in FY 2004 – an increase of 7 percent – due to the increase in *Unexpended Appropriations. Unexpended Appropriations* is affected mainly by *Appropriations Received* and *Appropriations Used*, with minor impact from *Appropriation Transfers* from USAID and *Other Adjustments,* which include appropriation rescissions and cancellations. NSF's FY 2003 Statement of Changes in Net Position was restated due to reclassifying balances from *Unexpended Appropriations* to *Cumulative Results of Operations*. The reclassification was to correct H-1B Nonimmigrant Petitioner Fees that were reported as appropriated funds rather than earmarked receipts in prior years. The reclassification also corrects expenditures reported as *Appropriations Used–Unexpended Appropriation* rather than *Unexpended Appropriations-Cumulative Results of Operations.* See footnote 14 in the financial statements for further details.

<u>Statement of Budgetary Resources</u>: This statement provides information on how budgetary resources were made available to NSF for the year and the status of those budgetary resources at year-end. For FY 2004, *Budgetary Authority* for Research and Related Activities, Education and Human Resources, Major Research Equipment and Facilities Construction, the combined National Science Board, OIG and Salaries & Expenses were $4,277 million, $945 million, $156 million and $234 million, respectively. *Total Budgetary Resources* increased by 4 percent and *Net Outlays* increased by 9 percent in FY 2004, which is due to NSF's increase in appropriated funds. The *Net Outlays* reported on this statement reflects the actual cash disbursed for the year by Treasury for NSF obligations; it is reduced by the amount of Donation Fund receipts, to include donations and interest received by NSF.

<u>Statement of Financing</u>: This statement illustrates the relationship between *Net Obligations* derived from NSF's budgetary accounts and the *Net Cost of Operations* reported on the Statement of Net Cost, which is derived from NSF's proprietary accounts. The statement is structured to first identify total resources classified by obligations, and then other adjustments are made to those resources based on how additional items financed those resources or contributed to net cost. *Total Resources Used to Finance Activities* are only resources that have been obligated and are derived from information provided on the Statement of Budgetary Resources. *Total Resources Used to Finance Items Not Part of Net Cost of Operations* consists mainly of an adjustment to undelivered orders of the agency that are reflected in net obligations but not part of *Net Cost of Operations*. *Components Requiring or Generating Resources in Future Periods* adjusts for future funded expenses that are recognized in *Net Cost of Operations* but resources will not be provided until subsequent periods.

Stewardship Investments: Stewardship investments are NSF-funded investments that yield long-term benefits to the general public. NSF investments in research and education yield quantifiable outputs shown in this statement as the number of awards made and the number of researchers, students and teachers supported or involved in the pursuit of discoveries in science and engineering and in science and math education. Stewardship investments from FY 2003 to FY 2004 showed consistent incremental increases in research and human capital activities in support of NSF's overall mission as reported in monetary investments and measured outputs. This is also in line with overall funding increases over the past four years.

Budgetary Integrity: NSF Resources and How They Are Used

NSF is funded primarily through six Congressional appropriations that totaled $5.6 billion in FY 2004, a 5.0 percent increase from the prior year.[23] As of September 30, 2004, other FY 2004 revenue sources included $111.6 million in reimbursable authority, $11.3 million in appropriation transfers from other federal agencies, and $23.9 million in donations to support NSF activities.

As shown in the Statement of Net Cost, in FY 2004, the Foundation made investments in fundamental research and education through ten Investment Categories that are linked to the agency's strategic outcome goals of *People, Ideas, Tools* and *Organization Excellence*. These Investment Categories, which together with NSF's priority areas, constitute the agency's PART programs. The investment categories are: Individuals; Institutions; Collaborations; Fundamental Science and Engineering; Centers; Capability Enhancements; Large Facilities; Infrastructure and Instrumentation; Polar Tools, Facilities, and Logistics; and Federally Funded Research and Development Centers. Support was provided across the full range of science and engineering disciplines with emphasis on the physical sciences. The Foundation also supported five key multidisciplinary priority areas: Biocomplexity in the Environment; Information Technology Research; Nanoscale Science and Engineering; Mathematical Sciences; and Human and Social Dynamics. NSF support of education activities span from pre-K to the post-doctoral level. NSF continued its third year of support for the President's Math and Science Partnership, to link state and local school districts with science, mathematics, engineering and education faculty in colleges and universities to improve preK-12 math and science educational practices, train teachers, and create innovative ways to reach out to underserved students and schools. Among major facility projects supported were the Atacama Large Millimeter Array (ALMA) aperture-synthesis radio telescope; EarthScope, a distributed geophysical instrument array that will enhance our understanding of the structure and dynamics of the North America continent; the IceCube Neutrino Detector Observatory in Antarctica; and Terascale Computing Systems that will provide state-of-the-art capabilities for simulation and modeling for a vast array of scientific, engineering and mathematical problems.

At the time of this report, NSF had not yet received its FY 2005 appropriations. For FY 2005, in keeping with efforts to promote fiscal responsibility across the government, NSF has identified three priorities: (1) Strengthen NSF management of the investment process and operations by increasing the workforce, enhancing the information technology infrastructure, promoting leading-edge approaches to e-Government and ensuring adequate safety and security for all of NSF's IT and physical resources; (2) Improve the productivity of researchers and expand opportunities for students; and (3) Strengthen the nation's performance with world-class

[23] Includes a government-wide 0.59 percent rescission.

instruments and facilities. Among the programmatic activities slated for support in FY 2005 are fundamental research that will help address homeland security challenges facing the nation; investments in cyberinfrastructure to bring next-generation computer and networking capabilities to researchers and educators nationwide; the Administration's Climate Change Research Initiative; ongoing research on the genomics of plants of major economic importance; and international science and engineering, to ensure that American researchers have opportunities to engage with the world's top researchers, to lead major international collaborations and to have access to the best research facilities throughout the world and across all the frontiers of science and engineering. Support is also slated for the four ongoing FY 2004 priority areas and for several major research equipment and facilities construction projects including ALMA, IceCube and EarthScope.

Improper Payments Information Act of 2002: Summary of Implementation Efforts for FY 2004 and Agency Plans for FY 2005 - 2007

NSF has made substantial progress in executing its approved action plan[24] implementing the Improper Payments Information Act of 2002 (IPIA). Our approach is to integrate this effort into our existing grant monitoring activities by sampling for improper payments during site visits to entities with high-risk awards. NSF's grant monitoring framework assesses and manages awardee risks and assets based on a planned, dynamic multi-level risk minimization strategy.

NSF has undertaken the lead in measuring improper payments in the research grant community. This was a result of NSF's research and education awards being the only research grant programs identified for improper payments reporting in the former Section 57 of OMB Circular A-11. This year, NSF has been a key participant in both the Chief Financial Officers Council (CFOC) improper payments PAR workgroup and the Erroneous and Improper Payments Grant workgroup (EIP).

Our initial baseline attempt for measuring improper use payments showed a very low level. NSF's method was designed to comply with OMB guidance on implementing IPIA, however, our methodology was not statistically valid. Accordingly, our projection is not a comprehensive estimate of the potential improper payments. Our sampling was skewed towards our high risk grantees and as such is not statistically valid across the continuum of NSF awards.

Even using this conservative approach, our sampling indicated that improper payments have an incidence of less than one percent of our outlays – less than $5 million. The sampling exercise reviewed our grantees expenses for propriety in accordance with OMB's May 21, 2003 improper payment guidance ("Improper Payments Information Act of 2002," M-03-13) and OMB's cost principles for grants.

After the award is made, awardees (e.g., colleges and universities, school systems, non-profit etc.), gain access to funds primarily through the Cash Request Function of the FastLane Financial Functions. Grantees can request funds as an advance or a reimbursement. NSF records all grantee payments in its general ledger as advances to the organizations. The grantees report actual expenditures quarterly on Part II of their Federal Cash Transaction Report (FCTR), "SF272a, Federal Share of Net Disbursements". These same expenditures are also included in the

[24] Submitted to OMB December 1, 2003.

annual A-133 audit. It is this FCTR report that provides the starting point for the sampling process and the link to the accounting records. From this point, we can identify individual transactions for further review as to the propriety of the payment.

NSF does not have an issue with determining whether the correct amount is paid to the correct grantee. NSF's electronic process for cash draws and FCTR payments are highly automated and accurate in paying the correct grantee with the proper amount. Our accuracy in this grant payment process is 99.9 percent.

As the lead research grant-making agency in this initiative, NSF encountered challenges this year developing an IPIA program. We will meet this challenge with a future focus on improving our sampling methodology, revising our plan, and most importantly improving our baseline information. We are also continuing our involvement in the EIP work group that is addressing how to report and measure improper payments for complex programs. Additional detailed information is provided in Appendix 4.

The Integration of Financial and Management Information

The goal of NSF's financial management team has always been to provide the highest quality of business services to our customers, stakeholders and staff, through effective funds control, prompt and streamlined award processes and reliable and timely financial data to support good management decisions. In today's environment of tight fiscal constraints where management decisions are often difficult to make, the availability of accurate and useful financial information and effective and efficient financial operations are especially important. This year, as part of NSF's continuing efforts to make information more easily and quickly available to management and staff, NSF established ReportWeb, an information website of on-line reports, that along with NSF's Financial Accounting System (FAS) and Enterprise Information System (EIS), provide management and staff access to the agency's full spectrum of financial, budgetary, grants administration, merit review, general management and GPRA performance information.

The establishment of ReportWeb has not only improved the timeliness of the distribution of information but has also provided efficient access to financial management data that supports the day-to-day operations of the program offices. The NSF program offices use the Budget Execution Plan reports to monitor funds on an ongoing basis, to track trends, monitor operating expenses, identify travel and training costs and determine overall fund availability. Further drilldown of financial data is available in NSF's FAS, which reports real-time commitments, obligations and fund availability. ReportWeb, EIS and FAS have become an integral source of information flow to program offices; with the availability of grant award system and financial system reports on ReportWeb, an added benefit has been the savings the agency has realized from reduced printing and storage costs.

The availability of this information allows management to link agency resources to performance goals and outputs/outcomes and identify the cost of achieving program goals. This budget, cost and performance integration means strategic planning drives budgetary decisions, tracks accountability for performance and identifies cost. Up-to-date financial data is accessible to senior management on a "24/7" basis and is used to inform resource allocation, resource management and policy decisions.

Key Financial Metrics

The information presented in this section relates some key financial measures of NSF's core business of awarding grants and our progress in associated electronic processes. NSF has an established record of success in leveraging automation to increase efficiency and productivity. In FY 2004, the Department of Treasury inaugurated a Financial Management Service Scorecard; like the PMA Executive Scorecard, ratings are issued quarterly. For the initial scorecard of FY 2004, NSF received the highest "green" rating, for accuracy and timeliness of reporting FMS reports 224, SF1218/1221 and FMS 1219/1220 (Figure 13). The third category, for Cash and Investments Held Outside of Treasury, does not apply to NSF.

Figures 14 and 15 focus on the agency's Federal Cash Transaction Report (FCTR) process, a key part of NSF's core grant business. In FY 1998, NSF established the capability for grantees to go online through a web-based "FastLane" system to electronically transmit their FCTR (SF 272) reports which are required by nearly all federal grant-making agencies. Within two years, virtually 100 percent of NSF grantees were submitting FCTR reports online and this trend has continued into FY 2004.

Figures 16, 17 and 18 depict the latest available information on key measures for NSF as reported in the Federal Measurement Tracking System (MTS) sponsored by the CFO Council Committee on Performance Measurement.[25] Figure 16 shows that in FY 2004, nearly 100 percent of grantee payments were transmitted electronically. Figure 17 shows that 100 percent of NSF vendor payments are made through electronic fund transfer; only vendor payments to foreign countries are not made via EFT. Figure 18 shows that close to 100 percent of NSF's non-credit card invoices are paid on time; NSF implemented an accounts payable module in its financial accounting system to ensure that Prompt Payment Act requirements are met. Finally, Figure 19 summarizes some of NSF's key workload and financial indicators.

[25] http://www.fido.gov/mts/

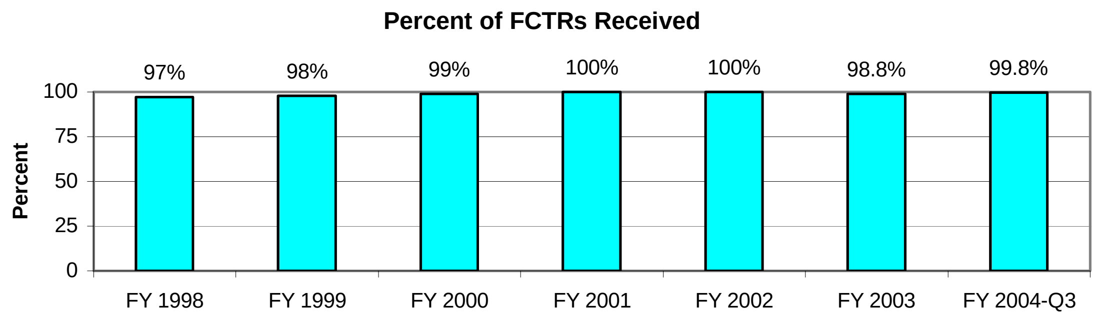
Figure 13.

U.S. Department of Treasury Financial Management Scorecard

	Standard	Initial Results as of 6/30/04
Accuracy of Reporting*****	Green*: If differences outstanding for <3 months.* *Yellow:* If differences outstanding from 3 to 6 months. *Red*: If differences outstanding for >6 months.	● GREEN
Timeliness of Reporting*****	*Green*: If original and supplemental reporting completed by the 3rd workday. *Yellow*: If supplemental report submitted on the 4th day. *Red:* If original submitted after the 3rd workday and/or supplemental submitted after the 4th workday.	● GREEN
Cash and Investments Held Outside of the Treasury (CIHO) Reporting**	*Green:* If no differences between CIHO activity reported monthly (via 224, 1218/1221 and 1219/1220) and quarterly/annual Financial Statements. *Yellow:* If CIHO reported on the monthly 224, 1218/1221 and/or 1219/1220, classified to a Treasury Account Symbol, however, there is an accountability balance on line 5.0 of the 1218 or 1219, and/or line 5.4 of the 224. *Red:* If CIHO activities reported on a quarterly/annual Financial Statement not included on the monthly 224, 1218/1221 and/or 1219/1220.	N/A

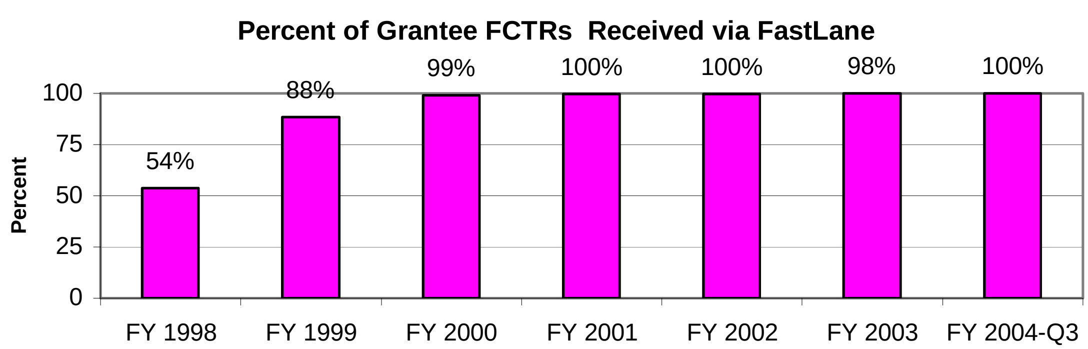
* FMS 224, SF1218/1221 and FMS 1219/1220.
** NSF does not have any of CIHO types of accounts.

Figure 14.



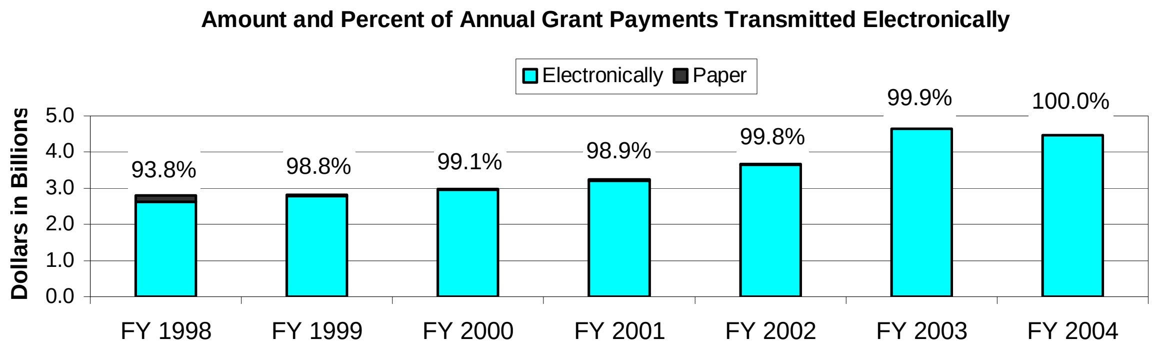
NSF has established the capability for grantees to go online through a web-based "FastLane" system to electronically transmit Federal Cash Transaction Reports (SF 272). Nearly 100% of grantees submit FCTRs on time.

Figure 15.



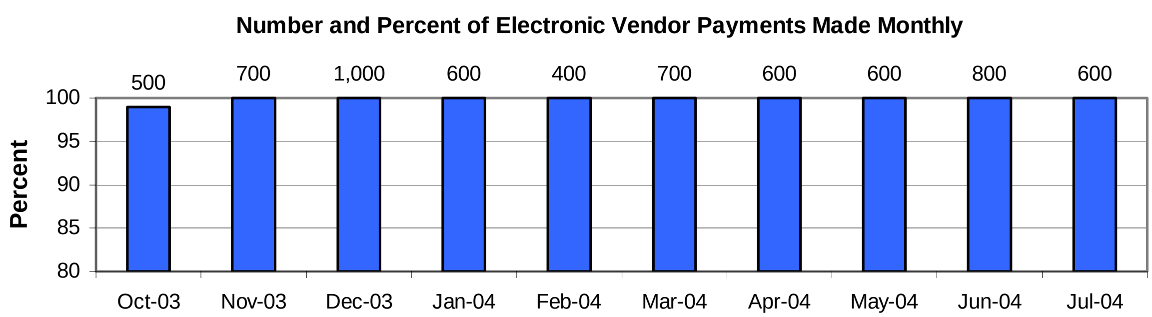
Virtually 100% of NSF grantees submit their FCTRs online. NSF receives close to 100% of FTCRs from those grantees eligible to use electronic transmission of the report.

Figure 16.



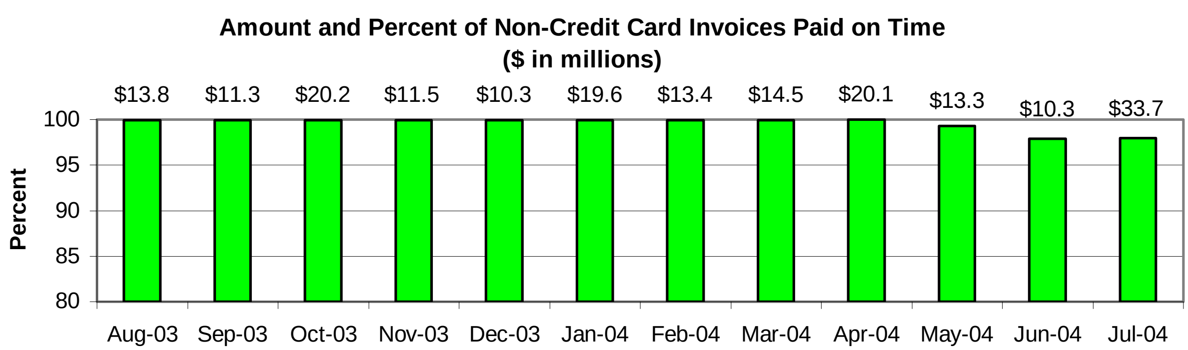
Customer-friendly enhancements to the FastLane FCTR module have greatly improved the efficiency of payments to grantees. Numbers shown above the bars indicate the percent of grantee payments transmitted electronically.

Figure 17.



NSF requires all commercial vendor payments be made through EFT, except foreign ones. Numbers shown above the bars indicate the number of electronic payments made. (Note: July 2004 is most recent data available at this time.)

Figure 18.



NSF has implemented an accounts payable module in its financial accounting system that ensures that Prompt Payment Act requirements are met. Numbers shown above bars indicate dollar amounts of invoices paid. (Note: July 2004 is most recent data available at this time.)

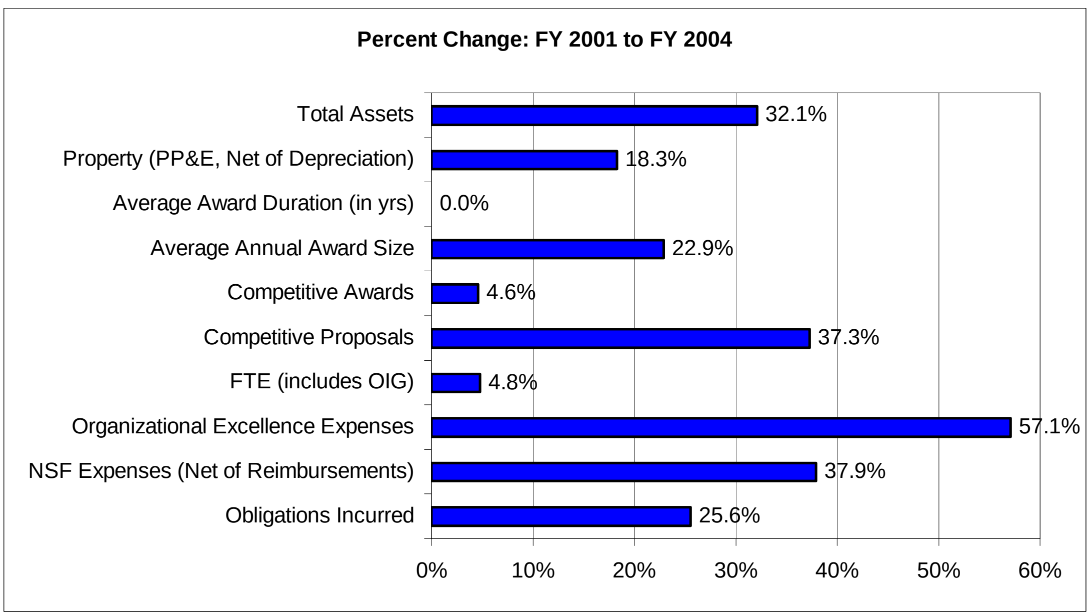
Figure 19.

Recent Trends

The following table summarizes several of NSF's key workload and financial indicators. For the period FY 2001 to FY 2004, NSF's expenses, administrative and management costs, competitive proposals and competitive awards all increased, reflecting the increase in NSF's budget. However, over this period, there has been only a small increase in staff. NSF property increased substantially due to the Antarctic South Pole Station Modernization multi-year project that is nearing completion. NSF's total assets increased mainly due to a larger cash balance with Treasury, which is also related to NSF's budget increase.

(Dollars in Millions)

	FY 2001	FY 2002	FY 2003	FY 2004	%Change FY 01-04
Obligations Incurred	$4,674.88	$4,953.64	$5,578.64	$5,870.72	25.6%
NSF Expenses (Net of Reimbursements)	$3,698.14	$4,132.27	$4,707.77	$5,100.14	37.9%
Organizational Excellence (Expenses)	$170.76	$183.89	$196.36	$268.30	57.1%
FTE (includes OIG)	1,216	1,239	1,242	1,274	4.8%
Competitive Proposals	31,942	35,164	40,075	43,851	37.3%
Competitive Awards	9,925	10,406	10,844	10,380	4.6%
Average Annual Award Size	$113,601	$115,666	$135,609	$139,637	22.9%
Average Award Duration (in yrs)	2.9	2.9	2.9	2.9	0.0%
Property (PP&E, Net of Depreciation)	$203.24	$224.14	$230.78	$240.44	18.3%
Total Assets	$6,001.90	$6,713.15	$7,424.92	$7,929.03	32.1%



Future Business Trends and Events

NSF is continuously evolving as we focus on new priorities and challenges. The future will require NSF to focus on demonstrating management excellence through sharpened attention to specific financial operational issues. For example, the President's Management Agenda (PMA) and other new administrative policy initiatives mandate that NSF, like other agencies, demonstrate consistent results and progress in improving financial management practices. NSF, although continuing to receive high marks from OMB and the financial community, will need to engineer constant improvements in achieving ever evolving management and policy initiatives. NSF is also committed to improving service to its stakeholders and leveraging technology. In addition, the agency also pro-actively addresses management challenges identified through internal review and oversight. Some of the areas NSF will focus on in both the immediate future and long term are:

- Accelerated and Interim Reporting: NSF has always prided itself in meeting all financial reporting deadlines as we have done with the new OMB accelerated reporting requirements for quarterly Financials as well as pro-actively meeting the fiscal year-end reporting requirements.

  Our next goal is to institutionalize this accelerated process into our daily financial reporting. NSF believes that it can use this accelerated process to help develop tools that can be used to identify financial issues earlier in the fiscal year. Through this process NSF has developed a system that generates Closing Entries and Financial Statements automatically. We have also incorporated the requirements for the New Government-wide Financial Reporting System (GFRS), by generating our Financial Statements in the format required by this new system. As a result of this automation process NSF is allowed to spend more time analyzing its data prior to producing the statements. With the Financial process accelerated NSF can ensure that its stakeholders have accurate and timely information available for their use.

  The accelerated process has been very demanding but NSF feels that we are meeting the challenge and believes through this we will become even better financial innovators.

- Budget, Cost and Performance Integration: NSF is making progress to accomplish this PMA goal; for a more detailed discussion see the PMA discussion on page I-13. A key element of NSF's Budget, Cost and Performance Integration Work Plan is to interface the Financial Accounting System with the new strategic framework, to allow automatic tracking of expenditures by the Foundation's primary investment categories. The availability of this information should enable better planning for long-term investments.

- E-Grants: NSF is utilizing a centralized approach for eGrants to leverage and coordinate our efforts for Grants.gov, Grants management Line of Business and the P.L. 106-107 initiatives. NSF continues our support as a full-fledged Grants.gov partner agency among the eleven partner agencies in the government-wide Grants.Gov Initiative; we continue to be a lead partner agency in the Grants Line of Business President's Management Agenda initiative. See PMA discussion on E-Gov, on page I-12.

- E-Travel: NSF is an official "participating agency" for the eTravel initiative. This project, one element of the PMA E-Gov initiative, will provide a government-wide, integrated state-of-the-art web-based solution for travel authorization; reservation and ticketing; and vouchering and payment processes. NSF's administrative and financial employees collaborated to make the eTravel system selection. This collaborative approach will continue as we plan and migrate to a new system. This eTravel system will automate the current financial paper system, improve employee productivity, increase controls, and institute systematic travel card management capabilities. By the end FY 2005, eTravel will put an integrated, easy to use end-to-end travel service on the desktop of every NSF employee.

- FM-Line of Business (FM-LOB): In March 2003, OMB launched new lines of business initiatives, which focus on common solutions within federal agencies. "Financial Management-Line of Business" is one of the new initiatives. The FM-LOB intends to establish and operate a Government-wide financial management solution that is efficient and improves business performance while ensuring integrity in accountability, financial controls and mission effectiveness.

  Some of the goals desired through the FM-LOB are to enhance process improvements and cost savings in the acquisition, development, implementation, and operation of financial management systems through shared services, joint procurements, and consolidation; provide standardization of business processes and data definitions; seamless data exchange between and among federal agencies and; strengthen internal controls through interoperability of core financial and subsidiary systems. NSF participates as an *ex-officio* member on the FM-LOB task force working to develop a government-wide financial management system business strategy that identifies efficiencies, improve business performance and reduces cost. Financially, NSF is focusing efforts on providing next generation grant financial functions as part of an overall end-to-end LOB solution. NSF serves on the Business Management Workgroup and the Business Case Work Group.

Limitations of the Financial Statements

In accordance with OMB Bulleting 01-09, *Form and Content of Agency Financial Statements*, we are disclosing the following limitations of NSF's FY 2004 financial statements, which are contained in NSF's *FY 2004 Performance and Accountability Report*. The financial statements have been prepared to report the financial position and results of operations of NSF, pursuant to the requirements of 31 U.S.C. 3515(b). While the statements have been prepared from NSF's books and records in accordance with generally accepted accounting principles (GAAP) for federal entities and the formats prescribed by OMB, the statements are in addition to the financial reports used to monitor and control budgetary resources, which are prepared from the same books and records. The statements should be read with the realization that they are for a component of the U.S. Government, a sovereign entity.

II. DETAILED PERFORMANCE INFORMATION

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Overview

Supporting Information for Fiscal Year 2004 GPRA Reporting

Appendix

EXECUTIVE SUMMARY

This report, prepared pursuant to the Government Performance and Results Act (GPRA) of 1993, covers activities of the National Science Foundation during Fiscal Year 2004. A general discussion of NSF's performance assessment activities is also provided in the Management's Discussion and Analysis under "Performance Highlights," which begins on page I-15.

NSF's annual goals fall into two broad areas: "Strategic Outcome Goals" and "Other Performance Goals."

Strategic Outcome Goals: NSF's strategic plan, adopted in the fall of 2003, included a new programmatic framework that translated into four strategic outcomes goals. These goals are: People, Ideas, Tools and Organizational Excellence. People, Ideas and Tools concern the practical, concrete, long-term results of NSF's grants and programs. These goals represent the outcomes from NSF investments in science and engineering research and education. The strategic outcome goal of Organizational Excellence ensures that NSF is a capable and responsive organization that can accomplish its other strategic outcome goals.

Other Performance Goals: These goals include performance measures included in NSF's Performance Assessment Rating Tool (PART) evaluation as well as goals addressing award size, duration and dwell time related to the effectiveness and efficiency of the agency's activities.

FY 2004 Performance Results	
Number of Goals Achieved	
Annual Performance Outcome Goals	**4 of 4 (100%)**
Other Annual Performance Goals	**23 of 26 (88%)**
TOTAL	**27 of 30 (90%)**

FY 2004 Results: For FY 2004 NSF met 27 (90%) of our 30 goals.[1]

<u>*Outcome Goals:*</u> NSF was successful for all (100%) of our four annual performance goals associated with our strategic outcome goals. Our strategic outcome goals are:

People – A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens;

Ideas – Discovery across the frontier of science and engineering, connected to learning, innovation and service to society;

Tools – Broadly accessible, state-of-the-art S&E facilities, tools, and other infrastructure that enable discovery, learning, and innovation; and

[1] IBM Business Consulting Services provided an independent verification and validation of performance information and data.

Organizational Excellence – An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.

Examples of accomplishments for each of the outcome goals are provided within the body of the report.

Other Performance Goals: We were successful for 23 of our other 26 performance goals (88%). Our goals in FY 2004 relative to FY 2003 goals were to:

- Increase the number of U.S. students receiving fellowships through Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT) (Goal 2). The number of students receiving fellowships increased from 3328 in FY 2003 to 3681 in FY 2004.
- Increase the stipend level for GRF and IGERT awards (Goal 3). We achieved a stipend level of $30,000 compared to $27,500 in FY 2003.
- Increase the number of applicants for Graduate Research Fellowships (GRF) from groups that are underrepresented in the science and engineering workforce (Goal 4). Our number of applicants increased from 820 in FY 2003 to 1009 in FY 2004.
- Increase the number of applications for Faculty Early Career Development Program (CAREER) awards from investigators at minority-serving institutions (Goal 5). We had 82 applications in FY 2004 compared to 67 applications in FY 2003.
- Increase the percent of Nanoscale Science and Engineering (NS&E) proposals with at least one female PI or Co-PI to 25% (Goal 6). We achieved 26% compared to 22% in FY 2003.
- Increase the percent of Information Technology Research (ITR) proposals with at least one female Principal Investigator (PI) or Co-PI to 25% (Goal 7). Twenty-nine percent of the proposals satisfied this criterion compared with 26% in FY 2003.
- Maintain the percent of Information Technology Research (ITR) proposals with at least one minority PI or Co-PI at 7% (Goal 9). We achieved 9% in FY 2004 compared to 7% in FY 2003.
- Maintain the percent of Nanoscale Science and Engineering (NS&E) proposals that are multi-investigator proposals at 75% (Goal 10). We achieved 80% in FY 2004 compared to 73% in FY 2003.
- Maintain the percent of Information Technology Research (ITR) proposals that are multi-investigator proposals at 50% (Goal 11). We achieved 62% compared to 59% in FY 2003.
- Continue to be on track with respect to development of workforce, as qualitatively evaluated by external experts for Nanoscale Science and Engineering (NS&E) (Goal 12). External experts found that we continued to be on track.
- Continue to be on track with respect to maintaining a program that is responsible for a broad-based and capable interdisciplinary research community that advances fundamental nanotechnology knowledge, with impact on other disciplinary fields, as qualitatively evaluated by external experts for NS&E (Goal 14). External experts found this to be the case.
- Continue to be on track with respect to the successful development of a knowledge base for systematic control of matter at the nanoscale level that will enable the next industrial revolution for the benefit of society, as qualitatively evaluated by external experts for NS&E (Goal 15). External experts found this to be the case.
- Increase the average annualized new award size for research grants to $139,000 (Goal 16). We achieved $140,000 compared to $136,000 in FY 2003.
- Increase the average annualized research grant award size for Nanoscale Interdisciplinary Research within NS&E from $315,000 in FY 2003 to $330,000 in FY 2004 (Goal 17). We achieved $336,000 compared to $315,000 in FY 2003.
- Maintain the average annual award size for new Information Technology Research (ITR) research grants at $230,000 (Goal 18). We achieved $336,000 compared to $276,000 in FY 2003.

- Maintain the average award duration of new Information Technology Research (ITR) research grants at 3.3 years (Goal 20). In FY 2004 this award duration was 3.7 years equal to the result of 3.7 years in FY 2003.
- Maintain the average duration of new research grant awards for Nanoscale Interdisciplinary Research within the NS&E solicitation at 3.8 years (Goal 21). We achieved an average duration of 3.9 years in FY 2004 compared with 3.8 years in FY 2003.
- Increasing to 90% the percentage of facilities construction, acquisition and upgrade projects with negative cost and schedule variances of less than 10% of the approved project plan (Goal 23). In FY 2004, the percent of facilities achieving the goal was 100%.
- Increase the number of users accessing National Nanofabrication Users Network/National Nanotechnology Infrastructure Network (NNUN/NNIN) and Network for Computational Nanotechnology (NCN) sites to 4000 (Goal 25). In FY 2004 we had 6350 compared to 3000 in FY 2003.
- Increase the number of nodes that comprise infrastructure (Goal 26). In FY 2004 we had 20 nodes compared to 12 in FY 2003.
- Increase the peak available teraflops (trillions of floating point operations per second) for scientific computation (Goal 27). In FY 2004 we had 22 peak available teraflops compared to 12 in FY 2003.
- Obtain an external committee finding that research infrastructure is appropriate to enable major discoveries for NS&E (Goal 28). External experts found this to be the case.
- For 70% of proposals, to inform applicants whether their proposals have been declined or recommended for funding within six months of deadline or target date, or receipt date, whichever is later (Goal 30). In FY 2004 we achieved 77%, the same as in FY 2003.

We were not successful for 3 of our 26 other performance goals (12%). These were:

- Maintaining the percent of NS&E proposals with at least one minority principal investigator (PI) or co-principal investigator (Co-PI) at the FY 2003 performance level (Goal 8). We achieved 12% compared to 13% in FY 2003.
- Increasing the average duration of awards for research grants (Goal 19). In FY 2004 the average duration was 2.96 years compared to the goal of 3.0 years.
- Increasing the percent of operational facilities that keep scheduled operating time lost to less than 10% (Goal 24). In FY 2004, the percent of facilities that achieved the goal was 89.7% compared to the goal of 90%.

I. SUMMARY OF PERFORMANCE RESULTS

Overall, NSF was successful in achieving 90% (27 of 30) of the performance goals in FY 2004. Progress towards achievement of NSF's four strategic outcome goals is measured by NSF's performance with respect to annual performance goals for People (Goal 1), Ideas (Goal 13), Tools (Goal 22), and Organizational Excellence (Goal 29).

FY 2000 – FY 2004 Performance Results
Number of Goals Achieved

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

Note: In FY 2000 through FY 2003, Other Performance Goals include goals that have been identified as Investment Process goals or Management Goals.

The tables that follow provide a summary of NSF's FY 2004 results for GPRA and PART.

ANNUAL PERFORMANCE GOALS

Strategic Outcome	FY 2004 Annual Performance Goal	Results for National Science Foundation
People Strategic Outcome Goal **Outcome Goal:** A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens.	***<u>Performance Goal 1:</u>*** **NSF will demonstrate significant achievement for the majority of the following performance indicators related to the People outcome goal:**	**FY 2001:** NSF successful for related goal. **FY 2002**: NSF successful for related goal. **FY 2003**: NSF successful for related goal. **FY 2004: NSF is successful for goal 1.**
	Indicators:	**Indicator Results:**
	Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities.	Demonstrated significant achievement
	Support programs that attract and prepare U.S. students to be highly qualified members of the global S&E workforce, including providing opportunities for international study, collaborations and partnerships.	Demonstrated significant achievement.
	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.	Demonstrated significant achievement.
	Promote public understanding and appreciation of science, technology, engineering, and mathematics, and build bridges between formal and informal science education.	Demonstrated significant achievement.
	Support innovative research on learning, teaching and mentoring that provides a scientific basis for improving science, technology, engineering and mathematics education at all levels.	Demonstrated significant achievement.
	<u>FY 2004 Result:</u> External expert assessment found that NSF has demonstrated significant achievement for each of the performance indicators associated with this goal.	

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Fellowships	***Performance Goal 2:*** Number of U.S. students receiving fellowships through Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT). FY 2002 Result 3011 FY 2003 Result 3328 FY 2004 Goal Increase FY 2004 Result 3681 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 2.**
Fellowships	***Performance Goal 3:*** Stipend level for Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT) awards (dollars/year). FY 2000 Goal \$15,000 FY 2000 Result \$16,800 FY 2001 Goal \$16,000 FY 2001 Result \$18,000 FY 2002 Goal \$18,000 FY 2002 Result \$21,500 FY 2003 Goal \$27,500 FY 2003 Result \$27,500 FY 2004 Goal \$30,000 FY 2004 Result \$30,000 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 3.**
Fellowships	***Performance Goal 4:*** Number of applicants for Graduate Research Fellowships from groups that are underrepresented in the science and engineering workforce. FY 2002 Result 730 FY 2003 Result 820 FY 2004 Goal Increase FY 2004 Result 1009 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 4.**

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Diversity	***Performance Goal 5:*** Number of applications for Faculty Early Career Development Program (CAREER) awards from investigators at minority-serving institutions. FY 2002 Result 60 FY 2003 Result 67 FY 2004 Goal Increase FY 2004 Result 82 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 5.**
Diversity	***Performance Goal 6:*** Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one female principal investigator (PI) or Co-PI. FY 2001 Result 25% FY 2002 Result 25% FY 2003 Result 22% FY 2004 Goal 25% FY 2004 Result 26% FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 6.**
Diversity	***Performance Goal 7:*** Percent of Information Technology Research (ITR) proposals with at least one female principal Investigator (PI) or Co-PI. FY 2001 Result 24% FY 2002 Result 25% FY 2003 Goal 24% FY 2003 Result 26% FY 2004 Goal 25% FY 2004 Result 29% FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 7.**

ANNUAL PERFORMANCE GOALS
(continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Diversity	***Performance Goal 8:*** Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one minority principal investigator (PI) or Co-PI. FY 2001 Result 10% FY 2002 Result 10% FY 2003 Result 13% FY 2004 Goal 13% FY 2004 Result 12% FY 2004 Result: NSF is not successful for this goal. We will continue our efforts to encourage minorities to submit proposals to these areas.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is not successful for goal 8.**
Diversity	***Performance Goal 9:*** Percent of Information Technology Research (ITR) proposals with at least one minority principal investigator (PI) or Co-PI. FY 2001 Result 7% FY 2002 Result 7% FY 2003 Goal 7% FY 2003 Result 7% FY 2004 Goal 7% FY 2004 Result 9% FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 9.**
Multidisciplinary	***Performance Goal 10:*** Percent of Nanoscale Science and Engineering (NS&E) proposals that are multi-investigator proposals. FY 2001 Result 75% FY 2002 Result 75% FY 2003 Goal 75% FY 2003 Result 73% FY 2004 Goal 75% FY 2004 Result 80% FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 10.**

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Multidisciplinary	***Performance Goal 11:*** Percent of ITR proposals that are multi-investigator FY 2001 Result 59% FY 2002 Result 58% FY 2003 Goal 50% FY 2003 Result 59% FY 2004 Goal 50% FY 2004 Result 62% FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 11.**
Workforce	***Performance Goal 12:*** Successful development of workforce, as qualitatively evaluated by external experts for NS&E. FY 2004 Goal On-track FY 2004 Result On-track FY 2004 Result: Based on the NanoScience and Engineering Committee of Visitors (COV) report NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 12.**

ANNUAL PERFORMANCE GOALS
(continued)

Strategic Outcome	FY 2004 Annual Performance Goal	Results for National Science Foundation
Ideas Strategic Outcome Goal **Outcome Goal:** Discovery across the frontier of science and engineering, connected to learning, innovation and service to society.	***<u>Performance Goal 13:</u>*** **NSF will demonstrate significant achievement for the majority of the following performance indicators related to the Ideas outcome goal:** **Indicators:**	**FY 2001:** NSF successful for related goal. **FY 2002**: NSF successful for related goal. **FY 2003**: NSF successful for related goal. **FY 2004: NSF is successful for goal 13.** **Indicator Results:**
	Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge.	Demonstrated significant achievement.
	Encourage collaborative research and education efforts – across organizations, disciplines, sectors and international boundaries.	Demonstrated significant achievement.
	Foster connections between discoveries and their use in the service of society.	Demonstrated significant achievement.
	Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities.	Demonstrated significant achievement.
	Provide leadership in identifying and developing new research and education opportunities within and across S&E fields.	Demonstrated significant achievement.
	Accelerate progress in selected S&E areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives.	Demonstrated significant achievement.
	<u>FY 2004 Result:</u> External expert assessment found that NSF has demonstrated significant achievement for each of the performance indicators associated with this goal.	

ANNUAL PERFORMANCE GOALS
(continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Ideas: Interdisciplinary Nanotechnology	***Performance Goal 14:*** Qualitative assessment by external experts that program is responsible for a broad-based and capable interdisciplinary research community that advances fundamental nanotechnology knowledge, with impact on other disciplinary fields. FY 2004 Goal — On-track FY 2004 Result — On-track FY 2004 Result: Based on the NanoScience and Engineering (NS&E) Committee of Visitors (COV) report NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 14.**
Ideas: Knowledge Base Nanotechnology	***Performance Goal 15:*** As qualitatively evaluated by external experts, the successful development of a knowledge base for systematic control of matter at the nanoscale level that will enable the next industrial revolution for the benefit of society. FY 2004 Goal — On-track FY 2004 Result — On-track FY 2004 Result: Based on the NanoScience and Engineering (NS&E) Committee of Visitors (COV) report NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 15.**
Award Size	***Performance Goal 16:*** NSF will increase the average annualized award size for research grants to $139,000. FY 2000 Result — $106,000 FY 2001 Goal — $110,000 FY 2001 Result — $114,000 FY 2002 Goal — $113,000 FY 2002 Result — $116,000 FY 2003 Goal — $125,000 FY 2003 Result — $136,000 FY 2004 Goal — $139,000 FY 2004 Result — $140,000 FY 2004 Result: NSF is successful for this goal.	**FY 2001:** NSF successful **FY 2002:** NSF successful **FY 2003:** NSF successful **FY 2004: NSF is successful for goal 16.**

ANNUAL PERFORMANCE GOALS
(continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Award Size	***Performance Goal 17:*** Average annualized new research grant award size for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering (NS&E) solicitation. FY 2001 Result $363,000 FY 2002 Result $323,000 FY 2003 Goal $330,000 FY 2003 Result $315,000 FY 2004 Goal $330,000 FY 2004 Result $336,000 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 17.**
Award Size	***Performance Goal 18:*** Average annual award size for new ITR research grants. FY 2001 Result $242,000 FY 2002 Result $226,000 FY 2003 Goal $230,000 FY 2003 Result $276,000 FY 2004 Goal $230,000 FY 2004 Result $336,000 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 18.**

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Award Duration	***Performance Goal 19:*** The average duration of awards for research grants will be 3.0 years. FY 2000 Result 2.8 years FY 2001 Goal 3.0 years FY 2001 Result 2.9 years FY 2002 Goal 3.0 years FY 2002 Result 2.9 years FY 2003 Goal 3.0 years FY 2003 Result 2.9 years FY 2004 Goal 3.0 years FY 2004 Result 2.96 years FY 2004 Result: NSF is not successful for this goal: Progress on this goal is budget dependent. Program Directors must balance competing requirements: increasing award size, increasing duration of awards, and/or making more awards. NSF will continue to focus on increasing award size and duration, together with recovering from recent declines in success rates, as permitting within budget constraints.	**FY 2000:** Goal not included in Performance Plan **FY 2001:** NSF not successful **FY 2002:** NSF not successful **FY 2003:** NSF not successful **FY 2004: NSF is not successful for goal 19.**
Award Duration	***Performance Goal 20:*** Average award duration of new ITR research grants (in years). FY 2001 Result 3.4 FY 2002 Result 3.3 FY 2003 Goal 3.3 FY 2003 Result 3.7 FY 2004 Goal 3.3 FY 2004 Result 3.7 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 20.**
Award Duration	***Performance Goal 21:*** Average duration (in years) of new research grant awards for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering solicitation. FY 2001 Result 4 FY 2002 Result 3.7 FY 2003 Goal 3.8 FY 2003 Result 3.8 FY 2004 Goal 3.8 FY 2004 Result 3.9 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 21.**

ANNUAL PERFORMANCE GOALS (continued)

Strategic Outcome	FY 2004 Annual Performance Goal	Results for National Science Foundation
Tools Strategic Outcome Goal **Outcome Goal:** Broadly accessible state-of-the-art S&E facilities, tools, and other infrastructure that enable discovery, learning and innovation.	***<u>Performance Goal 22:</u>*** **NSF will demonstrate significant achievement for the majority of the following performance indicators related to the Tools outcome goal:** **Indicators:**	**FY 2001:** NSF successful for related goal. **FY 2002**: NSF successful for related goal. **FY 2003**: NSF successful **FY 2004: NSF is successful for goal 22.** **Indicator Results:**
	Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of-the-art S&E facilities, tools, databases, and other infrastructure.	Demonstrated significant achievement.
	Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms.	Demonstrated significant achievement.
	Develop and deploy an advanced cyberinfrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation.	Demonstrated significant achievement.
	Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation.	Demonstrated significant achievement.
	Support research that advances instrument technology and leads to the development of next-generation research and education tools.	Demonstrated significant achievement.
	<u>FY 2004 Result:</u> External expert assessment found that NSF has demonstrated significant achievement for each of the performance indicators associated with this goal.	

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Construction and Upgrade of Facilities	**Performance Goal 23:** Percent of construction acquisition and upgrade projects with negative cost and schedule variances of less than 10% of the approved project plan. *FY 2004 target is 90%.* FY 2003 Goal 90% FY 2003 Result: 88% FY 2004 Goal 90% FY 2004 Result: Data collected from Facilities Managers external to NSF indicate that 100% (35 out of 35) of facilities kept any negative cost and schedule variances to less than 10 percent of the approved project plan. Later reporting of estimates to compare with actuals this past year may have contributed to the increase over the prior year.	FY 2003: NSF not successful **FY 2004: NSF is successful for goal 23.**
Operations and Management of Facilities	**Performance Goal 24:** Percent of operational facilities that keep scheduled operating time lost to less than 10%. *FY 2004 target is 90%.* FY 1999 Result: Reporting database under development. FY 2000 Result: Of the 26 reporting facilities, 22 (85%) met the goal of keeping unscheduled downtime to below 10% of the total scheduled operating time. FY 2001 Result: Of the 29 reporting facilities, 25 (86 percent) met the goal of keeping unscheduled downtime to below 10 percent of the total scheduled operating time. FY 2002 Result: Of the 31 reporting facilities, 26 (84 percent) met the goal of keeping unscheduled downtime to below 10 percent of the total scheduled operating time. FY 2003 Result: Of the 30 reporting facilities, 26 (87 percent) met the goal keeping scheduled operating time lost to less than 10 percent. FY 2004 Result: We were not successful in achieving this goal. Data collected from Facilities Managers external to NSF indicate that 89.7% (26 out of 29) facilities kept scheduled operating time lost to less than 10 percent. NSF will continue to work with Facility Managers to improve performance in this area.	**FY 1999:** Inconclusive for related goal **FY 2000:** NSF not successful for related goal **FY 2001:** NSF not successful **FY 2002:** NSF not successful **FY 2003:** NSF not successful **FY 2004: NSF not successful.**

ANNUAL PERFORMANCE GOALS (continued)

Performance Area	FY 2004 Annual Performance Goal	Results for National Science Foundation
Number of Users	***Performance Goal 25:*** Number of users accessing National Nanofabrication Users Network/National Nanotechnology Infrastructure Network (NNUN/NNIN) and Network for Computational Nanotechnology (NCN) sites. FY 2001 Result 1300 FY 2002 Result 1700 FY 2003 Goal 3000 FY 2003 Result 3000 FY 2004 Goal 4000 FY 2004 Result 6350 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004 NSF is successful for this goal.**
Number of Nodes	***Performance Goal 26:*** Number of nodes that comprise infrastructure. FY 2001 Result 5 FY 2002 Result 5 FY 2003 Goal 12 FY 2003 Result 12 FY 2004 Goal 14 FY 2004 Result 20 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 26.**
Scientific Computing	***Performance Goal 27:*** Peak available teraflops (trillions of floating point operations per second) for scientific computation FY 2002 Goal 6 FY 2002 Result 6 FY 2003 Goal 10 FY 2003 Result 12 FY 2004 Goal 20 FY 2004 Result 22 FY 2004 Result: NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 27.**
NS&E Infrastructure	***Performance Goal 28:*** External committee finding that research infrastructure is appropriate to enable major discoveries for Nanoscale Science and Engineering (NS&E). FY 2004 Goal On-track FY 2004 Result On-track FY 2004 Result: Based on the NanoScience and Engineering (NS&E) Committee of Visitors (COV) report NSF is successful for this goal.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 28.**

ANNUAL PERFORMANCE GOALS
(continued)

Strategic Outcome	FY 2004 Annual Performance Goal	Results for National Science Foundation
Organizational Excellence Strategic Outcome Goal **Outcome Goal:** An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.	***Performance Goal 29:*** **NSF will demonstrate significant achievement for the majority of the following performance indicators related to the Organizational Excellence outcome goal:** **Indicators:** Operate a credible, efficient merit review system. Utilize and sustain broad access to new and emerging technologies for business application. Develop a diverse, capable, motivated staff that operates with efficiency and integrity. Develop and use performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness. FY 2004 Result: Significant achievement was demonstrated for all indicators.	**(New Goal for GPRA Reporting)** **FY 2004: NSF is successful for goal 29.** **Indicator Results:** Demonstrated significant achievement. Demonstrated significant achievement. Demonstrated significant achievement. Demonstrated significant achievement.
Time to Decision	***Performance Goal 30:*** For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of deadline or target date, or receipt date, whichever is later. FY 2000 Goal 70% FY 2000 Result 54% FY 2001 Goal 70% FY 2001 Result 62% FY 2002 Goal 70% FY 2002 Result 74% FY 2003 Goal 70% FY 2003 Result 77% FY 2004 Goal 70% FY 2004 Result 77%	**FY 2000:** NSF not successful **FY 2001:** NSF not successful **FY 2002:** NSF successful **FY 2002:** NSF successful **FY 2004: NSF is successful for goal 30.**

II. ACHIEVEMENTS NOTED BY THE ADVISORY COMMITTEE FOR GPRA PERFORMANCE ASSESSMENT

NSF is the only agency to invite an external advisory committee, the Advisory Committee for GPRA Performance Assessment (AC/GPA), to perform an analysis of its entire portfolio as part of the agency GPRA assessment process. The material in this section has been taken from the FY 2004 AC/GPA Report available at http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216. The referenced award numbers are links to the NSF web site and provide further information on the awards.

PEOPLE

Indicator P1. ***Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities.***

The nuggets described below illustrate the many groups and institutions that require attention under this indicator (African Americans, Latino Americans, American Indians, Alaska Natives, migrant workers, low-income Americans, the visually impaired, the deaf, etc.) as well as institutions that are focused on serving them (tribal colleges, HBCUs, Hispanic-serving institutions, etc.). The nuggets also illustrate a focus on innovative and effective inclusion of these various groups. Links to relevant awards are provided.

For example, the Agricultural Science Summer Undergraduate Research Education and Development Project (ASSURED) (0244179) introduces children of migrant worker families to research careers through summer projects in plant science relevant to the cultural background of those participants. This brings research close to home for the participants.

The Deaf Initiative in Information Technology (0070982) has sponsored 21 Information Technology (IT) workshops for deaf and hard of hearing professionals from across the country. While giving deaf and hard of hearing professionals the opportunity to enhance their IT skills, the program also provides faculty at the National Technical Institute for the Deaf professional development opportunities.

The Oglala Lakota Nation is benefiting from a program to create a pool of scientists and lab technicians with entrepreneurial skills (0123149). Full time enrollment by American Indians in Oglala Lakota College on South Dakota's Pine Ridge Reservation has increased steadily and matriculation of students into four-year degree programs in partner higher education institutions has doubled in the last three years. This project takes place in an EPSCoR state at a tribal institution.

With support from NSF and several other Federal agencies, the National Society of Black Physicists (NSBP), in response to student demand, offered an intensive summer course in 2003 in the theoretical and mathematical frameworks necessary to work in the areas of physics encompassing gravity, astrophysics, and M-theory – a variant of string theory (0243399). Paul Gueye, Hampton University, and James Gates, University of Maryland, organized the course. About half of the attendees were African-American and members of the NSBP. Many of these students are now actively considering careers in physics.

Another summer program, Enhancing Diversity in Graduate Education (EDGE) held in 2003 at Pomona College, immersed bright women students, about half from minority groups, in training and mentoring in mathematics (0209478). The career-stimulating success rate is high: all the women who participated have been accepted to graduate school and two have completed a first year. The EDGE program is unique in that it represents perhaps the last time in the mathematical careers of the participants during which they are surrounded by other women.

Indicator P2. ***Support programs that attract and prepare U.S. students to be highly qualified members of the global science and engineering (S&E) workforce, including providing opportunities for international study, collaborations and partnerships.***

Four investigator-driven research projects are illustrated that have clearly had an impact on student activities internationally. The first started with a planning visit and was followed by a workshop organized by Kate Miller at the University of Texas at El Paso (0118594, 0325020). This international research collaboration has opened up research opportunities for geologists in a new part of the world, permitting U.S. graduate students to participate in research in the Kingdom of Bhutan in the Himalayan-Tibetan mountain range. This seismically active part of the world has only recently been opened up to Western investigators. Dr. Miller and her graduate students have been able to work side-by-side with Bhutanese scientists to obtain the first detailed seismic and geodetic measurements in this portion of the Himalayan-Tibetan mountain range. This is an extraordinary opportunity for students to work in an isolated and exotic part of the world in collaboration with indigenous people who share similar scientific interests but very different cultural and language backgrounds.

Moving from the Himalayas to East Africa, the second investigator-driven project is an REU (Research Experiences for Undergraduate) site led by Andrew Cohen of the University of Arizona (0223920). Interested in the effects of climate change on fish populations in Lake Tanganyika, Dr. Cohen has been able to take groups of undergraduate students to East Africa to help study and sample the fish and investigate how climate has affected fish populations on the African continent. As part of their experiences, the U.S. students work and live side-by-side with African scientists and students. In addition to gaining valuable research experience, these students also gain an awareness and experience with cultures and languages very different from their own.

The third example is a U.S.-Russian collaboration to develop a microbial observatory (0238407). The unique geothermal conditions present in some parts of the world, particularly in deep ocean vents, have led to extraordinary discoveries of living microbes in what had been thought to be conditions totally unsuitable for life. This collaboration, led by Juergen Wiegel at the University of Georgia, will allow teams of U.S. researchers and graduate students opportunities to work with Russian scientists to begin a systematic study of the Kamchatka region in Siberia. As a bonus, it is expected that microorganisms with a high potential for industrial application may be discovered during this work.

Finally, under the auspices of NSF's International Research Fellowship Program, postdoctoral researcher Geoffrey Braswell participated in an archaeological dig in the ancient Mayan city of Pusilha in Belize in Central America (0202581). In collaboration with the Archaeological Coordinator of the Ministry of Tourism in Belize, Dr. Braswell was able to recover many ancient artifacts and ceramics dating back to A.D. 500-950. He worked closely with local scientists to help excavate this archaeologically significant site that will eventually be economically significant to Belize from both the historical and tourism viewpoints.

To further illustrate the profound and significant impact that NSF awards may have on promoting global awareness and scientific research, an additional nugget is used to illustrate a much larger and broader scope project than those described above. This example is the "East Asia Summer Institutes for American Graduate Students in Science and Engineering," which provided an opportunity for 73 graduate students to live and work in Japan or Korea for eight weeks during the summer of 2003 (0310315). Being immersed in the culture, language, and scientific expertise of these countries is invaluable in terms of providing an international perspective and understanding to young people who are training to be scientists and engineers.

The range and array of international activities that are facilitated through the NSF are truly impressive. There is no part of the world that is not touched by the global nature of research efforts undertaken by NSF-sponsored U.S. students and researchers. The value of these efforts to our nation and the world is enormous, especially at a time when we may be losing ground in terms of bringing international students and scholars into the United States.

Indicator P3. ***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.***

The Columbus Ohio Urban Systemic Program (CUSP) demonstrates the impact of a large-scale change activity on district-wide student performance (0115599). CUSP offered professional development to more than 2,400 K-12 teachers to enable standards-based, inquiry-centered instruction to become classroom reality. Increased teacher effectiveness is the reason given for increasing the pass rate from three percent to 83 percent in elementary science in one school. Teachers have increased levels of comfort in implementing inquiry-based instruction and principals report that teachers' receptivity to inquiry-based learning has dramatically increased. On the Ohio Proficiency Test, the district outperformed the state average in mathematics and science at every tested grade level.

An innovative method of teaching known as Process Oriented Guided Inquiry Learning (POGIL) is an example of college-level adoption of an innovative method of teaching (0231120). This technique replaces the traditional lecture format with a learner-centered approach in which students explore data, search for patterns, develop concepts to explain these patterns, and then apply these concepts to new situations. The technique has been applied to general chemistry, organic chemistry and physical chemistry that, traditionally, have had high rates of attrition. The effectiveness of this approach has been demonstrated at the University of New Mexico, SUNY Stony Brook, Franklin and Marshall College, Carleton College, Washington College, and Catholic University. Through national dissemination, it is hoped that a critical mass of practitioners will change the culture in chemistry and increase the awareness and appreciation of learner-centered pedagogies.

In cooperation with the American Association of Community Colleges (AACC), Microsoft, and the NSF-funded National Workforce Center for Emerging Technologies (NWCET), more than 800 IT faculty from 300 different colleges upgraded their skills in the summer of 2003 by attending one of ten regional Working Connections IT Faculty Development Institutes (9553727, 9813446, 0101657). The goal of the institutes is to build a world-class national infrastructure to upgrade faculty skills to ensure that community and technical colleges are preparing globally competitive IT workers.

The National Computational Science Institute (NCSI) offered workshops for faculty from predominantly undergraduate institutions, minority serving institutions, and community colleges using in-person, video-conferenced, and web-accessible workshops, seminars and support activities to introduce hands-on computational science, numerical models and data visualization tools (0127488). NCSI also co-led the Supercomputing Conference 2003 Education Program that supported teams of K-12 teachers and undergraduate faculty as they learned about computational science tools and methods for invigorating their math and science courses. More than 100 participants were engaged in four days of intensive hands-on workshops to learn about modeling and visualization tools and methods including systems dynamics modeling, algebraic modeling, numerical modeling, agent systems modeling, and visualization techniques. Following the workshop, participants were encouraged and supported to attend regional summer workshops offered by NCSI at more than 15 workshops hosted at different colleges and universities, many of which are minority serving institutions.

A workshop (TeacherTech03) for Pittsburgh Public Schools middle and high school science teachers to enable them to effectively incorporate technology tools into their science curriculum and to raise awareness of the teacher's role in shaping and encouraging students to be scientists was sponsored by the Pittsburgh Supercomputing Center, the Pittsburgh Public Schools, the NSF's Education, Outreach and Training Partnership for Advanced Computational Infrastructure (EOT-PACI) and the Rice University Center for Equity and Excellence in Education (0328525). Throughout the week, participants studied and tested the technology that they could use in their own curriculum. They learned to download data automatically from the calculator to an Excel spreadsheet to create lab reports; they used web-based simulation tools to analyze a segment of a food chain to study population growth; and they engaged in discussions about the teacher's role in shaping the next generation of scientists. Post-workshop evaluations were very positive, but data are not available to indicate the impact the program would have in the classroom.

***Indicator P4.* Promote public understanding and appreciation of science, technology, engineering, and mathematics, and build bridges between formal and informal science education.**

Three themes emerged from the nuggets in this category: high public interest/information transfer, general public doing science, and education.

High Public Interest – Information Transfer

There are some areas of science, such as astronomy, exploration, and health, which attract public interest more than some other areas. The impact of these projects generally is based on the transfer of information to the general public, rather than the active involvement of citizens or students in the scientific process. Other nuggets, not discussed here in detail, describe products as varied as planetarium shows, IMAX movies, PBS television series, children’s books, and websites.

A somewhat unexpected example of this kind of work is provided by NSF CAREER award winner Duncan J. Watts, who has written a popular level book on his research (Six Degrees: the Science of a Connected Age) (0094162). It has attracted more than the usual amount of interest on Amazon.Com, and has 17 favorable reviews to its credit. Particularly noteworthy is one review, where reviewer James Chu noted that Watts “questioned the possible flaws and mistakes in his own theories and opinions, granting the readers some space to think, and to better digest the contents of this book.” (James Chu, Amazon review dated 2/14/04). The usual tendency in books like this is for authors to give highly uncritical accounts of their own work and present it as though it were established beyond any possible question. Watts is more humble, and thus makes readers think. He gives readers a taste of the side of science where tentative explanations can sometimes be wrong. This book was correctly identified as a high-risk project.

The Methuselah of NSF-funded public outreach programs is the radio program “Earth and Sky,” heard by three million listeners in the United States and in continuous operation since the early 1980s (counting Block and Byrd’s time with the similar “StarDate” radio series for the University of Texas at Austin) (9253378, 0125087, 0128985). This program has now considerably expanded its focus from its original basis, involving nearly 400 scientists as advisers in its production. The quality of these programs remains at a very high level, even though the principal author of these scripts has been doing this for almost 25 years.

General Public Doing Science

Somewhat more unusual are projects where the general public is asked to do something more than just read about science, or watch videos. An interesting example of such a project is the development of a birding database in the award "Citizen Science Online" (0087760). Interested people with no specialized training learn to identify species, follow observing protocols, and submit counts that are good enough that ornithologists will use the data. This grant represents a significant step forward from some other efforts, which were mostly done at the state level. A Committee member encountered people using these databases on a recent college class field trip. Bird experts and university colleagues verified the high quality of the data, and direct observation of enthusiastic birders on a cold day in May indicated the level of interest in this kind of activity.

Somewhat similar in spirit, but directly involving K-12 students, is the ALISON Project (Alaska Lake Ice and Snow Observatory Network) (0326631). In this activity, K-12 students in a network of schools become reliable observers of such quantities as snow depth. The students are trained to interpret as well as gather data. A website http://www.gi.alaska.edu/alison/ even has a flow chart showing how the observations gathered by students are used to determine the thermal conductivity of the snow pack. The website also contains a comparison of measurements made at different observatories throughout Alaska; such a comparison could easily be done by the teachers and students themselves.

Education

NSF has funded a fairly extensive number of curriculum or program development projects whose aim is to reach out to underrepresented groups. A target audience is identified in a particular geographical area. The interests of the PIs lead to the development of a curricular unit or after-school program that relates to some discipline. In some cases the discipline is one whose community believes, often with some justification, that it is underrepresented in the school curriculum. The teaching techniques used in these projects communicate a very different vision of science than is sometimes done in middle and high school where teacher-talk (lecturing) is the predominant mode of teaching.

An example is the California State University–San Bernardino award entitled "Earth Science Pipeline: Recruiting and Retaining Underrepresented Ethnic Groups in Earth Sciences" (0119934). Through an extensive outreach program to nearly 5,000 middle and high school students in the CSUSB service area, the program brings the students to the campus for hands-on activities and field trips. The majority of the students are from ethnic groups that are underrepresented in the geosciences. An important part of the program is a biannual Global Positioning System (GPS) campaign, which allows the students to work with scientists to use state of the art GPS receivers in tectonic research. In addition to the middle and high school students, undergraduates and graduate students from nearby community colleges and other CSU institutions are involved in the summer research projects.

As NSF support increases for projects like these, more and more products will become available that will make it easier for others to replicate. With the recent NSF emphasis on including more science education research in EHR grants, information will be available so that people starting, after-school programs may determine under what circumstances particular programs were effective.

<u>Indicator P5.</u> Support innovative research on learning, teaching and mentoring that provides a scientific basis for improving science, technology, engineering and mathematics education on all levels.

The Math and Science Partnership (MSP) program includes two broad components: the partnership between higher education institutions and K-12 school districts, and the Research, Evaluation, and Technical Assistance program (MSP-RETA). In the latter, three awards in particular are excellent examples of collaborative, multi-partner, multi-focus projects: "Design, Validation, and Dissemination of Measures of Content Knowledge for Teaching Mathematics," "Mathematical ACTS," and "Longitudinal Design to Measure Effects of MSP Professional Development in Improving Quality of Instruction in Mathematics and Science Education" (0335411, 0226948, 0233505). In the first award, the University of Michigan developed instruments to assess teachers' knowledge of mathematics content and how this content is used in teaching mathematics. Similar instruments were used in the second award, and the results from the two awards were compared and contrasted. In the third award, a collaborative research team from the Wisconsin Center for Education Research and the American Institutes for Research investigated how professional development programs and activities in multiple sites may be evaluated using a common set of research-based measures. The tools developed in this program assist the partnerships in assessing alignment or misalignment of project strategies with school needs. While these projects impact grades 4-8, the potential impact [is] broad and could impact any level in K-12.

An interesting project, "Science Analysis for TIMSS-R Videotape Classroom Study," (0002778) focused on the teaching of mathematics in eighth grade. This study compared the teaching of mathematics in the United States, Australia, the Czech Republic, Hong Kong, Japan, the Netherlands, and Switzerland, the countries with top-performing students on the TIMSS 1995 mathematics assessment. The study revealed similarities and differences in the way mathematics is taught in these countries. The data from this study will provide a valuable source of information for secondary analysis. The project made considerable contributions to the methodology of classroom video studies. The databases of teaching practice developed in this project will support both research and education of pre- and in-service teachers.

To demonstrate how effective research can lead to an exemplary education program, Cornell University involved faculty from nine departments, as well as undergraduate and graduate students, in research focused on a combination of theoretical and empirical approaches to the understanding of evolution in an award, "Evolution from DNA to the organism: The Interface Between Evolutionary Biology and the Mathematical Sciences" (9602229). Students gained deep understanding of evolutionary biology and applied mathematics that permitted them to work at the forefront of modern quantitative biology. This project involved a considerable number of underrepresented and international students. The experience gained in this project prompted the PI to found the Mathematical and Theoretical Biology Institute (MTBI), a summer program at the Los Alamos National Laboratory to encourage involvement of minority students in this highly interdisciplinary field.

The ARCHway Project at the University of Kentucky is a multidisciplinary program that involves a high level of interaction in teaching and research (0219924). Professors, graduate students, and undergraduate students in English and computer science are working together as a team to develop a workbench for creating and deploying image-based electronic editions of unique, historic manuscripts. Two very different disciplines bring different and indispensable knowledge and skills to this project. Students participating in this project learn more about their own discipline and gain better understanding and appreciation for the other discipline as well.

The Research on Learning and Education (ROLE) Program is one of the first studies on how teaching occurs in a surgical operating room (0126104). This is a multidisciplinary study that brings together psychologists skilled in cognitive research, communications scientists expert in the study of discourse, and experienced surgeons. While the project appears narrow in scope, it has broad implications for instruction in similarly complex situations such as classrooms or emergency response training.

The five nuggets selected illustrate NSF's effectiveness in pursuing the agenda of improving education at all levels, merging education and research in different ways and to a varied extent. Among so many excellent projects it was difficult to select the most representative and impressive ones.

IDEAS

Indicator I1. ***Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge.***

Notable among these awards were several that led to two Nobel Prizes in 2003. A series of awards made in the 1980s and 1990s to Robert Engle and Clive Granger by the Economics Program allowed these economists to develop new statistical methods for treating chronological sequences of observations to estimate relationships and test hypotheses based on economic theory (8008580, (8004414, and 9730062). These methods have been invaluable for economic research, government policy, and investment decisions. The number of NSF-supported economists who have won the prestigious Nobel Prize has now increased to seventeen. The success of these individuals is ample demonstration of the continuing quality of NSF funded work in this area.

The 2003 Nobel Prize for Physiology and Medicine was awarded to Paul Lauterbur for development of both the theoretical idea and the physical implementation of Magnetic Resonance Microscopy Imaging (8008629). MRI involves an ideal noninvasive method for medical diagnostics involving no ionizing radiation. Now at the University of Illinois, Dr. Lauterbur was funded by the Engineering Directorate's Civil and Mechanical Systems Division in the early 1980s to refine MRI into the routine diagnostic technique that it is today.

For a ten-year period in the 1990s the Biological Sciences directorate (BIO) led the world in organizing and implementing the sequencing of entire genome of a higher plant, *Arabidopsis thaliana.* The sequencing of the genome was an NSF-led international effort, involving the United States, the European Community, and Japan. *Arabidopsis* and rice are the only higher plants for which the entire sequence is known. *Arabidopsis* was completed in 2000 and rice in 2002. Researchers around the world are now able to make rapid advances in understanding the life of plants in a fundamentally new way. A 2002 award from the *Arabidopsis* 2010 initiative of the BIO Directorate to Philip Benfey of Duke University allowed him to be able to elucidate every gene that was active in every cell of the *Arabidopsis* root during its development and to begin to understand the networks of genes which control cell and organ development in the root (0209754). Given that all roots follow the same general developmental program this work should be applicable to improving understanding of development of agriculturally important crop plants such as maize and rice.

In the world in which we live, the ability to remotely sense chemical, or by extension, biological warfare agents is of paramount importance. The work of Sylvia Daunert of the University of Kentucky, supported by the Chemistry Division, has demonstrated that genetically engineered bacteria that produce light in the presence of Chemical Warfare Agents (CWA) could be introduced and would multiply in the gut of an insect (butterfly) through the award "Optical Sensing Based on Inducible Bacterial Luminescence" (9820808). The butterflies could then be used either to survey a field or for continuous monitoring and can be remotely monitored up to 19Km away. This system could be developed for monitoring a large number of chemical or biological agents and be monitored without endangering human observers.

Understanding environmental changes that have the potential to impact the entire earth and man's ability to live on it is crucially important in informing a global environmental policy. The research of John Toole and Ruth Curry at the Woods Hole Oceanographic Institution supported by the Geosciences (GEO) Directorate (0241354 and 0326778) has unequivocally demonstrated that since 1990, ten of the warmest years on record have occurred, and that the tropical oceans have become more salty as a result of evaporation and the polar oceans have more fresh water as a resulting of icecap melting. These events have the potential to affect global precipitation patterns that govern the distribution and severity of droughts, floods, and storms.

As the world becomes more connected and more data is being transmitted throughout the "cybersphere," improvements in the ability to transmit, organize, and store this data are essential to the continued growth and development of cyberinfrastructure. Two awards, one made by the Engineering Directorate and the second by the Directorate for Mathematical and Physical Sciences, have greatly facilitated the transmission of information. Robert Buhrman from the Center for Nanoscale Systems and Information Technologies at Cornell University has characterized a low-loss photonic band-gap fiber (PBGF) that looses light intensity 200 times slower than current cable (0117770). Other awards have facilitated the development of "grid computing," a new style of computing that enable researchers to find the data they need, to process that data, and to extract discoveries from that data across multiple sites in ways that have not been available until now: "ITR/AP: An International Virtual-Data Grid Laboratory for Data Intensive Science" (0122557), "The ATLAS Research Program: Empowering U.S. Universities (0204877), and " Empowering Universities: Preparation for the CMS Research Program" (0204786).

The Engineering Directorate has supported inventive and creative projects in the development of advanced materials, from bridge construction to the replacement of human tissues. In bridge construction, Nabil Grace and his research team comprised primarily of undergraduates at Lawrence Technological University developed a non-corrosive carbon based reinforcement to replace steel in the construction and reinforcement of prestressed concrete structures (9906404, 9900809). A bridge built using this composite was completed in 2003 and won that year's Construction and Design Award from the Construction Industry Council. In human tissue replacement, a major challenge in developing engineered substitutes for human tissue has been the ability to monitor the replacement structures directly and non-invasively in vivo after implantation. Researchers at the Georgia Tech/Emory University ERC (Engineering Research Center) for the Engineering of Living Tissues have devised a way of using Nuclear Magnetic Resonance (NMR) imaging to monitor and evaluate non-invasively the functioning and effectiveness of new tissue constructs in the human body (9731643).

***Indicator I2.* Encourage collaborative research and education efforts – across organizations, disciplines, sectors and international boundaries.**

Several excellent examples of collaborative projects that have contributed to the development of new ideas within disciplines and across disciplines are found in NSF's portfolio. For example, Timothy Koschmann's study of medical education, "Toward a Descriptive Science of Learning Practices," brought together psychologists, communications scientists, and physicians to develop a new methodological approach to the documentation of instructional practices (0126104). This is one of the first fine-grained studies of how teaching occurs in a surgical operating room. Stefan Schaal and Christopher Atkeson's "ITR: Collaborative Research: Using Humanoids to Understand Humans" (0326095 and 0325383) focuses on educating robots rather than doctors, but involved a similarly multidisciplinary team of scholars – a robot engineer, a modeler of human learning, and a software specialist. This cross-disciplinary team has demonstrated how the skills of robots can be expanded dramatically and quickly by programming them with two brain-like qualities: (1) a better ability to learn skills by initially copying humans; and (2) an ability to improve these skills further through practice, using a kind of learning called advanced reinforcement learning or adaptive dynamic programming (ADP).

An interesting example of collaboration across international boundaries is one in which a research team led by an anthropologist and a psychologist included research assistants from Guatemala, Mexico, Chile, France, and the United States (9981762 and 9910156). The project also involves collaboration across institutions. Researcher Medin is at the College of the Menominee Nation and Atran is at the University of Michigan in Ann Arbor. Atrin and Medin explore how cultural differences influence actions taken with respect to the environment and develop both new theoretical insights as well as new directions for public policy. Rollin-Smith's (0131184) study on antimicrobial peptide defenses in amphibian skin illustrates a different form of international collaboration. The principal researcher's study of frogs that lack protection from fungal infection is being done in concert with studies by other researchers from Australia, Europe, and Central America. This project contributes to the training of young scientists at all levels (high school, undergraduate, graduate, and postdoctoral fellows), as well as minorities. These young scientists are trained in all aspects of science from the molecular to whole-organism level. Rollins-Smith and her laboratory is the leader in identifying antimicrobial peptides in frog skin, the protein sequences of which could lead to development of therapeutic agents in the future.

NSF funding has also supported collaborative efforts across sectors and organizations. A Nanoscale Interdisciplinary Research Team (NIRT) project at Washington University brings together scientists from industry (IBM) and a national laboratory (NIST) to develop synthetic strategies and characterization protocols for the production and study of one-, two-, and three-dimensional superstructures composed of stabilized nanoparticle assemblies (0210247). This project has led to a totally surprising and unexpected result, which opens new horizons in research on polymeric fluids. The leading scientific magazine *Nature* published a commentary under its "Views" section titled "Nanoparticles Stump Einstein." (Nature "Views")

***Indicator I3.* Foster connections between discoveries and their use in the service of society.**

Steven Levitt of the University of Chicago received the prestigious John Bates Clark Medal from the American Economics Association in 2003 for research in the economics of gangs (9876098). He researched a variety of social problems and crime prevention involving a broad range of disciplines like economics, politics, sociology, and law (e.g., understanding gang dynamics, manipulation of standardized testing, ways to reduce car theft, etc).

Another example is a study examining how curriculum and available courses shape high school students' progress through science and mathematics and into science and teaching professions. Chandra Muller of the University of Texas conducted research on "Science Achievement and Health Behavior: High School Curriculum, Social Context, and Opportunity to Learn" (0126167). This study has produced a unique and rich data set that shows that minority students and those from families with lower socioeconomic status tend to have less access to advanced coursework from the start of their high school years and that this gap continues to grow throughout their high school years. This study also examined remedies. For example, female students who participate in science classes that are more active in nature, in terms of allowing students to design projects and work together in groups, are more likely to pursue advanced coursework in biology.

NSF has also funded proposals whose ideas have made it into the marketplace. For example, a video compression-decompression algorithm produced by Avideh Zakhor at the University of California-Berkeley (9903368) is now in use on video streaming application in the major U.S. telecommunication companies. This is a compelling example of how very theoretical research conducted in an academic institution can make the transition into the marketplace and have significant economic impact.

One last example (the first white-light polymeric) is a grant that led to the production of the first white-light polymeric light-emitting diodes (LED) (0209651). One can see these LEDs today in telephone handsets, street signs, and flat-panel displays. However, until this grant they could only be produced in a single color (e.g. red, yellow, green, blue). As a result of NSF's investments, LEDs now emit brighter and much cooler light than the standard incandescent lamps and have a far longer lifetime and produce variable colors depending on the level of chemical doping.

Indicator I4. ***Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities.***

The New Mexico State University program, the Agricultural Science Summer Undergraduate Research Education and Development (ASSURED) project, targets children of migrant family workers to entice them into scientific research careers (0244179). These are students that have not been exposed to the sciences and experience an intensive summer experience in the plant sciences. Normally, these students would be working on farms harvesting crops. Instead, they are learning about plants and what it might be like to study them as a career. This type of program could radically change the life of a migrant child and end a potential poverty cycle for that child's family.

Also noteworthy are two high-quality science education activities: the "Earth Science Pipeline Project" at California State University-San Bernardino (0119934) and the "Geoscience Diversity Enhancement Project" (GDEP) at California State University-Long Beach (0119891). Both programs draw in large numbers of students from ethnic groups that are underrepresented in the geosciences. The Pipeline project has reached nearly 5,000 middle and high schools in the San Bernardino area. The GDEP program involves faculty and students from community colleges and high schools in the Long Beach area in an intensive summer geoscience research experience. These programs integrate research and education and involve minority students in programs that are relevant to their local community and to society in general.

Two programs that focus on innovative research are located at the Center for Innovative Manufacturing of Advanced Materials at Tuskegee University (9706871) and the Computational Center for Molecular Structure and Interactions at Jackson State University (9805465) Both are NSF Centers for Research Excellence in Science and Technology (CREST). The Tuskegee center is focused on cutting-edge materials research on nanoparticle polymer interactions, has produced 60 refereed publications, and involves 33 graduate and 25 undergraduate students at this historically Black institution. The Jackson State center is becoming a national leader in computational chemistry and one of the largest producers of African-American PhDs in chemistry. These programs are doing innovative research in important fields and introducing minority students to exciting careers in research that have substantial economic potential to society.

Indicator I5. ***Provide leadership in identifying and developing new research and education opportunities within and across Science and Engineering fields.***

The pioneering work of Vittay Vittal, Iowa State University, a grantee of the CNCI program ("SGER: Robust Gain Scheduled Control Design in Power Systems") offers one example (0338624). Dr. Vittal has been developing real time control techniques to prevent disruptions and improve management of the power grid. MIT's Technology Review lists "Power Grid Control" as one of the ten emerging technologies that will affect our lives and work in revolutionary ways and identifies Dr. Vittal as a research leader in the field.

Another project with potential to revolutionize lives is the Pacific Rim Applications and Grid Middleware Assembly (PRAGMA) (0216895, 0314015). PRAGMA is a partnership of 14 high-performance computing institutions to promote cooperation in grid technology and regional standards development to make grid-enabled computing and resource sharing a reality. This partnership has provided leadership in the application of computing technology to fighting global epidemics. During the recent SARS outbreak, PRAGMA assisted Taiwan in developing a cutting-edge communication access grid that linked quarantined hospitals to each other and to the most up-to-date global sources of information. The PRAGMA partnership also vividly illustrates the value of international collaborative efforts.

NSF investigators at the University of California-Irvine have assumed a leadership role in the development of a new line of research on database outsourcing (0220069). Working with IBM, the researchers are exploring techniques to insure data privacy within a database-managed system shared with other institutions. UCI and IBM have built a prototype system, the NetDB2, that allows database users to get full functionality of data management – content creation, storage, and querying applications over the Internet without the overhead of maintaining or administering the data management system. This prototype, which is being used successfully by several educational institutions, has the potential to increase access across a wide range of organizations to this important computing tool. The development of techniques to insure data privacy will have implications beyond this specific application.

In the field of science education, NSF is funding the development and dissemination of an innovative method of teaching chemistry known as Process Oriented Guided Inquiry Learning (POGIL) (0231120). This technique replaces lectures with a learner-centered approach in which students explore data, search for patterns, develop concepts to explain these patterns, and then apply these concepts to new situations. POGIL has improved student performance at institutions ranging from the University of New Mexico, a large public university, to Carleton College, a private, liberal arts college.

Indicator I6. ***Accelerate progress in selected S&E areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives.***

The research team of Nersessian and Newstetter at Georgia Tech studied and analyzed the Biomedical Engineering Laboratories (BME), organizations already well-known for their high degree of innovation in order to unlock cognitive keys that could be not only transferred but integrated into undergraduate biomedical engineering curriculum through the NSF-funded award, "ROLE: Biomedical Engineering Thinking and Learning: The Challenge of Integrating Systems and Analytical Thinking" (0106773). "Hard-wiring" these lessons and approaches into the curriculum, one has a greater expectation of producing future student cohorts - ones better equipped to conceive of, implement, and carry to completion more complex and interdisciplinary research projects.

The work of James Zachos and his graduate students at the University of California-Santa Cruz is an example of an important type of collaborative effort between global climate modelers and scientists who look at the fossil record in deep ocean sediments (0120727). Under the auspices of a Biocomplexity in the Environment grant, the UCSC group used samples from well-preserved sediment cores from the interval known as Paleocene-Eocene Thermal Maximum (PETM), which were obtained from the NSF-supported oceanographic facility JOIDES *Resolution* deep drill vessel (9308410). The PETM occurred about 55 million years ago and led to shifts in precipitation patterns. Until recently, scientists had postulated that the PETM was a global event driven by a rise in greenhouse gas concentrations, but they lacked the tropical-latitude sediment cores required to confirm that warming truly occurred worldwide. The collaboration resulted in an article in Science (v. 302, 28 November 2003: 1551-1554) and provides important clues about the likely fate of our planet and life on the planet if anthropogenically driven global warming continues.

Two key components in accelerating progress in high priority S&E areas are the seamless integration of the social sciences and pushing "results" down to K-12 grades. Six Degrees: The Science of a Connected Age, by Duncan J. Watts, a CAREER award recipient, does both (0094162). This book is written at a level appropriate for an audience of school children and explains the structure of social networks. Via email projects, school children discover for themselves the "six degrees of separation." Watts has done more than merely introducing the public to social networks; he has developed new theory and applications of complex social networks by bringing together newly available economic and sociological data with enhanced computational methods. In so doing, he has not only drawn upon but has contributed to fields as diverse as physics and biology. This research (and resultant book) have provided people with new perspectives and critical thinking skills as evidenced by the enormous public interest in understanding social networks and how they explain such phenomena as epidemics, stock market bubbles, and personal relationships.

TOOLS

Indicator T1. ***Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of the-art S&E facilities, tools, databases, and other infrastructure.***

The Institute for Mathematics and Its Applications (IMA) at the University of Minnesota is one of several excellent mathematical sciences research institutes funded by NSF (0307274, 9810289). These institutes are especially well positioned to help expand opportunities for U.S. researchers who want to explore directions in exciting new interdisciplinary areas. In June 2003, the IMA launched two activities to assist established mathematicians to make such changes and to increase the impact of their research. The first is a series of summer crash courses designed to introduce mathematical scientists without applied background to an active area of interdisciplinary research through tutorials and work with more established researchers. The inaugural course attracted 27 researchers and focused on cellular physiology. The second activity augments the existing visiting membership of the IMA during its long-term annual programs by adding a few resident memberships reserved for mathematical scientists seeking new research directions in line with program topics. The first such members participated in the 2003-2004 program on "Probability and Statistics in Complex Systems: Genomics, Networks, and Financial Engineering." These experiments—and perhaps others to follow—are fine examples of how the mathematical sciences research institutes can help to maximize the productivity and impact of mid-career researchers.

The award “Earth Science Pipeline: Recruiting and Retaining Underrepresented Ethnic Groups in the Earth Sciences” (0119934) has been successful in focusing on outreach to middle and high school students from various ethnic backgrounds that are underrepresented in the geosciences. Hands-on activities and walking tours are enhanced by the close proximity of the San Andreas and San Jacinto faults. A web page http://geology.csusb.edu/DIVGRANT/Espindex.htm not only contains links to many activities that may be used in the classroom, such as construction of shoebox models that illustrate the hypothesis of sea-floor spreading and a computer animation program that help students to make observations about special patterns where earthquakes occur, but also breaking earth science news. These students are also exposed to pictures of black smokers at hydrothermal vents on the mid-ocean ridges and the process used to measure the movements of plates using Global Positioning Systems. This ties into a local research project involving the opportunity for geology majors to work with scientists measuring elastic strain accumulation across the San Andreas and San Jacinto faults. The Southern California Earthquake Data Center uses the data to construct its Crustal Motion Map, but more importantly this project encourages young students to further their involvement in the advancement of scientific research.

The GRASP computer program at Columbia University for studying membrane proteins (9808902) makes the important study of complex electrostatic surfaces of proteins easy and even user-friendly. It has become one of the most widely used programs in structural biology, to the point where nearly every relevant publication includes a GRASP image, attesting to its widespread adoption. The three-dimensional structure of proteins allows the GRASP algorithm, developed by the staff at Columbia

University, to calculate the electrical potentials of a protein and map them onto the protein surfaces. Through much analysis, it has been accepted that these GRASP images play an important role in recognizing many protein-protein interactions. This provides the basis for understanding the physical-chemical rules that govern these interactions, and for using these rules to predict the regions on a protein's surface involved in intermolecular recognition. A web interface to a database of protein-protein interfaces (the GRASP structure server) has made this tool accessible and therefore useful to researchers and educators throughout the world.

An award to Princeton University supports an open, globally distributed platform for developing, deploying and accessing world-scale network services (0335214). PlanetLab is designed to allow rapid but short-term experiments in distributed processing and network infrastructure issues such as high availability protocols. Network services deployed on PlanetLab experience all of the behaviors of the real Internet where the only thing predictable is unpredictability (latency, bandwidth, and paths taken). In addition, PlanetLab provides a diverse perspective on the Internet in terms of connection properties, network presence, and geographic location. PlanetLab has produced a vibrant user community that is building and deploying robust content distribution networks, worm detection systems, Internet measurement tools, survivable storage systems, and Internet health monitoring tools.

Indicator T2. ***Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms.***

On November 6, 2003, scientists from North America, Europe, and Chile broke ground on what will be the world's largest, most sensitive radio telescope operating at millimeter wavelengths (0244577). ALMA, the Atacama Large Millimeter Array, will scan the millimeter and sub-millimeter region of the electromagnetic spectrum with angular resolution beyond any previous device. These are the only bands in the electromagnetic spectrum in which we can detect cold dust and molecules far away in young, high-redshift galaxies in the early Universe, and nearby in low-temperature cocoons of protostars in our own Galaxy. The ALMA science program includes probing the origins of galaxies, stars, and planets. It is likely to provide new breakthroughs of comparable impact as the Hubble Space Telescope has had in its distinct shorter wavelength region of the spectrum. ALMA is located east of the village of San Pedro de Atacama in northern Chile. This is an exceptional site for (sub)-millimeter astronomy, possibly unique in the world. The median precipitable water-vapor content of the atmosphere is only about 1 mm, and the topography of the site can accommodate the large configurations required for ALMA. Site characterization studies have been underway since 1995, a collaborative effort between Europe, the United States, and Japan. NSF support clearly shows leadership in one of the forefront new facilities in the world.

The Laser Interferometer Gravitational Wave Observatory (LIGO) was completed with NSF Major Research Equipment (MRE) support in 2001 (0107417). Data started to be taken in 2002 for the first broad search for astrophysical sources of gravitational waves with sensitivity never before attained. It is able to measure ripples in spacetime that would be produced by cataclysmic astronomical events in galaxies well beyond our own. This grant provides the support to operate and manage LIGO for a period of five years. It is essential that NSF plan for such operations support for each facility in which it participates. With unpredictable budgets this becomes very difficult but essential in order to reap the benefit of the investment in the equipment. The first scientific papers have been submitted for publication this year from the international collaboration, which includes 42 institutions with members from Canada, Europe, and Japan. Part of the grant provides for R&D into the technology of this state of the art device. Partnerships with industry are planned to advance the capabilities of the current LIGO. There is also significant educational and public outreach. It must be noted that although LIGO is clearly a major, next-generation facility of world class, it is high risk in that there is no guarantee that gravity waves will be found at its current level of sensitivity.

The Sloan Digital Sky Survey (SDSS) project is a major inter-agency and private-foundation partnership funded ground-based effort to map 10,000 square degrees of the sky at a spatial resolution of 0.40 arcseconds in the spectral bands at: 0.35, 0.48, 0.62, 0.76 and 0.91 micrometer wavelengths with a signal to noise ratio of 10 for 22.3 stellar magnitudes at 0.62 micrometers wavelengths (0096900). The survey goals are to record 900,000 field galaxies down to red magnitudes of 17.7 The science goals are to analyze the large scale structure to determine information about the evolution of the universe. However, the huge data set obtained contains much information on a wide variety of discoveries. For example, last year the data on the clustering corroborated the conclusions on dark matter and dark energy obtained from cosmic microwave radiation and supernovae. Often news from SDSS reaches the popular press. The SDSS has passed the halfway point in its goal of measuring one million galaxy and quasar redshifts. The first public data release from the SDSS, called DR1, contained about 15 million galaxies, with redshift distance measurements for more than 100,000 of them. The second, DR2, was made available to the astronomical community in early 2004. This research project encourages international scientific collaboration and places the United States at the forefront of cosmological astrophysics.

Magma Reservoir-Conduit Dynamics Revealed by Borehole Geophysical Observatory and Continuous GPS (0116067, 0116826, 0116485) is a collaboration among scientists in the United States and the United Kingdom. Project CALIPSO (Caribbean Andesite Lava Island Precision Seismo-geodetic Observatory) had already studied the Soufriére Hills Volcano on the Caribbean island of Montserrat, which had its latest eruption on July 13, 2003. The work is being done in partnership with the Montserrat Volcano Observatory (MVO). This project deployed ultra-sensitive strainmeters and seismometers in four 200 m deep boreholes and GPS at surface sites. Since all the equipment was in place when the eruption took place, the opportunity to learn is unprecedented.

Indicator T3. ***Develop and deploy an advanced cyberinfrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation.***

Two clusters of the 44 nuggets within this indicator illustrate the achievements under this goal:

(1) High-performance (supercomputer) facilities and their supporting infrastructure. Two nuggets selected: PACI Program leading edge sites; and TeraGrid.
(2) High-speed network development to deliver these resources to research collaborations around the world. Two nuggets selected: Euro-Link: High Performance Network between US and Europe; and TransPac - Internet services for Trans-Pacific connectivity.

(1) Supercomputer Facilities. The massive PACI Program (Partnerships for Advanced Computational Infrastructure) encompasses the three supercomputer facilities, the National Computational Science Alliance (NCSA) in Illinois (9619019), the Terascale Computing System in Pittsburgh (9619020), and the National Partnership for Advanced Computational Infrastructure (NPACI) in San Diego (0085206). Each of these facilities has demonstrated remarkable innovation and organization, including educational outreach and training as well as their primary function of serving a broadening constituency of researchers. One facility (NCSA) reported 61 million CPU hours of usage in one year, a 43% growth over the previous year. The computational service offered by these facilities is essential to scientific advance in many areas. Notable successes include the discovery of a new brown dwarf star by data mining at SDSC within a huge astronomical database (0122449) and near real-time tele-immersion employing the Pittsburgh Supercomputing Center (0121293). The development of the Terascale Computing System (0307136, 0332116) and the TeraGrid (0122272), a distributed infrastructure incorporating all the supercomputing centers aiming for 20 Teraflop performance, seems exactly the correct direction for the scientific community.

(2) High-speed Networks. It is self-evident that these immense computational resources need networks that can deliver them to scientists at unprecedented speeds. EuroLink (9730202) and TransPAC (9730201) are exemplary programs that have achieved five Gbps via innovative optical network architectures, the former linking North America to Europe, and the latter to Tokyo. The connection in the United States is to NSF's very high-performance Backbone Network Services (vBNS). Innovations in administrative structures, hardware, and software are all necessary to advance the state of this art. Especially notable are the small research projects that are pushing the networking envelope and feeding into the national facilities, such as the five-fold speed increase of FAST TCP (0113425), and the thousand-fold energy reduction of narrow-beam wireless (0225379).

***Indicator T4.* Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation.**

Support for the development of textual data mining tools enables NSF to make better use of the mass of data it houses about its awards and reports (0211396). Tools of this kind may help increase the return on investment in the nation's research by dramatically improving the use of information about projects that NSF undertakes across organizations and time. The approach incorporates latent semantic indexing technology that allows for context-based searching in contrast to standard keyword searching or Google's voting scheme. An example was cited of how NSF used these tools to amass information for about eight years of awards involving mathematics education activity for use by its EHR directorate. Information retrieval, generally speaking, is one of the great challenges in today's electronic world, and it is gratifying to see NSF develop and apply such special purpose tools to increase its own efficiency of operation.

A popular and invaluable report, Science and Engineering Indicators 2004, provides a variety of indicators on the state of science and engineering in the United States and, increasingly, includes a variety of international comparisons. The information in this report is of great value to policymakers in government, as it should be, but it is also important for educators and administrators who need to track demographic and other trends over time. The report appears biennially and is widely disseminated.

The health of industrial research in the United States is critical to the nation not only from a research perspective but also because of its implication for the economy. It is to be commended that NSF continues to devote resources to improving the statistical and methodological design of its Survey of Industrial Research and Development. This will assure that the information used by policy makers, among others, will be of the highest quality. NSF is working in collaboration with the Census Bureau's Economic Statistical Methods and Programming Division and with the Committee on National Statistics (CNSTAT) at the National Academy of Sciences.

Another research project studied the determinants of patenting behavior and the effect of patenting on R&D efforts in the United States and Japanese manufacturing sectors and also the effect of the patenting and licensing of research tools on biomedical innovation. Based on careful modeling of data, a number of findings were reached that have implications for policymakers in both government and industry. A summary of the research was widely disseminated in Science magazine ("Working Through the Patent Problem," v. 299, p. 1021).

***Indicator T5.* Support research that advances instrument technology and leads to the development of next-generation research and education tools.**

The current trend in electronics is toward the smaller, faster, and cheaper. As size scales decrease and operation speeds increase rapidly, the physics of the materials used for constructing electronic components becomes more and more important. More than just understanding the basic properties of materials, actually observing the changes taking place during the construction of electronic materials has become a real need. Karl Ludwig of Boston University is developing a new instrument that makes use of surface scattering of X-rays to provide real-time observations of surface growth and other changes taking place within a substrate during processing (0116567). Instruments such as this will lead to a greater understanding of the physics of materials under a wide range of processing conditions.

One of the more surprising and exciting results of recent geoscience research is the wide range in conditions under which life has been found not only to exist but to flourish. Environments ranging over vast ranges in temperature, pressure, and chemical composition have been found to harbor living organisms. Such discoveries give hope and encouragement to those who would look for life beyond Earth, either throughout the solar system or around nearby stars. One class of instrument that has played a large role in this work has been deployable electrochemical analyzers that can operate under conditions that human researchers cannot. One such instrument is an in situ electrochemical analyzer (ISEA) developed by researchers at the University of Delaware to be deployed at any ocean depth for remote aquatic experiments (0136671). This instrument allows the simultaneous measurement of many different biologically important elements and compounds within the environments of undersea hydrothermal vents. Such measurements are of great importance for monitoring the “health” of ecosystems, which have developed in these environments. The ability to make real-time measurements in such hostile (to humans) environments will pay rich dividends in terms of understanding the development and long-term sustainability of such ecosystems.

The need for monitoring large and changing environments covers such diverse fields as ecology, atmospheric science, public health, and national security. Static, non-autonomous sensors do not provide investigators with the power and flexibility that they need. Research at the Center for Embedded Networked Sensing at UCLA seems to have overcome these difficulties (0120778). Utilizing a network of fixed and mobile nodes, a self-aware sensor network is created that can reconfigure itself in order to continually optimize its performance. Successful tests of the system have already been run, collecting data from within a forest environment not easily accessible by humans. The project also impacts K-12 education in that it provides students access to remote sensors that they may use to carry out investigations of their own.

SUPPORTING INFORMATION FOR FY 2004

Performance Reporting Requirements and Where to Find Them in Our Report

The Government Performance and Results Act of 1993 requires each Federal agency to report to the President and the Congress on its performance for the previous fiscal year. According to OMB Circular No. A-11 Part 6, Section 230.2, dated 16 July 2004, each report must include the following elements[2]:

1. *A comparison of your actual performance with the projected (target) levels of performance as set out in the performance goals in your annual performance;*
2. *An explanation, where a performance goal was not achieved, for why the goal was not met;*
3. *A description of the plans and schedules to meet an unmet goal in the future, or alternatively, your recommended action regarding an unmet goal where you have concluded it is impractical or infeasible to achieve that goal;*
4. *An evaluation of your performance budget for the current fiscal year, taking into account the actual performance achieved;*
5. *An assessment of the reliability and completeness of the performance data included in the report; and*
6. *Actual performance information for at least four fiscal years.*

Other features as they apply to the agency:

Program evaluations[3];
Information on use of non-Federal parties;
Classified appendices not available to the public;
Budget information.

[2] Elements 1-4 and 6 are provided with each goal discussed in our report. Element 5 is discussed in Section V.
[3] See Section IV.

III. NSF GOALS

Introduction to Section III: NSF Goals

To accomplish the NSF mission to promote the progress of science, NSF invests in the most capable people, supporting their creative ideas, and providing them with cutting-edge research and education tools. Within the NSF, the agency strives to maintain a diverse, agile, results-oriented cadre of NSF knowledge workers and leadership in state-of-the-art business processes, tools and technologies.

NSF has four strategic outcome goals. These are:

PEOPLE – *A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens.*

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. Each year, NSF supports more than 200,000 people – teachers, students, and researchers at every educational level and across all disciplines in science and engineering. Embedded in all NSF programs are efforts to build a more inclusive, knowledgeable, and globally engaged workforce that fully reflects the strength of the nation's diverse population.

IDEAS – *Discovery across the frontier of science and engineering, connected to learning, innovation and service to society.*

Investments in *Ideas* are aimed at the frontiers of science and engineering. 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 the most fundamental questions about the origin and nature of the universe and humankind.

TOOLS – *Broadly accessible, state-of-the-art S&E facilities, tools, and other infrastructure that enable discovery, learning and innovation.*

State-of-the-art tools and facilities boost the overall productivity of the research and education enterprise. NSF's strategy is to invest in a wide range of instrumentation, multi-user 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 – *An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business processes.*

Excellence in managing NSF underpins all of the agency's activities. Most importantly, this leadership depends on maintaining a diverse, agile, results-oriented NSF workforce that operates in a continuous learning environment. NSF's strategy focuses directly on the agency's leadership in core business processes, such as E-government and financial management. NSF's investments in administration and management must respond both to the growing complexity of its workload and to new requirements for accountability and transparency in its processes.

NSF also has an additional 25 performance goals associated with the Performance Assessment and Rating Tool (PART) developed by the Office of Management and Budget. Information concerning the PART process can be found at **http://www.whitehouse.gov/omb/part/2004_program_eval.pdf**. The performance goals and achievement with respect to these goals are found following the strategic outcome goal with which they are most closely associated.

NSF assessment activities are based on an OMB-approved alternative-reporting format that utilizes external experts for qualitative, retrospective evaluations of Foundation outcome results. In years prior to FY 2002, NSF used external independent assessments of NSF's outcome goal indicators provided by Committees of Visitors and Directorate Advisory Committees[4]. These committees provided assessment at program, divisional, or directorate levels.

In FY 2002, NSF created a new external advisory committee – the Advisory Committee for GPRA Performance Assessment (AC/GPA) – to provide advice and recommendations to the NSF Director regarding the Foundation's performance under the Government Performance and Results Act (GPRA) of 1993.

For FY 2004, Organizational Excellence (OE) is a specific NSF strategic outcome goal. This goal was included as a strategic outcome goal at the urging of NSF's Advisory Committee for Business and Operations (AC/B&O) since it is a key enabling tool for the outcome goals of People, Ideas, and Tools

In its FY 2003 report, the AC/GPA recommended that NSF should consider an approach that involved a significant component of "self study." They envisioned that this would involve a greater number of NSF staff, would be based on NSF's strategic goals and indicators, would be data driven, and would provide key information at multiple levels of detail. NSF adopted this approach for the Organizational Excellence goal. Early on, it was determined that the AC/B&O would provide an assessment of three of the indicators for the OE goal, Human Capital, Technology-Enabled Business Processes, and Performance Assessment. The AC/GPA would conduct an assessment of the Merit Review indicator.

The charge to the NSF AC/GPA asked for development and transmittal to NSF of a report that included:

An assessment of results for indicators associated with the strategic outcome goals of People, Ideas, Tools, and the merit review indicator for the Organizational Excellence goal. (The other three indicators for this goal were assessed by the Advisory Committee on Business and Operations – see above);
Comments on the quality and relevance of award portfolios; and
Comments on innovative, high risk, and multidisciplinary research and education.

The format of Section III is the following:

An NSF assessment of performance with respect to each strategic outcome goal;
Comments by the AC/GPA concerning the strategic outcome goal;
For each indicator or area of emphasis associated with a strategic outcome goal:
Comments by the AC/GPA; and
An NSF assessment of performance with respect to related PART performance goals.

[4] See Section IV for further details on these committees.

The following AC/GPA comments concerning the quality and relevance of NSF-supported research as well as AC/GPA comments on innovative, risky, and multi-disciplinary research and education supported by NSF are excerpted from the AC/GPA Report. The report is available at http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216.

AC/GPA Comments on Quality and Relevance

"The Committee concluded that the quality of the portfolio was high in the three outcome goals of People, Ideas, and Tools and that the Organizational Excellence goal demonstrated quality and innovativeness in its activities. The diversity of projects in the research portfolio is remarkable, representing a spectrum of mechanisms to support discovery that includes individuals, teams of various sizes, and centers as well as facilities and other infrastructure (defined broadly).

NSF continues to make significant contributions toward the achievement of important national goals and, in doing so, is serving the needs of its constituents in the scientific community as well as the the broader needs of science, engineering and education as human endeavors. In addition, NSF is clearly becoming a high-performing organization. Its focus on organizational excellence as a strategic outcome goal is a welcome and necessary complement to the other goals and will enable the Foundation to continue to make contributions to science, engineering, mathematics, and education and use the nation's investments wisely and efficiently.

The Committee wants to reiterate that the synergy of the four outcome goals is a major source of their power. Discoveries at the frontiers of knowledge are both supportive of and dependent on progress in effectively linking education and research, the development of new instrumentation, facilities, and other tools, and the education and training of a highly qualified cadre of individuals motivated and excited by science, engineering, and mathematics. Organizational excellence in people, processes, and assessment enables all three. The Committee felt that it was important to continue to make this point, as it has done in its two previous reports.

The Committee concluded that the high quality, relevance, and performance of the NSF portfolio is principally due to NSF's use of a rigorous process of competitive merit review in making awards. NSF has continued to make progress in implementing its two principal review criteria – intellectual merit and broader impacts. There is a heightened awareness and increased use of both criteria by proposers, reviewers, and program officers. Yet more work remains, particularly in improving the quality of the responses to the broader impact criterion. There are negative forces, such as Congressionally-directed appropriations, that have the effect of distorting the merit review process and adversely impacting future NSF performance. NSF and its external stakeholders, both within and outside the Federal government, should work together to resist the corrosive influence of these forces and to continue to support and expand competitive merit review across the Federal government's research portfolio."

AC/GPA Comments on Innovative, High Risk, and Multidisciplinary Research and Education

"With regard to innovative, high risk, and multidisciplinary research and education, the Committee saw evidence of accomplishment. However, the Committee notes that the term "high risk" with regard to research is still not clearly defined.[5] It was not always clear to the Committee what characteristics NSF staff (program officers) making the designation of "high risk" were using to indicate which specific

[5] The Committee prefers the term "bold" rather than "high risk" to describe this kind of research. "High risk" is somewhat of a term of art and could convey an inappropriate impression about research that is extremely novel or pathbreaking. A committee member noted that one NSF directorate, Computer and Information Science and Engineering, already uses the term "bold" to describe such research.

projects in the portfolio were deemed to be high risk. One subgroup attempted to develop criteria for this term so as to more clearly delineate examples from its portfolio. We offer those criteria as ones that NSF might consider as part of a broader discussion of this issue. "High risk research" might be assessed based on:

The probability that the project can be conducted as defined.
The level of assurance that the innovation will have the desired outcome.

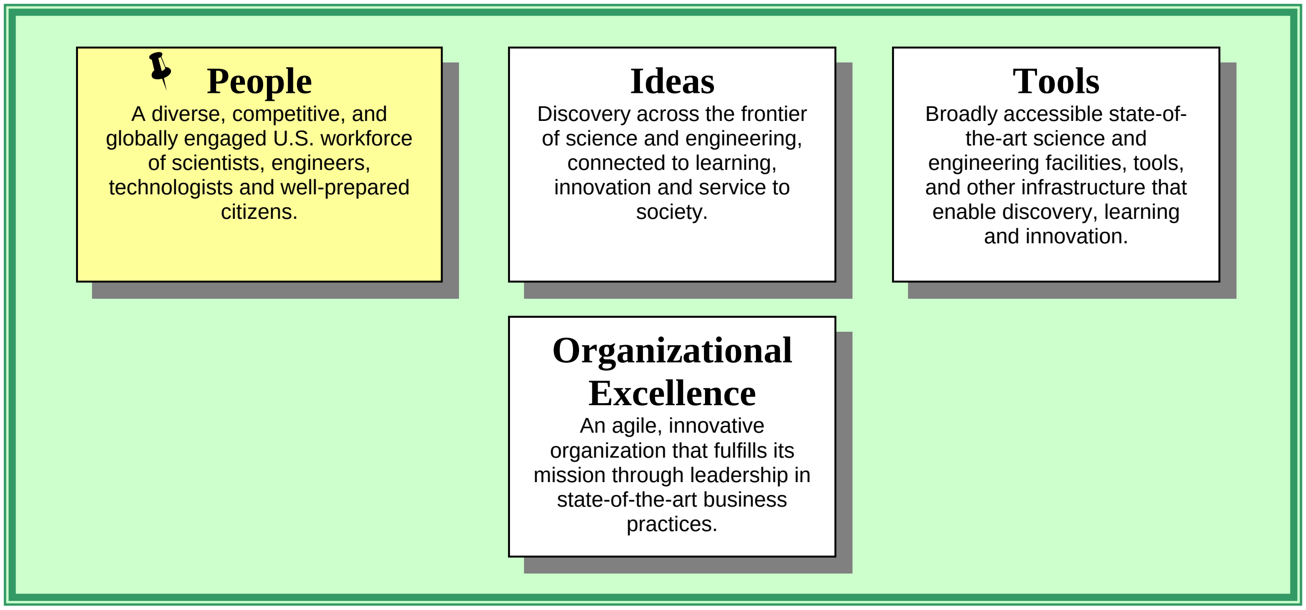
Projects may be classified as high risk not only because of the degree and/or nature of the innovation but also solely on the origin of the proposal (e.g., new researcher, context of the project.) In order to probe this more deeply, the People subgroup examined the COV reports for five programs in the Directorate for Education and Human Resources: Course Curriculum and Laboratory Improvement (CCLI), Teacher Enhancement (TE), Graduate Research Fellowship Program (GRFP), Advanced Technology Education (ATE), and Gender Diversity in STEM Education. In our analysis, we concluded that there is considerable uncertainty among COV responses regarding the operational meaning of the term "high risk" because in response to the question "Does the program portfolio have appropriate balance of high risk proposals?," three of the COVs responded "Yes," one said "No," and others said "Maybe" or gave no response. The single "No" response from TE reflected an approach that defined Small Grants for Exploratory Research (SGER) as high risk and then concluded that there were an insufficient number of them.

The Committee believes that this issue is important enough to warrant attention by the National Science Board. No obvious formula exists to guide NSF as to the fraction of the portfolio that should be "high risk" (or "bold.") However, we can say without hesitation that it is vital that the overall portfolio contain an appropriate amount of "bold" research and that the definition of such research must be clear and widely understood by NSF's key stakeholders. We also recognize that there is always a tension in finding and funding such research relative to other priorities and, where possible, we suggest that NSF should do more. However, we also offer a caution: the need to show "results" and, indeed, this GPRA process, should not make the finding and funding of such research more difficult. There must be an appreciation by all who support the use of taxpayer money for good and valid national purposes that advancing the frontiers of human knowledge requires, indeed demands, that our research portfolio contain investments with long odds of success (but, if successful, with the ability to fundamentally transform our understanding).

The Committee also believes that it would be useful to separate the characterization of NSF-supported research into that which is "innovative," that which is "high risk" (bold), and that which is multidisciplinary. The phrasing of the charge to the Committee seemed to indicate that we were to assess research that met all three criteria simultaneously (innovative AND high risk AND multidisciplinary). We found many instances where projects met one or two of the criteria but few where all three were met. These criteria are not mutually exclusive and all have intrinsic value in a broad and balanced portfolio. We encourage NSF to consider this change for future years. With regard to multidisciplinary research, the Committee notes that the encouraging trend continues wherein multiple NSF directorates collaborate to fund a suite of related research activities (e.g., mathematics and biology, environmental research, cyberinfrastructure). While the relative level of these types of collaborations within NSF may be able to serve as a proxy for investment in multidisciplinary research and education, more definitive analyses of the long term impact of these investments is needed."

III. NSF GPRA GOALS

A. PEOPLE



PEOPLE STRATEGIC OUTCOME GOAL: A diverse, competitive, and globally engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens.

✓ Goal 1 Achieved

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. Each year, NSF supports more than 200,000 people – teachers, students, and researchers at every educational level and across all disciplines in science and engineering. Embedded in all NSF programs are efforts to build a more inclusive, knowledgeable, and globally engaged workforce that fully reflects the strength of the Nation's diverse population.

Annual Performance Goal 1: Our performance for this goal is successful when, *in the aggregate*, results reported in the period FY 2004 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 S&E workforce, including providing 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.

RESULT FOR PERFORMANCE GOAL 1: NSF achieved this goal. External experts provided examples of significant achievement during FY 2004 reporting. Comments by the AC/GPA and examples they selected are presented for each of the performance indicators and areas of emphasis for this goal.

Implications for the FY 2005 Performance Plan: This goal will be continued in FY 2005.

PEOPLE: Comments by the Advisory Committee for GPRA Performance Assessment (AC/GPA)

The following statements concerning NSF achievement with respect to the indicators for the PEOPLE goal are excerpted from the AC/GPA Report on NSF's PEOPLE portfolio. Additional comments as well as examples in support of significant achievement for each indicator are available at http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216.

"The Committee concluded that there is significant achievement in all indicators of the PEOPLE strategic outcome goal, which is to create "a diverse, competitive, and globally-engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens." The Committee concluded that NSF had met the goal for each indicator in making investments in individuals, institutions, and collaborations. This decision was based on the collective review and discussion of each indicator summary.

Quality and relevance: Based on the summary of COV reports and the review of accomplishments (nuggets) the overall quality of projects was determined to be high and relevant to the People strategic outcome goal. COVs appear to be paying significant attention to the issue of quality and where concerns were noted, NSF is being both responsible and responsive to the recommendations of these review groups.

High risk, innovative, multidisciplinary projects: Overall, the Committee concluded that there were many nuggets that demonstrated a high level of investment in interdisciplinary, innovative/creative, and high-risk research. The Committee also believed that collaboration was a key criterion on which to judge the portfolio for this strategic outcome goal. Thus, we have added it for purposes of evaluating NSF's investments. We find that there are numerous and rich examples of collaborative activities.

Committee reviewers of the PEOPLE indicators were unanimous in their observation that the overall quality and relevance of the nuggets available for review were high. Selections were made of those accomplishments that were believed to best represent each of the five indicators. Although the rationale for nugget selection varied among the panel members within the context of each of the indicators, several common themes emerged for selection:

> Accomplishments that represented the diversity of projects (e.g., people, topic, geographic, project type, culture)
>
> Accomplishments that demonstrated broad impact of project (e.g., collaborations, number of participants)"

"Other Issues to Address Related to the PEOPLE strategic outcome goal:

NSF should strongly consider encouraging the increased use of the Research Experiences for Undergraduates (REU) Program to encourage more involvement of undergraduates in projects related to People. This is especially true for international and multicultural projects.

In order to expand the number of projects related to the preparation of U.S. students to be highly qualified members of the global S&E workforce, faculty should be encouraged to interact with existing offices and organizations on their campuses that coordinate study abroad.

NSF should consider bringing to the forefront excellent activities related to the PEOPLE goal as models even if NSF does not fund these programs.

NSF needs to support research on the factors that affect the ability to attract graduate students to the United States. Currently there is mostly anecdotal information that does not lend itself to the development of strategies to address the issue in ways that will be effective in the long term."

INDICATOR 1: Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities.

RESULT: ***Demonstrated significant achievement.***

"The national challenge: According to Science and Engineering Indicators 2004, members of underrepresented minorities (American Indians/Alaska Natives, African Americans, and Latino/a Americans) made up only seven percent of the S&E workforce in 1999, but 24 percent of the U.S. population. Women constituted only 24.7 percent of the college-educated workforce in S&E occupations in 1999, but 46 percent of the total U.S. workforce. According to the 2002 report of the Committee on Equal Opportunities in Science and Engineering (CEOSE), persons with disabilities made up 11.6% of the U.S. workforce in 1999, but only 5.5% of the S&E workforce. The nation is not getting full benefits from the talents of these groups. Overall, the participation of women in S&E careers increased during the 1990s, and the participation of underrepresented minority groups remained about the same.

Furthermore, if these groups continue to be underrepresented in science and engineering, other groups within the United States are not likely to fill in the gaps. The number of men earning bachelor's degrees in science and engineering fields has been approximately constant since 1975. The number of women earning bachelor's degrees in S&E fields has been rising steadily, particularly since 1990, but not as fast as the number earning bachelor's degrees in other fields. For white Americans, the number of bachelor's degrees earned per thousand 20-24 year olds has been declining since the mid-1990s, but rising steadily since 1989 for members of the underrepresented racial and ethnic groups. Persons with disabilities earned only 1.2% of U.S. doctorates in 2000. (All data from the CEOSE 2002 report.)

The NSF response: NSF has actively taken on the challenge of recruiting these underrepresented groups into science, technology, engineering, and mathematics (STEM) careers through a wide array of special programs and encouragement through all programs. The FY 2005 NSF Budget Request to Congress includes $498 million for programs that support individuals, including both master teachers for school classrooms and graduate support for men and women entering S&T careers. NSF requests $172 million for support to institutions, and $393 million for investment in collaborations.

Assessing Results: Under this performance indicator, NSF is committed to promoting greater diversity by raising the participation of underrepresented groups and institutions in its own programs."

INDICATOR 2: Support programs that attract and prepare U.S. students to be highly qualified members of the global S&E workforce, including providing opportunities for international study, collaborations and partnerships.

RESULT: *Demonstrated significant achievement.*

"NSF and NSF investigators have clearly found novel projects and ways in which to prepare U.S. students to learn about and participate in international activities. Five nuggets were selected representing two distinct types of projects to illustrate the range of activities and potential effectiveness of research activities in addressing this specific goal. All of the nuggets selected reflect high levels of risk, innovation and collaboration given the diverse language, culture, and political barriers that had to be overcome to accomplish these projects."

INDICATOR 3: 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.

RESULT: *Demonstrated significant achievement.*

"NSF has funded a variety of projects to achieve the goal of providing K-12 and higher education faculty opportunities for continuous learning and career development in science, technology, engineering and mathematics. Research Experience for Teachers (RET), CAREER awards, astronomy and astrophysics postdoctoral fellowships, Presidential Early Career Awards for Scientists and Engineers (PECASE), Small Grants for Exploratory Research (SGER), ADVANCE Fellows awards to help individuals reenter the science and engineering workforce, and the Alliance for Graduate Education and the Professoriate (AGEP) are examples of programs which are helping to achieve NSF's goals. In most cases, these programs support individual professionals or small groups of teachers and faculty. The decision not to include them as examples in this report in no way minimizes the impact they have had on development of faculty.

Likewise, researchers and educators from many colleges and universities are utilizing facilities of the supercomputer centers funded by NSF through NPACI (The National Partnerships for Advanced Computational Infrastructure) and PACI (Partnerships for Advanced Computational Infrastructure), and their Education, Outreach and Training Programs. These outstanding programs are not among the nuggets selected for illustration in this report since they are more appropriately included in the IDEAS category. However, their contribution to professional development is significant.

On the other hand, considering the importance of community colleges, HBCUs and minority serving institutions in educating the future STEM workforce, it was surprising that of the 97 nuggets in the pool of nuggets provided by NSF for this indicator, no HBCU, and only two community colleges and two minority serving institutions were primary grantees. Participation by faculty from underserved populations was mentioned in several programs, but data were insufficient to evaluate the overall impact of these programs on minority populations."

INDICATOR 4: Promote public understanding and appreciation of science, technology, engineering, and mathematics, and build bridges between formal and informal science education.

RESULT: *Demonstrated significant achievement.*

"Many NSF-funded projects have led to significant achievements in the areas of education and public outreach. Three themes emerged from the nuggets in this category: high public interest/information transfer, general public doing science, and education."

High Public Interest – Information Transfer

"There are some areas of science, such as astronomy, exploration, and health, which attract public interest more than some other areas. The impact of these projects generally is based on the transfer of information to the general public, rather than the active involvement of citizens or students in the scientific process. Other nuggets, not discussed here in detail, describe products as varied as planetarium shows, IMAX movies, PBS television series, children's books, and websites."

General Public Doing Science

"Somewhat more unusual are projects where the general public is asked to do something more than just read about science, or watch videos."

Education

"NSF has funded a fairly extensive number of curriculum or program development projects whose aim is to reach out to underrepresented groups. A target audience is identified in a particular geographical area. The interests of the PIs lead to the development of a curricular unit or after-school program that relates to some discipline. In some cases the discipline is one whose community believes, often with some justification, that it is underrepresented in the school curriculum. The teaching techniques used in these projects communicate a very different vision of science than is sometimes done in middle and high school where teacher-talk (lecturing) is the predominant mode of teaching."

INDICATOR 5: Support innovative research on learning, teaching and mentoring that provides a scientific basis for improving science, technology, engineering and mathematics education at all levels.

RESULT: *Demonstrated significant achievement.*

"The nuggets reviewed were very broad in their scope and spanned the learning experience of pre-school children to graduate students, doctors, and scientists. The diversity of nuggets in terms of age, race, and geography was impressive. The nuggets demonstrate diversity of ideas and were impressive in their creativity. While many of them point out that the projects are research based, there were very few projects focused exclusively on education research. Some projects are focused on a single discipline, while the majority exemplifies the collaborative and interdisciplinary nature of NSF awards."

Annual Performance Goal 2: Number of U.S. students receiving fellowships through Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT).

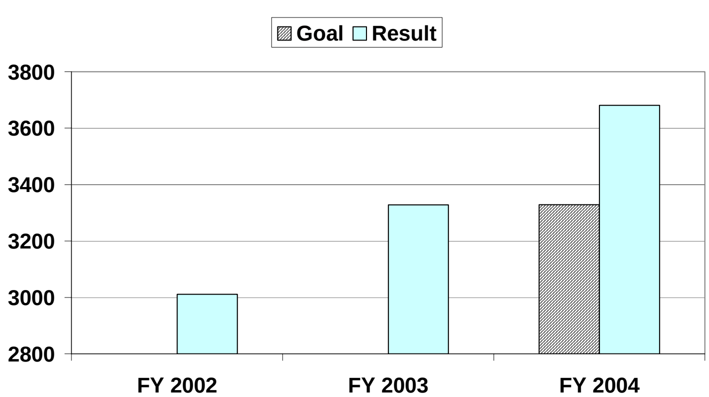
✓ Goal 2 Achieved

The National Science Foundation (NSF) seeks to ensure the vitality of the human resource base of science, mathematics, and engineering in the United States and to reinforce its diversity. A competition is conducted for Graduate Research Fellowships, with additional awards offered for women in engineering and computer and information science. NSF Graduate Fellowships offer recognition and three years of support for advanced study to outstanding graduate students in the mathematical, physical, biological, engineering, and behavioral and social sciences, including the history of science and the philosophy of science, and to research-based Ph.D. degrees in science education.

The Integrative Graduate Education and Research Traineeships (IGERT) program has been developed to meet the challenges of educating U.S. Ph.D. scientists, engineers, and educators with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become in their own careers the leaders and creative agents for change. The program is intended to catalyze a cultural change in graduate education, for students, faculty, and institutions, by establishing innovative new models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate greater diversity in student participation and preparation, and to contribute to the development of a diverse, globally-engaged science and engineering workforce.

NUMBER OF U.S. STUDENTS RECEIVING FELLOWSHIPS THROUGH GRF AND TRAINEESHIPS THROUGH IGERT.

	FY 2002	FY 2003	FY 2004	FY 2005
Goal			increase	increase
Result	3011	3328	**✓3681**[6]	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005. However, it may be revised in the future to include active students in NSF graduate fellowship and traineeship programs.

[6] For this report, NSF is only including funded GRF and IGERT recipients and has revised FY 2002 and FY 2003 accordingly. Prior numbers had also included active students in these programs even if they were not currently funded.

Annual Performance Goal 3: Stipend level for Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT) awards.

✓ Goal 3 Achieved

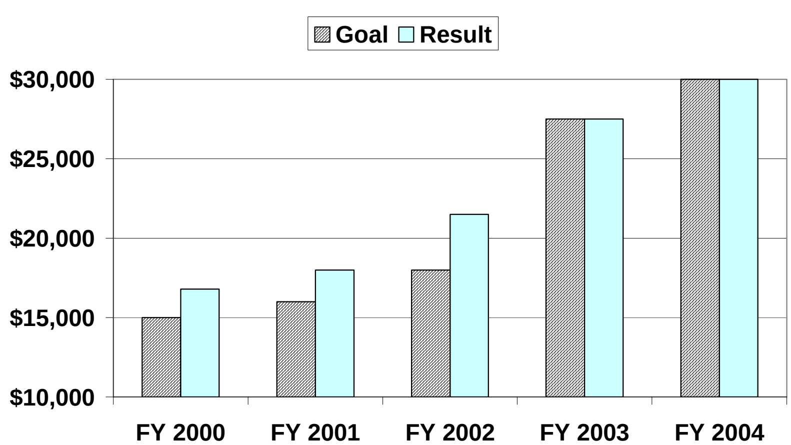
The National Science Foundation (NSF) seeks to ensure the vitality of the human resource base of science, mathematics, and engineering in the United States and to reinforce its diversity. A competition is conducted for Graduate Research Fellowships, with additional awards offered for women in engineering and computer and information science. NSF Graduate Fellowships offer recognition and three years of support for advanced study to outstanding graduate students in the mathematical, physical, biological, engineering, and behavioral and social sciences, including the history of science and the philosophy of science, and to research-based PhD degrees in science education.

The Integrative Graduate Education and Research Traineeships (IGERT) program has been developed to meet the challenges of educating U.S. Ph.D. scientists, engineers, and educators with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become in their own careers the leaders and creative agents for change. The program is intended to catalyze a cultural change in graduate education, for students, faculty, and institutions, by establishing innovative new models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate greater diversity in student participation and preparation, and to contribute to the development of a diverse, globally engaged science and engineering workforce.

STIPEND LEVEL FOR GRF AND IGERT AWARDS (DOLLARS/YEAR)

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal	$15,000	$16,000	$18,000	$27,500	$30,000	
Result	$16,800	$18,000	$21,500	$27,500	**✓$30,000**[7]	

Stipend Level for GRF and IGERT Awards (dollars/year)



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: NSF is replacing, in FY 2005, PART program award size and duration efficiency goals with goals that combine merit review quality and the time it takes to process proposals. Therefore, this goal will not be continued as a PART goal.

[7] The goal of $30,000 is achieved during the 2004-2005 Academic Year, part of which falls in FY 2004. All new GRF and IGERT awards for academic year 2004-2005, funded in fiscal year 2004, were funded at the 30,000 level. While NSF has processes in place to provide sufficient funds to institutions (colleges and universities) to support students at the stipend level, the institutions are responsible for ensuring that the students receive the correct stipend award level.

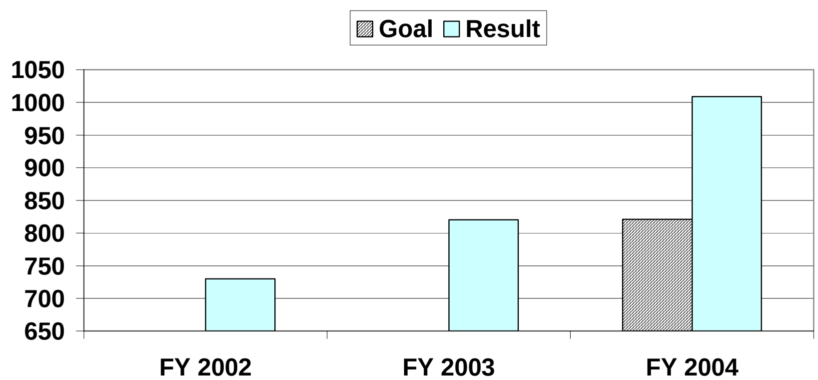
Annual Performance Goal 4: Number of applicants for Graduate Research Fellowships from groups that are underrepresented in the science and engineering workforce.

✓ Goal 4 Achieved

Graduate Research Fellowships are NSF's flagship investment in graduate education and training, and outreach efforts to increase the number of applicants from underrepresented groups are an ongoing priority. As with all demographic goals, the data come from voluntary self-reporting. This year 99% of applicants reported on race and ethnicity. Therefore, the number of applicants from underrepresented groups may actually be slightly, but not significantly, higher.

NUMBER OF APPLICANTS FOR GRADUATE RESEARCH FELLOWSHIPS FROM GROUPS THAT ARE UNDERREPRESENTED IN THE SCIENCE AND ENGINEERING WORKFORCE.				
	FY 2002	**FY 2003**	**FY 2004**	**FY 2005**
Goal			increase	increase
Result	730	820	**✓1009**	

Number of Applicants for Graduate Research Fellowships from Groups that are Underrepresented in the Science and Engineering Workforce.



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[8]:
This goal will be continued in FY 2005.

[8] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 5: Number of applications for Faculty Early Career Development Program (CAREER) awards from investigators at minority-serving institutions.

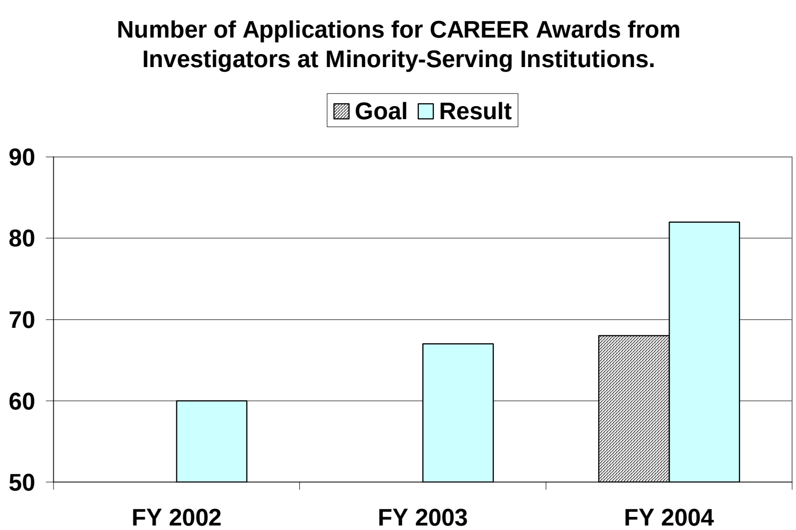
✓ Goal 5 Achieved

The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that supports junior faculty within the context of their overall career development. It combines in a single program the support of research and education of the highest quality and in the broadest sense. This premier program emphasizes the importance the Foundation places on the early development of academic careers dedicated to stimulating the discovery process in which the excitement of research is enhanced by inspired teaching and enthusiastic learning. Each year NSF selects nominees for Presidential Early Career Awards for Scientists and Engineers (PECASE) from among the first-year awardees supported by the CAREER Program. PECASE awards recognize outstanding scientists and engineers who are in the early stages in their careers, and show exceptional potential for leadership at the frontiers of knowledge.

CAREER is NSF's flagship investment in the development of young faculty, and broadening the institutional base of applicants to the program is a continuing priority. Outreach efforts have specifically focused on attracting faculty from minority-serving institutions and from a broader geographic base.

NUMBER OF APPLICATIONS FOR CAREER AWARDS FROM INVESTIGATORS AT MINORITY-SERVING INSTITUTIONS.

	FY 2002	FY 2003	FY 2004	FY 2005
Goal			increase	increase
Result	60	67	**✓82**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[9]: This goal will be continued in FY 2005.

[9] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 6: Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one female PI or Co-PI.

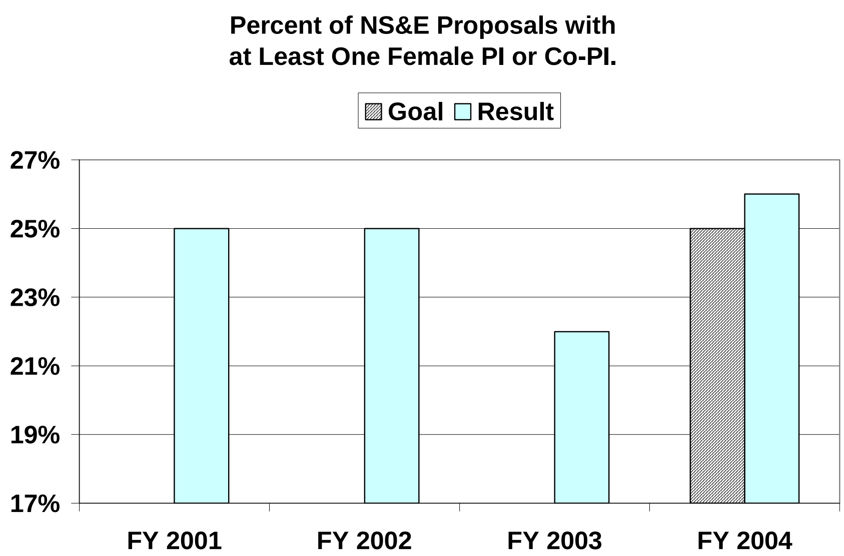
✓Goal 6 Achieved

The Nanoscale Science and Engineering (NS&E) priority area encompasses the systematic organization, manipulation and control of matter at atomic, molecular and supramolecular levels. Novel materials, devices, and systems – with their building blocks on the scale of nanometers – shift and expand possibilities in science, engineering and technology. A nanometer (one-billionth of a meter) is to an inch what an inch is to 400 miles. With the capacity to manipulate matter at this scale, science, engineering and technology are realizing revolutionary advances, in areas such as individualized pharmaceuticals, new drug delivery systems, more resilient materials and fabrics, catalysts for industry and order-of-magnitude faster computer chips.

Nanoscale science and engineering research promises a better understanding of nature, a new world of products beyond what is now possible, high efficiency in manufacturing, sustainable development, better healthcare, and improved human performance. NSF has a continued commitment to increasing participation of female investigators in this priority area.

PERCENT OF NS&E PROPOSALS WITH AT LEAST ONE FEMALE PI OR CO-PI.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal				25%	25%
Result	25%	25%	22%	**✓26%**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[10]: This goal will be continued in FY 2005.

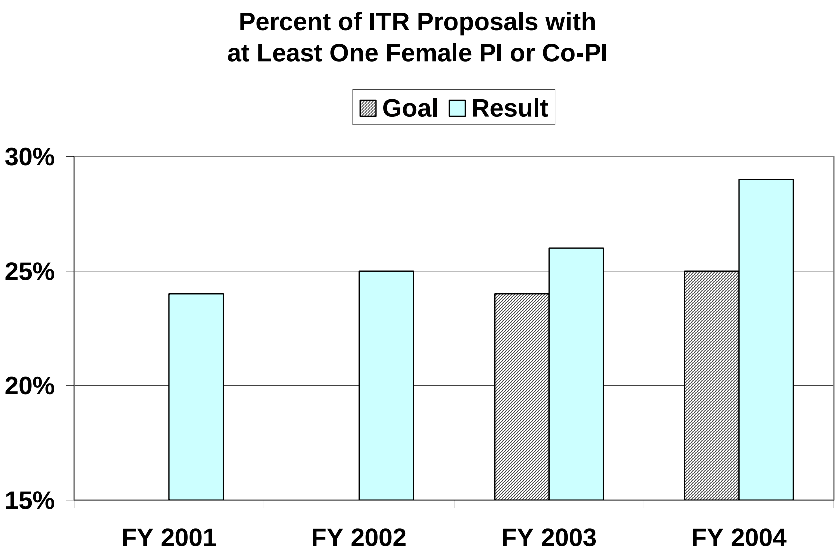
[10] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 7: Percent of Information Technology Research (ITR) proposals with at least one female PI or Co-PI.

✓ Goal 7 Achieved

Information Technology Research (ITR) has created unprecedented new possibilities for advancing knowledge across the spectrum of human endeavors, including fundamental scientific research, education, engineering design and manufacturing, environmental systems, health care, business, entertainment, and government operations. Information technology is essential in the growth of our economy and in solving critical problems facing our Nation. NSF supports research that extends the frontiers of Information Technology, improves our understanding of Information Technology and its impacts on society, and helps prepare Americans for the Information Age. NSF has a continued commitment to increasing participation of female investigators in this area.

PERCENT OF ITR PROPOSALS WITH AT LEAST ONE FEMALE PI OR CO-PI					
	FY 2001	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal			24%	25%	
Result	24%	25%	26%	**✓29%**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[11]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

[11] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 8: Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one minority principal investigator (PI) or co-principal investigator (Co-PI).

✗ Goal 8 Not Achieved

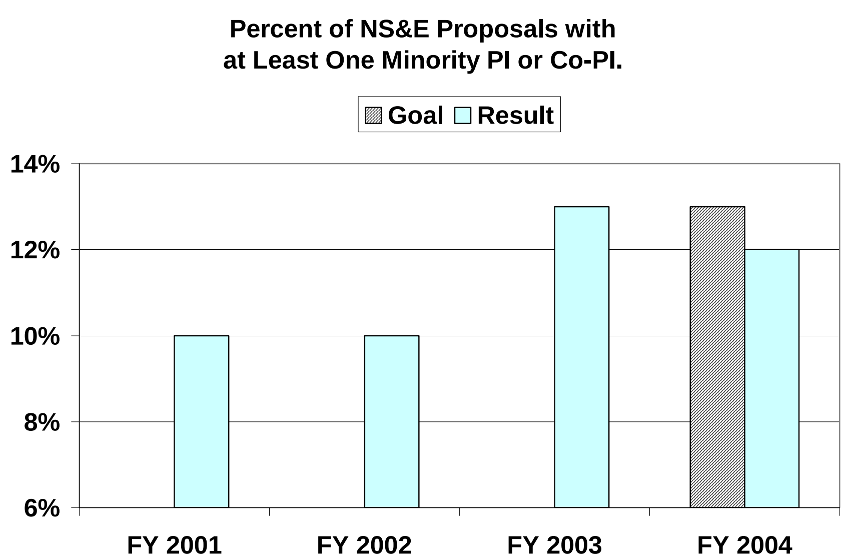
The Nanoscale Science and Engineering (NS&E) priority area encompasses the systematic organization, manipulation and control of matter at atomic, molecular and supramolecular levels. Novel materials, devices, and systems – with their building blocks on the scale of nanometers – shift and expand possibilities in science, engineering and technology. A nanometer (one-billionth of a meter) is to an inch what an inch is to 400 miles. With the capacity to manipulate matter at this scale, science, engineering and technology are realizing revolutionary advances, in areas such as individualized pharmaceuticals, new drug delivery systems, more resilient materials and fabrics, catalysts for industry and order-of-magnitude faster computer chips.

Nanoscale science and engineering research promises a better understanding of nature, a new world of products beyond what it is now possible, high efficiency in manufacturing, sustainable development, better healthcare and improved human performance. NSF has a continued commitment to increasing participation of investigators from underrepresented minority groups in this priority area.

PERCENT OF NS&E PROPOSALS WITH AT LEAST ONE MINORITY PI OR CO-PI.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal				13%	13%
Result	10%	10%	13%	**✗12%**	

WHY WE DID NOT ACHIEVE THIS GOAL: NSF is committed to its goal of increasing participation by minorities. It is not evident why there was a decrease in applications from minority investigators this year.



STEPS WE WILL TAKE TO ACHIEVE THIS GOAL: We will continue our efforts to encourage minorities to submit proposals to these areas.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[12]: This goal will be continued in FY 2005.

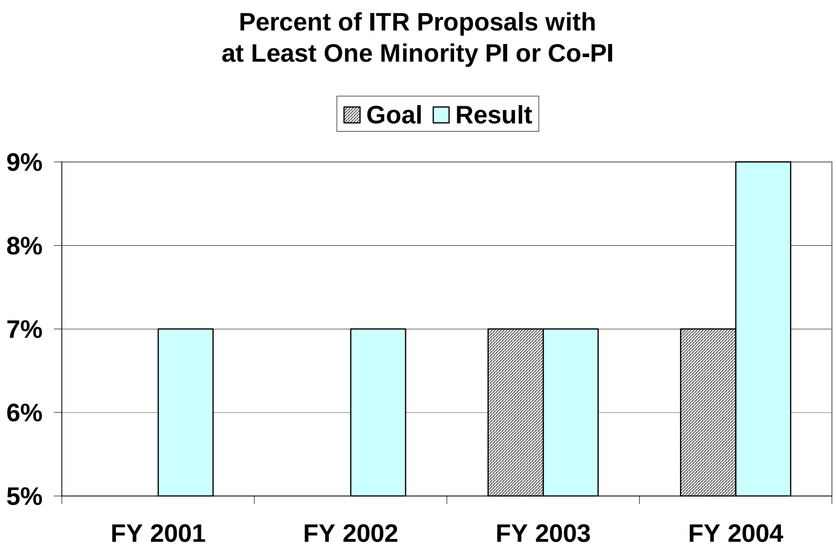
[12] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 9: Percent of Information Technology Research (ITR) proposals with at least one minority PI or Co-PI.

✓ Goal 9 Achieved

Information Technology Research (ITR) has created unprecedented new possibilities for advancing knowledge across the spectrum of human endeavors, including fundamental scientific research, education, engineering design and manufacturing, environmental systems, health care, business, entertainment, and government operations. Information technology is essential in the growth of our economy and in solving critical problems facing our nation. NSF supports research that extends the frontiers of Information Technology, improves our understanding of Information Technology and its impacts on society, and helps prepare Americans for the Information Age. NSF has a continued commitment to increasing participation of investigators from underrepresented minority groups in this area.

PERCENT OF ITR PROPOSALS WITH AT LEAST ONE MINORITY PI OR CO-PI					
	FY 2001	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal			7%	7%	
Result	7%	7%	7%	**✓9%**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[13]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

[13] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 10: Percent of Nanoscale Science and Engineering (NS&E) proposals that are multi-investigator proposals.

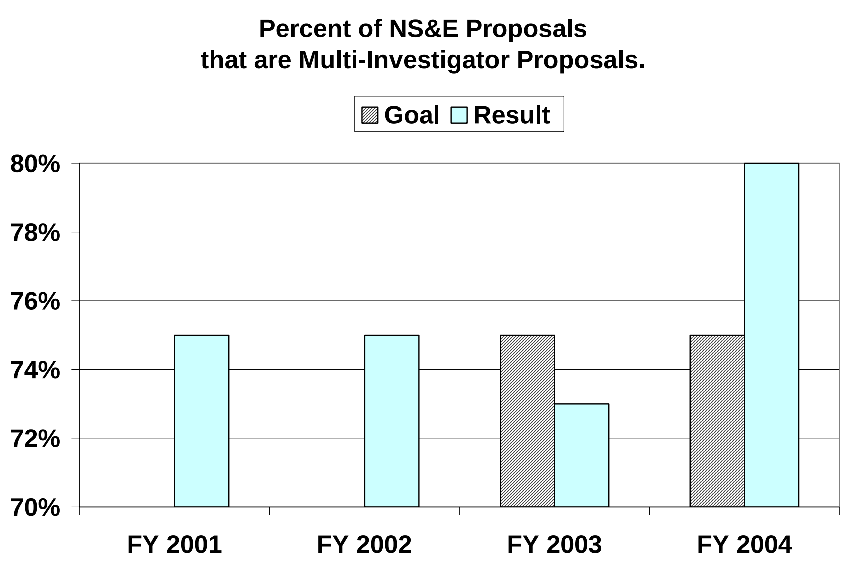
✓ Goal 10 Achieved

The Nanoscale Science and Engineering (NS&E) priority area encompasses the systematic organization, manipulation and control of matter at atomic, molecular and supramolecular levels. Novel materials, devices, and systems – with their building blocks on the scale of nanometers – shift and expand possibilities in science, engineering and technology. A nanometer (one-billionth of a meter) is to an inch what an inch is to 400 miles. With the capacity to manipulate matter at this scale, science, engineering and technology are realizing revolutionary advances, in areas such as individualized pharmaceuticals, new drug delivery systems, more resilient materials and fabrics, catalysts for industry and order-of-magnitude faster computer chips.

Nanoscale science and engineering research promises a better understanding of nature, a new world of products beyond what it is now possible, high efficiency in manufacturing, sustainable development, better healthcare and improved human performance. The NSF NS&E priority area strives to foster collaborations among investigators that may not have otherwise occurred.

PERCENT OF NS&E PROPOSALS THAT ARE MULTI-INVESTIGATOR PROPOSALS.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			75%	75%	75%
Result	75%	75%	73%	**✓80%**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[14]: This goal will be continued in FY 2005.

[14] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

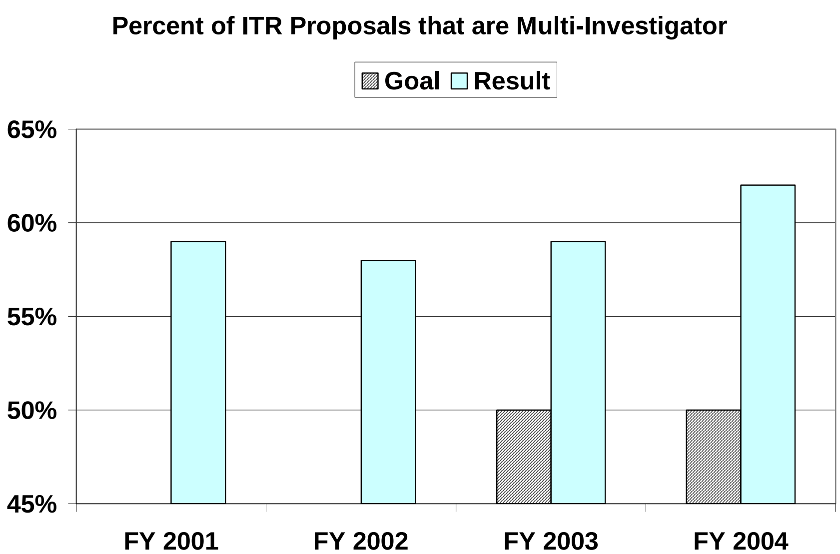
Annual Performance Goal 11: Percent of Information Technology Research (ITR) proposals that are multi-investigator.

✓ Goal 11 Achieved

Information Technology Research (ITR) has created unprecedented new possibilities for advancing knowledge across the spectrum of human endeavors, including fundamental scientific research, education, engineering design and manufacturing, environmental systems, health care, business, entertainment, and government operations. Information technology is essential in the growth of our economy and in solving critical problems facing our Nation. NSF supports research that extends the frontiers of Information Technology, improves our understanding of Information Technology and its impacts on society, and helps prepare Americans for the Information Age. The NSF ITR priority area strives to foster collaborations among investigators that may not have otherwise occurred.

PERCENT OF ITR PROPOSALS THAT ARE MULTI-INVESTIGATOR

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			50%	50%	
Result	59%	58%	59%	**✓62%**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[15]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

[15] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 12: Successful development of workforce, as qualitatively evaluated by external experts for Nanoscale Science and Engineering (NS&E).

✓ Goal 12 Achieved

The following is taken from the Nanoscale Science and Engineering Committee of Visitors report dated 07/30/2004 Question[16] *D.7, page 33. After reporting to its parent Advisory Committee (Engineering), the report will be available at www.nsf.gov/od/gpra/COV/start.htm.*

"The developments are on track for this longer term goal. The NS&E program has been pivotal in developing a skilled workforce and a public that is informed about nanoscience and engineering. The number of scientists working in this area and the amazing web of interdisciplinary connections established are some of the best outcomes to-date. The skilled workforce and the web of interactions are critical for maintaining U.S. leadership in this area. The outcomes are on track for development of a skilled nanotechnology workforce and an informed public on nanoscale science and engineering.

The entire NUE program is designed to promote the successful development of a skilled workforce and a public that is informed about nanoscience and nanotechnology. A particularly good example of workforce development is the (Award #0302163) Pennsylvania State University, University Park program whose goal is to develop a well-educated, technician level nanotechnology workforce. This is accomplished by offering Penn State and area community college students a six-module capstone semester at the Penn State Nanofabrication Facility. In addition, this same Penn State NUE project offers summer "nano camps" for middle school and high school students from across Pennsylvania, contributing to a more scientifically informed public.

In some cases, industry has partnered with educators to train students. An excellent example of such a partnership was between Siena College and Evident Technologies, Inc. (award #0303992). Evident Technologies, a nanotechnology manufacturing and application firm, provided internships for undergraduates. Evident Technologies also provided expert staff members to team-teach a nanotechnology course at Siena College."

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: The next scheduled evaluation of this program is FY 2007. The goal will not appear in FY 2005.

[16] D.7 Have the awards promoted the successful development of a skilled workforce and a public that is informed about nanoscience and nanoengineering? (NIRTs and NSECs)

NSF STRATEGIC OUTCOME GOALS

B. IDEAS

IDEAS STRATEGIC OUTCOME GOAL: Discovery across the frontier of science and engineering, connected to learning, innovation and service to society.

✓ Goal 13 Achieved

Investments in IDEAS support cutting-edge research that yields new and important discoveries and promotes the development of new knowledge and techniques within and across traditional boundaries. These investments enable the Foundation to meet its mission of promoting the progress of science – while at the same time helping to maintain the nation's capacity to excel in science and engineering, particularly in academic institutions. The results of NSF-funded research projects provide a rich foundation for broad and useful applications of knowledge and the development of new technologies. Support in this area also promotes the education and training of the next generation of scientists and engineers by providing them with an opportunity to participate in discovery-oriented projects.

Annual Performance Goal 13: NSF's performance is successful when, *in the aggregate*, results reported in the period FY 2004 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 the service of society.
- Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities.

- Provide leadership in identifying and developing new research and education opportunities within and across S&E fields.
- Accelerate progress in selected S&E areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives.

RESULT: NSF achieved this goal. External experts provided examples of significant achievement during FY 2004 reporting. Comments by the AC/GPA and examples they selected are presented for each of the performance indicators and areas of emphasis for this goal.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005.

IDEAS: Comments by the Advisory Committee for GPRA Performance Assessment

The following statements concerning NSF achievement with respect to the indicators for the IDEAS goal are excerpted from the AC/GPA Report on NSF's IDEAS portfolio. Additional comments as well as examples in support of significant achievement for each indicator are available at *http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216*.

"The Committee concluded that there is significant achievement in all indicators of the IDEAS strategic outcome goal, which is to foster "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society." The Committee concluded that NSF had met the goal for each indicator in making investments in discovery, collaborative research and education, connections between discoveries and their use in society, increased opportunities for underrepresented individuals and institutions, developing new research and education opportunities, and creating new integrative and cross-disciplinary knowledge and tools.

Quality: We were asked to comment on how NSF *allocates* funds to ensure quality in its research portfolio. We wondered why this 'allocation' quality perspective was chosen versus a more generic quality perspective. NSF might reconsider how this question is asked. From the allocation perspective, one can examine whether overall award size is too small to carry out meaningful research or whether the allocation process is optimal when one NSF program can fund research rated fair and another program only has enough funds to support proposals that are rated excellent. NSF might track how deep into the rating levels a particular program, division, or directorate goes to explore whether NSF needs to "rebalance" its funding portfolio to ensure that the highest rated proposals across the NSF get funded. In some respects, this imbalance could be due to the artificial division of funding stemming from NSF's organization.

The Committees of Visitors looked at several issues that may or may not be related to this "allocation" quality perspective. One was whether there is enough participation of underrepresented groups or geographically distributed institutions to ensure that the NSF gets the broadest engagement of intellectual capacity offered in the nation's academic sector. For example, one COV review noted that non-minority PIs were almost twice as likely to be funded as minority PIs. In addition, the COV believed that the quality of proposals could be substantially improved through the increased involvement of NSF program managers in guiding proposal development. Declining numbers of or increasingly burdened program managers could jeopardize the system of feedback that improves the quality of proposals (see discussion of merit review in the Organizational Excellence chapter). In general, the very existence of the merit review process is a major element in ensuring that NSF funds the highest quality proposals. The allocation issues mentioned above are ones that should be examined in order to further optimize the system.

From the Committee's review of the available COV reports, there may be evidence of inequitable resource allocation among directorates. For example, the EHR Teacher Enhancement COV stated, 'Although proposals were generally of high quality, six of the 27 proposals funded seemed to be of lower quality. And there was little documentation in the jackets for justifications, based on needs, geography, innovation, or other considerations.' Conversely, in one CISE division, the COV reported that although the program continues to fund proposals of high quality, funds are inadequate to support all of the high quality proposals – a comment NOT unique to the CISE Directorate. However, the COV further stated, 'A particularly disturbing trend is the increasing gap between the appropriateness and actual size of the awards: while the allocation is fair given the available levels, the amounts are so inadequate as to verge on irrelevance.'

Relevance: We were also asked to comment on *why* an NSF R&D investment is important, relevant, and appropriate. Relevance is a function of national priorities, agency mission, specific field of science or engineering, and customer needs. It was not entirely clear how NSF ties its goals and programs to national needs. It may do that, but we did not see how that happens in our short time together. Having said that, however, we are not suggesting that NSF relate every dollar it awards to some specific (and perhaps transitory) national need, e.g., homeland security, or energy independence, or transportation infrastructure (the list is endless). This was last tried in the 1970s in the Research Applied to National Needs program, which was, with a few notable exceptions, not particularly successful. We are, however, suggesting that NSF might consider describing more fully the relevance or impact of its entire portfolio for future AC/GPA committees beyond its current articulated goal to fund broad and basic research. Clearly, most of these investments advance knowledge and train the next generation of scientists and engineers. That is clearly relevant to our nation and clearly consistent with NSF's mission.

High Risk: We were asked to look at nuggets that were high risk, innovative, or multidisciplinary. In general, we saw few proposals that we would consider high risk although we did not have a definition of what high risk really means. To many of us, it would be like building a cutting edge satellite observing system or some other technology that had never been done before with the understanding that there was a reasonable chance that it might fail. We believe the merit review process actually filters out these type of high risk projects and they are likely only to be funded when a NSF program manager takes the bold steps to support one of these efforts despite reviews that might be unfavorable (i.e., because of the somewhat conservative nature of the merit review process). There were a few proposals that did fall into what we considered the high risk category.

Multidisciplinary Research: Efforts to fund multidisciplinary projects appear uneven across programs. For example, the COV report on the MPS Office of Multidisciplinary Activities (OMA) raises concerns about the relative level of participation in this Office by the various MPS divisions. The COV found that OMA has been effective in the Astronomy, Chemistry, and Physics Divisions, but that both the Mathematics Division and the Materials Research Division are less dependent on OMA because each has its own interdisciplinary programs. Within the Social, Behavioral and Economic Sciences (SBE) Directorate, there are several programs that are inherently multidisciplinary, but at least one COV report expressed concern that interdisciplinary initiatives were diluting support for core disciplines. The Economics, Decision and Management Sciences Cluster COV report observes that, 'evidence exists that large and multidisciplinary efforts have been successful in the natural and physical sciences and in engineering, but is not obvious that similar success in the social sciences and economics is likely.' The COV expressed concern that 'attempts to integrate science across even broader disciplinary boundaries can result in dilution of funding and programmatic energies without sufficiently concentrated support for success.'

Funding of multidisciplinary, collaborative research appears to fall into three categories: (i) projects that bring together scientists from different disciplines around a specific theme; (ii) projects that fund scientists from within a single discipline to conduct research that is interdisciplinary; and (iii) projects that fund collaborative research among scientists from different disciplines.

The unevenness in the support for multidisciplinary research across programs could reflect variations across disciplines in the extent to which disciplinary boundaries are blurred. There is also some indication that there are problems for programs that are not inherently interdisciplinary in reviewing interdisciplinary proposals. Finally, because of funding constraints, especially in directorates with smaller budgets, there is a tension between funding research in core disciplines and funding multidisciplinary activities. This tension is not new, but as disciplines naturally evolve, such strains will need to be thoughtfully managed so as to continue to encourage and support the key stakeholders in the scientific communities.

The Committee was impressed at the overall number, breadth, and depth of the accomplishments (nuggets) available for review. Accomplishments were selected that best represented each of the six indicators."

INDICATOR 1: Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge.

RESULT: *Demonstrated significant achievement.*

"Results reported in 2004 indicate that awards made in each of the directorates have enabled people to work at the forefront of discovery and to make important and significant contributions to science and engineering, and in many cases to enable these individuals, or others, to transform these ideas/results into "products" that benefit humankind."

INDICATOR 2: Encourage collaborative research and education efforts – across organizations, disciplines, sectors and international boundaries.

RESULT: *Demonstrated significant achievement.*

"NSF has supported several projects that encourage collaborative research and education efforts across organizations, disciplines, sectors and international boundaries. Several programs are inherently interdisciplinary -- for example, within the Social, Behavioral and Economic Sciences (SBE) Directorate, the Decision, Risk and Management Science program; Innovation and Organizational Change program; the Law and Social Science program; the Methodology, Measurement and Statistics program; the Science and Technology Studies Program; and the Societal Dimensions of Engineering, Science and Technology Program sponsor research that crosses traditional disciplinary boundaries. The COV report on the LSS programs describes the cross-fertilization process that results from this funding:

> "LSS studies often offer new perspectives on established disciplinary scholarship by importing existing theories into the study of law and testing these theories in the legal arena. In other instances, core social processes can be studied especially well in the legal arena and theoretical innovations can then be exported to the main social science disciplines. As an example of this latter pattern, we point to research on regulation and institutionalization. LSS-funded empirical studies of institutionalization are every bit as important to the development of institutional theory in sociology and political science as they are the understanding of legal processes." (LSS COV Report, March 2003, p. 19).

These programs have also been important as a source of expertise within NSF in the review of cross-disciplinary proposals. (IOC COV report, March 2004, p. 7)."

INDICATOR 3: Foster connections between discoveries and their use in the service of society.

RESULT: *Demonstrated significant achievement.*

"NSF funds a broad range of proposals that foster connections between discoveries and their use in the service of society. "

INDICATOR 4: Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities.

RESULT: *Demonstrated significant achievement.*

"Projects and accomplishments under this indicator are impressive and contribute significantly toward the attainment of the overall IDEAS strategic outcome goal. The accomplishments described below represent novel programs that engage underrepresented individuals and institutions in the sciences in general as well as in high quality research activities."

INDICATOR 5: Provide leadership in identifying and developing new research and education opportunities within and across S&E fields.

RESULT: *Demonstrated significant achievement.*

"NSF funding has developed new areas of scientific inquiry, new applications of scientific knowledge, and innovative programs that integrate research and STEM education."

INDICATOR 6: Accelerate progress in selected S&E areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives.

RESULT: *Demonstrated significant achievement.*

"NSF has funded several proposals that support this indictor. The underlying theme of these examples is the creation of new knowledge and skill sets by learning differently together."

Annual Performance Goal 14: Qualitative assessment by external experts that program is responsible for a broad-based and capable interdisciplinary research community that advances fundamental nanotechnology knowledge, with impact on other disciplinary fields.

✓ Goal 14 Achieved

The following is taken from the Nanoscale Science and Engineering Committee of Visitors report dated 07/30/2004 Question D.6[17]*, page 33. After reporting to its parent Advisory Committee (Engineering), the report will be available a www.nsf.gov/od/gpra/COV/start.htm.*

"The developments are on track for this longer term goal. One of the most significant outcomes of the NS&E investment has been the development of a broad-based and capable interdisciplinary research community. COV members termed this contribution "off scale" and used words like "outstanding performance." The program structure that Mike Roco has instituted truly fosters and encourages interdisciplinary participation and is very effective in developing an interdisciplinary research community.

NSF has done an exceptional job in building nanoscience, a nanoscience community, and the tradition of interdisciplinary collaboration. The NS&E program should be praised for setting the standard in this regard. There is no question that the strong interdisciplinary research community that has been fostered by the NSE will be contributing to the next generation of work force who will be extremely well equipped for our nation's next generation of industrial needs.

The existence of this community is evidence by the large number of meetings that service the community and the journals that are emerging to capture the advances. Examples of new journals include the American Chemical Society's *Nano Letters* and *Small*."

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: The next scheduled evaluation of this program is FY 2007. The goal will not appear in FY 2005.

[17] D.6 Has NS&E been responsible for developing a broad-based and capable interdisciplinary research community that advances fundamental nanoscience and engineering knowledge, with impact on other disciplinary fields? (All modes and themes)

Annual Performance Goal 15: As qualitatively evaluated by external experts, the successful development of a knowledge base for systematic control of matter at the nanoscale level that will enable the next industrial revolution for the benefit of society.

✓ Goal 15 Achieved

The following is taken from the draft version of the Nanoscale Science and Engineering Committee of Visitors report dated 07/30/2004 Question D.3[18], page 29. After reporting to its parent Advisory Committee (Engineering), the report will be available a www.nsf.gov/od/gpra/COV/start.htm. The numbers in parenthesis are NSF award numbers.

"The ability to systematically control matter at the nanoscale has been a great success story. The developments are on track for this longer term goal. Nanoparticle synthesis strategies that didn't exist five to ten years ago now allow us to control size and composition and shape with precision and infinite variability." For example:

- Semiconductor Quantum Dots - We can control size and optical properties of semiconductor nanoparticles at will. These particles are made by simple chemical synthesis methods. The applications of quantum dots in bio-sensing are rapidly developing. Example: UC Davis (0210807)
- Carbon Nanotubes – These are now commercially available. Example: Smalley at Rice University (NSEC 0118007).
- Metal Nanoparticles – Colloidal metal nanoparticles have been studied since Faraday. However, these particles were almost always spherical. In recent years we have learned to control metal nanoparticles shape, making nanorods and nanoprisms. These have many applications, for example in surface-enhanced Raman spectroscopy, that are progressing. Example: Penn State (0210229)
- Organic Nanoparticles - There are many examples here, including *dendrimer chemistry*, which allows us to control size and chemistry of organic nanoparticles with amazing precision and great variability. Applications to drug delivery are being developed. Examples: Crommie at UC Berkeley (0210176), Karen Wooley at Washington University (0210247).

New fabrication techniques are being developed, including nanolithography and chemical vapor deposition techniques. For example, new chemical vapor deposition (CVD) growth techniques of carbon nanotubes holds great promises for the development of integrated nanoscale systems (NSF Award 0102995). NSF is supporting the developments of new nanoscale fabrication techniques; such as deposition by ultrafast laser-assisted scanning probe techniques (NSF Award 0103390).

Furthermore, the area of molecular electronics is where a tremendous amount of work is beginning to produce some fundamental understanding for the phenomena and how these phenomena may be exploited for sensors, for ultra high density memory, *etc*. Areas include new magnetic phenomena, which can generate new memory concepts. We are learning a tremendous amount about the creation of nanoscale particulate materials including needles, pyramids, and other novel shapes and about the electrical, chemical, and mechanical properties of these materials and composites made from these materials.

[18] D.3 Has there been successful development of a knowledge base for systematic control of matter at the nanoscale that will enable the next industrial revolution for the benefit of society?

The important question is: Will these developments enable the next industrial revolution? We now need to move into areas that will bridge the gap between fundamental understanding and industrial processes, and here the future is less certain. For example, the ability to assemble, measure, and model lags significantly behind the repertoire of experimental methods available to make nanoparticles. As an example: we have perhaps 50 ways to make a small amount of drug nanoparticles, perhaps three ways to make large (manufacturing scale) amounts, and almost no knowledge regarding how to incorporate drug nanoparticles into practical products, and minimal knowledge in how to test for safety and comparative efficacy of products containing drug nanoparticles.

Despite the remarkable progress cited above, we have a long way to go. The need to "systematically" control matter and enable the next generation of industry may require a more focused and strategic investment than is appropriate for the NSF. While this topic lies outside the purview of the COV, we urge NSF to couple with other mission agency investments in NNI to ensure that fundamental knowledge is transferred and appropriately developed to ensure broader societal impact.

Implications for the FY 2005 Performance Plan: The next scheduled evaluation of this program is FY 2007. The goal will not appear in FY 2005.

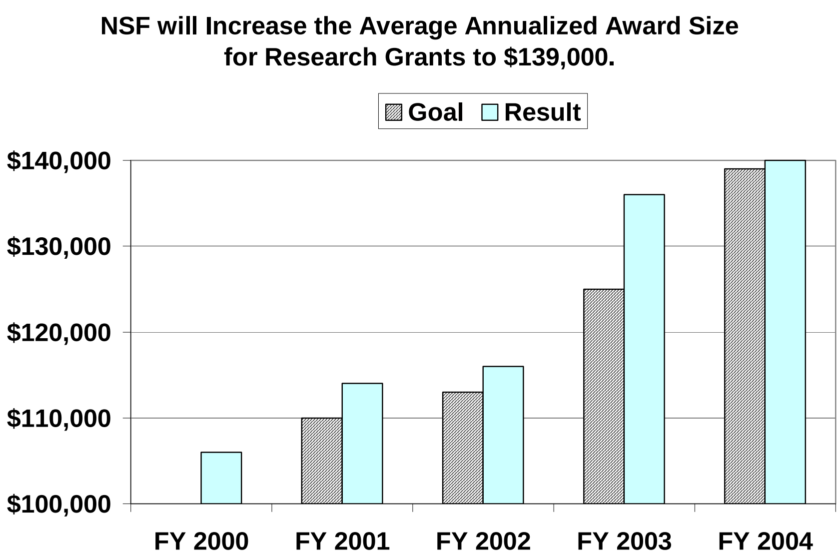
Annual Performance Goal 16: NSF will increase the average annualized award size for research grants to $139,000.

✓ Goal 16 Achieved

NSF is continuing its goal of increasing award size[19]. Our long-term goal is to reach an average annualized award size of $250,000.

Adequate award size is important both for attracting high-quality proposals and for ensuring that proposed work can be accomplished as planned. Larger awards increase the efficiency of the system by allowing scientists and engineers to devote a greater portion of their time to actual research rather than to proposal writing and other administrative work.

NSF will increase the AVERAGE ANNUALIZED AWARD SIZE FOR RESEARCH GRANTS to $139,000.						
	FY 2000	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal		$110,000	$113,000	$125,000	$139,000	$142,000
Result	$106,000	$114,000	$116,000	$136,000[20]	**✓$140,000**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: The average annualized award size will be increased to $142,000 for FY 2005.

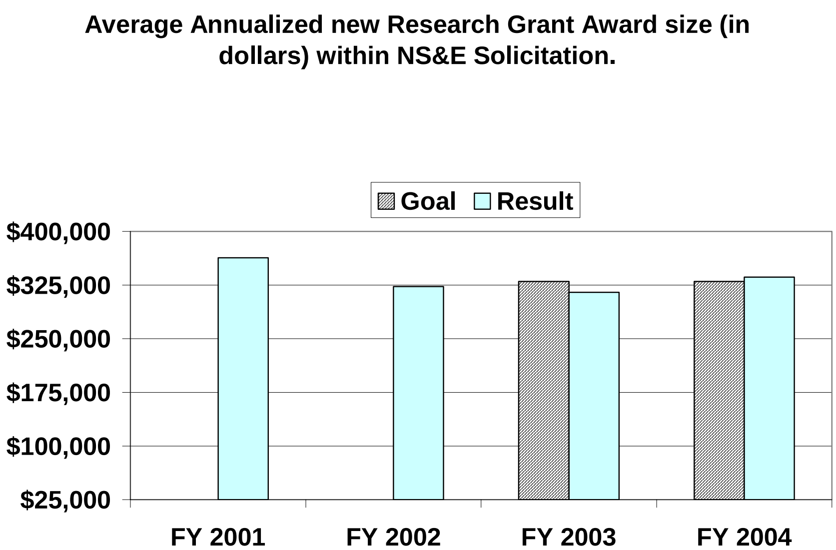
[19] The award size and duration performance goals are applicable only to competitive research grants (a subset of awards that focuses on awards to individual investigators and small groups).
[20] In FY 2003 collaborative proposals submitted as individual proposals from the collaborating institutions were counted as a single proposal as NSF treats them as a single proposal for review and award/decline decisions. If such collaborative proposals are counted individually, the average annualized award size for FY 2003 is $121,380.

Annual Performance Goal 17: Average annualized new research grant award size for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering (NS&E) solicitation.

✓ Goal 17 Achieved

Larger award sizes allow the research community to spend more time conducting research, and less time preparing multiple proposals to accomplish a research goal. An average annualized award size of $330,000 for Nanoscale Interdisciplinary Research Teams (to which this goal applies) is an ambitious target; significantly greater than NSF's current average annualized award size goal of $139,000, and even larger than NSF's long-term goal of $250,000.

AVERAGE ANNUALIZED NEW RESEARCH GRANT AWARD SIZE WITHIN NS&E SOLICITATION.					
	FY 2001	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal			$330,000	$330,000	
Result	$363,000	$323,000	$315,000	✓**$336,000**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[21]: NSF is replacing, in FY 2005, PART program award size and duration efficiency goals with goals that combine merit review quality and the time it takes to process proposals. Therefore, this goal will not be continued as a PART goal.

[21] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

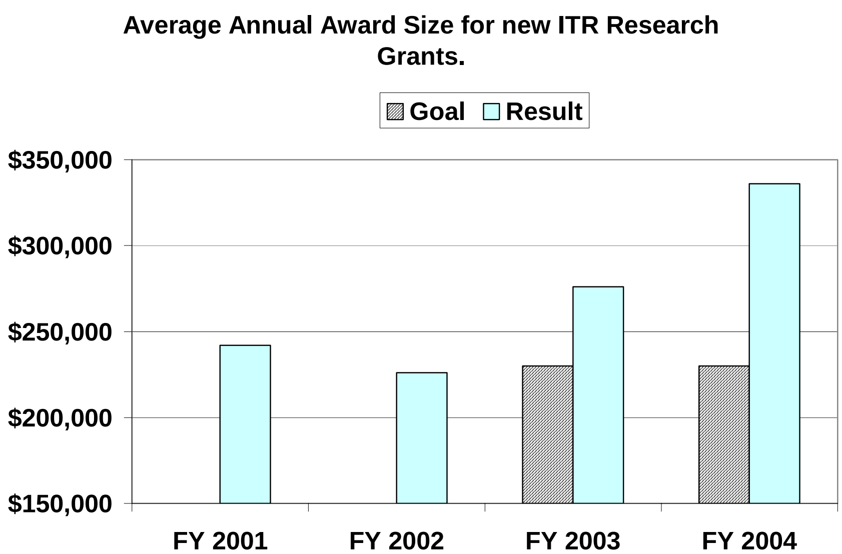
Annual Performance Goal 18: Average annual award size for new Information Technology Research (ITR) research grants.

✓ Goal 18 Achieved

Larger award sizes allow the research community to spend more time conducting research, and less time preparing multiple proposals to accomplish a research goal. An average annualized award size of $230,000 is an ambitious target for this priority area; significantly greater than NSF's current average annualized award size of $140,000.

AVERAGE ANNUAL AWARD SIZE FOR NEW ITR RESEARCH GRANTS.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			$230,000	$230,000	
Result	$242,000	$226,000	$276,000	✓**$336,000**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[22]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

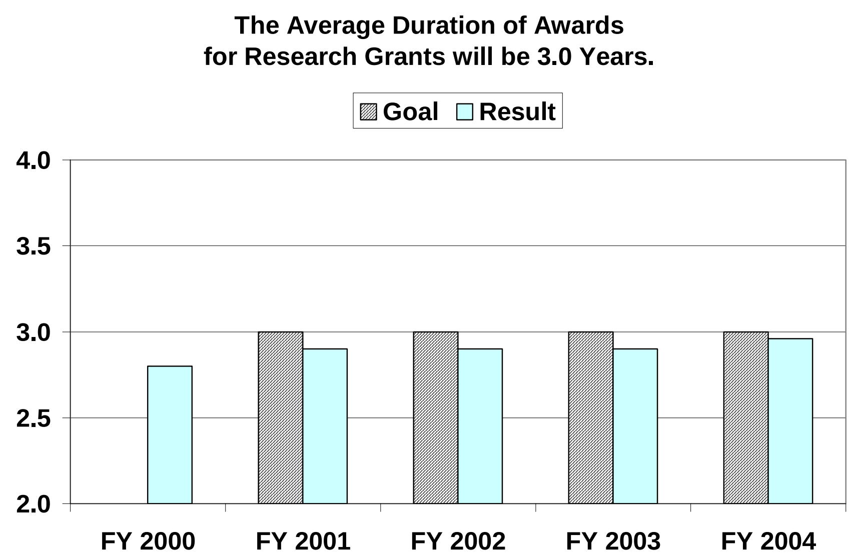
[22] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 19: The average duration of awards for research grants will be 3.0 years.

✕ Goal 19 Not Achieved

Our long-term goal is to reach an average award duration of 5 years[23].

The AVERAGE duration of Awards for Research Grants.						
	FY 2000	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal	N/A	3.0 years	3.0 years	3.0 years	3.0 years	3.0 years
Result	2.8 years	2.9 years	2.9 years	2.9 years	**✕2.96 years**	



WHY WE DID NOT ACHIEVE THIS GOAL: NSF is committed for FY 2005 to its long-term goal of increasing award duration to 5 years. Progress on this goal is budget dependent.

STEPS WE WILL TAKE TO ACHIEVE THIS GOAL: Program Directors must balance competing requirements: increasing award size, increasing duration of awards, and success rates. NSF will continue to focus in FY 2005 on increasing award size and duration. However, due to decreasing success rate for our investigators, this goal is being re-evaluated.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be maintained but re-evaluated in FY 2005.

[23] The award size and duration performance goals are applicable only to competitive research grants (a subset of awards that focuses on awards to individual investigators and small groups).

Annual Performance Goal 20: Average award duration of new Information Technology Research (ITR) research grants.

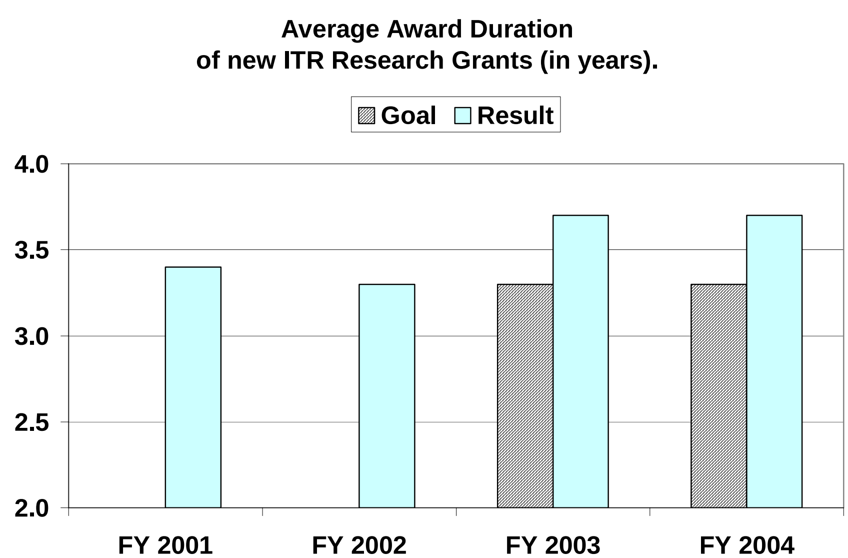
✓ Goal 20 Achieved

Information Technology Research (ITR) has created unprecedented new possibilities for advancing knowledge across the spectrum of human endeavors, including fundamental scientific research, education, engineering design and manufacturing, environmental systems, health care, business, entertainment, and government operations. Information technology is essential in the growth of our economy and in solving critical problems facing our nation. NSF supports research that extends the frontiers of Information Technology, improves our understanding of Information Technology and its impacts on society, and helps prepare Americans for the Information Age.

Longer award durations allow the research community to spend more time conducting research, and less time preparing proposals to continue funding ongoing projects.

AVERAGE AWARD DURATION OF NEW ITR RESEARCH GRANTS (IN YEARS).

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			3.3 years	3.3 years	
Result	3.4 years	3.3 years	3.7 years	**✓3.7 years**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[24]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

[24] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 21: Average duration of new research grant awards for Nanoscale Interdisciplinary Research within the Nanoscale Science and Engineering solicitation.

✓ Goal 21 Achieved

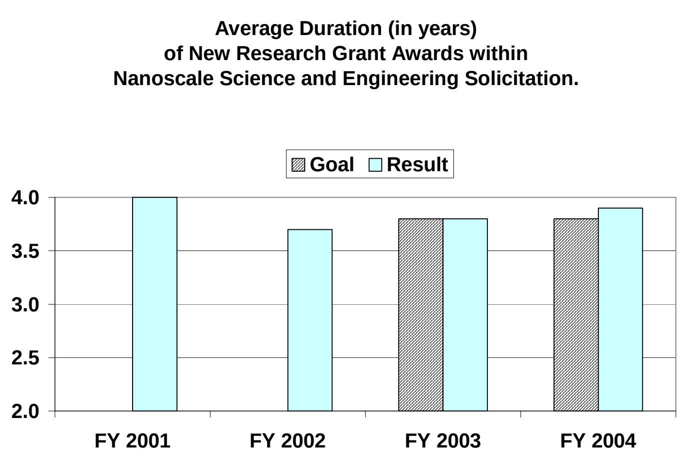
The Nanoscale Science and Engineering (NS&E) priority area encompasses the systematic organization, manipulation and control of matter at atomic, molecular and supramolecular levels. Novel materials, devices, and systems – with their building blocks on the scale of nanometers – shift and expand possibilities in science, engineering and technology. A nanometer (one-billionth of a meter) is to an inch what an inch is to 400 miles. With the capacity to manipulate matter at this scale, science, engineering and technology are realizing revolutionary advances, in areas such as individualized pharmaceuticals, new drug delivery systems, more resilient materials and fabrics, catalysts for industry and order-of-magnitude faster computer chips.

Nanoscale science and engineering research promises a better understanding of nature, a new world of products beyond what it is now possible, high efficiency in manufacturing, sustainable development, better healthcare and improved human performance.

Longer award durations allow the research community to spend more time conducting research, and less time preparing proposals to continue funding ongoing projects. An average award duration of 3.8 years for Nanoscale Interdisciplinary Research Teams is an ambitious target; significantly greater than NSF's current average duration of 3.0 years.

AVERAGE DURATION (IN YEARS) OF NEW RESEARCH GRANT AWARDS WITHIN NANOSCALE SCIENCE AND ENGINEERING SOLICITATION.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			3.8 years	3.8 years	
Result	4 years	3.7 years	3.8 years	**✓3.9 years**	

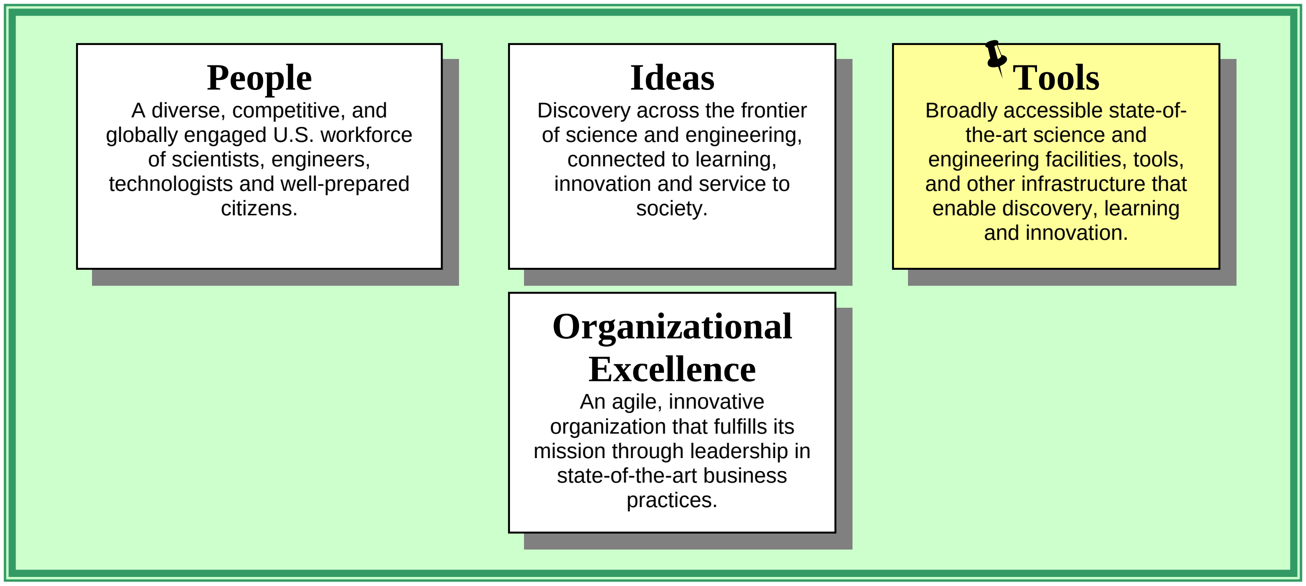


IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[25]: NSF is replacing, in FY 2005, PART program award size and duration efficiency goals with goals that combine merit review quality and the time it takes to process proposals. Therefore, this goal will not be continued as a PART goal.

[25] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

NSF STRATEGIC OUTCOME GOALS

C. TOOLS



TOOLS STRATEGIC OUTCOME GOAL: Broadly accessible state-of-the-art S&E facilities, tools, and other infrastructure that enable discovery, learning and innovation.

✓ Goal 22 Achieved

As the issues researchers face increasingly involve phenomena at or beyond the limits of our measurement capabilities, their study requires the use of new generations of powerful tools. Examples of such tools include instrumentation and equipment needed by individual investigators in the conduct of their research, multi-user facilities, digital libraries, accelerators, telescopes, research vessels, and aircraft and earthquake simulators. In addition, funding devoted to the TOOLS strategic outcome area provides resources needed to support large surveys and databases as well as computational and computing infrastructures for all fields of science, engineering, and education.

NSF provides support for large multi-user facilities that meet the need for state-of-the-art, world-class research platforms vital to new discoveries and the progress of research. NSF support may include construction, upgrades, operations, maintenance, and personnel needed to assist scientists and engineers in the conduct of research at such facilities. NSF consults with other agencies and international partners to avoid duplication and optimize capabilities for American researchers.

All of these investments enable the Foundation to meet its mission of promoting the progress of science, while responding specifically to direction in the NSF Act of 1950 to foster and support the development and use of computer and other scientific and engineering methods and technologies, primarily for research and education in the sciences and engineering.

Annual Performance Goal 22: Our performance is successful when, *in the aggregate*, results reported in the period FY 2004 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 S&E 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 U.S. 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.

RESULT: External experts provided examples of significant achievement during FY 2004 reporting. Comments by the AC/GPA and examples they selected are presented for each of the performance indicators and areas of emphasis for this goal.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005.

TOOLS: Comments by the Advisory Committee for GPRA Performance Assessment

The following statements concerning NSF achievement with respect to the Indicators and Areas of Emphasis for the TOOLS goal are excerpted from the AC/GPA Report on NSF's TOOLS portfolio. Additional comments as well as examples in support of significant achievement for each indicator are available at http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216.

"The Committee concluded that there is significant achievement in all indicators of the TOOLS strategic outcome goal, which is to provide "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation." The essence of TOOLS is to amplify the scientific achievements of the nation by the development and distribution of high-quality tools to various constituents of the community. We found significant achievement in increasing access, in the development of major facilities, the development of cyberinfrastructure, the development of instrument technology, and the collection and analysis of the produced data.

The Committee continues to be concerned about the point made in the FY 2003 AC/GPA Report concerning the tension between ongoing commitments and new awards. This relates to the "big science/small science" issue discussed by NSF Acting Director Bement at our meeting and is intensified by the overextended budget. We feel that budgeting and planning for the operation of major facilities (MREFC) should be more transparent throughout the agency. Once a facility becomes operational, the funding burden shifts to the divisions, pressuring their budgets. It seems that planning for this future pressure could use attention.

A second related issue, especially acute for major facilities but affecting all research grants, is the scheduling and scientific difficulties that funding delays create due to late appropriations. While this is a problem that is not under NSF's control, we still believe it merits mentioning because of the adverse effects it has over time on overall achievement of NSF's (and other agencies') strategic goals."

INDICATOR 1: Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of the-art S&E facilities, tools, databases, and other infrastructure.

RESULT: *Demonstrated significant achievement.*

"The Committee had some difficulty interpreting this meaning of this indicator. Few grants actually satisfied the "and" conjunction of "researchers, educators, and students." It appears that NSF program officers interpreted the conjunction as a disjunction (or), and we followed suit."

INDICATOR 2: Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms.

RESULT: *Demonstrated significant achievement.*

The AC/GPA provided examples of nuggets.

INDICATOR 3: Develop and deploy an advanced cyberinfrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation.

RESULT: *Demonstrated significant achievement.*

The AC/GPA provided examples of nuggets.

INDICATOR 4: Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation.

RESULT: *Demonstrated significant achievement.*

"NSF has supported a wide range of research that contributes to this indicator and the impact appears to be both highly valuable and far-reaching. Some of the work may be categorized as building a supporting infrastructure, for example construction tools to search for critical information efficiently, which will facilitate high quality decisions about policy and resource allocation. Other work is of a more direct technical nature, such as the invention of a tool that will assist in a particular resource allocation problem, leading to more informed decisions of the same type."

"The health of industrial research in the United States is critical to the nation not only from a research perspective but also because of its implication for the economy. It is to be commended that NSF continues to devote resources to improving the statistical and methodological design of its Survey of

Industrial Research and Development. This will assure that the information used by policy makers, among others, will be of the highest quality. NSF is working in collaboration with the Census Bureau's Economic Statistical Methods and Programming Division and with the Committee on National Statistics (CNSTAT) at the National Academy of Sciences."

INDICATOR 5: Support research that advances instrument technology and leads to the development of next-generation research and education tools.

RESULT: *Demonstrated significant achievement.*

"NSF has demonstrated significant achievement in supporting research that advances instrument technology and leads to the development of next-generation research and education tools. This achievement is demonstrated across a wide range of disciplines, from physics, astronomy, and chemistry, to materials science, biology, and geosciences, to computer science and education. In the following paragraphs we will highlight achievements from three areas: physics/materials science, geosciences, and computer science."

Annual Performance Goal 23: Percent of construction acquisition and upgrade projects with negative cost and schedule variances of less than 10% of the approved project plan.

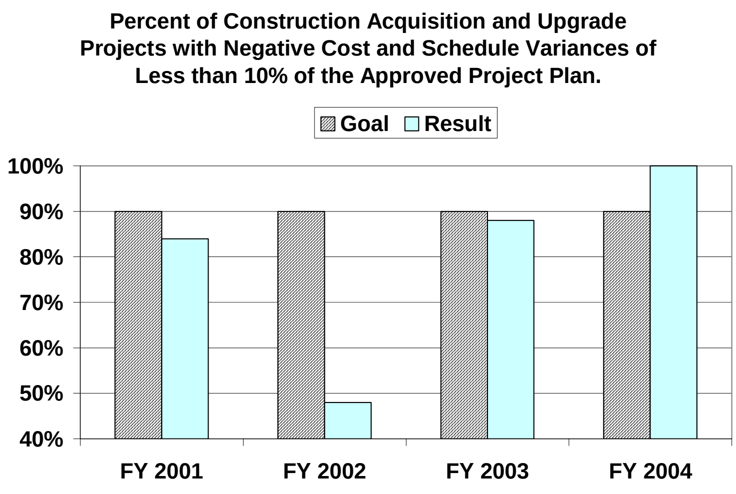
✓ Goal 23 Achieved

In FY 2001 and FY 2002 NSF undertook a comprehensive internal review of the facilities goals. In FY 2003 NSF improved the construction goals by combining cost and schedule performance into a single goal. The revised goal assesses performance based on the Earned Value technique, a widely accepted project management tool for measuring progress that recognizes that cost or schedule data alone can lead to distorted perceptions of performance.

Investments in development, construction of state-of-the-art facilities and platforms are implemented consistently with planned cost and schedule. Through FY 2002, there were three interrelated but separate GPRA goals for schedule and cost for construction/upgrade projects. For FY 2003 and beyond, these goals were combined into the single goal. While annual and total cost targets were all met in FY 2001 and FY 2002, scheduling milestones were not. The goals and actual performance shown (*) for FY 2001 and FY 2002 reflect the schedule goal only. The low number for FY 2002 reflects the requirement that year that facilities meet schedule milestones throughout the year.

PERCENT OF CONSTRUCTION ACQUISITION AND UPGRADE PROJECTS WITH NEGATIVE COST AND SCHEDULE VARIANCES OF LESS THAN 10% OF THE APPROVED PROJECT PLAN.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal	90%	90%	90%	90%	90%
Result	84%	48%	88%	✓**100%**[26]	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005.

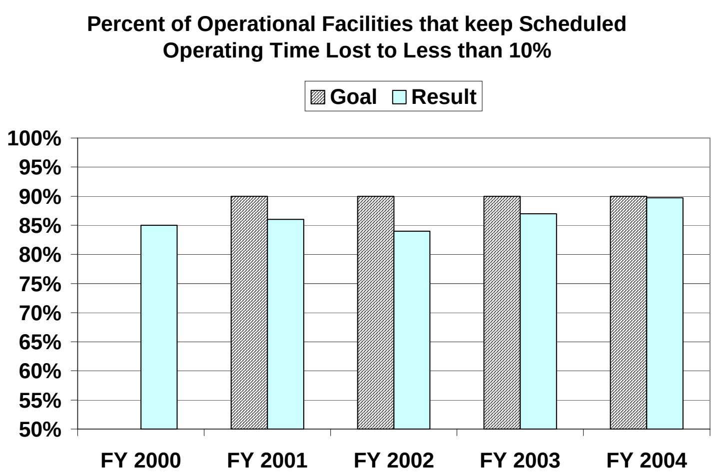
[26] Submissions of cost and schedule estimates for the year occurred later during FY 2004 than in FY 2003 due to changes in the submission process for cumulative Earned Value Management. This could have contributed to the increase in the percentage this year. Note also that starting in FY 2004, polar facilities have their own PART evaluation and efficiency goals (to be reported in the PAR in FY 2006).

Annual Performance Goal 24: Percent of Operational Facilities that keep Scheduled Operating Time Lost to Less than 10%.

✕ Goal 24 Not Achieved

To provide the flexibility necessary for NSF to report realistic goals, we maintained the level deemed "successful" at 90% of the facilities. Measure in FY 2001 and 2002 was based on keeping operating time greater than 90%; results reported here are in terms of present measure.

PERCENT OF OPERATIONAL FACILITIES THAT KEEP SCHEDULED OPERATING TIME LOST TO LESS THAN 10%						
	FY 2000	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal	Keep operating time lost due to unscheduled downtime to less than 10% of the total scheduled operating time.	For 90% of facilities, keep operating time lost due to unscheduled downtime to less than 10% of the total scheduled operating time.	For 90% of facilities, keep operating time lost due to unscheduled downtime to less than 10% of the total scheduled operating time.	For 90% of operational facilities, keep scheduled operating time lost to less than 10%.	For 90% of operational facilities, keep scheduled operating time lost to less than 10%.	For 90% of operational facilities, keep scheduled operating time lost to less than 10%.
Result	22 of 26 (85%) reporting facilities met goal.	25 of 29 (86%) reporting facilities met goal.	26 of 31 (84%) reporting facilities met goal.	26 of 30 (87%) reporting facilities met goal.	**✕26 of 29 (89.7%) reporting facilities met goal.**	



WHY WE DID NOT ACHIEVE THIS GOAL: Some causes of unscheduled operating time losses include the acceleration for the shutdown of another agency's reactor and startup problems with new computer technology.

STEPS WE WILL TAKE TO ACHIEVE THIS GOAL: NSF will continue to work with project managers to identify obstacles to successful performance.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005.

Annual Performance Goal 25: Number of users accessing National Nanofabrication Users Network/National Nanotechnology Infrastructure Network (NNUN/NNIN) and Network for Computational Nanotechnology (NCN) sites.

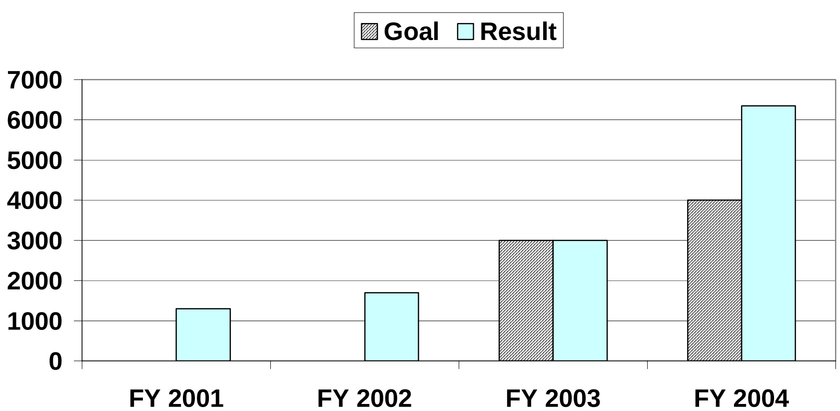
✓ Goal 25 Achieved

The National Nanotechnology Infrastructure Network (NNIN), is an integrated national network of user facilities that supports the future infrastructure needs for research and education in the burgeoning nanoscale science and engineering field. The facilities comprising this network are diverse in capabilities, research areas, and geographic locations, and the network will have the flexibility to grow or reconfigure as needs arise. The NNIN broadly supports nanotechnology activities outlined in the National Nanotechnology Initiative investment strategy. It provides users across the nation access to leading-edge fabrication and characterization tools and instruments in support of nanoscale science and engineering research. The NNIN supersedes the National Nanofabrication Users Network (NNUN), initiated in 1994 and for which NSF support concluded at the end of 2003.

NUMBER OF USERS ACCESSING NATIONAL NANOFABRICATION USERS NETWORK/NATIONAL NANOTECHNOLOGY INFRASTRUCURE NETWORK (NNUN/NNIN) AND NETWORK FOR COMPUTATIONAL NANOTECHNOLOGY (NCN) SITES

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			3000	4000	4000
Result	1300	1700	3000	**✓6350**	

Number of Users Accessing National Nanofabrication Users Network/National Nanotechnology Infrastructure Network (NNUN/NNIN) and Network for Computational Nanotechnology (NCN) sites.



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[27]: This goal will be continued in FY 2005.

[27] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 26: Number of nodes that comprise infrastructure.

✓ Goal 26 Achieved

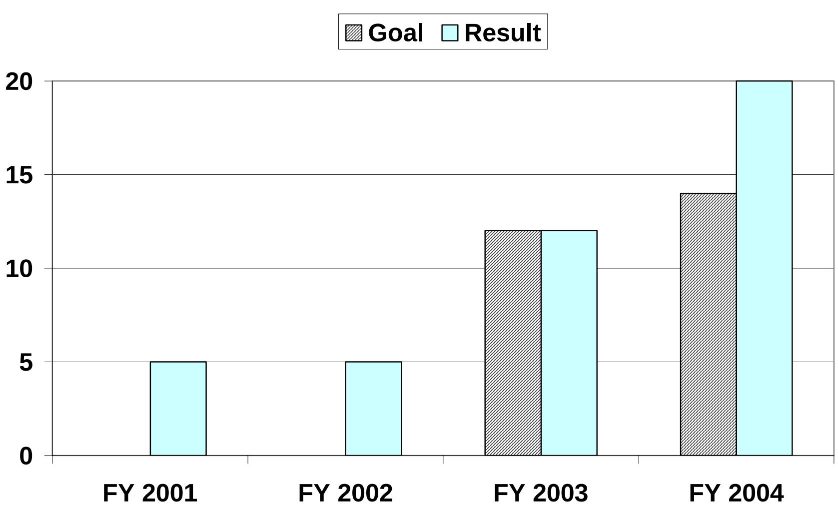
The National Nanotechnology Infrastructure Network (NNIN), is an integrated national network of user facilities that supports the future infrastructure needs for research and education in the burgeoning nanoscale science and engineering field. The facilities comprising this network are diverse in capabilities, research areas, and geographic locations, and the network will have the flexibility to grow or reconfigure as needs arise. The NNIN broadly supports nanotechnology activities outlined in the National Nanotechnology Initiative investment strategy. It provides users across the nation access to leading-edge fabrication and characterization tools and instruments in support of nanoscale science and engineering research. The NNIN supersedes the National Nanofabrication Users Network (NNUN), initiated in 1994 and for which NSF support concluded at the end of 2003.

NNIN nodes are defined as both large and small individual user facilities, geographically distributed and with diverse and complementary capabilities to design, create, characterize, and measure novel nanoscale structures, materials, devices, and systems.

NUMBER OF NODES THAT COMPRISE INFRASTRUCTURE.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Goal			12	14	14
Result	5	5	12	**✓20**	

Number of Nodes that Comprise Infrastructure.



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[28]: This goal will be continued in FY 2005.

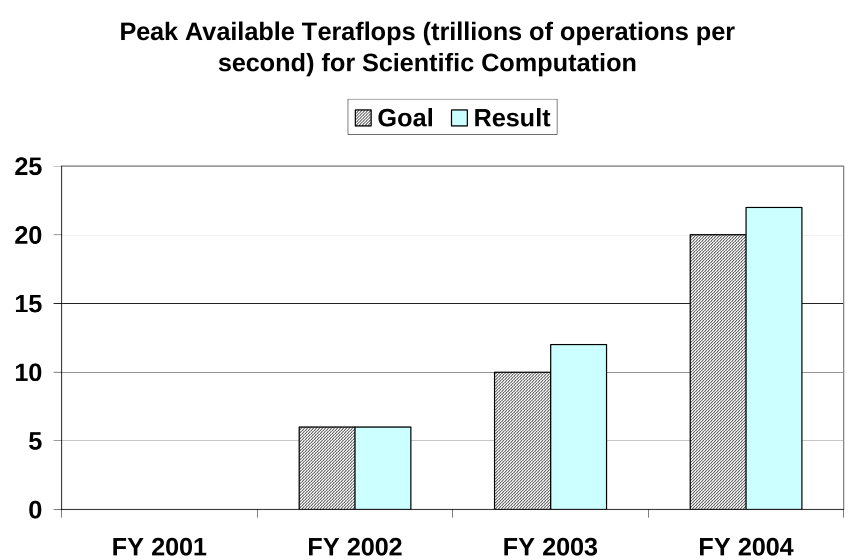
[28] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 27: Peak available teraflops (trillions of floating point operations per second) for scientific computation.

✓ Goal 27 Achieved

Teraflops (trillions of floating-point operations per second) are a measure of the power/speed of the computing facilities. About 80% of the quoted numbers are available at any time of the year to the academic and broader scientific community. After FY 2004, NSF will continue to upgrade and improve the ITR funded Terascale Computing facilities and provide the indicated level or higher to S&E users.

PEAK AVAILABLE TERAFLOPS (TRILLIONS OF FLOATING POINT OPERATIONS PER SECOND) FOR SCIENTIFIC COMPUTATION					
	FY 2001	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal	0	6	10	20	
Result	0	6	12	**✓22**	



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[29]: ITR is no longer a Foundation-wide priority area as of FY 2005. This goal will not continue in FY 2005.

[29] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

Annual Performance Goal 28: External committee finding that research infrastructure is appropriate to enable major discoveries for Nanoscale Science and Engineering (NS&E).

✓ Goal 28 Achieved

The following is taken from the Nanoscale Science and Engineering Committee of Visitors report dated 07/30/2004 Question D.10[30], page 35. After reporting to its parent Advisory Committee (Engineering), the report will be available at www.nsf.gov/od/gpra/COV/start.htm.

"The developments are on track for this longer term goal. The availability of multiple funding modes within NS&E is very appropriate for producing enabling technologies. However, before we fully answer this question, it is important to set the stage for generally how things will go in nanoscience and technology in the future. At least in terms of nanotechnology and the end products that come from it, we are still clearly in the first generation of what is often called passive nanostructures (nano-coatings, nano-particles, etc.). These products and uses are novel and important, but just the very beginning. The current developments are on track for establishing a proper infrastructure in the long term. Over the next twenty years or so, experts are anticipating that second, third, and fourth generation developments will occur in the areas of active nanostructures, nanosystems, and heterogeneous molecular nanosystems, respectively (Roco M.C., 2004, AIChE Jounal, 50, 890-897). Therefore, further development of research infrastructure appropriate to enable major discoveries in the future is absolutely critical so that we can reap the benefits from this revolution as soon as possible.

At this time, the answer to question 10 is generally yes, at all levels. The four to five year funding periods for NIRTs and NSECs are conducive to enabling future discoveries when one remembers that nanoscience and engineering technology is still in its infancy, and tremendous strides in research are still occurring with each passing year."

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: The next scheduled evaluation of this program is FY 2007. The goal will not appear in FY 2005.

[30] D.10 Is the NS&E-supported research infrastructure appropriate to enable major future discoveries? (Modes of support and themes)?

NSF STRATEGIC OUTCOME GOALS

D. ORGANIZATIONAL EXCELLENCE

ORGANIZATIONAL EXCELLENCE STRATEGIC OUTCOME GOAL: An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.

✓ Goal 29 Achieved

Excellence in managing NSF's activities is critical to achievement of the Foundation's mission-oriented outcome goals. Long-term investment categories include *human capital*, which produces a diverse, agile, results-oriented cadre of knowledge workers committed to enabling the agency's mission and to constantly expanding their abilities to shape the agency's future; *business processes*, which produce effective, efficient, strategically-aligned business processes that integrate and capitalize on the agency's human capital and technology resources; and *technologies and tools*, which produce flexible, reliable, state-of-the-art business tools and technologies designed to support the agency's mission, business processes, and customers.

Annual Performance Goal 29: Our performance is successful when, *in the aggregate*, results reported in the FY 2004period demonstrate significant achievement in the majority of the following indicators:

- Operate a credible, efficient merit review system.
- Utilize and sustain broad access to new and emerging technologies for business application.
- Develop a diverse, capable, motivated staff that operates with efficiency and integrity.
- Develop and use performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

RESULT: External experts provided examples of significant achievement during FY 2004 reporting. Comments by the AC/GPA and examples they selected are presented for each of the performance indicators and areas of emphasis for this goal.

IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN: This goal will be continued in FY 2005.

ORAGANIZATIONAL EXCELLENCE: Comments by the Advisory Committee for GPRA Performance Assessment

The following statements concerning NSF achievement with respect to the Indicators for the ORGANIZATIONAL EXCELLENCE goal are excerpted from the AC/GPA Report on NSF's ORGANIZATIONAL EXCELLENCE at http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf04216.

"This strategic outcome goal was added to the NSF Strategic Plan for FY 2003-2008. This is a major step forward in recognizing the linkages between excellence in advancing science and excellence in organizational development. Within the OE goal, the indicators "mirror" the P, I, T structure of the other strategic outcome goals. The Human Capital indicator is the "people" dimension of OE, the Technology-Enabled Business Processes is the 'ideas' dimension of OE, and the Performance Assessment and Merit Review indicators are the 'tools' dimension.

The AC/GPA recommended in its FY2003 report that NSF consider an approach that involved a significant component of 'self study.' This 'self study' would involve a greater number of NSF staff, would be based on NSF's strategic goals and indicators, would be data driven and would provide key information at multiple levels of detail. NSF adopted this approach for the Organizational Excellence goal. Early on, it was determined that the Advisory Committee for Business and Operations (AC/B&O) would provide an assessment of the three of the indicators for the OE goal: Human Capital, Technology-Enabled Business Processes, and Performance Assessment. The AC/GPA would conduct an assessment of the Merit Review indicator since it had, in previous years, looked at this aspect of OE.

The AC/B&O supported NSF's determination that the agency had demonstrated significant achievement for the three indicators it considered. The AC/B&O also made a number of comments to improve the approach, methodology and analysis for the assessment of performance in subsequent years. The letter and the revised assessment are found below. The OE subgroup of the AC/GPA reviewed the letter and the assessment and performed its own review of the merit review indicator. The results of this analysis were presented to the full AC/GPA for its consideration.

With regard to Merit Review, the OE subgroup reviewed data and information from the <u>Report to the National Science Board on the Merit Review Process Fiscal Year 2003</u>, supporting documentation provided by the NSF including a customer survey conducted by Booz, Allen, Hamilton, and the reports from a number of Committees of Visitors (COVs). We concluded that NSF had demonstrated significant achievement for this indicator. While the Merit Review Process will always, in our view, require vigilance and a commitment to continuous improvement, when taken as a whole and when one looks at the results as illustrated in the People, Ideas, and Tools portfolios, clearly, the process remains a major positive force in advancing the frontiers of science, mathematics, and engineering.

With regard to the OE goal as a whole, the AC/GPA inquired as to the extent to which organizational excellence is linked to individual performance goals and the mission and vision of the NSF. NSF staff noted that this practice was started with those NSF employees in the Senior Executive Service two years ago and extended to other employees during the past year. The AC/GPA applauds this and recommends that individual performance goals for all NSF employees continue to be linked to organizational excellence. We believe this will not only have the effect of increasing accountability, but also will encourage and motivate organizational leadership at all levels within the Foundation."

INDICATOR 1: Operate a credible, efficient merit review system.

RESULT: *Demonstrated significant achievement.*

"With regard to Merit Review, the OE subgroup reviewed data and information from the Report to the National Science Board on the Merit Review Process Fiscal Year 2003, supporting documentation provided by the NSF including a customer survey conducted by Booz, Allen, Hamilton, and the reports from a number of Committees of Visitors (COVs). We concluded that NSF had demonstrated significant achievement for this indicator. While the Merit Review Process will always, in our view, require vigilance and a commitment to continuous improvement, when taken as a whole and when one looks at the results as illustrated in the People, Ideas, and Tools portfolios, clearly, the process remains a major positive force in advancing the frontiers of science, mathematics, and engineering. "

INDICATOR 2: Utilize and sustain broad access to new and emerging technologies for business application.

RESULT: *Demonstrated significant achievement.*

Evaluated by the AC/B&O.

INDICATOR 3: Develop a diverse, capable, motivated staff that operates with efficiency and integrity.

RESULT: *Demonstrated significant achievement.*

Evaluated by the AC/B&O.

INDICATOR 4: Develop and use performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

RESULT: *Demonstrated significant achievement.*

" 'The Human Capital' indicator is the 'people' dimension of OE, the Technology-Enabled Business Processes is the 'ideas' dimension of OE, and the Performance Assessment and Merit Review indicators are the 'tools' dimension.

The AC/B&O supported NSF's determination that the agency had demonstrated significant achievement for the three indicators it considered."

Annual Performance Goal 30: For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of deadline or target date, or receipt date, whichever is later.

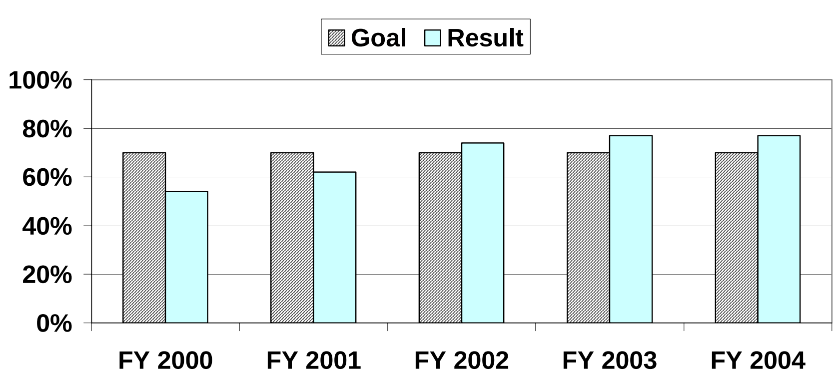
✓ Goal 30 Achieved

One of the most significant issues raised in customer satisfaction surveys is the amount of time it takes us to process proposals. We recognize the importance of this issue.

FOR 70 PERCENT OF PROPOSALS, BE ABLE TO INFORM APPLICANTS WHETHER THEIR PROPOSALS HAVE BEEN DECLINED OR RECOMMENDED FOR FUNDING WITHIN SIX MONTHS OF DEADLINE OR TARGET DATE, OR RECEIPT DATE, WHICHEVER IS LATER.						
	FY 2000	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**	**FY 2005**
Goal	70%	70%	70%	70%	70%	70%
Result	54%	62%	74%	77%	**✓77%**	

In FY 2005, we will continue to focus on improving the efficiency of proposal processing.

For 70 Percent of Proposals, Make Information Available to Applicants on whether their Proposals have been Declined or Recommended for Funding within Six Months of Deadline or Receipt Date, Whichever is Later.



IMPLICATIONS FOR THE FY 2005 PERFORMANCE PLAN[31]: This goal will be continued in FY 2005.

[31] The FY 2005 Performance Plan has now been integrated within the FY 2005 Performance Budget.

IV. ASSESSMENT AND EVALUATION PROCESS

Measuring NSF's Ability to Meet Mission-Oriented Goals

The National Science Foundation's Advisory Committee for GPRA Performance Assessment (AC/GPA) was established in June 2002 to provide advice and recommendations to the NSF Director regarding the Foundation's performance under the Government Performance and Results Act (GPRA) of 1993. The Committee of 20-25 scientists, engineers and educators review NSF's broad portfolio in their analysis of annual progress toward NSF's four strategic outcome goals of People, Ideas, Tools, and Organizational Excellence.

Indicators are used by the Foundation to assess annual progress toward attainment of its long-term outcome goals. For each outcome goal, NSF judges itself successful when, in the aggregate, results reported demonstrate significant achievement for the majority of associated indicators. The AC/GPA's assessment of whether NSF has demonstrated significant achievement with respect to individual performance indicators is based on the collective experience and expertise of the Committee using input from "nuggets" (exemplary outcomes from NSF-funded research), COV reports, PI project reports and input from NSF and the Business and Operations Advisory Committee regarding Organizational Excellence activities. These sources cover NSF's entire portfolio. After its meetings, the AC/GPA provides NSF with a report concerning NSF performance with respect to the indicators associated with each annual performance goal. The recommendations developed by the AC/GPA are used, along with other qualitative information and quantitative management results, to prepare NSF's Performance and Accountability Report.

Project Assessment During NSF Merit Review

Applicants provide results from previous NSF support, information about existing facilities and equipment available to conduct the proposed activity, biographical information on the Principal Investigator(s), other sources of support, federally required certifications, and certifications specific to NSF. Such information is required at the time of application, and in annual and final project reports. It is reviewed by NSF staff, is utilized during merit review, and is available to external committees (COVs and the AC/GPA) conducting performance assessment. The merit review process provides a rigorous, first phase of assessment of NSF's research and education portfolio. Thus, from the onset, only the most competitive one-fourth of proposals submitted for consideration are selected (down from one-third in FY 2001).

Program Officers review the annual progress of awards. The project reports include information on significant accomplishments, progress achieved in the prior year, and points out issues that may impact progress or completion of the project on schedule and within budget. On approval of this report by the Program Officer, NSF releases funds for the ensuing year for continuing grants.

All materials associated with the review of a proposal as well as subsequent annual reports are available to Committees of Visitors. NSF staff also prepare materials (reports, evaluations, highlights) for use by COVs and the AC/GPA in developing their reports and making their assessments.

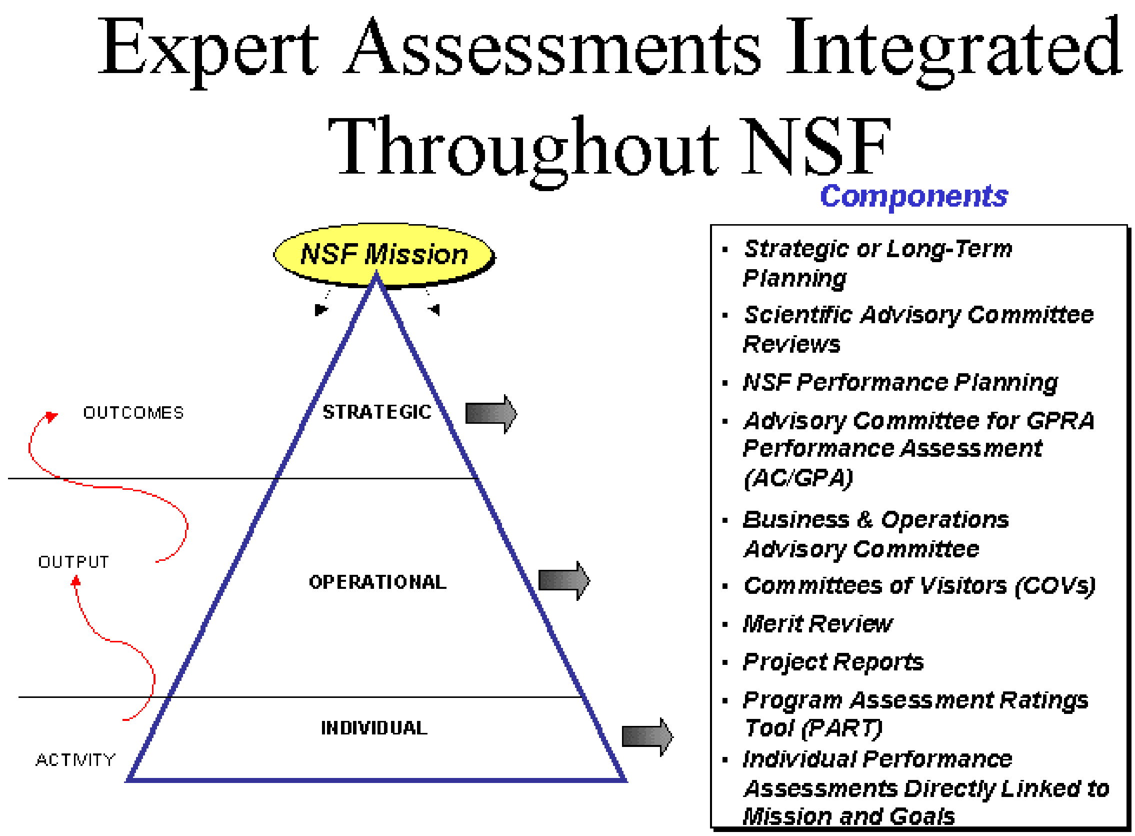


Figure: Shows components and the value of expert evaluations performed at NSF.

Program Assessment by Committees of Visitors (COVs)

NSF's Committees of Visitors provide program assessments that are used both in program management and in annual GPRA reporting. Each COV typically consists of five to twenty external experts who review one or more programs over a two or three day period. These experts are selected to ensure independence, programmatic coverage, and balanced representation. They typically represent academia, industry, government, and the public sector. Approximately one-third of NSF activities are assessed each year.

All COVs are asked to complete a report template with questions addressing how programs contribute to NSF's goals. Questions to Committees of Visitors include: (A) the integrity and efficiency of the *processes* involved in proposal review; and (B) the results, including quality, of NSF's investments.

The FY 2004 COVs were asked to comment on program activities as they relate to NSF's strategic outcome goals. COVs are asked to justify their assessment and provide supporting examples or statements.

COVs are subcommittees of NSF directorate advisory committees. As such, their reports, along with NSF responses to the recommendations made by the COVs, are submitted to the parent advisory committee.

Advisory Committee (AC) Reporting on Directorate/Office Performance

Advisory Committees advise the seven directorates and the Office of Polar Programs. They are typically composed of 18-25 external experts in the respective fields who have broad experience in academia, industry, and government. Advisory Committees are chartered and hence are subject to Federal Advisory Committee Act (FACA) rules. The role of the ACs is to provide advice on priorities, address program effectiveness, and review COV reports and directorate responses to COV recommendations.

In FY 2001 and previous years, directorate advisory committees assessed directorate progress in achieving NSF-wide GPRA goals. With the advent of the AC/GPA, advisory committees no longer assess directorate progress towards these goals.

Advisory Committee for Business and Operations

In FY 2001, NSF established the Advisory Committee for Business and Operations. The committee is composed of 15 members selected from the research administration, education management and business communities, including business professionals and academics in the field. The committee is charged with providing advice on issues related to NSF's business practices and operations, including innovative approaches to the achievement of NSF's strategic goals. This committee provided significant input to the formulation of NSF's Organizational Excellence strategic outcome goal and provided an assessment of NSF performance with respect to three of the four indicators associated with this goal.

Agency GPRA and PART Reporting

NSF has integrated its GPRA and PART reporting. For the second straight year, all performance goals in the Performance and Accountability Report were verified and validated by an external third party. This year, that includes both GPRA and PART goals. The verification and validation (V&V) process is discussed in Section V.

The COV and AC/GPA reports prepared by external experts are integral to the evaluation of NSF performance and address a broad set of issues ranging from staffing and quality of merit review to specifics of a scientific project. The GPRA components of these reports are used in assessing NSF's progress toward achieving its People, Ideas, Tools, and Organization Excellence outcome goals.

The criterion for success for each of the annual performance goals for the strategic outcome goals of People, Ideas, Tools, and Organizational Excellence can be stated:

"NSF is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of the associated indicators."

NSF staff examines statements of significant accomplishment in the AC/GPA to ensure that ratings for the qualitative outcome goals and indicators are justified.

V. Verification and Validation (V&V)

We used a V&V process similar to the one used in FY 2003 to verify and validate all FY 2004 GPRA performance information. For FY 2004 data verification and analyses, we engaged IBMBCS to document the processes we follow to collect, process, maintain, and report all performance data. They identified relevant controls and commented on their effectiveness. Based on General Accounting Office (GAO) guidance, they provided an assessment of the validity and verifiability of the data, policies, and procedures we used to report results for the FY 2004 goals. For the outcome goals, IBM Business Consulting Services reviewed the processes NSF used to obtain external assessment of NSF activities with respect to these goals. IBM Business Consulting Services also provided high-level review of NSF's information systems based on GAO standards for application controls[32].

In their October 2004 report[33], IBM Business Consulting Services states: *"Based on our third quarter and fiscal year-end review, we were able to verify the reliability of the processes and validate the accuracy of all 30 GPRA and PART goals under review. Overall, we conclude that NSF has made a concerted effort to report it s performance results accurately and has effective systems, policies and procedures to promote data quality. We verify that NSF relies on sound business policies, internal controls, and manual checks of system queries to report performance. Finally, NSF maintains adequate documentation of its processes and data to allow for an effective verification and validation review."*

The Foundation has both qualitative and quantitative GPRA and PART goals. Its qualitative goals include annual performance goals that support the strategic outcome goals of People, Ideas, Tools and Organizational Excellence. These outcome goals are presented in a format that requires expert assessment of achievement. These assessments are based largely on information included in reports prepared by committees of independent, external experts (e.g. Committees of Visitors and the Advisory Committee for GPRA Performance Assessment) who assess the quality of program results based on their collective experience-based norms. NSF's quantitative goals provide insight into management activities, enabling assessment of progress toward goal achievement. Assessment for these goals is primarily based on data collected with NSF's central data systems.

TYPES AND SOURCES OF PERFORMANCE DATA AND INFORMATION

Most of the data that underlie achievement assessments for strategic outcome goals (with the exception of the Organizational Excellence goal) originate outside the agency and are submitted to us through the Project Reporting System, which includes annual and final project reports for all awards. Through this system, performance information/data such as the following are available to program staff, third party evaluators, and other external committees:

- Information on People – student, teacher and faculty participants in NSF activities; demographics of participants; descriptions of student involvement; education and outreach activities under grants; demographics of science and engineering students and workforce; numbers and quality of educational models, products and practices used/developed; number and quality of teachers trained; and student outcomes including enrollments in mathematics and science courses, retention, achievement, and science and mathematics degrees received.

[32] An executive summary of the IBMBCS report is provided in the Appendix of this Chapter.
[33] Page 1 of the IBMBCS report.

- Information on Ideas – published and disseminated results, including journal publications, books, software, audio or video products created; contributions within and across disciplines; organizations of participants and collaborators (including collaborations with industry); contributions to other disciplines, infrastructure, and beyond science and engineering; use beyond the research group of specific products, instruments, and equipment resulting from NSF awards; and role of NSF-sponsored activities in stimulating innovation and policy development.
- Information on Tools – published and disseminated results; new tools and technologies, multidisciplinary databases; software, newly-developed instrumentation, and other inventions; data, samples, specimens, germ lines, and related products of awards placed in shared repositories; facilities construction and upgrade costs and schedules; and operating efficiency of shared-use facilities.
- Information on Organizational Excellence – information provided by NSF on diversity initiatives, diversity statistics, the NSF Academy and the government-wide eTraining Initiative; information on performance management system improvements, employee recognition activities, innovative capital studies within NSF, the development and implementation of a human capital management plan, and eGovernment human resource initiatives; information on technology enabled business processes, government-wide grants management initiatives, the ePayroll initiative, compliance with the FY 2003 Federal Information Security Management Act (FISMA) Compliance, Greater IT Security Awareness Training Throughout Foundation, and activities associated with GPRA performance assessment.

Most of the data supporting quantitative goals can be found in NSF's central systems. These central systems include the Enterprise Information System (EIS); FastLane, with its Performance Reporting System and its Facilities Performance Reporting System; the Online Document System (ODS); the Proposal and Reviewer System (PARS); the Awards System; the Electronic Jacket; and the Financial Accounting System (FAS). These systems are subject to regular checks for accuracy and reliability.

Data / Information Limitations

For outcome goals, the collection of qualitative data during assessment may be influenced by factors such as a lack of long-term data/information to assess the impact of outcomes, the potential for self-reporting bias, the unpredictable nature of discoveries, and the timing of research and education activities. For the quantitative management goals, the assessment may be influenced by factors such as accuracy of data entry into central computer systems, lack of experience in using new reporting systems or modules, or individual non-responsiveness (e.g., self-reporting of diversity information; workplace surveys).

Finally, external expert assessments (presented in COV and AC/GPA reports) may lack sufficient justification or may provide incomplete information. To address this issue NSF is continuing to modify its reporting templates and improve guidance to committees and staff in order to improve the completeness and consistency of the reports. This will aid in compiling qualitative information.

Judgmental Sampling

With respect to People, Ideas and Tools outcome goals, the AC/GPA is provided with access to recent Committee of Visitor (COV) reports or program assessments conducted by external programmatic expert panels, Principal Investigator project reports, award abstracts, and, since it is impractical for an external committee to review the contributions to the associated performance goals by each of the over 25,000 active awards, NSF Program Officers provided the Committee with nearly 900 summaries of notable results relevant to the performance indicators. Collections obtained from expert sampling of outstanding accomplishments ("nuggets") from awards, together with COV reports and project reports, formed the primary basis for determining, through the recommendations of the external Advisory Committee for GPRA Performance Assessment, whether or not NSF demonstrated significant achievement in its Strategic Outcome Goals for People, Ideas and Tools. The approach to nugget collection is a type of non-probabilistic sampling, commonly referred to as "judgmental" or "purposeful" sampling, that is best designed to identify notable examples and outcomes resulting from NSF's investments. It is the aggregate of collections of notable examples and outcomes that can, by themselves, demonstrate significant agency-wide achievement in the Strategic Outcome Goals. Nevertheless, the combination of COV reports, project reports, award abstracts and notable accomplishments cover the entire NSF portfolio.

In their October 2004 report[34], IBM Business Consulting Services states with regard to the use of "nuggets" by the AC/GPA:

"*As in FY 2003, we reviewed the nuggets based on the GAO auditing standards of materiality, relevance and significance:*[35]

- ***Materiality.*** *In FY 2004, NSF went further to assure adequate materiality by ensuring that the thirty largest NSF programs, by award amount, were represented in the nuggets. As in FY 2003, we conclude that the nuggets materially represent a sufficient share of overall NSF resources, committed to funding research, for the AC/GPA to rely upon to make its assessments*
- **Relevance.** As in FY 2003, we conclude that the distribution of nuggets by directorate adequately represent the level of NSF funding for each directorate. This distribution provides assurance that the diversity of NSF's entire award portfolio is adequately represented in the nuggets provided to the AC/GPA.
- ***Significance.*** *As in FY 2003, we believe that the use of judgmental sampling is appropriate for the purposes of the AC/GPA. Judgmental sampling assures that those programs that NSF professional staff judge as scientifically significant are included in the nuggets for use by the Committee. Because of the importance of applying professional judgment in the selection process, we view the traditional audit approach of random sampling as inappropriate in this instance. It is also important to reiterate that the charge of the AC/GPA is to provide a subjective, qualitative opinion on NSF's outcomes based on a wide range of performance information that extends beyond the nuggets, thus reinforcing the appropriateness of the judgmental sampling approach.*"

[34] Page 148 of the IBMBCS report.
[35] While we applied GAO auditing standards, this review does not qualify as an audit.

VI. OTHER FEATURES

INFORMATION ON USE OF NON-FEDERAL PARTIES

This GPRA performance report was prepared solely by NSF staff.

Non-Federal external sources of information we used in preparing this report include:

- Reports from awardees demonstrating results.
- Reports prepared by evaluators – Committees of Visitors (COV) and Advisory Committees – in assessing our programs for progress in achieving Outcome Goals.
- Reports prepared by a consulting firm to assess the procedures we use to collect, process, maintain, and report performance goals and measures.
- Reports from facilities managers on construction/upgrade costs and schedules and on operational reliability.

Specific examples:

Highlights or sources of examples shown as results may be provided by Principal Investigators who received support from NSF.

We use external committees to assess the progress of our programs toward qualitative goal achievement. External evaluators provide us with reports of programs, and provide feedback to us on a report template we prepare. Examples are COV and Advisory Committee reports that provide an independent external assessment of NSF's performance.

We engaged an independent third-party, IBM Business Consulting Services, to conduct a review of data and information used in performance reporting. IBM Business Consulting Services reviewed NSF's performance data and information pertaining to our outcome goals, and management goals. This additional independent review helped to eliminate potential reporting bias that can develop in self-assessments. It also provides assurance of the credibility of performance reporting information and results.

CLASSIFIED APPENDICES NOT AVAILABLE TO THE PUBLIC

None

ANALYSIS OF TAX EXPENDITURES

None

WAIVERS OF ADMINISTRATIVE REQUIREMENTS

None

National Science Foundation

Government Performance and Results Act (GPRA) and Program Assessment Rating Tool (PART)

Performance Measurement Validation and Verification

Report on FY 2004 Results

October 2004

1 Executive Summary

The National Science Foundation (NSF or the Foundation), as a federal agency, is subject to the performance reporting requirements of the Government Performance and Results Act (GPRA). In addition, NSF measures its programmatic performance using the Office of Management and Budget's Program Assessment Rating Tool (PART). These performance reporting requirements hold Federal agencies accountable for providing detailed information on their progress in meeting performance objectives. Accordingly, NSF measures itself against a series of GPRA and PART goals to help the agency achieve its mission and objectives.

Government Accountability Office (GAO) auditing standards require Federal agencies to provide confidence that the policies and procedures underlying performance reporting are complete, accurate, and consistent. As such, NSF asked IBM Business Consulting Services to assess the validity of the data and reported results of its performance goals and to verify the reliability of the methods used to compile and report data for these performance measurement goals and objectives.[36] Our review consisted of an analysis of NSF's processes and results as of the end of the third quarter and an update review after the end of the fiscal year when final results were reported. FY 2004 is the fifth consecutive year that we have performed this assessment for NSF.

Once again, we commend NSF for undertaking this fifth-year effort to verify the reliability of its processes to collect, process, maintain, and report data for its performance goals and the validity of its reported results. NSF reaffirmed its commitment to reporting accurate and reliable performance results by incorporating its PART process into our verification and validation review for the first time this year. The relative infancy and unique nature of the PART process presented some new challenges to the Foundation in collecting data and developing processes in a relatively short period of time for our review. To address these challenges, NSF staff worked and collaborated extensively to provide us with the necessary data, documentation and access to staff and systems to complete our review. We commend the Foundation for this effort.

Based on our third quarter and fiscal year-end review, we were able to verify the reliability of the processes and validate the accuracy of all 30 GPRA and PART goals under review. Overall, we conclude that NSF has made a concerted effort to report it s performance results accurately and has effective systems, policies and procedures to promote data quality. We verify that NSF relies on sound business policies, internal controls, and manual checks of system queries to report performance. Finally, NSF maintains adequate documentation of its processes and data to allow for an effective verification and validation review.

1.1 Review of Strategic Outcome Goals

NSF measures its overall performance as a Foundation using four Strategic Outcome Goals: People, Ideas, Tools, and a new goal of Organizational Excellence, introduced in FY 2004. A key component of NSF's performance assessment in these areas is the Advisory Committee for GPRA Performance Assessment (AC/GPA), a group of independent experts who offer advice and recommendations to the NSF Director on NSF's achievement on a series of performance indicators related to these Strategic Outcome Goals.

We first assessed the AC/GPA process in FY 2003 with the purpose of verifying the reliability of the process and performance data and the validity of the AC/GPA's conclusions based on the strength of these processes. In FY 2004, NSF asked us to conduct an updated review, focusing on changes from the prior year. To conduct this review, we:

- Reviewed NSF and AC/GPA background information
- Attended the AC/GPA meeting, which took place at NSF on June 22-23, 2004
- Discussed the process with NSF staff and AC/GPA members

[36] GAO defines "verification" as a means to check or test performance data in order to reduce the risk of using data that contains significant errors. GAO defines "validation" as a way to test data to endure that no error creates significant bias.

- Documented the AC/GPA process with emphasis on changes from FY 2003
- Verified the quality of the AC/GPA process to yield valid results
- Assessed the validity of the AC/GPA's conclusions based on the quality of the processes and performance information available

To verify the reliability of the AC/GPA process to produce valid results, we developed eight dimensions on which we assessed the quality of the processes, which are:

- AC/GPA meeting planning: Quality of NSF planning and preliminary review activities to maximize the effectiveness of the AC/GPA meeting and overall quality of the AC/GPA assessment
- AC/GPA scope of review: Expectations and extensiveness of the AC/GPA's review and assessment of NSF's performance
- Membership: Expertise, experience and level of knowledge of the AC/GPA membership
- Performance information: Quality, timeliness, impartiality, and relevance of the information available to the AC/GPA to reach its conclusions
- Independence: Confidence that the Committee's judgment is objective and free from NSF influence
- Determination of achievement: The Committee's determination of "significant achievement" with respect to the annual performance indicators and Foundation-level comments
- Documentation and transparency: Extent to which the AC/GPA process and results are clear, visible and open to review and scrutiny
- NSF's response to AC/GPA recommendations: How NSF responded to the Committee's recommendations in its FY 2003 AC/GPA Report to NSF

1.2 Review of Annual GPRA and PART Goals

In addition to its four Strategic Outcome Goals, NSF measures its performance using 26 other GPRA and PART performance measures, which focus on management and specific program performance. The FY 2004 GPRA and PART measures we reviewed fall under three categories:

- 17 quantitative PART goals, being reviewed for the first time in FY 2004
- Four qualitative PART goals, being reviewed for the first time in FY 2004
- Five quantitative GPRA and PART goals, which we reviewed in prior years, receiving an updated review in FY 2004

As part of our review of the processes and results for the quantitative GPRA and PART goals, we:

- Assessed the accuracy of NSF's performance data and reported outcomes of performance goals and indicators
- Described the reliability of the processes NSF uses to collect, process, maintain, and report data
- Reviewed system controls to confirm that quality input results in quality output
- Created detailed process descriptions and process maps for those goals being reviewed for the first time
- Identified changes to processes and data for those goals receiving an update review

We applied GAO's Guide to Assessing Agency Annual Performance Plans (GAO/GGD-10.1.20) to guide our review. Based on GAO guidance, we assessed whether NSF's processes to collect, process, maintain and report data meet the following criteria:

- Does the process provide for periodic review of collection, maintenance, and processing procedures to ensure they are consistently applied and continue to be adequate?
- Does the process provide for periodic sampling and review of data to ensure completeness, accuracy, and consistency?
- Does the process rely on independent audits or other established procedures for verifying and validating financial information when performance measures require the use of financial information?
- Does NSF address problems in verification and validation procedures, known to GAO or the agency?
- Does the agency recognize the potential impacts of data limitations should they exist?

To assess NSF's qualitative annual PART goals related to Nanotechnology, we followed a methodology similar to the process we used to assess the AC/GPA and the Strategic Outcome Goals. NSF based its results for these qualitative PART goals on an assessment by the Nanotechnology Committee of Visitors (COV). To conduct our review, we analyzed performance data given to the COV; held discussions with NSF staff; documented and assessed the COV review process; and validated the COV's final conclusions. We based our assessment on the expertise and level of knowledge of the COV members; the quality of the data provided to the COV; the independence of the COV from NSF influence; and the overall reliability of the process to yield valid results.

We did not consider the appropriateness of NSF's performance goals or indicators in our assessment of the validity of NSF's reported results. Rather, our validation is based strictly on whether NSF achieved or did not achieve its performance goals based on the accuracy of the performance data and the reliability of NSF's processes.

1.3 Results and Recommendations

Based on our third quarter and fiscal year-end review, we verified the reliability and processes used to collect, process, maintain and report data and results for all 30 GPRA and PART goals we reviewed. Overall, NSF relies on sound business processes, systems and application controls, and manual checks of system queries to report performance. We believe that these processes are valid and verifiable. We also validated the accuracy and reliability of the results reported by NSF for these goals.

We were also able to verify the reliability of the processes and performance data used by the Advisory Committee for GPRA Performance Assessment (AC/GPA). Based on the strength of these processes, we validate the reasonableness of the AC/GPA's conclusion that NSF had demonstrated significant achievement in all the indicators for the Strategic Outcome Goals of People, Ideas and Tools and the Merit Review indicator for the Organizational Excellence Goal.

We summarize the results of our review for each performance goal in the following tables. We indicate the third and fourth quarter results of each goal as reported by NSF in the "Q3 Result" and "Q4 Result" columns. In the "Process Verified" column, a "yes" indicates that we were able to verify the reliability of NSF's processes to collect, process, maintain and report data. In the "Result Validation" column, a "yes" indicates that we were able to validate the accuracy or reasonableness of NSF's reported results for the corresponding performance goal. Finally, where appropriate, we also summarize any significant observations, recommendations or issues for consideration we determined through our review of each goal. The full results of our review are discussed in greater detail in the balance of this report.

NSF FY 2004 Strategic Outcome Goals Indicators: Verification and Validation Summary

FY 2004 GPRA Strategic Outcome Goals	AC/GPA Assessment	Process Verified	Results Validated
Goal 1: People – A diverse, competitive, and globally-engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens ▪ P1: Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities ▪ P2: Support programs that attract and prepare U.S. students to be highly qualified members of the global science and engineering workforce, including providing opportunities for international study, collaborations and partnerships ▪ P3: 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 ▪ P4: Promote public understanding and appreciation of science, technology, engineering, and mathematics, and build bridges between formal and informal science education ▪ P5: Support innovative research on learning, teaching and mentoring that provides a scientific basis for improving science, technology, engineering and mathematics education at all levels	Achieved	Yes	Yes
Goal 13: Ideas – Discovery across the frontier of science and engineering, connected to learning, innovation, and service to society ▪ I1: Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge ▪ I2: Encourage collaborative research and education efforts – across organizations, disciplines, sectors and international boundaries ▪ I3: Foster connections between discoveries and their use in the service of society ▪ I4: Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities ▪ I5: Provide leadership in identifying and developing new research and education opportunities within and across science and engineering fields ▪ I6: Accelerate progress in selected science and engineering areas of high priority by creating new integrative and cross-disciplinary knowledge and tools, and by providing people with new skills and perspectives	Achieved	Yes	Yes

FY 2004 GPRA Strategic Outcome Goals	AC/GPA Assessment	Process Verified	Results Validated
Goal 22: Tools Goal – Broadly accessible, state-of-the-art science and engineering facilities, tools and other infrastructure that enable discovery, learning and innovation ▪ T1: 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 ▪ T2: Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms ▪ T3: Develop and deploy an advanced cyber-infrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation ▪ T4: Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation ▪ T5: Support research that advances instrument technology and leads to the development of next-generation research and education tools	Achieved	Yes	Yes
Goal 29: Organizational Excellence Goal – An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices Merit Review Indicator: Operate a credible, efficient merit review system[37]	Achieved	Yes	Yes

[37] The Organizational Excellence Goal indicators of Human Capital, Performance Assessment, and Technology-Enabled Business Processes were assessed by the NSF Advisory Committee for Business and Operations.

NSF FY 2004 Annual GPRA and PART Goals: Verification and Validation Summary

FY 2004 GPRA and PART Goals	Target	Q3 Result	Q4 Result	Process Verified	Results Validated	Issues for Consideration
Goal 2: Number of U.S. students receiving fellowships through Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeships (IGERT)	Increase from 3328	3870	Achieved 3681	Yes	Yes	▪ Examine and identify the causes for data errors, due to double-counting and miscoding of GRF students, in the GRFP module in Fastlane, which NSF appropriately identified and corrected.
Goal 3: Stipend level for Graduate Research Fellowships (GRF) and Integrative Graduate Education and Research Traineeship (IGERT) awards (dollars/year)	$30,000	Not Applicable	Achieved $30,000[38]	Yes	Yes	▪ Automate process to calculate institution "carry-over" funds from prior year to determine GRF funding amount for upcoming academic year. ▪ Integrate the Graduate Research Fellowship Program (GRFP) system and the IGERT project reporting process with NSF's Central System to eliminate manual entry.
Goal 4: Number of applicants for Graduate Research Fellowships from groups that are underrepresented in the science and engineering workforce.	Increase from 820	932	Achieved 1009	Yes	Yes	None
Goal 5: Number of applicants for Faculty Early Career Development Program (CAREER) awards from investigators at minority-serving institutions	Increase from 67	81	Achieved 82	Yes	Yes	None

[38] We note that the institutions funded by NSF are ultimately responsible for disbursing GRF and IGERT stipends to students at the $30,000 level. While these disbursements occur after the end of the federal fiscal year (during the 2004-2005 academic year) and therefore after the period of our review, we can validate that NSF achieved this goal based on the reliability of its funding processes and controls to assure a $30,000 stipend level, including the NSF grant agreement and Congressional law.

FY 2004 GPRA and PART Goals	Target	Q3 Result	Q4 Result	Process Verified	Results Validated	Issues for Consideration
Goal 6: Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one female principal investigator (PI) or co-principal investigator (Co-PI)	25%	24%	Achieved 26%	Yes	Yes	None
Goal 7: Percent of Information Technology Research (ITR) proposals with at least one female PI or Co-PI	25%	36%	Achieved 29%	Yes	Yes	None
Goal 8: Percent of Nanoscale Science and Engineering (NS&E) proposals with at least one minority PI or co-PI	13%	12%	Not Achieved 12%	Yes	Yes	None
Goal 9: Percent of ITR proposals with at least one minority PI or Co-PI	7%	8%	Achieved 9%	Yes	Yes	None
Goal 10: Percent of NS&E proposals that are multi-investigator proposals	75%	78%	Achieved 80%	Yes	Yes	None
Goal 11: Percent of ITR proposals that are multi-investigator	50%	67%	Achieved 62%	Yes	Yes	None
Goal 12: Successful development of workforce, as qualitatively evaluated by external experts for NS&E	On-Track	Achieved Based on NS&E COV draft report	Achieved Based on NS&E COV final report	Yes	Yes	None
Goal 14: Qualitatively assessment by external experts that program is responsible for a broad-based and capable interdisciplinary research community that advances fundamental nanotechnology knowledge, with impact on other disciplinary fields	On-Track	Achieved Based on NS&E COV draft report	Achieved Based on NS&E COV final report	Yes	Yes	None
Goal 15: As qualitatively evaluated by external experts,	On-Track	Achieved	Achieved	Yes	Yes	None

FY 2004 GPRA and PART Goals	Target	Q3 Result	Q4 Result	Process Verified	Results Validated	Issues for Consideration
the successful development of a knowledge base for systematic control of matter at the nanoscale level that will enable the next industrial revolution for the benefit of society		Based on NS&E COV draft report	Based on NS&E COV final report			
Goal 16: NSF will increase the average annualized award size for research grants to $139,000	$139,000	$123,236	Achieved $140,000	Yes	Yes	None
Goal 17: Average annualized new research grant award size (in dollars) within NS&E solicitation.	$330,000	$135,422[39]	Achieved $336,000	Yes	Yes	None
Goal 18: Average annual award size for new ITR research grants.	$230,000	$349,494	Achieved $336,000	Yes	Yes	None
Goal 19: The average duration of awards for research grants will be 3.0 years	3.0	3.01	Not Achieved 2.96	Yes	Yes	None
Goal 20: Average award duration of new ITR research grants (in years)	3.3	3.8	Achieved 3.7	Yes	Yes	None
Goal 21: Average duration (in years) of new research grant awards for Nanoscale Interdisciplinary Research within the NS&E solicitation	3.8	1.26	Achieved 3.9	Yes	Yes	None
Goal 23: Percent of construction acquisition and upgrade projects with negative cost and schedule variances of less than 10% of the approved project plan	90%	No Results	Achieved 100%	Yes	Yes	▪ Formally require and standardize the collection of facilities performance and progress documentation ▪ Require PIs to formally submit work breakdown structures (WBS) online to the Program Officer

[39] NSF's third quarter results for Goal 17 include three types of NS&E awards: Nanoscale Interdisciplinary Research Teams (NIRT), Nanoscale Exploratory Research (NER), and Nanoscale Science and Engineering Centers (NSEC). However, the purpose of this goal is only to measure NIRT award sizes. As such, the fourth quarter results only reflect NIRT awards

FY 2004 GPRA and PART Goals	Target	Q3 Result	Q4 Result	Process Verified	Results Validated	Issues for Consideration
Goal 24: Percent of operational facilities that keep scheduled operating time lost to less than 10%	90%	No Results	Not Achieved 89.7%	Yes	Yes	Formally require and standardize the collection of facilities performance and progress documentation
Goal 25: Number of users accessing National Nanofabrication Users Network/National Nanotechnology Infrastructure Network (NNUN/NNIN) and Network for Computational Nanotechnology (NCN) sites	4000	None Reported	Achieved 6350	Yes	Yes	None
Goal 26: Number of nodes that comprise infrastructure	14	20	Achieved 20	Yes	Yes	None
Goal 27: Peak available teraflops (trillions of floating point operations per second) for scientific computation	20	22.49	Achieved 22.49[40]	Yes	Yes	None
Goal 28: External Committee finding that research infrastructure is appropriate to enable major discoveries for NS&E	On-Track	Achieved Based on NS&E COV draft report	Achieved Based on NS&E COV final report	Yes	Yes	None
Goal 30: For 70% of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of receipt	70%	79%	Achieved 77%	Yes	Yes	None

[40] NSF rounded this figure to 22 Teraflops for the final FY 2004 results.

III. FINANCIALS

A MESSAGE FROM THE CHIEF FINANCIAL OFFICER

I am proud to join NSF Acting Director Dr. Arden Bement in presenting the National Science Foundation's *FY 2004 Performance and Accountability Report.* This report is an integrated presentation of our programmatic and management achievements over the past year and our financial status as of September 30, 2004.

NSF's continuing quest to provide the highest quality of 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. NSF'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. Some notable FY 2004 achievements include the following:

- NSF received over 14,000 cash requests and over 6,500 quarterly expense reports electronically; all were processed by only two employees because NSF's grant financial functions are fully automated.

- NSF was able to meet accelerated reporting requirements a year earlier than required; the year-end report was produced 45 days after the close of the fiscal year compared to 120 days in previous years.

- This year, NSF was able to automate the new Government-wide financial statements in conjunction with our agency statements; this has been recognized by the Department of Treasury as a best practice.

- NSF developed a new web-based "ReportWeb" database that allows managers and staff "24/7" access to timely and reliable financial information and grant award system reports. "ReportWeb" is updated as frequently as every hour depending on the data and is directly accessible at workstations. This new electronic report system has increased the efficiency of report delivery and benefited the agency through savings realized from reduced printing and storage costs.

Providing useful, pertinent and timely information to both our internal decision-makers and external customers remains a high priority for the agency. For the third consecutive year, our annual *Performance Highlights* brochure was ranked among the Top 10 by the League of American Communication Professionals in a national competition of annual reports. In a recent report issued by IBM's Center for the Business of Government, NSF was commended with an

"A+" rating for exemplary public accountability reporting. We are also proud to have again received two "green" ratings from the Office of Management and Budget, for successful achievement in the financial performance and electronic government initiatives of the President's Management Agenda (PMA). NSF has sustained our "green" rating in financial performance for nine consecutive Scorecards.

I am pleased to report that the agency received an unqualified audit opinion. We also note that the audit report conveyed two reportable conditions – post-award administration and contract monitoring. NSF management believes the audit findings do not support either of these determinations of reportable conditions. Of particular note, the Foundation has made significant progress in developing and implementing a grant administration program that is considered a best practice in the federal arena. Additional information can be found in Management's Response to the Independent Auditors' Report.

NSF's long-standing practice of embracing advanced technology and leading edge business practices has served us well. 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 importantly, to 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 our children will live in a secure homeland, enjoy continued economic prosperity and maintain a high quality of life.

Thomas N. Cooley

Thomas N. Cooley

November 10, 2004

National Science Foundation

Financial Statements
as of and for the years ended
September 30, 2004 and 2003

National Science Foundation
Balance Sheet
As of September 30, 2004 and 2003
(Amounts in Thousands)

ASSETS	**2004**	**2003 Restated (Note 14)**
Intragovernmental		
Fund Balance With Treasury (Note 2)	$ 7,543,452	$ 7,083,797
Accounts Receivable (Note 3)	23,875	18,247
Advances (Note 4)	38,389	18,557
Total Intragovernmental Assets	7,605,716	7,120,601
Cash and Other Monetary Assets	9,355	6,729
Accounts Receivable, Net (Note 3)	97	202
Advances (Note 4)	73,423	66,610
General Property, Plant and Equipment, Net (Note 5)	240,443	230,777
Total Assets	**$ 7,929,034**	**$ 7,424,919**
LIABILITIES		
Intragovernmental Liabilities		
Advances From Others	$ 23,411	$ 41,933
Employer Contributions & Other (Note 7)	557	396
FECA Employee Benefits (Notes 8 and 9)	280	264
Other Intragovernmental Liabilities (Note 12)	3,000	-
Total Intragovernmental Liabilities	27,248	42,593
Accounts Payable	43,519	68,420
Accrued Liabilities – Grants, Payroll & Other (Note 7)	311,719	255,923
FECA Employee Benefits (Notes 8 and 9)	1,465	1,649
Accrued Annual Leave (Note 8)	12,162	11,120
Total Liabilities	**396,113**	**379,705**
Commitments and Contingencies (Note 12)		
NET POSITION		
Unexpended Appropriations	7,097,014	6,555,803
Cumulative Results of Operations	435,907	489,411
Total Net Position	7,532,921	7,045,214
Total Liabilities and Net Position	**$ 7,929,034**	**$ 7,424,919**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Net Cost
For the Year Ended September 30, 2004
(Amounts in Thousands)

Program Costs		**2004**
People		
Individuals	$	651,050
Institutions		202,087
Collaborations		428,260
Total People Program Costs		1,281,397
Less: Earned Revenue		20,289
Net People Program Cost		**1,261,108**
Ideas		
Fundamental Science & Engineering		2,121,465
Centers		297,569
Capability Enhancements		221,127
Total Ideas Program Costs		2,640,161
Less: Earned Revenue		62,110
Net Ideas Program Cost		**2,578,051**
Tools		
Large Facilities		536,163
Infrastructure and Instrumentation		280,542
Polar Tools, Facilities and Logistics		245,232
Federally Funded Research & Development Centers		212,388
Total Tools Program Costs		1,274,325
Less: Earned Revenue		13,341
Net Tools Program Cost		**1,260,984**
Net Cost of Operations (Note 10)	$	**5,100,143**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Net Cost
For the Year Ended September 30, 2003
(Amounts in Thousands)

Program Costs		**2003**
People		
Intragovernmental		
Program Cost	$	2,363
Salary & Expense, NSB and Inspector General Cost		699
Total Intragovernmental Cost		3,062
With the Public		
Program Cost		865,126
Salary & Expense, NSB and Inspector General Cost		30,975
Total Public Cost		896,101
Total People Program Cost		899,163
Less: Intragovernmental Earned Revenues		22,880
Net People Program Cost		**876,283**
Ideas		
Intragovernmental		
Program Cost		3,188
Salary & Expense, NSB and Inspector General Cost		3,414
Total Intragovernmental Cost		6,602
With the Public		
Program Cost		2,464,532
Salary & Expense, NSB and Inspector General Cost		84,806
Total Public Cost		2,549,338
Total Ideas Program Cost		2,555,940
Less: Intragovernmental Earned Revenues		42,003
Net Ideas Program Cost		**2,513,937**
Tools		
Intragovernmental		
Program Cost		113,396
Salary & Expense, NSB and Inspector General Cost		34,295
Total Intragovernmental Cost		147,691
With the Public		
Program Cost		1,156,195
Salary & Expense, NSB and Inspector General Cost		42,174
Total Public Cost		1,198,369
Total Tools Program Cost		1,346,060
Less: Intragovernmental Earned Revenues		28,509
Net Tools Program Cost		**1,317,551**
Net Cost of Operations (Note 10)	**$**	**4,707,771**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Changes in Net Position
For the Year Ended September 30, 2004
(Amounts in Thousands)

	2004	
	Cumulative Results of Operations	Unexpended Appropriations
Beginning Balances		
Beginning Balances	$ 489,411	$ 6,555,803
Budgetary Financing Sources		
Appropriations Received (Net of Offsetting Receipts)	-	5,610,950
Appropriations Transferred In/(Out)	-	11,250
Other Adjustments	-	(67,712)
Appropriations Used	5,013,277	(5,013,277)
Non-exchange Revenue and Other	23	-
Donations	23,915	-
Appropriated Earmarked Receipts Transferred In	569	-
Other Financing Sources		
Transfers-in/out Without Reimbursement	303	-
Imputed Financing from Costs Absorbed by Others	8,552	-
Total Financing Sources	**5,046,639**	**541,211**
Net Cost of Operations	**5,100,143**	**-**
Ending Balances	**$ 435,907**	**$ 7,097,014**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Changes in Net Position
For the Year Ended September 30, 2003
(Amounts in Thousands)

	2003 Restated (Note 14)	
	Cumulative Results of Operations	Unexpended Appropriations
Beginning Balances		
Beginning Balances, as adjusted	$ 444,277	$ 5,902,868
Budgetary Financing Sources		
Appropriations Received (Net of Offsetting Receipts)	-	5,344,692
Appropriations Transferred In/(Out)	-	13,143
Other Adjustments	-	(67,254)
Appropriations Used	4,637,646	(4,637,646)
Non-exchange Revenue	49	-
Donations	42,113	-
Appropriated Earmarked Receipts Transferred In	65,343	-
Other Financing Sources		
Transfers-in/out Without Reimbursement	54	-
Imputed Financing from Costs Absorbed by Others	7,700	-
Total Financing Sources	**4,752,905**	**652,935**
Net Cost of Operations	**4,707,771**	**-**
Ending Balances	**$ 489,411**	**$ 6,555,803**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Budgetary Resources
For the Years Ended September 30, 2004 and 2003
(Amounts in Thousands)

	2004	2003
Budgetary Resources		
Budgetary Authority:		
Appropriations Received	$ 5,635,457	$ 5,452,197
Net Transfers	11,250	13,143
Unobligated Balance – Beginning of Period	298,368	304,817
Spending Authority from Offsetting Collections:		
Earned:		
Collected	90,247	75,568
Receivable from Federal Sources	5,629	18,062
Change in Unfilled Customer Orders:		
Advance Received	(18,522)	(58,598)
Without Advance from Federal Sources	33,975	73,755
Subtotal	111,329	108,787
Recoveries of Prior Year Obligations	61,168	65,399
Permanently Not Available	(67,709)	(67,271)
Total Budgetary Resources (Note 11)	$ **6,049,863**	$ **5,877,072**
Status of Budgetary Resources		
Obligations Incurred:		
Direct	$ 5,759,154	$ 5,469,724
Reimbursable	111,565	108,920
Subtotal	5,870,719	5,578,644
Unobligated Balance:		
Apportioned	85,230	202,221
Unobligated Balance Not Available	93,914	96,207
Total Status of Budgetary Resources	$ **6,049,863**	$ **5,877,072**
Relationship of Obligations to Outlays		
Net Obligated Balance – Beginning of Period	$ 6,784,209	$ 6,114,623
Net Obligated Balance – End of Period		
Accounts Receivable	(23,875)	(18,247)
Unfilled Customer Orders from Federal Sources	(110,236)	(76,261)
Undelivered Orders	7,148,677	6,561,867
Accounts Payable	349,742	317,088
Total Net Obligated Balance – End of Period	$ **7,364,308**	$ **6,784,447**
Outlays:		
Disbursements	$ 5,189,847	$ 4,751,604
Collections	(71,725)	(16,970)
Subtotal	5,118,122	4,734,634
Less: Offsetting Receipts	23,938	42,162
Net Outlays	$ **5,094,184**	$ **4,692,472**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statements of Financing
For the Years Ended September 30, 2004 and 2003
(Amounts in Thousands)

Resources Used to Finance Activities	**2004**	**2003**
Budgetary Resources Obligated		
Obligations Incurred	$ 5,870,719	$ 5,578,644
Less: Spending Authority for Offsetting Collections and Recoveries	172,497	174,186
Obligations Net of Offsetting Collections and Recoveries	5,698,222	5,404,458
Less: Offsetting Receipts	23,938	42,162
Net Obligations	5,674,284	5,362,296
Other Resources		
Transfers-in	303	54
Imputed Financing	8,552	7,700
Net Other Resources Used to Finance Activities	8,855	7,754
Total Resources Used to Finance Activities	5,683,139	5,370,050
Resources Used to Finance Items Not Part of the Net Cost of Operations		
Change in Budgetary Resources Obligated for Goods, Services and Benefits Ordered But Not Yet Provided	(598,238)	(698,707)
Resources that Fund Expenses Recognized in Prior Periods	(146)	369
Budgetary Offsetting Collections and Receipts that Do Not Affect Net Cost of Operations	23,938	42,162
Resources that Finance the Acquisition of Assets	(27,078)	(24,029)
Total Resources Used to Finance Items Not Part of the Net Cost of Operations	(601,524)	(680,205)
Total Resources Used to Finance Net Cost of Operations	5,081,615	4,689,845
Components of the Net Cost of Operations that will not Require or Generate Resources in the Current Period		
Components Requiring or Generating Resources in Future Periods		
Other	1,058	516
Total Components of Net Cost of Operations that will Require or Generate Resources in Future Periods (Note 13)	1,058	516
Components Not Requiring or Generating Resources		
Depreciation and Amortization	17,396	17,314
Revaluation of Assets or Liabilities	-	17
Other	74	79
Total Components of Net Cost of Operations that will not Require or Generate Resources	17,470	17,410
Total Components of Net Cost of Operations that will not Require or Generate Resources in the Current Period	18,528	17,926
Net Cost of Operations (Note 10)	**$ 5,100,143**	**$ 4,707,771**

The accompanying notes are an integral part of these statements.

Note 1. Summary of Significant Accounting Policies

A. Reporting Entity

The National Science Foundation (NSF or Foundation) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75). Its aim is to promote and advance scientific progress in the United States. NSF initiates and supports basic scientific research and research fundamental to the engineering process and programs to strengthen scientific and engineering research potential. NSF also supports science and engineering education programs at all levels in all fields of science and engineering. NSF funds research and education in science and engineering by awarding grants and contracts to educational and research institutions in all parts of the United States. NSF, by law, cannot operate research facilities. By award, NSF enters into relationships to fund the research operations conducted by grantees.

NSF is led by a presidentially-appointed director and the policy-making National Science Board (NSB). The NSB, composed of 24 members, represents a cross section of American leaders in science and engineering research and education, who are appointed by the President for six-year terms. The NSF Director is a member *ex officio* of the Board.

NSF is authorized to accept and use U.S. and foreign funds into the NSF Donation Account per the General Authority of the Foundation as found in 42 U.S.C. 1862 Section 3 (a)(3), "to foster the interchange of scientific and engineering information among scientists and engineers in the United States and foreign countries, and also 42 U.S.C. 1870 Section 11 (f) which allows NSF to receive and use funds donated by others. Donations are received from foreign governments, private companies, academic institutions, non-profit foundations, and individuals. Donated funds are either earmarked for a specific NSF program or unrestricted, which can be used on one or more of the general purposes of the foundation. NSF maintains four interest bearing accounts; interest earned on the bank deposits are used for the same purpose as the principal donations. When needed for program support donations are transferred into the trust fund account at the U.S. Treasury. Funds are made available for obligations as necessary to support NSF programs.

B. Basis of Presentation

These financial statements have been prepared to report the financial position and results of operations of NSF as required by the Chief Financial Officers Act of 1990, the Government Management Reform Act of 1994, the Reports Consolidation Act of 2000, and the Office of Management and Budget (OMB) Bulletin No. 01-09, *Form and Content of Agency Financial Statements*. They have been prepared from the books and records of NSF in accordance with generally accepted accounting principles in the United States of America. These statements are therefore different from the financial reports, also prepared by NSF pursuant to OMB directives that are used to monitor and control NSF's use of budgetary resources.

The fiscal year (FY) 2006 *Budget of the United States* (also known as the President's Budget) with actual numbers for FY 2004 was not published at the time that these financial statements were issued. The President's Budget is expected to be published in February 2005 and will be available from the United States Government Printing Office. There are no differences in the actual amounts for FY 2003 that have been reported in the FY 2005 Budget of the United States and the actual numbers that appear in the FY 2003 Statement of Budgetary Resources.

C. Basis of Accounting

The accompanying financial statements have been prepared using the accrual method of accounting in addition to recognizing certain budgetary transactions. Under the accrual method, revenues are recognized when earned and expenses are recognized when a liability is incurred, without regard to receipt or payment of cash. Budgetary accounting facilitates compliance with legal constraints and controls over the use of federal funds. NSF records grant expenses from expenditure reports submitted by the grantees.

D. Revenues and Other Financing Sources

NSF receives the majority of its funding through appropriations contained in the Departments of Veterans Affairs, Housing and Urban Development, and Independent Agencies Appropriations Act. NSF receives both annual and multi-year appropriations that may be expended, within statutory limits. Additional amounts are obtained through reimbursements for services provided to and allocation transfers from other federal agencies and through receipts to the donation account. Also, NSF receives interest earned on overdue receivables and excess cash advances to grantees. The interest earned on overdue receivables is returned to the Treasury. Interest earned on excess cash advances to grantees is sent directly to the Department of Health and Human Services in accordance with OMB Circular A-110, *Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals and Other Non Profit Organizations.*

Appropriations are recognized as a financing source at the time the related "funded" program or administrative expenses are incurred. Appropriations are also recognized when used to purchase property, plant and equipment. "Unfunded" liabilities result from liabilities not covered by budgetary resources and will be paid when future appropriations are made available for these purposes. Donations are recognized as revenues when funds are received. Revenues from reimbursable agreements are recognized when the services are provided and the related expenditures are incurred. Reimbursable agreements are mainly for grant administrative services provided by NSF on behalf of other federal agencies.

E. Fund Balance with Treasury and Cash

Cash receipts and disbursements are processed by the Treasury. The Fund Balance with Treasury is composed primarily of appropriated funds that are available to pay current liabilities and finance authorized purchase commitments, but also includes non-appropriated funding sources from donations and other revenue received from an NSF cooperative agreement to register Internet domain names.

NSF has also established commercial bank accounts to hold some donated funds in trust, in interest bearing accounts as permitted by the contributors. These funds are collateralized by the bank through the U.S. Treasury.

F. Accounts Receivable, Net

Accounts Receivable consists of amounts due from governmental agencies, private organizations, and individuals. NSF establishes an allowance for accounts receivable from private sources that are deemed uncollectible, but regards amounts due from other federal agencies as fully collectible. In FY 2004, OMB issued M-04-10: *Memorandum on Debt Collection Improvement Act Requirements*, which reminded agencies of their responsibility to comply with the policies for writing off and closing out debt. Based on this memo, NSF has now incorporated the policy of writing off delinquent debt more than two years old. NSF also analyzes each account independently to assess collectability and the need for an offsetting allowance or write-off.

G. Advances

Advances consist of advances to grantees, contractors, federal agencies and employees. Advance payments are made to grant recipients so that recipients may incur expenses related to the approved grant. Payments are only made within the amount of the recorded grant obligation and are intended to cover immediate cash needs. Total grant expenditures for the year includes an estimate of fourth quarter amounts due and payable to grantees. The estimate is compiled using historical grantee expenditure data. For those grantees with advance payments exceeding expenditures, the aggregate difference is reported as an advance. Additionally, for those grantees with expenditures exceeding advance payments, the aggregate difference is reported as a grant liability. Advances to contractors are payments made in advance of incurring expenses. Advances to employees are related to travel. Advances are reduced when documentation supporting the expenditures is received. Advances to federal agencies are only issued when agencies are operating under working capital funds and are unable to incur costs on a reimbursable basis.

H. General Property, Plant and Equipment (PP&E)

PP&E

NSF capitalizes acquisitions with costs exceeding $25,000 and useful lives of two or more years. Acquisitions not meeting these criteria are recorded as operating expenses. NSF currently reports capitalized PP&E at original acquisition cost; assets acquired from General Services Administration's (GSA) excess property schedules are recorded at the value assigned by the donating agency; assets transferred in from other agencies are at the cost recorded by the transferring entity for the asset net of accumulated depreciation or amortization. Completed buildings are transferred from CIP to Real Property at NSF's acceptance. Depreciation expense is calculated using the straight-line method. The economic life classifications for capitalized assets are as follows:

Equipment

5 years	-	computers and peripheral equipment, fuel storage tanks, laboratory equipment, and vehicles
7 years	-	communications equipment, office furniture and equipment, pumps and compressors
10 years	-	generators, Department of Defense equipment

Aircraft and Satellites

7 years	-	aircraft, aircraft conversions, and satellites

Buildings and Structures

31.5 years	-	buildings and structures placed in service prior to 1993
39 years	-	buildings and structures placed in service after 1993

Internal Use Software

5 years	-	internal use software

Leasehold Improvements

The economic life of Leasehold Improvements is amortized over the number of years remaining on the occupancy agreement for the NSF headquarters building. In FY 2004, Leasehold Improvements completed during the year were amortized over 9 years. This represents the remaining years on NSF's lease with GSA.

The PP&E balance consists of Equipment, Aircraft and Satellites, Buildings and Structures, Leasehold Improvements, and Construction in Progress. Costs are accumulated in construction in progress until the complete project receives NSF acceptance and at that time, project costs are capitalized and depreciated over the respective useful life of the assets. These balances are comprised of PP&E maintained "in-house" by NSF to support agency operations and PP&E under the U.S. Antarctic Program (USAP). The majority of USAP property is currently the custodial responsibility of Raytheon Technical Services Company, the NSF contractor for the program. Additionally, the U.S. Navy's Space and Naval Warfare Center, and the Air National Guard 109th also have custodial responsibility for some USAP property.

Office Space

The NSF headquarters buildings are leased through the GSA under an occupancy agreement. The cancellation clause within the agreement allows NSF to terminate use with a 120 day notice. NSF is billed by GSA for the leased space as rent based upon estimated lease payments made by GSA plus an administrative fee. The cost of the headquarters building is not capitalized by NSF. The cost of leasehold improvements performed by GSA is financed with NSF appropriated funds. The leasehold improvements are capitalized by NSF as they are transferred from CIP.

Amortization is calculated using the straight-line method over the lesser of their useful lives or the unexpired lease term.

Internal Use Software

NSF controls, values and reports purchased or developed software as tangible property assets, in accordance with the Statement of Federal Financial Accounting Standards (SFFAS) No. 10 – "Accounting for Internal Use Software." NSF identifies software investments as accountable property for items that, in the aggregate, cost $500,000 or more to purchase, develop, enhance or modify a new or existing NSF system. Software projects that are not completed at year end and are expected to exceed the capitalization threshold are recorded as software in development. All internal use software meeting the capitalization threshold is amortized over a five-year period using the straight-line method.

Assets Owned by NSF in the Custody of Other Entities

NSF awards grants, cooperative agreements, and contracts to various organizations, including colleges and universities, non-profit organizations, state and local governments, Federally Funded Research and Development Centers (FFRDC), and private entities. The funds provided may be used in certain cases to purchase or construct Property, Plant and Equipment (PP&E) to be used for operations or research on projects or programs sponsored by NSF. In these instances, NSF funds the acquisition of property, but transfers control to these entities. NSF's authorizing legislation specifically prohibits it from operating such property directly. In practice, NSF's ownership interest in such PP&E is similar to a reversionary interest. To address the accounting and reporting of these assets, specific guidance was sought by NSF and provided by the Federal Accounting Standards Advisory Board (FASAB). This guidance stipulated that NSF should: (i) disclose the value of such PP&E held by others in its financial statements based on information contained in the audited financial statements of these entities (if available). Where separate audited amounts are not available for a specific entity, NSF should name the entity and note that these amounts are unavailable; and (ii) report information on costs incurred to acquire the research facilities, equipment, and platforms in the Research and Human Capital Activity costs as required by the Statement of Federal Financial Accounting Standards No. 8, *Supplementary Stewardship Reporting*.

I. Advances from Others

Advances from Others consist of prior year amounts obligated and advanced by other federal entities to NSF for grant administration and other services to be furnished under reimbursable agreements. Balances at the end of the year are adjusted by an allocated amount from the fourth quarter grantee expenditure estimate described under Note 1G, Advances. The amount to be allocated is based on a percentage of the reimbursable grant expenditures, by partner agencies to NSF, to the total grant expenditures.

J. Accounts Payable

Accounts Payable consists of liabilities to commercial vendors, contractors, and disbursements in transit. Accounts payable to commercial vendors are expenses for goods and services received but not yet paid by NSF at the end of the fiscal year. At year end, NSF accrues for the amount of estimated unpaid expenses to commercial vendors. Contract liabilities are estimated expenses over and above the amount of advances given to contractors. At year end, NSF accrues the amount of estimated expenses not covered by advances given to contractors. Intra-governmental accounts payable consists of disbursements in transit, recorded by NSF but not paid by Treasury.

K. Other Liabilities

Other liabilities consist of grant accruals, accrued payroll, benefits, and income taxes withheld. Grant liabilities are estimated grantee expenses over and above the amount of advances given to grantees. At year end, NSF accrues for the amount of estimated grantee expenses not covered by advances given to grantees. Accrued payroll, benefits, and income taxes withheld relate to services rendered by NSF employees but not yet paid. At year end, NSF accrues the actual amount of wages and benefits earned, but not yet paid, and income tax withholdings. In FY 2004, NSF outsourced its payroll services to the Department of the Interior.

L. Annual, Sick, and Other Leave

Annual leave is accrued as it is earned, and the accrual is reduced as leave is taken. Each year, the balance in the accrued annual leave account is adjusted to reflect changes. To the extent current and prior-year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future Salaries and Expenses appropriations. Sick leave and other types of nonvested leave are expensed as taken.

M. Employee Benefits

A liability is recorded for estimated and actual future payments to be made for workers' compensation pursuant to the Federal Employees' Compensation Act (FECA). The liability consists of the net present value of estimated future payments calculated by the U.S. Department of Labor (DOL) and the actual unreimbursed cost paid by DOL for compensation paid to recipients under FECA. The actual costs incurred are reflected as a liability because NSF will reimburse DOL two years after the actual payment of expenses. Future NSF Salaries and Expenses Appropriations will be used for DOL's estimated reimbursement.

N. Net Position

Net position is the residual difference between assets and liabilities and is composed of unexpended appropriations and cumulative results of operations. Unexpended appropriations represent the amount of unobligated and unexpended budget authority. Unobligated balances are the amount of appropriations or other authority remaining after deducting the cumulative obligations from the amount available for obligation. The cumulative results of operations figure is the net result of NSF’s operations since inception.

O. Retirement Plan

In FY 2004, approximately 28 percent of NSF employees participated in the Civil Service Retirement System (CSRS), to which NSF made matching contributions equal to 7 percent of pay. The majority of NSF employees are covered by the Federal Employees Retirement System (FERS) and Social Security. A primary feature of FERS is that it offers a thrift savings plan to which NSF automatically contributes 1 percent of pay and matches employee contributions up to an additional 4 percent of pay. NSF also contributes the employer's matching share for Social Security for FERS participants.

Although NSF funds a portion of the benefits under FERS and CSRS relating to its employees and withholds the necessary payroll deductions, the agency has no liability for future payments to employees under these plans, nor does NSF report CSRS, FERS, or Social Security assets, or accumulated plan benefits, on its financial statements. Reporting such amounts is the responsibility of the Office of Personnel Management (OPM) and The Federal Retirement Thrift Investment Board. In FY 2004, NSF's contributions to CSRS and FERS were $2,363,364 and $7,862,417 respectively. In FY 2003, NSF's contributions to CSRS and FERS were $2,448,930 and $7,108,098 respectively.

SFFAS No. 5, *Accounting for Liabilities of the Federal Government*, requires employing agencies to recognize the cost of pensions and other retirement benefits during their employees' active years of service. OPM actuaries determine pension cost factors by calculating the value of pension benefits expected to be paid in the future, and communicate these factors to the agency for current period expense reporting. Information was also provided by OPM regarding the full cost of health and life insurance benefits.

In FY 2004, NSF, utilizing OPM provided cost factors, recognized $3,942,925 of pension expenses, $4,587,960 of post-retirement health benefits expenses, and $21,285 of post-retirement life insurance expenses, beyond amounts actually paid. NSF recognized offsetting revenue of $8,552,170 as an imputed financing source to the extent that these intragovernmental expenses will be paid by OPM.

In FY 2003, NSF, utilizing OPM provided cost factors, recognized $3,835,518 of pension expenses, $3,845,086 of post-retirement health benefits expenses, and $19,540 of post-retirement life insurance expenses, beyond amounts actually paid. NSF recognized offsetting revenue of $7,700,144 as an imputed financing source to the extent that these intragovernmental expenses will be paid by OPM.

P. Commitments, Contingencies, and Possible Future Costs

Commitments

Commitments are contractual agreements involving financial obligations. NSF is committed for goods and services that have been ordered, but have not yet been delivered.

Contingencies - Claims and Lawsuits

NSF is a party to various legal actions and claims brought against it. In the opinion of NSF management and legal counsel, the ultimate resolution of the actions and claims will not materially affect the financial position or operations of the Foundation. NSF recognizes the contingency in the financial statements when claims are expected to result in a material loss, whether from NSF's appropriations or the "Judgment Fund" administered by the Department of Justice under Section 1304 of Title 31 of the United States Code, and, the payment amounts can be reasonably estimated.

Claims and lawsuits have also been made and filed against awardees of the Foundation by third parties. NSF is not a party to these actions and NSF believes there is no possibility that NSF will be legally required to satisfy such claims. Judgments or settlements of the claims against awardees that impose financial obligation on them may be claimed as costs under the applicable contract, grant, or cooperative agreement and thus may affect the allocation of program funds in future fiscal years. In the event that the likelihood of loss on such claims by awardees becomes probable, these amounts can be reasonably estimated and NSF management determines that it will probably pay them, NSF will recognize these potential payments as expenses.

Contingencies – Unasserted Claims

For claims and lawsuits that have not been made and filed against the Foundation, NSF management and legal counsel determine, in their opinion, whether resolution of the actions and claims it is aware of will materially affect the agency's financial position or operations. NSF recognizes a contingency in the financial statements when unasserted claims are probable of assertion, and if asserted would be probable of an unfavorable outcome, and expected to result in a measurable loss, whether from NSF's appropriations or the "Judgment Fund." NSF discloses unasserted claims if materiality or measurability of a potential loss cannot be determined or the loss is more likely than not to occur rather than probable.

Termination Claims

NSF engages organizations in cooperative agreements and contracts to manage, operate and maintain research facilities for the benefit of the scientific community. As part of these agreements and contracts, NSF funds on a pay as you go basis certain employee benefit costs, (accrued vacation and other employee related liabilities, severance pay and medical insurance), long term leases and vessel usage. These agreements permit awardees to make claims for any unpaid costs upon termination or non-renewal of the agreements and contracts.

NSF considers the likelihood of termination or non-renewal to be remote, and has not recorded liabilities for these termination claims on its financial statements. However, one FFRDC operator has identified these payments as obligations of NSF. The termination provision of the cooperative agreement clearly states that NSF's liability for such costs exists only upon termination and is limited to the lesser of available appropriations or $25 million. NSF, at the discretion of its Director, has offered to use its best efforts to obtain these additional funds, including efforts to obtain such funds from Congress. However, nothing in the agreements or contracts can be construed as implying that Congress will appropriate funds to meet the terms of these claims.

Q. Use of Estimates

The preparation of the accompanying financial statements requires management to make estimates and assumptions about certain estimates included in the financial statements. Actual results will invariably differ from those estimates.

R. Tax Status

NSF, as a federal agency, is not subject to federal, state, or local income taxes and, accordingly, no provision for income taxes is recorded.

Note 2. Fund Balance with Treasury

Fund Balance with Treasury consisted of the following components as of September 30, 2004 and 2003:

(Amounts in Thousands) **2004**

		Appropriated Funds	Donated Funds	Special Funds	Other Funds		Total
Obligated	$	7,204,385	9,979	149,944	-	$	7,364,308
Unobligated Available		45,802	13,276	26,152	-		85,230
Unobligated Unavailable		90,601	364	2,949	-		93,914
Total Fund Balance with Treasury	$	7,340,788	23,619	179,045	-	$	7,543,452

(Amounts in Thousands) **2003**

		Appropriated Funds	Donated Funds	Special Funds	Other Funds		Total
Obligated	$	6,617,266	32,366	133,224	1,591	$	6,784,447
Unobligated Available		100,391	18,918	82,912	-		202,221
Unobligated Unavailable		95,122	98	987	922		97,129
Total Fund Balance with Treasury	$	6,812,779	51,382	217,123	2,513	$	7,083,797

The Donations Account includes amounts donated to NSF from all sources. Other Funds and amounts in the Donations Account are restricted for intended purposes. Unavailable balances include recovered expired appropriations and other amounts related to expired authority and holdings, which are unavailable for NSF use.

In 1999, by law (P.L. 105-277) NSF established a special fund called H-1B Nonimmigrant Petitioner Fees Account. These funds are considered "Special Fund" and are not included in Appropriated Funds. The funds are fees collected for each petition for nonimmigrant status. Under the law, NSF was prescribed a percentage of these fees for specific programs.

"Other Funds" consisted of $1,591,019 as of September 30, 2003 received from a corporation that registered second level Internet domain names under NSF's cooperative agreement. In FY04, the authority under which these funds were issued was cancelled. The obligations have been removed and any available funds have been returned to Treasury. "Other Funds" also includes deposit accounts, holding accounts and miscellaneous receipt accounts in the amount of $922,952. These "Other Funds – Unobligated Unavailable" have no budgetary impact and therefore are not part of the unobligated balance per the Statement of Budgetary Resources.

Note 3. Accounts Receivable, Net

Intragovernmental

The Intragovernmental Accounts Receivable consists of reimbursements and repayments due from other government agencies. As of September 30, 2004 and 2003, the amount of intragovernmental accounts receivable was $23,875,393 and $18,246,756, respectively. The increase in our Intragovernmental Receivable balance is due to the implementation of OMB's Memorandum M-03-01: *Business Rules for Intragovernmental Transactions*. These rules required NSF to transition to bill agencies on a reimbursable basis after costs have been incurred. Previously, NSF billed most agencies on an advance basis.

Public

In FY 2004, according to the Debt Collection Act of 1982, as amended by the Debt Collection Improvement Act of 1996 (DCIA), and the Office of Management and Budget guidance, NSF wrote off a debt of $7,928,591, which represents a receivable with a grantee that filed for dissolution.

As of September 30, 2004 and 2003, Accounts Receivable (net) due from private organizations and individuals consisted of:

(Amounts in Thousands)		2004		2003
Accounts Receivable	$	97	$	8,384
Allowance for Uncollectible Accounts		-		(8,182)
Net Amount Due	$	97	$	202

As of September 30, 2004 and 2003, the reconciliation of the allowance for uncollectible accounts is as follows:

(Amounts in Thousands)	2004	2003
Beginning Allowance	$ 8,182	$ 8,182
Additions	66	-
Reductions (write-offs)	(8,248)	-
Ending Allowance	$ -	$ 8,182

Note 4. Advances

As of September 30, 2004 and 2003, Advances consisted of the following components:

Intragovernmental

(Amounts in Thousands)	2004	2003
Advances to Others	$ 38,389	$ 18,557

Public

(Amounts in Thousands)	2004	2003
Advances to Grantees	$ 72,268	$ 66,601
Advances to Contractors	1,155	9
Total Advances with the Public	$ 73,423	$ 66,610

Note 5. Property, Plant and Equipment in the Custody of NSF

The components of Property, Plant and Equipment as of September 30, 2004 and 2003 were:

(Amounts in Thousands)	2004		
	Acquisition Cost	Accumulated Depreciation	Net Book Value
Equipment	$ 121,160	$ 103,219	$ 17,941
Aircraft and Satellites	138,487	109,683	28,804
Buildings and Structures	129,319	44,296	85,023
Construction in Progress	104,848	-	104,848
Internal Use Software	6,259	2,432	3,827
Software in Development	-	-	-
Total PP&E	$ 500,073	$ 259,630	$ 240,443

(Amounts in Thousands)		2003				
		Acquisition Cost		Accumulated Depreciation		Net Book Value
Equipment	$	67,066	$	47,179	$	19,887
Aircraft and Satellites		138,109		103,321		34,788
Buildings and Structures		89,537		41,169		48,368
Construction in Progress		122,700		-		122,700
Internal Use Software		4,714		1,087		3,627
Software in Development		1,407		-		1,407
Total PP&E	$	423,533	$	192,756	$	230,777

Note 6. Property, Plant and Equipment in the Custody of Other Entities

As explained in Note 1-H, *Assets Owned by NSF in the Custody of Other Entities,* NSF received a ruling from FASAB on accounting for PP&E owned by NSF but in the custody of and used by others. The FASAB guidance requires that PP&E in the custody of others be excluded from NSF PP&E as defined in the Statement of Federal Financial Accounting Standards No. 6 *Accounting for Property, Plant and Equipment,* and instead based on information contained in the audited financial statements of the organizations holding the assets, disclose the dollar amount of NSF PP&E held by others in the footnotes.

The amount of PP&E owned by NSF but in the custody of other entities identified in the following table was obtained from the respective entities' audited financial statements. If the audited financial statements were not published or released by September 1, or if NSF PP&E is not separately stated on the entities' audited financial statements, then the amounts relating to such entities are annotated as Not Available (N/A) in the table.

The amounts reported by entities in their audited financial statements submitted as of September 1 are as follows:

(Amounts in Thousands)					
Federally Funded Research and Development Centers		2004		2003	Year End
National Center for Atmospheric Research - UCAR	$	N/A	$	173,830	9/30
National Optical Astronomy Observatories - AURA		N/A		400,334	9/30
National Radio Astronomy Observatory - AUI		N/A		N/A	9/30
Colleges and Universities		2004		2003	Year End
California Institute of Technology	$	N/A	$	N/A	9/30
Columbia University		N/A		N/A	9/30
Cornell University - Endowed		N/A		N/A	6/30
Duke University		N/A		N/A	6/30

Colleges and Universities, continued	2004	2003	Year End
Oregon State University	N/A	N/A	6/30
San Jose State University Foundation	N/A	N/A	6/30
University of Alaska Fairbanks Campus	N/A	N/A	6/30
University of California - San Diego	N/A	N/A	6/30
University of Hawaii	N/A	N/A	6/30
University of Rhode Island	N/A	N/A	6/30
University of Texas at Austin	N/A	N/A	8/31
University of Washington	N/A	N/A	6/30
University of Wisconsin	N/A	N/A	6/30
University of Wisconsin - Madison	N/A	N/A	6/30

Other Entities	2004	2003	Year End
Aerodyne Research Inc	$ N/A	$ N/A	9/28
Articular Engineering LLC	N/A	N/A	N/A
Bossa Nova Technologies LLC	N/A	N/A	N/A
Brighton Technologies Group, Inc	N/A	N/A	Not Audited
Ekips Technologies Inc	N/A	N/A	Not Audited
EM Photonics, Inc	N/A	N/A	N/A
Fourth Wave Imaging Corporation	N/A	N/A	Not Audited
Global Contour Ltd	N/A	N/A	N/A
Imago Scientific Instruments Corp	N/A	N/A	9/30
Incorporated Research Institutions for Seismology	N/A	N/A	6/30
Information Systems Laboratories Inc	N/A	N/A	12/31
Joint Oceanographic Institutions Inc	N/A	NA	9/30
Kapetyn-Murnane Laboratories LLC	N/A	N/A	Not Audited
Lucigen Corporation (Formerly Microgen - a WI Corp)	N/A	N/A	Not Audited
Lynntech, Inc	N/A	N/A	Not Audited
Monterey Bay Aquarium Research Institute	N/A	N/A	12/31
Physical Optics Corporation	N/A	N/A	12/31
SINMAT Inc	N/A	N/A	Not Audited
Tetramer Technologies LLC	N/A	N/A	Not Audited
The Venture Group (Venture Innovations, Inc)	N/A	N/A	Not Audited
UNAVCO, Inc	N/A	N/A	12/31
Veco Rocky Mountain, Inc	N/A	N/A	Not Audited
Verionix Engineering Inc	N/A	N/A	N/A
Vista Engineering Inc	N/A	N/A	Not Audited
Woods Hole Oceanographic Institute	N/A	N/A	12/31

Note 7. Other Liabilities

These are current accrued liabilities, which consist of grant and contract accruals, accrued employer contributions for payroll and benefits, disbursements in transit, accrued payroll and benefits, and various employee related liabilities for payroll and benefit deductions. As of September 30, 2004 and 2003, these liabilities consisted of the following:

(Amounts in Thousands)		2004		2003
Intragovernmental				
Employer Contributions for Payroll Benefits and Other	$	557	$	396
Total Intragovernmental	$	557	$	396
Accrued Liabilities – Grants, Payroll and Other				
Accrued Liabilities	$	306,609	$	251,107
Accrued Payroll and Benefits		5,110		3,893
State and Other Income Taxes Withheld		-		915
Employee Deductions for U.S. Savings Bonds		-		8
Total Other Liabilities	$	311,719	$	255,923

Note 8. Liabilities Not Covered by Budgetary Resources

Certain liabilities are not funded by current budgetary resources. As of September 30, 2004 and 2003, Liabilities Not Covered by Budgetary Resources consisted of the following:

(Amounts in Thousands)		2004		2003
Intragovernmental: FECA Employee Benefits	$	280	$	264
Public: FECA Employee Benefits		1,465		1,649
Accrued Annual Leave		12,162		11,120
Liabilities Not Covered by Budgetary Resources to Fund Cost of Operations	$	13,907	$	13,033
Total Liabilities Not Covered by Budgetary Resources	$	13,907	$	13,033

Note 9. FECA Employee Benefits

FECA Employee Benefits consisted of the following components as of September 30, 2004 and 2003:

(Amounts in Thousands)		2004		2003
Intragovernmental: Unreimbursed Actual Costs	$	280	$	264
Public: Estimated Liability		1,465		1,649
Total Workers' Compensation Benefits	$	1,745	$	1,913

For FY 2004 and 2003, these amounts represent $280,398 and $264,278 respectively, of unreimbursed cost to the DOL for actual compensation paid to recipients under FECA. FECA provides income and medical cost protection to cover federal employees injured on the job or who have a work-related injury or occupational disease, and beneficiaries of employees whose death is attributable to a job related injury or occupational disease. The DOL initially pays valid claims and then bills the employing federal agency.

As of September 30, 2004 and 2003, the estimated liability of $1,465,000 and $1,649,000, respectively, are for future worker compensation claims calculated by DOL and include the expected liability for death, disability, medical, and miscellaneous costs for approved compensation cases. The liability is determined using a method that utilizes historical benefit payment patterns related to a specific incurred period and annual benefit payments discounted to present value using OMB's economic assumptions for 10-year Treasury notes and bonds. To account for the effects of inflation on the liability, wage and medical inflation factors are applied to the calculation of future benefits.

Note 10. Statement of Net Cost

Major Program Descriptions

NSF's primary business is to make merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other public, private, state, local, and federal institutions, throughout the U.S. By providing these resources, NSF contributes to the health and vitality of the U.S. research and education enterprise, which enables and enhances the Nation's capacity to sustain growth and prosperity. These grants are managed through eight programmatic organizations within NSF that review and evaluate competitive proposals submitted by the science and engineering community for its consideration.

NSF is a single entity for net cost reporting purposes. NSF's programmatic organizations are the Directorates for the Biological Sciences; Computer and Information Science and Engineering; Education and Human Resources; Engineering; Geosciences; Mathematical and Physical Sciences; Social, Behavioral and Economic Sciences; and the Office of Polar Programs.

The Statement of Net Cost was updated in FY 2004 to include investment categories which represents a change in the cost categorization utilized in FY 2003. The Statement of Net Cost is a general overall presentation of NSF-wide expenses incurred by the agency. The presentation of the Statement of Net Cost is aligned with NSF's strategic goals of *People, Ideas, Tools* and *Organizational Excellence*. NSF's new *Organizational Excellence* strategic goal focuses on NSF's administrative and management activities. NSF has assigned ten investment categories that align to *People, Ideas and Tools*. The Investment categories for *People* are Individuals; Institutions; and Collaborations. For Ideas they are Fundamental Science and Engineering; Centers; and Capability Enhancements. For *Tools* they are Large Facilities; Infrastructure and Instrumentation; Polar Tools, Facilities and Logistics; and FFRDCs. These goals are outlined in NSF's FY 2003-2008 Strategic Plan and are integrated into NSF's FY 2005 Budget Request (www.nsf.gov/bfa/bud/fy2005/toc.htm).

In pursuit of its mission, NSF makes investments in *People, Ideas, Tools*. These goals reflect outcomes at the heart of the research enterprise: a diverse, competitive, and globally-engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens (*People*); the discovery across the frontier of science and engineering, connected to learning, innovation and service to society (*Ideas*); and the broadly accessible, state-of-the-art science and engineering facilities (*Tools*); to get the job done efficiently and effectively. *People* produce the *Ideas* that are the currency of the new knowledge-based economy. The need for more sophisticated *Tools* has paralleled recent advances in science and engineering, creating a growing demand for access to them. NSF's overall strategy is to invest in state-of-the-art tools that add unique value to research and are accessible and widely shared among researchers across the nation.

Approximately 95 percent of NSF's funds are directly related to the *People, Ideas*, and *Tools* strategic areas of focus. The remaining five percent of NSF's investments are for support of *Organizational Excellence* activities. In FY 2004, *Organizational Excellence* costs amounted to $268,298,594. All *Organizational Excellence* costs are assigned on a prorated basis to the *People, Ideas* and *Tools* strategic areas.

In FY 2003 and 2004, organizational excellence activities include Salary & Expenses, NSB and Office of Inspector General (OIG) expenses which provide for salaries and benefits of persons employed at the NSF; general operating expenses, including key activities to advance the NSF information systems technology and to enhance staff training, audit and OIG activities, and OPM and DOL benefits costs paid on behalf of NSF. These indirect costs are allocated to NSF programs based on each program's direct costs.

In accordance with OMB Bulletin 01-09, *Form and Content of Agency Financial Statements*, costs incurred for services provided by other federal entities are reported in the full costs of NSF programs and are identified as "intragovernmental." All earned revenues are funding sources provided through reimbursable agreements with other federal entities and are retained by NSF. Earned revenues are recognized when the related program or administrative expenses are incurred and are deducted from the full cost of the programs to arrive at the net cost of operating NSF's programs. In FY 2004, the Statement of Net Cost does not report intragovernmental costs separately. The intragovernmental costs are as follows:

Intragovernmental Costs and Earned Revenue by Investment Category

(Amounts in Thousands)		2004		
		Federal	Public	Total
People				
Individuals	$	3,368	647,682	
Institutions		62	202,025	
Collaborations		2,233	426,027	
Total People Program Cost				1,281,397
Less: Earned Revenue				20,289
Net People				1,261,108
Ideas				
Fundamental Science & Engineering		25,312	2,096,153	
Centers		2,400	295,169	
Capability Enhancements		1,596	219,531	
Total Ideas Program Cost				2,640,161
Less: Earned Revenue				62,110
Net Ideas				2,578,051

Intragovernmental Costs and Earned Revenue by Investment Category, continued

		Federal	Public	Total
Tools				
Large Facilities	$	5,260	530,903	
Infrastructure and Implementation		15,688	264,854	
Polar Tools, Facilities and Logistics		70,276	174,956	
Federally Funded Research & Development Centers		4,275	208,113	
Total Tools Program Cost				1,274,325
Less Earned Revenue				13,341
Net Tools				1,260,984
Total Net Costs	$	130,471	5,065,413	5,100,143

Gross Cost and Earned Revenue by Budget Functional Classification

Total Gross Cost and Earned Revenue by Budget Functional Classification for FY 2004 and 2003 were as follows:

Budget Functional Classification
NSF - General Science, Space and Technology (Code 250)

(Amounts in Thousands)		2004		2003
Gross Cost	$	5,195,883	$	4,801,163
Earned Revenue		95,740		93,392
Net Cost	$	5,100,143	$	4,707,771

Intragovernmental Gross Cost and Earned Revenue by Budget Functional Classification

Intragovernmental Gross Cost and Earned Revenue by Budget Functional Classification for FY 2004 and 2003 were as follows:

Budget Functional Classification
NSF - General Science, Space and Technology (Code 250)

(Amounts in Thousands)		2004		2003
Gross Cost	$	130,471	$	157,356
Earned Revenue		95,740		93,392
Net Cost	$	34,731	$	63,964

Note 11. Budgetary Resources

Budget Authority includes $23,937,915 and $42,161,490 of donations and interest as of September 30, 2004 and 2003, respectively. Budget Authority was increased for non-expenditure transfers from the U.S. Agency for International Development of $11,250,000 in 2004, and $13,143,175 in 2003. Budget Authority as of September 30, 2004 and 2003 was also adjusted for Congressional initiated rescissions contained in P.L. 108-199 totaling $33,104,605 and P.L. 108-7 totaling $34,740,498, respectively.

NSF maintains permanent indefinite appropriations for Research and Related Activities - 49x0100 and Major Research Equipment - 49x0551. NSF also maintains permanent indefinite accounts for Donations - 49x8960 and H-1B Nonimmigrant Petitioner fees - 49x5176.

The status of Budgetary Resources as of September 30, 2004, consisted of Budgetary Resources obligated of $5,870,718,720 available authority of $85,230,105 and unavailable authority of $93,913,641. The status of Budgetary Resources as of September 30, 2003, included Budgetary Resources obligated of $5,578,644,000, available authority of $202,220,949 and unavailable authority of $96,207,143.

In FY 2004, per OMB guidance dated March 23, NSF excluded reporting Indian Rupees in any Budgetary Accounts. As a result, the difference between FY 2004 beginning of period unobligated balance and FY 2003 end of period unobligated balance is $59,745. Similarly, the difference between FY 2004 net obligated balance beginning of period and FY 2003 end of period net obligated balance is $237,348.

Note 12. Commitments and Contingencies

Claims

NSF has been informed of potential contractor claims for additional compensation under a contract awarded by the United States Air Force for the reconfiguration of three NSF-owned LC130 aircraft. NSF worked with the Air Force to determine the validity of the potential contractor's claims. It is NSF's opinion that payment of the additional compensation is probable. The amount of additional compensation has been estimated at approximately $3,000,000.

Environmental and Clean up Costs

The Toolik Field Station is operated by the Institute of Arctic Biology at the University of Alaska, Fairbanks. As the primary customer for the Institute, NSF projects a remaining balance of $121,972 in remediation costs for the Toolik Field Station oil spill that occurred on August 25, 2001.

NSF manages the U.S. Antarctic Program. The Antarctic Conservation Act and its implementing regulations identify the requirements for environmental clean-up in Antarctica. NSF continually monitors the U.S. Antarctic Program in regards to environmental issues.

NSF is continuing its efforts to conduct limited clean-up of a former research station at Cape Hallet, in cooperation with the New Zealand Antarctic Program. The station was jointly operated by the U.S. and New Zealand from 1957 to 1973. In the past year, progress has been made in determining the scope of the effort that will need to be undertaken to assess clean-up activities. Approximately $80,000 will be provided to conduct an assessment of the fuel storage tank. Remediation efforts are expected to continue during the 2004-2005 summer season operations. At present, the full extent of clean-up efforts and the associated costs are unknown.

NSF is continuing its actions to excess the National Scientific Balloon Facility (NSBF) land through the General Services Administration to the National Aeronautics and Space Administration (NASA) by completing a no-cost transfer. NASA engineers have reported 10 wells on the NSBF site and are aware of one contaminated well from battery disposal. NSF estimates clean-up costs at $50,000.

Note 13. Statement of Financing Disclosures

Explanation of the Relationship Between Liabilities Not Covered by Budgetary Resources on the Balance Sheet and the Change in Components Requiring or Generating Resources in Future Periods.

Liabilities Not Covered by Budgetary Resources of $13,907,308 and $13,032,863 for FY 2004 and 2003, respectively, represent NSF's FECA liability to DOL and employees, leave earned but not taken, and lease liabilities. The amount reported on the Statement of Financing as Total Components of Net Cost of Operations that will Require or Generate Resources in Future Periods of $1,058,445 for FY 2004 and $515,543 for FY 2003, represents the change in NSF's expenses for unfunded liabilities for FECA, leave earned but not taken, and lease liabilities.

Note 14. Restatement

NSF's FY 2003 Statement of Changes in Net Position has been restated to correct the reporting of H-1B Nonimmigrant Petitioner Fees (fees) that were considered appropriations in prior years. Accordingly, the activities of these fees were presented in prior years as part of *Unexpended Appropriations* rather than *Cumulative Results of Operations* as required by the U.S. Department of Treasury's guidance on *Unavailable Special Fund Receipt Account Transfers*. As a result, beginning balances related to *Unexpended Appropriations* and *Cumulative Results of Operations* for FY 2003 were overstated and understated by $186,249,525 respectively, representing the balance of the unexpended fees from prior years. FY 2003 activities relating to fees received of $65,343,110 were reclassified from *Appropriations Received* to *Earmarked Receipts*, and expenditures of $35,806,159 were reclassified from *Appropriations Used – Unexpended Appropriations*, to *Appropriations Used – Cumulative Results of Operations*. The effect of the restatement on the FY 2003 Statement of Changes in Net Position is summarized below:

(Amounts in Thousands)

Cumulative Results of Operations		2003 Reported	Effect of Restatement		2003 Restated
Beginning Balances	$	258,027	186,250	$	444,277
Budgetary Financing Sources					
Appropriated Earmarked Receipts Transferred In		-	65,343		65,343
Appropriations Used		4,673,452	(35,806)		4,637,646
Ending Balances	$	273,624	215,787	$	489,411

(Amounts in Thousands)

Unexpended Appropriations		2003 Reported	Effect of Restatement		2003 Restated
Beginning Balances	$	6,089,118	(186,250)	$	5,902,868
Budgetary Financing Sources					
Appropriations Received		5,410,035	(65,343)		5,344,692
Appropriations Used		(4,673,452)	35,806		(4,637,646)
Ending Balances	$	6,771,590	(215,787)	$	6,555,803

The FY 2003 amounts for *Unexpended Appropriations* and *Cumulative Results of Operations* shown above as $6,555,803,794 and $489,410,698 have also been restated on the Balance Sheet.

Required Supplementary Information

Budgetary Resources by Major Budgetary Accounts

In the following table, NSF budgetary information for the fiscal years ended September 30, 2004 and 2003, as presented in the Statement of Budgetary Resources, is disaggregated for each of NSF's major budgetary accounts.

Combining Statement of Budgetary Resources

2004
(Amounts in Thousands)

		Research and Related	Education	Major Research Equipment	OIG, S&E, and NSB	Special and Donated		Total
Budgetary Resources								
Budget Authority:								
Appropriations Received	$	4,276,600	944,550	155,900	233,900	24,507	$	5,635,457
Net Transfers		10,989	-	-	261	-		11,250
Unobligated Balances - Beginning of Period		82,985	41,979	66,108	4,381	102,915		298,368
Spending Authority from Offsetting Collections:								
Earned:								
Collected		74,296	10,996	-	4,955	-		90,247
Receivable from Federal Sources		4,607	1,305	-	(283)	-		5,629
Change in Unfilled Customer Orders:								
Advance Received		(10,647)	(7,875)	-	-	-		(18,522)
Without Advance from Federal Sources		33,911	66	-	(2)	-		33,975
Spending Authority Subtotal		102,167	4,492	-	4,670	-		111,329
Recoveries of Prior Year Obligations		38,864	17,285	-	2,736	2,283		61,168
Permanently Not Available		(43,707)	(20,357)	(920)	(2,725)	-		(67,709)
Total Budgetary Resources	$	4,467,898	987,949	221,088	243,223	129,705	$	6,049,863
Status of Budgetary Resources								
Obligations Incurred:								
Direct	$	4,306,488	950,679	183,964	231,058	86,965	$	5,759,154
Reimbursable		102,462	4,502	-	4,601	-		111,565
Total Obligations Incurred		4,408,950	955,181	183,964	235,659	86,965		5,870,719
Unobligated Balances:								
Apportioned		4,351	1,406	37,124	2,921	39,428		85,230
Unobligated Balances Not Available		54,597	31,362	-	4,643	3,312		93,914
Total Status of Budgetary Resources	$	4,467,898	987,949	221,088	243,223	129,705	$	6,049,863
Relationship of Obligations to Outlays								
Net Obligated Balance - Beginning of Period	$	4,855,623	1,528,165	198,482	36,349	165,590	$	6,784,209
Net Obligated Balance - End of Period								
Accounts Receivable		(21,741)	(1,925)	-	(209)	-		(23,875)
Unfilled Customer Orders from Federal Sources		(106,805)	(3,426)	-	(5)	-		(110,236)
Undelivered Orders		5,171,697	1,568,165	209,444	34,621	164,750		7,148,677
Accounts Payable		274,560	55,225	10,260	14,524	(4,827)		349,742
Total Net Obligated Balance - End of Period	$	5,317,711	1,618,039	219,704	48,931	159,923	$	7,364,308
Outlays								
Disbursements	$	3,869,480	846,651	162,743	220,624	90,349	$	5,189,847
Collections		(63,649)	(3,121)	-	(4,955)	-		(71,725)
Subtotal		3,805,831	843,530	162,743	215,669	90,349		5,118,122
Less: Offsetting Receipts		-	-	-	-	23,938		23,938
Net Outlays	$	3,805,831	843,530	162,743	215,669	66,411	$	5,094,184

Combining Statement of Budgetary Resources

2003
(Amounts in Thousands)

	Research And Related	Education	Major Research Equipment	OIG, S&E, and NSB	Special and Donated	Total
Budgetary Resources						
Budget Authority:						
Appropriations Received	$ 4,083,000	909,080	149,510	203,102	107,505	$ 5,452,197
Net Transfers	12,828	-	-	315	-	13,143
Unobligated Balances - Beginning of Period	56,677	64,032	96,551	2,773	84,784	304,817
Spending Authority from Offsetting Collections:						
Earned:						
Collected	62,487	8,261	-	4,819	1	75,568
Receivable from Federal Sources	17,067	621	-	374	-	18,062
Change in Unfilled Customer Orders:						
Advance Received	(50,871)	(7,724)	-	(3)	-	(58,598)
Without Advance from Federal Sources	70,396	3,359	-	-	-	73,755
Spending Authority Subtotal	99,079	4,517	-	5,190	1	108,787
Recoveries of Prior Year Obligations	38,858	23,431	48	1,962	1,100	65,399
Permanently Not Available	(45,794)	(18,012)	(972)	(2,493)	-	(67,271)
Total Budgetary Resources	$ 4,244,648	983,048	245,137	210,849	193,390	$ 5,877,072
Status of Budgetary Resources						
Obligations Incurred:						
Direct	$ 4,062,220	936,560	179,029	201,440	90,475	$ 5,469,724
Reimbursable	99,384	4,508	-	5,028	-	108,920
Total Obligations Incurred	4,161,604	941,068	179,029	206,468	90,475	5,578,644
Unobligated Balances:						
Apportioned	28,075	5,002	66,060	1,254	101,830	202,221
Unobligated Balances Not Available	54,969	36,978	48	3,127	1,085	96,207
Total Status of Budgetary Resources	$ 4,244,648	983,048	245,137	210,849	193,390	$ 5,877,072
Relationship of Obligations to Outlays						
Net Obligated Balance - Beginning of Period	$ 4,441,353	1,376,305	137,418	25,402	134,145	$ 6,114,623
Net Obligated Balance - End of Period						
Accounts Receivable	(17,134)	(621)	-	(492)	-	(18,247)
Unfilled Customer Orders from Federal Sources	(72,895)	(3,359)	-	(7)	-	(76,261)
Undelivered Orders	4,699,456	1,484,685	191,010	20,083	166,633	6,561,867
Accounts Payable	246,434	47,460	7,472	16,765	(1,043)	317,088
Total Net Obligated Balance - End of Period	$ 4,855,861	1,528,165	198,482	36,349	165,590	$ 6,784,447
Outlays						
Disbursements	$ 3,620,775	761,798	117,916	193,186	57,929	$ 4,751,604
Collections	(11,616)	(537)	-	(4,816)	(1)	(16,970)
Subtotal	3,609,159	761,261	117,916	188,370	57,928	4,734,634
Less: Offsetting Receipts	-	-	-	-	42,162	42,162
Net Outlays	$ 3,609,159	761,261	117,916	188,370	15,766	$ 4,692,472

Required Supplementary Information

Intragovernmental Balances and Deferred Maintenance

Intragovernmental Assets by Partner Agency (Unaudited)

Intragovernmental assets on this schedule support the intragovernmental asset line items on NSF's Balance Sheets as of September 30, 2004 and 2003. Intragovernmental balances included in Fund Balance with Treasury as of September 30, 2004 and 2003, consisted of the following:

(Amounts in Thousands)		2004		2003
Department of State	$	-	$	297
Department of the Treasury		7,543,452		7,083,500
Total	$	7,543,452	$	7,083,797

In FY 2004, NSF foreign currency assets consisted of the following:

(Amounts in Thousands)		2004		2003
Department of State	$	302	$	-

Intragovernmental Accounts Receivable balances as of September 30, 2004 and 2003, consisted of the following:

(Amounts in Thousands)	2004	2003
Central Intelligence Agency	$ 5,306	$ 3,374
Department of Agriculture	84	66
Department of Air Force	958	547
Department of Army	418	819
Department of Commerce	1,443	886
Department of Defense	4,191	2,486
Department of Education	433	166
Department of Energy	1,313	1,276
Department of Health and Human Services	4,175	4,796
Department of Homeland Security	820	118
Department of Housing and Urban Development	205	135
Department of Justice	23	7
Department of Labor	121	44
Department of Navy	520	303
Department of State	176	70
Department of the Interior	64	58
Department of Transportation	244	108
Department of Treasury	8	4
Environmental Protection Agency	98	120
General Services Administration	1	4
Library of Congress	71	-
National Aeronautics and Space Administration	2,325	2,723
National Archives and Records Administration	245	-
National Foundation on the Arts and Humanities	8	12
Office of the President	-	4
Small Business Administration	2	-
Smithsonian Institute	1	2
Social Security Administration	50	12
U.S. Army Corp of Engineers	572	107
Total	$ 23,875	$ 18,247

Intragovernmental Advances balances as of September 30, 2004 and 2003 consisted of the following:

(Amounts in Thousands)		2004		2003
Department of the Air Force	$	9,202	$	-
Department of Commerce		300		-
Department of the Navy		28,887		18,557
Total	$	38,389	$	18,557

Intragovernmental Liabilities by Partner Agency (Unaudited)
(Amounts in Thousands)

	2004			2003		
Agency	Advances From Others	Other Liabilities	Employee Benefits	Advances From Others	Other Liabilities	Employee Benefits
Central Intelligence Agency	$ 406	$ -	$ -	$ 1,833	$ -	$ -
Department of Agriculture	86	-	-	194	-	-
Department of Air Force	1,514	3,000	-	2,264	-	-
Department of Army	26	-	-	259	-	-
Department of Commerce	713	-	-	1,647	-	-
Department of Education	15,642	-	-	19,107	-	-
Department of Energy	495	-	-	2,205	-	-
Department of Health and Human Services	875	-	-	5,218	-	-
Department of Housing and Urban Development	718	-	-	973	-	-
Department of the Interior	-	-	-	28	-	-
Department of Justice	36	-	-	112	-	-
Department of Labor	148	-	280	237	-	264
Department of Navy	204	-	-	702	-	-
Department of State	204	-	-	441	-	-
Department of Transportation	413	-	-	606	-	-
Department of Treasury	11	-	-	111	-	-
Environmental Protection Agency	-	-	-	59	-	-
General Services Administration	1	-	-	73	-	-
National Aeronautics and Space Administration	924	-	-	3,032	-	-
National Foundation on the Arts and Humanities	-	-	-	2	-	-
Office of Personnel Management	-	557	-	-	396	-
Office of the President	2	-	-	6	-	-
Office of the Secretary - Defense Agencies	920	-	-	2,604	-	-
Smithsonian Institute	-	-	-	8	-	-
Social Security Administration	22	-	-	19	-	-
U.S. Army Corp of Engineers	51	-	-	193	-	-
Total	$ 23,411	$ 3,557	$ 280	$ 41,933	$ 396	$ 264

Deferred Maintenance (Unaudited)

NSF performs condition assessment surveys in accordance with FASAB standards for capitalized property, plant and equipment to determine if any maintenance is needed to keep an asset in an acceptable condition or restore an asset to a specific level of performance. NSF considers deferred maintenance to be any maintenance that is not performed on schedule, unless it is determined from the condition of the asset that scheduled maintenance does not have to be performed. Deferred maintenance also includes any other type of maintenance that, if not performed, would render the PP&E non-operational. Circumstances such as non-availability of parts or funding are considered reasons for deferring maintenance.

NSF considered whether any scheduled maintenance necessary to keep fixed assets of the agency in an acceptable condition was deferred at the end of fiscal years 2004 and 2003. Assets deemed to be in excellent or good condition are considered to be in acceptable condition. Assets in fair or poor condition are in unacceptable condition and the deferred maintenance required to get them to an acceptable condition are reported. NSF determines the condition of an asset in accordance with standards comparable to those used in the private industry. Due to the environment and remote location of Antarctica, all deferred maintenance on assets in fair or poor condition is considered critical in order to maintain operational status.

During FY 2003, NSF determined that scheduled maintenance on 194 items of Antarctic equipment was not completed and was deferred or delayed for a future period. The largest dollar amount of deferred maintenance for any single item approximated $16,000. The items included light and heavy mobile equipment requiring $134,083 of maintenance and a few power distribution and shop equipment items requiring $3,167. There are 176 items rated to be in fair condition and 18 rated to be in poor condition. All of the equipment is considered critical to NSF operations and estimated to require $137,250 in total maintenance.

In FY 2004, NSF determined that scheduled maintenance on 173 items of Antarctic equipment was not completed and was deferred or delayed for a future period. The largest dollar amount of deferred maintenance for any single item approximated $15,383. The items included light and heavy mobile equipment with a few items of power distribution and shop equipment. 167 items were rated to be in fair condition and 6 were rated to be in poor condition. All of the equipment is considered critical to NSF operations and estimated to require $127,646 in maintenance.

Required Supplementary Stewardship Information

Stewardship Investments

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 & 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
FFRDC	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 & 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

NSF's mission is to support basic scientific research and research fundamental to the engineering process as well as science and engineering education programs. To this end, NSF invests in the three strategic areas: *People, Ideas*, and *Tools*. Investment activities focused on *People* facilitate the creation of a diverse, internationally competitive and globally engaged workforce of scientists, engineers and well-prepared citizens. NSF supports activities to improve formal and informal science, mathematics, engineering and technology education at all levels, as well as public science literacy projects that engage people of all ages in life-long learning. Investment activities focused on *Ideas* support cutting edge research and education that yield new and important discoveries and promote the development of new knowledge and techniques within and across traditional disciplinary boundaries. Investment in *Tools* provides state-of-the-art instrumentation, equipment, computation and computing infrastructure and multi-user facilities such as digital libraries, research vessels and aircraft, for all fields of science, engineering and education. The *Organizational Excellence* strategic goal focuses on the administration and management activities that support the other three goals.

NATIONAL SCIENCE FOUNDATION
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ARLINGTON, VIRGINIA 22230

OFFICE OF
INSPECTOR GENERAL

November 12, 2004

To: Dr. Warren M. Washington
Chairman, National Science Board

Dr. Arden L. Bement
Acting Director, National Science Foundation

Deborah Cureton for
From: Dr. Christine C. Boesz
Inspector General

Subject: Audit of the National Science Foundation's Fiscal Years 2004 and 2003 Financial Statements

This memorandum transmits KPMG LLP's financial statement audit report of the National Science Foundation (NSF) for its Fiscal Year 2004, which includes Fiscal Year 2003 comparative information.

Results of Independent Audit

The Chief Financial Officer's (CFO) Act of 1990 (P.L. 101-576), as amended, requires NSF's Inspector General or an independent external auditor, as determined by the Inspector General, to audit the Foundation's financial statements. Under a contract monitored by the Office of Inspector General (OIG), KPMG, an independent public accounting firm, performed an audit of NSF's Fiscal Years 2004 and 2003 financial statements. The contract required that the audit be performed in accordance with the Government Auditing Standards issued by the Comptroller General of the United States, and Bulletin 01-02, *Audit Requirements for Federal Financial Statements*, issued by the United States Office of Management and Budget.

KPMG issued an unqualified opinion on NSF's financial statements. In its Report on Internal Controls Over Financial Reporting, KPMG identified two reportable conditions relating to NSF's post-award administration and contract monitoring. KPMG also reported that there were no instances in which NSF's financial management systems did not substantially comply with the requirements of the Federal Financial Management Improvement Act of 1996 (FFMIA), and found no reportable noncompliance with laws and regulations it tested.

Management's response dated November 10, 2004, follows KPMG's report.

Evaluation of KPMG's Audit Performance

To fulfill our responsibilities under the CFO Act of 1990, as amended, and other related financial management legislation, the Office of Inspector General:

- Reviewed KPMG's approach and planning of the audit;
- Evaluated the qualifications and independence of the auditors;
- Monitored the progress of the audit at key points;
- Coordinated periodic meetings with NSF management to discuss audit progress, findings and recommendations;
- Reviewed KPMG's audit report to ensure compliance with Government Auditing Standards and Office of Management and Budget Bulletin No. 01-02; and
- Coordinated issuance of the audit report.

KPMG LLP is responsible for the attached auditor's report dated November 4, 2004, and the conclusions expressed in the report. We do not express any opinion on NSF's financial statements, internal control, conclusions on compliance with laws and regulations, or on whether NSF's financial management systems substantially complied with FFMIA.

The Office of Inspector General appreciates the courtesies and cooperation extended to KPMG LLP and OIG staff by NSF during the audit. If you or your staff have any questions, please contact me or Deborah H. Cureton, Associate Inspector General for Audit.

Attachment

cc: Dr. Mark S. Wrighton, Chair, Audit and Oversight Committee

KPMG LLP
2001 M Street, NW
Washington, DC 20036

Independent Auditors' Report

Dr. Warren M. Washington
Chairman, National Science Board

Dr. Arden Bement
Acting Director, National Science Foundation

We have audited the accompanying balance sheets of the National Science Foundation (NSF) as of September 30, 2004 and 2003, and the related statements of net cost, changes in net position, budgetary resources, and financing (hereinafter referred to as the financial statements) for the years then ended. The objective of our audits was to express an opinion on the fair presentation of these financial statements. In connection with our audits, we also considered NSF's internal control over financial reporting and tested the NSF's compliance with certain provisions of applicable laws, regulations, contracts and grant agreements that could have a direct and material effect on its financial statements.

Summary

As stated in our opinion on the financial statements, we concluded that NSF's financial statements as of and for the years ended September 30, 2004 and 2003 are presented fairly, in all material respects, in conformity with accounting principles generally accepted in the United States of America.

As discussed in Note 14 to the financial statements, NSF restated its fiscal year 2003 unexpended appropriations and cumulative results balances reported on the Balance Sheet and Statement of Changes in Net Position.

Our consideration of internal control over financial reporting resulted in the following conditions being identified as reportable conditions:

- **Post-award Administration -** Post-award administration, especially with respect to financial monitoring, has been a long-standing problem and NSF has not made sufficient progress to effectively address the findings identified to date.
- **Contract Monitoring -** NSF does not adequately review the public vouchers submitted by contractors receiving advanced payments. Without adequately performing such procedures, misstatements in expenditures may remain undetected.

However, the reportable conditions identified above are not considered to be material weaknesses.

The results of our tests of compliance with certain provisions of laws, regulations, contracts, and grant agreements disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*, issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 01-02, *Audit Requirements for Federal Financial Statements*.

NSF management does not concur with the findings regarding the reportable conditions. Management's response dated November 10, 2004 follows this report.

The following sections discuss our opinion on the NSF's financial statements, our consideration of the NSF's internal control over financial reporting, our tests of the NSF's compliance with certain provisions of applicable laws, regulations, contracts, and grant agreements, and management's and our responsibilities.

Opinion on the Financial Statements

We have audited the accompanying balance sheets of the National Science Foundation as of September 30, 2004 and 2003, and the related statements of net cost, changes in net position, budgetary resources, and financing, for the years then ended.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of NSF as of September 30, 2004 and 2003, and its net costs, changes in net position, budgetary resources, and reconciliation of net costs to budgetary obligations for the years then ended, in conformity with accounting principles generally accepted in the United States of America.

As discussed in Note 14 to the financial statements, the NSF restated its fiscal year 2003 unexpended appropriations and cumulative results balances reported on the Balance Sheet and Statement of Changes in Net Position.

The information in the Management Discussion and Analysis, Required Supplementary Stewardship Information, and Required Supplementary Information sections is not a required part of the financial statements, but is supplementary information required by accounting principles generally accepted in the United States of America or OMB Bulletin No. 01-09, *Form and Content of Agency Financial Statements*. We have applied certain limited procedures, which consisted principally of inquiries of management regarding the methods of measurement and presentation of this information. However, we did not audit this information and, accordingly, we express no opinion on it. Based upon our limited procedures, we determined that NSF could not complete the intragovernmental balance reconciliations with its governmental trading partners, as required by OMB Bulletin 01-09, because, although NSF issued confirmations to its major partners, such partners did not respond with adequate information to assist in reconciling such balances.

Our audits were conducted for the purpose of forming an opinion on the financial statements taken as a whole. The Detailed Performance Information (Section II) is an integral part of NSF's *Fiscal Year 2004 Performance and Accountability Report.* However, this information is not a required part of the financial statements and is presented for additional analysis. Accordingly, it has not been subjected to auditing procedures and therefore we express no opinion on it.

Internal Control Over Financial Reporting

Our consideration of internal control over financial reporting would not necessarily disclose all matters in the internal control over financial reporting that might be reportable conditions. Under standards issued by the American Institute of Certified Public Accountants, reportable conditions are matters coming to our attention relating to significant deficiencies in the design or operation of the internal control over financial reporting that, in our judgment, could adversely affect NSF's ability to record, process, summarize, and report financial data consistent with the assertions by management in the financial statements.

Material weaknesses are reportable conditions in which the design or operation of one or more of the internal control components does not reduce to a relatively low level the risk that misstatements, in amounts that would be material in relation to the financial statements being audited, may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions.

In our fiscal year 2004 audit, we noted certain matters, described in Exhibit I involving internal control over financial reporting and its operation that we consider to be reportable conditions. However, the reportable conditions identified are not considered to be material weaknesses.

* * * * *

A summary of the status of the prior year reportable condition is included as Exhibit II.

We also noted other matters involving internal control over financial reporting and its operation that we have reported to the management of NSF in a separate letter dated November 4, 2004.

Compliance and Other Matters

Our tests of compliance with certain provisions of laws, regulations, contracts, and grant agreements, as described in the Responsibilities section of this report, exclusive of those referred to in the *Federal Financial Management Improvement Act* (FFMIA), disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards* and OMB Bulletin No. 01-02.

The results of our tests of FFMIA disclosed no instances in which NSF's financial management systems did not substantially comply with Federal financial management system requirements, applicable Federal accounting standards, or the United States Government Standard General Ledger at the transaction level.

We noted other matters involving compliance with laws and regulations that, under *Government Auditing Standards* and OMB Bulletin 01-02, were not required to be included in this report, that we have reported to the management of NSF in a separate letter dated November 4, 2004.

Responsibilities

Management's Responsibilities. The *Government Management Reform Act of 1994* (GMRA) requires each Chief Financial Officer (CFO) Act agency to report annually to Congress on its financial status and any other information needed to fairly present its financial position and results of operations. To meet the GMRA reporting requirements, NSF prepares annual financial statements.

Management is responsible for the financial statements, including:

- Preparing the financial statements in conformity with accounting principles generally accepted in the United States of America;
- Establishing and maintaining internal controls over financial reporting, and preparing the Management Discussion and Analysis (including the performance measures), Required Supplementary Information, and Required Supplementary Stewardship Information, and
- Complying with laws, regulations, contracts, and grant agreements, including FFMIA.

In fulfilling this responsibility, estimates and judgments by management are required to assess the expected benefits and related costs of internal control policies. Because of inherent limitations in internal control, misstatements, due to error or fraud may nevertheless occur and not be detected.

Auditors' Responsibilities. Our responsibility is to express an opinion on the fiscal year 2004 and 2003 financial statements of NSF based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America, the standards applicable to financial audits contained in *Government Auditing Standards*, and OMB Bulletin No. 01-02. Those standards and OMB Bulletin No. 01-02 require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement.

An audit includes:

- Examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements;
- Assessing the accounting principles used and significant estimates made by management; and
- Evaluating the overall financial statement presentation.

We believe that our audits provide a reasonable basis for our opinion.

In planning and performing our fiscal year 2004 audit, we considered NSF's internal control over financial reporting by obtaining an understanding of NSF's internal control, determining whether internal controls had been placed in operation, assessing control risk, and performing tests of controls in order to determine our auditing procedures for the purpose of expressing our opinion on the financial statements. We limited our internal control testing to those controls necessary to achieve the objectives described in *Government Auditing Standards* and OMB Bulletin No. 01-02. We did not test all internal controls relevant to operating objectives as broadly defined by the *Federal Managers' Financial Integrity Act of 1982*. The objective of our audit was not to provide assurance on internal control over financial reporting. Consequently, we do not provide an opinion thereon.

As required by OMB Bulletin No. 01-02, we considered NSF's internal control over Required Supplementary Stewardship Information by obtaining an understanding of NSF's internal control, determining whether these internal controls had been placed in operation, assessing control risk, and performing tests of controls. Our procedures were not designed to provide assurance on internal control over Required Supplementary Stewardship Information and, accordingly, we do not provide an opinion thereon.

As further required by OMB Bulletin No. 01-02 with respect to internal control related to performance measures determined by management to be key and reported in the Management Discussion and Analysis section, we obtained an understanding of the design of significant internal controls relating to the existence and completeness assertions and determined whether they had been placed in operation. Our procedures were not designed to provide assurance on internal control over performance measures and, accordingly, we do not provide an opinion thereon.

As part of obtaining reasonable assurance about whether NSF's fiscal year 2004 financial statements are free of material misstatement, we performed tests of NSF's compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and certain provisions of other laws and regulations specified in OMB Bulletin No. 01-02, including certain provisions referred to in FFMIA. We limited our tests of compliance to the provisions described in the preceding sentence, and we did not test compliance with all laws, regulations, contracts, and grant agreements applicable to NSF. Providing an opinion on compliance with laws, regulations, contracts, and grant agreements was not an objective of our audit and, accordingly, we do not express such an opinion.

Under OMB Bulletin No. 01-02 and FFMIA, we are required to report whether NSF's financial management systems substantially comply with (1) Federal financial management systems requirements, (2) applicable Federal accounting standards, and (3) the United States Government Standard General Ledger at the transaction level. To meet this requirement, we performed tests of compliance with FFMIA Section 803(a) requirements.

Distribution

This report is intended for the information and use of NSF's management, NSF's Office of the Inspector General, OMB, the Government Accountability Office, and the U.S. Congress, and is not intended to be and should not be used by anyone other than these specified parties.

KPMG LLP

November 4, 2004

Exhibit I

Fiscal Year 2004 Reportable Conditions

04-01 Post-Award Monitoring

NSF relies almost exclusively on awardees' representations in their financial expenditure reports to support approximately 90 percent of NSF expenditures, without performing any periodic internal reviews of the expenditure reports. In fiscal year 2004, NSF had a budget of over $5 billion and managed an estimated 35,000 awards. Post-award administration, especially with respect to financial monitoring, has been a long-standing problem and NSF has not made sufficient progress to effectively address the findings identified to date. We believe NSF's post-award administration structure and resources are inadequate. Management needs to make post-award administration a higher priority, particularly in an age of increased accountability.

In response to a reportable condition identified in the Independent Auditors' Report in prior years, NSF developed the Award Monitoring and Business Assistance Program Guide (Guide) which provided procedures for grantee risk assessments, and on-site visits to ensure among other things that grantee financial management practices are sound. While the Guide represents a significant effort to improve NSF's award monitoring, several concerns remain about the limitations of the risk assessment model, the adequacy of on-site visit procedures and most importantly NSF's ability to provide adequate resources for an effective post-award monitoring program.

NSF's current post-award monitoring program contains the following deficiencies:

- The current risk assessment model determined that only 0.01 percent of NSF awards were high risk. Also, the model does not identify some awards that are known to be high risk.
- The award-monitoring program does not address procedures for both baseline and advanced monitoring depending on the financial risk of the award. Baseline monitoring, which should be completed for all awards, consists of ensuring that administrative award terms and conditions are satisfied, required audit reports are filed, and progress and final reports are received and acted upon as appropriate. Advanced monitoring, which should be performed on high-risk awards provides a more in depth evaluation of award activity including desk reviews and on-site visits.
- On-site visit procedures identified in the Guide are not adequate for the performance of an effective on-site review since the procedures in the Guide were streamlined in a manner that decreased the effectiveness of the work to be conducted on site-visits. Additionally, the length and staffing of the site visits does not allow for thorough reviews of grantees' compliance with grant terms and conditions.

In March 2004, a consultant to NSF issued a report titled *Post-award Monitoring Assessment*. The report indicated that while NSF made commendable efforts to develop policies and procedures, it still faces a number of challenges to achieve effective administration. Further, using other grant making agencies as a benchmark, the consultant identified gaps in NSF's post-award administration. NSF has not developed an action plan to address the reported opportunities for improvement.

The NSF Office of Inspector General (NSF OIG) audits continue to disclose noncompliance with federal regulations as well as questioned costs. Two NSF OIG audits that have recently been completed, but not formally issued, questioned approximately $51 million of costs claimed on these awards, a large portion of which was unauditable due primarily to a lack of accounting records. Such findings demonstrate the increased need for a robust grantee financial monitoring program. Since a significant amount of grants are not subject to any type of financial monitoring, NSF is exposed to a higher risk that grants are not spent for the purpose originally intended and that expenses reported in the financial statements could be improperly stated.

Recommendations

We believe that a more robust post-award monitoring program is needed. Accordingly, we recommend that the Chief Financial Officer:

1. Revise the fiscal year 2005 risk assessment model so that it identifies all known high risk awards;
2. Develop and begin implementing a plan for required baseline and advanced monitoring of all grantees;
3. Develop a corrective action plan to address the suggestions in the "Overall Assessment Opportunities for Improvement" section in the *Post-award Monitoring Assessment* Report, dated March 2004; and
4. Increase the resources dedicated to post-award monitoring. This should include increasing the number of professionals fully focused on post-award monitoring, performing more desk reviews and site reviews, and devoting more time to each site review.

Management's Response

See Exhibit III.

Auditors' Comments

We continue to believe that the lack of an effective post-award monitoring program creates a risk that grant funds are not spent for the purpose originally intended and that expenses reported in the financial statements could be improperly stated. The purpose of this finding is to convey the continuing limitations of the policies and procedures implemented to date. Management has taken little action to our previously issued recommendations. NSF's consultant reported concerns similar to ours in their *Post-award Monitoring Assessment* report, dated March 2004. Further, although the NSF OIG plays a support function in post-award monitoring, the primary responsibility for monitoring grantees rests with NSF. Therefore, we continue to recommend that management take steps as recommended above to strengthen the post-award administration program.

04-02 Contract Monitoring

NSF does not adequately review public vouchers submitted by contractors receiving advance payments to ensure that the reported expenditures are correct and consistent with the contract. Without adequately performing such procedures, misstatements in expenditures may remain undetected. Federal law requires that responsible officials review the public vouchers for accuracy and propriety, correct computations, and authorized purpose under the contractual agreement.

Contractors submit advance requests to NSF's Division of Financial Management (DFM). These advance requests are evaluated by DFM and the contracting officer's technical representative (COTR) to determine whether funds are available. The contractor electronically submits a *Public Voucher for Purchases and Services Other than Personnel* (Public Voucher) on a quarterly basis to DFM. The Public Voucher is supported by project expenditure reports that contain obligation, advance and expense summaries by contract modification and is used to reconcile the amounts advanced to the amounts expended on the contract. DFM uses the information contained in the public voucher to record expenditures incurred on the contract and to reconcile the expenditures to the outstanding advance payment balance in NSF's records.

NSF limits its review of the Public Voucher to a comparison of the reported quarterly expenditures with the cumulative advance request amount and does not independently assess the validity and accuracy of the reported contractor expenditures. In addition, neither the contracting officer nor the COTR receive copies of Public Vouchers. Without receiving and reviewing this information, NSF officials cannot determine whether the Public Vouchers are factually and mathematically accurate and in accordance with federal law (31 U.S.C. § 3528 (a)). As a result, over $150 million of annual contract expenditures have not been subjected to an adequate review or approval to determine if these expenditures are appropriate and accurate. In addition, the Public Vouchers do not contain the requisite certification by an official of the contractor's organization stating that the amounts are correct.

Recommendations:

We recommend that the Chief Financial Officer develop procedures to require that:

1. Public Vouchers are adequately certified by the contractors' representatives; and
2. Public Vouchers are distributed to all responsible officials for review and approval. The review and approval process should include periodic testing of a sample of expenditures to actual invoices/other supporting documentation.

Management's Response

See Exhibit III.

Auditors' Comments

We continue to believe that the lack of adequate reviews over these public vouchers creates the potential for abuse or error and elevates the risk of fraudulent activities occurring without detection. The purpose of this finding is to convey the concern that without regular review of the amounts expended, unauthorized expenditures may take place. These public vouchers support the amounts expended on the contract using the funds that were advanced by NSF and are the only source for the contract expenditures recorded by NSF. Further, the magnitude of contract expenditures incurred by NSF elevates the need for NSF to implement appropriate procedures and controls over these expenditures. Therefore, we continue to recommend that management implement procedures to appropriately review these public vouchers.

Exhibit II

Status of FY 2003 Reportable Condition

Post-award Grant Monitoring

NSF continues to need improvement in implementing a comprehensive and systematic risk-based internal grants management program to monitor its post-award phase. Our review of NSF's corrective actions in fiscal year 2004 revealed that NSF needs to fully implement its post-award monitoring procedures, as well as dedicate adequate resources both in terms of additional funding and staffing, before effective monitoring can take place. This is a repeat finding (Finding 04-01) making it the fourth year of reporting post-award grant monitoring as a reportable condition.

NSF Management's Response to Independent Auditor's Report for Fiscal Year 2004

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

November 10, 2004

To: Christine C. Boesz
Inspector General

From: Thomas N. Cooley
Chief Financial Officer

Thomas N. Cooley

Subject: Management's Response to Independent Auditors' Report
Fiscal Year 2004

This memorandum and attachment transmit NSF management's response to KPMG LLP's audit report for fiscal year 2004. We have included detailed responses to the findings as Attachment 1.

SUMMARY

The auditors' report concluded that NSF's financial statements as of and for the years ended September 30, 2004 and 2003 are presented fairly, in all material respects, and are in conformity with generally accepted accounting principles in the United States of America (unqualified opinion). Their consideration of internal control over financial reporting found two reportable conditions: post-award monitoring and contract monitoring. NSF management feels that neither finding establishes a reportable condition – i.e. a significant deficiency that could adversely affect NSF's ability to record, process, summarize, and report financial data.

Reportable Conditions

The auditors' report identified the following as reportable conditions:

- Post-Award Monitoring – NSF's post-award administration structure and resources are inadequate.

NSF Management Response: Based on NSF's comprehensive grant administration process, recent improvements to that process, and the auditors' failure to support this finding or their recommendations regarding post-award monitoring, management strenuously disagrees with both the finding and the level assigned to it. Award monitoring is appropriately classified as a management challenge for FY 2005.

- Contract Monitoring – NSF does not adequately review public vouchers submitted under the Antarctic logistical services contract to ensure that the reported expenditures are correct and consistent with the contract.

NSF Management Response: The finding does not support the level of a reportable condition. On an advance-payment contract, such as the Foundation's contract with Raytheon for Antarctic support (the contract reviewed in the course of this year's audit), no payment is made to the contractor based on the submission of a public voucher. The public voucher is merely the vehicle which prompts the reclassification of amounts from advances to expenditures. Multiple controls are in place for overseeing the contract.

NSF management appreciates the cooperation extended by both the OIG and KPMG LLP throughout the audit process. We will continue with our collaborative efforts in maintaining excellence in financial management, and providing the highest quality of business services to our customers and stakeholders.

cc: Dr. Warren M. Washington
cc: Dr. Arden L. Bement, Jr.

Attachment 1

Attachment 1

Management's Responses to Auditors' Report

Management's Response to 03-01 Post-Award Monitoring

Management strongly objects to the characterization of this as a "repeat finding" as well as its categorization as a reportable condition. Though titled as it has been for the past three years, the substance of the finding and attendant recommendations have changed annually, owing to NSF's substantial progress in strengthening an already robust program of post-award administration.

In the FY 2001 audit, the auditors recommended that NSF establish a risk-based post-award monitoring program. NSF did so the following fiscal year. For FY 2002, the auditors critiqued the program and recommended changes. NSF implemented the changes. In FY 2003, the auditors recommended that increased resources be committed to award monitoring, standardization of review processes, and full implementation of the award-monitoring program. NSF realigned staff and resources, fully implemented the post-award program, and improved policies and procedures.

By continuing to cite the agency's approach to post-award management as a reportable condition, the auditors suggest that the agency's focused investment in this area over the past three years has been of no value.

NSF's Award Administration Enterprise

Over the course of its 54 years, the Foundation had developed a comprehensive, dynamic award administration process. The Foundation's programmatic, financial, and administrative expertise is fully used in NSF's "life-cycle" award administration program -- a program that provides oversight of NSF's investment throughout the course of an award -- from solicitation through closeout.

During the pre-proposal stage, all proposal-generating documents prepared by program staff are reviewed by Budget, Finance, and Award Management (BFA) staff, to ensure consistency with federal and NSF policies governing assistance awards.

The merit review process, internationally recognized as the "gold standard" of scientific peer review, next provides scrutiny of the scientific merit and broader impacts of every potential award. Once a funding action is recommended, BFA staff review the financial and administrative terms of the proposed action. This review ensures that each awardee institution has full notice, within its award documents, of administrative and financial requirements. New awardee organizations receive additional scrutiny before being deemed eligible to receive and manage federal funds.

Throughout the post-award period, current management controls reasonably ensure that awardees accomplish program objectives; that resources are used consistent with agency mission; that laws and regulations are followed; and that timely information is obtained and maintained. Internal controls provided by information technology systems assure the receipt of final reports from the awardee. Successful progress under prior funding is a key consideration in determining whether to fund a subsequent award.

During the course of an award, NSF program staff monitor technical effort while BFA staff oversee financial and administrative processes, policies, and practices. Large facilities are subject to the oversight processes outlined in the Facilities Management and Oversight Guide that can be found at: http://www.nsf.gov/pubs/2003/nsf03049/nsf03049.pdf, designed specifically for the particular risks presented by large facilities.

In addition, PART, GPRA, and other assessments validate awards at the outcome point. Each of these activities contributes to the Foundation's comprehensive award monitoring program.

Equally important, BFA provides business assistance to awardees, enhancing awardees' understanding of federal requirements. NSF hosts reverse site visits and training events as opportunities for discussing NSF's programmatic, administrative, and financial policies with the awardee community. BFA and other senior NSF staff present NSF policy and guidelines at a variety of annual professional meetings and regional grant conferences.

Audit responsibility resides with the Office of the Inspector General and other cognizant federal agencies. BFA staff manage audit resolution with the awardee and the Office of Inspector General. Unfortunately, audits referred to BFA for resolution too often focus on expired awards. Results from audits of contemporary awards would be more useful as a method of feedback on the effectiveness of our post award administration and more consistent with the complementary roles of the OIG and NSF.

Over the last three years, NSF has aggressively implemented a range of activities that has fortified NSF's ability to mitigate the risk of an awardee expending federal dollars in violation of federal law or policy. These include:

- Creation of a formal Award Monitoring and Business Assistance Program (AMBAP);
- Realignment of the Office of Budget, Finance, and Award Management including the establishment of the Division of Institution and Award Support,

as well as the more effective deployment of resources in the Divisions of Grants and Agreements and Contracts and Complex Agreements;
- Increased investment of staff and funding in post-award administration;
- Continued enhancement of IT-enabled awards management systems;
- Created a dedicated outreach management position to facilitate communication with the grantee community; and
- Active, award-winning participation in federal-wide efforts to improve accountability and develop responsible, cost-effective eGovernment systems.

From NSF's business assistance efforts and onsite reviews the past two years, NSF has learned that most awardees have adequate systems in place to appropriately manage federal dollars. We have found some shortcomings in the areas of written/consolidated policies and procedures, and cost-sharing allowability and tracking. BFA assists awardees with these areas as well as with establishing indirect cost rates – another area that is challenging to new awardees.

Equally important, since FY 2001 audits of NSF awardees (by the A-133 auditors or by the OIG) have yielded less than $2 million in disallowed costs per year. This is in the context of award outlays of $4,310,941,579 for FY2001; $4,586,255,240 for FY 2002; and, $5,129,724,220 for FY 2003. These extremely low levels of disallowed costs powerfully demonstrate the effectiveness of NSF's post-award administration.

Notwithstanding the Foundation's significant investment in strengthening award administration over the past three years, and the absence of audit findings demonstrating inadequate award administration, the auditors assert significant deficiencies in the Foundation's award administration internal control that could adversely affect NSF's ability to record, process, summarize, and report financial data consistent with the assertions of management in the financial statements. The Foundation strongly disagrees with the finding, the stated deficiencies and the recommendations.

The finding fails to develop the criteria as prescribed by the General Accountability Office Yellow Book: "criteria are the standards, measures, expectations of what should exist, best practices, and benchmarks against which performance is compared or evaluated." Without criteria, one cannot independently assess whether a deficiency exists much less whether it has been corrected.

Management disputes each of the deficiencies stated in the finding. The above summary of NSF's award administration enterprise, coupled with the below responses to the four recommendations provide management's response to the finding, the deficiencies, and the recommendations.

Recommendation One: Revise the fiscal year 2005 risk assessment model so that it identifies all known high-risk awards.

This recommendation baffles management. If an award is known to be high-risk, one needn't rely on a model to identify the award as high risk. Additionally, by definition, a model is a tool that allows approximate identification of a particular target group – in this case, high-risk awardees. In addition to the model, professional experience and judgment inform a determination of an award's classification as high risk.

Recommendation Two: Develop and begin implementing a plan for required baseline and advanced monitoring of all grantees:

As explained above, NSF employs a comprehensive award administration program. All awardees are subject to the oversight and review of that award administration process. Additional scrutiny and assistance are offered to high-risk awardees.

Recommendation Three: Develop a corrective action plan to address the suggestions in the "Overall Assessment Opportunities for Improvement" section in the *Post Award Monitoring Assessment Report*, dated March 2004;

In the referenced report, NSF's contractor – IBM Business Consulting Services (IBMBCS) – stated, "Overall, NSF has a sound post-award monitoring program, which provides valuable oversight and assistance to a risk-based sample of institutions." While the consultant identified opportunities for improvement, it also noted, "NSF has begun to pursue many of these opportunities in FY 2004, a promising indication that NSF's post-award monitoring program will improve over time." A corrective action plan is certainly not required for addressing opportunities for improvement identified in an independent report. Management welcomed the input from IBMBCS and will determine whether and when to implement recommended changes.

Recommendation Four: Increase the resources dedicated to post-award monitoring. This should include increasing the number of professionals fully focused on post-award monitoring, performing more desk reviews and site reviews, and devoting more time to each site review.

Recent increases in FTEs have been strategically placed throughout NSF to assist in both pre-award and post-award activities.

NSF management believes strongly that having staff serve in complementary functions brings synergies that would be lost if they were narrowly focused. DIAS is building the Cost Analysis and Audit Resolution Branch (CAAR) specifically to provide leadership and expertise in three complementary functions: Award Monitoring, Cost Analysis and Indirect Costs, and Audit Resolution.

NSF management greatly strengthened the AMBAP Guide during FY 2004 by clearly defining roles and responsibilities, documenting required pre-visit activities and procedures, and clearly delineating core review areas and allowing for targeted reviews based on risk. These review areas are further enhanced by on-site review modules that have five sections as follows: Introduction, Reference Documents, Objective of Review, Areas of Concern, and Detailed Procedures. There are modules for general management, accounting and financial system reviews, time and effort records for personnel, fringe benefits, travel, consultants, cost sharing, participant costs, indirect costs, FCTR reconciliation to the accounting system, procurement, subrecipient monitoring and property. Furthermore, the Guide delineates necessary award documentation that should be reviewed, describes consultation with program officials, delineates expectations for entrance and exit meetings, and has a section on planning for the site visit report. Reports and files have been standardized for consistency of review and reporting.

NSF management strongly believes that the length and staffing of site visits is sufficient to achieve our objectives. These reviews include an on-site component as part of a comprehensive review that actually begins with a desk review prior to the site visit. This desk review enhances the on-site portion of the review because significant analytical work and coordination with Program Officers takes place before the on-site visit begins. These reviews are not intended to be audits and should not be held to the same standards for duration and detail as an audit.

The final paragraph in the audit report that appears just before the recommendations should be removed. Discussing two NSF OIG audits that have not been formally issued is not appropriate. Until the reports are referred to NSF management for resolution and an NSF management decision is made, there is no way to estimate, which questioned costs will be sustained.

Based on NSF's comprehensive award administration process, recent improvements to that process, and the auditors' failure to support a finding or their recommendations regarding post-award administration, management strenuously objects to both the finding as drafted and the level assigned to it. Award administration is appropriately classified as a management challenge for FY 2005.

Management's Response to 03-02 Contract Monitoring

NSF Management disagrees with the finding and the second recommendation. The auditors' statement that over $150 million of annual contract expenditures have not been subject to review or approval is, at best, misleading.

Although the finding uses the plural "contracts", it is based solely on the examination of the contract for Antarctic logistical services and so our response will focus on that award.

Pursuant to the NSF Act (42 U.S.C. 1870(d)), the Raytheon Technical Services Company LLC, Polar Services (RPSC) contract utilizes advance payments, consistent with the Federal Acquisition Regulation (FAR) clause 52.232-12, Advance Payments. [1] This FAR clause does not require the use of invoices or vouchers when a letter of credit is utilized. FAR 52.232-12(a) states, "If a letter of credit is used, the Contractor shall withdraw cash only when needed for disbursements acceptable under this contract and report cash disbursements and balances as required by the administrative office."

In accordance with the contract, RPSC receives weekly cash advance drawdowns. The drawdowns are secured by a $10 million corporate guarantee, which substantially reduces any risk to the U.S. Government. The drawdowns are supported by project reports estimating anticipated costs. The drawdowns are reviewed by the technical, contract and financial offices.

Since drawdown amounts are reviewed, the actual amounts showing on the public voucher that have not been reviewed are only the expenses that were not included in the drawdown request. The average net weekly timing differences (between the cumulative quarterly drawdowns and vouchers) for the four quarterly reports submitted in FY 2004 were $2,905,538. This amount is at odds with the $150 million claimed in the finding. Additionally, in only two of the quarters did RPSC expenditures exceed drawdowns.

No payments are made based on the public vouchers submitted by RPSC. The Contracting Officer simply selected the voucher as the accounting mechanism to report cash disbursements and balances, consistent with FAR 52.232-12(a). The public voucher, then, is the accounting vehicle that prompts the reclassification of payments from advances to expenses. Because no payments are made based on these public vouchers as provided in section 3325 of title 31 of the United States Code, the certification requirement in section 3528 (a) is irrelevant.

Submission of the public voucher by an authorized RPSC representative is deemed an electronic certification and signature by DFM. This will be formalized under the contract.

[1] RPSC is one of a small number of contracts in which the agency utilizes advance payments.

The finding describes the DFM process related to contract monitoring but fails to mention the controls in place in both the contracts and technical offices for overseeing contract expenditures.

Copies of RPSC's drawdown requests are sent to the Division of Contract and Complex Agreements (DCCA) and the Office of Polar Programs (OPP). DCCA and OPP review the drawdown for reasonableness based upon knowledge of past and planned expenditures and trends it has observed over time.

Additionally, DFM notifies DCCA, if the quarterly reconciliation reflects costs incurred against a project that has expended all of its funding or against line items known to be complete. DCCA addresses any problem with RPSC, negotiates resolutions, and advises DFM on recording proper expenditures.

Ultimately, DCCA relies on audit activities and reviews to assure that costs incurred are allowable, reasonable, and allocable to the contract. FAR clause 52.216-7, Allowable Costs and Payment, requires an annual cost incurred audit. DCCA has repeatedly requested that our Office of Inspector General (OIG) undertake audits for this contract and is pleased that OIG did agree to start a cost incurred audit in FY 2004. These cost incurred audits are the appropriate mechanism for detecting misstatements in expenditures; expenditures are considered final only after the completion of the incurred cost audit.

Additional controls under the RPSC are provided within DCCA. These include:

- Business System Reviews:
  - → A business systems review addressing RPSC purchasing, property and personnel practices.
  - → A second review addressing RPSC purchasing, accounts payable and personnel compensation practices.
- Subcontract Consent – To the extent that NSF has not granted purchasing authority to RPSC, DCCA reviews and must consent to RPSC subcontracts prior to their being awarded.
- Non-Payment of Subcontractors – DCCA is required to review subcontractor assertions of non-payment by RPSC and take action to protect the Government's interests.
- Annual Program Plan – DCCA oversees OPP's efforts to develop the Annual Program Plan in conjunction with RPSC, establishing the contractor's work requirements for each Government fiscal year. DCCA is

also the final approval authority for the Program Plan and any changes thereto.

- Special Program Reviews – DCCA supports and participates in special program reviews conducted by OPP (e.g., quarterly SPSE/SPSM reviews, ad hoc medical program review).

- Value Engineering Change Proposals – DCCA is responsible for accepting and negotiating any VECP's.

- Subcontracting Plan – DCCA administers RPSC's subcontracting plan for this contract.

Additionally, the Office of Polar Programs (OPP) centrally monitors the Raytheon contract and operations. The office monitors the project through a wide variety of methods and techniques. In addition to the COTR, seven OPP Program Officers are responsible for the budget development and oversight of each of the major functional areas of the contract, which includes performance and delivery of tasked services. The monitoring of the contract by OPP provides additional controls over contract expenditures.

- Financial Reporting – Financial reporting is supplemented through the Polar Operations Financial Management System (POFMS) through which RPSC reports expenditure information monthly. Additionally, The Deputy Section Head, Polar Research Support, who is also the Contracting Officer's Technical Representative on the NSF/RPSC contract, monitors expenditures through monthly financial status reports submitted by RPSC and through constant, near-daily interaction with RPSC's controller.

- Contractor Performance – Video-teleconferences are conducted quarterly between RPSC and OPP personnel to review contractor performance and discuss anticipated activities for the next 90 days.

- Annual Planning Conference – A planning conference is held annually to plan for future work and address continuing performance issues.

- Annual Program Plan – OPP and RPSC develop the Annual Program Plan, setting forth required work efforts and cost estimates for all activities anticipated for each fiscal year.

- Worksite Oversight – OPP assigns personnel (both operational and scientific) to various locations across the geographical area of operations (i.e., McMurdo Station, Amundsen-Scott South Pole Station, Palmer Station, and Christchurch, NZ) to oversee RPSC activities.

- Performance Evaluation – OPP annually evaluates the contractor's performance via an extensive list of performance metrics that are reviewed and updated annually. This makes up 75% of the performance score. The balance is a qualitative assessment of project management, and innovation. The total score is used to determine the contractor's annual fee.

- Engineering Support – To oversight more technical aspects of construction and engineering, OPP teams with other Federal agencies such as the Pacific Division (PACDIV) of the Naval Facilities Command and the Cold Regions Research and Engineering Laboratory of the Army Corps of Engineers to provide architectural, and engineering expertise to oversight design, and construction.

- Construction Inspection – On-site inspection of construction is done via a Title II inspector reporting to NSF via PACDIV.

- Project Feedback – Each science project supported in the field is debriefed at the completion of the field portion of their project and therefore provides their assessment to OPP of the support received from RPSC.

- Program Reviews – OPP conducts regular program reviews for projects of greatest significance (e.g., SPSE/SPSM and IceCube), and ad hoc program reviews addressing other contract performance matters (e.g., medical program) as required. Earned Value Management techniques are employed for projects that require significant budgetary resources.

Management disagrees with the contract monitoring finding and the second recommendation. Controls over expenditures are in place at the time of drawdown and through the term of the contract. The annual incurred cost audit is the appropriate mechanism for testing of expenditures against supporting documentation.

IV. OTHER REPORTING REQUIREMENTS

OTHER REPORTING REQUIREMENTS

Debt Collection Improvement Act of 1996
Net Accounts Receivable totaled $23,972,447 at September 30, 2004. Of that amount, $23,875,393 is receivable from other federal agencies. The remaining $97,054 is receivable from the public. NSF fully participates in the Department of the Treasury Cross-Servicing Program. In accordance with the Debt Collection Improvement Act, this program allows NSF to refer debts that are delinquent more than 180 days to the Department of the Treasury for appropriate action to collect those accounts. In FY 2004 OMB issued M-04-10 Memorandum on Debt Collection Improvement Act Requirements which reminded agencies of their responsibility to comply with the policies for writing-off and closing-out debt. Based on this memo, NSF has now incorporated the policy of writing-off delinquent debt more than two years old. Additionally, NSF seeks Department of Justice concurrence for action on items over $100,000.

Civil Monetary Penalty Act
There were no Civil Monetary Penalties assessed by NSF during the relevant financial statement reporting period.

Prompt Payment Act
NSF continues to strive for the highest levels of electronic fund transfers (EFT) payments required by the Prompt Payment Act. Payroll, vendor and grantee payment transactions are made by EFT. Only payments made to foreign banks are made by paper check. Our FastLane system utilized for grants enables grantees to draw cash as required for execution of the grant. Interest payments for commercial vendors under the Prompt Payment Act in FY 2004 are $11,360.04.

Cash Management Improvement Act (CMIA)
In FY 2004, NSF had no awards covered under CMIA Treasury-State Agreements. NSF's FastLane system with grantee draws of cash make the timeliness of payments issue under the Act essentially not applicable to the agency. No interest payments were made in FY 2004.

Patents and Inventions Resulting From NSF Support
The following information about inventions is being reported in compliance with Section 3(f) of the National Science Foundation Act of 1950, as amended [42 U.S.C. 1862(f)]. There were 1,006 NSF invention disclosures reported to the Foundation either directly or through NIH's iEdison database during FY 2004. Rights to these inventions were allocated in accordance with Chapter 18 of Title 35 of the United States Code, commonly called the "Bayh-Dole Act."

Management Challenges
As required by the Reports Consolidation Act of 2000, the following is the Inspector General’s memorandum addressing NSF’s FY 2005 management challenges. It is followed by the Director’s response and a report on actions the Foundation has undertaken in the past year with respect to management challenges identified by the IG in FY 2004.

NATIONAL SCIENCE FOUNDATION
4201 Wilson Boulevard
ARLINGTON, VIRGINIA 22230

OFFICE OF
INSPECTOR GENERAL

October 15, 2004

MEMORANDUM

To: Dr. Warren Washington
Chair, National Science Board

Dr. Arden Bement
Acting Director, National Science Foundation

From: Dr. Christine C. Boesz
Inspector General, National Science Foundation

Subject: Management Challenges for NSF in FY 2005

In accordance with the Reports Consolidation Act of2000, I am submitting our annual statement summarizing what the Office of Inspector General (OIG) considers to be the most serious management and performance challenges facing the National Science Foundation (NSF). We have compiled this list based on our audit work, general knowledge of the agency's operations, and the evaluative reports of others, such as GAO and NSF's various advisory committees, contractors, and staff.

The challenges are unchanged from last year, mainly because they reflect areas of fundamental program risk that continue to pose obstacles to NSF's accomplishment of its mission. They will therefore require ongoing attention from NSF management over the long term. We have duly noted NSF's progress over the last year on many of the challenges listed, although much remains to be done.

The 11 specific challenges fall into five general categories, the first four of which are linked to the President's Management Agenda: 1) strategic management of agency resources, 2) improved financial performance, 3) expanded electronic government, 4) budget and performance integration, and 5) program-specific challenges.

If you have any questions or need additional information, please call me at 703-292-7100.

1. Strategic Management of Agency Resources

Workforce Planning and Training

Workforce planning continues to be one of the most serious challenges facing NSF. Since 1999 the number of proposals processed has increased by 40 percent, while the number of program officers assigned to their review has remained relatively flat. Last year alone, the number of proposals increased by 14 percent to 40,075, the largest annual percentage increase in over a decade. The quantity of proposals transmitted to NSF is perhaps the single best indicator of its overall workload. According to NSF, program officers now spend 55 percent of their time on merit review, leaving less time available for other important responsibilities such as award management and oversight and program planning[1].

NSF's reliance on "non-permanent" personnel is another area of concern. Forty-seven percent of NSF's 700 science and engineering staff are either visiting personnel, temporary employees, or intermittent employees. Visiting personnel make an important contribution to NSF's mission by enabling the agency to refresh and supplement the knowledge base of its permanent professional staff. But managers who serve at NSF on a temporary basis frequently lack institutional knowledge and are less likely or able to make long-term planning a priority. In fact NSF's *Business Analysis* project (a multi-year review aimed at reengineering the agency's core business processes) reports that NSF in general is spending less time on forward-looking activities such as strategic planning and program development. Moreover, there are administrative costs that NSF incurs in recruiting, hiring, processing, and training personnel that rotate every 1 to 4 years. In FY 2004, we conducted an audit that identified the additional salary, fringe benefits, travel and other costs of visiting or temporary personnel, and found three areas where NSF could improve its administration of the programs[2]. Therefore, while visiting personnel are an important resource for NSF, the agency must continually balance the benefits of their services against the additional costs involved.

The agency's response to these and other workforce issues is being formulated as part of the *Business Analysis*, which is scheduled for completion by the end of FY 2005. In FY 2004, NSF initiated an agency-wide workforce planning effort based on the findings of the business analysis to date. NSF's Human Capital Management Plan, which was delivered in December 2003, integrates and links Human Capital activities to the NSF business plan and to the Human Capital Assessment and Accountability Framework provided by the Office of Personnel Management. While the current plan provides a roadmap for identifying NSF's future workforce needs, the needs themselves are still in the process of being defined.

[1] Report to the National Science Board on NSF's Merit Review Process FY 2003 (May 2004)

[2] Audit of Costs Associated with Visiting Personnel, July 23, 2004, OIG 04-2-006. Opportunities for improvement cited in the report include consulting income documentation, IPA pay computations, and VSEE cost of living adjustments.

Administrative Infrastructure

A shortage of administrative resources continues to hinder NSF's staff from keeping pace with its growing workload. NSF states that over the past year it has leased an additional 26,576 square feet of space and the travel budget increased from $4.32 million in FY 2003 to $6.05 million in FY 2004 to support the merit review process and increase oversight activities. Management reports that it conducts ongoing assessments of space management and allocation in addition to its regular budget analysis and planning activities. It also encourages video conferencing and telecommuting as methods of leveraging scarce administrative resources.

While these efforts provided some relief, more than a third of the management control weaknesses cited by NSF's managers in the agency's FY 2004 controls assessment involves a shortage of human or administrative resources. Space remains a critical issue, impeding the recruitment of quality staff and the ability to store sensitive documents. In some cases, program officers are sharing cubicles, while contractors are located in file rooms. Travel funds were repeatedly cited as inadequate for the purpose of properly overseeing existing awards. NSF must make it a priority to allocate more of its funding for administrative resources in order to maximize the effectiveness of staff.

2. Improved Financial Performance

Management of Large Infrastructure Projects

NSF's investment in large facilities and infrastructure projects presents management with a number of budgetary and operational challenges. The construction of projects such as telescopes, research equipment, supercomputing databases, and earthquake simulators are inherently risky due to their complex design, cutting-edge technology, and expense. A disciplined project management approach is essential to success; at the same time, modifications are sometimes necessary when developing a new technological tool. NSF spends approximately $1.1 billion a year on these scientific tools, with many of the projects costing as much as several hundred million dollars each.

NSF continues to make measured progress towards addressing the recommendations we offered during two past audits of large facility projects[3]. Our audit reports identified the need to improve oversight of large projects by enhancing organizational accountability, providing better guidance (particularly in the area of financial management), and improving NSF's systems to capture complete information about project costs. During the past two years, NSF has hired a Deputy Director for Large Facility Projects and developed more detailed guidance to support its *Facilities Management and Oversight Guide.*

[3] Audit of the Financial Management of the Gemini Project, December 15, 2000, OIG 01-2001
Audit of Funding for Major Research Equipment and Facilities, May 1, 2002, OIG 02-2007

However, we remain concerned that NSF does not have adequate staff assigned to oversee and manage large projects, and that those assigned may not have sufficient resources or authority to carry out their responsibilities. In addition, many of the modules intended to support the *Facilities Management and Oversight Guide* are still under development, including those pertaining to financial management. Finally, the problem of recording and tracking the full costs of projects has not yet been addressed. A contract to enhance the financial system for tracking life cycle costs of Major Research Equipment and Facilities Construction projects was awarded at the end of FY 2004.

Post-Award Administration

Since FY 2002, independent audits of NSF's financial statements have cited weaknesses in the agency's post-award monitoring of grantee institutions as a major deficiency. An effective post-award monitoring program should ensure that: awardees are complying with award terms and conditions and federal regulations; adequate progress is being made toward achieving the objectives and milestones of the program; and expenditures listed on NSF's financial statements are accurate. While NSF has taken some steps over the past three years toward establishing a risk-based program for post-award monitoring of its grants, more needs to be done. NSF must broaden its approach to award monitoring to go beyond high-risk awardees, develop more effective award oversight guidance, and increase the coordination between program and financial officers.

In FY 2004, NSF reorganized the Office of Budget, Finance and Award Management to establish the Division of Institution and Award Support. The Division's role is to manage federal funds awarded by NSF, including providing financial and administrative assistance to institutional awardees and NSF directorates to implement business models, processes and practices. In addition, NSF has increased its outreach to at-risk institutions and developed creative ideas for partnering with other agencies to monitor common grantees. Together these actions represent progress toward addressing post-award administration issues at NSF.

However, NSF's approach to post-award administration focuses too narrowly on high-risk awardees. Because the agency considers only 42 out of its 34,011 awards to be high-risk, the impact of the Award Monitoring and Business Assistance Program (AMBAP) is effectively limited to 0.1% of its award portfolio. To broaden the scope of its activities, NSF should apply more cost-effective monitoring procedures such as desk reviews of reports from awardees and computer-assisted screening to medium and low risk awardees on a random basis.

NSF also issued an award-monitoring guide in FY 2002 and a revised site-visit guide in FY 2003 for agency staff; however, both guides need improvement. In an assessment of NSF's post-award monitoring efforts, IBM Business Consulting commented, "the staff did not follow or only loosely followed the AMBAP guide noting that it was too broad and extensive to be implemented in a realistic timeframe." Meanwhile, the site visit guide does not address many important details for conducting a review, such as how and what types of reviews should be conducted, and therefore does not assure quality or consistency.

The site-visit guide does not standardize documentation for performing or recording the results of the review, thereby increasing the risk that procedures may not be consistently applied. IBM noted that this lack of documentation undermined the follow-up of site visits, and recommended standardized procedures for writing the report, following up, and maintaining documentation in a database for analysis of overall findings. Furthermore, in a recent audit report we cited close coordination between the program and administrative offices as an effective practice of organizations engaged in post-award monitoring and oversight[4]. NSF should seek to develop one comprehensive approach to award monitoring that would include both a financial and programmatic component.

Finally, the Improper Payments Improvement Act of 2002 requires agencies to review all programs and activities annually and identify those that are susceptible to significant improper payments. In May of 2003, the Office of Management and Budget (OMB) issued guidance requiring agencies to statistically sample those programs at high risk for improper payments and establish baseline error rates and improvement targets for future reporting. NSF, like other grant making agencies, is challenged to implement the OMB requirements. Since improper payments include those made by NSF's awardees and subawardees, designing a methodology to statistically sample the voluminous number of payments made by NSF's 2500 awardees is complex.

<u>Cost Sharing</u>

Cost sharing refers to the contribution of financial or in-kind support by recipients of federal grants to the cost of their research projects. Federal guidelines require that the accounting of cost-shared expenses be treated in a manner consistent with federal expenditures. However, our past audit work indicates that many awardees do not adequately account for or substantiate the value of cost-shared expenditures, raising questions about whether required contributions are actually being made.

Two years ago, NSF changed its policy to require cost sharing above the statutory requirement *only when there is tangible benefit to the awardee*, such as a facility that will outlast the life of the research project or income derived by the awardee as a result of the research. There is evidence that the new policy has effectively curtailed new cost sharing agreements. The number of new awards that include cost sharing declined from 3346 in FY 2001 to just 1556 during FY 2004. During the same period, the amount of promised cost sharing declined by 54 percent. Less cost sharing reduces the potential for compliance problems and the burden on the agency for correcting them.

While reducing cost sharing requirements mitigates the challenge, it does not eliminate it since some cost sharing is required by statute and some is voluntary. The agency states that it is providing greater oversight in the risk assessment protocol and site

[4] Management Framework: Award Monitoring; September 30, 2003; OIG 03-2-015

reviews. Cost sharing is also identified as a high-risk factor and a focus of the new protocol. It is too early to assess the effectiveness of these efforts. In October, the agency acted to eliminate future cost sharing except for what is required by statute. The policy is likely to further reduce the amount of cost sharing entered into by the agency but to what extent is not known. We will continue to monitor the substantial amount of cost shared funds still outstanding and reassess changes brought about by the new policy.

3. Expanded Electronic Government

Information Security

NSF must have a comprehensive and effective information technology (IT) security program both to meet Federal requirements and to mitigate risks that threaten the successful operation and development of its IT systems. These systems and the information they contain need to be protected from unauthorized access, use, disclosure, disruption, modification, and destruction. Over the past several years, NSF has taken a number of steps to strengthen its IT security program. For example, it formed a Security Working Group comprised of managers from across the agency to set NSF policy and procedures, and established a new security office to implement them. All staff are required to complete security awareness training each year. NSF has undertaken penetration testing of its systems in order to find and address vulnerabilities more quickly. In addition, the agency completed the certification and accreditation of 18 of its 19 general support systems and major applications by the end of FY 2003, and in FY 2004 began a triennial cycle of recertification of all systems. Also in FY 2004, the Office of Polar Programs completed a comprehensive inventory of the systems supporting the U.S. Antarctic Program (USAP), classifying them as one general support system and two major applications, rather than one major application as they had been classified in 2003. The agency plans to certify and accredit those systems by the end of CY 2004,

Despite these accomplishments, IT security is an ongoing challenge for NSF, as for all federal agencies, and some weaknesses remain. The OIG's FY 2004 Federal Information Security Management Act (FISMA) report issued on June 30, 2004, noted that the systems serving the USAP still had not been certified and accredited, information security policies had not been established and implemented, and required background investigations for key information security personnel had not been performed. Our review also found that NSF had not updated its risk assessments and security plans to account for the migration of its payroll and personnel systems to another federal agency, NSF's disaster recovery plan had not been fully tested, and access controls could be strengthened. These vulnerabilities could result in unauthorized access to and modification of financial, programmatic, and other sensitive information; loss of assets; health and safety risks; and disruption of critical operations and the ensuing costs associated with business downtime and recovery. NSF has reported that it has made significant progress in all these areas since our review.

4. Budget and Performance Integration

GPRA Reporting

Congress enacted the Government Performance and Results Act (GPRA) in 1993 as a means of making government more results oriented. The Act requires each agency to develop a strategic plan that establishes specific goals against which its performance can be objectively evaluated. To further focus government agencies on results, the President's Management Agenda requires that performance be considered in funding and management decisions and that programs work toward continual improvement. In support of these objectives, OMB introduced the Program Assessment Rating Tool (PART) to provide a framework for evaluating performance and generate program effectiveness ratings for Congress to consider when making budget decisions.

GPRA poses a significant challenge to agencies involved in science or education research because the benefits are difficult to measure and may only become apparent over time. Moreover performance measures must be carefully formulated so as not to discourage appropriate high-risk research that offers the potential for a "transformational" discovery. Because of the complexity involved in measuring the benefits of research, a full discussion of the methodology employed in reporting performance results should be prominently included in each performance report. Last year we issued an audit report on the Committee of Visitors panels that are used by NSF to provide qualitative data for GPRA reporting. We found that some of the limitations associated with the use of the data were not fully disclosed in the agency's GPRA report. Further, we noted that NSF relied on judgmentally selected "nuggets" (research success stories) as evidence that it has achieved its GPRA goals, again without full disclosure. Our report indicated that a user of NSF's performance report might infer that the nuggets are representative of the performance of the entire portfolio, and the credibility of the reports could become compromised. We recommended that NSF more clearly disclose the limitations associated with both issues.

In FY 2004, NSF has expanded its disclosure of the methodology it employed and while this disclosure has resolved the issues raised in the audit report, we continue to believe NSF should report on the performance results of its entire research portfolio. To do this, NSF will need to develop a knowledge management system to capture, categorize and analyze the research results.

Cost Accounting

An effective accounting and reporting system is essential to attaining the objectives of the President's Management Agenda and complying with GPRA. However, NSF's current information systems do not readily provide the cost accounting information necessary to link its costs to program performance. While NSF has been a leader in generating annual financial statements that have received "unqualified" audit opinions for the past six years, it is only beginning to focus on developing a cost accounting system to address its program performance evaluation and reporting needs.

For the past four years, each financial statement audit has recommended that NSF identify management cost information requirements for each organizational unit or program, establish activities/projects and corresponding outcomes within each unit, and develop and report cost efficiency measures that align with outputs and outcome goals. The auditors have also noted that NSF's systems do not track complete cost data for projects in which the costs are borne by more than one NSF directorate or organizational unit. Consequently, program officers cannot monitor the full cost of a project.

In FY 2004, NSF management developed a Budget, Cost and Performance Integration (BCPI) work plan that was approved by OMB. The agency states that cost accounting is a key element of the BCPI plan. A crosswalk was developed between the costs accounted for in the appropriations reporting system and those in the new programmatic reporting framework. When NSF is able to interface the crosswalk with the Financial Accounting System, the agency will be able to identify the full direct costs of its programs and projects, including its large facility projects. However, the plan does not provide for tracking costs of NSF's internal business processes and activities such as the cost of soliciting grants, conducting merit reviews, or performing post-award grant administration. Identifying the costs of these internal functions is important for evaluating NSF's performance accomplishments under its organizational excellence strategic goal.

5. NSF Program-Specific Challenges

Management of U. S. Antarctic Program

As part of its mission, NSF finances and supports Antarctic research, providing over $197 million in FY 2004 for research activities in Antarctica. Its single largest award is a contract for Antarctic logistics and support services valued at $1.116 billion over 10 years. Each year the United States Antarctic Program (USAP) deploys about 700 people to the continent to perform scientific research and another 2,500 to provide logistics in support of this research, including the operation and maintenance of year-round research stations. Those deployed include research teams from academia, industry, and government, military personnel, and contractor employees.

NSF's contract for Antarctic support contains many inherent risks and complex requirements. The contractor must have technical expertise in a variety of disciplines, including medical and environmental engineering, and is responsible for managing a number of subcontractors in the U.S. and overseas. Therefore, NSF's oversight of the programmatic and financial performance of this large contract is itself a formidable challenge, requiring considerable administrative and technical skill. The remote and harsh Antarctic landscape leaves little margin of error for many basic support activities. For example, weaknesses in the USAP information system were cited as a reportable condition during the agency's most recent IT audit since they could potentially disrupt essential life support or science activities. The agency also has yet to resolve an outstanding recommendation from an audit report issued last year aimed at strengthening the USAP's capital asset management program and renewing its aging infrastructure. The issue involves how best to assure funding is available to maintain the infrastructure in a timely manner. NSF comments that it has sustained an ongoing effort to maintain and upgrade facilities at McMurdo and Palmer Stations, albeit at a slower pace than is ideal, and affirms that the USAP is providing a safe and healthy environment.

A recent audit identified instances of overbilling by the contractor. Consequently, the OIG is planning to conduct a financial and compliance audit of the Antarctic Logistics and Support Contractor that will include a review of internal controls over cash management and compliance with various fund restrictions. We will also continue to monitor its information systems.

Broadening Participation in the Merit Review Process

The merit review process is a cornerstone of NSF's operations, ensuring the integrity and fairness of the proposal review process and maintaining the high standards of excellence for which NSF is known. NSF was able to fund only 27 percent of the more than 40,000 proposals it received in FY 2003. The agency decides which research, engineering and education projects to fund by subjecting most proposals to a rigorous merit review process that ensures each will receive knowledgeable and unbiased consideration based on specific criteria. It is largely through the merit review system that NSF adds value to the national research and education enterprise. One objective in NSF's Strategic Plan is to increase the participation of underrepresented groups and institutions in all NSF programs and activities, including merit review. Developing the untapped potential of underrepresented groups should lead to expanded individual opportunity and improved national competitiveness and prosperity.

During FY 2003, the percentage of underrepresented groups that received awards remained steady, with female and minority PIs funded at approximately the same rate as the overall proposer population. The number of awards made to minority PIs remains at 5 percent of total awards. Beginning in FY 2001, NSF started requesting demographic data from all merit panel reviewers to determine the extent of participation of underrepresented groups in the NSF reviewer population. However, NSF cannot legally require reviewers to provide demographic information. In FY 2003, out of a total of 40,020 reviewers who returned reviews, only 5,336 provided demographic information. Thirty-four percent of those indicated they were members of an underrepresented group. In FY 2004, NSF continued to use seminars and workshops at minority-serving institutions in an effort to expand interest in NSF's programs. Reviewer diversity is emphasized through the use of a large and expanding Foundation-wide reviewer database, explicit policy guidance, mandatory training for all program officers, and directorate-level initiatives. The agency will also continue to request demographic information and adjust the FastLane reviewer module to make it more convenient for reviewers to provide such information.

Math and Science Partnership

NSF has responsibility for the Math and Science Partnership (MSP) program, a key element of the President's initiative, *No Child Left Behind*, aimed at strengthening and reforming K-12 education. In FY 2002 and 2003, NSF awarded a total of $280 million to fund partnerships between school districts, colleges and universities, and other organizations for the purpose of improving math and science education at the K-12 level. NSF has requested an additional $80 million to support ongoing activities of the MSP program in FY 2005. The program poses several challenges for NSF, including the need to facilitate partnerships among institutions that do not normally collaborate, monitor awardees that are unaccustomed to handling federal funds, and ensure that projects are implemented as proposed and have effective evaluation plans that adequately report their impact on student achievement.

In a recent report, we reviewed the evaluation plans for nine of the first 23 MSP projects and found that five had effective evaluation plans. The other four projects in our sample were missing key elements of an effective evaluation process. In response to this finding, NSF plans to enlist the help of evaluation experts to frame a statement of practice to serve as a framework for current and future MSP award recipients. We also recommended that the agency develop a comprehensive management plan for evaluating the MSP program. An award for an external evaluation of the MSP program consistent with the research and development nature of the program was recently made.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE DIRECTOR

November 3, 2004

MEMORANDUM

To: Inspector General, NSF

From: Acting Director, NSF

Subject: Response to the Inspector General's Memorandum on Management Challenges for NSF in 2005

Thank you for your memorandum of October 15, 2004 on the management challenges facing the National Science Foundation in FY 2005.

NSF has a strong record as an efficient and effective organization and continues to build on that tradition. As reflected in our strategic goal for organizational excellence, the Foundation's commitment to high standards applies to its business processes, just as it does to its investments in science, engineering and education. Success in achieving our mission is widely acknowledged. The Foundation's Advisory Committee for GPRA Performance Assessment recently reported that NSF's accomplishments in its organizational excellence goal demonstrate innovation in business processes and attention to continuous improvement in management effectiveness. The President's management scorecard continues to recognize "green lights" for NSF in financial management, electronic government, and R&D investment criteria.

NSF faces an increasing, and increasingly complex, workload. Such challenges are inherent at the frontiers of research and education. The Foundation employs a robust process for identifying and addressing demands on agency staff and systems. Actions undertaken in FY 2004, detailed in the attached report on management challenges, reflect a significant investment of time, effort and resources.

In FY 2005, we will continue to address management challenges based on priority and urgency. We are guided by our long-standing practice of executing a sound, reasoned approach as efficiently as possible, assured that NSF staff commitment to the agency's mission maximizes the Foundation's effectiveness and performance.

Arden L. Bement, Jr.

Attachment

cc: Chair, National Science Board

Attachment

NSF Management Challenges for FY2004 — Agency Actions

NSF MANAGEMENT CHALLENGES FOR 2004

MANAGEMENT CHALLENGE	AGENCY ACTIONS
Workforce Planning and Training	
Planning for NSF's future workforce needs and training large numbers of temporary staff remains a serious problem. The workload of the agency, as reflected by the number of proposals forwarded to NSF for review, has increased by 36% over the past three years, while the agency's permanent workforce has increased just 3.6% over the past 20 years. Although advancements in technology have enhanced productivity across the board, NSF's rapidly increasing workload has forced the agency to become increasingly dependent on temporary staff and contractors to handle the additional work. For the second year in a row, NSF's Management Controls Committee has cited the grim assessments submitted by the directorates and called human capital "a significant concern." In addition, we consider NSF's reliance on temporary personnel, particularly in management positions, to be an area of program risk. According to NSF, 59% of the agency's program officers are in a temporary status, such as rotators from research institutions. Managers who serve at NSF on a short-term basis frequently lack institutional knowledge and are less likely to make long-term workforce planning a priority. NSF's efforts to justify an increase in staff have been impeded by the lack of a comprehensive workforce plan that identifies workforce gaps and outlines specific actions for addressing them. Without such a plan, NSF cannot determine whether it has the appropriate number of people and competencies to accomplish its strategic goals. It was partly for this reason that NSF contracted in FY 2002 for a "business analysis," a multi-year review of its core business processes that will include a human capital management plan. As the business analysis approaches its mid-point, the preliminary assessment provided by the contractor confirms that NSF's current workforce planning activities are limited and identifies opportunities for improvement. The first draft of the human capital management plan is expected to be only a blueprint for developing a process for managing human capital, containing few specific recommendations that will have near-term impact. According to the project schedule, it will be two more years before the plan will identify the specific gaps that NSF needs for justifying budget requests for additional staff resources. We believe that NSF cannot afford to wait that long to address its workforce issues. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	Management embraces workforce planning and training as an exciting challenge. We have chosen not to react hastily to the significant increase in applications and corresponding workload, believing that a hasty response to a complex problem is rarely a wise course of action. NSF is engaged in a multi-year strategic business analysis, which is examining organizational alignment, workforce size, skill mix, potential gaps, and deployment necessary to ensure mission accomplishment. This analysis began in July 2002, and is expected to continue through the end of FY 2005. As part of this effort, NSF is developing and implementing human capital strategies, which address both the needs of the organization and the overall concerns of the President's Management Agenda. Management believes this is the most responsible approach to planning for NSF's future workforce needs. NSF's Human Capital Management Plan (HCMP) integrates and links Human Capital activities to the NSF business plan and to the Human Capital Assessment and Accountability Framework as provided by the Office of Personnel Management. NSF is measuring its progress quarterly on the action strategies contained in the HCMP. In FY 2004, NSF initiated an agency-wide workforce planning effort based on the findings of the business analysis to date. In addition, several studies that are part of the business analysis, such as the Electronic Jacket Human Capital Pilot and the Administrative Functions Study, promise to provide meaningful results for NSF in FY 2005 on the impact of business processes changes on the workforce. Management's difference of opinion with the OIG on the issue of agency use of rotators is well documented. Management does not agree that use of IPAs and other rotators and contractors places agency programs at risk. Rather, management believes that the use of rotators at the Foundation is critical to fulfilling NSF's statutory mandate. The National Academy of Public Administration (NAPA) recently endorsed the continued use of both permanent and temporary personnel at NSF. In an April 2003 report,* NAPA noted the value of rotators to the NSF mission, and found that, generally, NSF has the right mix of rotators and career employees. The report recommended that (1) NSF continue to use rotators in the positions of program officers, managers, and assistant directors; (2) NSF continue to balance the number of rotators and permanent employees based on its experience and the specific requirements of individual positions; and (3) the Director establish and support an ongoing management and executive level knowledge sharing program. Over 70 percent of NSF staff and nearly 50 percent of Science and Engineering staff are permanent. Both rotating and permanent managers at NSF are actively engaged in long-term strategic and resource planning focused on both budget and workforce. *"National Science Foundation: Governance and Management for the Future," NAPA, April 2004 (pp. 91-115).

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Administrative Infrastructure

NSF's directorates again reported as part of their annual certification of the agency's management controls that some of the resources necessary to administer their responsibilities are inadequate. Travel funds and office space remain scarce, and these shortages impede the ability of staff to properly oversee existing awards. Adequate travel funds are necessary to conduct on-site inspections and monitor large infrastructure projects and other awards. The lack of office space adversely affects staff morale, the recruitment of new staff, and the agency's ability to store sensitive documents. If office space is inadequate at current workforce levels, it will severely constrain the agency's ability to add the staff needed to keep pace with its growing workload and budget. The agency states that it is addressing these shortages through budget analyses and planning, assessments of space management and allocation, and increased emphasis on innovative approaches. However, 7 of the 10 directorates cited administrative resource shortages as undermining effective management controls and creating significant concern. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	Management agrees that administrative resources are constrained at NSF. As reflected in the agency's FY 2004 and FY 2005 budget requests, management is seeking to relieve some of the strain caused by the need for additional office space and travel resources through increased investment in both. To provide relief for some of the most critical space shortages, NSF leased an additional 26,576 square feet of space in FY 2004. To continue to support the merit review process and increase oversight activities – as NSF's science and engineering and research programs continue to emphasize more complex, interrelated sets of activities – the NSF travel budget increased from $4.32 million in FY 2003 to $6.05 million in FY 2004. The FY 2005 Budget Request emphasizes this priority by investing an additional $1.21 million, or 20 percent, for a requested total of $7.26 million. In addition to budget analysis and planning, management conducts ongoing assessments of space management and allocation, and encourages innovative and creative approaches to work management, such as video conferencing and telecommuting. In FY 2004, NSF and AFGE Local 3403 completed negotiations on a new telework agreement.

Management of Large Infrastructure Projects

Our audit of the Gemini Project in FY 2001 recommended that NSF improve its oversight and management of large infrastructure projects by, among other things, updating and expanding existing policies and procedures. In FY 2002, we released an audit report of the financial management of NSF's large facility projects that raised additional concerns about their management. The audit, which was conducted at the request of Congress, found that NSF's policies failed to ensure 1) that the projects remained within authorized funding levels and 2) that accurate and complete information on the total costs of major research equipment and facilities was available to decision makers. NSF responded that it would combine corrective actions recommended by this audit with those initiated as a result of the earlier Gemini audit. During the past year NSF has continued to make gradual progress toward completing the corrective action plans. Thus far, the agency has implemented approximately half of the original recommendations, including providing guidance to staff for charging expenditures to the proper appropriations account. In June 2003, NSF hired a new Deputy Director for Large Facility Projects, and in July the agency issued a *Facilities Management and Oversight Guide*. NSF has also begun to offer Project Management Certificate Programs through the NSF Academy to help program officers improve their skills in managing large facility projects. Nonetheless, key actions remain incomplete. Although the agency is planning supplements to the *Facilities Management*	Over the past two years, NSF has strengthened every aspect of its management of large facilities. There are now two permanent staff in the Office of Budget, Finance and Award Management – the Deputy Director for Large Facility Projects (LFP Deputy) and the new Facility Management and Oversight Advisor reporting to the Deputy. The LFP Deputy meets regularly with program officers for Major Research Equipment and Facilities Construction (MREFC) projects. He participates in site visits, cost reviews and operational reviews, and serves on all internal Project Advisory Teams (PATs) for MREFC projects. The Deputy has established the Facilities Panel, a group of NSF staff with project experience in business or technical oversight, that formally reviews and approves the Internal Management Plans for large facility projects. The Facilities Management & Oversight Guide, released July 2003, is continually updated to reflect policy changes and lessons learned. It is available at: http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf03049. During FY 2004, additional supporting material was developed providing more detailed information and instruction, including modules on: Roles & Responsibilities of NSF Staff Involved in the Management & Oversight of Large Facilities; Risk Management Guide; Definition & Use of Contingency Resources in NSF Facility Construction; and Guidelines for Development of Project Execution Plans. A module on Financial Management is expected to be released shortly; others will follow. For training , the LFP Deputy is working with the NSF Academy

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and Oversight Guide, it does not yet address the problem of recording and tracking the full cost of large facility projects, and it needs to contain more practical guidance for staff who perform the day-to-day work. A systematic process for reporting and tracking both the operational milestones and the associated financial transactions that occur during a project's lifecycle, particularly those pertaining to changes in scope, is still needed. Finally, staff involved with large facility projects need to be trained on the revised policies and procedures that affect funding, accounting, and monitoring. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	to provide courses and workshops on project management. Over 180 staff have taken one or more project management training class since 2001, with 46 earning associate certificates and 16 earning masters certificates. The LFP Deputy has also been coordinating with the organizers of the NSF-funded "Project Science" workshop on Large Project Management to define course content and encourage participation by NSF staff and project managers from NSF-funded or proposed large facility projects. Since January 2002, nearly 40 people associated with large NSF projects have taken the workshop (about half NSF staff and half project personnel), and many more are registered for the upcoming workshop in October 2004. In addition, internal seminars are held to share lessons learned in facility management. An internal website on Large Facility Projects provides information with links to all of the facilities, the Facilities Guide and modules, and project management seminars and training opportunities. For fund control and accounting, complete and detailed information about project costs is now routinely included in NSF's annual budget request to Congress. NSF has also strengthened its procedures through issuance of standard operating guidance for handling funds for projects funded through the MREFC account (July 2001) and with sections on Budgeting and Funding in the Guide. A contract to enhance the financial system for tracking life cycle costs of MREFC projects will be awarded before the end of FY 2004.

Post-Award Administration

While NSF has a proven system for administering its pre-award and award disbursement responsibilities, the agency still lacks a comprehensive, risk-based program for monitoring its grants once the money has been awarded. As a result, there is little assurance that NSF award funds are adequately protected from fraud, waste, abuse and mismanagement. Recent audits of high-risk awardees, such as foreign organizations and recipients of Urban Systemic Initiative (USI) grants, confirm that in the absence of an effective post-award monitoring program, problems with certain types of grants tend to recur. In FY 2002, NSF reviewed 35,165 proposals in order to fund 10,406 grants and cooperative agreements. Given the amount of work required to process an award, NSF is challenged to monitor its $18.7 billion award portfolio (including all active multi-year awards) for both scientific accomplishment and financial compliance. Booz-Allen and Hamilton estimates that program officers spend just 23% of their time on award management and oversight activities and that program directors commit only 12% of their time to these efforts. During the FY 2001 and 2002 audits of NSF's financial statements, weaknesses in the agency's internal controls over the financial, administrative, and compliance aspects of post-award management were cited as a reportable condition. NSF management has recognized these concerns and is taking steps to improve its award administration and monitoring activities. The agency has developed a risk assessment and award-monitoring document to provide guidance to staff responsible for tracking the financial aspects of awards. Using	NSF has a proactive approach to integrated award management – incorporating programmatic, administrative and financial oversight – while making the most effective use of limited NSF staff and travel resources. The research and education results emerging from NSF-supported projects demonstrate the effectiveness of programs. A challenge for financial oversight is to ensure accountability while minimizing administrative burden on awardees. Over the course of the last two years, the Office of Budget Finance and Award Management (BFA) has developed and implemented a comprehensive, risk-based program for post-award involvement with awardees. In FY 2004, BFA implemented organizational changes to focus responsibility for award oversight, monitoring, outreach, policy, and systems support within a newly created independent division – the Division of Institution and Award Support – and to realign functional responsibility for NSF grant, agreement and contract awards. BFA also continued improving the Award Monitoring and Business Assistance Program (AMBAP). The AMBAP is an evolving and improving set of practices and procedures for assisting NSF awardees in understanding and complying with both NSF and Federal government award terms and conditions. Within the AMBAP, the Risk Assessment Tool was further refined and modified to address additional risk factors as suggested by the NSF OIG. As a "living" document, the AMBAP guide was also reviewed to address concerns brought up in previously conducted outreach reviews and to incorporate lessons learned as we complete reviews. In March of 2004, an independent assessment was conducted of the Post Award Monitoring program, and our efforts were

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this guidance, NSF has begun to identify awardees requiring a higher level of oversight and to perform on-site evaluations of their activities. NSF has also included award management and oversight as a core business process to be evaluated in its agency-wide business analysis. While these actions are encouraging, more needs to be done. NSF should provide more detail in its Risk Assessment and Award Monitoring Guide to ensure both comprehensive and consistent award monitoring activities. In addition, NSF's current practices should be strengthened by increasing the application of simple, cost-effective monitoring tools, such as periodic telephone calls to monitor performance and provide technical assistance, random desk reviews to ensure compliance with reporting requirements, and comparisons of financial and progress reports to proactively locate potential problems. Finally, NSF would benefit from better oversight coordination between its program officers and financial and grants managers to ensure effective sharing of information and action to address compliance issues. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	benchmarked against four comparable Federal agencies - EPA, NIH, DOJ, and ONR. The assessment (based on FY 2003 activities) found that, overall, NSF has a sound post-award monitoring program, providing valuable oversight and assistance to a sample of institutions, based on risk. With respect to risk assessment, the report stated that NSF's risk assessment process to identify high-risk institutions, as part of its monitoring plan, appears to be relatively extensive and comprehensive, compared to other agencies.* Issues identified in the report are being addressed by BFA staff in the reviews conducted in FY 2004. During FY 2004 to date, BFA staff performed 35 Award Monitoring and Business Assistance site visits to awardee institutions. These 35 organizations manage 280 active awards representing $280 million in NSF support. In addition, six on-site visits were performed at the request of NSF program officers and the OIG. Working together, NSF program officers and BFA staff members responsible for post award administration conducted targeted outreach for financial administrative staff for groups such as Engineering Research Centers (ERCs), Native American Indian tribes, and Education and Human Resources (EHR) awardees. These activities included follow-up on award monitoring issues identified in audit reports, reviewing annual reporting requirements and accounting systems for ERCs, and assisting new performing organizations in setting up accounting systems to manage large dollar awards. In particular, the USI program, in collaboration with BFA, has a well defined set of management and oversight activities aimed at reducing risk in the portfolio, including terms and conditions in cooperative agreements; site visits; financial management workshops; regional and national meetings to share lessons learned; conferences on data; research and evaluation studies; and technical assistance/support via contractors. In FY 2004, BFA continued its analysis of Federal Cash Transaction Reports to identify potential problems. These desk reviews allow NSF to determine whether the requested adjustments were for allowable and allocable costs, and whether awardees are maintaining appropriate documentation. The reviews also help to identify organizations that may be having trouble accounting for award expenditures in an accurate and timely manner. In FY 2004, as of mid September, BFA also resolved 163 audit reports. During resolution of these reports, NSF staff – primarily through desk review – reviewed the supporting source documentation and awardee actions taken to address compliance and internal control findings. The internal control findings identified in these reports as requiring NSF action were all resolved. *"National Science Foundation: Post Award Monitoring Assessment," IBM Business Consulting Services, March 2004 (Executive Summary, page 3; p. 76)

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Cost-Sharing

Cost sharing refers to the contribution of financial or in-kind support by recipients of federal grants to the cost of their research projects. In the past, NSF program officers have usually requested cost sharing to help determine an awardee's commitment to a project and to leverage federal support of research. Federal guidelines require that the accounting of cost-shared expenses be treated in a manner consistent with federal expenditures. However, our past audit work indicates that many awardees do not adequately account for or substantiate the value of cost-shared expenditures, raising questions about whether required contributions are actually being made.

During the past year NSF has employed a dual strategy for dealing with this challenge. First, NSF has changed its policy to require cost sharing above the statutory requirement *only when there is tangible benefit to the awardee*, such as a facility that will outlast the life of the research project or income derived by the awardee as a result of the research. The agency also states that it is providing greater oversight in the risk assessment protocol and site reviews. It is too early to determine whether the change in policy is having the intended effect -- reducing cost-sharing not required by statute or program solicitation -- or to assess the effectiveness of the new risk assessment protocol. However, increased funding for travel will be needed to implement the site reviews associated with the new risk protocol, and several NSF directorates recently reported that the resources available for travel were inadequate (see Administrative Infrastructure).

[OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]

Since approval of the revised cost sharing policy by the NSB in November 2002, NSF has taken several steps to implement the revised policy:

- Issued Important Notice 128, *Revision of the NSF Cost Sharing Policy* (January 24, 2003) which addressed:
  - continued existence of the statutory cost sharing requirement;
  - restatement of the principal components of the policy, including the concept of "tangible benefit";
  - guidance to proposers that, if cost sharing is not required by program solicitation, it should not be reflected in the requested budget (Line M); and
  - guidance to proposers that, if the program solicitation did require cost sharing, the proposal should not include cost sharing in excess of the requirement.
- Revised relevant NSF policy documents, e.g., *Grant Proposal Guide* and the NSF *Proposal and Award Manual,* to ensure consistency with the revised cost sharing policy.
- Increased emphasis on review and approval of cost sharing requirements stated in solicitations to ensure compliance with the policy, and clarified boilerplate coverage on cost sharing in program solicitations for clarity of understanding by all parties.
- Masked the cost sharing line on the NSF Budget (Line M) from reviewers to ensure that such cost sharing is not considered in the review process.
- Developed and implemented an electronic capability in FastLane to submit the required annual and final certifications for awards that contain cost sharing in excess of $500,000.

In addition, during FY 2003 and 2004, NSF established and refined the Award Monitoring and Business Assistance Program that provides the strategic framework for assessing and managing awardee risks. Cost sharing is identified as a high-risk factor and is a focus of the risk assessment protocol. The increased use of on-site review provides important business and managerial assistance to awardees in this area.

NSF cost sharing requirements beyond the statutory requirement (1%) are clearly stated in relevant program solicitations. The most recent award data reveal a significant reduction in awards with required cost sharing (non-statutory):

Fiscal Year	C/S Dollars	Awards	Total Award Actions	%
FY 2000	$508 M	3109	19,789	15.71
FY 2001	$534 M	3346	20,529	16.30
FY 2002	$419 M	3188	21,369	14.92
FY 2003	$325 M	2359	22,782	10.35
FY 2004	$244 M	1556	22,862	6.80

On October 14, 2004, the NSB revised the Board policy on cost sharing, to eliminate program specific cost sharing and require only statutory cost sharing (1%). NSF will develop a plan to implement the revised policy, including continued monitoring of the remaining ongoing awards that have specific cost sharing requirements.

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Information (IT) Security	
The challenge for NSF is to implement a security program that protects key information and information systems against unauthorized access, misuse, and corruption, while maintaining the open and collaborative working environment necessary to carry out NSF's mission. Despite having made significant progress strengthening information security over the past few years, the recent hacking of the U.S. Antarctic Program's operations center in a high-profile but unsuccessful extortion attempt is a dramatic example of how vulnerable some parts of NSF's network remain to this persistent threat. NSF's Management Controls Committee describes IT security as a significant concern in the wake of recent regional electrical blackouts, disruptions to NSF's computer network, and the demand for improved systems integration from NSF staff. Our FY 2003 review of NSF's information security program identified three significant deficiencies: lack of certification and accreditation of major systems, vulnerabilities in the United States Antarctic Program information systems, and inadequate development and implementation of agency-wide security policies. Although NSF management disagreed with our assessment of the severity of these problems, it agreed with our recommendations and is taking action to correct the problems. The agency deserves credit for the improvements made to its security program in recent years, including implementation of a mandatory security awareness training program, establishment of an intrusion detection system, formal assignment of security responsibilities and authorities, restructuring of key security positions, appointment of an agency-wide security officer, updated security policies and procedures, and certification and accreditation of most major systems. These accomplishments are evidence of the agency's commitment to information security. However, as information security threats become more aggressive and potentially more destructive, the challenge to NSF's security program will be to provide increasing vigilance, continuous system improvement, and support at all organizational levels to ensure the integrity, confidentiality, and availability of mission critical information and information systems. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	The NSF Information Technology Security (ITS) Program remains focused on ensuring that NSF infrastructure and critical assets are appropriately protected while maintaining an open and collaborative environment for science and engineering research and education. NSF has strengthened all areas of its information security program in FY 2004, and has invested significant time and resources to certify and accredit general support systems and major applications. To address Foundation concerns regarding agency computer systems that might be vulnerable to attack, in FY 2003 NSF embarked on an ambitious endeavor to identify and certify and accredit the major applications and general support systems critical to the agency's mission. NSF ultimately identified nineteen systems (two general support systems and seventeen major applications) requiring certification and accreditation, as required by OMB Circular A-130. Eighteen of those systems had the requisite certification and accreditation as of September 30, 2003. In FY 2004, NSF began the triennial cycle of recertification. Documentation in accordance with OMB Circular A-130, "Management of Federal Information Resources" of risk assessments and commensurate security plans for major systems is prepared and independently reviewed. NSF has a comprehensive disaster recovery program and continuity of operations plan. In FY 2004, NSF conducted two Disaster Recovery exercises. In addition, NSF participated in the May 11-13 Forward Challenge 2004 (FC 04) government-wide continuity of operations exercise developed by the Department of Homeland Security (DHS). Antarctic Security: The United States Antarctic Program (USAP) made significant progress in 2004 toward resolving vulnerabilities. The program developed and issued program-wide security policies, completed an inventory of their IT systems, and developed a comprehensive Plan of Action and Milestones (POA&M) that the program is actively working on. The USAP general support system has been certified and accredited. The major applications are on track to be certified and accredited by the end of this calendar year. NSF has addressed development of security policies in 2004 by developing and publishing policies for Networks Connections, Passwords, Secure Storage and Transmission of System and Application Passwords, Wireless Data Networking, Peer-to-Peer File Sharing, and Personal Use for NSF's Technology and Communication Resources. The agency's Information Security Handbook was also updated.
GPRA Reporting	
The Government Performance and Results Act (GPRA) was enacted by Congress in 1993 and requires each agency to produce a strategic plan that establishes specific goals against which its performance can be objectively evaluated. Building on the foundation of GPRA, the President's Management Agenda has sought to link program performance with budget	The use of external expert panels to review results and outcomes is a common, long-standing practice used by the academic research and education community. NSF's use of such panels (e.g., Committees of Visitors) predates GPRA and was specifically cited as an example of a good quality assessment tool by GAO* as well as in a memorandum on research and development investment

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decisions about agency funding. To accomplish this goal, the Office of Management and Budget (OMB) has introduced the Program Assessment Rating Tool as a means of integrating an agency's performance and budget. But for agencies engaged in funding scientific research, GPRA poses a challenge because the benefits of basic research are not easy to measure and may not be evident for years to come. NSF relies in part on Committees of Visitors (COV) to do the difficult work of evaluating its award decisions and providing qualitative data about its performance that is used in GPRA reporting. In the past we have expressed concerns about the lack of validation for the COV information used in NSF's GPRA reports. A recent OIG audit of the COV process found that some COVs do not provide complete responses to questions regarding NSF's strategic goals and indicators. While NSF acknowledges in its performance report that limitations may exist, it does not discuss the exact nature of the data limitations. OIG recommends that these data limitations be fully disclosed so that users of the information will not misinterpret the data. The OIG report also notes that NSF has changed how it collects and reviews data for its GPRA performance reporting in ways that raise new concerns about the objectivity of the data collection process. Beginning with FY 2002, NSF established an external Advisory Committee for GPRA Performance Assessment that reviews and assesses NSF's performance in achieving its strategic goals and related performance indicators. The Committee relies heavily on COV reports, and NSF selected "*nuggets*," i.e., research, engineering, and education highlights, to make its assessments. Since the nuggets are judgmentally selected success stories and do not represent the performance of the entire research portfolio, we believe that their usefulness as a primary assessment tool is limited. If NSF continues to use judgmental sampling, it should clearly disclose and discuss its data collection methodology in order to better inform decision makers and to comply with GPRA's reporting requirements for a complete, balanced, and objective assessment of an agency's performance. Without either a change in its data gathering process or adequate disclosure of the method's limitations, the credibility of NSF's performance reporting is compromised. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	criteria issued jointly by OMB and the Office of Science and Technology Policy (OSTP) on June 5, 2003, to all federal agency heads. Nevertheless, NSF continues to strengthen and improve the COV process. Specifically, as a result of a September 2003 OIG audit of the COV process, NSF has made the necessary changes as recommended by the OIG and has completely resolved the issues identified. NSF has engaged an external party to provide an independent verification and validation (V&V) of selected GPRA goals for FY 2000-2002, and <u>all</u> GPRA goals starting in FY 2003. The independent V&V and the Advisory Committee for GPRA Performance Assessment (AC/GPA), including experts in statistics and performance assessment, concluded in their reports that the approach to nugget collection – a type of non-probabilistic sampling, commonly referred to as "judgmental" or "purposeful" sampling – is best designed to identify notable examples and outcomes resulting from NSF's investments, and is appropriate for the purposes of evaluating NSF's outcome goals. The FY 2003 Performance and Accountability Report (PAR) provided additional details to ensure that readers understand the reasons for these conclusions, and the FY 2004 PAR includes similar statements. The AC/GPA had access to over 50,000 project reports and three years of COV reports in addition to nuggets. While it is correct that some COV reports do not address all strategic outcome goals, the volume of information covering the NSF portfolio vastly overshadows these minor gaps. The work of COVs is well known to the Committee membership as most currently and formerly served as COV members. *An Evaluation Culture and Collaborative Partnerships Help Build Agency Capacity (GAO-03-454)

Budget, Cost and Performance Integration

The requirement to maintain managerial cost information has gained increasing recognition over the years as an important element of an agency's reporting system. It appears in the CFO Act of 1990, and has been a federal accounting standard since 1998. Most recently, the President's Management Agenda requires an effective accounting and reporting system in order to successfully integrate budget and performance information. The measurement and comparison of inputs to outputs is fundamental to any meaningful organizational evaluation.	In FY 2004, NSF developed a work plan to integrate budget, cost and performance that has been approved by OMB and enables NSF to achieve success in the President's Management Agenda initiative to integrate budget and performance. The Budget, Cost and Performance Integration (BCPI) work plan outlines a process in which strategic planning drives budgetary decisions, tracks accountability for performance and identifies full cost. NSF adopted a new strategic plan in the fall of 2003 that established a new programmatic framework that aligns the

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However, at present, NSF's information systems do not readily provide basic cost accounting information needed to link its costs to its program performance. The agency is only just beginning to focus on developing a cost accounting system that will enhance its management information systems and GPRA reporting. The FY 2002 Management Letter Report notes that NSF's financial and award systems do not track or maintain cost data for its programs and projects, and costs incurred under different funding sources are not linked to provide program officers with information to monitor the full cost of a program or project. The FY 2000, 2001 and 2002 Management Letter Reports accompanying the annual financial statement audit reports recommended that NSF identify management cost information needs for its programs, activities and projects; establish output and outcome goals for each; and develop and report cost efficiency measures that align costs with output and outcome goals. Although NSF management plans to institute cost-measurement practices, they have stated that they must first work with the Office of Management and Budget to define NSF programs in order to establish a system for identifying and measuring the cost of these programs. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	agency's four long-term strategic outcome goals with investment categories for which resources can be discretely identified and tracked, from operating plans to obligations to expenditures. Full budgetary costs for each investment category are identified, as administrative and management overhead (indirect costs) is distributed to strategic goals and investment categories. NSF's FY 2004 Statement of Net Cost was updated to reflect NSF's new programmatic framework and identifies the full cost of NSF's primary programs. Cost accounting is a key aspect of the BCPI work plan. NSF developed a financial crosswalk that aligns costs collected in the appropriations structure with the program investment categories. Work is currently underway to interface the crosswalk with the Financial Accounting System (FAS); when completed NSF will have the capability to identify the full cost of all investments, including both direct and indirect costs, automatically. Currently, NSF senior management meets quarterly to review financial and performance information, including cost data since it has become available.

Management of U.S. Antarctic Program

The U.S. Antarctic Program provides the means by which American scientists are able to conduct polar research. Last year, the USAP sponsored nearly 700 researchers conducting 141 projects. Through its contractors, the USAP also operates the three U.S. year-round stations in Antarctica at McMurdo, Amundsen-Scott South Pole, and Palmer, as well as two research vessels. Two thousand civilian contract employees and U.S. military personnel support the work of the Antarctic scientists. NSF's contract for Antarctic support is both costly and complex. The contractor must have technical expertise in a variety of disciplines (medical, environmental engineering, etc.) and is responsible for managing a number of subcontractors in the U.S. and overseas. Therefore, it is important that NSF closely monitor the programmatic and financial performance of this large contract. The oversight of the United States Antarctica Program remains an ongoing challenge for NSF in part because of its responsibility for the safety and good health of the more than 1000 scientists and contractors that work there during the year. When Antarctic-based personnel become ill questions are raised about whether additional measures can be taken to protect workers in Antarctica from being subjected to unnecessary risks. To address these questions, our office performed an audit of the occupational health and safety, and medical programs established by the USAP contractor. We found that in general these programs are effective in protecting the health of Antarctic scientists and support staff.	NSF agrees with the OIG that the safety of scientists and workers, environmental concerns, and the national interests of the U.S. Government require unique management and administrative skills that are responsive to the special needs of Antarctic scientific research. In order to meet these challenges, NSF staff utilize their special expertise to coordinate support of scientists in Antarctica, to oversee construction and maintenance of all infrastructure, and to oversee environmental, health, safety and medical activities. NSF's response to the 2003 OIG audit of the occupational health and safety, and medical programs noted that the Office of Polar Programs (OPP) has extensive plans for upgrading and updating its Antarctic facilities and infrastructure, including the McMurdo Long Range Development Plan, which was subsequently provided to the OIG. The subsequent semiannual OIG report commented that this plan "reflects a robust methodology for identifying and prioritizing facilities requirements, and properly recognizes projects with safety and environmental concerns as being the highest priority." A similar plan led to funding for modernization of our facilities at South Pole Station, a comprehensive project scheduled for completion in 2007. NSF includes in its budget requests the priorities for each year. The report suggests that plans be updated regularly, and in fact planning and prioritizing is done in preparation for the annual Congressional budget request. We will continue to work to acquire the funding to meet the needs of the Program in an effective manner. On the issue of recommendations on infrastructure made by committees in 1997 and 2001, OPP fully agrees that facilities

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However, the audit report notes that facilities and infrastructure at the Antarctic research stations are deteriorating from age and use, and it recommends developing a life-cycle oriented capital asset management program that would serve as support for a dedicated line item (funding source) in its Research and Related Activities budget request. Also, the aged condition of the USAP's physical infrastructure was mentioned by two external committees charged with reviewing the USAP since 1997, and poses a potential health and safety hazard to the men and women who work in the harsh polar environment. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	maintenance deserves high priority. Success within the budget process comes through coupling maintenance and relatively small facility upgrade requirements closely to the future needs – both specific and general – of the Program. For major infrastructure projects, support is available through the agency's Major Research Equipment and Facilities Construction account, as in the case of the South Pole environment and safety upgrade, as well as South Pole Station Modernization and LC-130 conversions. OPP has been able to sustain an ongoing effort to maintain and upgrade facilities at McMurdo and Palmer Stations, albeit at a slower pace than is ideal. Even at that pace, however, the following projects are representative of those undertaken since the committee reports referenced in the OIG Memorandum: • South Pole Telemedicine Capabilities • McMurdo Wastewater Treatment Plant • McMurdo Fire Water Suppression • McMurdo – Dining Facility and Dormitories Upgrades • McMurdo Hazardous Waste Yard • Energy Conservation Upgrades • Replacement Fuel Storage and Secondary Containment • Palmer Lab and General Purpose Buildings Upgrades • Palmer Garage Warehouse Upgrade • Palmer Earth Station Upgrade NSF is fully committed to providing infrastructure that provides a safe and healthy environment, and we believe we have done so.
Broadening Participation in the Merit Review Process	
A key NSF strategy is to broaden participation and enhance diversity in all NSF activities involving researchers, educators, and students. NSF reported both successes and frustrations in achieving their objectives over the past year. Significant gains have been made in attracting more proposals from women and minorities. Proposals from female PIs increased by 13% in 2002, while proposals from minority PIs have gone up by 29% over the past two years. NSF reported that they have expanded the use of seminars and workshops, focusing on underrepresented minorities, minority serving institutions, and geographic regions that have not in the past received major research support from the government. However, the number of minority awards remains a relatively small percentage of the total number of awards (5%), and the percentage has only increased slightly over the past 8 years. In addition, NSF continues to lag in its attempts to track diversity among reviewers participating in the merit review process. Increasing the number of minority reviewers is considered an effective means of promoting increases in the number of proposals from and awards to minority PIs. Demographic information was volunteered for only 3,507 out of a total of 37,943 distinct reviewers. NSF intends to continue its efforts to identify new reviewers from underrepresented groups, but states that it cannot require reviewers to provide demographic information. [OIG Memorandum October 17, 2003: Management	NSF considers its merit review process the keystone for award selection. The agency evaluates proposals using two criteria – the intellectual merit of the proposed activity and its broader impacts. NSF staff rely on expert evaluation by selected peers when evaluating proposals and making funding decisions. Each year, approximately 250,000 merit reviews are provided to assist NSF with the evaluation of proposals. In FY 2003, the number of proposals received from minority PIs increased by 12 percent. The funding rate for minority PIs was 27 percent, the same as the overall funding rate for NSF. During FY 2003, the number of proposals received from women PIs increased by 9 percent, and the funding rate was 28 percent. Obtaining data about the gender and ethnicity of individual reviewers remains a challenge due to the fact that provision of such data is voluntary. For example, in FY 2003, out of a total of 40,020 distinct reviewers who returned reviews, 5,336 provided demographic information. Out of the 5,336 who provided information, 1,818 (34 %) indicated they were members of an underrepresented group. In FY 2004 NSF altered the FastLane reviewer module to make it more convenient for reviewers to provide demographic information. A preliminary examination has shown a slight increase in the proportion of reviewers providing information after the FastLane change. NSF will continue to monitor the situation over time, and take additional measures as needed in order to obtain the data necessary to evaluate increased participation. In FY 2003 and FY 2004 NSF continued to use seminars and

MANAGEMENT CHALLENGE	AGENCY ACTIONS
Challenges for NSF in FY 2004]	proposal writing workshops for broadening participation purposes, focusing on underrepresented minorities, minority serving institutions (Tribal Colleges, Historically Black Colleges and Universities, and Hispanic Serving Institutions), and regions of the country that normally do not receive major research support from the federal government. In FY 2004 NSF hired Dr. Thomas Windham as Senior Advisor for Science and Engineering Workforce. Dr. Windham will be addressing efforts to broaden participation, including the vertical and horizontal integration of programs within the Foundation to provide synergy and sharing of effective approaches. In addition, NSF is preparing an internal science and engineering diversity plan.
The Math and Science Partnership Program	
In spite of the significant amount of money invested by the federal government in programs to improve K-12 education, the Nation's Report Card and other evaluations of math and science education continue to indicate that achievement gaps still exist between American schoolchildren and their foreign counterparts. The Math and Science Partnership Program was established to promote partnerships between state and local school districts, and colleges and universities to improve math and science education at the K-12 level. NSF made 23 multi-year awards worth approximately $230 million in FY 2002, and 12 multi-year awards worth approximately $203 million in FY 2003. NSF will fund many of these projects for up to five years. To be successful, NSF will need to resolve difficult issues such as how best to facilitate partnerships between parties that are not used to working together (e.g., university math and science departments, and local school systems), determining how the success of the projects will be evaluated, and the challenge of monitoring awardees with limited experience in handling federal funds. Although NSF has developed a 6-pronged plan for the oversight and management of MSP awards that includes site and reverse site visits to awardees, use of cooperative agreements for the larger more complex awards, and a contract to develop a substantial overall program evaluation, the plan will be difficult to implement given resource and technical constraints. An audit of specific issues associated with the administration of the program is planned for the fall. [OIG Memorandum October 17, 2003: Management Challenges for NSF in FY 2004]	NSF has developed a comprehensive plan for the oversight and management of all Math and Science Partnership (MSP) awards. Larger, more complex awards have been made as cooperative agreements. These cooperative agreements describe the post-award management and oversight needed to support the Partnerships in realizing their goals. In making decisions for continued funding, the MSP program draws upon NSF's strong, community-based site visit processes. With few exceptions, the lead partners responsible for both fiscal and project management of Partnerships are institutions with significant experience and a track record of responsibility in handling federal funds. In FY 2004 – consistent with the focus of the solicitation on the middle and high school grade levels – no large, new Comprehensive Partnerships that address the entire K-12 continuum are being funded. The Targeted Partnerships being recommended for award from the FY 2004 solicitation have been subjected to an increased and more intensive level of review than in previous years, and this review has included an early analysis of the prospective awardee's experience/ability to properly administer federal funds. In FY 2004, all Partnership awards are being made to institutions of higher education, thus increasing the likelihood of the awardee's ability to receive and spend federal dollars responsibly. Early in FY 2004 NSF hosted a financial and management oversight meeting for all funded Partnerships in order to enhance their fiscal management capacity, and to enhance awardees' understanding of their responsibilities in such critical areas as subaward monitoring, proper documentation of time and effort, participant support, etc. **All** MSP awardees – each Principal Investigator and a representative from his/her institutional business/accounting office – participated in this fiscal management workshop at NSF. In summer 2004, critical site visits were completed for Cohort I Comprehensive Partnerships to inform NSF decisions about continued funding. In addition, any questions or concerns about a grantee's financial management identified through review of annual progress reports (which include financial reports), through site visits, or by other means are pursued further, in consultation with NSF's Division of Grants and Agreements (DGA) and/or staff in Cost Accounting and Audit Resolution, Division of

MANAGEMENT CHALLENGE	AGENCY ACTIONS
	Institution and Award Support (DIAS). <u>Ongoing Management and Oversight</u>. MSP employs a six-pronged approach to project management and oversight: (1) site and reverse site visits to awardees; (2) Program Officer review of annual progress reports and project-specific formative evaluations; (3) use of co-operative agreements for all Comprehensive Partnerships and – starting in FY 2003 – all Targeted Partnerships, and other mechanisms, such as carefully formulated "conditions of award" in grants, that enable focused oversight; (4) technical assistance, especially for new awardees; (5) an information management system for data collection and monitoring of awards; and (6) a substantial overall program evaluation. An award for a comprehensive, overall external evaluation of the MSP program is being made in FY 2004, consonant with the research and development nature of the program. Because the MSP program extends beyond traditional domains and calls for innovative practices that go beyond the commonplace, its intellectual foundations and progression of work define it as an R&D effort. R&D efforts are necessarily administered and evaluated in ways that differ from implementation efforts, where the nature of the work is predetermined and where the tools and best practices needed for effective evaluation and administration are known in advance. The six-pronged approach discussed above utilizes all available resources that are known to have potential for informing and shaping such R&D work as NSF's MSP program.

V. APPENDIXES

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 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 planning and operations of facilities that provide national cyberinfrastructure supporting science and engineering research and education. CISE supports a range of activities in education and workforce 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 assure diversity and quality in the nation's infrastructure for engineering education and research.

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

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

The **Directorate for Social, Behavioral and Economic Sciences (SBE)** supports research 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 man-made 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. The Office supports international collaborative research that provides U.S. scientists and engineers access to the world's top researchers, institutions and facilities. The Office 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 has responsibility for budget, financial management, grants administration and procurement operations and related policy. Budget responsibilities include the development of the Foundation's annual budget, long range planning and budget operations and control. BFA's financial, grants and other administrative management systems ensure that the Foundation's resources are well managed and that efficient, streamlined business and management practices are in place. NSF has been acknowledged as a leader in the federal research administration community, especially in its pursuit of a paperless environment that provides more timely, efficient awards administration.

The **Office of Information and Resource Management (OIRM)** provides 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 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. It is also 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.

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Office of Budget, Finance, and Award Management
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Office of Information and Resource Management
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Director
National Science Foundation

Arden L. Bement, Jr. (*Member Ex Officio*)[4]
Acting 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.

IMPROPER PAYMENTS INFORMATION ACT REPORTING DETAILS

I. Describe your agency's risk assessment(s), performed subsequent to compiling your full program inventory. List the risk-susceptible programs (i.e., programs that have a significant risk of improper payments based on OMB guidance thresholds) identified through your risk assessments. Be sure to include the programs previously identified in the former Section 57 of OMB Circular A-11.

NSF's risk assessment program applies to all award programs and activities that NSF funds through our Research & Related Activities (R&RA) and Education and Human Resources (EHR) appropriations. "Research and Education Grants and Cooperative Agreements" identified in the former Section 57 of OMB Circular A-11 is included in these appropriations.

<u>Risk Assessment and Asset Management</u>

The risk categories that have been identified apply to EHR and R&RA and focus on those aspects of the award universe that affect accountability in research and fiscal compliance. The aim is to protect the government and public interests in the stewardship of federal dollars. Risk categories may have either an organizational or award focus, depending on the circumstances of the review. NSF has identified certain risk factors that may warrant closer monitoring. These factors were identified based on research administration issues and audit findings that recur throughout the year.

Reviews of audit report findings and other empirical data also indicate certain risk indicators that should be addressed in our risk assessment. For example, cost sharing compliance proved to be a significant finding in most of the audits for a variety of reasons. Reviews of certain types of organizations representing our non-traditional awardees showed indications of risk. These include small non-profit groups, awards made to schools and colleges through State and local governments, and federally recognized Indian tribal governments, and new awardees. Regarding the latter, evidence suggests that business assistance provided at the initial stages of the award process lowers overall risk activity during the life of the process.

Although the academic institutions that receive 80 percent of the overall NSF budget are normally outside the high-risk area, NSF will still randomly sample awards at these institutions to insure that the appropriate processes and procedures are indeed in place and will continue to review any special needs of this portion of our award base.

The following factors are relevant to the NSF Office of Budget, Finance and Award Management (BFA) review and are similar to risk factors identified at other agencies:

- Compliance responsibilities in <u>financial management</u> require reviews of accounting systems to insure acceptability and adequacy for the accumulation and billing of costs under government agreements. Part of this review would include the application of appropriate cost principles, and transactional review of costs for subcontracts, cost sharing, salaries, participant support, and the application of the appropriate indirect cost rate to ensure appropriate expenditure oversight. Financial monitoring practices need to provide adequate assurance that funds are being spent for their intended purposes.

- Administrative factors include a review of management responsibilities and compliance with the terms and conditions of the award and with the reporting requirements. Additional reviews may include appropriate subcontracting procedures and property oversight.

- Programmatic factors are taken into account by providing additional oversight for awards supporting large and complex projects such as multi-user facilities. When needed, NSF program staff request the services of BFA staff, specifically as participants on site review panels, and on occasions where there are administratively complex issues, such as suspension, termination, or phase out, that must be handled with the utmost of administrative care and due process. These are *ad hoc* occasions and are addressed accordingly.

The table below contains weighted risk factors that relate to organizational and individual award characteristics used to help identify the highest risk awardees. The following is the Point Structure used in estimating the cumulative weighted risk:

Low:	Less than 10
Medium:	10 – 15
High:	16 or Greater

	RISK LEVELS		
	Low	**Medium**	**High**
Type Of Awardee	**0-1**	**3**	**5**
Academic Institution	x		
Non-Profit Organization		x	
School District or Community College			x
Tribal Government			x
For-Profit			x
New Awardee			x
Foreign Awardee			x
Dollar Value			
Under $500K	x		
$500K - $2M		x	
over $2M			x
Cost Sharing Activity			
None	x		
Less than $500K		x	
Greater than $500K			x

	RISK LEVELS		
	Low	Medium	High
Complexity: Type Of Award & Special Award Conditions	**0-1**	**3**	**5**
Grants for Basic Research	x		
Subaward of significant portion of effort		x	
Cooperative Agreements - Single University		x	
Cooperative Agreements - Large Centers			x
Property			
None proposed	x		
Personal - title to awardee	x		
Equipment Award		x	
Real Property			x
Personal - Title retained by Government			x
Programmatic Concerns: (as identified)			x
Cost Analysis & Audit Concerns			x

II. Describe the statistical sampling process conducted to estimate the improper payment rate for each program identified.

In accordance with the OMB guidance and formula, we determined that for FY 2004 the minimum sample size is 126 transactions. This is based upon an estimated error rate of 3.0 percent with a confidence level of 90 percent and a precision of plus or minus 2.5 percent. The improper payment review was conducted concurrently with the award monitoring site visits. Our original plan was to visit and perform erroneous payment reviews on the 26 organizations having the highest risk grants resulting in approximately five transactions per organization. However, as we finalized the monitoring plans, additional high-risk organizations were identified. Rather than adjust the transactions to be reviewed at each organization, we expanded the sample size. The final number of sites that were visited was 35 with the actual sample size being 175 transactions reviewed.

The sampling process was as follows:

- Prior to the on-site visit, which was determined by our risk assessment program, we obtained a copy of the latest FCTR submitted by the organization. We requested a transaction listing by award for each NSF award listed on Part II of the SF272A. The transaction listing should reconcile to the amount reported under the "Net Disbursements Reporting Quarter" column.
- From the listing, five transactions were selected using the DCAA EZ-Quant random number generator. Prior to the visit, we requested the organization to make copies of the supporting documentation for the selected transactions.
- The transactions were evaluated for propriety in accordance with Improper Payment Act guidance. (OMB Bulletin M-03-13, "Improper Payments Information Act of 2002.")
- The results of the review were summarized. If any errors were noted, we discussed a corrective action plan with the organization. If significant errors were noted, we

planned to expand the review to ascertain whether these findings represent a systemic finding or a unique error. These results were incorporated into the monitoring results. If necessary, the systemic findings would be referred to the cognizant oversight agency for resolution.

The sample results were evaluated using the Defense Contract Audit Agency EZ-Quant Statistical Analysis software to project the sample results to the universe. The confidence level was set at 90 percent. The ratio method was used for projection because the number of items in the universe was unknown. After projecting the upper limit of the erroneous payment dollars in the universe, the IPIA rate was computed by dividing universe erroneous payment dollars by total universe dollars.

III. Explain the corrective actions your agency plans to implement to reduce the estimated rate of improper payments. Include in this discussion what is seen as the cause(s) of errors and the corresponding steps necessary to prevent future occurrences. If efforts are already underway, and/or have been ongoing for some length of time, it is appropriate to include that information in this section.

NSF has undertaken the lead in measuring improper payments in the research grant community. This fiscal year, NSF experienced challenges in developing a statistically valid methodology for use as a baseline and in projections. Our sampling was skewed towards our high risk grantees. Even using this conservative approach the results indicated an improper payment rate of less than one percent and under $5 million. This data has led our focus away from corrective actions and reduction estimates to concentrate on improving our baseline information. For the coming fiscal year, we will address the statistical sampling challenges by reviewing and modifying the sample selection process in order to broaden the coverage beyond the high-risk awardees.

IV.

Improper Payment Reduction Outlook FY 2004 – FY 2007
($ in millions)

Program	FY 2004 Outlays	Improper Payments				
		FY 2004 (Percent)	FY 2004 (Dollars)	FY 2005 (Percent)	FY 2006 (Percent)	FY 2007 (Percent)
R&RA and EHR	$4,742	.93%	$4.4	Under 1%	Under 1%	Under 1%

V. Discuss your agency's Recovery Auditing effort, if applicable, including the amount of recoveries expected, the actions taken to recover them, and the business process changes and internal controls instituted and/or strengthened to prevent further occurrences. (This reporting replaces the original legislative requirement for reporting not later than 12/31/04.)

Not applicable for NSF's program of Research and Education Grants and Cooperative agreements.

VI. Describe the steps the agency has taken and plans to take (including time line) to ensure that agency managers (including the agency head) are held accountable for reducing and recovering improper payments.

NSF's grant monitoring framework for assessing and managing awardee risks and assets is based on a planned, dynamic multi-level risk minimization strategy with levels related to**:**

- An expanded, yet more focused, pre-award review process that provides both internal and external assistance and training to help ensure:
    - o the most effective and efficient operation of a given program; and
    - o awardee understanding of proposal and award requirements.
- An award phase review that is facilitated by the enhanced pre-award reviews and assistance;
- A comprehensive, formal desk review of the award portfolio that reports annually on identified risk and asset indicators; as well as
- A formal desk review resolution and follow-up activity that includes additional information requests, on-site formal reviews, and on-site review follow-up through the desk review process until resolution is reached or another site-review is conducted.

It is within this overall context that NSF incorporates risk assessment as a management tool to ensure a balanced cost-benefit approach that frames its post-award outreach and monitoring. It is a proactive approach that requires a working relationship with both the program staff and the awardee community and helps to ensure that the public funds that are received are properly managed and accounted for.

Most recently, the NSF Director approved a realignment of major functional responsibilities, with commensurate resources, to create a new Division that will focus on:

- Institutional assistance
- Risk management
- Award monitoring and oversight
- Strategic business systems development

This realignment along with our framework for awardee monitoring shows a top to bottom agency focus on improving accountability and oversight in our stewardship of award funds.

VII. A. Describe whether the agency has the information systems and other infrastructure it needs to reduce improper payments to the levels the agency has targeted.

We are currently using our existing end-to-end award information systems and infrastructure and will evaluate additional future needs, if any, as our improper payment plans and processes mature.

B. If the agency does not have such systems and infrastructure, describe the resources the agency requested in its FY 2005 budget submission to Congress to obtain the necessary information systems and infrastructure.

VIII. A description of any statutory or regulatory barriers that may limit the agencies' corrective actions in reducing improper payments.

None currently identified.

IX. Additional comments, if any, on overall agency efforts, specific programs, best practices, or common challenges identified, as a result of IPIA implementation.

None.

SCHEDULE OF PROGRAM EVALUATIONS

The following table provides information on the scheduling of meetings for Committees of Visitors (COVs) for NSF programs. The table lists the fiscal year of the most recent COV meeting for the program and the fiscal year for the next COV review of the program. The COV meetings that were held in FY 2003 are highlighted in bold.

Committee of Visitors Meetings by Directorate

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
BIOLOGICAL SCIENCES		
Biological Infrastructure	**2004**	2007
Research Resources (includes former Instrument-Related Activities)	**2004**	2007
Human Resources (includes former Training Cluster)	**2004**	2007
Plant Genome Research Program	**2004**	2007
Environmental Biology	2003	2006
Ecological Biology (Ecol. Studies held COV in 2002)	2002	2006
Ecosystem Science (Thematic Review held COV in 2001)	2001	2006
Population and Evolutionary Processes (Systematic and Population Biology held COV in 2000)	2000	2006
Systematic Biology and Biodiversity Inventories		2006
Integrative Organismal Biology(formerly Int. Biology and Neuroscience)[1]		2005
Behavioral Systems		2005
Developmental Systems		2005
Environmental and Structural Systems		2005
Functional and Regulatory Systems		2005
Molecular and Cellular Biosciences	2002	2005
Biomolecular Systems (formerly Biomolecular Structure and Function and Biomolecular Processes)	2000	2005 2005
Cellular Systems (formerly Cell Biology)	2001	2005
Genes and Genome Systems (formerly Genetics)	2003	2005
Emerging Frontiers (new in '03)	N/A	2006

[1] Please note that programs in this division have been reorganized. Previous COVs were held for Neuroscience (2001); Developmental Mechanisms (2000); and Physiology and Ethology (2002).

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
COMPUTER AND INFORMATION SCIENCE AND ENGINEERING		
Please note that CISE programs and divisions were reorganized in FY 2003. COVs for IIS, ANIR, and CCR were held in FY 2003.		2006
Computing & Communication Foundations (CCF)		
Emerging Models & Technologies for Computation		2006
Formal & Mathematical Foundations		2006
Foundations of Computing Processes & Artifacts		2006
Computer & Network Systems (CNS)		2006
Computer Systems		2006
Computing Research Infrastructure		2006
Education & Workforce		2006
Network Systems		2006
Information & Intelligent Systems (IIS)		2006
Data, Inference & Understanding		2006
Science & Engineering Informatics		2006
Systems in Context		2006
Shared Cyberinfrastructure (SCI)	2005	2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
EDUCATION AND HUMAN RESOURCES		
Educational Systemic Reform (discontinued)		
Statewide Systemic Initiatives	**2004**	
Urban Systemic Initiatives	**2004**	
Rural Systemic Initiatives	**2004**	
Office of Innovation Partnerships		
EPSCoR	2000	2005
Elementary, Secondary and Informal Education		
Informal Science Education	2001	2005
Teacher Enhancement	2003	2006
Instructional Materials Development	2005	2008
Centers for Learning and Teaching (new in ’01)	**2004**	2007
Undergraduate Education		
Teacher Preparation	**2004**	2007
Advanced Technological Education	2003	2006
NSF Computer, Science, Engineering and Mathematics Scholarships (new in ’01)	2003	2006
Distinguished Teaching Scholars (new in ’02)		2005
Scholarship for Service (new in ’01)	2004	2007
National SMETE Digital Library (new in ’01)	2002	2005
Course, Curriculum, and Laboratory Improvement	2003	2006
Undergraduate Assessment (new in ’02)	2003	2006
The STEM Talent Expansion Program (STEP) (new in ’02)		2005
Robert Noyce Scholarship (new in ’02)		
Graduate Education		
Graduate Research Fellowships	2003	2006
NATO Post doctorate Fellowships (program discontinued)	**2004**	
IGERT (new in ’97)	2002	2005
GK-12 Fellows (new in ’99)	2002	2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
EDUCATION AND HUMAN RESOURCES (continued)		
Human Resource Development		
The Louis Stokes Alliances for Minority Participation	2001	2005
Centers for Research Excellence in Science and Technology (CREST)	2001	2005
Gender Diversity in STEM Education	2003	2006
Programs for Persons with Disabilities (PPD)	2003	2006
Alliances for Graduate Education and the Professoriate (AGEP)	2001	2005
Tribal Colleges Program (TCP) (new in ’01)	**2004**	2007
Historically Black Colleges and Universities (HBCU)	2001	2005
Research, Evaluation & Communications		
Research on Learning and Education (ROLE)	2002	2005
Evaluation	2004	2007
Interagency Education Research Initiative (IERI) (new in ’01)	2002	2005
Other		
H-IB VISA K-12		2005
Math and Science Partnership (MSP) (new in ’02)		2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
ENGINEERING		
Bioengineering and Environmental Systems	2002	2005
Biochemical Engineering & Biotechnology	2002	2005
Biomedical Engineering & Research to Aid Persons with Disabilities	2002	2005
Environmental Engineering & Technology	2002	2005
Civil and Mechanical Systems	2004	2007
Dynamic System Modeling, Sensing and Control	**2004**	2007
Geotechnical and GeoHazard Systems	**2004**	2007
Infrastructure and Information Systems	**2004**	2007
Solid Mechanics and Materials Engineering	**2004**	2007
Structural Systems and Engineering	**2004**	2007
Network for Earthquake Engineering Simulation	**2004**	2007
Chemical and Transport Systems		2006
Chemical Reaction Processes	2003	2006
Interfacial, Transport and Separation Processes	2003	2006
Fluid and Particle Processes	2003	2006
Thermal Systems	2003	2006
Design, Manufacture and Industrial Innovation		
-Engineering Decision Systems Programs (new in ’02)	2003	2006
Engineering Design	2003	2006
Manufacturing Enterprise Systems (new in ’02)	2003	2006
Service Enterprise Systems (new in ’02)	2003	2006
Operations Research	2003	2006
-Manufacturing Processes and Equipment Systems	2003	2006
Materials Processing and Manufacturing	2003	2006
Manufacturing Machines and Equipment	2003	2006
Nanomanufacturing (new in ’02)	2003	2006
-Small Business		
Small Business Innovation Research (SBIR)	**2004**	2007
Small Business Technology Transfer	**2004**	2007
-Crosscutting		
Grant Opportunities for Academic Liaison w/ Industry	2003	2006
Innovation and Organizational Change	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
ENGINEERING (continued)		
Electrical and Communications Systems		
Electronics, Photonics and Device Technologies	2002	2005
Control, Networks, and Computational Intelligence	2002	2005
Integrative Systems (new in ’02)	2002	2005
Engineering, Education and Centers		
Engineering Education	**2004**	2007
Engineering Research Centers	**2004**	2007
Industry/University Cooperative Research Centers	**2004**	2007
Partnerships for Innovation (new in ’01)	**2004**	2007

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
GEOSCIENCES		
Atmospheric Sciences		
-Lower Atmosphere Research Section		
Atmospheric Chemistry	**2004**	2007
Climate Dynamics	**2004**	2007
Mesoscale Dynamic Meteorology	**2004**	2007
Large-scale Dynamic Meteorology	**2004**	2007
Physical Meteorology	**2004**	2007
Paleoclimate	**2004**	2007
-Upper Atmosphere Research Section		
Magnetospheric Physics	2002	2005
Aeronomy	2002	2005
Upper Atmospheric Research Facilities	2002	2005
Solar Terrestrial Research	2002	2005
-UCAR and Lower Atmospheric Facilities Oversight Section		
Lower Atmospheric Observing Facilities	2003	2006
UNIDATA	2003	2006
NCAR/UCAR	2003	2006
Earth Sciences		
Instrumentation and Facilities	**2004**	2007
-Research Support		
Tectonics	2002	2005
Geology and Paleontology	2002	2005
Hydrological Sciences	2002	2005
Petrology and Geochemistry	2002	2005
Geophysics	2002	2005
Continental Dynamics	2002	2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
GEOSCIENCES (continued)		
Ocean Sciences		
-Integrative Programs Section		
Oceanographic Technical Services	2002	2005
Ship Operations	2002	2005
Oceanographic Instrumentation	2002	2005
Ship Acquisitions and Upgrades (new in ’02)	2002	2005
Shipboard Scientific Support Equipment (new in ’02)	2002	2005
Oceanographic Tech and Interdisciplinary Coordination	2003	2006
Ocean Science Education and Human Resources	2003	2006
-Marine Geosciences Section		
Marine Geology and Geophysics	2003	2006
Ocean Drilling	2003	2006
-Ocean Section		
Chemical Oceanography	2003	2006
Physical Oceanography	2003	2006
Biological Oceanography	2003	2006
Other Programs		
Global Learning and Observation to Benefit the Environment	2003	2006
Opportunities to Enhance Diversity in the Geosciences	2003	2006
Geoscience Education	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
MATHEMATICAL AND PHYSICAL SCIENCES		
Astronomical Sciences	2002	2005
Planetary Astronomy	2002	2005
Stellar Astronomy and Astrophysics	2002	2005
Galactic Astronomy	2002	2005
Education, Human Resources and Special Programs	2002	2005
Advanced Technologies and Instrumentation	2002	2005
Electromagnetic Spectrum Management	2002	2005
Extragalactic Astronomy and Cosmology	2002	2005
-Facilities Cluster		
Gemini Observatory	2002	2005
National Radio Astronomy Observatory (NRAO)	2002	2005
National Optical Astronomy Observatories (NOAO)	2002	2005
National Solar Observatory (NSO)	2002	2005
National Astronomy and Ionosphere Center (NAIC)	2002	2005
Atacama Large Millimeter Array (ALMA)	2002	2005
Chemistry	**2004**	2007
Analytical & Surface Chemistry	**2004**	2007
Chemistry Research Instrumentation and Facilities	**2004**	2007
Collaborative Research in Chemistry	**2004**	2007
Inorganic, Bioinorganic and Organometallic Chemistry	**2004**	2007
Organic & Macromolecular Chemistry	**2004**	2007
Physical Chemistry	**2004**	2007
Undergraduate Research Centers (pilot program, new in ‘04)		2007
Materials Research	2002	2008
-Base Science Cluster		
Condensed Matter Physics	2002	2008
Solid-State Chemistry	2002	2008
Polymers	2002	2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
MATHEMATICAL AND PHYSICAL SCIENCES (continued)		
-Advanced Materials and Processing Cluster		
Metals	2002	2005
Ceramics	2002	2005
Electronic Materials	2002	2005
-Materials Research and Technology Enabling Cluster		
Materials Theory	2002	2005
Instrumentation for Materials Research	2002	2005
National Facilities	2002	2005
Materials Research Science and Engineering Centers	2002	2005
-Office of Special Programs (new in ’03)	N/A	2008
Mathematical Sciences	**2004**	2007
Applied Mathematics	**2004**	2007
Geometric Analysis, Topology and Foundations	**2004**	2007
Computational Mathematics	**2004**	2007
Infrastructure	**2004**	2007
Analysis	**2004**	2007
Algebra, Number Theory, and Combinatorics	**2004**	2007
Statistics and Probability	**2004**	2007
Mathematical Biology (new in ‘04)		2007
Physics		
Atomic, Molecular, Optical and Plasma Physics	2003	2006
Elementary Particle Physics	2003	2006
Theoretical Physics	2003	2006
Particle and Nuclear Astrophysics (new in ’00)	2003	2006
Nuclear Physics	2003	2006
Biological Physics (new in ’03)		2006
Physics at the Information Frontier (new in ’03)		2006
Physics Frontier Centers (new in ’02)		2006
Education and Interdisciplinary Research (new in ’00)	2003	2006
Gravitational Physics	2003	2006
Office of MultidisciplinaryResearch	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES		
Office of International Science and Engineering (INT)	2002	2005
Science Resource Statistics (SRS)		
All programs	Several	2006
Behavioral and Cognitive Sciences (BCS)		
Cultural Anthropology	2003	2006
Linguistics	2003	2006
Social Psychology	2003	2006
Physical Anthropology	2003	2006
Geography and Regional Sciences	2003	2006
Cognitive Neuroscience (new in ’01)	2003	2006
Developmental and Learning Sciences (formally Child Learning & Development)	2003	2006
Perception, Action, and Cognition (formally Human Cognition & Perception)	2003	2006
Archaeology	2003	2006
Archaeometry (formally part of Archaeology)	2003	2006
Environmental Social and Behavioral Science (new in ’99)	2003	2006
Social and Economic Sciences (SES)		
Decision, Risk, and Management Sciences	**2004**	2007
Political Science	**2004**	2007
Law and Social Science	**2004**	2007
Innovation and Organizational Change	**2004**	2007
Methodology, Measurement and Statistics	**2004**	2007
Science and Technology Studies	**2004**	2007
Societal Dimensions of Engineering, Science, and Technology	**2004**	2007
Economics	**2004**	2007
Sociology	**2004**	2007
ADVANCE (Cross-Directorate Program, new in FY01/FY02)		2005
Science of Learning Centers (new in FY03/FY04)		2007
Human and Social Dynamics (new in FY04)		2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF POLAR PROGRAMS		
Polar Research Support	**2004**	2007
Antarctic Sciences	2003	2006
Antarctic Aeronomy and Astrophysics	2003	2006
Antarctic Biology and Medicine	2003	2006
Antarctic Geology and Geophysics	2003	2006
Antarctic Glaciology	2003	2006
Antarctic Ocean and Climate Systems	2003	2006
Arctic Sciences		
Arctic Research Support and Logistics	2003	2006
Arctic System Sciences	2003	2006
Arctic Natural Sciences	2003	2006
Arctic Social Sciences	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF INTEGRATIVE ACTIVITIES		
Major Research Instrumentation (MRI)	2000*	2005
Science and Technology Centers (STC)	1996*	2007
*External Evaluations		

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
NSF PRIORITY AREAS AND CROSSCUTTING PROGRAMS		
Nanoscale Science and Engineering Priority Area	**2004**	2007
Biocompexity in the Environment	**2004**	2007
CAREER	2001	2005
Information Technology Research (new in ’00)		2005
*External Evaluations		

TABLE OF EXTERNAL EVALUATIONS

The Table on the following pages provides information on program assessments and evaluations other than Committee of Visitor and Advisory Committee assessments.

The Table lists other types of evaluations not used in GPRA performance assessment that were completed in FY 2004. These reports, studies, and evaluations are frequently used in setting new priorities in a field or in documenting progress in a particular area. The reader is encouraged to review the reports for additional information on findings and recommendations that are beyond the scope of this report.

Reports (other than COV reports) produced by NSF are available online at http://www.nsf.gov/pubs/start.htm using the NSF's online document system and the publication number indicated.

Information on obtaining reports produced by the National Research Council or National Academy of Sciences can be found online by searching www.nap.edu or from the National Academy Press, 2101 Constitution Avenue, N.W., Lockbox 285, Washington, D.C. 20055 (1.800.642.6242).

Evaluations Completed in FY 2004	
	Directorate for Biological Sciences (BIO)
Outcomes and Impacts of the National Science Foundation's Program of Minority Postdoctoral Research Fellowships (MPRF)	**Findings:** Overall The MPRF program is meeting its broad goal of preparing scientists from those ethnic groups that are significantly under-represented at advanced levels in U.S. science and engineering for tenured university professorships and for positions of leadership in industry and government. 1.Analysis of employer institutions and position titles shows that most former Fellows were in tenured or tenure-track positions at major research universities. 2.Most of the former Fellows indicated that their MPRF experiences had prepared them appropriately for their careers. 3.Most former Fellows reported that they valued their MPRF experiences highly. 4.Analyses of NSF and NIH application records show that former Fellows were generally quite successful in obtaining awards from NSF and NIH. 5.National surveys show that the MPRF program supported more than one-tenth of minority fellowship seekers in BIO fields, and about one-twentieth of those in SBE fields. *Findings about the Program's Policies and Operations* 1.The most important reasons for applying to MPRF centered on opportunities to work toward a tenured position. 2.Half of the respondents chose MPRF over other offer(s). 3.The most important factors in choosing a mentor were reputation and research interests. The mentor's minority status was least important. 4.Most former Fellows thought that the MPRF funding amounts and award duration were sufficient. 5.Former Fellows found the program workshops to be generally useful. 6.About half of the former Fellows were satisfied with their opportunities to mentor minority students, but almost a third were not. Findings About the Pool of Scholars Eligible for MPRF 1.The pool of eligible scholars has doubled over the past 12 years but remains relatively small. 2.In 2000, Hispanics were about three-fifths, and women more than one-half, of the potential pool of minority postdoctoral fellows in biology. 3.In 2000, women accounted for almost one-half of underrepresented minorities who received doctorates in the social and economic sciences, and about three-quarters of those who received doctorates in the behavioral sciences. **Availability:** Availability of report: SRI International and BIO Directorate

Workshop to Produce a Decadal Vision for Taxonomy and Natural History Collections	Scope: (a) Identify the major research questions that must be addressed with knowledge resulting from natural history collections. (b) Identify important societal benefits that accrue from taxonomic research and natural history collections. (c) Produce a 10-year vision for taxonomy and natural history collections, and develop a plan to meet the priorities of that vision. (d) Communicate the results and recommendations of the workshop participants to scientists, administrators, and policy makers. Findings: 1. Natural history collections contain a vast amount of biological information that exists in no other form or place and that cost the nation billions of dollars and centuries of effort to amass. 2. Many of the specimens and ancillary data in collections were obtained prior to major modifications of the landscape that have characterized modern development and, consequently, are an irreplaceable record of our natural heritage. 3. Important societal benefits are unrealized because natural history collections are not managed (or even properly recognized) as a national resource. 4. The solution to the unrealized potential of natural history collections is to view them as a single entity, i.e., as a network of biological observatories distributed across the nation and with a database that is continually increasing in quantity, quality, and scientific value. 5. Creating an interactive and linked network of biological observatories will substantially increase the amount of available information on the geographic and temporal distributions of organisms and significantly enhance the ability of taxonomists to identify and describe species, and of phylogeneticists to ascertain relationships among species. Recommendations: 1. Manage natural history collections in the United States as components of one large electronically interconnected network of biological observatories 2. Expand and modernize the basic infrastructure of natural history collections in universities and museums, update specimen identifications, and expand the electronic availability of collection databases. **Availability:** www.flmnh.ufl.edu/taxonomy_workshop/NSF_workshop_Report_3-08-04.pdf :

Frontiers in Polar Biology in the Genomic Era	**Findings:** 1. Environmental issues will define the 21st Century, as will a world with a large human population and ecosystems that are increasingly shaped by human intervention. 2. The science of ecology can and should play a greatly expanded role in ensuring a future in which natural systems and the humans they include coexist on a more sustainable planet. 3. Ecological science can use its extensive knowledge of natural systems to develop a greater understanding of how to manage, restore, and create the ecosystems that can deliver the key ecological services that sustain life on our planet. 4.Ecologists will have to forge partnerships at scales and in forms they have not traditionally used. 5.These alliances must implement action plans within three visionary areas: enhance the extent to which decisions are ecologically informed; advance innovative ecological research directed at the sustainability of an over-populated planet; and stimulate cultural changes within the science itself that build a forward-looking and international ecology. 6. New partnerships and large-scale, cross-cutting activities will be key to incorporating ecological solutions in sustainability. **Recommendations:** 1. Initiate a four-pronged research initiative, to be built on new and existing programs, to enhance research project development, facilitate large-scale experiments and data collection, and link science to solutions 2. Improve interactions among researchers, managers, and decision makers 3. Develop a major public information campaign to bring issues and raise awareness of ecological sustainability before the general public. 4. Standardize data collection, data documentation, and data sharing. 5. Develop resources that will help ecologists and collaborators from other sciences work together more effectively. 6. Convene a meeting of key leaders in research, management, and business to produce a plan to create reward systems for ecological researchers and educators, as well as to foster collaborations. 7. Provide global access to ecological knowledge. 8. Implement strategies to ease the exchange of students, managers and practitioners among institutions in various countries. **Availability:** www.esa.org/ecovisions

	Directorate for Computer and Information Science and Engineering (CISE)
Security at Line Speed Workshop	**Scope:** To disseminate information on problems, discuss potential solutions and identify areas requiring additional research in areas of intersection between security and advanced, high-performance networking. **Findings:** It is increasingly difficult to couple the performance requirements of advanced applications with the necessities of prudent network security. It has always been a challenge to realize high-performance from the mesh of systems, software, local connections and national backbones that compose the typical advanced, computational environments that much of the research community uses. Now, with increases in network threats over recent months, the defensive security actions that many enterprises must take offer several depressing prospects. First, these actions significantly compound the problem of delivering high performance networking, where high performance represents a broad set of needs including bandwidth, latency, multi-protocol support, and port agility. Secondly, the defensive actions, while somewhat effective in the short-term, may be ultimately doomed themselves, as new technologies could render them ineffective. Thirdly, the increased complexity of networks will make troubleshooting more difficult. Lastly, and perhaps most profoundly, they undermine the basic principles of the Internet, including end-to-end transparency and open access, and so may stifle the innovation that has characterized the network to date. There are good steps for campuses and national research facilities to take that will support some advanced applications. There are network architectures and technologies that are useful, though their value to individual campuses depends on local conditions as diverse as traffic loads and distribution of academic departments on campuses. There are steps that the research community can take to adapt their protocols and approaches to better fit the realities of the current level of security threats. The use of layered authentication and authorization services offer new opportunities for security. The traditional benefits of education and awareness, mixed with appropriate policies, remain; we have had a number of recently teachable moments. Taken together, they can do much. Applied security research, well anchored in the realities of performance issues and network constraints, could significantly advance the future options available. Some of those alternatives may present their own challenges in deployment, in expense, a need for a flag day, management integration, etc. The investment in research and deployment may need to be considerable. The consensus of the workshop was that the state of networking is at a crossroads. If no action is taken, we will continue to see attacks, experience pain and create barriers that will eventually hinder the ability for the network to support the original goal of the Internet. Open networks capable of supporting a variety of users and uses are possible, but will require research. The workshop report identifies research areas that will begin to address the problem. **Availability:** http://apps.internet2.edu/sals/

	Directorate for Education and Human Resources (EHR)
Mathematics Education Portfolio Review	**Scope**: Relevance: How well does the mathematics education portfolio address the problems and issues in the field? Quality: Is the research and development of high quality as defined by relevant standards in the field? Performance: What has been the impact of the portfolio on the improvement of mathematics education? **Findings:** - Utilize a portfolio perspective—built on an explicit logic—to guide program planning and funding of future efforts. - Emphasize the importance of the integrity of mathematics in both NSF proposal solicitations and subsequent funded projects. - Enhance the portfolio by building on existing knowledge bases and requiring rigorous evaluations of funded projects. - Strengthen NSF support for improvement of infrastructure (i.e., human capital) for improved mathematics teaching and learning. **Availability:** The Executive Summary for the Mathematics Education Portfolio Review is available through the EHR Directorate.
The Advanced Technological Education) Evaluation Project	**Scope:** Assess the impact and effectiveness of the NSF Advanced Technological Education (ATE) Program. **Findings:** The project is ongoing, but has provided primary findings for each category of work that will serve as a baseline from which future actions can be tracked and ultimately judged. Findings include: • The projects are actively addressing the goals of the ATE program • The ATE projects have established a large number of collaborative arrangements. The collaborations serve multiple purposes and provide monetary support as well as other kinds of assistance for materials development, academic programs, and professional development efforts • ATE projects are developing many materials to support the preparation of technicians. These materials include full courses, adaptations of courses, and modules that can be incorporated into coursework • Projects and centers are improving their technician-based programs by constructing new courses, modifying existing courses, and taking steps to better serve students in matters of recruitment, retention, placement, and diversity. • Projects conduct large numbers of professional development activities. These activities are well attended and well received. Where follow-up has occurred, reportedly about half the participants try out materials and a third implement them **Availability:** http://www.wmich.edu/evalctr/ate

On Evaluating Curricular Effectiveness: Judging the Quality of K-12 Mathematics Evaluation	**Scope:** This goal is to evaluate the quality of evaluations of 19 mathematics curricula -- 13 supported by NSF's Instructional Materials Development program, and 6 commercially generated. The study resulted in clarification of proper elements of an array of evaluation studies for judging curricula effectiveness, as well as standards of evidence. **Findings**: • A total of 698 studies were categorized as historical (225), content analyses (36), comparative studies (95), case studies (45), and syntheses (16). A total of 147 met minimal criteria for consideration (75% of which were NSF-supported). • Limitation on number of studies and arrays of methods, as well as uneven quality leads to inconclusive findings of effectiveness of any one individual curriculum. • Future studies should incorporate 3 major components: (1) program materials and design principles; (2) quality, extent, and means of curricular implementation; and (3) quality, breadth, type, and distribution of student learning outcomes over time. • Curriculum effectiveness should be ascertained through the use of multiple methods of evaluation, each of which is a scientifically valid study. Periodic syntheses of results across evaluation studies should also be conducted. • A curriculum program is scientifically established as effective only when it produces valid improvements in student learning with convincing demonstration that improvements result from the curricular intervention. • Three primary bodies (federal agencies developing curricula, publishers, and state/local districts and schools) share responsibility for curricular evaluation, with recommendations provided for each. Federal government and publishers should support multidisciplinary, basic empirical research studies on curricular effectiveness. **Availability:** National Research Council (2004). Committee for a Review of the Effectiveness of NSF-Supported and Commercially Generated Mathematics Curriculum Materials. Mathematical Sciences Education Board, Center for Education, Division of Behavioral and Social Sciences and Education, Washington, DC: The National Academies Press. Available at http://www.nap.edu/catalog/11025.html

Local Systemic Change (LSC) through Teacher Enhancement: Year Nine Cross-Site Report	**Scope:** Supported under NSF's Teacher Enhancement program, the LSC initiative sought to improve science and mathematics (S/M) teaching through extensive professional development of teachers in whole schools/districts. A standardized, CORE evaluation of 88 projects funded from 1966-2003, developed data collection instruments and procedures to evaluate individual projects, aggregate across projects, and produce cross-project analysis. Findings for September 1, 2002-August 31 2003, evaluation activities show strengths and weaknesses in design and implementation of professional development and impact on teachers and instruction. **Findings**: • LSC professional development received high ratings for appropriateness of S/M content, providing climate of respect, encouraging active participation, and promoting collaborative learning approaches. Weaknesses related to lack of questioning for enhancing conceptual understanding; adequate time/structure for wrap-up; and encouraging "sense-making" about classroom practice. • Districts often used their own personnel (teachers leaders) as professional developers and did not adequately emphasize the need to deepen disciplinary content. • Just over one-third of randomly observed lessons focused on helping teachers understand student thinking/learning about content that is increasingly identified as important in teacher development. Extent of participation in LSC professional development was positively correlated with highest ratings of quality (39% rated professional development as excellent or very good). • Teachers liked LSC design aligning professional development, curriculum, collaboration, deepening of content and pedagogy, and opportunities to collaborate with their peers. Teacher concerns were lack of time and quality of professional development, as well as problems implementing curricula in classrooms. • Teacher participants noted LSC professional development had significant positive impact on pedagogical preparedness, confidence in content knowledge, and use of standards-based instructional strategies. • Among participants, both K-8 S/M teachers were most likely to use reform-oriented teaching (e.g., engaging in hands-on activities, work on extended investigations, journal writing). • Strategy supports benefits of providing professional development aimed at implementing exemplary materials. Classroom observations show increased likelihood of use and quality of lessons. **Availability:** Horizon Research, Inc. (August 2004). Available at http://www.horizon-research.com/reports/2004/year9.php.

CLT Online Monitoring System: Report for the 2003-04 Academic Year	**Scope:** The Centers for Learning and Teaching (CLT) program's standardized monitoring system was designed to collect GPRA-related program data in support of strategic planning and performance measurement. This report covers data for 13 Centers funded from FY 2000-04 on (1) participant characteristics; (2) educational and occupational status of exiting students; (3) characteristics of K-12 teachers and other educator participants; and (4) characteristics of CLT courses (developed, revised, implemented). These data for the 2003-2004 academic year complement qualitative and quantitative evaluations of program implementation and impact conducted by SRI International and Abt Associates, Inc. **Findings**: • 226 participating faculty members -- male (57%); white, one race only (91%); primary field of research, education (70%) or mathematical sciences (9%); primary field of instruction, education (54%) or mathematical sciences (13%); Full Professor (44%) or Associate Professor (20%). • 312 participating graduate students were enrolled full-time (80%); female (70%); white, one race only (79%); enrolled in a CLT doctoral program (84%) or in a CLT master's program (14%); thesis/dissertation topics "not yet determined" (70%). • Graduate students reported wide range of prior degrees and other qualifications (e.g., certifications, licensures, credentials); prior degrees ranged from associate to other professional degrees. All K-12 grade bands represented; mathematical science is the most-cited content area. • 35 participating postdoctorates – male (31%); white, one race only (80%); had doctoral degrees in education (43%); experience teaching at some level (91%) [K-12 teaching (37%) postsecondary teaching (86%)]. 30% of postdoctorates were conducting education research; others in sciences and mathematics. • 155 participating professional developers/other educators -- male (36%); white (92%). Primary roles were to develop, conduct, and plan (59%) or conduct research (16%). Professional affiliation was – higher education (46%); K-12 school/system (30%); or museum (8%). • 95 courses received CLT support – new course offerings (57%); modification of pre-existing courses (16%). 2,139 students were enrolled in CLT-supported courses. • Since 2001, 12 graduate students obtained master's degrees and 8 obtained doctorates. Five exiting graduate students are teaching in a U.S. K-12 school; six are employed at a U.S. 4-year higher education institution. **Availability:** WESTAT (August 2004). Available in paper and CD-ROM from NSF and WESTAT, 1650 Research Boulevard, Rockville, MD, 20850.

	Directorate for Engineering (ENG)
Infrastructure for Biology at Regional to Continental Scales Working Group of the American Institute of Biological Sciences White Paper on the National Ecological Observatory Network	**Findings:** IBRCS White Paper Rationale, Blueprint, and Expectations for the National Ecological Observatory Network, explains the scientific rationale behind the need for NEON, how NEON will operate to meet that need, and the results that NEON is expected to produce. The IBRCS white paper is a summary and evaluation of past NEON and BON workshops on relevant infrastructure and data-networks and a synthesis of the current scientific communities perspective on networks and infrastructure needed to address biological research at over large geographical regions, and highlights the need for coordinated scientific infrastructure that is itself spread over large regions. Ongoing advances in our technical capability permit the development of networks of people and tools that can meet that need. NEON has been designed by the scientific community to capitalize on such capabilities and to enable discoveries about our nation's ecosystems that until now have been impossible to address. By fostering collaboration, the development of new tools and technologies, and the study of regional- and continental-scale questions, NEON will produce new perspectives in ecosystem science and thus public benefits, both anticipated and unforeseeable **Recommendations:** 1. NEON should provide a research platform that will apply experimental, observational, analytical, communication, and information technologies to investigate the structure, dynamics, and evolution of ecosystems in the United States, to measure the pace of biological change resulting from natural and human influences at local to continental scales, and to forecast the consequences of that change. 2. Each observatory will provide state-of-the-art infrastructure to support interdisciplinary, integrated research at regional to continental scales. Collectively, the network of observatories will allow scientists to conduct comprehensive, local to continental-scale experiments on ecological systems. 3. NEON should be designed to provide an integrated network of regionally distributed, extensively-instrumented, shared use research observatories with teleobservation and teleoperation capabilities; next generation laboratory instrumentation, field-based sensors, and computational infrastructure; curated repository system; and information technology to facilitate collaboration in biological sciences and education.4. NEON should be administered and governed through a national-level coordinating agency. **Availability:** http://ibrcs.aibs.org/reports/pdf/IBRCSWhitePaper_NEON.pdf

World Technology Evaluation Center (WTEC) Panel Report on "International Research and Development on Biosensing"	**Findings:** The WTEC panel's findings regarding the relative strengths in Europe, Japan, and the United States of biosensing R&D may be summarized as follows: • Europe leads in development and deployment of inexpensive distributed sensing systems and in the integration of components and materials in microfabricated systems. • The United States leads in surface engineering applied to biosensing and in integration of analog-digital systems. • Both Europe's and Japan's communication infrastructures are better suited for networked biosensing applications than those of the United States. • Integrated biosensing research groups are more common in Europe and Japan. Among the significant overall trends and emerging opportunities that the WTEC biosensing panel identified are the following: • Increasing pervasiveness of systems on a chip and other integrated systems approaches • Growth of microfluidic/micromechanical systems • Emergence of molecular receptor engineering • Development of sensor networks and advanced logistical strategies There is also a general trend towards the development of biosensors as a low-cost, commodity-like technology that will find application in a wide variety of consumer products. **Recommendations:** In addition to the above trends, the U.S. research community has identified several broad requirements and goals for ongoing development of the field of biosensing systems: • Rapid, inexpensive, and broad based tests for detection and identification of toxic materials and organisms • Standards for validation and comparison of technologies • Methods that can be fielded as sentinels in the environment to monitor food, water, soil, and air quality • Improved sampling and preprocessing techniques • System automation for unskilled operators **Availability:** **http://wtec.org/biosensing/**

	Directorate for Geosciences (GEO)
NSF Workshop Report on "Emerging Issues in Nanoparticle Aerosol Science and Technology (NAST)"	**Scope:** This report summarizes the discussions and results of a workshop held at UCLS, June 27-28, 2003. The workshop was sponsored by NSF, the Southern California Particle Center, and the UCLA Department of Chemical Engineering. The workshop brought together scientists from the fields of atmospheric aerosols and engineers working on aerosol science and technology. Aerosol research is driven by concerns about air quality and climate change, workplace exposure to particulate matter, nuclear reactor safety, but also interest in the manufacture of materials of many different kinds and applications, inhalation therapy, counter terrorism, and many other areas. **Findings:** The workshop identified the following topics for research: (1) Photochemically-driven nucleation in the atmosphere (2) Nucleation and rapid growth that occurs as hot pollutant exhaust gases mix with cooler air in the ambient environment (3) Growth rates of freshly nucleated atmospheric ultrafine particles (4) Chemical and physical transformations of atmospheric ultrafine particles (5) Improvements in measurement technology for ultrafine particles (6) Atmospheric measurement needs for ultrafine particles (7) Measurement and characterization of ultrafine particle emissions from sources (8) Source apportionment of ultrafine particles (9) Population exposure assessment (10) Dosimetry (11) Health effects of ultrafine particles (12) Control technology (13) Ultrafine particles and homeland security **Availability:** http://www.scpcs.ucla.edu/news/Nanoreport.pdf
Cooperative Studies of the Earth's Deep Interior: Developments, Discoveries, Future	**Scope:** This report summarizes the discussions and results of a workshop organized by the CSEDI Coordinating Committee to examine progress made over the past decade and recommend future directions for the Program. **Findings:** The CSEDI Program needs to provide support both for collaborative projects and integrative research. The report identifies specific areas recommended for scientific investigation. Support should be at the level of approximately $10M, with $5M in new awards made each year. **Availability:** http://www.csedi.org/CSEDI.Sept29.04.pdf

Future Needs in Deep Submergence Science: Occupied and Unoccupied Vehicles in Basic Ocean Research	**Scope:** A study to assess the current and future national deep submergence science facility needs. **Findings:** The report summarizes and confirms the need for the US government to provide facilities to support basic deep submergence research activities. The report provides five recommendations to enhance or improve upon existing facilities: 1) NSF/OCE should establish a small pool of funds to support non-National Deep Submergence Facilities (NDSF) when legitimate barriers to existing NDSF assets can be demonstrated; 2) NSF/OCE should construct an additional scientific Remotely Operated Vehicle (ROV) system dedicated to expeditionary research; 3) NSF/OCE should consider basing this new ROV system at a different location than the NDSF to minimize transit/refit time; 4) NSF/OCE should construct a new, more capable Human Occupied Vehicle (HOV); and 5) A new HOV should be constructed to operate at significantly greater depths only if it can be delivered for a relatively small increase in cost and risk. **Availability:** National Academy of Sciences www.nas.edu

Population Connectivity in Marine Systems: Report of a Workshop to Develop Science Recommendations for the National Science Foundation	**Scope:** A workshop was held to address science issues and resources needed to develop a mechanistic understanding of marine population “connectivity”, i.e. the exchange of individuals among populations through larval dispersal. Participants were charged with developing a Science Action Plan and to make recommendations regarding the resources needed to implement it. **Recommendations:** The workshop participants recommended that the present model of small research groups should be replaced by a coordinated, multidisciplinary research effort capable of addressing complex processes at multiple scales. An overall recommendation was made for programmatic development focused on marine population connectivity, with the following specific recommendations. Development and application of key technologies. Marine population connectivity research will require development of new tools and their application in an interdisciplinary framework. Integration of Population Connectivity science issues into planning and implementation of Ocean Observing Systems and Observatories. Ocean observing systems provide a large-scale framework to examine inter-annual variability of connectivity as it relates to known climate signals. Instrumentation should be capable of resolving physical transport processes and both large and small scales, and should include appropriate biological sensors. Connectivity issues should be included in the planning of ocean observatories. Participants supported the development of re-locatable observatories, and encouraged observatories that can be deployed in a range of environments for ecologically relevant time scales. Application of multiple techniques from several disciplines simultaneously. For example, testing of biophysical models will require application of techniques that are not typically used together over a range of spatio-temporal scales. Participants noted that new models for ship use will be needed, to respond quickly to unpredictable events. Transfer of information fostering cross-training and collaboration. Cross-training programs are needed to bring together diverse expertise. These may include graduate and post-graduate traineeships, workshops, summer courses and symposia. The participants also encourage the creation of a Center for Integrative Marine Ecology (CIMEC) dedicated to the development of quantitative approaches to conservation and sustainable management of marine ecosystems. **Availability:** Through GEO/OCE

Autonomous and Lagrangian Platforms and Sensors (ALPS) Report of a Workshop to Develop a Plan for Coordinated Development and Community Access to ALPS Systems	**Scope:** The final report of a workshop held to discuss autonomous and Lagrangian platforms and sensors (ALPS) was released in August 2004. Participants were charged with identifying major science questions that can best be addressed using ALPS, identifying needs for more capable platforms and sensors, and proposing models for advancing the technology and enabling broad community access. **Recommendations:** The workshop participants recommended that: ALPS networks and technical support must be regarded as permanent infrastructure and funded as such, even though individual instruments may be comparatively inexpensive and have limited lifetimes. A working group of technology developers and end users should be formed to develop an implementation plan and ensure broad community participation. Sustained development of platforms and sensors. Examples of new instruments include: new platform designs for testing instruments, microfloats mimicking larval dispersal, autonomous vehicles for under-ice exploration, and others. Improved performance needs include: a great sensor payload; increased reliability, endurance, and stability of sensors; improved communications; standardized interfaces; and others. Existing platforms and sensors should be combined into new observational systems. A mechanism should be established to support pilot projects. Workshops, short courses, training programs and fellowships are needed to address a shortage of trained engineers and scientists capable of developing and supporting the ALPS infrastructure. **Availability:** White papers are available at: http://www.geo-prose.com/ALPS/

Ocean Carbon and Climate Change. An Implementation Strategy for U.S. Ocean Carbon Research	**Scope:** A report prepared for the U.S. Carbon Cycle Science Scientific Steering Group and Inter-Agency Working Group by the Carbon Cycle Science Ocean Interim Implementation Group was released in January 2004. This report focuses on four science questions: 1. What are the global inventory, geographic distribution and temporal evolution of anthropogenic CO_2 in the oceans? 2. What are the magnitude, spatial patter and variability of air-sea CO_2 flux? 3. What are the major physical, chemical and biological feedback mechanisms and climate sensitivities for ocean carbon storage? 4. What is the scientific basis for ocean carbon mitigation strategies? **Recommendations:** The report outlines a recommended decadal-scale research program. Phase I will be located primarily in the North Atlantic and the North and Equatorial Pacific, and will include pilot studies in the Southern Ocean that will be expanded to a full Southern Ocean field program in Phase II. The recommended implementation strategy consists of four coordinated elements: 1. Global ocean carbon observing network The group recommended adopting an integrated and multidisciplinary research model to address the wide range of relevant time and space scales. Specific recommendations include: • repeat transects at which CO_2 system properties, and physical, chemical and biological system properties are measured; • an upper ocean observing system on ships to determine air-sea CO_2 flux and processes that determine CO_2 partial pressure at the sea surface; • ocean and coastal time series stations; • remote sensing observations to constrain air-sea CO_2 flux and biological variables; • atmospheric observations of the O_2/N_2 ratio of air; and • compilation of global maps of variables accessible by remote sensing. 2. Targeted multi-disciplinary process studies The group recommends that process studies be conducted at time series sites operating for 5 or more years, to provide the background needed to estimate large-scale air-sea CO_2 flux and predict the system response to climate change. Key elements and identified priorities are: • Upper-ocean and mesopelagic studies o Priorities: improved estimates of biological pump efficiency; controls on stoichiometry of organic matter production and export; temporal variability in ecosystem structure; partitioning of exported carbon into DOC and POC; regeneration length scales; particle dynamics; ecosystem structure; improved mass budgets; and $CaCO_3$ dissolution rates. • Continental margin biogeochemistry o Priorities: Selection of sites representing a wide range of margin types; studies establishing distribution and transport of carbon at each site; and shipboard and monitoring studies of both water-column and benthic processes, emphasizing processes expected to be sensitive to change.

	• Air-sea gas exchange
	  o Priorities: Dedicated gas exchange process studies; longer-term CO_2 flux observations; and development of remote sensing algorithms.
	
	3. Data synthesis and numerical modeling
	
	The group identified three key modeling activities: prognostic modeling, diagnostic modeling, and reconciliation of oceanic and atmospheric data. Specific recommendations include
	• augmented and new carbon data management centers;
	• modeling studies to design and assess sampling and measurement strategies;
	• development and evaluation of ocean circulation and biogeochemical models;
	• reconciliation of independent estimates of air-sea CO2 fluxes;
	• hindcast simulations of ocean carbon variability over the recent historical period;
	• pilot studies to evaluate feasibility of carbon data assimilation systems;
	• prognostic model development to improve projections of future changes to the carbon cycle; and
	• development of tools to support carbon cycle and climate assessments.
	
	4. Enabling activities
	
	The group identified several activities needed to support and enable the work as envisioned. Key elements and specific recommendations include:
	
	• Methods and technology development
	  o The group recommended development and application of a variety of chemical and biological techniques ranging from natural nucleotide tracers to molecular biology to sediment traps; development of improved or new platforms, including autonomous vehicles, towed devices, floats and drifters; development of new sensors for carbon cycle properties and processes; nutrients and micronutrients, and biological processes; and support for remote sensing including development of new systems.
	• Data management and availability
	  o A data management system should include a CO_2 Science Team and a Process Study Team to develop standards for data collection, reporting and quality control; a Data Management Group responsible for maintaining data sets; and a Data Acquisition System, i.e. the actual hardware and software.
	
	• Synergy with US and international programs
	  o Strong interactions with existing US and international programs should be encouraged through joint workshops, steering committee meetings, sharing of sampling platforms, coordination of field campaigns and other activities.
	
	• Workshops, education and outreach activities
	  o The group emphasized the importance of communication research findings to the policy makers, the public in general and K-12 educators in particular. Suggested supporting activities included workshops to train scientists to communicate with the media and to develop avenues for providing information to various sectors of society.
	
	Accessibility: http://www.carboncyclescience.gov/occc-feb04.pdf

The EU-US Scientific Initiative on Harmful Algal Blooms: Report from a Workshop Jointly Funded by the European Commission DG Research – Environmental Directorate and the U.S. National Science Foundation	**Scope:** A workshop was held in Trieste, Italy to assess the status of harmful algal bloom (HAB) science, to identify gaps in knowledge, and to develop an international plan for cooperative, comparative studies. **Findings:** HAB research has a long history in the US and European countries, but areas exist where research would particularly benefit from collaborative research. For example, similar HAB species occur in the EU and US, but differ in bloom dynamics and expression of harmful attributes. The working group proposed that forcing functions select for different functional groups of HABs in different oceanographic regimes (e.g. open versus enclosed or semi-enclosed systems), with consequences for the bloom and population dynamics of selected groups. Examples of forcing functions include physical dynamics, climate change, nutrient loading, and changes in grazing communities. Major anthropogenic and natural forcing (e.g. climate variability) appear to have different effects on HABs in the EU and US. Comparisons between environments common to both the EU and the US should lead to improved understanding of the processes affecting HABs in different oceanographic regimes. Other issues are not specific to particular oceanographic regimes. For example, observed changes in the biogeography of HABs and their toxicity may depend on selection of different subpopulations of genetically diverse species. Only some genotypes bloom under a given set of conditions, and not all genotypes express toxicity. Comparison of genetic structure of populations of widespread species will lead to a better understanding of the interactions between environmental selective pressures, selection for or against specific genotypes, and the expression of favored genotypes in blooms. **Recommendations:** The participants recommended continued discussion including additional workshops, meetings and symposia to plan for implementation of coordinated research activities. Specific issues that must be resolved include coordination of announcements of calls for proposals; joint evaluation of proposals; joint opportunities for ship time; increased flexibility for funding joint cruises; and joint access to remote sensing and other databases. The recommendations provided the foundation for the program "Cooperative Activities in Environmental Research between the National Science Foundation and the European Commission: Ecology and Oceanography of Harmful Algae" (program solicitation NSF 03-580). **Accessibility:** http://www.whoi.edu/redtide/announcements/EU_US_Sci-Init.pdf

An Ocean Blueprint for the 21st Century	**Scope:** A report prepared for the President and Congress by the U.S. Commission on Ocean Policy. The report contains a comprehensive review of the management of the nation's oceans and the Commission's final recommendations for a new, comprehensive national ocean policy that ensures sustainable use and protection of the nation's oceans, coasts and Great Lakes. **Findings:** "Recommendations throughout this report are intended to strengthen the execution of programs in federal agencies with ocean- and coastal-related responsibilities, including the … National Science Foundation (NSF)." …. "some entities, such as the U.S. Navy, the U.S. Department of Justice, or the National Science Foundation, have such distinct missions that their ocean- and coastal related components could not be simply removed and transferred without harm to the overall enterprise." **Recommendations:** The report outlines the following key overarching recommendations that will provide the foundation for a comprehensive national ocean policy leading to significant improvements in ocean and coastal management. 1. Establish a new National Ocean Policy Framework to improve decision making, promote effective coordination, and move toward an ecosystem-based management approach. 2. Base national ocean policy decisions on the most current, credible, and unbiased scientific data and information. 3. Strengthen formal and informal ocean education to better engage the general public, promote stewardship, and prepare an ocean-related workforce to meet future ocean policy challenges. **Recommendations specific to the National Science Foundation**: The report makes 212 recommendations to transform U.S. ocean policy and restore the nation's oceans and coastal areas by revamping an ineffective mix of federal, state and local authorities and regulations. Several of the Commissions final recommendations call for actions to be taken by the National Science Foundation. 1. Help strengthen the national awareness of the importance of the oceans through formal and informal education efforts. • Recommendation 8-3. The National Oceanic and Atmospheric Administration, National Science Foundation, Office of Naval Research, and National Aeronautics and Space Administration should strengthen their support of both formal and informal ocean-related education, including appropriate evaluations of these efforts. • Recommendation 8-5. The National Ocean Council (NOC), working with the National Science Foundation, should place the Centers for Ocean Sciences Education Excellence (COSEE) within the NOC structure as a program to be organized and overseen through Ocean.ED. The NOC should also work to expand the COSEE program. • Recommendation 8-10. The National Oceanic and Atmospheric Administration, National Science Foundation, and Office of Naval Research should support colleges and universities in promoting introductory ocean and coastal science and engineering courses to expose a wider cross-section of students, including non-science majors, to these subjects.

	• Recommendation 8-14. The National Science Foundation's Directorates for Geosciences, Biological Sciences, and Education and Human Resources should develop cooperative programs to provide diverse, multidisciplinary educational opportunities at the undergraduate, graduate, and postdoctoral levels in a range of ocean-related fields. • Recommendation 8-16. The National Oceanic and Atmospheric Administration, National Science Foundation, Office of Naval Research, and National Aeronautics and Space Administration should encourage increased participation of traditionally underrepresented and underserved groups in the ocean-related workforce. Ocean.ED should coordinate among these agencies and institutions of higher learning. 2. Help strengthen the understanding of the links between oceans and human health. • Recommendation 23-1. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities should support expanded research and development efforts to encourage multidisciplinary studies of the evolution, ecology, chemistry, and molecular biology of marine species, discover potential marine bioproducts, and develop practical compounds. • Recommendation 23-2. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities, should support expanded research efforts in marine microbiology and virology. • Recommendation 23-3. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities should support the development of improved methods for monitoring and identifying pathogens and chemical toxins in ocean and coastal waters and organisms. 3. Creating a national strategy for increasing scientific knowledge • Recommendation 25-1. Congress should double the Federal Ocean and coastal research budget over the next five years. The new funds should be used to support a balance of basic and applied research. • Recommendation 25-6. The National Oceanic and Atmospheric Administration and the National Science Foundation should lead an expanded national ocean exploration program, with additional involvement from the U.S. Geological Survey and the U.S. Navy's Office of Naval Research. Public outreach and education should be integral components of the program. 4. Help achieve a sustained national Integrated Ocean Observing System (IOOS) by encouraging the conversion of research into operational capabilities. • Recommendation 26-6. The National Oceanic and Atmospheric Administration, the National Science Foundation (NSF), the Office of Naval Research, and the National Aeronautics and Space Administration should require investigators who receive federal funding related to ocean observatories, including the NSF Ocean Observatories Initiative, to plan for the transfer of successful technologies to an operational mode in the Integrated Ocean Observing System. • **Availability:** http://www.oceancommission.gov/documents/welcome.html

	Directorate for Mathematical and Physical Sciences (MPS)
Communicating Astronomy to the Public	**Scope:** A workshop on "Communicating Astronomy to the Public" was held on 1-3 October 2003 in Washington sponsored by the National Radio Astronomy Observatory, in association with the National Research Council. The goals of the conference were to share outreach and education resources among the astronomical community, to find ways to communicate with underdeveloped constituencies, to develop recommendations to establish Education and Public Outreach as a necessary aspect of research astronomy, and to exchange information about best practices and successful outreach programs among interested parties in the community. **Findings:** The workshop resulted in the "Washington Charter for Communicating Astronomy with the Public", a statement of the context and importance of sharing the results of astronomical research with the community and principles of action for funding agencies, professional astronomical societies, institutions that conduct astronomical research, and individual researchers. All have responsibilities and a compelling obligation to communicate their results and efforts with the public for the benefit of all. **Availability:** The "Washington Charter for Communicating Astronomy with the Public", is available at http://www.nrao.edu/ccap/conf_wash.shtml.
Building the System from the Ground Up – 2nd Community Workshop for the Ground-Based O/IR System	**Scope:** The 2nd community workshop on the Ground-Based Optical/Infrared System, "Building the System from the Ground Up" was held 13-14 May 2004 in Alexandria, VA. The workshop was hosted by the National Optical Astronomy Observatory, on behalf of its newly established Committee for the Development of an Integrated Ground-Based OIR System. The objective of the Second Workshop was to identify, as a community, the strategic issues involved in making the effective system of all ground-based facilities, both public and private, a reality. The workshop also addressed topics raised in the Committee's recent survey of over 900 U.S. astronomers, such as the System concept applied to smaller telescopes, the organization of instrumentation partnerships, including a software, archives, and the emerging virtual observatory in the system, and enabling unique observational modes. **Findings:** The report drawn up by the organizing committee based on presentations and discussions at the meeting reach 4 primary conclusions and recommendations – existing programs to integrate the system are working well, but need to continue to evolve with the benefit of experience; the incorporation of medium-sized telescopes in the system is essential, as is attention to the data reduction pipelines, data archives and data access and support; and that NOAO has an important role to play in the further development of the system in these areas. **Availability:** The report is available on the website of the National Optical Astronomy Observatory at: http://www.noao.edu/meetings/system2/.

Future Science at Gemini: New Horizons, New Science, New Tools	**Scope:** The community of the Gemini Observatory partnership held a workshop in Aspen, CO in June 2003 to refine its scientific vision and the plans for future instrumentation that would enable that vision. Preceding the June workshop, individual Gemini countries held national meetings to define the scientific aspirations of their communities in 4 broad subject areas in astrophysics. These discussions culminated in the Aspen workshop where over 100 representatives from the member communities gathered to distill these scientific goals and arrive at a definition of instrumental capabilities that would enable them. **Findings:** The Aspen participants defined basic questions that the Gemini Observatory expects to answer over the coming decade, such as 'how do galaxies form' or 'how did the cosmic dark age end', or 'how do stars process elements into the chemical building blocks of life'. The specific instrumental capabilities required to pursue these questions were also defined, from which a detailed plan for future instrumentation was developed. **Availability:** The report is now available at the Gemini Observatory web site at: http://www.gemini.edu/files/docman/science/aspen_report.pdf
Undergraduate Research Summit	**Scope:** The Division of Chemistry supported an Undergraduate Research Summit at Bates College. The purpose of the Summit was to examine issues involved in undertaking and sustaining research at predominantly undergraduate institutions and to provide recommendations on how to enhance the amount, quality, productivity, and visibility of chemistry research at these institutions. **Findings:** Undergraduates participating in research must be involved in an original investigation aimed at creating new knowledge. The findings of an undergraduate research project should be intended for dissemination among the relevant community through established means such as conference presentations and peer-reviewed publications. The specific goals emphasized in an undergraduate project (e.g., student learning, student recruitment and retention, faculty development, recognition within the discipline), and how they are balanced, often differ from project to project and individual to individual. **Availability:** http://abacus.bates.edu/acad/depts/chemistry/twenzel/summit.html.
DOE-NSF-NIH Workshop on Opportunities in THz Science	**Scope:** A workshop was held to discuss basic research problems that can be answered using THz radiation. The workshop was jointly sponsored by DOE, NSF, and NIH. **Findings:** The THz community needs a network.. Sources of THz radiation are, at this point, very rare in physics and materials science laboratories and almost non-existent in chemistry, biology and medical laboratories. The barriers to performing experiments using THz radiation are enormous. . **Availability:** http://www.sc.doe.gov/bes/reports/list.html

Collaborative Research in Chemistry Conference	**Scope:** The Collaborative Research in Chemistry (CRC) Conference provided an opportunity for CRC grantees to gather together with colleagues from the NSF and discuss the opportunities and barriers to collaborative research in the chemical sciences. **Findings:** Numerous findings are listed in the workshop report **Availability:** http://web.mit.edu/chemistry/dgn/www/CRCC03FinalReport.pdf
Preparing Chemists and Chemical Engineers for a Globally Oriented Workforce	**Scope:** Leaders in chemistry and chemical engineering from industry, academia, government, and private funding organizations explored the implications of an increasingly global research environment for the chemistry and chemical engineering workforce in this workshop organized by the Chemical Sciences Roundtable. **Findings:** The workshop presentations described deficiencies in the current educational system and the need to create and sustain a globally aware workforce in the near future. **Availability:** NAS Press http://www.nap.edu/catalog/11059.html
Neutron Scattering for Chemistry and the Chemistry/Biology Interface	**Scope:** This workshop discussed the opportunities that exist for scientific advances using neutron scattering and spectroscopic investigations by chemists and by biologists workding at the chemistry-biology interface. The number of neutron beam users in the United States among these communities is currently small and the workshop provided a forum for discussion of the barriers for more extensive use of neutron beam techniques. **Findings:** Recommendations were provided in the following areas: (1) support facilities needs for soft matter, (2) needs for hard matter: support facilities, sample environments, and isotopic labeling, (3) deuterium labeling, and (4) education and outreach. **Availability:** http://www.sns.gov/jins/tallahassee_workshops_2003/workshops.htm
Prospects for the Miniaturization of Mass Spectrometry	**Scope**: This workshop brought together leading researchers, technologists, users, potential new contributors, manufacturers and funding agencies to discuss prospects for the miniaturization of mass spectroscopy. **Findings:** Discussions of the future prospects for miniaturized mass spectrometers were discussed along with the technical and other barriers to the realization of these potentially useful analytical instruments. Recommendations appear in the report. **Availability:** http://www.nsf-mass-spec.umd.edu

Future Directions in Catalysis: Structures that Function at the Nanoscale	**Scope:** The purpose of the workshop was to bring together a leading group of engineers and scientists from academia, industry and government agencies to focus on the future directions of catalysis. **Findings:** An overriding grand challenge that emerged from these discussions was to develop the ability to control the composition and structure of catalytic materials over length scales from 1 nanometer to 1 micron in order to provide catalytic materials that accurately and efficiently control reaction pathways. **Availability:** http://cheme.caltech.edu/nsfcatworkshop/
Water and Sustainable Development: Opportunities for the Chemical Sciences	**Scope:** This report, supported by the Chemical Sciences Roundtable, National Research Council, was organized to explore how the chemical science community could respond to the need for clean reliable sources of water and the relationship of this need to sustainable development **Findings:** Numerous recommendations and observations appear in the report. **Availability:** http://books.nap.edu/catalog/10994.html
National Science Foundation/European Commission Workshop: Methods in Computational Materials Science	**Scope:** This report contains the scientific program, abstracts, references and views from the US and European scientists participating in a workshop on *Methods in Computational Materials Science* jointly organized by the US-National Science Foundation and the European Community in San Francisco in April 2004. The joint workshop was the first on computational methods. It is hoped that it will lay the foundations for several active and exciting research areas for US-EU collaborations dealing with modeling the complex behavior of materials, and spanning length scales from the atomic level to the continuum. **Findings:** The workshop participants recommended that NSF and the EC launch a collaborative research program in computational materials science. Such a program would considerably enhance the pre-eminent international position of the EU and the US in computational materials science, and promote genuine interdisciplinary collaborations between scientists from the EU and from the US. Future joint US-EU scientific collaborations would drive scientific discoveries through the application of materials modeling to new and emerging areas of chemistry, physics, material science and materials engineering, and will enable the development of new capabilities to integrate appropriate modeling approaches to describe material phenomena involving different length and time scales. Collaborations between US and EU scientists would also enhance educational opportunities to young scientists through international research collaborations. **Availability:** Institute for the Theory of Advanced Materials in Information Technology, University of Minnesota. https://www.itamit.dtc.umn.edu/nsfreport.php

The Role of Theory in Biological Physics and Materials	**Scope:** A workshop on *The Role of Theory in Biological Physics and Materials* was convened in Tempe, Arizona from 16-18 May 2004 to evaluate the unique role that theory (particularly condensed-matter and materials theory) can play in the emerging field between the biological and physical sciences. **Findings:** The main finding of the workshop was that this is a time of tremendous growth and opportunity for biological physics and materials, and the NSF should act strongly to support the role of theory in this field. On the basis of the workshop discussions, we recommend several specific ways to expand the pool of qualified individuals with a command of both the theoretical methods of the hard sciences and the language of biology. This involves catalyzing transitions into biological physics and materials at various career stages. The NSF can recognize the rapid growth of this field, and its potential, by expanding the funding available to theorists working in biological physics and materials. In addition, we make the following specific recommendations: *The expansion of NSF joint funding linking the NSF, especially DMR, with the NIH.* *The establishment of regional research and training centers in biological physics and materials to bring together biologists and physicists.* *The expansion of postdoctoral fellowships supporting transitions into biological physics.* *The development of more summer schools, internet resources and textbooks.* *Support for sabbatical visits to institutions with active biological physics and/or biology programs.* **Availability:** http://biophysics.asu.edu/workshop
NSF-EC Workshop on Nanomaterials and Nanotechnology	**Scope:** The NSF-EC Workshop on Nanomaterials and Nanotechnology was held at the British Consukate in Cambridge, MA in December 2002. This workshop was developed to provide important feedback to NSF and EC on two issues: I) The most critical and timely issues facing those investigators developing new nanomaterials and technologies related to those materials, and II) The best practices for catalyzing cooperative research in the emerging area of nanomaterials. **Findings:** Recommendations for important topics and challenges in nanomaterials research were arrived at by discussions in breakout groups in each of the three topical theme areas of the work. These discussions were preceded by brief talks from each of the participants. The common themes found in this discussion were: •**An increased focus on developing materials which have multifunctional capabilities.** •**Recognition of the importance that the environmental impact of nanomaterials in developing sustainable nanotechnologies.** •**The development of controlled assembly methodologies which allow for the complex arrangement of materials from the nanoscale up to the macroscale.** Participants also were naturally drawn into conversations concerning the best ways to encourage effective interactions between US and EC scientists. The differences between the level of funding and research styles between the two continents were apparent in the workshop; most people felt that programmatic features could be developed to take advantage of these complementary features. Recommendations include: •**A harmonization between the review criteria of the NSF and EC sponsors.** •**A two proposal process for collaborative interactions.** •**Investment into activities (e.g. more topical workshops) to encourage scientists to overcome the barriers to preparing funding requests.** •**An evolution towards a panel review process for proposals with reviewers from both countries participating in the reviews for collaborative US/EC projects.** **Availability:** DMR web page at http://www.nsf.gov/mps/divisions/dmr/research/

NSF-AFOSR Joint Workshop on Future Ultra-High Temperature Materials	**Scope:** The "NSF-AFOSR Joint Workshop on Future Ultra-High Temperature Materials" was held on January 13 and 14, 2004 at NSF Headquarters in Arlington, VA. The workshop goal was to identify basic research opportunities related specifically to ultra-high temperature materials (UHTMs). The workshop brought together people from industry, government, and academia from the U.S. and abroad. For the workshop, UHTMs were broadly defined as materials for use in extreme environments such as hypersonic flight, atmospheric re-entry, and rocket propulsion. These applications require service at temperatures above 1800°C in an oxidizing atmosphere. Some compounds that have been proposed for use in these extreme environments include ZrB_2, ZrC, HfB_2, HfC, HfN, and TaC, which have melting temperatures above 3000°C. The workshop considered current unmet needs, potentially valuable experimental approaches, and research/education needs related to UHTMs. **Findings:** The major outcome of the workshop has been identification of specific basic research and education needs in this field. From the Unmet Needs discussion, the major items were exploration of new materials, elucidation of fundamental processing-microstructure-property relationships, and definition of potential application environments. The Experimental Approaches discussion identified synthesis techniques, processing science, oxidation behavior, and intrinsic properties at elevated temperature as areas with needs that could be addressed through basic research. Issues of curriculum, integration of research into teaching, and interdisciplinary activities were raised as part of the Education and Training discussion. In addition to identifying basic research needs, the workshop had two other immediate outcomes. First, workshop participants formed the core of a UHTM working group that has pledged to meet annually to discuss recent developments in the field. Second, a sub-set of workshop participants is pursuing a multi-institutional NSF IGERT focused on materials for extreme environments. Finally, it is hoped that the workshop report will serve as a roadmap that will encourage others to begin to investigate the fundamental aspects of ultra-high temperature materials. **Continuing Activities:** Report distributed to workshop participants (~20) and plus ~55 others in UHTM field Working group established, currently ~ 30 members Working group meeting scheduled for January 2005 in Cocoa Beach, FL UHTM website established at web.umr.edu/~uhtm **Availability:** http://web.umr.edu/~uhtm

The Physics of the Universe	**Scope:** This report from the NSTC Committee on Science's Interagency Working Group on the Physics of the Universe (IWG on POU) put forth a cross-agency strategic plan for federal research at the intersection of physics and astronomy. It presents the conclusions on actions necessary to implement the recommendations of the 2002 report of the National Research Council entitled "Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century". **Findings:** The report identifies actions that NASA, NSF, and DOE will undertake in cooperation to carry out the recommendations of the NRC report. It recommends actions A) Ready for Immediate Investment and Direction Known to address Dark Energy; Dark Matter, Neutrinos, and Proton Decay; and Gravity; and B) Next Steps for Future Investments to address the Origin of Heavy Elements; Birth of the Universe Using Cosmic Microwave Background; and High Density and Temperature Physics. **Availability:** The report is available at: http://www.ostp.gov/html/physicsoftheuniverse2.pdf
Quantum Universe: The Revolution in 21st Century Particle Physics	**Scope:** The Quantum Universe Committee of the DOE/NSF High Energy Physics Advisory Panel (HEPAP) identified nine interrelated science questions that define the path ahead for elementary particle physics. The report articulates how existing and planned particle physics experiments at accelerators and underground laboratories, together with space probes and ground-based telescopes, bring within reach new opportunities for discovery about the fundamental nature of the universe. **Findings:** The report explored the primary US physics programs of existing and planned major facilities and selected smaller facilities. It concluded with summary tables that identify selected facilities of the US program whose primary physics goals align most directly with the reports nine science questions **Availability:** http://www.science.doe.gov/hep/HEPAP/Quantum_Universe_GR.pdf

	Office of Polar Programs
A Vision for the International Polar Year 2007-2008	**Scope**: This report reflects a vision for U.S. participation in the IPY 2007-2008. **Recommendations**: • The U.S. science community and agencies should use the International Polar Year to initiate a sustained effort aimed at assessing large-scale environmental change and variability in the polar regions. • The U.S. science community and agencies should pioneer new polar studies of coupled human-natural systems that are critical to U.S. societal, economic, and strategic interests. • The U.S. International Polar Year effort should explore new scientific frontiers from the molecular to the planetary scale. • The International Polar Year should be used as an opportunity to design and implement multidisciplinary polar observing networks that will provide a long-term perspective. • The United States should invest in critical infrastructure (both physical and human) and technology to guarantee that the International Polar Year 2007-2008 leaves enduring benefits for the nation and for the residents of northern regions. • The U.S. International Polar Year effort should excite and engage the public, with the goals of increasing understanding of the importance of polar regions in the global system and, at the same time, advancing general science literacy in the nation. • The U.S. science community and agencies should participate as leaders in International Polar Year 2007-2008. **Availability**: http://www.nap.edu/html/ipr2007-2008/0309092124.pdf
Bering Ecosystems Study (BEST) Science Plan	**Scope:** The intent of this document is to outline a multi-year research initiative that will improve understanding of the effects of climate variability, at multiple temporal and spatial scales, on eastern Bering Sea marine ecosystems. **Summary:** The BEST Science Plan provides the scientific background and rationale for a series of questions designed to elucidate mechanisms connecting regional climate forcing to the responses of ecosystems and their constituent species. The investigations necessary to answer these questions will form the backbone of a multi-year, multiplatform research program in the eastern Bering Sea. Elements of the program include study of the connections between climate variability and flows through the Aleutian Archipelago and into and across the eastern and northern shelves, the roles of sea ice and water temperature in controlling the timing, amount, and fate of primary production, and the interactions among species that control the ultimate structure of the region's ecosystems and their ability to support sustainable fisheries. BEST provides an excellent opportunity to integrate basic oceanographic research and the emerging requirement for ecosystem-based management of fisheries. Because the eastern Bering Sea supports some of the nation's largest and most lucrative fisheries, and its ecosystems are already showing signs of response to climate variability and change, BEST is timely and will fill an important societal need for knowledge and sound, science-based management. **Availability:** http://www.arcus.org/Bering/Downloads/BEST_science_plan.pdf

Arctic Logistics Report: Strategies and Recommendations for System-scale Studies in a Changing Environment	**Scope**: Update a report published in 1997, *Logistics Recommendations for an Improved U.S. Arctic Research Capability*. This update summarizes the progress made in improving research support since 1997 and responds to changing needs for Arctic logistics and research support since the earlier report was published. **Recommendation:** The range of research support and logistics needs identified during the development of the report can be served by three board strategies: • Supplying critical components for development of a pan-Arctic perspective; • Supporting the basic infrastructure for safe and efficient research; and • Maximizing resources and cooperation. The report contained major recommendations to implement these strategies and meet the Arctic research community's support and logistics needs. **Availability**: http://www.arcus.org/Logistics/03_report.html
Mcmurdo Sound, Antarctica: An Opportunity for Long Term Investigation of a High-latitude Coastal Ecosystem	**Scope**: This report summarizes the results of a meeting to assess the feasibility and challenges of initiating an LTER program in McMurdo Sound, Antarctica. **Findings**: McMurdo Sound offers a unique and important opportunity to understand basic ecological processes that are occurring in a coastal, polar marine system, and would provide an invaluable comparison with the existing more pelagic Palmer LTER project as well as other coastal LTERs in the Network. Some questions that could be answered by the LTER Network, with major contributions from a McMurdo Sound LTER, include: • How do ecosystems with contrasting time-scales of seasonal energy fluxes differ in regard to life-history adaptations among all trophic levels (examples include, mixotrophy, stasis, hibernation, migration)? • Over what time scales can the matching of life histories and productivity pulses be altered without affecting an ecosystem's trophic structure? • How dynamic are the earth's ecosystems, currently and in the past? **Availability**: http://penguinscience.com/home.htm

The Future of the Next Generation Satellite Fleet and the McMurdo Ground Station	**Scope**: The purpose of this report is to provide information, options, and recommendations for deciding how to collect and provide the transmitted data from the next generation of polar orbiting satellites for use by the United States Antarctic Program (USAP) in Antarctica. The focus of this document is to report on the Antarctic science and operations community recommendations regarding the capabilities of the next generation satellite fleet along with applications and reception possibilities with a focus on the MGS, especially as it relates to USAP research and operation activities. **Recommendations:** The recommendations of this report with regards to these issues as well as critically related communications issues are the following: Recommend that the United States Antarctic Program actively pursue increased and improved Internet communications both to and from McMurdo Station, Antarctica. This recommendation is critical for both the MGS and other stand alone direct readout reception stations at McMurdo Station, as the fast return of data received at these locations to users is critical. • Recommend the installation of a stand-alone X-band direct readout reception station for science and operational use by the United States Antarctic Program and its partners. • Recommend the processing and use of X-band direct broadcast data be required both on site at McMurdo Station as well as off site. • Recommend that if the MGS is to remain a viable ground station that sufficient monies for MGS are required to adequately manage and maintain MGS so as to insure a year round reliability consistent with other satellite ground stations. Given some recent developments, the following additional recommendations have been put forth: • Recommend that the second L-band direct readout ground system get upgraded to Dual X-/L-Band system during it next maintenance cycle upgrade to match the first system or if at all possible, a pure X-Band system be installed in the L-band system's place. Additionally, it is strongly encouraged that the capabilities of the MGS be expanded to be a backup for these systems in the case of catastrophic failure. In addition, it will be of benefit to the MGS to have this capability, as it will likely make the MGS more attractive to other users, and in turn a more valuable asset to the NASA Ground Station Network. **Availability**: http://amrc.ssec.wisc.edu/MGS/draft2.doc

	Directorate for Social, Behavioral and Economic Sciences
Comparative Research on Biotechnology and the Public Workshop	**Scope:** To provide recommendations for future directions of research on policy decisions, media discourse, and public opinion as these relate to the social landscape of biotechnology. **Findings:** This report to the US-EC Task Force on Biotechnology Research concluded that new levels of cooperation and collaboration between US and EC social and behavioral scientists could answer interesting and provocative questions about public perception and response to new developments in biotechnology. The answers have implications for policies and programs to encourage biotechnological research and applications. Workshop participants encouraged joint research efforts, spanning disciplines and perspectives, including the natural and social sciences, and the humanities. Key questions relate to policy trajectories, media trajectories, and opinion trajectories. They include: Policy trajectories – How do the various actors involved in policy decisions gain, maintain, and lose legitimacy among the public? What role does science play in policy decisions? Media trajectories – Will differential access to new forms of media have an impact on public perceptions of biotechnology? What are the best approaches to investigating the role of gatekeepers in the flows of information between research centers, governments, reporters, activists, and audience members? Opinion trajectories-Which groups are in a position to set ethical standards? Will new applications of biotechnology face the same problems as those that have already been introduced? Are there measurement tools that are particularly suited for investigating the processes of policy, media, and public opinion trajectories?

Genomics of Human Origins Workshop	**Scope:** To assess the contributions that comparative genomics can make to the study of human origins research. **Findings:** The participants concluded that tremendous opportunities exist to apply innovations in genomics, developmental biology and neuroscience to specific questions of human evolution. While a large number of differences can be noted that separate humans from non-human primates, many of these are not understood in detail. Precise definition of these differences requires collaborative efforts by researchers in numerous sciences. The definitions can then lead to a more thorough understanding of the mechanisms underlying human origins. Key questions relate to the tension between the high degree of observed similarity between human and non-human primate DNA sequences and the obvious anatomical, phenotypic and cognitive differences between the species. A deep understanding of (2) rests in part on deciphering the evolution of human ontogeny. This will require the development of new analytical techniques. Continued progress in the reconstruction of primate phylogeny, relying on DNA analysis, is necessary to draw the framework for interpreting phenotypic data. The broader impacts of a concerted effort in this area are great, e.g. leading to a clearer understanding of the workings of the human mind and advancing our understanding of human learning capabilities. Information on comparative primate genomics can be used to assist in pharmaceutical development. Few, if any, scientific topics are as compelling to the general public as the ancestry of our species. While the basic questions posed by the participants have been part of biological anthropology for years, opportunities for major advances now arise through the application of state-of-the-art genomic, neuroscience and computer technology. An infusion of resources beyond those of the core programs is necessary to support this exciting expansion of human origins research.

Education and Training in the Social, Behavioral, and Economic Sciences: A Plan of Action	**Scope:** The purpose of this report is to provide guidance to NSF on the development of a strategic plan for education and training in the SBE sciences. The report reflects the advice of 120 SBE scientists who attended a National Workshop on this issue. The report focuses on four levels of education—K-12, undergraduate, graduate, and postdoctoral and early career stages—and on diversity issues. In each area, the report addresses key needs, impediments and challenges, and best practices as well as the components of an action plan. The action plan itself is presented in three parts: enhancements to existing NSF programs, new opportunities and initiatives, and immediate steps. It emphasizes that, even in times of scarce resources, demonstrable progress is possible in the short term and in the years ahead. **Findings:** Over the last quarter of a century, the world has undergone rapid change. Almost every aspect of human life is more complex and interdependent, requiring knowledge of human and social systems as well as physical and biological systems. The social, behavioral, and economic (SBE) sciences contribute penetrating insights on such issues as the causes and consequences of conflict, how individuals and groups perceive and misperceive hazards, how they understand or misunderstand the risks they run in their daily lives, and how they organize and structure their interactions and transactions. Understanding and utilizing this knowledge require basic competence in the SBE sciences in all citizens, and a talent pool of SBE scientists to undertake research and teach about it. A number of issues critical to effective implementation of an action plan are presented, including attention to the language used in extant programs and outreach, the commitment of new resources and the reallocation of funds to stimulate and support SBE science education enhancements, and assessment of which new initiatives should have the highest priority for adoption. The report recommends attention to the structural arrangements at NSF to manage and monitor this strategic commitment and calls for immediate and demonstrable progress. Appropriately implemented, a priority emphasis on SBE science education can contribute substantially to public understanding of these sciences and their capacity to make important new discoveries. **Availability:** http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf0442
Workshop on Scientific Foundations of Qualitative Research	**Scope:** This is a report from a workshop sponsored by the National Science Foundation, Directorate for Social, Behavioral and Economic Sciences, Sociology, and Methodology, Measurement and Statistics Programs. The two major goals of the workshop were to provide: 1) guidance both to reviewers and investigators about the characteristics of strong qualitative research proposals and the criteria that should be used for evaluating projects in NSF's merit review process, and 2) recommendations on how to strengthen qualitative methods in sociology and the social sciences in general. The workshop contributes to advancing the quality of qualitative research, and thus to advancing research capacity, tools, and infrastructure in the social sciences. **Findings:** The report provides guidelines for designing and evaluating qualitative research and recommendations for supporting and strengthening qualitative research. **Availability:** http://www.nsf.gov/pubs/2004/nsf04219/nsf04219.pdf

The U.S. Scientific and Technical Workforce: Improving Data for Decision-making	**Scope:** This is a report, by the Rand Science and Technology unit, to the Office of Science and Technology Policy and the Alfred P. Sloan Foundation. The study posed two questions: Are the current data on the S&T workforce adequate to support relevant decision-making and, if not, what improvements are necessary? **Findings:** Numerous recommendations and observations appear in the report. Availability: http://www.rand.org/publications/CF/CF194/
Education and Employment in Science and Engineering: A Global Perspective	**Scope:** The purpose of the workshop, conducted by the Committee of Professionals in Science and Engineering (CPST), was to facilitate the sharing of information on current projects, future activities and topic of mutual interest between the professional societies representing various science and engineering disciplines, CPST and the Division of Science Resources Statistics. It served as a mechanism to keep these groups abreast of new and current activities of the societies and SRS and also to strengthen the ties between SRS and the professional societies. It also helped the organizations to collect and use their data in a complimentary fashion. Finally it helped enhance the data collection of the SRS. **Findings:** Numerous observations. **Availability:** http://www.cpst.orgson

List of Acronyms

AACC	American Association of Community Colleges
AC	Advisory Committee
AC/GPA	Advisory Committee for GPRA Performance Assessment
ADP	Adaptive Dynamic Programming
AGEP	Alliances for Graduate Education and the Professoriate
ALMA	Atacama Large Millimeter Array
AM&O	Award Management & Oversight
AP	Advanced Placement
ATE	Advanced Technology Education
ATLAS	A Toroidal LHC ApparatuS
AUI	Associated Universities Incorporated
AURA	Associated Universities for Research in Astronomy
BE	Biocomplexity in the Environment
BFA	Office of Budget, Finance, and Award Management
BIO	Directorate for Biological Sciences
BME	Biomedical Engineering Laboratories
CALIPSO	Caribbean Andesite Lava Island Precision Seismo-geodetic Observatory
CCF	Division of Computing and Communication Foundations
CCLI	Course Curriculum and Laboratory Improvement
CCR	Central Contractor Registration
CEOSE	Committee on Equal Opportunities in Science and Engineering
CFOC	Chief Financial Officer Council
CIHO	Cash and Investments Held Outside of the Treasury
CIP	Construction in Progress
CISE	Directorate for Computer and Information Science and Engineering
CMS	Compact Muon Solenoid
CNCI	Control, Networks, and Computaional Intelligence Division (CISE)
CNS	Computer and Network Systems Division (CISE)
COV	Committee of Visitors
CPU	Central Processing Unit
CREST	Centers for Research Excellence In Science and Technology
CRIF	Chemistry Research Instrumentation and Facilities
CSRS	Civil Service Retirement System
CSU	California State University

CSUSB	California State University San Bernadino
CWA	Chemical Warfare Agents
DCAA	Defense Contract Audit Agency
DCIA	Debt Collection Improvement Act
DNA	Deoxyribonucleic Acid
DOI	Department of the Interior
DOE	Department of Energy
DOL	Department of Labor
DR1	Deep Redshift 1
DR2	Deep Redshift 2
EFT	Electronic Fund Transfer
EHR	Directorate for Education and Human Resources
EIP	Erroneous and Improper Payments Grant Workshop
EIS	Enterprise Information System
ENG	Directorate for Engineering
EOT	Education, Outreach, and Training
ERC	Engineering Research Center
FACA	Federal Advisory Committee Act
FAST	An alternative congestion control scheme for TCP
FCTR	Federal Cash Transaction Report
FECA	Federal Employees Compensation Act
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act of 1996
FISMA	Federal Information Security Management Act
FM-LOB	Financial Management – Line of Business
FMFIA	Federal Managers' Financial Integrity Act of 1982
FMS	Financial Management Service, U.S. Department of Treasury
FY	Fiscal Year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GDEP	Geoscience Diversity Enhancement Project
GEO	Directorate for Geosciences
GFRS	Government-wide Financial Reporting System
GK-12	Graduate Teaching Fellows in K-12 Education
GPA	GPRA Performance Assessment
GPRA	Government Performance and Results Act
GPS	Global Positioning System
GRF	Graduate Research Fellowships

IBMBCS	IBM Business Consulting Services
IERI	Interagency Education Research Initiative
IIS	Information and Intelligent Systems Division (CISE)
IMA	Institute for Mathematics and its Applications
INT	Office of International Science and Engineering
IOC	Innovation and Organizational Change program
IPIA	Improper Payments Information Act of 2002
ISEA	*In Situ* Electrochemical Analyzer
IT	Information Technology
ITR	Information Technology Research
LMS	Learning Management System
LOB	Lines of Business
LSS	Law and Social Science Program (SBE)
MCC	Management Controls Committee
MPS	Directorate for Mathematical and Physical Sciences
MR	Merit Review
MREFC	Major Research Equipment and Facilities Construction
MSP	Math and Science Partnerships
MTBI	Mathematical and Theoretical Biology Institute
MTS	Federal Measurement Tracking System
MVO	Montserrat Volcano Observatory
NA	Not Applicable or Not Available (see context)
NAIC	National Astronomy and Ionosphere Center
NAPA	National Academy of Public Administration
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCAR	National Center for Atmospheric Research
NMR	Nuclear Magnetic Resonance
NNI	National Nanotechnology Infrastructure
NNIN	National Nanotechnology Infrastructure Network
NNUN	National Nanofabrication Users Network
NOAO	National Optical Astronomy Observatory
NPACI	National Partnership for Advanced Computational Infrastructure
NRAO	National Radio Astronomy Observatory
NS	Nanoscale Science
NSB	National Science Board
NSBF	National Scientific Balloon Facility
NSBP	National Society of Black Physicists
NSE	National Science and Engineering
NSEC	National Science and Engineering Centers
NSF	National Science Foundation
NSO	National Solar Observatory
NUE	Nanotechnology Undergraduate Education
NWCET	National Workforce Center for Emerging Technology
ODS	Online Document System
OE	Organizational Excellence
OIG	Office of Inspector General
OIRM	Office of Information and Resource Management
OISE	Office of International Science and Engineering
OMA	Office of Multidisciplinary Activities (MPS)
OMB	Office of Management and Budget
OPM	United States Office of Personnel Management
OPP	Office of Polar Programs
OSTP	Office of Science and Technology Policy
PACI	Partnerships for Advanced Computational Infrastructure
PAR	Performance and Accountability Report
PARS	Proposal and Reviewer System
PART	Program Assessment Rating Tool
PBGF	Photonic Band Gap Fiber
PBS	Public Broadcasting System
PECASE	Presidential Early Career Awards for Scientists and Engineers
PETM	Paleocene-Eocene Thermal Maximum
PI	Principal Investigator
PITO	People, Ideas, Tools and Organizational Excellence
PMA	President's Management Agenda
POAM	Plan of Actions and Milestones
POGIL	Process Oriented Guided Inquiry Learning
PPD	Programs for Persons with Disabilities
PRAGMA	Pacific Rim Applications and Grid Middleware Assembly
R&RA	Research and Related Activities Appropriation
RET	Research Experience for Teachers

RETA	Research, Evaluation, and Technical Assistance Program
REU	Research Experiences for Undergraduates
SARS	Severe Acute Respiratory Syndrome
SBE	Directorate for Social, Behavioral and Economic Sciences
SBIR	Small Business Innovation Research
SCI	Division of Shared Cyberinfrastructure
SDSC	San Diego Supercomputing Center
SDSS	Sloan Digital Sky Survey
SES	Division of Social and Economic Sciences
SFFAS	Statement of Federal Financial Accounting Standards
SGER	Small Grant for Exploratory Research
SMETE	Science, Mathematics, Engineering and Technology Education
SMIG	Senior Management Integration Group
SRS	Division of Science Resources Statistics
STC	Science and Technology Center
STEM	Science, Technology, Engineering and Mathematics
STEP	Systemic Teacher Excellence Preparation
SUNY	State University of New York
TCP	Transmission Control Protocol
TE	Teacher Enhancements
UC	University of California
UCAR	University Corporation for Atmospheric Research
UCI	University of California, Irvine
UCLA	University of California, Los Angeles
UCSC	University of California, Santa Cruz
UNAVCO	University NAVSTAR Consortium
USAID	U.S. Agency for International Development
USAP	U.S. Antarctic Program
WBS	Work Breakdown Structures

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