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

The **Office of Polar Programs (OPP)**, which includes the U.S. Polar Research Programs and U.S. Antarctic Logistical Support Activities, supports multidisciplinary research in 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 information systems, human resource management, and general administrative and logistical support functions to the NSF community of scientists, engineers, and educators as well as to the general public. OIRM is responsible for staffing and personnel service requirements for staff members including visiting scientists; NSF's physical infrastructure; dissemination of information about NSF programs to the external community; and administration of NSF's sophisticated technological infrastructure, providing the hardware, software and support systems necessary to manage the Foundation's grant-making process and to maintain advance financial and accounting systems.

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Joseph Bordogna, Deputy Director

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

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

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Lawrence Rudolph, General Counsel

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Nathaniel G. Pitts, Director

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Office of Polar Programs
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Directorate for Computer and Information Science and Engineering
Peter A. Freeman, Assistant Director

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

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John A. Brighton, Assistant Director

Directorate for Geosciences
Margaret S. Leinen, Assistant Director

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

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

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

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

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

Chief Information Officer
George Strawn (Office of Information and Resource Management)

NSF Affirmative Action Officer
Ana A. Ortiz (Office of Equal Opportunity Programs)

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Acting Executive Officer
National Science Board

Michael P. Crosby[1]
Executive Officer
National Science Board

[1] From July 28, 2003

MANAGEMENT CHALLENGES AND REFORMS

This appendix contains a discussion of management issues presented in the President's Management Agenda or identified for NSF and other federal agencies by OMB or GAO, in NSF's annual review of financial and administrative systems as required by the Federal Managers' Financial Integrity Act, or by the NSF Office of Inspector General. The OIG issues addressed are those included in a December 23, 2002 memorandum on NSF's management and performance challenges.

Many of the issues discussed also fall within the purview of the internal NSF Management Controls Committee (MCC), chaired by the Chief Financial Officer. That committee provides continuing and long-term senior executive attention to NSF's management challenges and reforms.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Broadening Participation in the Merit Review Process (OIG)	
NSF's OIG (December 2002*) noted "Increasing the participation of minority scientists as proposers, reviewers, and investigators, while maintaining the integrity of the award process, remains an important priority and challenge for NSF." The OIG notes that the NAPA study on the Foundation's criteria for project selection, which focused on the impact of the "broader impacts" criterion recommended "broader-based review panels with participants drawn from a wider range of institutions, disciplines and underrepresented minorities" but also noted that low participation in voluntary data disclosure has hampered accurate data tracking.	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, more than 250,000 merit reviews are provided to assist NSF with the evaluation of proposals. NSF focuses its management activities on a wide variety of issues related to merit review – including use of both merit review criteria by reviewers and program officers, broadening participation, and enhancing customer service. NSF also makes use of Directorate Advisory Committees for research and education programmatic guidance, and Committees of Visitors for an independent assessment of the processes used for award selection and the outcomes obtained. As a result of NSF guidance to proposers in the *Grant Proposal Guide* (GPG) that each project summary must address both review criteria, proposals were returned without review in FY 2003 for non-compliance if they failed to address both criteria. Also in FY 2003 the quantitative GPRA goal was achieved for usage of both criteria by reviewers. A similar goal for usage by NSF program officers was not met. In FY 2002 and FY 2003 NSF continued to expand the use of seminars and 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. While obtaining data about the gender and ethnicity of individual reviewers has remained a challenge, NSF has moved to the strategy of employing NSF's science and engineering staff for diversity. The Foundation met its FY 2003 GPRA goal to initiate development of an NSF science and engineering diversity plan. Although the Foundation increased the number of minority women appointed to its science, engineering and management staff, NSF did not meet its overall GPRA goal to increase such appointments from underrepresented groups. Still, NSF has demonstrated great progress by infusing diversity in its review panels, Directorate Advisory Committees, and it's Committees of Visitors.

*The December 2002 OIG reference that appears throughout this section refers to the NSF Inspector General's statement concerning NSF's Management and Performance Challenges. See the NSF FY 2002 Performance and Accountability Report to view a copy.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
	Over 10 years, awards going to minority serving institutions have increased from about 2.7% to 4% in 2002. Moreover, underrepresented minority investigators, women and majority men have about the same success rate for proposals submitted to NSF, 29%, 30%, and 30% respectively. While the number of proposals continue to increase for the following groups, women received (in FY 2002) about 20% of all awards going to NSF researchers, and underrepresented minorities received about 5% of all awards.

Management of Large Infrastructure Projects (OMB, OIG)

In response to OMB concerns related to NSF's capability to manage proposed multi-year, large facility projects given their magnitude and costs NSF was asked to develop and submit a plan to OMB that documents its costing, approval, and oversight of major facility projects. The NSF OIG (December 2002) noted concern about the management of NSF's large infrastructure projects, stating "In particular, fund control and the accurate accounting for infrastructure projects have been cited as a problem in recent audit reports." Concerns were noted that policies and procedures allowed the use of multiple appropriation accounts to fund projects; that NSF's accounting only captured costs funded from the MREFC account; and that "…NSF could not ensure it stayed within its authorized funding limits or that it provided accurate and complete information about project costs to key decision makers." The OIG also noted that "…NSF has made progress toward correcting the types of problems identified" in audits and that "the agency recently issued its current draft of the Facilities Management and Oversight Guide and instructed staff to begin using it." The OIG also recognized that NSF "will continue to make needed improvements to the Guide over time."	NSF continues its efforts to improve management and oversight of its large facility projects. In June 2003, a new Deputy Director for Large Facility Projects came onboard, within BFA, to strengthen NSF's ability to effectively manage large facility projects. On July 31, 2003, the *Facilities Management & Oversight Guide* was released after addressing and incorporating both internal and external review and comment. The Guide will be a *living document* to be updated over time, to reflect policy changes and lessons learned, as the Foundation continues to create and operate facilities at the research frontiers. Additional supporting material is being developed in modular form that will provide more detailed information and instruction. The purposes of the Guide are as follows: • Provide requirements and guidance to NSF staff and Awardees to strengthen project management and oversight of large facilities. • State clearly the policies, procedures and requirements that come into play at each stage of the facility project – throughout its lifecycle. • Document the experience, knowledge and best practices gained over many years in order to facilitate a process of continuous improvement, based upon the learning of best practices. The Facilities Management and Oversight Guide is available on the Web at http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf03049 Regarding fund control and accounting, NSF has strengthened its procedures for large facility projects 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. NSF is also working with a contractor to enhance the financial system to facilitate tracking of life cycle costs for MREFC projects. The Foundation has provided complete and detailed information about project costs through special reports to Congress (February 2002, July 2002) and such information is now routinely included in NSF's annual budget request to Congress.

Award Administration (OIG)

Award administration is a broad term used to describe the award and program monitoring directed toward scientific progress and the oversight exercised by BFA (Office of Budget, Finance, and Award Management) over grantees' financial management of NSF awards. The NSF OIG (December 2002) noted that "NSF	In FY 2002, BFA initiated a pilot program of risk based award monitoring site visits to strengthen its stewardship of federal funds by augmenting NSF existing award management and oversight activities. The program set forth a strategic framework for assessing and managing awardee risks and assets focusing on financial and administrative monitoring and was designed to test the proposed site visit methodology and tools. During FY 2002, NSF and BFA staff conducted award monitoring site visits at 19 awardee institutions with 1,360 active awards representing $2.3 billion in NSF support.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
lacks a comprehensive, risk-based management program to monitor its grants during the post-award phase" and that this challenge will be a reportable condition again in the FY 2002 Management Letter Report. The OIG noted that NSF should establish policies for award monitoring "including 1) implementing a comprehensive risk-based program that describes when and how monitoring will occur; and 2) establishing a system of risk assessment of awardees to ensure that each receives the appropriate level of oversight." The OIG also noted that "NSF recently issued a draft version of a Risk Assessment and Award Monitoring Guide and has been working closely with the OIG to address this challenge. The Guide is generally responsive to the recommendations outlined in the FY 2001 Management Letter Report and represents an important first step to improving NSF's post-award administration practices" but encouraged more detail and more emphasis on lower risk awardees.	Informed from its experience with the pilot program, BFA established a formal Award Monitoring and Business Assistance Program (AMBAP) in FY 2003. Using the new AMBAP procedures and guidelines, BFA site visited 32 awardee institutions with 1,351 active awards representing $700 million in NSF support. The new award monitoring program is documented in the *Award Monitoring and Business Assistance Program Guide*. It includes the following major components: • An *Award Monitoring Training Program* that consists of a core curriculum and hands on training for BFA staff members during on-site monitoring visits. • An awardee review selection process based on an established framework for risk assessment and asset management. • An annual plan that is resource dependent and is flexible to accommodate programmatic and/or awardee assistance requests that may arise throughout the year. • *An Award Monitoring Site Visit Review Module* that is prepared at the trainee level to provide detailed instructions on how to plan, conduct, and report on award monitoring and business assistance site visits. The Award Monitoring and Business Assistance Program Guide is available on the Web at http://www.inside.nsf.gov/bfa/dga/. The Foundation continues to disagree with the categorization of this issue as a reportable condition, and sees this ongoing activity as a management challenge for the foreseeable future.
GPRA Data Quality (OIG)	
The NSF OIG (December 2002) noted, "We continue to have concerns about the validity and quality of NSF's Government Performance and Results Act (GPRA) data and outcome measures." Particular concerns were expressed about the perception of too many GPRA goals, the need for more agency level data capture to support programs, and the need for clarity in the priority setting process.	Since the FY 2000 GPRA reporting cycle, NSF has engaged an external party to provide an independent verification and validation (V&V) of selected GPRA goals. The V&V focused on reliability of data, on processes to collect, process, maintain, and report the data, and on program reports prepared by external experts. The V&V report maps out NSF procedures against GAO guidance for polices and procedures that underlie GPRA performance reporting. The annual V&V assessments for FY 2000 - 2003 were positive and constructive and have helped NSF be in compliance with standards set forth in OMB Circular A-11. For example, the report on FY 2003 results concluded that "NSF has made a concerted effort to assure that it reports its performance results accurately and has effective systems, policies and procedures to promote data quality. Overall, we verify that NSF relies on sound business practices, internal controls, and manual checks of system queries to report performance. NSF maintains adequate documentation of its processes and data to allow for an effective verification and validation review. Further, we validate the reliability of NSF's third and fourth quarter results through our successful recalculation and reconfirmation of these results based on processes, data and systems." Regarding the "perception of too many GPRA goals", the addition of program-specific goals from the Performance Assessment Rating Tool (PART) process may exacerbate this issue. To alleviate the situation, NSF is aligning program-specific PART goals to agency-wide goals, where possible. There will also be a reduction in the number of agency-wide goals , limiting these goals to the ones most critical to NSF's mission. NSF reassessed its GPRA outcome measures during preparation of the updated and revised 2003-2008 Strategic Plan, finalized in September 2003. The agency

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
	also engaged the services of an external management-consulting firm to conduct an integrated performance, cost, and budget strategy assessment, with the intent of obtaining different scenarios to meet our growing requirements in this arena. This assessment was completed in August 2002. Information derived from this assessment was used to develop an action plan for integrating budget, cost and performance activities. The plan was submitted to OMB to formalize NSF actions for implementing the PMA. Copies of the action plan have also been provided to the OIG and NSF's Business and Operations Advisory Committee. This plan was updated to reflect the framework outlined in the new NSF Strategic Plan and to incorporate new guidance in OMB Circular A-11.
Management of U.S. Antarctic Program (OIG)	
The NSF OIG (December 2002) has stated that "The successful operation of the USAP requires unique management and administrative skills combined with knowledge of the special needs of Antarctic researchers." They also note that "One issue that has been raised in Committee of Visitors (COV) reports, as well as our audit work, is the need to improve long-range capital planning and budgeting for repairing and maintaining the Antarctic infrastructure, including facilities, transportation, and communications.	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: • Implement next steps in long-range plan for renovating/updating McMurdo Station infrastructure. • Coordinate Department of Defense, NASA, USGS and DOE activities; • Oversee environmental, health, safety, and medical activities; • Oversee construction and maintenance of all infrastructure at three U.S. stations in Antarctica (roads, fire stations, clinics, power stations, heating, communications, ground stations, air traffic control, ground vehicles, food services, sewage treatment, water supplies, etc.); • Coordinate support of scientists in Antarctica, construction of specialized science instrumentation, etc.; • Plan and budget for the above activities; and • Select science projects for deployment on the basis of merit review and ability to meet logistics requirements.
The Math and Science Partnership Program (OIG)	
NSF's OIG notes in December 2002, "The sustained involvement of NSF remains essential. NSF program officers now need to provide extensive coaching of the new projects …[and] will also need to assist project partners in building a shared sense of purpose and in coordinating efforts. Also, those projects involving awardees with limited experience in handling federal funds will require close monitoring of all aspects of their projects, including financial and administrative matters. Therefore, NSF staff will need to help coordinate the efforts of the various parties, monitor the progress of the projects, and ensure that federal funds are handled properly, while at the same time administering the subsequent program solicitation of approximately $200 million.	NSF has developed a comprehensive award oversight and management plan for all Math and Science Partnership (MSP) awards. NSF made 24 MSP awards in FY 2002. Larger, more complex awards were made as cooperative agreements. These cooperative agreements describe the post-award management and oversight that will support the work of MSP partnerships in realization of their goals; management and oversight activities will draw upon NSF's strong, community-based site visit processes. The lead partners responsible for both fiscal and project management of MSP-supported projects will, for the most part, be institutions with significant experience handling federal funds. In FY 2003, the 14 most highly rated Comprehensive projects were invited for reverse site visits. Prior to the reverse site visits, these 14 Partnerships were sent questions to elicit additional information emanating from questions and concerns identified by reviewers and NSF staff. At the reverse site visits, an external panel of experts engaged in discussion with each Partnership and then prepared a written summary of the panel's evaluation and engaged in final debriefing with NSF program staff. Thus, the Comprehensive Partnerships being recommended for award in FY 2003 have already been subjected to an increased and more intensive level of review, and this review has included an early analysis of the prospective awardee's experience/ability to handle federal funds. In this pre-

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
	award review and analysis, one prospective Partnership was identified as potentially needing additional technical assistance, and the Partnership (including its SRO/financial personnel) traveled to NSF for a workshop with staff from the Office of Budget, Finance and Award Management (BFA), the Division of Grants and Agreements (DGA) and the Cost Analysis/Audit Resolution Branch (CAAR), prior to recommendation for an award. DGA has developed a coordinated post-award effort, working in collaboration with CAAR and MSP Program Officers and awardees. The effort includes site visits, outreach visits and meetings with individual awardees to discuss specific issues, as well as an administrative workshop all MSP awardees. Ongoing Management and Oversight. MSP will employ 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 Comprehensive 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; and (6) a substantial overall program evaluation, whose task order and statement of work are to be released for bid soon.
Electronic Government (PMA, OMB, GAO)	
Expanded electronic government is one of the government-wide initiatives presented in the *President's Management Agenda for 2002*. That document states that "the administration's goal is to champion citizen-centered electronic government." Specifics were delineated in the February 27, 2002 E-government Strategy Document, http://www.whitehouse.gov/omb/inforeg/egovstrategy.pdf, which includes E-grants, E-travel and E-payroll/HR projects of relevance to NSF.	The NSF Administration and Management Strategic Plan provides the framework for agency activities that address the President's Management Agenda E-government initiative. The results of NSF's E-government initiatives are significant and earned NSF the only E-government "green light," in the July 2002 scorecard from OMB. NSF has maintained green status in E-government from FY 2002 Quarter 2 to the present. The OMB mid-session review reports that NSF is a "model for successful E-Government." In FY 2002, NSF received 99.99% of proposals through electronic systems. In FY 2003, we duplicated this achievement. NSF's FastLane system, which handles virtually all business transactions with proposers and awardees, exemplifies what can be accomplished in E-government information system design, development, and implementation. NSF continues to be an active leader in interagency E-government efforts through the government-wide E-grants initiative as well as actively participating in E-travel and E-payroll/HR activities.
Data/Information (IT) Security (GAO, OMB, OIG)	
The NSF OIG (December 2002) stated "The challenge for management is to implement security controls to protect … key information systems against unauthorized access and misuse, while maintaining the open and collaborative working environment needed to achieve NSF's mission." The FY 2002 review "identified three significant deficiencies related to weaknesses in access controls, the security management structure, and the certification and accreditation of major systems. Although NSF management disagreed with our assessment of	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 2003, and has invested significant time and resources to certification and accreditation of all major systems. To address Foundation concerns regarding agency computer systems that might be vulnerable to attack, NSF embarked on an ambitious endeavor to identify and certify and accredit the major applications and general support systems critical to fulfill the organization's mission. NSF ultimately identified 19 systems; 18 of those systems were certified and accredited by September 30, 2003. NSF has

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
the severity of these problems, it agreed with our recommendations and is taking action to correct the problems." The OIG also noted "The agency is to be commended for the improvements in its security program made in the past year, including implementation of a mandatory security awareness training program, formal assignment of security responsibilities and authorities, restructuring of key security positions, appointment of an agency-wide security officer, and establishment of updated security policies and procedures. These accomplishments help build a foundation for a comprehensive security program and demonstrate the agency's commitment to information security." Nevertheless, concern was expressed that "more improvements are needed." GAO (01-758) noted that recent audits continue to show that federal computer systems are riddled with weaknesses that make them highly vulnerable to computer-based attacks and place a broad range of critical operations and assets at risk of fraud, misuse and disruption.	also implemented policies and processes to monitor and protect against intrusion attempts. Periodic penetration testing began FY 2003. 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 and continuity of operations plan, which are tested at least annually at a remote location. In accordance with the Federal Information Security Management Act of 2002 (FISMA) and the Computer Security Act, NSF has again in FY 2003 required IT security training for all NSF staff and contractors who use NSF computer systems. Based on the FY 2003 OIG audit and security program review, the OIG closed out the three findings noted by the OIG in December 2002.

Erroneous Payments to Recipients of Government Funds (PMA, OMB)

OMB guidance and the *President's Management Agenda for 2002* addresses improved financial performance for federal agencies, including erroneous payments. In addition, the General Accounting Office (GAO) recently issued an executive guidance, which outlines strategies for agencies to effectively manage improper payments.	NSF has always understood its fiduciary responsibility to ensure taxpayer funds entrusted to it are properly controlled and disbursed. Consequently, NSF has a culture of high operating efficiencies and sophisticated systems, which results in few improper payments as part of pre-award internal controls. NSF will further expand its review of improper payments as part of NSF's annual post-award monitoring and oversight processes. NSF uses a well defined risk monitoring program to apply tools for conducting on-site reviews of NSF awardees that are deemed to have the most significant risk, and we plan to expand this to address improper payments beginning in FY 2004. This expanded approach will assist NSF as we continue to monitor improper payments and to implement those strategies that are appropriate to guard against improper payments.

Cost-Sharing (OIG)

The NSF OIG (December 2002) noted, "… audit work indicates that NSF grantees continue to experience significant problems in accounting for cost sharing, raising questions about whether required contributions are actually being made. The issues cited in our reports are primarily related to the commingling of reimbursable and cost-shared expenses, time and effort reporting, and cost-sharing certification."	During FY 2003, BFA established an Award Monitoring and Business Assistance Program which provides the strategic framework for assessing and managing awardee risks and assets. Cost sharing is identified as a high-risk factor and is a focus of the risk assessment protocol. Our increased use of on-site review provides important business and managerial assistance to awardees in this area. In addition, BFA has continued to assess issues that have surfaced since implementation of Important Notice 124, *Implementation of the New Cost Sharing Policy*. At the November 2002 meeting, the NSB approved clarifications to Important Notice 124 that are expected to improve cost sharing negotiations. Since November 2002, NSF has taken the following steps to implement the revised policy for use by NSF staff and the awardee community:

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
	• Issued Important Notice 128, *Revision of the NSF Cost Sharing Policy*, dated 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 on 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 required level. • Revised 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 to cost sharing requirements stated in solicitations to ensure clarity of understanding by all parties. • BFA has worked with DIS to develop an electronic capability in FastLane to submit the required certifications for awards that contain cost sharing in excess of $500,000. This new capability is anticipated to be available in September 2003. Overall, NSF is pursuing a two-pronged approach: 1) limit cost sharing requirements consistent with the NSB policy, and 2) provide greater oversight of cost-sharing in the risk assessment protocol and site reviews.

Competitive Sourcing [A-76 Competitions and FAIR Act Inventories] (PMA, OMB)

The *President's Management Agenda* proposes to increase competition for commercial activities performed by the government as listed on agency Federal Activities Inventory Reform (FAIR) Act inventories. OMB guidance "Conducting Public-Private Competition in a Reasoned and Responsible Manner" (July 2003) calls for agency customized competition plans built around (i) a reasoned classification of their workforce, (ii) careful consideration of where competitive sourcing can best help their mission and workforce, and (iii) collaborative reviews with OMB. OMB has also recently released a revision to its Circular A-76 (May 29, 2003), and NSF will monitor the impact of these changes.	The National Science Foundation is conducting a multi-year, comprehensive, integrated analysis of its business processes and workforce and technology management. This analysis began in July 2002, and is expected to continue through the end of FY 2005. NSF expects to dramatically improve the effectiveness and efficiency of its business processes, human capital management, and technology and tools management through this effort. In the area of human capital management, NSF is developing a strategic approach to workforce planning and deployment that: • Evaluates mission needs, customer expectations, and workload; • Identifies competencies; • Develops strategies to obtain, develop, and retain skills; and • Reduces excess organizational layers and redundancies. Clearly, this effort is likely to suggest significant changes to NSF's organizational structure and staff composition over time. Initial results from the Human Capital Planning effort were available internally by the end of September 2003. NSF will begin to develop a competitive sourcing plan or an alternative strategy for implementing the competitive sourcing initiative in FY 2004. The Human Capital Planning effort, along with other findings from the business analysis, will inform possible structural or functional realignments across the agency, and will, therefore inform the overall competitive sourcing strategy. In July 2003 the Foundation appointed a Competitive Sourcing Official (CSO) in accordance with the requirements of OMB Circular A-76 (Revised), who exercises agency-wide responsibility for implementing the circular.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Budget and Performance Integration (OIG, PMA)	
NSF's OIG noted in December 2002 that "managerial (cost) accounting information is used to assess operational effectiveness and efficiency. Cost information not only adds significant value to activities such as budgeting, cost control, and performance measurement, but also is useful in informing capital investment decisions such as prioritizing the funding of large infrastructure projects…. NSF should use its accounting systems to capture total project or outcome costs and supply information useful to the Congress, OMB, the National Science Board and NSF management." In addition, NSF is rated "red" on the Budget-Performance Integration initiative of the President's Management Agenda in part because the NSF Budget does not charge the full budgetary cost to individual activities.	NSF has made steady progress toward Budget, Cost, and Performance Integration (BCPI). Its score on the President's Management Agenda scorecard for Budget & Performance Integration rose from "red" to "yellow" on the most recent scorecard (issued 10/2003). This improvement was driven largely by the update of NSF's Strategic Plan, as the plan now aligns NSF's strategic outcome goals (People, Ideas, Tools, and Organizational Excellence) with 10 "investment categories." These investment categories provide the framework both for completing the PART (Program Assessment Rating Tool) and for the linkage of full budgetary and proprietary cost accounting. NSF is now in the process of aligning its Financial Accounting System with these investment categories, so that budgeted cost, actual cost, and performance can be tracked in tandem for NSF's investments. In addition, the agency's FY 2005 Budget submission to OMB incorporated the new alignment and included a presentation of the request with full budgetary costing.
Workforce Planning and Training (Human Capital) (PMA, OMB, GAO, OIG)	
GAO *(GAO-01-236, April 2001)* has identified shortcomings of many agencies involving key elements of modern strategic human capital management, including (1) strategic planning and organizational alignment; (2) leadership continuity and succession planning; and (3) acquiring and developing staff whose size, skills, and deployment meet agency needs. The NSF OIG (December 2002) notes, "planning for NSF's future workforce needs and training the large number of temporary staff continue to be serious concerns." Personnel records also indicate that since 1996, NSF's reliance on temporary staff has increased in tandem with the size of its appropriation … [and that the increase in temporary staff places a greater burden on the agency, particularly Human Resource Management, to continually recruit and train these personnel and find them suitable office space. Additionally, the *President's Management Agenda (2002)* includes strategic management of human capital as a government-wide initiative.	NSF is one year into a multi-year strategic business analysis, which will examine organizational alignment, workforce size, skill mix, 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 will develop and implement human capital strategies, which will address both the needs of the organization and the overall concerns of the President's Management Agenda. In FY 2003, NSF completed the first iteration of its Human Capital Management Plan. This plan 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. Using this outline, a cross-functional, cross-organizational, Human Capital Management Planning Team developed a working draft of the NSF Human Capital Management Plan. At the same time, NSF completed an inventory of business functions and activities for an NSF-wide workload analysis and defined competencies for all key occupations. These competencies are the basis for operationalizing the various components of the Human Capital Management Plan.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Efficiency of the Research Process (OMB)	
In discussions with OMB, NSF has asserted that the current size of its grants and their duration might result in inefficiency at U.S. academic institutions if scientists and engineers devote a greater proportion of their time to preparing proposals than to conducting research. OMB has asked the agency to develop metrics to measure the efficiency of the research process and determine the "right" grant size for the types of proposals that the Foundation funds.	NSF surveyed the community and established an average annualized award size goal of $250,000 and average award duration goal of 5.0 years. When achieved this will improve efficiency by reducing the number of awards required to conduct research. Improving award size and duration remains among the top priorities of the Foundation, and NSF increased its award size to $136,000 in FY 2003. Award size and duration are two of the key NSF investment goals in its annual GPRA plan. Therefore, this activity will be dropped as a management challenge and retained as an annual goal for the foreseeable future.
Federal Funding of Astronomy and Astrophysics (OMB)	
NSF and NASA provide more than 90 percent of Federal funds for academic astronomy research and facilities. Historically, NASA has funded space-based astronomy and NSF has funded ground-based astronomy as well as unsolicited astronomy research proposals. Recent changes (e.g., the share of grants funding and the need for more integration of ground and space-based facilities) suggest that the Federal government's management and organization of astronomical research should be assessed.	Following the recommendations in September 2001 of the National Research Council (NRC) Committee on the Organization and Management of Research in Astronomy and Astrophysics (COMRAA) and the implementation called for in the NSF Authorization Act of 2002, NSF and NASA have established the joint Astronomy and Astrophysics Advisory Committee (AAAC). The AAAC is responsible for assessing and providing advice to both NSF and NASA on the coordination of the two agencies' astronomy and astrophysics programs and the development of strategic plans to meet community recommendations in NRC reports such as the "Astronomy and Astrophysics in the New Millennium" and "Connecting Quarks with the Cosmos". The Committee meets four times annually. Its reports are currently available at <http://www.aas.org/naaac/index.html>. This management challenge is considered closed.
Budget for Administration and Management (OIG)	
In December 2002, the OIG noted that: "It is increasingly apparent that NSF's staff is in need of two basic resources to do its job: office space and travel funds. This year's management certification of the agency's internal controls contains multiple cautionary statements from senior managers about these two issues and their impact on operations." In particular they noted that "the agency cannot afford to wait for the results of its Business Analysis, which is not expected to conclude until 2006, to begin planning for and acquiring new offices." They further note that "the shortage of travel funds affects NSF's ability to successfully address several of the management challenges identified here" and that "NSF should seek to maximize the effectiveness of staff by allocating more funding for these two essential resources."	This resource challenge is being addressed through budget analyses and planning; ongoing assessments of space management and allocation; increased emphasis on innovative and creative approaches such as telecommuting; exploring cost efficiencies that can be gained in the move to E-travel and in the use of video conferencing. NSF is also leasing additional space in Stafford II to help alleviate the current space issues. The travel budget increased in FY 2003 and a further increase is requested in the FY 2004 Budget Request for the Salaries and Expenses account.

NSF ASSESSMENT ACTIVITIES

Assessment is fundamental to the mission of the NSF, permeating all NSF processes. Using mail merit review, panel merit review, and site visits, agency personnel are continually engaged with assessment activities through the review of research and education proposals. These assessments guide the NSF investment in individual investigator proposals, centers and institutes, and major facilities[1]. Programs, divisions, directorates and other units within the agency periodically undertake assessments of the current state and future directions of science, engineering and education[2]. Both the NSF and the NSB commission assessments to determine how best the agency can serve investigators or the public[3] and to determine the effectiveness and vitality of the NSF's internal management processes[4]. In FY 1999, as part of government-wide performance assessment, NSF began reporting on the agency's annual GPRA (Government's Performance and Results Act of 1993) performance goals. In FY 2002, NSF began participation in a new assessment tool – the Program Assessment Rating Tool (PART). PART is an evaluative questionnaire developed by the White House Office of Management and Budget (OMB) for rating federal programs. In a report issued March 2003 by the U.S. General Accounting Office (GAO), NSF was identified as one of five exemplary federal agencies successfully conducting evaluative activities[5].

Committees of Visitors (COVs) and Advisory Committees (AC) are two types of review panels that the Foundation has used for over 20 years to conduct independent assessments of the quality and integrity of NSF's programmatic investments.

The following provides a more detailed description of NSF Committee of Visitors and Advisory Committees. For information about NSF's COV meeting schedule, see Appendix 6. For a schedule of the external evaluations that were completed in FY 2003, see Appendix 7.

Committees of Visitors: NSF convenes panels composed of qualified external evaluators from academia, industry, government and the public sector to review NSF's awards, declinations, and other management issues of each NSF program. These panels are known as Committee of Visitors (COV). Each program is reviewed by a COV approximately once each three years. These experts assess the integrity and efficiency of the processes for proposal review and recommendation and provide an assessment of NSF's programmatic investments. The COV process has been carefully refined and improved with specific definitions and requirements for all steps of the process, from the selection of the committee, to documentation given to the committee, to the exact task of the review, to the form and content of the report, to the

[1] *Report to the National Science Board on the National Science Foundation's Merit Review Process*, Fiscal Year 2002. NSB-03-2-66.
[2] For example, *Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure 2003* (http://www.communitytechnology.org/nsf_ci_report/) or *Assessing the Impact and Effectiveness of the Advanced Technological Education (ATE) Program Survey 2002: The Status of ATE Projects and Centers*, by Arlen Gullickson, Frances Lawrenz, and Nanette Keiser (http://www.wmich.edu/evalctr/ate/survey2002/sr2002esfinal.pdf)
[3] For example, *NSF Report on Efficiency of Grant Size and Duration.* (http://www.nsf.gov/od/gpra/grantsize/contents.htm?gpraplan97)
[4] For example, *Business Analysis*, Booz, Allen, Hamilton (ongoing)
[5] GAO-03-454, GAO Report to Congressional Committees: *Program Evaluation: An Evaluation Culture and Collaborative Partnerships Help Build Agency Capacity*, May 2003.

responsibility and actions required throughout the Foundation responding to and using the findings and recommendations of the report. COV reports are reviewed by Directorate/Office Advisory Committees before submission to the NSF Director. On behalf of the Director, NSF's Office of Integrated Activities (OIA) oversees the COV process and schedule. COVs address questions contained on a template that is modified and updated by OIA. For FY 2001, the template had two sections: The first section addressed the integrity and efficiency of the programs management and processes; the second section addressed the outcomes of investments and the extent these outcomes reflected the strategic goals of NSF.

Directorate/Office Advisory Committees (AC), whose membership parallels that of the COVs (but AC members normally serve three years), advise the seven directorates, the Office of Polar Programs, the Offices of Information and Resource Management, and the Office of Business, Finance and Award Management. The ACs provide advice on priority setting, address program effectiveness, review COV reports, examine directorate/office responses to COV recommendations, and occasionally undertake studies. For example, the Biology Advisory Committee describes its mission as advising the Directorate for Biological Sciences (BIO) on such issues as:

- How BIO's mission, programs, and goals can best serve the scientific community
- Important issues in institutional administration and policy
- How BIO can promote quality graduate and undergraduate education in the biological sciences
- Priority investment areas in biological research
- Government Performance and Results Act, including Committees of Visitors

In FY 2001 and in prior years, directorate/office advisory committees assessed directorate/office progress in achieving NSF-wide GPRA goals. With the establishment of the Advisory Committee for GPRA Performance Assessment (AC/GPA), Directorate/Office Advisory Committees no longer assess directorate progress toward these goals, although AC reports are source material used by the AC/GPA.

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	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
BIOLOGICAL SCIENCES		
Biological Infrastructure	2000	2004
Instrument Related Activities	2002	2004
Research Resources	**2003**	2004
Training	**2003**	2004
Plant Genome	2001	2004
Environmental Biology	**2003**	2006
Ecological Studies	2002	2006
Thematic Review	2001	2006
Systematic and Population Biology	2000	2006
Integrative Biology and Neuroscience	2001	2005
Neuroscience	**2003**	2005
Developmental Mechanisms	2000	2005
Physiology and Ethnology	2002	2005
Molecular and Cellular Biosciences	2002	2005
Biomolecular Structure and Function	2000	2005
Biomolecular Processes	2000	2005
Cell Biology	2001	2005
Genetics	**2003**	2005
Emerging Frontiers (new in 2003)	N/A	2006

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
COMPUTER AND INFORMATION SCIENCE AND ENGINEERING		
Advanced Computational Infrastructure and Research		
Advanced Computational Research	2001	2004
PACI	2002	2004
Computer-Communications Research		
Communications	**2003**	2006
Computer Systems Architecture	**2003**	2006
Design Automation	**2003**	2006
Hybrid and Embedded Systems (new in ’02)	N/A	2006
Numeric, Symbolic and Geometric Computation	**2003**	2006
Operating Systems and Compilers	**2003**	2006
Signal Processing Systems	**2003**	2006
Software Engineering and Languages	**2003**	2006
Theory of Computing	**2003**	2006
Trusted Computing (new in ’02)	N/A	2006
Information and Intelligent Systems		
Computation and Social Systems	**2003**	2006
Human Computer Interaction	**2003**	2006
Knowledge and Cognitive Systems	**2003**	2006
Robotics and Human Augmentation	**2003**	2006
Information and Data Management	**2003**	2006
Advanced Networking Infrastructure and Research		
Networking Research	**2003**	2006
Special Projects in Networking Research	**2003**	2006
Advanced Networking Infrastructure	**2003**	2006
Information Technology Research (ITR) (new in ’00)	2004	2007
Experimental and Integrative Activities	2001	2004
-Instrumentation Infrastructure Cluster		
Research Infrastructure	2001	2004
Research Resources (new in ‘02)	N/A	2004
-Multidisciplinary Research Cluster		
Biological Information Technology and Systems (new in ’02)	N/A	2004
Quantum and Biologically Inspired Computing (new in ’02)	N/A	2004
Digital Government	2001	2004
Next Generation Software	2001	2004
-Education Workforce Cluster		
Information Technology Workforce (new in ’02)	N/A	2004
Minority Institutions Infrastructure	2001	2004
CISE Educational Innovation	2001	2004

**CISE Postdoctoral Research Associates	2001	
-EIA Special Projects Cluster		
Special Projects (new in '02)	N/A	2004
**NSF-CONACyT Collaborative Research	2001	
**NSF-CNPq Collaborative Research	2001	
**EIA monitored, managed/reviewed by Division in Partnership with Engineering		

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
EDUCATION AND HUMAN RESOURCES		
Educational Systemic Reform		
Statewide Systemic Initiatives	2001	2004
Urban Systemic Initiatives	2001	2004
Rural Systemic Initiatives	2001	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	2002	2005
Centers for Learning and Teaching (new in '01)	N/A	2004
Undergraduate Education		
Teacher Preparation	2000	2004
Advanced Technological Education	**2003**	2006
NSF Computer, Science, Engineering and Mathematics Scholarships (new in '01)	**2003**	2006
Distinguished Teaching Scholars (new in '02)	N/A	2004
Scholarship for Service (new in '01)	N/A	2005
National SMETE Digital Library (new in '01)	2002	2005
Course, Curriculum, and Laboratory Improvement	**2003**	2006
Undergraduate Assessment (new in '02)	N/A	2004
The STEM Talent Expansion Program (STEP)	N/A	2005
Graduate Education		
Graduate Research Fellowships	**2003**	2006
NATO Postdoctorate Fellowships	2001	2004
IGERT (new in '97)	2002	2005
GK-12 Fellows (new in '99)	2002	2005
Human Resource Development		
The Louis Stokes Alliances for Minority Participation	2001	2005
Centers for Research Excellence In Science and Technology (CREST)	2001	2005
Programs for Gender Equity (PGE)	**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)	N/A	2005
Historically Black Colleges and Universities (HBCU)	2001	2005
Research, Evaluation & Communications		
REPP/ROLE (new in '96)	2002	2005
Evaluation	**2003**	2006
Interagency Education Research Initiative (IERI) (new in '01)	2002	2005
Other		
H-IB VISA K-12	N/A	2004
Math and Science Partnership (MSP) (new in '02)	N/A	2005

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
ENGINEERING		
Bioengineering and Environmental Systems	2002	2005
Biochemical Engineering	2002	2005
Biotechnology	2002	2005
Biomedical Engineering	2002	2005
Research to Aid the Disabled	2002	2005
Environmental Engineering	2002	2005
Environmental Technology	2002	2005
Civil and Mechanical Systems	2001	2004
Dynamic System Modeling, Sensing and Control	2001	2004
Geotechnical and GeoHazard Systems	2001	2004
Infrastructure and Information Systems	2001	2004
Solid Mechanics and Materials Engineering	2001	2004
Structural Systems and Engineering	2001	2004
Network for Earthquake Engineering Simulation	2001	2004
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
-Industrial Innovation Programs Cluster		
Small Business Innovation Research (SBIR)	2001	2004
Innovation and Organizational Change	**2003**	2006
Grant Opportunities for Academic Liaison with Industry	**2003**	2006
Small Business Technology Transfer	2001	2004
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	2001	2004
Engineering Education	2001	2004
Engineering Research Centers	2001	2004
Earthquake Engineering Research Centers	2001	2004
Human Resource Development	2001	2004
State/Industry/University Cooperative Research Centers	2001	2004
Industry/Univ. Cooperative Research Centers	2001	2004
Innovation Partnership Activities (new in '01)	N/A	2004

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
GEOSCIENCES		
Atmospheric Sciences		
-Lower Atmosphere Research Section		
Atmospheric Chemistry	2001	2004
Climate Dynamics	2001	2004
Mesoscale Dynamic Meteorology	2001	2004
Large-scale Dynamic Meteorology	2001	2004
Physical Meteorology	2001	2004
Paleoclimate	2001	2004
-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	2001	2004
-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
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	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 Observatory (NOAO)	2002	2005
National Solar Observatory (NSO)	2002	2005
National Astronomy and Ionosphere Center (NAIC)	2002	2005
Atacama Large Millimeter Array (ALMA)	N/A	2005
Chemistry	2001	2004
Office of Special Projects	2001	2004
Chemistry Research Instrumentation and Facilities (CRIF)	2001	2004
Organic Chemical Dynamics	2001	2004
Organic Synthesis	2001	2004
Chemistry of Materials	2001	2004
Theoretical and Computational Chemistry	2001	2004
Experimental Physical Chemistry	2001	2004
Inorganic, Bioinorganic and Organometallic Chemistry	2001	2004
Analytical and Surface Chemistry	2001	2004
Materials Research	2002	2005
-Base Science Cluster		
Condensed Matter Physics	2002	2005
Solid-State Chemistry	2002	2005
Polymers	2002	2005
-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 for Special Programs (new in 2003)	N/A	2005
Mathematical Sciences	2001	2004
Applied Mathematics	2001	2004
Topology and Foundations	2001	2004
Computational Mathematics	2001	2004
Infrastructure	2001	2004
Geometric Analysis	2001	2004
Analysis	2001	2004
Algebra, Number Theory, and Combinatorics	2001	2004
Statistics and Probability	2001	2004
Physics	**2003**	
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
Education and Interdisciplinary Research (new in ’00)	**2003**	2006
Gravitational Physics	**2003**	2006
Office of Multidisciplinary Research	**2003**	2006

DIRECTORATE *Division* Program	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)	2000	
Human Resources Statistics	2002	
Research and Development Statistics	2000	2004
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 if FY2001)	**2003**	2006
Developmental and Learning Sciences (formally Child Learning & Development)	**2003**	2006
Perception, Action, and Cognition (formally Human Cognition and Perception)	**2003**	2006
Archaeology	**2003**	2006
Archaeometry (formally part of Archaeology)	**2003**	2006
Environmental Social and Behavioral Science (new in FY1999)	**2003**	2006
Social and Economic Sciences (SES)		
Decision, Risk, and Management Sciences	2000	2004
Political Science	2000	2004
Law and Social Science	2000	2004
Innovation and Organizational Change	2000	2004
Methodology, Measurement and Statistics	2000	2004
Science and Technology Studies	2000	2004
Societal Dimensions of Engineering, Science, and Technology	2000	2004
Economics	2000	2004
Sociology	2000	2004
ADVANCE (Cross-Directorate Program, new in FY01/FY02)		2005
Science of Learning Centers (New in FY03/04)		2007

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF POLAR PROGRAMS		
Polar Research Support	2001	2004
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	**2003**	2006
Arctic Research Opportunities	**2003**	2006
Arctic Research and Policy	**2003**	2006
Arctic System Sciences	**2003**	2006
Arctic Natural Sciences	**2003**	2006
Arctic Social Sciences	**2003**	2006

DIRECTORATE *Division* Program	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF INTEGRATIVE ACTIVITIES		
Major Research Instrumentation (MRI)	2000*	
Science and Technology Centers (STC)	1996*	2007
NSF PRIORITY AREAS		
NSF Nanoscale Science and Engineering Priority Area	N/A	2004
*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 2003. 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 2003

	Directorate for Biological Sciences (BIO)
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**

Microbial Research: Progress and Potential	**Findings:** NSF Microbial Observatories (MO)/Life in Extreme Environments (LExEn) PI Workshop to discuss recent accomplishments and point to future directions in microbial diversity research. The MO and LExEn programs have fostered significant advances in microbial diversity research, discovering novel microbial lineages, describing the complexity of natural microbial communities, and linking microbial taxa to critical ecosystem functions. The LExEn program has now run its course. Despite the success of the MO program in addressing a critical research need in site-based microbial discovery and activity, significant funding gaps remain in areas such as: • Microbial discovery that is not site-based; • Microbe-microbe interactions; • Microbial community interactions (physiological, biochemical, genetic); • Natural patterns of microbial distribution; • Environmental proteomics and functional genomics. **Recommendations:** 1. Continue the MO program, broadening its scope to include smaller microbial diversity projects that need not be site-based, and are geared more to individual investigators. Consider establishing this or a similar activity as a core program for integrative microbial diversity research. 2. Increase NSF funding opportunities and resources to support continued advances in areas such as: i) environmental microbial genomics, metagenomics and proteomics; ii) environmental sequence databasing and informatics; iii) microbial cultivation-based approaches that take advantage of recent advances in micro- and nanotechnologies; iv) environmental sample and culture collection archiving and v) improved micro- and nanosensor techniques to identify and quantify metabolites in situ, as well as follow reactant sources and products in real time. **Accessibility:** http://www.simo.marsci.uga.edu/MainWeb/pages/MOLExEnWorkshop.pdf

Frontiers in Polar Biology in the Genomic Era	**Findings:** The new era of genomics is opening doors to an unparalleled realm of research questions, and polar scientists are poised to make great advances. The application of new genomic technologies has the potential to be a unifying paradigm for polar biological sciences. However, to facilitate the advancement of polar genome sciences, coordination of research efforts will be required to ensure efficient transfer of technologies, provide guidance to researchers on choosing organisms for genome analyses, and help in the development of new scientific initiatives. Although genomic technologies are applicable to some of the key questions in polar biology, the technical demands of genome science often transcend the resources of any individual researcher. The development of enabling technologies is critical to the successful application of genomic technologies to polar studies. There is a need for enhanced flow of information about polar biology to a wide audience of scientists, policymakers and the general public, because of the important role that polar systems play in global-scale phenomena. A number of impediments to conducting multidisciplinary integrated polar science exist, including administrative, fiscal and infrastructure issues. **Recommendations:** NSF should develop a major new initiative in polar genome sciences emphasizing collaborative multidisciplinary research. The initiative could: Facilitate genome analyses of polar organisms and support the relevant research on their physiology, biochemistry, ecosystem function, and biotechnological applications. Capitalize on data from existing LTER and Microbial Observatory sites, and enable research conducted at sites with comparable conditions at both poles. NSF should form a scientific standing committee to establish priorities and coordinate large-scale efforts for genome-enabled polar science. NSF should support some mechanism to facilitate gene sequencing and related genomic activities beyond the budget of an individual principal investigator, such as virtual genome science centers. Ancillary technologies such as observatories, ice drilling, remote sensing, mooring and autonomous sensors, and isotope approaches should be developed to support application of genomic technologies to polar studies. NSF should continue its efforts to make information about polar regions available to teachers, schools, and the public. Short- and long-term plans should be developed for increasing public awareness of polar biology, encouraging the entry of young scientists into the field, and incorporating polar biology in college and K-12 curricula. To address impediments to conducting multidisciplinary integrated polar science, NSF should: Remove impediments to cross-directorate funding, and should form interagency partnerships with the National Aeronautics and Space Administration and others as relevant. Establish international research partnerships or memoranda of understanding (addressing stipends, travel; visas, education, ship time, aircraft use and other logistical issues) to facilitate and enhance international collaborative efforts. Conduct a brief survey of researchers and research groups who would potentially work in both poles to identify impediments to bipolar research and then take steps to address them. Improve biological laboratories and research vessels, and develop ice-drilling resources in the polar regions, to facilitate integrated, multidisciplinary biological research at both poles. Opportunities to allow year-round access to, and operation of, field sites should be pursued. **Availability:** http://www.nap.edu/books/0309087279/html/

	Directorate for Computer & Information Sciences & Engineering (CISE)
Revolutionizing Science and Engineering through Cyberinfrastructure: Report of the National Science Foundation Advisory Panel on Cyberinfrastructure.	**Scope:** The committee assessed NSF's Partnerships for Advanced Computational Infrastructure (PACI) program and and recommended new areas of emphasis for cyberinfrastructure. **Findings:** "Following the guidelines of the original PACI solicitation, the activities of the PACI partnerships have addressed multiple needs and served multiple purposes, some of which we highlight: • During the five years of the current program [PACI], the two PACI partnerships have fulfilled their mission of providing high-end computing cycles. This conclusion is based on systematic, regularly conducted user surveys that are reported to NSF, and on the survey conducted as part of this panel's information-gathering process … • The PACIs have supported, engendered, and supplied software tools to help users take advantage of architecturally diverse, increasingly complex, and distributed hardware. … • Through a joint Education, Outreach and Training activity, the PACIs have broadened access to computational science and engineering by encouraging the participation of women and underrepresented groups at all educational levels. • Many successes in domain science and engineering have been enabled as well as supported in part by PACI funding. In particular some PACI-enabled collaborations have been exemplars of interdisciplinary interactions in which information technology becomes a creative, close partner with science. …" On planning for a new generation of cyberinfrastructure, the committee notes "a new age has dawned in scientific and engineering research, pushed by continuing progress in computing, information and communication technology, and pulled by the expanding complexity, scope, and scale of today's challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive "cyberinfrastructure" on which to build new types of scientific and engineering knowledge environments and organizations and to pursue research in new ways and with increased efficiency." **Availability:** http://www.cise.nsf.gov/news/cybr/cybr.htm

Preliminary Study of Information Technology Research (ITR).	**Scope:** The committee examined the extent to which the ITR program is responsive to the Presidential Information Technology Advisory Committee Report (PITAC Report) and made recommendations for issues to be examined by a committee of visitors. **Findings:** The subcommittee found that NSF is not slavishly adhering to topic area recommendations of the PITAC report and has appropriately moved into new areas where appropriate. With respect to outcomes, the subcommittee found that all the sampled (sample size of 10 projects) large and medium ITR awards promised some sort of interdisciplinary or cross-institutional activity, although several did not give evidence of accomplishing that in their annual reports. They noted that all of the projects promised educational activities to complement their research and all but one gave evidence in annual reports of accomplishing that. Examining decisions, they found evidence that NSF staff were making awards to high risk projects and judged this to be correct handling of high-risk proposals. The subcommittee also looked at questions of how focus areas are identified and what the purpose is; these were called out for additional study by a full COV.
"Who Goes There? Authentication through the Lens of Privacy"	**Scope:** The study examined authentication systems that capture identity information about information system users and the implications for privacy in the use of these systems Findings: Issues such as the need for identification, the type of identification, security of captured information, linking information across multiple resources, and other matters were discussed as areas for needed research. **Availability:** Computer Science and Telecommunications Board, part of the NRC.
NSF ANIR Workshop on Experimental Infostructure Networks	**Scope:** The workshop was asked if the computer and telecommunications industry sector agreed on a need for experimental infostructure networks. If so recommended, they were asked to recommend what sorts of experimental networks were needed and what roles should industry, government and academia play. **Findings:** The group, with emphasis on industry participation, recommended that NSF support a program for experimental networks (i.e., networks that support research and experimentation rather than production networks). Recommendation included maintaining an applications-driven focus with vertical integration (from network to middleware to application to user interface), emphasis on innovation rather than geographic scope, emphasis on delivered end-t0-end connections of all resources involved in each experiment, and demonstrations of controls of network capabilities that facilitate applications. **Availability:** http://www.calit2.net/events/2002/nsf/index.html

"IT Roadmap to a Geospatial Future"	**Scope:** The study examined directions for research that would enhance the performance, accessibility and usability of geospatial information. **Findings:** The group recommended an integrative, interdisciplinary approach; more coordination in government support; accessible location-sensing infrastructure; and research in several areas including mobile envorinments; geospatial data models and algorithms; geospatial data ontologies; data mining for geospatial data; geospatial interaction technologies; improved access technologies; and collaborative interaction with geoinformation. **Availability:** Science and Telecommunications Board, part of the NRC.

	Directorate for Education and Human Resources (EHR)
Teaching Mathematics in Seven Countries: Results From the TIMSS 1999 Video Study. (March 2003)	**Scope:** The 1998-2000 Third International Mathematics and Science Study Video Study (TIMSS 1999 Video Study) builds on the Third International Mathematics & Science Study (TIMSS). It seeks to deepen understanding of classroom mathematics teaching; to deepen understanding of how teaching methods can be increasingly aligned with student learning goals; and to develop communication strategies to reach research and professional development communities. Countries: Australia, Czech Republic, Hong Kong, Japan, Netherlands, Switzerland, and the US. Of these, in 1995, Japan top performer (581) -- US (492) lowest; in 1999, Hong Kong top (582) – US lowest (502). **Findings:** Provides documentation that the prevalent instructional activity internationally is problem solving. All countries devoted at least 80 percent of time on solving problems and less time on presenting new content. U.S. and Czech Republic place more emphasis on reviewing materials; Hong Kong and Japan emphasize new content. Japan is distinguished by devoting lesson time to relatively few problems with higher procedural complexity, that include proofs more often, and that relate to each other in mathematically significant ways. In Japan, 74% of problems require students to decide how to use procedures (not just execute them); in US, 34% (lowest reported number). High achieving countries do not employ one single method of mathematics teaching; teaching practice must be aligned with learning goals. **Availability:** Available from U.S. DoED, National Center for Education Statistics. See http://www.ed.gov/index.jsp.
Studying Classroom Teaching as a Medium for Professional Development: Proceedings of a U.S.-Japan Workshop	**Scope:** Draws on elementary mathematics expertise from Japan and the U.S. in order to understand better the knowledge needed to teach mathematics well and determine how to help teachers gain this knowledge. Focus was on Japanese "lesson study," and U.S. use of classroom documentation and written cases. **Findings:** Helps define research agenda for improving the study of mathematics: • How are the practice of teaching learned & what things are instrumental to that learning? • What do teachers need to learn to effectively engage in mathematics teaching? • How do teachers learn to know mathematics in ways that enable them to organize content and to create and adjust activities to address lesson goals and student interests, needs, problems, difficulties, etc.? • "Teacher Mathematics" is an applied field, covering both pure and applied mathematics, algorithms and proof, concepts and representations. What would constitute a coherent field of study? Important ideas include: phenomenology of mathematical concepts, extended analyses of related problems, and connects and generalizations within/among diverse branches of mathematics. **Availability:** Available from U.S. National Commission on Mathematics Instruction and Mathematical Sciences Education Board, National Research Council. See: http://www/nap.edu.

Mathematical Proficiency for All Students: Toward a Strategic Research & Development Program in Mathematics Education (2003)	**Scope:** Report proposes long-term, strategic research and development in mathematics education. The effort would develop knowledge, materials, and programs to help educators raise the level of mathematical proficiency and eliminate differences in levels of proficiency among students from different social, cultural, and ethnic groups. **Findings:** Limited resources leads to recommendation of three foci to generate immediate progress: • Develop teachers' mathematics knowledge in ways that are directly useful for teaching; • Teaching & learning skills used in mathematical thinking and problem solving; • Teaching and learning algebra from kindergarten through 12th grade. The effort requires use of effective scientific practices; use of methods appropriate to the goals of component project; building knowledge over time, and rigorously testing and revising of interventions through cycles of design and trial. Research and development initiatives must be solidly informed and guided by practice; partnerships are required among research institutions and schools/school districts. Requires greater collaboration and interdisciplinary action in planning; willingness of researchers to develop common measures; and attention to building both knowledge and practice. The effort also requires research on competing views over proficiency standards, curricular designs, pedagogical styles, and assessment methods. **Availability:** RAND Mathematics Study Panel, the RAND Corporation. See: http://www.rand.org.

Looking Inside the Classroom: A Study of K-12 Mathematics and Science Education in the U.S. (May 2003)	**Scope:** Study provides education research and policy communities with snapshots of mathematics and science education from U.S. classrooms across a variety of contexts. Uses systematic sampling and implicit stratification to ensure representativeness of sample with respect to teacher backgrounds, instructional objectives, and classroom activities. Uses classroom observation instrument developed by HRI for the NSF Local Systemic Change initiative to assess quality of design and implementation of science and mathematics lessons. Sample includes 31 schools and nearly 400 classrooms. **Findings:** Study findings have implications for preparation and continuing education of teachers of science and mathematics, and for other support provided to teachers. • No one pedagogical style should be advocated. • High-quality instruction must emphasize developmentally appropriate learning goals; instructional activities engaging students in content; learning environments that support and challenge students; and helping students make sense of mathematics and science concepts. • Teachers need to analyze role of teacher questioning and sense-making focused on conceptual understanding. • Support materials accompanying textbooks and other instructional materials should provide targeted assistance for teachers, articulating learning goals for activities; research on student thinking in content areas; strategies for monitoring student understanding; and outlining points to help students make sense of concepts. • Professional development needs to reflect elements of high-quality instruction; content knowledge alone is not sufficient. • Further exploration is needed to mitigate equities in high-quality instruction. • Administrators/policymakers need to ensure that teachers get coherent messages. Need alignment of preservice, K-12 curriculum, student assessment, professional development, and teacher evaluation policies at state, district, and school levels to achieve excellence and equity. **Availability:** Horizon Research, Inc., See http://www.horizon-research.com.

Local Systemic Change through Teacher Enhancement: Year Eight Cross-Site Report	**Scope:** An evaluative study of the 52 Local Systemic Change projects active during the 2001–02 academic year. **Findings**: Questionnaire data collected from a random sample of targeted teachers suggest that LSC professional development has had a significant impact on teachers' attitudes and beliefs about mathematics/science education. In addition, participants were becoming more confident in their knowledge of mathematics and science content, and more likely to use standards-based instructional strategies. Both mathematics and science participants reported making greater use of strategies that facilitate exploration and investigation by students, such as using open ended questions and requiring students to supply evidence to support their claims, than did non-participants. Science participants were also more likely than other science teachers to use reform-oriented teaching practices such as having students engage in hands-on activities, work on extended investigations, and write reflections in notebooks or journals. Data from a random sample of classroom observations show that teachers who participated in LSC professional development were more likely to be using the designated instructional materials, and that the quality of the lessons taught improved with increased participation in LSC activities. Furthermore, lessons taught by teachers who had participated in at least 20 hours of LSC professional development and were using the designated materials were more likely to receive high ratings for their lessons, lending support to the program's focus on professional development aimed at implementing exemplary instructional materials. **Availability:** Available from EHR Directorate, NSF.
Progress and Pitfalls: A Cross-Site Look at Local Systemic Change through Teacher Enhancement	**Scope**: A program evaluation study of the efforts and lessons learned of 61 Local Systemic Change projects based on data collected from 1998 to 2001. **Findings**: LSC projects have demonstrated important successes in a number of areas. Overall, LSCs have had a positive impact on teachers' attitudes toward teaching mathematics and science, and their perceptions of preparedness in content and pedagogy. With increased participation in LSC professional development, teachers are more likely to use designated instructional materials, and the quality of their instruction improves. LSC projects have developed a core of teacher leaders, many of whom have played integral roles in planning, designing, and implementing professional development, policy alignment efforts, and community outreach. Many LSCs reported considerable success in moving mathematics and science to the forefront of district priorities, in securing a supportive policy environment for reforms, and in increasing stakeholder support over the course of the project. Projects also faced a number of key challenges in their work with teachers and school systems: building capacity for and consistency of high quality professional development, attracting teachers and sustaining their involvement, focusing professional development for a teaching population with diverse needs, securing administrative support, and dealing with the constraints of a district context (e.g., teacher/administrative turnover, making time for teachers to attend professional development, and poorly aligned assessments). **Availability:** Available from EHR Directorate, NSF.

Instructional Materials Development (IMD) Dissemination and Implementation Site Evaluation	**Scope:** A program evaluation of the impact and effectiveness of seven IMD Dissemination and Implementation projects and their satellite sites. **Findings:** The IMD Dissemination and Implementation Centers contributed to the dissemination and use of standards-based mathematics and science materials by exposing districts and schools to standards-based reform, providing districts with greater accessibility to standards-based materials, encouraging a systematic selection process for materials, and substantially increasing the capacity of well-qualified staff to provide professional development to districts and schools. Each center adopted either a process- or product-oriented theory of action to guide project structures and activities. In the process model, both the Center and its satellites focused on school or district conditions that fostered appropriate selection and full implementation of curricula, such as leadership, professional development, and teacher content knowledge. In the product-oriented model, the Centers focused on raising awareness of multiple curricula and providing technical assistance in making choices. In the product-oriented projects, the satellites provided technical assistance in implementation of the curriculum itself. Both process- and product-focused satellites relied on building a network of staff developers experienced with teaching and/or the curricula. The evaluation concluded that the center with the least impact at the district and school levels is one that focuses primarily on public awareness and planning, rather than on issues of implementation. Overall, the Dissemination and Implementation sites provide high quality professional development and other services to support adoption and implementation of IMD materials. **Availability:** Available from EHR Directorate, NSF
Protecting Information: The Role of Community Colleges in Cybersecurity	**Scope:** Focus on how community college resources could be utilized and further developed to help educate a cybersecurity workforce. **Findings:** The Report includes recommendations in the following areas: • Role of certification and skill standards • Establishment and maintenance of cybersecurity programs at community colleges • Specification of topics, courses, curricula, and programs • Preparation for cybersecurity positions • Advancement of the role of community colleges in cybersecurity education Key Areas: **Availability:** Community College Press, American Association of Community Colleges, One Dupont Circle, Suite 410, Washington, DC 20036-1176

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

	Directorate for Geosciences (GEO)
The Sun to the Earth—and Beyond: A Decadal Research Strategy in Solar and Space Physics	**Scope:** A study to assess the current status and future directions of U.S. ground- and space-based programs in solar and space physics research. **Findings:** The report summarizes the state of knowledge about the total heliospheric system, poses key scientific questions for further research, and presents an integrated research strategy, with priorities, for the next decade. The report emphasizes the importance of understanding the Sun, the heliosphere, and planetary magnetospheres and ionospheres as astrophysical objects and as laboratories for the investigation of fundamental plasma physics phenomena. **Availability:** National Academy of Sciences www.nas.edu
EarthLab: A subterranean Laboratory and Observatory to Study Microbial Life, Fluid Flow, and Rock Deformation	**Scope:** EarthLab is an initiative to build a laboratory in the deep subsurface to study the biological, geomechanical, hydrological and geochemical processes that modify Earth from its surface to the limit of habitable depths. **Findings:** At a joint conference between the physics and Earth science communities, *Neutrinos and Subterranean Science 2002* (September 2002), the concept and goals of EarthLab were established. To carry out needed experiments and observe changes over the long term, EarthLab requires a large-scale underground excavation where drilling, coring, and tunneling can access a variety of structural, hydrological, biological, and geochemical environments. Such a facility will be a unique resource for multidisciplinary and multi-institution investigations for the international geological and biological science and engineering communities. **Availability:** EarthLab, http://www.earthlab.org/
Ocean Boise and Marine Mammals	**Scope:** Reviews sources of noise in the ocean environment, what is known of the responses of marine mammals to acoustic disturbance, and what models exist for describing ocean noise and marine mammal response. **Findings:** Recommendations are made for future data gathering efforts, studies of marine mammal behavior and physiology, and modeling efforts necessary to determine what the long- and short-term impacts of ocean noise on marine mammals. **Availability:** National Academy of Sciences www.nas.edu

Beyond the Molecular Frontier: Challenges for Chemistry and Chemical Engineering	**Scope:** This Committee on Challenges for the Chemical Sciences in the 21st Century, National Research Council study, brings together research, discovery, and invention across the entire spectrum of the chemical sciences—from fundamental, molecular-level chemistry to large-scale chemical processing technology. This reflects the way the field has evolved, the synergy at academic institutions between research and education in chemistry and chemical engineering, and the way chemists and chemical engineers work together in industry. **Findings:** The study identifies the key opportunities and challenges for the chemical sciences, from basic research to societal needs, and from terrorism defense to environmental protection. It looks at the ways in which chemists and chemical engineers can work together to contribute to an improved future. **Availability:** National Academy Press, http://www.nap.edu/catalog/10633.html
Materials Science and Technology: Challenges for the Chemical Sciences in the 21st Century	**Scope:** This Organizing Committee for the Workshop on Materials and Manufacturing, Committee on Challenges for the Chemical Sciences in the 21st Century, National Research Council workshop report, outlines the role that the chemical sciences has played in past and future developments in the design, creation and understanding of new materials. **Findings:** Numerous findings are listed in the categories of Discovery, Interfaces, Challenges, and Infrastructure. **Availability:** National Academy Press, http://www.nap.edu/catalog/10694.html
National Security and Homeland Defense: Challenges for the Chemical Sciences in the 21st Century	**Scope:** This Committee on Challenges for the Chemical Sciences in the 21st Century, National Research Council workshop report outlines the role that the chemical sciences can play in national security and homeland defense. **Findings:** Numerous findings are listed in the categories of Discovery, Interfaces, Challenges, and Infrastructure **Availability:** National Academy Press, http://www.nap.edu/catalog/10543.html

Exploring the Concept of Undergraduate Research Centers	**Scope:** On March 31 – April 1, 2003 a workshop was held at the NSF. The hypothesis motivating this workshop was that by providing research opportunities to young students in their first or second year of college through the creation of undergraduate research centers (URCs), we would attract a larger and more diverse student body to chemistry. Projects conducted at the URCs could be more broadly defined from traditional norms, and they could be "titrated" to the skills of students as well as available instrumentation. The types of projects could be faculty-initiated research projects or carefully designed discovery-based laboratory exercises, or others. **Findings:** Workshop participants agreed that URCs should bring institutions with divergent missions together to their mutual benefit. A second strong theme that emerged was that, as often as possible, students should be involved in real research and actively contribute to the production of new knowledge. The utility of community-based research experiences in attracting students to the sciences, particularly at urban and nonresidential institutions, was recognized in this context. While it was agreed that URCs should focus initially on expanding research opportunities for freshmen and sophomores, participants articulated an expansive vision in which URCs support research-based learning "from cradle to grave," from elementary school to civic involvement within the local community. Finally, the themes of institutionalization of the culture of research as the cornerstone of scientific literacy for all students and curricular reform necessary to successfully support such a vision of URCs were also emphasized. Despite its focus on a seemingly limited problem—improving research opportunities for undergraduates early in their academic experience—the concept of URCs clearly represents the kernel of a comprehensive vision for undergraduate education, one with the potential to transform it from an exclusive "ivory tower" into a vigorous and dynamic forum of inclusiveness and engagement for a larger group of students than we currently serve. **Availability:** http://urc.arizona.edu/
Postdoctoral Appointments: Roles and Opportunities	**Scope:** On May 11-13, 2003 an NSF-supported workshop was held to discuss new postdoctoral and professional development models that combine research expertise with professional service. These models would combine professional development and research and education activities addressing needs. **Findings:** Numerous recommendations and observations will appear in the report for both enhancing traditional postdoctoral appointments supported by NSF and new models. **Availability:** To appear at http://www.merrimackllc.com/2003/postdoc-workshop.html

Workshop on New Mechanisms for Support Of High-Risk and Unconventional Research in Chemistry	**Scope**: A group of academic scientists and engineers met at the NSF on May 17-18, 2003 to discuss mechanisms for funding "high-risk" and unconventional research in the chemical sciences. Specifically, this group considered whether it would be desirable to develop an experimental program designed to support highly innovative research (which might be high-risk, in areas relatively unfamiliar to chemistry, or unconventional in focus or structure of the programs); that is, research of types that would be difficult or impossible to support within existing structures. **Findings:** The committee concluded that there were a number of opportunities to provide funding mechanisms that would be more responsive to unconventional ideas, and more proactive in helping the community to develop and shape new ideas. It developed the concept of a program that would support Centers (either real or virtual), having a number of key features: • A Focus on a Big Problem, and a Common Vision. • Three to Six Highly Talented Investigators and a Strong Leader. • Representation from a Range of Skills and Approaches. • A Critical Mass in Financial and Human Resources. • Local Autonomy with accountability, in Allocation of Resources, in Personnel, and in Direction. • A Culture of Innovation and Risk-Taking. **Availability:** The report is available at http://www.mrl.uiuc.edu/NSFGMWFinal.pdf
Reducing the Time from Basic Research to Innovation in the Chemical Sciences: A Workshop Report to the Chemical Sciences Roundtable	**Scope:** This report, supported by the Chemical Sciences Roundtable, National Research Council, focused on factors such as work processes, systems, and technologies that could enable and accelerate the pace of innovation and increase the yield of major innovations from work in basic chemical sciences. **Findings:** Numerous recommendations and observations appear in the report. **Availability:** http://www.nap.edu/catalog/10676.html
Minorities in the Chemical Workforce: Diversity Models that Work - A Workshop Report to the Chemical Sciences Roundtable	**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 challenge of increasing the diversity of the workforce. Sessions were organized on why diversity is important, pipeline issues beginning at the undergraduate level through graduate school, and successful activities in industry to attract and retain minorities in the workforce. **Findings:** Numerous recommendations and observations appear in the report. **Availability:** http://doe-hep.hep.net/lrp_panel/

Statistics: Challenges and Opportunities for the 21st Century	**Scope:** On May 6-8, 2002 a workshop was held at the NSF to identify the future challenges and opportunities for the statistics profession. The report that will be available in the early part of 2003 identifies major opportunities and challenges for the field of Statistics and formulates recommendations. The organizing committee of the workshop that is responsible in producing this report decided that the entire domain of statistics should be covered, both as a core science and in its scientific application areas, except for the health sciences, which is a very large and thriving specialty deserving of its own report. The report, in addition to discussing scientific opportunities and the challenges associated with those, discusses the role of education and training in statistics. **Findings:** Three high-priority opportunities are identified; analysis of massive data sets, modeling complex systems and understanding uncertainty. An in- depth discussion of each of these areas is provided in the report. Four major challenges were also identified; challenge of recognition, challenge of multidisciplinary activity, challenges in core research areas, and challenges in education and training. Five recommendations are made and discussed in the report: promote recognition of the unique identity of statistics, strengthen the core research areas; strengthen multidisciplinary research activities; develop new models for statistical education and accelerate the recruitment of the next generation of statisticians. **Availability:** The latest version of the report is available on the website of the American Statistical Association at http://www.amstat.org. It is expected that the final version will be available in early fall 2003.
Computational Opportunities in Algebra, Number Theory, and Combinatorics (ANTC)	**Scope:** The Workshop on Computational Opportunities in Algebra, Number Theory, and Combinatorics (ANTC) was held in September 2002 at the NSF. The purpose of the workshop was to bring together members of the ANTC community with extensive computing expertise to discuss the role of computation in ANTC research, future needs in computing support and new research opportunities for this area. **Findings:** Numerous recommendations and observations appear in the report. The report includes sections on the role of computation in ANTC research, research problems where computation is likely to have a significant impact, hardware and software issues, web databases, the role of computers in proofs, and education and outreach. A set of recommendations may be found in the report. **Availability:** The report is now available on the website of the American Institute of Mathematics at http://www.aimath.org/ResearchService.

Current and Emerging Research Opportunities in Probability	**Scope:** The Workshop on Current and Emerging Research Opportunities in Probability was held on May 29-31, 2002 at the NSF. The report identifies the strengths of the discipline, both internally and in its applications. It describes some of the exciting areas of current research. While it does not quantify the needs of the community, it does demonstrate the need for a larger community trained in probability and probabilistic reasoning. It further points to the responsibilities of the funding agencies, the academic institutions, and the community itself, to meet the growing demands for the discipline. **Findings:** Probability is both a fundamental way of viewing the world, and a core mathematical discipline, alongside geometry, algebra, and analysis. In recent years, the evident power and utility of probabilistic reasoning as a distinctive method of scientific inquiry has led to an explosive growth in the importance of probability theory in scientific research. Central to statistics and commonplace in physics, genetics, and information theory for many decades, the probabilistic approach to science has more recently become indispensable in many other disciplines, including finance, geosciences, neuroscience, artificial intelligence and communication networks. **Availability:** The report is now available at http://www.math.cornell.edu/~durrett/probrep/probrep.html
Accelerating Mathematical-Biological Linkages: Report of a Joint NSF-NIH Workshop	**Scope:** On February 12-13, 2003, a workshop was held at the National Institutes of Health in order to highlight the opportunities and challenges present at the mathematical-biological interface, and to challenge the institutional, cultural, and educational barriers to these essential and fruitful partnerships. The workshop consisted of a day-long symposium followed by a half day in which small working groups identified key needs to move mathematical-biological linkages forward. Linkages are broadly defined to include collaborations among mathematicians and biologists, educational and training opportunities, new research initiatives, as well as other activities. **Findings:** Three working groups were formed to discuss (1) institutional issues, (2) education and training, and (3) strengthening ties among researchers. Each group was charged with developing and articulating critical actions needed to enhance mathematical-biological linkages. The report contains the recommendations of these groups, some of which are directed at the NSF and NIH, while others are directed at scientists and mathematicians or at academic and research institutions. **Availability:** The report is now available at: http://www.palmerlab.umd.edu/report.pdf

Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century	**Scope:** This report from the National Research Council's "Committee on the Physics of the Universe" was commissioned jointly by NASA, NSF, and DOE, in recognition of the deep connections that exist between quarks and the cosmos. It identifies eleven science questions that focus on the interface between physics and astrophysics, connecting physics at the most microscopic scales to the properties of the universe and its contents on the largest physical scales. Further, it recommends research and research coordination needed to address the 11 science questions. **Findings:** The report recommends that NASA, NSF, and DOE work together to carry out an extensive program of experiments, including: measure polarization of the cosmic microwave background; determine properties of the dark matter; determine the neutrino masses, the constituents of dark matter, and the lifetime of the proton; use space to probe the basic laws of physics; determine the origin of the highest energy gamma rays, neutrinos, and cosmic rays; discern physical principles of extreme astrophysical environments through laboratory study of high-energy-density physics; and realize the scientific opportunities at the intersection of physics and astronomy. **Availability:** Ordering information and Executive Summary available at: http://www.nap.edu/catalog/10079.html
Neutrinos and Beyond: New Windows on Nature	**Scope:** The National Research Council's "Neutrino Facilities Assessment Committee" was charged by OSTP with providing scientific assessments of: (1) IceCube, a very large volume detector of high-energy neutrinos proposed for the South Pole and (2) a possible deep underground science facility to be developed in the U.S. to pursue a broad range of fundamental questions in physics and astronomy. The assessments were to be in the context of current and planned neutrino capabilities throughout the world. **Findings:** The NRC committee reported its assessments that: (1) The planned IceCube experiment can open a new window on the universe by detecting very high-energy neutrinos from objects across the universe. The science is well motivated and exciting, the detection technique is proven, and the experiment appears ready for construction. (2) A deep underground laboratory can house a new generation of experiments that will advance understanding of the fundamental properties of neutrinos and the forces that govern elementary particles, as well as shed light on the nature of the dark matter that holds the universe together. Recent ideas about neutrinos, new ideas and technologies, and the scientific leadership in the U.S. make the time ripe to build such a unique facility. **Availability:** http://www.nap.edu/catalog/10583.html

NeSS 2002: International Workshop on Neutrinos and Subterranean Science	**Scope:** This workshop, requested by the executive branch of the U.S. government, was held September 19 - 21, 2002 and was tasked to develop a roadmap to guide neutrino and subterranean science investigations worldwide over the next few years. The interdisciplinary meeting was structured around working groups that covered double-beta decay, proton decay, neutrino oscillations, dark matter, solar neutrinos, astrophysical and cosmological neutrinos, and geosciences; as well as topics of national security, and education and outreach. This activity coordinated with the NRC's Neutrino Facilities Assessment Committee and vice versa. **Findings:** A principal conclusion of the workshop was that the goals of IceCube and a national underground laboratory are two separate research endeavors. IceCube will be a high-energy neutrino observatory that instruments a large volume of ice at the South Pole to detect neutrinos from distant regions of the universe. In contrast, there is a group of detectors designed to measure rare, low-energy processes of a fundamental nature that require the low background environment of a deep underground location. There was considerable excitement from the physicists about the science proposed by the geosciences working groups. **Availability:** http://www.physics.umd.edu/events/spevents/NeSS02/
Frontiers in High Energy Density Physics: The X-Games of Contemporary Science	**Scope:** The NRC Committee on High Energy Density Plasma Physics was charged to: (a) review recent advances in the field of high energy density plasma phenomena, on both the laboratory scale and the astrophysical scale; (b) provide a scientific assessment of the field, identifying compelling research opportunities and intellectual challenges; (c) develop a unifying framework for diverse aspects of the field; (d) outline a strategy for extending the forefronts of the field through scientific experiments at various facilities where high energy density plasmas can be created; and (e) discuss the roles of the national laboratories, universities, and industry in achieving these objectives. **Findings:** High energy density physics (HEDP) includes a wide variety of physical phenomena at energy densities exceeding 10**11 J/m**3. Their principal findings are: (a) HEDP is a rapidly growing field with exciting research opportunities; (b) a new generation of sophisticated laboratory facilities exist or are planned; (c) advances in computing have made numerical modeling of nonlinear dynamics and astrophysical hydrodynamics possible; (d) instruments for measuring astrophysical processes under HEDP conditions are unprecedented in their sensitivity and detail; (e) the NNSA has recently established a program to fund research at universities in HEDP S&T relevant to stockpile stewardship; (f) increased support of HEDP research by DOE, NSF, DOD, and NASA is recommended; (g) upgrade opportunities exist at current experimental facilities; and (h) partnerships between industry and universities and laboratories are mutually beneficial. **Availability:** Ordering information and Executive Summary available at: http://www.nap.edu/catalog/10544.html

The Science and Applications of Ultrafast, Ultraintense Lasers (SAUUL)	**Scope:** This report is the result of a workshop held June 17 - 19, 2002 in Washington, DC to assess the potential national impact of ultra-fast, ultra-high intensity lasers (UUL). It was supported by DOE, NNSA and NSF. The report isolates five areas where opportunities for major breakthroughs exist with UULs: fusion energy; compact, high gradient particle accelerators; ultrafast x-ray generation; creation of extreme states of matter, and the generation of attosecond bursts of radiation. **Findings:** Their four central conclusions are: (1) science studied with UULs is a fast growing field in the U.S., Europe, and Japan; (2) applications of UULs are much broader and more interdisciplinary than in the 1980s; (3) state-of-the-art lasers are more complex and expensive than in the past; and (4) a new mode of organization (a network of institutions) is needed to maintain the vitality of the field in the U.S. **Availability:** The report is available at: **http://www.ph.utexas.edu/~utlasers/papers/SAUUL_report.pdf**

	Directorate for Social, Behavioral and Economic Sciences
National Research Council's Committee to Review the 2000 Decade Design of the Scientists and Engineers Statistical Data System (SESTAT)	**Scope:** The review and assessment of three proposed design options for the 2000 decade being considered by NSF staff for SESTAT (the Scientists and Engineers Statistical Data System, a system of surveys that provide information about the numbers and characteristics of scientists and engineers in the United States). **Findings:** The committee's report presents their understanding of the purposes and characteristics of the SESTAT, applies the criteria important for assessing design options for the database, provides recommendations for the best approach to adopt in the 2000 decade, and offers encouragement to NSF to pursue opportunities to improve the understanding of the numbers and characteristics of scientists and engineers in the United States. The report presents the following recommendations: 1. Almost all of the resources allocated to the SESTAT data collection effort in 2003 should be devoted to drawing a new National Survey of College Graduates from the 2000 census and supplementing this panel with the National Survey of Recent College Graduates. 2. If Division of Science Resources Statistics (SRS) staff confirm that a targeted sample could be useful for the purpose of adjustment, SRS should consider surveying in 2003 a very small, carefully targeted subset of the current panel to study biases in the current sample, possibly to use for the purpose of adjustment. 3. A cost-benefit analysis should be conducted to optimize the relative allocation of resources between the National Survey of College Graduates and the National Survey of Recent College Graduates. Also, additional oversampling should be applied to capture adequate numbers for small domains for which increased interest has become apparent since the last design. 4. The Division of Science Resources Statistics should make every effort to achieve a response rate of 85 percent or higher for the recommended new sample and to retain the sample over time.

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.

LIST OF ACRONYMS

AAAC	Astronomy and Astrophysics Advisory Committee
AAAS	American Association for the Advancement of Science
AC	Advisory Committee
ACBAR	Arcminute Cosmology Bolometer Array Receiver
AC/GPA	Advisory Committee for GPRA Performance Assessment
ACS	American Chemical Society
ADVANCE	Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers
AGEP	Alliances for Graduate Education and the Professoriate
AKRSI	Alaska Rural Systemic Initiative
ALMA	Atacama Large Millimeter Array
AMANDA	Antarctic Muon and Neutrino Detector Array
AMBAP	Award Monitoring and Business Assistance Program
ANIR	Advanced Networking Infrastructure and Research
ANSC	Alaska Native Science Commission
ANTC	Algebra, Number Theory, Combinatorics
ARCUS	Arctic Research Consortium
ATE	Advance Technological Education
AUI	Associated Universities, Inc.
AURA	Association of Universities for Research in Astronomy
BCPI	Budget, Cost, and Performance Integration
BCS	Behavioral and Cognitive Sciences
BFA	Division of Budget, Finance, and Award Management
BI	Burning Index
BIO	Directorate for Biological Sciences
BIRN	Biomedical Informatics Research Network
BCPI	Budget, Cost and Performance Integration
BPI	Budget Performance Integration
CA	California
CAAR	Cost Analysis/Audit Resolution Branch
CBI	Cosmic Background Imager
CBS	Columbia Broadcasting System
CCD	Charge-Coupled Device
CCLI	Course, Curriculum, and Laboratory Improvement
CeBASE	Center for Empirically Based Software Engineering
CFO	Chief Financial Officer
CIP	Construction in Progress
CISE	Directorate for Computer and Information Science and Engineering
CLT	Centers for Learning and Teaching
CMB	Cosmic Microwave Background
CMU	Carnegie Mellon University
CNN	Cable Network News
COMRAA	Committee on the Organization and Management of Research in Astronomy and Astrophysics
COSMIC	Constellation Observing System for Meteorology, Ionosphere, and Climate
COTS	Commercial Off-The-Shelf
COV	Committee of Visitors
CREST	Centers for Research Excellence In Science and Technology
CRIF	Chemistry Research Instrumentation and Facilities
CSDT	Culturally Situated Design Tools
CSLA	California School Leadership Academy
CSO	Competitive Source Official
CSRS	Civil Service Retirement System
CT	Connecticut
CURE	Consortium for Undergraduate Research Experience
DAPCEP	Detroit Area Pre-College Engineering Program
DC	District of Columbia
DGA	Division of Grants and Agreements
DIS	Division of Information Systems
DMFT	Dynamical Mean Field Theory
DNA	Deoxyribonucleic Acid
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOL	Department of Labor
DPOSS	Digital Palomar Observatory Sky Survey
EC	European Community
EFT	Electronic Fund Transfer
EHR	Directorate for Education and Human Resources
EIA	Division of Experimental and Integrative Activities
EIS	Enterprise Information System
ENG	Directorate for Engineering
ERC	Engineering Research Center
ESO	European Southern Observatory
ET-S	E-Travel Solution
FACA	Federal Advisory Committee Act

FAIR	Federal Activities Inventory Reform
FAS	Financial Accounting System
FASAB	Federal Accounting Standards Advisory Board
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
FMFIA	Federal Managers' Financial Integrity Act of 1982
FTS	Fischer-Tropsch Synthesis
FY	Fiscal Year
FY1999	Fiscal Year 1999
FY2001	Fiscal Year 2001
GAPP	Generally Accepted Accounting Principles
GAO	General Accounting Office
GEO	Directorate for Geosciences
GISRA	Government Information Security Reform Act
GMRA	Government Management Reform Act
GPG	Grant Proposal Guide
GPRA	Government Performance and Results Act
GPS	Global Positioning System
GSA	Government Services Administration
HIAPER	High-Performance Instrumented Airborne Platform for Environmental Research
H1-B	Nonimmigrant Petitioner Visa
H_2O	Water
HBCU	Historically Black Colleges and Universities
HE	Hamburg/European Southern Observatory Survey
HEDP	High Energy Density Physics
HIV	Human Immune Deficiency Virus
HLT	Human Language Technology
HRM	Division of Human Resources Management
HR	Human Resources
HRI	Horizon Research, Inc.
IBMBCS	IBM Business Consulting Services
IBRCS	Infrastructure for Biology at Regional to Continental Scales
ID	Identification
IERI	Interagency Education Research Initiative
IGERT	Integrative Graduate Education and Research Traineeship
IHOP	International H_2O Project
IMD	Instructional Materials Development
INT	Office of International Science and Engineering
IP	Intellectual Property
IPERS	Integrated Personnel System
IS	Information Security
ISP	Integrated and Sustained Program
IT	Information Technology
ITR	Information Technology Research
ITRD	Information Technology Research and Development
ITS	Information Technology Security
IVET	Immersive Virtual Environment Technology
JPL	Jet Propulsion Laboratory
KITP	Kavli Institute of Theoretical Physics
KY	Kentucky
LA	Los Angeles
LEO	Low Earth Orbiting
LSAMP	Louis Stokes Alliances for Minority Participation
LSC	Local Systemic Change
LTER	Long-Term Ecological Research
MAC	Minority Affairs Committee
MATLAB	Matrix Laboratory
MCC	Management Controls Committee
MD&A	Management's Discussion and Analysis
MLIAM	Multilingual Information Access and Management
MN	Minnesota
MPS	Directorate for Mathematical and Physical Sciences
MREFC	Major Research Equipment and Facilities Construction (account)
MRI	Major Research Instrumentation (program)
MIT	Massachusetts Institute of Technology
MO	Microbial Observatories
MPS	Directorate for Mathematical and Physical Sciences
MSP	Math and Science Partnerships
MTS	Measurement Tracking System
NA	Not Applicable or Not Available (see context)
NAIC	National Astronomy and Ionosphere Center
NAPA	National Academy of Public Administration
NAS	National Academy of Sciences

NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NC	North Carolina
NCAR	National Center for Atmospheric Research
NCMIR	National Center for Microscopy and Imaging Research
NEON	National Ecological Observatory Network
NESPOLE	Negotiating Through SPOken Language in E-Commerce
NHMFL	National High Magnetic Field Laboratory
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NMR	Nuclear Magnetic Resonance
NNUN	National Nanofabrication Users Network
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NOAO	National Optical Astronomy Observatory
NOPP	National Oceanographic Partnership Program
NPACI	National Partnership for Advanced Computational Infrastructure
NRAO	National Radio Astronomy Observatories
NRC	National Research Council
NSB	National Science Board
NSF	National Science Foundation
NSO	National Solar Observatory
NVO	National Virtual Observatory
NY	New York
ODS	Online Document System
OEOP	Office of Equal Opportunity Programs
OFRG	Oligonucleotide Fingerprinting of Ribosomal RNA Genes
OIG	Office of the Inspector General
OIRM	Office of Information and Resource Management
OISE	Office of International Science and Engineering
OMB	Office of Management and Budget
ONR	Office of Naval Research
OPM	United States Office of Personnel Management
OPP	Office of Polar Programs
OSTP	Office of Science and Technology Policy
PA	Pennsylvania
PACI	Partnerships for Advanced Computational Infrastructure
PAR	Performance and Accountability Reports
PARS	Proposal, PI and Reviewer System
PART	Performance Assessment Rating Tool
PBS	Public Broadcasting System
PGE	Programs for Gender Equity
PI	Principal Investigator
PIT	People, Ideas, Tools
PITAC	Presidential Information Technology Advisory Committee
PMA	President's Management Agenda
PO	Program Officer
PPD	Programs for Persons with Disabilities
PP&E	Property, Plant and Equipment
PRAGMA	Pacific Rim Applications and Grid Middleware Assembly
PSID	Panel Study of Income Dynamics
PUMS	Public Use Microdata Sample
Q3	Third Quarter
Q4	Fourth Quarter
QSAR	Quantitative Structure Activity Relationships
R&RA	Research and Related Activities
REPP	Research in Education Policy and Practice
REU	Research Experiences for Undergraduates
RNA	Ribonucleic Acid
RO	Radio Occultation
RPI	Rensselaer Polytechnic Institute
S&E	Salaries and Expenses
SARS	Severe Accute Respitory Syndrome
SAL	Speech Assisted Learning
SAUUL	Science and Applications of Ultrafast, Ultraintense Lasers
SBE	Directorate for Social, Behavioral and Economic Sciences
SBIR	Small Business Innovation Research
SDSC	San Diego Supercomputing Center
SEM	Science, Engineering, and Mathematics
SES	Division of Social and Economic Sciences
SESTAT	Scientists and Engineers Statistical Data System
SFFAS	Statement of Federal Financial Accounting Standards
SGER	Small Grant for Exploratory Research
SMETE	Science, Mathematics, Engineering and Technology Education

SPSS	Statistical Program for Social Sciences
SRB	Storage Resource Broker
SRS	Division of Science Resources Statistics
STC	Science and Technology Center
STEM	Science, Technology, Engineering and Mathematics
STEP	Systemic Teacher Excellence Preparation
STTR	Small Business Technology Transfer Program
TCP	Tribal Colleges Program
TIMSS	Third International Mathematics and Science Study
TX	Texas
TV	Television
UA	University of Arizona
UAF	University of Alaska, Fairbanks
UCAR	University Corporation for Atmospheric Research
UCLA	University of California, Los Angeles
UCSB	University of California, Santa Barbara
U.S.	United States of America
USAID	U.S. Agency for International Development
USAP	U.S. Antarctic Program
USGS	U.S. Geological Survey
USI	Urban Systemic Initiative
USWRP	U.S. Weather Research Program
UUL	Ultra-Fast, Ultra-High Intensity Lasers
VIGRE	Vertical Integration of Graduate Research and Education
VIPS	Valle Imperial Project in Science
VT	Vermont
WIMS	Center for Wireless Integrated MicroSystems