V. APPENDIXES

DESCRIPTION OF NSF DIRECTORATES AND MANAGEMENT OFFICES

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

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

The **Directorate for Education and Human Resources (EHR)** supports activities that promote excellence in U.S. science, technology, engineering, mathematics (STEM) education at all levels and in all settings (both formal and informal). The goal of these activities is to develop a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians, and educators, as well as a well-informed citizenry with access to the ideas and tools of science and engineering. Support is provided for individuals to pursue advanced study, for institutions to build their capacity to provide excellent STEM education, and for collaborations to strengthen STEM education at all levels by fostering alliances and partnerships among colleges, universities, school districts, and other institutions in the public and private sectors.

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

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

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

The **Directorate for Social, Behavioral and Economic Sciences (SBE)** supports research and education to build fundamental scientific knowledge about human cognition, language, social behavior and culture, and on economic, legal, political and social systems, organizations and institutions. To improve understanding of the science and engineering enterprise, SBE also supports science resources studies that are the nation's primary source of data on the science and engineering enterprise.

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

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

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

The **Office of Information and Resource Management (OIRM)** provides human capital management, information technology solutions, continuous learning opportunities, and general administrative services to the NSF community of scientists, engineers, and educators. OIRM also provides logistical support functions for NSF staff as well as the general public. It is responsible for recruiting, staffing and other human resource service requirements for all NSF staff and visiting personnel. OIRM is responsible for the management of NSF's physical infrastructure and conference facilities; the administration of its sophisticated technology infrastructure, and the dissemination of information about NSF programs to the external community through the agency's website. It is also responsible for delivery of the hardware, software and support systems necessary to manage the Foundation's grant-making process and to maintain advanced financial and accounting systems.

NSF EXECUTIVE STAFF AND NSF OFFICERS

NSF Executive Staff

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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

Office of the General Counsel
Lawrence Rudolph, General Counsel

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

Office of Integrative Activities
Nathaniel G. Pitts, Director

Office of Legislative and Public Affairs
Curtis Suplee, Director

Office of Polar Programs
Karl A. Erb, Director

Directorate for Biological Sciences
Mary E. Clutter, Assistant Director

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

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

Directorate for Engineering
John A. Brighton, Assistant Director

Directorate for Geosciences
Margaret S. Leinen, Assistant Director

Directorate for Mathematical and Physical Sciences
Michael S. Turner, Assistant Director

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

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

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

NSF Officers

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

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

NSF Affirmative Action Officer
John F. Wilkinson, Acting (Office of Equal Opportunity Programs)

NATIONAL SCIENCE BOARD MEMBERS DURING FY 2004

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Senior Scientist and
Head, Climate Change Research Section
National Center for Atmospheric Research

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Quarles Professor of Engineering and
Applied Science
Department of Computer Science
University of Virginia

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

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Department of Physics
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Department of Biological Sciences
Purdue University

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General Manager
Technology Partnerships
Honeywell Corporation (Retired)

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Departments of Bacteriology and Plant Pathology
University of Wisconsin-Madison

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

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

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Mark S. Wrighton
Chancellor
Washington University

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

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

Michael P. Crosby
Executive Officer
National Science Board

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

IMPROPER PAYMENTS INFORMATION ACT REPORTING DETAILS

I. Describe your agency's risk assessment(s), performed subsequent to compiling your full program inventory. List the risk-susceptible programs (i.e., programs that have a significant risk of improper payments based on OMB guidance thresholds) identified through your risk assessments. Be sure to include the programs previously identified in the former Section 57 of OMB Circular A-11.

NSF's risk assessment program applies to all award programs and activities that NSF funds through our Research & Related Activities (R&RA) and Education and Human Resources (EHR) appropriations. "Research and Education Grants and Cooperative Agreements" identified in the former Section 57 of OMB Circular A-11 is included in these appropriations.

Risk Assessment and Asset Management

The risk categories that have been identified apply to EHR and R&RA and focus on those aspects of the award universe that affect accountability in research and fiscal compliance. The aim is to protect the government and public interests in the stewardship of federal dollars. Risk categories may have either an organizational or award focus, depending on the circumstances of the review. NSF has identified certain risk factors that may warrant closer monitoring. These factors were identified based on research administration issues and audit findings that recur throughout the year.

Reviews of audit report findings and other empirical data also indicate certain risk indicators that should be addressed in our risk assessment. For example, cost sharing compliance proved to be a significant finding in most of the audits for a variety of reasons. Reviews of certain types of organizations representing our non-traditional awardees showed indications of risk. These include small non-profit groups, awards made to schools and colleges through State and local governments, and federally recognized Indian tribal governments, and new awardees. Regarding the latter, evidence suggests that business assistance provided at the initial stages of the award process lowers overall risk activity during the life of the process.

Although the academic institutions that receive 80 percent of the overall NSF budget are normally outside the high-risk area, NSF will still randomly sample awards at these institutions to insure that the appropriate processes and procedures are indeed in place and will continue to review any special needs of this portion of our award base.

The following factors are relevant to the NSF Office of Budget, Finance and Award Management (BFA) review and are similar to risk factors identified at other agencies:

- Compliance responsibilities in financial management require reviews of accounting systems to insure acceptability and adequacy for the accumulation and billing of costs under government agreements. Part of this review would include the application of appropriate cost principles, and transactional review of costs for subcontracts, cost sharing, salaries, participant support, and the application of the appropriate indirect cost rate to ensure appropriate expenditure oversight. Financial monitoring practices need to provide adequate assurance that funds are being spent for their intended purposes.

- Administrative factors include a review of management responsibilities and compliance with the terms and conditions of the award and with the reporting requirements. Additional reviews may include appropriate subcontracting procedures and property oversight.

- Programmatic factors are taken into account by providing additional oversight for awards supporting large and complex projects such as multi-user facilities. When needed, NSF program staff request the services of BFA staff, specifically as participants on site review panels, and on occasions where there are administratively complex issues, such as suspension, termination, or phase out, that must be handled with the utmost of administrative care and due process. These are *ad hoc* occasions and are addressed accordingly.

The table below contains weighted risk factors that relate to organizational and individual award characteristics used to help identify the highest risk awardees. The following is the Point Structure used in estimating the cumulative weighted risk:

Low:	Less than 10
Medium:	10 – 15
High:	16 or Greater

	RISK LEVELS		
	Low	**Medium**	**High**
Type Of Awardee	**0-1**	**3**	**5**
Academic Institution	x		
Non-Profit Organization		x	
School District or Community College			x
Tribal Government			x
For-Profit			x
New Awardee			x
Foreign Awardee			x
Dollar Value			
Under $500K	x		
$500K - $2M		x	
over $2M			x
Cost Sharing Activity			
None	x		
Less than $500K		x	
Greater than $500K			x

	RISK LEVELS		
	Low	Medium	High
Complexity: Type Of Award & Special Award Conditions	**0-1**	**3**	**5**
Grants for Basic Research	x		
Subaward of significant portion of effort		x	
Cooperative Agreements - Single University		x	
Cooperative Agreements - Large Centers			x
Property			
None proposed	x		
Personal - title to awardee	x		
Equipment Award		x	
Real Property			x
Personal - Title retained by Government			x
Programmatic Concerns: (as identified)			x
Cost Analysis & Audit Concerns			x

II. Describe the statistical sampling process conducted to estimate the improper payment rate for each program identified.

In accordance with the OMB guidance and formula, we determined that for FY 2004 the minimum sample size is 126 transactions. This is based upon an estimated error rate of 3.0 percent with a confidence level of 90 percent and a precision of plus or minus 2.5 percent. The improper payment review was conducted concurrently with the award monitoring site visits. Our original plan was to visit and perform erroneous payment reviews on the 26 organizations having the highest risk grants resulting in approximately five transactions per organization. However, as we finalized the monitoring plans, additional high-risk organizations were identified. Rather than adjust the transactions to be reviewed at each organization, we expanded the sample size. The final number of sites that were visited was 35 with the actual sample size being 175 transactions reviewed.

The sampling process was as follows:

- Prior to the on-site visit, which was determined by our risk assessment program, we obtained a copy of the latest FCTR submitted by the organization. We requested a transaction listing by award for each NSF award listed on Part II of the SF272A. The transaction listing should reconcile to the amount reported under the "Net Disbursements Reporting Quarter" column.
- From the listing, five transactions were selected using the DCAA EZ-Quant random number generator. Prior to the visit, we requested the organization to make copies of the supporting documentation for the selected transactions.
- The transactions were evaluated for propriety in accordance with Improper Payment Act guidance. (OMB Bulletin M-03-13, "Improper Payments Information Act of 2002.")
- The results of the review were summarized. If any errors were noted, we discussed a corrective action plan with the organization. If significant errors were noted, we

planned to expand the review to ascertain whether these findings represent a systemic finding or a unique error. These results were incorporated into the monitoring results. If necessary, the systemic findings would be referred to the cognizant oversight agency for resolution.

The sample results were evaluated using the Defense Contract Audit Agency EZ-Quant Statistical Analysis software to project the sample results to the universe. The confidence level was set at 90 percent. The ratio method was used for projection because the number of items in the universe was unknown. After projecting the upper limit of the erroneous payment dollars in the universe, the IPIA rate was computed by dividing universe erroneous payment dollars by total universe dollars.

III. Explain the corrective actions your agency plans to implement to reduce the estimated rate of improper payments. Include in this discussion what is seen as the cause(s) of errors and the corresponding steps necessary to prevent future occurrences. If efforts are already underway, and/or have been ongoing for some length of time, it is appropriate to include that information in this section.

NSF has undertaken the lead in measuring improper payments in the research grant community. This fiscal year, NSF experienced challenges in developing a statistically valid methodology for use as a baseline and in projections. Our sampling was skewed towards our high risk grantees. Even using this conservative approach the results indicated an improper payment rate of less than one percent and under $5 million. This data has led our focus away from corrective actions and reduction estimates to concentrate on improving our baseline information. For the coming fiscal year, we will address the statistical sampling challenges by reviewing and modifying the sample selection process in order to broaden the coverage beyond the high-risk awardees.

IV.

Improper Payment Reduction Outlook FY 2004 – FY 2007
($ in millions)

Program	FY 2004 Outlays	Improper Payments				
		FY 2004 (Percent)	FY 2004 (Dollars)	FY 2005 (Percent)	FY 2006 (Percent)	FY 2007 (Percent)
R&RA and EHR	$4,742	.93%	$4.4	Under 1%	Under 1%	Under 1%

V. Discuss your agency's Recovery Auditing effort, if applicable, including the amount of recoveries expected, the actions taken to recover them, and the business process changes and internal controls instituted and/or strengthened to prevent further occurrences. (This reporting replaces the original legislative requirement for reporting not later than 12/31/04.)

Not applicable for NSF's program of Research and Education Grants and Cooperative agreements.

VI. Describe the steps the agency has taken and plans to take (including time line) to ensure that agency managers (including the agency head) are held accountable for reducing and recovering improper payments.

NSF's grant monitoring framework for assessing and managing awardee risks and assets is based on a planned, dynamic multi-level risk minimization strategy with levels related to**:**

- An expanded, yet more focused, pre-award review process that provides both internal and external assistance and training to help ensure:
    - the most effective and efficient operation of a given program; and
    - awardee understanding of proposal and award requirements.
- An award phase review that is facilitated by the enhanced pre-award reviews and assistance;
- A comprehensive, formal desk review of the award portfolio that reports annually on identified risk and asset indicators; as well as
- A formal desk review resolution and follow-up activity that includes additional information requests, on-site formal reviews, and on-site review follow-up through the desk review process until resolution is reached or another site-review is conducted.

It is within this overall context that NSF incorporates risk assessment as a management tool to ensure a balanced cost-benefit approach that frames its post-award outreach and monitoring. It is a proactive approach that requires a working relationship with both the program staff and the awardee community and helps to ensure that the public funds that are received are properly managed and accounted for.

Most recently, the NSF Director approved a realignment of major functional responsibilities, with commensurate resources, to create a new Division that will focus on:

- Institutional assistance
- Risk management
- Award monitoring and oversight
- Strategic business systems development

This realignment along with our framework for awardee monitoring shows a top to bottom agency focus on improving accountability and oversight in our stewardship of award funds.

VII. A. Describe whether the agency has the information systems and other infrastructure it needs to reduce improper payments to the levels the agency has targeted.

We are currently using our existing end-to-end award information systems and infrastructure and will evaluate additional future needs, if any, as our improper payment plans and processes mature.

B. If the agency does not have such systems and infrastructure, describe the resources the agency requested in its FY 2005 budget submission to Congress to obtain the necessary information systems and infrastructure.

VIII. A description of any statutory or regulatory barriers that may limit the agencies' corrective actions in reducing improper payments.

None currently identified.

IX. Additional comments, if any, on overall agency efforts, specific programs, best practices, or common challenges identified, as a result of IPIA implementation.

None.

SCHEDULE OF PROGRAM EVALUATIONS

The following table provides information on the scheduling of meetings for Committees of Visitors (COVs) for NSF programs. The table lists the fiscal year of the most recent COV meeting for the program and the fiscal year for the next COV review of the program. The COV meetings that were held in FY 2003 are highlighted in bold.

Committee of Visitors Meetings by Directorate

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
BIOLOGICAL SCIENCES		
Biological Infrastructure	**2004**	2007
Research Resources (includes former Instrument-Related Activities)	**2004**	2007
Human Resources (includes former Training Cluster)	**2004**	2007
Plant Genome Research Program	**2004**	2007
Environmental Biology	2003	2006
Ecological Biology (Ecol. Studies held COV in 2002)	2002	2006
Ecosystem Science (Thematic Review held COV in 2001)	2001	2006
Population and Evolutionary Processes (Systematic and Population Biology held COV in 2000)	2000	2006
Systematic Biology and Biodiversity Inventories		2006
Integrative Organismal Biology(formerly Int. Biology and Neuroscience)[1]		2005
Behavioral Systems		2005
Developmental Systems		2005
Environmental and Structural Systems		2005
Functional and Regulatory Systems		2005
Molecular and Cellular Biosciences	2002	2005
Biomolecular Systems (formerly Biomolecular Structure and Function		2005
and Biomolecular Processes)	2000	2005
Cellular Systems (formerly Cell Biology)	2001	2005
Genes and Genome Systems (formerly Genetics)	2003	2005
Emerging Frontiers (new in '03)	N/A	2006

[1] Please note that programs in this division have been reorganized. Previous COVs were held for Neuroscience (2001); Developmental Mechanisms (2000); and Physiology and Ethology (2002).

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
COMPUTER AND INFORMATION SCIENCE AND ENGINEERING		
Please note that CISE programs and divisions were reorganized in FY 2003. COVs for IIS, ANIR, and CCR were held in FY 2003.		2006
Computing & Communication Foundations (CCF)		
Emerging Models & Technologies for Computation		2006
Formal & Mathematical Foundations		2006
Foundations of Computing Processes & Artifacts		2006
Computer & Network Systems (CNS)		2006
Computer Systems		2006
Computing Research Infrastructure		2006
Education & Workforce		2006
Network Systems		2006
Information & Intelligent Systems (IIS)		2006
Data, Inference & Understanding		2006
Science & Engineering Informatics		2006
Systems in Context		2006
Shared Cyberinfrastructure (SCI)	2005	2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
EDUCATION AND HUMAN RESOURCES		
Educational Systemic Reform (discontinued)		
Statewide Systemic Initiatives	**2004**	
Urban Systemic Initiatives	**2004**	
Rural Systemic Initiatives	**2004**	
Office of Innovation Partnerships		
EPSCoR	2000	2005
Elementary, Secondary and Informal Education		
Informal Science Education	2001	2005
Teacher Enhancement	2003	2006
Instructional Materials Development	2005	2008
Centers for Learning and Teaching (new in '01)	**2004**	2007
Undergraduate Education		
Teacher Preparation	**2004**	2007
Advanced Technological Education	2003	2006
NSF Computer, Science, Engineering and Mathematics Scholarships (new in '01)	2003	2006
Distinguished Teaching Scholars (new in '02)		2005
Scholarship for Service (new in '01)	2004	2007
National SMETE Digital Library (new in '01)	2002	2005
Course, Curriculum, and Laboratory Improvement	2003	2006
Undergraduate Assessment (new in '02)	2003	2006
The STEM Talent Expansion Program (STEP) (new in '02)		2005
Robert Noyce Scholarship (new in '02)		
Graduate Education		
Graduate Research Fellowships	2003	2006
NATO Post doctorate Fellowships (program discontinued)	**2004**	
IGERT (new in '97)	2002	2005
GK-12 Fellows (new in '99)	2002	2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
EDUCATION AND HUMAN RESOURCES (continued)		
Human Resource Development		
The Louis Stokes Alliances for Minority Participation	2001	2005
Centers for Research Excellence in Science and Technology (CREST)	2001	2005
Gender Diversity in STEM Education	2003	2006
Programs for Persons with Disabilities (PPD)	2003	2006
Alliances for Graduate Education and the Professoriate (AGEP)	2001	2005
Tribal Colleges Program (TCP) (new in ’01)	**2004**	2007
Historically Black Colleges and Universities (HBCU)	2001	2005
Research, Evaluation & Communications		
Research on Learning and Education (ROLE)	2002	2005
Evaluation	2004	2007
Interagency Education Research Initiative (IERI) (new in ’01)	2002	2005
Other		
H-IB VISA K-12		2005
Math and Science Partnership (MSP) (new in ’02)		2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
ENGINEERING		
Bioengineering and Environmental Systems	2002	2005
Biochemical Engineering & Biotechnology	2002	2005
Biomedical Engineering & Research to Aid Persons with Disabilities	2002	2005
Environmental Engineering & Technology	2002	2005
Civil and Mechanical Systems	2004	2007
Dynamic System Modeling, Sensing and Control	**2004**	2007
Geotechnical and GeoHazard Systems	**2004**	2007
Infrastructure and Information Systems	**2004**	2007
Solid Mechanics and Materials Engineering	**2004**	2007
Structural Systems and Engineering	**2004**	2007
Network for Earthquake Engineering Simulation	**2004**	2007
Chemical and Transport Systems		2006
Chemical Reaction Processes	2003	2006
Interfacial, Transport and Separation Processes	2003	2006
Fluid and Particle Processes	2003	2006
Thermal Systems	2003	2006
Design, Manufacture and Industrial Innovation		
-Engineering Decision Systems Programs (new in ’02)	2003	2006
Engineering Design	2003	2006
Manufacturing Enterprise Systems (new in ’02)	2003	2006
Service Enterprise Systems (new in ’02)	2003	2006
Operations Research	2003	2006
-Manufacturing Processes and Equipment Systems	2003	2006
Materials Processing and Manufacturing	2003	2006
Manufacturing Machines and Equipment	2003	2006
Nanomanufacturing (new in ’02)	2003	2006
-Small Business		
Small Business Innovation Research (SBIR)	**2004**	2007
Small Business Technology Transfer	**2004**	2007
-Crosscutting		
Grant Opportunities for Academic Liaison w/ Industry	2003	2006
Innovation and Organizational Change	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
ENGINEERING (continued)		
Electrical and Communications Systems		
Electronics, Photonics and Device Technologies	2002	2005
Control, Networks, and Computational Intelligence	2002	2005
Integrative Systems (new in ’02)	2002	2005
Engineering, Education and Centers		
Engineering Education	**2004**	2007
Engineering Research Centers	**2004**	2007
Industry/University Cooperative Research Centers	**2004**	2007
Partnerships for Innovation (new in ’01)	**2004**	2007

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
GEOSCIENCES		
Atmospheric Sciences		
-Lower Atmosphere Research Section		
Atmospheric Chemistry	**2004**	2007
Climate Dynamics	**2004**	2007
Mesoscale Dynamic Meteorology	**2004**	2007
Large-scale Dynamic Meteorology	**2004**	2007
Physical Meteorology	**2004**	2007
Paleoclimate	**2004**	2007
-Upper Atmosphere Research Section		
Magnetospheric Physics	2002	2005
Aeronomy	2002	2005
Upper Atmospheric Research Facilities	2002	2005
Solar Terrestrial Research	2002	2005
-UCAR and Lower Atmospheric Facilities Oversight Section		
Lower Atmospheric Observing Facilities	2003	2006
UNIDATA	2003	2006
NCAR/UCAR	2003	2006
Earth Sciences		
Instrumentation and Facilities	**2004**	2007
-Research Support		
Tectonics	2002	2005
Geology and Paleontology	2002	2005
Hydrological Sciences	2002	2005
Petrology and Geochemistry	2002	2005
Geophysics	2002	2005
Continental Dynamics	2002	2005

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
GEOSCIENCES (continued)		
Ocean Sciences		
-Integrative Programs Section		
Oceanographic Technical Services	2002	2005
Ship Operations	2002	2005
Oceanographic Instrumentation	2002	2005
Ship Acquisitions and Upgrades (new in '02)	2002	2005
Shipboard Scientific Support Equipment (new in '02)	2002	2005
Oceanographic Tech and Interdisciplinary Coordination	2003	2006
Ocean Science Education and Human Resources	2003	2006
-Marine Geosciences Section		
Marine Geology and Geophysics	2003	2006
Ocean Drilling	2003	2006
-Ocean Section		
Chemical Oceanography	2003	2006
Physical Oceanography	2003	2006
Biological Oceanography	2003	2006
Other Programs		
Global Learning and Observation to Benefit the Environment	2003	2006
Opportunities to Enhance Diversity in the Geosciences	2003	2006
Geoscience Education	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
MATHEMATICAL AND PHYSICAL SCIENCES		
Astronomical Sciences	2002	2005
Planetary Astronomy	2002	2005
Stellar Astronomy and Astrophysics	2002	2005
Galactic Astronomy	2002	2005
Education, Human Resources and Special Programs	2002	2005
Advanced Technologies and Instrumentation	2002	2005
Electromagnetic Spectrum Management	2002	2005
Extragalactic Astronomy and Cosmology	2002	2005
-Facilities Cluster		
Gemini Observatory	2002	2005
National Radio Astronomy Observatory (NRAO)	2002	2005
National Optical Astronomy Observatories (NOAO)	2002	2005
National Solar Observatory (NSO)	2002	2005
National Astronomy and Ionosphere Center (NAIC)	2002	2005
Atacama Large Millimeter Array (ALMA)	2002	2005
Chemistry	**2004**	2007
Analytical & Surface Chemistry	**2004**	2007
Chemistry Research Instrumentation and Facilities	**2004**	2007
Collaborative Research in Chemistry	**2004**	2007
Inorganic, Bioinorganic and Organometallic Chemistry	**2004**	2007
Organic & Macromolecular Chemistry	**2004**	2007
Physical Chemistry	**2004**	2007
Undergraduate Research Centers (pilot program, new in ‘04)		2007
Materials Research	2002	2008
-Base Science Cluster		
Condensed Matter Physics	2002	2008
Solid-State Chemistry	2002	2008
Polymers	2002	2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
MATHEMATICAL AND PHYSICAL SCIENCES (continued)		
-Advanced Materials and Processing Cluster		
Metals	2002	2005
Ceramics	2002	2005
Electronic Materials	2002	2005
-Materials Research and Technology Enabling Cluster		
Materials Theory	2002	2005
Instrumentation for Materials Research	2002	2005
National Facilities	2002	2005
Materials Research Science and Engineering Centers	2002	2005
-Office of Special Programs (new in ’03)	N/A	2008
Mathematical Sciences	**2004**	2007
Applied Mathematics	**2004**	2007
Geometric Analysis, Topology and Foundations	**2004**	2007
Computational Mathematics	**2004**	2007
Infrastructure	**2004**	2007
Analysis	**2004**	2007
Algebra, Number Theory, and Combinatorics	**2004**	2007
Statistics and Probability	**2004**	2007
Mathematical Biology (new in ‘04)		2007
Physics		
Atomic, Molecular, Optical and Plasma Physics	2003	2006
Elementary Particle Physics	2003	2006
Theoretical Physics	2003	2006
Particle and Nuclear Astrophysics (new in ’00)	2003	2006
Nuclear Physics	2003	2006
Biological Physics (new in ’03)		2006
Physics at the Information Frontier (new in ’03)		2006
Physics Frontier Centers (new in ’02)		2006
Education and Interdisciplinary Research (new in ’00)	2003	2006
Gravitational Physics	2003	2006
Office of MultidisciplinaryResearch	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES		
Office of International Science and Engineering (INT)	2002	2005
Science Resource Statistics (SRS)		
All programs	Several	2006
Behavioral and Cognitive Sciences (BCS)		
Cultural Anthropology	2003	2006
Linguistics	2003	2006
Social Psychology	2003	2006
Physical Anthropology	2003	2006
Geography and Regional Sciences	2003	2006
Cognitive Neuroscience (new in '01)	2003	2006
Developmental and Learning Sciences (formally Child Learning & Development)	2003	2006
Perception, Action, and Cognition (formally Human Cognition & Perception)	2003	2006
Archaeology	2003	2006
Archaeometry (formally part of Archaeology)	2003	2006
Environmental Social and Behavioral Science (new in '99)	2003	2006
Social and Economic Sciences (SES)		
Decision, Risk, and Management Sciences	**2004**	2007
Political Science	**2004**	2007
Law and Social Science	**2004**	2007
Innovation and Organizational Change	**2004**	2007
Methodology, Measurement and Statistics	**2004**	2007
Science and Technology Studies	**2004**	2007
Societal Dimensions of Engineering, Science, and Technology	**2004**	2007
Economics	**2004**	2007
Sociology	**2004**	2007
ADVANCE (Cross-Directorate Program, new in FY01/FY02)		2005
Science of Learning Centers (new in FY03/FY04)		2007
Human and Social Dynamics (new in FY04)		2008

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF POLAR PROGRAMS		
Polar Research Support	**2004**	2007
Antarctic Sciences	2003	2006
Antarctic Aeronomy and Astrophysics	2003	2006
Antarctic Biology and Medicine	2003	2006
Antarctic Geology and Geophysics	2003	2006
Antarctic Glaciology	2003	2006
Antarctic Ocean and Climate Systems	2003	2006
Arctic Sciences		
Arctic Research Support and Logistics	2003	2006
Arctic System Sciences	2003	2006
Arctic Natural Sciences	2003	2006
Arctic Social Sciences	2003	2006

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
OFFICE OF INTEGRATIVE ACTIVITIES		
Major Research Instrumentation (MRI)	2000*	2005
Science and Technology Centers (STC)	1996*	2007
*External Evaluations		

DIRECTORATE *Division* Program or Cluster	Fiscal Year of Most Recent COV	Fiscal Year of Next COV
NSF PRIORITY AREAS AND CROSSCUTTING PROGRAMS		
Nanoscale Science and Engineering Priority Area	**2004**	2007
Biocompexity in the Environment	**2004**	2007
CAREER	2001	2005
Information Technology Research (new in ’00)		2005
*External Evaluations		

TABLE OF EXTERNAL EVALUATIONS

The Table on the following pages provides information on program assessments and evaluations other than Committee of Visitor and Advisory Committee assessments.

The Table lists other types of evaluations not used in GPRA performance assessment that were completed in FY 2004. These reports, studies, and evaluations are frequently used in setting new priorities in a field or in documenting progress in a particular area. The reader is encouraged to review the reports for additional information on findings and recommendations that are beyond the scope of this report.

Reports (other than COV reports) produced by NSF are available online at http://www.nsf.gov/pubs/start.htm using the NSF's online document system and the publication number indicated.

Information on obtaining reports produced by the National Research Council or National Academy of Sciences can be found online by searching www.nap.edu or from the National Academy Press, 2101 Constitution Avenue, N.W., Lockbox 285, Washington, D.C. 20055 (1.800.642.6242).

Evaluations Completed in FY 2004	
	Directorate for Biological Sciences (BIO)
Outcomes and Impacts of the National Science Foundation's Program of Minority Postdoctoral Research Fellowships (MPRF)	**Findings:** Overall The MPRF program is meeting its broad goal of preparing scientists from those ethnic groups that are significantly under-represented at advanced levels in U.S. science and engineering for tenured university professorships and for positions of leadership in industry and government. 1.Analysis of employer institutions and position titles shows that most former Fellows were in tenured or tenure-track positions at major research universities. 2.Most of the former Fellows indicated that their MPRF experiences had prepared them appropriately for their careers. 3.Most former Fellows reported that they valued their MPRF experiences highly. 4.Analyses of NSF and NIH application records show that former Fellows were generally quite successful in obtaining awards from NSF and NIH. 5.National surveys show that the MPRF program supported more than one-tenth of minority fellowship seekers in BIO fields, and about one-twentieth of those in SBE fields. *Findings about the Program's Policies and Operations* 1.The most important reasons for applying to MPRF centered on opportunities to work toward a tenured position. 2.Half of the respondents chose MPRF over other offer(s). 3.The most important factors in choosing a mentor were reputation and research interests. The mentor's minority status was least important. 4.Most former Fellows thought that the MPRF funding amounts and award duration were sufficient. 5.Former Fellows found the program workshops to be generally useful. 6.About half of the former Fellows were satisfied with their opportunities to mentor minority students, but almost a third were not. Findings About the Pool of Scholars Eligible for MPRF 1.The pool of eligible scholars has doubled over the past 12 years but remains relatively small. 2.In 2000, Hispanics were about three-fifths, and women more than one-half, of the potential pool of minority postdoctoral fellows in biology. 3.In 2000, women accounted for almost one-half of underrepresented minorities who received doctorates in the social and economic sciences, and about three-quarters of those who received doctorates in the behavioral sciences. **Availability:** Availability of report: SRI International and BIO Directorate

Workshop to Produce a Decadal Vision for Taxonomy and Natural History Collections	Scope: (a) Identify the major research questions that must be addressed with knowledge resulting from natural history collections. (b) Identify important societal benefits that accrue from taxonomic research and natural history collections. (c) Produce a 10-year vision for taxonomy and natural history collections, and develop a plan to meet the priorities of that vision. (d) Communicate the results and recommendations of the workshop participants to scientists, administrators, and policy makers. Findings: 1. Natural history collections contain a vast amount of biological information that exists in no other form or place and that cost the nation billions of dollars and centuries of effort to amass. 2. Many of the specimens and ancillary data in collections were obtained prior to major modifications of the landscape that have characterized modern development and, consequently, are an irreplaceable record of our natural heritage. 3. Important societal benefits are unrealized because natural history collections are not managed (or even properly recognized) as a national resource. 4. The solution to the unrealized potential of natural history collections is to view them as a single entity, i.e., as a network of biological observatories distributed across the nation and with a database that is continually increasing in quantity, quality, and scientific value. 5. Creating an interactive and linked network of biological observatories will substantially increase the amount of available information on the geographic and temporal distributions of organisms and significantly enhance the ability of taxonomists to identify and describe species, and of phylogeneticists to ascertain relationships among species. Recommendations: 1. Manage natural history collections in the United States as components of one large electronically interconnected network of biological observatories 2. Expand and modernize the basic infrastructure of natural history collections in universities and museums, update specimen identifications, and expand the electronic availability of collection databases. **Availability:** www.flmnh.ufl.edu/taxonomy_workshop/NSF_workshop_Report_3-08-04.pdf :

Frontiers in Polar Biology in the Genomic Era	**Findings:** 1. Environmental issues will define the 21st Century, as will a world with a large human population and ecosystems that are increasingly shaped by human intervention. 2. The science of ecology can and should play a greatly expanded role in ensuring a future in which natural systems and the humans they include coexist on a more sustainable planet. 3. Ecological science can use its extensive knowledge of natural systems to develop a greater understanding of how to manage, restore, and create the ecosystems that can deliver the key ecological services that sustain life on our planet. 4.Ecologists will have to forge partnerships at scales and in forms they have not traditionally used. 5.These alliances must implement action plans within three visionary areas: enhance the extent to which decisions are ecologically informed; advance innovative ecological research directed at the sustainability of an over-populated planet; and stimulate cultural changes within the science itself that build a forward-looking and international ecology. 6. New partnerships and large-scale, cross-cutting activities will be key to incorporating ecological solutions in sustainability. **Recommendations:** 1. Initiate a four-pronged research initiative, to be built on new and existing programs, to enhance research project development, facilitate large-scale experiments and data collection, and link science to solutions 2. Improve interactions among researchers, managers, and decision makers 3. Develop a major public information campaign to bring issues and raise awareness of ecological sustainability before the general public. 4. Standardize data collection, data documentation, and data sharing. 5. Develop resources that will help ecologists and collaborators from other sciences work together more effectively. 6. Convene a meeting of key leaders in research, management, and business to produce a plan to create reward systems for ecological researchers and educators, as well as to foster collaborations. 7. Provide global access to ecological knowledge. 8. Implement strategies to ease the exchange of students, managers and practitioners among institutions in various countries. **Availability:** www.esa.org/ecovisions

	Directorate for Computer and Information Science and Engineering (CISE)
Security at Line Speed Workshop	**Scope:** To disseminate information on problems, discuss potential solutions and identify areas requiring additional research in areas of intersection between security and advanced, high-performance networking. **Findings:** It is increasingly difficult to couple the performance requirements of advanced applications with the necessities of prudent network security. It has always been a challenge to realize high-performance from the mesh of systems, software, local connections and national backbones that compose the typical advanced, computational environments that much of the research community uses. Now, with increases in network threats over recent months, the defensive security actions that many enterprises must take offer several depressing prospects. First, these actions significantly compound the problem of delivering high performance networking, where high performance represents a broad set of needs including bandwidth, latency, multi-protocol support, and port agility. Secondly, the defensive actions, while somewhat effective in the short-term, may be ultimately doomed themselves, as new technologies could render them ineffective. Thirdly, the increased complexity of networks will make troubleshooting more difficult. Lastly, and perhaps most profoundly, they undermine the basic principles of the Internet, including end-to-end transparency and open access, and so may stifle the innovation that has characterized the network to date. There are good steps for campuses and national research facilities to take that will support some advanced applications. There are network architectures and technologies that are useful, though their value to individual campuses depends on local conditions as diverse as traffic loads and distribution of academic departments on campuses. There are steps that the research community can take to adapt their protocols and approaches to better fit the realities of the current level of security threats. The use of layered authentication and authorization services offer new opportunities for security. The traditional benefits of education and awareness, mixed with appropriate policies, remain; we have had a number of recently teachable moments. Taken together, they can do much. Applied security research, well anchored in the realities of performance issues and network constraints, could significantly advance the future options available. Some of those alternatives may present their own challenges in deployment, in expense, a need for a flag day, management integration, etc. The investment in research and deployment may need to be considerable. The consensus of the workshop was that the state of networking is at a crossroads. If no action is taken, we will continue to see attacks, experience pain and create barriers that will eventually hinder the ability for the network to support the original goal of the Internet. Open networks capable of supporting a variety of users and uses are possible, but will require research. The workshop report identifies research areas that will begin to address the problem. **Availability:** http://apps.internet2.edu/sals/

	Directorate for Education and Human Resources (EHR)
Mathematics Education Portfolio Review	**Scope**: Relevance: How well does the mathematics education portfolio address the problems and issues in the field? Quality: Is the research and development of high quality as defined by relevant standards in the field? Performance: What has been the impact of the portfolio on the improvement of mathematics education? **Findings:** - Utilize a portfolio perspective—built on an explicit logic—to guide program planning and funding of future efforts. - Emphasize the importance of the integrity of mathematics in both NSF proposal solicitations and subsequent funded projects. - Enhance the portfolio by building on existing knowledge bases and requiring rigorous evaluations of funded projects. - Strengthen NSF support for improvement of infrastructure (i.e., human capital) for improved mathematics teaching and learning. **Availability:** The Executive Summary for the Mathematics Education Portfolio Review is available through the EHR Directorate.
The Advanced Technological Education) Evaluation Project	**Scope:** Assess the impact and effectiveness of the NSF Advanced Technological Education (ATE) Program. **Findings:** The project is ongoing, but has provided primary findings for each category of work that will serve as a baseline from which future actions can be tracked and ultimately judged. Findings include: • The projects are actively addressing the goals of the ATE program • The ATE projects have established a large number of collaborative arrangements. The collaborations serve multiple purposes and provide monetary support as well as other kinds of assistance for materials development, academic programs, and professional development efforts • ATE projects are developing many materials to support the preparation of technicians. These materials include full courses, adaptations of courses, and modules that can be incorporated into coursework • Projects and centers are improving their technician-based programs by constructing new courses, modifying existing courses, and taking steps to better serve students in matters of recruitment, retention, placement, and diversity. • Projects conduct large numbers of professional development activities. These activities are well attended and well received. Where follow-up has occurred, reportedly about half the participants try out materials and a third implement them **Availability:** http://www.wmich.edu/evalctr/ate

On Evaluating Curricular Effectiveness: Judging the Quality of K-12 Mathematics Evaluation	**Scope:** This goal is to evaluate the quality of evaluations of 19 mathematics curricula -- 13 supported by NSF's Instructional Materials Development program, and 6 commercially generated. The study resulted in clarification of proper elements of an array of evaluation studies for judging curricula effectiveness, as well as standards of evidence. **Findings**: • A total of 698 studies were categorized as historical (225), content analyses (36), comparative studies (95), case studies (45), and syntheses (16). A total of 147 met minimal criteria for consideration (75% of which were NSF-supported). • Limitation on number of studies and arrays of methods, as well as uneven quality leads to inconclusive findings of effectiveness of any one individual curriculum. • Future studies should incorporate 3 major components: (1) program materials and design principles; (2) quality, extent, and means of curricular implementation; and (3) quality, breadth, type, and distribution of student learning outcomes over time. • Curriculum effectiveness should be ascertained through the use of multiple methods of evaluation, each of which is a scientifically valid study. Periodic syntheses of results across evaluation studies should also be conducted. • A curriculum program is scientifically established as effective only when it produces valid improvements in student learning with convincing demonstration that improvements result from the curricular intervention. • Three primary bodies (federal agencies developing curricula, publishers, and state/local districts and schools) share responsibility for curricular evaluation, with recommendations provided for each. Federal government and publishers should support multidisciplinary, basic empirical research studies on curricular effectiveness. **Availability:** National Research Council (2004). Committee for a Review of the Effectiveness of NSF-Supported and Commercially Generated Mathematics Curriculum Materials. Mathematical Sciences Education Board, Center for Education, Division of Behavioral and Social Sciences and Education, Washington, DC: The National Academies Press. Available at http://www.nap.edu/catalog/11025.html

Local Systemic Change (LSC) through Teacher Enhancement: Year Nine Cross-Site Report	**Scope:** Supported under NSF's Teacher Enhancement program, the LSC initiative sought to improve science and mathematics (S/M) teaching through extensive professional development of teachers in whole schools/districts. A standardized, CORE evaluation of 88 projects funded from 1966-2003, developed data collection instruments and procedures to evaluate individual projects, aggregate across projects, and produce cross-project analysis. Findings for September 1, 2002-August 31 2003, evaluation activities show strengths and weaknesses in design and implementation of professional development and impact on teachers and instruction. **Findings**: • LSC professional development received high ratings for appropriateness of S/M content, providing climate of respect, encouraging active participation, and promoting collaborative learning approaches. Weaknesses related to lack of questioning for enhancing conceptual understanding; adequate time/structure for wrap-up; and encouraging "sense-making" about classroom practice. • Districts often used their own personnel (teachers leaders) as professional developers and did not adequately emphasize the need to deepen disciplinary content. • Just over one-third of randomly observed lessons focused on helping teachers understand student thinking/learning about content that is increasingly identified as important in teacher development. Extent of participation in LSC professional development was positively correlated with highest ratings of quality (39% rated professional development as excellent or very good). • Teachers liked LSC design aligning professional development, curriculum, collaboration, deepening of content and pedagogy, and opportunities to collaborate with their peers. Teacher concerns were lack of time and quality of professional development, as well as problems implementing curricula in classrooms. • Teacher participants noted LSC professional development had significant positive impact on pedagogical preparedness, confidence in content knowledge, and use of standards-based instructional strategies. • Among participants, both K-8 S/M teachers were most likely to use reform-oriented teaching (e.g., engaging in hands-on activities, work on extended investigations, journal writing). • Strategy supports benefits of providing professional development aimed at implementing exemplary materials. Classroom observations show increased likelihood of use and quality of lessons. **Availability:** Horizon Research, Inc. (August 2004). Available at http://www.horizon-research.com/reports/2004/year9.php.

CLT Online Monitoring System: Report for the 2003-04 Academic Year	**Scope:** The Centers for Learning and Teaching (CLT) program's standardized monitoring system was designed to collect GPRA-related program data in support of strategic planning and performance measurement. This report covers data for 13 Centers funded from FY 2000-04 on (1) participant characteristics; (2) educational and occupational status of exiting students; (3) characteristics of K-12 teachers and other educator participants; and (4) characteristics of CLT courses (developed, revised, implemented). These data for the 2003-2004 academic year complement qualitative and quantitative evaluations of program implementation and impact conducted by SRI International and Abt Associates, Inc. **Findings**: • 226 participating faculty members -- male (57%); white, one race only (91%); primary field of research, education (70%) or mathematical sciences (9%); primary field of instruction, education (54%) or mathematical sciences (13%); Full Professor (44%) or Associate Professor (20%). • 312 participating graduate students were enrolled full-time (80%); female (70%); white, one race only (79%); enrolled in a CLT doctoral program (84%) or in a CLT master's program (14%); thesis/dissertation topics "not yet determined" (70%). • Graduate students reported wide range of prior degrees and other qualifications (e.g., certifications, licensures, credentials); prior degrees ranged from associate to other professional degrees. All K-12 grade bands represented; mathematical science is the most-cited content area. • 35 participating postdoctorates – male (31%); white, one race only (80%); had doctoral degrees in education (43%); experience teaching at some level (91%) [K-12 teaching (37%) postsecondary teaching (86%)]. 30% of postdoctorates were conducting education research; others in sciences and mathematics. • 155 participating professional developers/other educators -- male (36%); white (92%). Primary roles were to develop, conduct, and plan (59%) or conduct research (16%). Professional affiliation was – higher education (46%); K-12 school/system (30%); or museum (8%). • 95 courses received CLT support – new course offerings (57%); modification of pre-existing courses (16%). 2,139 students were enrolled in CLT-supported courses. • Since 2001, 12 graduate students obtained master's degrees and 8 obtained doctorates. Five exiting graduate students are teaching in a U.S. K-12 school; six are employed at a U.S. 4-year higher education institution. **Availability:** WESTAT (August 2004). Available in paper and CD-ROM from NSF and WESTAT, 1650 Research Boulevard, Rockville, MD, 20850.

	Directorate for Engineering (ENG)
Infrastructure for Biology at Regional to Continental Scales Working Group of the American Institute of Biological Sciences White Paper on the National Ecological Observatory Network	**Findings:** IBRCS White Paper Rationale, Blueprint, and Expectations for the National Ecological Observatory Network, explains the scientific rationale behind the need for NEON, how NEON will operate to meet that need, and the results that NEON is expected to produce. The IBRCS white paper is a summary and evaluation of past NEON and BON workshops on relevant infrastructure and data-networks and a synthesis of the current scientific communities perspective on networks and infrastructure needed to address biological research at over large geographical regions, and highlights the need for coordinated scientific infrastructure that is itself spread over large regions. Ongoing advances in our technical capability permit the development of networks of people and tools that can meet that need. NEON has been designed by the scientific community to capitalize on such capabilities and to enable discoveries about our nation's ecosystems that until now have been impossible to address. By fostering collaboration, the development of new tools and technologies, and the study of regional- and continental-scale questions, NEON will produce new perspectives in ecosystem science and thus public benefits, both anticipated and unforeseeable **Recommendations:** 1. NEON should provide a research platform that will apply experimental, observational, analytical, communication, and information technologies to investigate the structure, dynamics, and evolution of ecosystems in the United States, to measure the pace of biological change resulting from natural and human influences at local to continental scales, and to forecast the consequences of that change. 2. Each observatory will provide state-of-the-art infrastructure to support interdisciplinary, integrated research at regional to continental scales. Collectively, the network of observatories will allow scientists to conduct comprehensive, local to continental-scale experiments on ecological systems. 3. NEON should be designed to provide an integrated network of regionally distributed, extensively-instrumented, shared use research observatories with teleobservation and teleoperation capabilities; next generation laboratory instrumentation, field-based sensors, and computational infrastructure; curated repository system; and information technology to facilitate collaboration in biological sciences and education.4. NEON should be administered and governed through a national-level coordinating agency. **Availability:** http://ibrcs.aibs.org/reports/pdf/IBRCSWhitePaper_NEON.pdf

World Technology Evaluation Center (WTEC) Panel Report on "International Research and Development on Biosensing"	**Findings:** The WTEC panel's findings regarding the relative strengths in Europe, Japan, and the United States of biosensing R&D may be summarized as follows: • Europe leads in development and deployment of inexpensive distributed sensing systems and in the integration of components and materials in microfabricated systems. • The United States leads in surface engineering applied to biosensing and in integration of analog-digital systems. • Both Europe's and Japan's communication infrastructures are better suited for networked biosensing applications than those of the United States. • Integrated biosensing research groups are more common in Europe and Japan. Among the significant overall trends and emerging opportunities that the WTEC biosensing panel identified are the following: • Increasing pervasiveness of systems on a chip and other integrated systems approaches • Growth of microfluidic/micromechanical systems • Emergence of molecular receptor engineering • Development of sensor networks and advanced logistical strategies There is also a general trend towards the development of biosensors as a low-cost, commodity-like technology that will find application in a wide variety of consumer products. **Recommendations:** In addition to the above trends, the U.S. research community has identified several broad requirements and goals for ongoing development of the field of biosensing systems: • Rapid, inexpensive, and broad based tests for detection and identification of toxic materials and organisms • Standards for validation and comparison of technologies • Methods that can be fielded as sentinels in the environment to monitor food, water, soil, and air quality • Improved sampling and preprocessing techniques • System automation for unskilled operators **Availability:** **http://wtec.org/biosensing/**

	Directorate for Geosciences (GEO)
NSF Workshop Report on "Emerging Issues in Nanoparticle Aerosol Science and Technology (NAST)"	**Scope:** This report summarizes the discussions and results of a workshop held at UCLS, June 27-28, 2003. The workshop was sponsored by NSF, the Southern California Particle Center, and the UCLA Department of Chemical Engineering. The workshop brought together scientists from the fields of atmospheric aerosols and engineers working on aerosol science and technology. Aerosol research is driven by concerns about air quality and climate change, workplace exposure to particulate matter, nuclear reactor safety, but also interest in the manufacture of materials of many different kinds and applications, inhalation therapy, counter terrorism, and many other areas. **Findings:** The workshop identified the following topics for research: (1) Photochemically-driven nucleation in the atmosphere (2) Nucleation and rapid growth that occurs as hot pollutant exhaust gases mix with cooler air in the ambient environment (3) Growth rates of freshly nucleated atmospheric ultrafine particles (4) Chemical and physical transformations of atmospheric ultrafine particles (5) Improvements in measurement technology for ultrafine particles (6) Atmospheric measurement needs for ultrafine particles (7) Measurement and characterization of ultrafine particle emissions from sources (8) Source apportionment of ultrafine particles (9) Population exposure assessment (10) Dosimetry (11) Health effects of ultrafine particles (12) Control technology (13) Ultrafine particles and homeland security **Availability:** http://www.scpcs.ucla.edu/news/Nanoreport.pdf
Cooperative Studies of the Earth's Deep Interior: Developments, Discoveries, Future	**Scope:** This report summarizes the discussions and results of a workshop organized by the CSEDI Coordinating Committee to examine progress made over the past decade and recommend future directions for the Program. **Findings:** The CSEDI Program needs to provide support both for collaborative projects and integrative research. The report identifies specific areas recommended for scientific investigation. Support should be at the level of approximately \$10M, with \$5M in new awards made each year. **Availability:** http://www.csedi.org/CSEDI.Sept29.04.pdf

Future Needs in Deep Submergence Science: Occupied and Unoccupied Vehicles in Basic Ocean Research	**Scope:** A study to assess the current and future national deep submergence science facility needs. **Findings:** The report summarizes and confirms the need for the US government to provide facilities to support basic deep submergence research activities. The report provides five recommendations to enhance or improve upon existing facilities: 1) NSF/OCE should establish a small pool of funds to support non-National Deep Submergence Facilities (NDSF) when legitimate barriers to existing NDSF assets can be demonstrated; 2) NSF/OCE should construct an additional scientific Remotely Operated Vehicle (ROV) system dedicated to expeditionary research; 3) NSF/OCE should consider basing this new ROV system at a different location than the NDSF to minimize transit/refit time; 4) NSF/OCE should construct a new, more capable Human Occupied Vehicle (HOV); and 5) A new HOV should be constructed to operate at significantly greater depths only if it can be delivered for a relatively small increase in cost and risk. **Availability:** National Academy of Sciences www.nas.edu

Population Connectivity in Marine Systems: Report of a Workshop to Develop Science Recommendations for the National Science Foundation	**Scope:** A workshop was held to address science issues and resources needed to develop a mechanistic understanding of marine population "connectivity", i.e. the exchange of individuals among populations through larval dispersal. Participants were charged with developing a Science Action Plan and to make recommendations regarding the resources needed to implement it. **Recommendations:** The workshop participants recommended that the present model of small research groups should be replaced by a coordinated, multidisciplinary research effort capable of addressing complex processes at multiple scales. An overall recommendation was made for programmatic development focused on marine population connectivity, with the following specific recommendations. Development and application of key technologies. Marine population connectivity research will require development of new tools and their application in an interdisciplinary framework. Integration of Population Connectivity science issues into planning and implementation of Ocean Observing Systems and Observatories. Ocean observing systems provide a large-scale framework to examine inter-annual variability of connectivity as it relates to known climate signals. Instrumentation should be capable of resolving physical transport processes and both large and small scales, and should include appropriate biological sensors. Connectivity issues should be included in the planning of ocean observatories. Participants supported the development of re-locatable observatories, and encouraged observatories that can be deployed in a range of environments for ecologically relevant time scales. Application of multiple techniques from several disciplines simultaneously. For example, testing of biophysical models will require application of techniques that are not typically used together over a range of spatio-temporal scales. Participants noted that new models for ship use will be needed, to respond quickly to unpredictable events. Transfer of information fostering cross-training and collaboration. Cross-training programs are needed to bring together diverse expertise. These may include graduate and post-graduate traineeships, workshops, summer courses and symposia. The participants also encourage the creation of a Center for Integrative Marine Ecology (CIMEC) dedicated to the development of quantitative approaches to conservation and sustainable management of marine ecosystems. **Availability:** Through GEO/OCE

Autonomous and Lagrangian Platforms and Sensors (ALPS) Report of a Workshop to Develop a Plan for Coordinated Development and Community Access to ALPS Systems	**Scope:** The final report of a workshop held to discuss autonomous and Lagrangian platforms and sensors (ALPS) was released in August 2004. Participants were charged with identifying major science questions that can best be addressed using ALPS, identifying needs for more capable platforms and sensors, and proposing models for advancing the technology and enabling broad community access. **Recommendations:** The workshop participants recommended that: ALPS networks and technical support must be regarded as permanent infrastructure and funded as such, even though individual instruments may be comparatively inexpensive and have limited lifetimes. A working group of technology developers and end users should be formed to develop an implementation plan and ensure broad community participation. Sustained development of platforms and sensors. Examples of new instruments include: new platform designs for testing instruments, microfloats mimicking larval dispersal, autonomous vehicles for under-ice exploration, and others. Improved performance needs include: a great sensor payload; increased reliability, endurance, and stability of sensors; improved communications; standardized interfaces; and others. Existing platforms and sensors should be combined into new observational systems. A mechanism should be established to support pilot projects. Workshops, short courses, training programs and fellowships are needed to address a shortage of trained engineers and scientists capable of developing and supporting the ALPS infrastructure. **Availability:** White papers are available at: http://www.geo-prose.com/ALPS/

Ocean Carbon and Climate Change. An Implementation Strategy for U.S. Ocean Carbon Research	**Scope:** A report prepared for the U.S. Carbon Cycle Science Scientific Steering Group and Inter-Agency Working Group by the Carbon Cycle Science Ocean Interim Implementation Group was released in January 2004. This report focuses on four science questions: 1. What are the global inventory, geographic distribution and temporal evolution of anthropogenic CO_2 in the oceans? 2. What are the magnitude, spatial patter and variability of air-sea CO_2 flux? 3. What are the major physical, chemical and biological feedback mechanisms and climate sensitivities for ocean carbon storage? 4. What is the scientific basis for ocean carbon mitigation strategies? **Recommendations:** The report outlines a recommended decadal-scale research program. Phase I will be located primarily in the North Atlantic and the North and Equatorial Pacific, and will include pilot studies in the Southern Ocean that will be expanded to a full Southern Ocean field program in Phase II. The recommended implementation strategy consists of four coordinated elements: 1. Global ocean carbon observing network The group recommended adopting an integrated and multidisciplinary research model to address the wide range of relevant time and space scales. Specific recommendations include: • repeat transects at which CO_2 system properties, and physical, chemical and biological system properties are measured; • an upper ocean observing system on ships to determine air-sea CO_2 flux and processes that determine CO_2 partial pressure at the sea surface; • ocean and coastal time series stations; • remote sensing observations to constrain air-sea CO_2 flux and biological variables; • atmospheric observations of the O_2/N_2 ratio of air; and • compilation of global maps of variables accessible by remote sensing. 2. Targeted multi-disciplinary process studies The group recommends that process studies be conducted at time series sites operating for 5 or more years, to provide the background needed to estimate large-scale air-sea CO_2 flux and predict the system response to climate change. Key elements and identified priorities are: • Upper-ocean and mesopelagic studies o Priorities: improved estimates of biological pump efficiency; controls on stoichiometry of organic matter production and export; temporal variability in ecosystem structure; partitioning of exported carbon into DOC and POC; regeneration length scales; particle dynamics; ecosystem structure; improved mass budgets; and $CaCO_3$ dissolution rates. • Continental margin biogeochemistry o Priorities: Selection of sites representing a wide range of margin types; studies establishing distribution and transport of carbon at each site; and shipboard and monitoring studies of both water-column and benthic processes, emphasizing processes expected to be sensitive to change.

	• Air-sea gas exchange
	  o Priorities: Dedicated gas exchange process studies; longer-term CO_2 flux observations; and development of remote sensing algorithms.
	
	3. Data synthesis and numerical modeling
	
	The group identified three key modeling activities: prognostic modeling, diagnostic modeling, and reconciliation of oceanic and atmospheric data. Specific recommendations include
	• augmented and new carbon data management centers;
	• modeling studies to design and assess sampling and measurement strategies;
	• development and evaluation of ocean circulation and biogeochemical models;
	• reconciliation of independent estimates of air-sea CO2 fluxes;
	• hindcast simulations of ocean carbon variability over the recent historical period;
	• pilot studies to evaluate feasibility of carbon data assimilation systems;
	• prognostic model development to improve projections of future changes to the carbon cycle; and
	• development of tools to support carbon cycle and climate assessments.
	
	4. Enabling activities
	
	The group identified several activities needed to support and enable the work as envisioned. Key elements and specific recommendations include:
	
	• Methods and technology development
	  o The group recommended development and application of a variety of chemical and biological techniques ranging from natural nucleotide tracers to molecular biology to sediment traps; development of improved or new platforms, including autonomous vehicles, towed devices, floats and drifters; development of new sensors for carbon cycle properties and processes; nutrients and micronutrients, and biological processes; and support for remote sensing including development of new systems.
	• Data management and availability
	  o A data management system should include a CO_2 Science Team and a Process Study Team to develop standards for data collection, reporting and quality control; a Data Management Group responsible for maintaining data sets; and a Data Acquisition System, i.e. the actual hardware and software.
	
	• Synergy with US and international programs
	  o Strong interactions with existing US and international programs should be encouraged through joint workshops, steering committee meetings, sharing of sampling platforms, coordination of field campaigns and other activities.
	
	• Workshops, education and outreach activities
	  o The group emphasized the importance of communication research findings to the policy makers, the public in general and K-12 educators in particular. Suggested supporting activities included workshops to train scientists to communicate with the media and to develop avenues for providing information to various sectors of society.
	
	Accessibility: http://www.carboncyclescience.gov/occc-feb04.pdf

The EU-US Scientific Initiative on Harmful Algal Blooms: Report from a Workshop Jointly Funded by the European Commission DG Research – Environmental Directorate and the U.S. National Science Foundation	**Scope:** A workshop was held in Trieste, Italy to assess the status of harmful algal bloom (HAB) science, to identify gaps in knowledge, and to develop an international plan for cooperative, comparative studies. **Findings:** HAB research has a long history in the US and European countries, but areas exist where research would particularly benefit from collaborative research. For example, similar HAB species occur in the EU and US, but differ in bloom dynamics and expression of harmful attributes. The working group proposed that forcing functions select for different functional groups of HABs in different oceanographic regimes (e.g. open versus enclosed or semi-enclosed systems), with consequences for the bloom and population dynamics of selected groups. Examples of forcing functions include physical dynamics, climate change, nutrient loading, and changes in grazing communities. Major anthropogenic and natural forcing (e.g. climate variability) appear to have different effects on HABs in the EU and US. Comparisons between environments common to both the EU and the US should lead to improved understanding of the processes affecting HABs in different oceanographic regimes. Other issues are not specific to particular oceanographic regimes. For example, observed changes in the biogeography of HABs and their toxicity may depend on selection of different subpopulations of genetically diverse species. Only some genotypes bloom under a given set of conditions, and not all genotypes express toxicity. Comparison of genetic structure of populations of widespread species will lead to a better understanding of the interactions between environmental selective pressures, selection for or against specific genotypes, and the expression of favored genotypes in blooms. **Recommendations:** The participants recommended continued discussion including additional workshops, meetings and symposia to plan for implementation of coordinated research activities. Specific issues that must be resolved include coordination of announcements of calls for proposals; joint evaluation of proposals; joint opportunities for ship time; increased flexibility for funding joint cruises; and joint access to remote sensing and other databases. The recommendations provided the foundation for the program "Cooperative Activities in Environmental Research between the National Science Foundation and the European Commission: Ecology and Oceanography of Harmful Algae" (program solicitation NSF 03-580). **Accessibility:** http://www.whoi.edu/redtide/announcements/EU_US_Sci-Init.pdf

An Ocean Blueprint for the 21st Century	**Scope:** A report prepared for the President and Congress by the U.S. Commission on Ocean Policy. The report contains a comprehensive review of the management of the nation's oceans and the Commission's final recommendations for a new, comprehensive national ocean policy that ensures sustainable use and protection of the nation's oceans, coasts and Great Lakes. **Findings:** "Recommendations throughout this report are intended to strengthen the execution of programs in federal agencies with ocean- and coastal-related responsibilities, including the … National Science Foundation (NSF)." …. "some entities, such as the U.S. Navy, the U.S. Department of Justice, or the National Science Foundation, have such distinct missions that their ocean- and coastal related components could not be simply removed and transferred without harm to the overall enterprise." **Recommendations:** The report outlines the following key overarching recommendations that will provide the foundation for a comprehensive national ocean policy leading to significant improvements in ocean and coastal management. 1. Establish a new National Ocean Policy Framework to improve decision making, promote effective coordination, and move toward an ecosystem-based management approach. 2. Base national ocean policy decisions on the most current, credible, and unbiased scientific data and information. 3. Strengthen formal and informal ocean education to better engage the general public, promote stewardship, and prepare an ocean-related workforce to meet future ocean policy challenges. **Recommendations specific to the National Science Foundation**: The report makes 212 recommendations to transform U.S. ocean policy and restore the nation's oceans and coastal areas by revamping an ineffective mix of federal, state and local authorities and regulations. Several of the Commissions final recommendations call for actions to be taken by the National Science Foundation. 1. Help strengthen the national awareness of the importance of the oceans through formal and informal education efforts. • Recommendation 8-3. The National Oceanic and Atmospheric Administration, National Science Foundation, Office of Naval Research, and National Aeronautics and Space Administration should strengthen their support of both formal and informal ocean-related education, including appropriate evaluations of these efforts. • Recommendation 8-5. The National Ocean Council (NOC), working with the National Science Foundation, should place the Centers for Ocean Sciences Education Excellence (COSEE) within the NOC structure as a program to be organized and overseen through Ocean.ED. The NOC should also work to expand the COSEE program. • Recommendation 8-10. The National Oceanic and Atmospheric Administration, National Science Foundation, and Office of Naval Research should support colleges and universities in promoting introductory ocean and coastal science and engineering courses to expose a wider cross-section of students, including non-science majors, to these subjects.

	• Recommendation 8-14. The National Science Foundation's Directorates for Geosciences, Biological Sciences, and Education and Human Resources should develop cooperative programs to provide diverse, multidisciplinary educational opportunities at the undergraduate, graduate, and postdoctoral levels in a range of ocean-related fields. • Recommendation 8-16. The National Oceanic and Atmospheric Administration, National Science Foundation, Office of Naval Research, and National Aeronautics and Space Administration should encourage increased participation of traditionally underrepresented and underserved groups in the ocean-related workforce. Ocean.ED should coordinate among these agencies and institutions of higher learning. 2. Help strengthen the understanding of the links between oceans and human health. • Recommendation 23-1. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities should support expanded research and development efforts to encourage multidisciplinary studies of the evolution, ecology, chemistry, and molecular biology of marine species, discover potential marine bioproducts, and develop practical compounds. • Recommendation 23-2. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities, should support expanded research efforts in marine microbiology and virology. • Recommendation 23-3. The National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities should support the development of improved methods for monitoring and identifying pathogens and chemical toxins in ocean and coastal waters and organisms. 3. Creating a national strategy for increasing scientific knowledge • Recommendation 25-1. Congress should double the Federal Ocean and coastal research budget over the next five years. The new funds should be used to support a balance of basic and applied research. • Recommendation 25-6. The National Oceanic and Atmospheric Administration and the National Science Foundation should lead an expanded national ocean exploration program, with additional involvement from the U.S. Geological Survey and the U.S. Navy's Office of Naval Research. Public outreach and education should be integral components of the program. 4. Help achieve a sustained national Integrated Ocean Observing System (IOOS) by encouraging the conversion of research into operational capabilities. • Recommendation 26-6. The National Oceanic and Atmospheric Administration, the National Science Foundation (NSF), the Office of Naval Research, and the National Aeronautics and Space Administration should require investigators who receive federal funding related to ocean observatories, including the NSF Ocean Observatories Initiative, to plan for the transfer of successful technologies to an operational mode in the Integrated Ocean Observing System. • **Availability:** http://www.oceancommission.gov/documents/welcome.html

	Directorate for Mathematical and Physical Sciences (MPS)
Communicating Astronomy to the Public	**Scope:** A workshop on "Communicating Astronomy to the Public" was held on 1-3 October 2003 in Washington sponsored by the National Radio Astronomy Observatory, in association with the National Research Council. The goals of the conference were to share outreach and education resources among the astronomical community, to find ways to communicate with underdeveloped constituencies, to develop recommendations to establish Education and Public Outreach as a necessary aspect of research astronomy, and to exchange information about best practices and successful outreach programs among interested parties in the community. **Findings:** The workshop resulted in the "Washington Charter for Communicating Astronomy with the Public", a statement of the context and importance of sharing the results of astronomical research with the community and principles of action for funding agencies, professional astronomical societies, institutions that conduct astronomical research, and individual researchers. All have responsibilities and a compelling obligation to communicate their results and efforts with the public for the benefit of all. **Availability:** The "Washington Charter for Communicating Astronomy with the Public", is available at http://www.nrao.edu/ccap/conf_wash.shtml.
Building the System from the Ground Up – 2nd Community Workshop for the Ground-Based O/IR System	**Scope:** The 2nd community workshop on the Ground-Based Optical/Infrared System, "Building the System from the Ground Up" was held 13-14 May 2004 in Alexandria, VA. The workshop was hosted by the National Optical Astronomy Observatory, on behalf of its newly established Committee for the Development of an Integrated Ground-Based OIR System. The objective of the Second Workshop was to identify, as a community, the strategic issues involved in making the effective system of all ground-based facilities, both public and private, a reality. The workshop also addressed topics raised in the Committee's recent survey of over 900 U.S. astronomers, such as the System concept applied to smaller telescopes, the organization of instrumentation partnerships, including a software, archives, and the emerging virtual observatory in the system, and enabling unique observational modes. **Findings:** The report drawn up by the organizing committee based on presentations and discussions at the meeting reach 4 primary conclusions and recommendations – existing programs to integrate the system are working well, but need to continue to evolve with the benefit of experience; the incorporation of medium-sized telescopes in the system is essential, as is attention to the data reduction pipelines, data archives and data access and support; and that NOAO has an important role to play in the further development of the system in these areas. **Availability:** The report is available on the website of the National Optical Astronomy Observatory at: http://www.noao.edu/meetings/system2/.

Future Science at Gemini: New Horizons, New Science, New Tools	**Scope:** The community of the Gemini Observatory partnership held a workshop in Aspen, CO in June 2003 to refine its scientific vision and the plans for future instrumentation that would enable that vision. Preceding the June workshop, individual Gemini countries held national meetings to define the scientific aspirations of their communities in 4 broad subject areas in astrophysics. These discussions culminated in the Aspen workshop where over 100 representatives from the member communities gathered to distill these scientific goals and arrive at a definition of instrumental capabilities that would enable them. **Findings:** The Aspen participants defined basic questions that the Gemini Observatory expects to answer over the coming decade, such as 'how do galaxies form' or 'how did the cosmic dark age end', or 'how do stars process elements into the chemical building blocks of life'. The specific instrumental capabilities required to pursue these questions were also defined, from which a detailed plan for future instrumentation was developed. **Availability:** The report is now available at the Gemini Observatory web site at: http://www.gemini.edu/files/docman/science/aspen_report.pdf
Undergraduate Research Summit	**Scope:** The Division of Chemistry supported an Undergraduate Research Summit at Bates College. The purpose of the Summit was to examine issues involved in undertaking and sustaining research at predominantly undergraduate institutions and to provide recommendations on how to enhance the amount, quality, productivity, and visibility of chemistry research at these institutions. **Findings:** Undergraduates participating in research must be involved in an original investigation aimed at creating new knowledge. The findings of an undergraduate research project should be intended for dissemination among the relevant community through established means such as conference presentations and peer-reviewed publications. The specific goals emphasized in an undergraduate project (e.g., student learning, student recruitment and retention, faculty development, recognition within the discipline), and how they are balanced, often differ from project to project and individual to individual. **Availability:** http://abacus.bates.edu/acad/depts/chemistry/twenzel/summit.html.
DOE-NSF-NIH Workshop on Opportunities in THz Science	**Scope:** A workshop was held to discuss basic research problems that can be answered using THz radiation. The workshop was jointly sponsored by DOE, NSF, and NIH. **Findings:** The THz community needs a network.. Sources of THz radiation are, at this point, very rare in physics and materials science laboratories and almost non-existent in chemistry, biology and medical laboratories. The barriers to performing experiments using THz radiation are enormous. . **Availability:** http://www.sc.doe.gov/bes/reports/list.html

Collaborative Research in Chemistry Conference	**Scope:** The Collaborative Research in Chemistry (CRC) Conference provided an opportunity for CRC grantees to gather together with colleagues from the NSF and discuss the opportunities and barriers to collaborative research in the chemical sciences. **Findings:** Numerous findings are listed in the workshop report **Availability:** http://web.mit.edu/chemistry/dgn/www/CRCC03FinalReport.pdf
Preparing Chemists and Chemical Engineers for a Globally Oriented Workforce	**Scope:** Leaders in chemistry and chemical engineering from industry, academia, government, and private funding organizations explored the implications of an increasingly global research environment for the chemistry and chemical engineering workforce in this workshop organized by the Chemical Sciences Roundtable. **Findings:** The workshop presentations described deficiencies in the current educational system and the need to create and sustain a globally aware workforce in the near future. **Availability:** NAS Press http://www.nap.edu/catalog/11059.html
Neutron Scattering for Chemistry and the Chemistry/Biology Interface	**Scope:** This workshop discussed the opportunities that exist for scientific advances using neutron scattering and spectroscopic investigations by chemists and by biologists workding at the chemistry-biology interface. The number of neutron beam users in the United States among these communities is currently small and the workshop provided a forum for discussion of the barriers for more extensive use of neutron beam techniques. **Findings:** Recommendations were provided in the following areas: (1) support facilities needs for soft matter, (2) needs for hard matter: support facilities, sample environments, and isotopic labeling, (3) deuterium labeling, and (4) education and outreach. **Availability:** http://www.sns.gov/jins/tallahassee_workshops_2003/workshops.htm
Prospects for the Miniaturization of Mass Spectrometry	**Scope**: This workshop brought together leading researchers, technologists, users, potential new contributors, manufacturers and funding agencies to discuss prospects for the miniaturization of mass spectroscopy. **Findings:** Discussions of the future prospects for miniaturized mass spectrometers were discussed along with the technical and other barriers to the realization of these potentially useful analytical instruments. Recommendations appear in the report. **Availability:** http://www.nsf-mass-spec.umd.edu

Future Directions in Catalysis: Structures that Function at the Nanoscale	**Scope:** The purpose of the workshop was to bring together a leading group of engineers and scientists from academia, industry and government agencies to focus on the future directions of catalysis. **Findings:** An overriding grand challenge that emerged from these discussions was to develop the ability to control the composition and structure of catalytic materials over length scales from 1 nanometer to 1 micron in order to provide catalytic materials that accurately and efficiently control reaction pathways. **Availability:** http://cheme.caltech.edu/nsfcatworkshop/
Water and Sustainable Development: Opportunities for the Chemical Sciences	**Scope:** This report, supported by the Chemical Sciences Roundtable, National Research Council, was organized to explore how the chemical science community could respond to the need for clean reliable sources of water and the relationship of this need to sustainable development **Findings:** Numerous recommendations and observations appear in the report. **Availability:** http://books.nap.edu/catalog/10994.html
National Science Foundation/European Commission Workshop: Methods in Computational Materials Science	**Scope:** This report contains the scientific program, abstracts, references and views from the US and European scientists participating in a workshop on *Methods in Computational Materials Science* jointly organized by the US-National Science Foundation and the European Community in San Francisco in April 2004. The joint workshop was the first on computational methods. It is hoped that it will lay the foundations for several active and exciting research areas for US-EU collaborations dealing with modeling the complex behavior of materials, and spanning length scales from the atomic level to the continuum. **Findings:** The workshop participants recommended that NSF and the EC launch a collaborative research program in computational materials science. Such a program would considerably enhance the pre-eminent international position of the EU and the US in computational materials science, and promote genuine interdisciplinary collaborations between scientists from the EU and from the US. Future joint US-EU scientific collaborations would drive scientific discoveries through the application of materials modeling to new and emerging areas of chemistry, physics, material science and materials engineering, and will enable the development of new capabilities to integrate appropriate modeling approaches to describe material phenomena involving different length and time scales. Collaborations between US and EU scientists would also enhance educational opportunities to young scientists through international research collaborations. **Availability:** Institute for the Theory of Advanced Materials in Information Technology, University of Minnesota. https://www.itamit.dtc.umn.edu/nsfreport.php

The Role of Theory in Biological Physics and Materials	**Scope:** A workshop on *The Role of Theory in Biological Physics and Materials* was convened in Tempe, Arizona from 16-18 May 2004 to evaluate the unique role that theory (particularly condensed-matter and materials theory) can play in the emerging field between the biological and physical sciences. **Findings:** The main finding of the workshop was that this is a time of tremendous growth and opportunity for biological physics and materials, and the NSF should act strongly to support the role of theory in this field. On the basis of the workshop discussions, we recommend several specific ways to expand the pool of qualified individuals with a command of both the theoretical methods of the hard sciences and the language of biology. This involves catalyzing transitions into biological physics and materials at various career stages. The NSF can recognize the rapid growth of this field, and its potential, by expanding the funding available to theorists working in biological physics and materials. In addition, we make the following specific recommendations: *The expansion of NSF joint funding linking the NSF, especially DMR, with the NIH.* *The establishment of regional research and training centers in biological physics and materials to bring together biologists and physicists.* *The expansion of postdoctoral fellowships supporting transitions into biological physics.* *The development of more summer schools, internet resources and textbooks.* *Support for sabbatical visits to institutions with active biological physics and/or biology programs.* **Availability:** http://biophysics.asu.edu/workshop
NSF-EC Workshop on Nanomaterials and Nanotechnology	**Scope:** The NSF-EC Workshop on Nanomaterials and Nanotechnology was held at the British Consukate in Cambridge, MA in December 2002. This workshop was developed to provide important feedback to NSF and EC on two issues: I) The most critical and timely issues facing those investigators developing new nanomaterials and technologies related to those materials, and II) The best practices for catalyzing cooperative research in the emerging area of nanomaterials. **Findings:** Recommendations for important topics and challenges in nanomaterials research were arrived at by discussions in breakout groups in each of the three topical theme areas of the work. These discussions were preceded by brief talks from each of the participants. The common themes found in this discussion were: •**An increased focus on developing materials which have multifunctional capabilities.** •**Recognition of the importance that the environmental impact of nanomaterials in developing sustainable nanotechnologies.** •**The development of controlled assembly methodologies which allow for the complex arrangement of materials from the nanoscale up to the macroscale.** Participants also were naturally drawn into conversations concerning the best ways to encourage effective interactions between US and EC scientists. The differences between the level of funding and research styles between the two continents were apparent in the workshop; most people felt that programmatic features could be developed to take advantage of these complementary features. Recommendations include: •**A harmonization between the review criteria of the NSF and EC sponsors.** •**A two proposal process for collaborative interactions.** •**Investment into activities (e.g. more topical workshops) to encourage scientists to overcome the barriers to preparing funding requests.** •**An evolution towards a panel review process for proposals with reviewers from both countries participating in the reviews for collaborative US/EC projects.** **Availability:** DMR web page at http://www.nsf.gov/mps/divisions/dmr/research/

NSF-AFOSR Joint Workshop on Future Ultra-High Temperature Materials	**Scope:** The "NSF-AFOSR Joint Workshop on Future Ultra-High Temperature Materials" was held on January 13 and 14, 2004 at NSF Headquarters in Arlington, VA. The workshop goal was to identify basic research opportunities related specifically to ultra-high temperature materials (UHTMs). The workshop brought together people from industry, government, and academia from the U.S. and abroad. For the workshop, UHTMs were broadly defined as materials for use in extreme environments such as hypersonic flight, atmospheric re-entry, and rocket propulsion. These applications require service at temperatures above 1800°C in an oxidizing atmosphere. Some compounds that have been proposed for use in these extreme environments include ZrB_2, ZrC, HfB_2, HfC, HfN, and TaC, which have melting temperatures above 3000°C. The workshop considered current unmet needs, potentially valuable experimental approaches, and research/education needs related to UHTMs. **Findings:** The major outcome of the workshop has been identification of specific basic research and education needs in this field. From the Unmet Needs discussion, the major items were exploration of new materials, elucidation of fundamental processing-microstructure-property relationships, and definition of potential application environments. The Experimental Approaches discussion identified synthesis techniques, processing science, oxidation behavior, and intrinsic properties at elevated temperature as areas with needs that could be addressed through basic research. Issues of curriculum, integration of research into teaching, and interdisciplinary activities were raised as part of the Education and Training discussion. In addition to identifying basic research needs, the workshop had two other immediate outcomes. First, workshop participants formed the core of a UHTM working group that has pledged to meet annually to discuss recent developments in the field. Second, a sub-set of workshop participants is pursuing a multi-institutional NSF IGERT focused on materials for extreme environments. Finally, it is hoped that the workshop report will serve as a roadmap that will encourage others to begin to investigate the fundamental aspects of ultra-high temperature materials. **Continuing Activities:** Report distributed to workshop participants (~20) and plus ~55 others in UHTM field Working group established, currently ~ 30 members Working group meeting scheduled for January 2005 in Cocoa Beach, FL UHTM website established at web.umr.edu/~uhtm **Availability:** http://web.umr.edu/~uhtm

The Physics of the Universe	**Scope:** This report from the NSTC Committee on Science's Interagency Working Group on the Physics of the Universe (IWG on POU) put forth a cross-agency strategic plan for federal research at the intersection of physics and astronomy. It presents the conclusions on actions necessary to implement the recommendations of the 2002 report of the National Research Council entitled "Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century". **Findings:** The report identifies actions that NASA, NSF, and DOE will undertake in cooperation to carry out the recommendations of the NRC report. It recommends actions A) Ready for Immediate Investment and Direction Known to address Dark Energy; Dark Matter, Neutrinos, and Proton Decay; and Gravity; and B) Next Steps for Future Investments to address the Origin of Heavy Elements; Birth of the Universe Using Cosmic Microwave Background; and High Density and Temperature Physics. **Availability:** The report is available at: http://www.ostp.gov/html/physicsoftheuniverse2.pdf
Quantum Universe: The Revolution in 21st Century Particle Physics	**Scope:** The Quantum Universe Committee of the DOE/NSF High Energy Physics Advisory Panel (HEPAP) identified nine interrelated science questions that define the path ahead for elementary particle physics. The report articulates how existing and planned particle physics experiments at accelerators and underground laboratories, together with space probes and ground-based telescopes, bring within reach new opportunities for discovery about the fundamental nature of the universe. **Findings:** The report explored the primary US physics programs of existing and planned major facilities and selected smaller facilities. It concluded with summary tables that identify selected facilities of the US program whose primary physics goals align most directly with the reports nine science questions **Availability:** http://www.science.doe.gov/hep/HEPAP/Quantum_Universe_GR.pdf

	Office of Polar Programs
A Vision for the International Polar Year 2007-2008	**Scope**: This report reflects a vision for U.S. participation in the IPY 2007-2008. **Recommendations**: • The U.S. science community and agencies should use the International Polar Year to initiate a sustained effort aimed at assessing large-scale environmental change and variability in the polar regions. • The U.S. science community and agencies should pioneer new polar studies of coupled human-natural systems that are critical to U.S. societal, economic, and strategic interests. • The U.S. International Polar Year effort should explore new scientific frontiers from the molecular to the planetary scale. • The International Polar Year should be used as an opportunity to design and implement multidisciplinary polar observing networks that will provide a long-term perspective. • The United States should invest in critical infrastructure (both physical and human) and technology to guarantee that the International Polar Year 2007-2008 leaves enduring benefits for the nation and for the residents of northern regions. • The U.S. International Polar Year effort should excite and engage the public, with the goals of increasing understanding of the importance of polar regions in the global system and, at the same time, advancing general science literacy in the nation. • The U.S. science community and agencies should participate as leaders in International Polar Year 2007-2008. **Availability**: http://www.nap.edu/html/ipr2007-2008/0309092124.pdf
Bering Ecosystems Study (BEST) Science Plan	**Scope:** The intent of this document is to outline a multi-year research initiative that will improve understanding of the effects of climate variability, at multiple temporal and spatial scales, on eastern Bering Sea marine ecosystems. **Summary:** The BEST Science Plan provides the scientific background and rationale for a series of questions designed to elucidate mechanisms connecting regional climate forcing to the responses of ecosystems and their constituent species. The investigations necessary to answer these questions will form the backbone of a multi-year, multiplatform research program in the eastern Bering Sea. Elements of the program include study of the connections between climate variability and flows through the Aleutian Archipelago and into and across the eastern and northern shelves, the roles of sea ice and water temperature in controlling the timing, amount, and fate of primary production, and the interactions among species that control the ultimate structure of the region's ecosystems and their ability to support sustainable fisheries. BEST provides an excellent opportunity to integrate basic oceanographic research and the emerging requirement for ecosystem-based management of fisheries. Because the eastern Bering Sea supports some of the nation's largest and most lucrative fisheries, and its ecosystems are already showing signs of response to climate variability and change, BEST is timely and will fill an important societal need for knowledge and sound, science-based management. **Availability:** http://www.arcus.org/Bering/Downloads/BEST_science_plan.pdf

Arctic Logistics Report: Strategies and Recommendations for System-scale Studies in a Changing Environment	**Scope**: Update a report published in 1997, *Logistics Recommendations for an Improved U.S. Arctic Research Capability*. This update summarizes the progress made in improving research support since 1997 and responds to changing needs for Arctic logistics and research support since the earlier report was published. **Recommendation:** The range of research support and logistics needs identified during the development of the report can be served by three board strategies: • Supplying critical components for development of a pan-Arctic perspective; • Supporting the basic infrastructure for safe and efficient research; and • Maximizing resources and cooperation. The report contained major recommendations to implement these strategies and meet the Arctic research community's support and logistics needs. **Availability**: http://www.arcus.org/Logistics/03_report.html
Mcmurdo Sound, Antarctica: An Opportunity for Long Term Investigation of a High-latitude Coastal Ecosystem	**Scope**: This report summarizes the results of a meeting to assess the feasibility and challenges of initiating an LTER program in McMurdo Sound, Antarctica. **Findings**: McMurdo Sound offers a unique and important opportunity to understand basic ecological processes that are occurring in a coastal, polar marine system, and would provide an invaluable comparison with the existing more pelagic Palmer LTER project as well as other coastal LTERs in the Network. Some questions that could be answered by the LTER Network, with major contributions from a McMurdo Sound LTER, include: • How do ecosystems with contrasting time-scales of seasonal energy fluxes differ in regard to life-history adaptations among all trophic levels (examples include, mixotrophy, stasis, hibernation, migration)? • Over what time scales can the matching of life histories and productivity pulses be altered without affecting an ecosystem's trophic structure? • How dynamic are the earth's ecosystems, currently and in the past? **Availability**: http://penguinscience.com/home.htm

The Future of the Next Generation Satellite Fleet and the McMurdo Ground Station	**Scope**: The purpose of this report is to provide information, options, and recommendations for deciding how to collect and provide the transmitted data from the next generation of polar orbiting satellites for use by the United States Antarctic Program (USAP) in Antarctica. The focus of this document is to report on the Antarctic science and operations community recommendations regarding the capabilities of the next generation satellite fleet along with applications and reception possibilities with a focus on the MGS, especially as it relates to USAP research and operation activities. **Recommendations:** The recommendations of this report with regards to these issues as well as critically related communications issues are the following: Recommend that the United States Antarctic Program actively pursue increased and improved Internet communications both to and from McMurdo Station, Antarctica. This recommendation is critical for both the MGS and other stand alone direct readout reception stations at McMurdo Station, as the fast return of data received at these locations to users is critical. • Recommend the installation of a stand-alone X-band direct readout reception station for science and operational use by the United States Antarctic Program and its partners. • Recommend the processing and use of X-band direct broadcast data be required both on site at McMurdo Station as well as off site. • Recommend that if the MGS is to remain a viable ground station that sufficient monies for MGS are required to adequately manage and maintain MGS so as to insure a year round reliability consistent with other satellite ground stations. Given some recent developments, the following additional recommendations have been put forth: • Recommend that the second L-band direct readout ground system get upgraded to Dual X-/L-Band system during it next maintenance cycle upgrade to match the first system or if at all possible, a pure X-Band system be installed in the L-band system's place. Additionally, it is strongly encouraged that the capabilities of the MGS be expanded to be a backup for these systems in the case of catastrophic failure. In addition, it will be of benefit to the MGS to have this capability, as it will likely make the MGS more attractive to other users, and in turn a more valuable asset to the NASA Ground Station Network. **Availability**: http://amrc.ssec.wisc.edu/MGS/draft2.doc

	Directorate for Social, Behavioral and Economic Sciences
Comparative Research on Biotechnology and the Public Workshop	**Scope:** To provide recommendations for future directions of research on policy decisions, media discourse, and public opinion as these relate to the social landscape of biotechnology. **Findings:** This report to the US-EC Task Force on Biotechnology Research concluded that new levels of cooperation and collaboration between US and EC social and behavioral scientists could answer interesting and provocative questions about public perception and response to new developments in biotechnology. The answers have implications for policies and programs to encourage biotechnological research and applications. Workshop participants encouraged joint research efforts, spanning disciplines and perspectives, including the natural and social sciences, and the humanities. Key questions relate to policy trajectories, media trajectories, and opinion trajectories. They include: Policy trajectories – How do the various actors involved in policy decisions gain, maintain, and lose legitimacy among the public? What role does science play in policy decisions? Media trajectories – Will differential access to new forms of media have an impact on public perceptions of biotechnology? What are the best approaches to investigating the role of gatekeepers in the flows of information between research centers, governments, reporters, activists, and audience members? Opinion trajectories-Which groups are in a position to set ethical standards? Will new applications of biotechnology face the same problems as those that have already been introduced? Are there measurement tools that are particularly suited for investigating the processes of policy, media, and public opinion trajectories?

Genomics of Human Origins Workshop	**Scope:** To assess the contributions that comparative genomics can make to the study of human origins research. **Findings:** The participants concluded that tremendous opportunities exist to apply innovations in genomics, developmental biology and neuroscience to specific questions of human evolution. While a large number of differences can be noted that separate humans from non-human primates, many of these are not understood in detail. Precise definition of these differences requires collaborative efforts by researchers in numerous sciences. The definitions can then lead to a more thorough understanding of the mechanisms underlying human origins. Key questions relate to the tension between the high degree of observed similarity between human and non-human primate DNA sequences and the obvious anatomical, phenotypic and cognitive differences between the species. A deep understanding of (2) rests in part on deciphering the evolution of human ontogeny. This will require the development of new analytical techniques. Continued progress in the reconstruction of primate phylogeny, relying on DNA analysis, is necessary to draw the framework for interpreting phenotypic data. The broader impacts of a concerted effort in this area are great, e.g. leading to a clearer understanding of the workings of the human mind and advancing our understanding of human learning capabilities. Information on comparative primate genomics can be used to assist in pharmaceutical development. Few, if any, scientific topics are as compelling to the general public as the ancestry of our species. While the basic questions posed by the participants have been part of biological anthropology for years, opportunities for major advances now arise through the application of state-of-the-art genomic, neuroscience and computer technology. An infusion of resources beyond those of the core programs is necessary to support this exciting expansion of human origins research.

Education and Training in the Social, Behavioral, and Economic Sciences: A Plan of Action	**Scope:** The purpose of this report is to provide guidance to NSF on the development of a strategic plan for education and training in the SBE sciences. The report reflects the advice of 120 SBE scientists who attended a National Workshop on this issue. The report focuses on four levels of education—K-12, undergraduate, graduate, and postdoctoral and early career stages—and on diversity issues. In each area, the report addresses key needs, impediments and challenges, and best practices as well as the components of an action plan. The action plan itself is presented in three parts: enhancements to existing NSF programs, new opportunities and initiatives, and immediate steps. It emphasizes that, even in times of scarce resources, demonstrable progress is possible in the short term and in the years ahead. **Findings:** Over the last quarter of a century, the world has undergone rapid change. Almost every aspect of human life is more complex and interdependent, requiring knowledge of human and social systems as well as physical and biological systems. The social, behavioral, and economic (SBE) sciences contribute penetrating insights on such issues as the causes and consequences of conflict, how individuals and groups perceive and misperceive hazards, how they understand or misunderstand the risks they run in their daily lives, and how they organize and structure their interactions and transactions. Understanding and utilizing this knowledge require basic competence in the SBE sciences in all citizens, and a talent pool of SBE scientists to undertake research and teach about it. A number of issues critical to effective implementation of an action plan are presented, including attention to the language used in extant programs and outreach, the commitment of new resources and the reallocation of funds to stimulate and support SBE science education enhancements, and assessment of which new initiatives should have the highest priority for adoption. The report recommends attention to the structural arrangements at NSF to manage and monitor this strategic commitment and calls for immediate and demonstrable progress. Appropriately implemented, a priority emphasis on SBE science education can contribute substantially to public understanding of these sciences and their capacity to make important new discoveries. **Availability:** http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf0442
Workshop on Scientific Foundations of Qualitative Research	**Scope:** This is a report from a workshop sponsored by the National Science Foundation, Directorate for Social, Behavioral and Economic Sciences, Sociology, and Methodology, Measurement and Statistics Programs. The two major goals of the workshop were to provide: 1) guidance both to reviewers and investigators about the characteristics of strong qualitative research proposals and the criteria that should be used for evaluating projects in NSF's merit review process, and 2) recommendations on how to strengthen qualitative methods in sociology and the social sciences in general. The workshop contributes to advancing the quality of qualitative research, and thus to advancing research capacity, tools, and infrastructure in the social sciences. **Findings:** The report provides guidelines for designing and evaluating qualitative research and recommendations for supporting and strengthening qualitative research. **Availability:** http://www.nsf.gov/pubs/2004/nsf04219/nsf04219.pdf

The U.S. Scientific and Technical Workforce: Improving Data for Decision-making	**Scope:** This is a report, by the Rand Science and Technology unit, to the Office of Science and Technology Policy and the Alfred P. Sloan Foundation. The study posed two questions: Are the current data on the S&T workforce adequate to support relevant decision-making and, if not, what improvements are necessary? **Findings:** Numerous recommendations and observations appear in the report. Availability: http://www.rand.org/publications/CF/CF194/
Education and Employment in Science and Engineering: A Global Perspective	**Scope:** The purpose of the workshop, conducted by the Committee of Professionals in Science and Engineering (CPST), was to facilitate the sharing of information on current projects, future activities and topic of mutual interest between the professional societies representing various science and engineering disciplines, CPST and the Division of Science Resources Statistics. It served as a mechanism to keep these groups abreast of new and current activities of the societies and SRS and also to strengthen the ties between SRS and the professional societies. It also helped the organizations to collect and use their data in a complimentary fashion. Finally it helped enhance the data collection of the SRS. **Findings:** Numerous observations. **Availability:** http://www.cpst.orgson

List of Acronyms

AACC	American Association of Community Colleges
AC	Advisory Committee
AC/GPA	Advisory Committee for GPRA Performance Assessment
ADP	Adaptive Dynamic Programming
AGEP	Alliances for Graduate Education and the Professoriate
ALMA	Atacama Large Millimeter Array
AM&O	Award Management & Oversight
AP	Advanced Placement
ATE	Advanced Technology Education
ATLAS	A Toroidal LHC ApparatuS
AUI	Associated Universities Incorporated
AURA	Associated Universities for Research in Astronomy
BE	Biocomplexity in the Environment
BFA	Office of Budget, Finance, and Award Management
BIO	Directorate for Biological Sciences
BME	Biomedical Engineering Laboratories
CALIPSO	Caribbean Andesite Lava Island Precision Seismo-geodetic Observatory
CCF	Division of Computing and Communication Foundations
CCLI	Course Curriculum and Laboratory Improvement
CCR	Central Contractor Registration
CEOSE	Committee on Equal Opportunities in Science and Engineering
CFOC	Chief Financial Officer Council
CIHO	Cash and Investments Held Outside of the Treasury
CIP	Construction in Progress
CISE	Directorate for Computer and Information Science and Engineering
CMS	Compact Muon Solenoid
CNCI	Control, Networks, and Computaional Intelligence Division (CISE)
CNS	Computer and Network Systems Division (CISE)
COV	Committee of Visitors
CPU	Central Processing Unit
CREST	Centers for Research Excellence In Science and Technology
CRIF	Chemistry Research Instrumentation and Facilities
CSRS	Civil Service Retirement System
CSU	California State University
CSUSB	California State University San Bernadino
CWA	Chemical Warfare Agents
DCAA	Defense Contract Audit Agency
DCIA	Debt Collection Improvement Act
DNA	Deoxyribonucleic Acid
DOI	Department of the Interior
DOE	Department of Energy
DOL	Department of Labor
DR1	Deep Redshift 1
DR2	Deep Redshift 2
EFT	Electronic Fund Transfer
EHR	Directorate for Education and Human Resources
EIP	Erroneous and Improper Payments Grant Workshop
EIS	Enterprise Information System
ENG	Directorate for Engineering
EOT	Education, Outreach, and Training
ERC	Engineering Research Center
FACA	Federal Advisory Committee Act
FAST	An alternative congestion control scheme for TCP
FCTR	Federal Cash Transaction Report
FECA	Federal Employees Compensation Act
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act of 1996
FISMA	Federal Information Security Management Act
FM-LOB	Financial Management – Line of Business
FMFIA	Federal Managers' Financial Integrity Act of 1982
FMS	Financial Management Service, U.S. Department of Treasury
FY	Fiscal Year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GDEP	Geoscience Diversity Enhancement Project
GEO	Directorate for Geosciences
GFRS	Government-wide Financial Reporting System
GK-12	Graduate Teaching Fellows in K-12 Education
GPA	GPRA Performance Assessment
GPRA	Government Performance and Results Act
GPS	Global Positioning System
GRF	Graduate Research Fellowships

IBMBCS	IBM Business Consulting Services
IERI	Interagency Education Research Initiative
IIS	Information and Intelligent Systems Division (CISE)
IMA	Institute for Mathematics and its Applications
INT	Office of International Science and Engineering
IOC	Innovation and Organizational Change program
IPIA	Improper Payments Information Act of 2002
ISEA	*In Situ* Electrochemical Analyzer
IT	Information Technology
ITR	Information Technology Research
LMS	Learning Management System
LOB	Lines of Business
LSS	Law and Social Science Program (SBE)
MCC	Management Controls Committee
MPS	Directorate for Mathematical and Physical Sciences
MR	Merit Review
MREFC	Major Research Equipment and Facilities Construction
MSP	Math and Science Partnerships
MTBI	Mathematical and Theoretical Biology Institute
MTS	Federal Measurement Tracking System
MVO	Montserrat Volcano Observatory
NA	Not Applicable or Not Available (see context)
NAIC	National Astronomy and Ionosphere Center
NAPA	National Academy of Public Administration
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCAR	National Center for Atmospheric Research
NMR	Nuclear Magnetic Resonance
NNI	National Nanotechnology Infrastructure
NNIN	National Nanotechnology Infrastructure Network
NNUN	National Nanofabrication Users Network
NOAO	National Optical Astronomy Observatory
NPACI	National Partnership for Advanced Computational Infrastructure
NRAO	National Radio Astronomy Observatory
NS	Nanoscale Science
NSB	National Science Board
NSBF	National Scientific Balloon Facility
NSBP	National Society of Black Physicists
NSE	National Science and Engineering
NSEC	National Science and Engineering Centers
NSF	National Science Foundation
NSO	National Solar Observatory
NUE	Nanotechnology Undergraduate Education
NWCET	National Workforce Center for Emerging Technology
ODS	Online Document System
OE	Organizational Excellence
OIG	Office of Inspector General
OIRM	Office of Information and Resource Management
OISE	Office of International Science and Engineering
OMA	Office of Multidisciplinary Activities (MPS)
OMB	Office of Management and Budget
OPM	United States Office of Personnel Management
OPP	Office of Polar Programs
OSTP	Office of Science and Technology Policy
PACI	Partnerships for Advanced Computational Infrastructure
PAR	Performance and Accountability Report
PARS	Proposal and Reviewer System
PART	Program Assessment Rating Tool
PBGF	Photonic Band Gap Fiber
PBS	Public Broadcasting System
PECASE	Presidential Early Career Awards for Scientists and Engineers
PETM	Paleocene-Eocene Thermal Maximum
PI	Principal Investigator
PITO	People, Ideas, Tools and Organizational Excellence
PMA	President's Management Agenda
POAM	Plan of Actions and Milestones
POGIL	Process Oriented Guided Inquiry Learning
PPD	Programs for Persons with Disabilities
PRAGMA	Pacific Rim Applications and Grid Middleware Assembly
R&RA	Research and Related Activities Appropriation
RET	Research Experience for Teachers

RETA	Research, Evaluation, and Technical Assistance Program
REU	Research Experiences for Undergraduates
SARS	Severe Acute Respiratory Syndrome
SBE	Directorate for Social, Behavioral and Economic Sciences
SBIR	Small Business Innovation Research
SCI	Division of Shared Cyberinfrastructure
SDSC	San Diego Supercomputing Center
SDSS	Sloan Digital Sky Survey
SES	Division of Social and Economic Sciences
SFFAS	Statement of Federal Financial Accounting Standards
SGER	Small Grant for Exploratory Research
SMETE	Science, Mathematics, Engineering and Technology Education
SMIG	Senior Management Integration Group
SRS	Division of Science Resources Statistics
STC	Science and Technology Center
STEM	Science, Technology, Engineering and Mathematics
STEP	Systemic Teacher Excellence Preparation
SUNY	State University of New York
TCP	Transmission Control Protocol
TE	Teacher Enhancements
UC	University of California
UCAR	University Corporation for Atmospheric Research
UCI	University of California, Irvine
UCLA	University of California, Los Angeles
UCSC	University of California, Santa Cruz
UNAVCO	University NAVSTAR Consortium
USAID	U.S. Agency for International Development
USAP	U.S. Antarctic Program
WBS	Work Breakdown Structures