National Science Foundation
FY 2000 GPRA Performance Plan[1]

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[1] This GPRA performance plan was developed solely by NSF staff. It reflects discussions of general principles with elements of the research and education communities, the administration, and congressional staff.

I. INTRODUCTION

This is NSF's second GPRA performance plan. It is based on NSF's GPRA strategic plan, submitted to Congress in September, 1997, and the FY 1999 performance plan. The mission, outcome goals, and critical factors for success from the strategic plan are outlined below.

Mission

NSF's continuing mission is set out in the preamble to the National Science Foundation Act of 1950 (Public Law 810507):

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

The Act authorizes and directs NSF to initiate and support:

- basic scientific research and research fundamental to the engineering process,
- programs to strengthen scientific and engineering research potential,
- science and engineering education programs at all levels and in all the various fields of science and engineering,
- an information base for science and engineering appropriate for development of national and international policy.

NSF carries out its mission primarily by making merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other institutions -- public, private, state, local, and federal -- throughout the U.S.

Outcome Goals

The outcomes of NSF investments, the results stemming from the grants and cooperative agreements we make, provide the evidence for NSF's success as an investment agent. NSF staff pursue the following outcome goals, the general goals of the strategic plan, as they develop the NSF award portfolio:

1. Discoveries at and across the frontier of science and engineering;
2. Connections between discoveries and their use in service to society;
3. A diverse, globally-oriented workforce of scientists and engineers;
4. Improved achievement in mathematics and science skills needed by all Americans; and
5. Relevant, timely information on the national and international science and engineering enterprise.

Critical Factors for Success: Goals for Management

Excellence in managing the agency's processes is an NSF goal on a par with our mission-oriented outcome goals. In the GPRA strategic plan, NSF articulated four critical factors in managing for excellence that provide the framework for annual performance goals.

- Operating a viable, credible, efficient merit review system;
- Exemplary use of and broad access to new and emerging technologies;
- A diverse, capable, motivated staff that operates with integrity; and
- Implementation of mandated performance assessment and management reforms in line with agency needs.

Means and Strategies

NSF's primary business is to make merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other institutions -- public, private, state, local, and federal -- throughout the U.S. By providing these resources, NSF contributes to the health and vitality of the U.S. research and education system, which enables and enhances the nation's capacity for sustained growth and prosperity. The individuals and organizations in which NSF invests conduct the work that ultimately determines the outcomes of the investment process that NSF manages.

NSF uses merit review with external peer evaluation to select about 10,000 new awards each year from about 30,000 competitive proposals submitted by the science and engineering community for its consideration. Work continues through another 10,000 awards made in competitions of previous years. NSF's role in the fabric of federal funding of science and engineering is defined by the fundamental nature of the problems our grantees propose and explore, the innovative nature of the research and education we support, and our integrative approach to research and education.

NSF's GPRA strategic plan outlines key investment strategies and an action plan for achievement of each of the outcome goals. There are common themes running through these investment strategies, and this performance plan reflects the importance of emphasizing activities that influence achievement of multiple objectives. Common strategies include: (1) broad support for activities across science and engineering research and education using competitive merit review with peer evaluation to identify the most promising ideas from the strongest researchers and educators; (2) integrating research and education to strengthen both; (3) extending NSF's reach to underserved communities, including enhancing the diversity of the human resource base for science and engineering; (4) emphasis on emerging opportunities, particularly those that drive science and engineering forward at disciplinary interfaces while adding to the knowledge base in areas of national interest; (5) building partnerships with other agencies and other sectors; and (6) assuring that both NSF and the research and education communities reap optimal benefit from the revolution in information, communications, and computing technologies. In addition, NSF is committed to using committees and panels of external experts to assess its effectiveness and directions on a regular basis.

NSF's management uses information on past performance (where available) and applies the strategies for enhancing outcomes to allocate available resources. NSF staff, advised by the merit review process, select the individual projects to be supported, managing toward the optimal mix of outcomes, given the available resources. At the NSF level, response to these common strategic elements has led to the identification of broad thematic areas for investment. Three thematic areas are emphasized in the FY 2000 Request: Information Technologies, Biocomplexity in the Environment, and Educating for the Future. These areas for enhanced investment stimulate coordination and synergy outside the usual budget lines, that is, across NSF organizations and with other agencies.

Deployment of Resources

Proposals and awards are managed through eight programmatic organizations, seven directorates and the Office of Polar Programs.[2]

- The **Biological Sciences** (BIO) directorate supports research 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. (FY 2000 Request: $408.62 million)
- The **Computer and Information Science and Engineering** (CISE) directorate supports research on the theory and foundations of computing, system software and computer system design, and human-computer interactions, as well as prototyping, testing and development of cutting-edge computing and communications systems. (FY 2000 Request: $422.53 million)

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[2] For convenience, we will refer to all of these organizations as directorates in the remainder of the document.

- The **Engineering** (ENG) directorate supports research in bioengineering and environmental systems; chemical and transport systems; civil and mechanical systems; electrical and communications systems; design, manufacture, and industrial innovation; and engineering education activities. (FY 2000 Request: $378.53 million)
- The **Geosciences** (GEO) directorate supports research in the atmospheric, earth, and ocean sciences. (FY 2000 Request: $485.48 million)
- The **Mathematical and Physical Sciences** directorate supports research in mathematics, astronomy, physics, chemistry, and materials science. (FY 2000 Request: $753.97 million)
- The **Social, Behavioral and Economic Sciences** (SBE) directorate supports research on human characteristics and behavior of individuals and groups, including research on economic systems; coordinates and supports the Foundation's international activities; and provides informational tools for tracking the human and institutional resources that make up the nation's science and engineering infrastructure. (FY 2000 Request: $143.01 million)
- The **Office of Polar Programs** (OPP) supports multidisciplinary research in Arctic and Antarctic regions. (FY 2000 Request: $250.63 million)
- The **Education and Human Resources** directorate (EHR) supports education and training activities at every level, informal education, research on teaching and learning, human resource development, and development of research capabilities in every region of the country. (FY 2000 Request: $711.00 million)
- In FY 1999, NSF established an additional budget activity entitled **Integrative Activities** to manage funds for selected Foundation-wide activities such as the Opportunity Fund and the Major Research Instrumentation (MRI) program. (FY 2000 Request: $161.23 million)

NSF directorates make investments in three functional categories of activity: research projects, research facilities, and education and training. Approximately 95% of NSF's budget goes directly to these investments. A fourth function, administration and management, provides support for the immediate activities of the agency. Each of these functions supports progress toward multiple outcome goals and is distinct in how that support is structured.

The FY 2000 Request leads to the following distribution of NSF budget resources across the key functions, with a total Request of $3.954 billion.

58%	19%	18%	5%
Research Project Support	Research Facilities	Education & Training	Adm. & Mgmt.
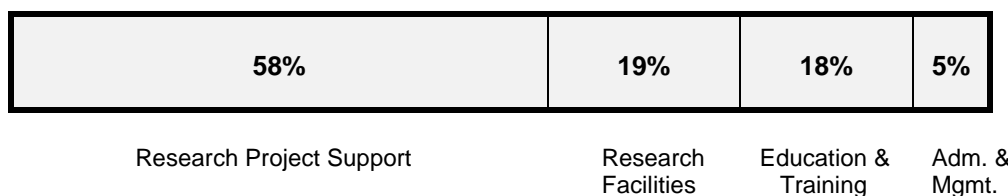
Investments in **Research Project Support** fund the cutting edge research that yields new discoveries. These investments help to maintain the nation's capacity to excel in science and engineering, particularly in academic institutions. The store of knowledge produced by NSF-funded research projects also provides a rich foundation for broad and useful applications of knowledge and the development of new technologies. Research projects contribute to the education and training of the next generation of scientists and engineers by giving them the opportunity to participate in discovery-oriented projects. NSF centers provide a particularly rich environment for broad interdisciplinary research and education at all levels. The FY 2000 Request for Research Project Support is $2,316 million.

NSF provides support for large, multi-user **Research Facilities** that meet the need for access to state-of-the-art research facilities that would otherwise be unavailable to academic scientists and engineers. Support includes funding for construction, upgrade, operations, and maintenance of facilities, and for staff and support personnel to assist scientists and engineers in conducting research at the facilities. Support for these unique national facilities is essential to advancing U.S. research and education capabilities, and is driven predominantly by research opportunities and priorities. Planning for facilities involves selecting from among many exciting ideas those where facilities will be initiated or upgraded. It also involves

phasing down or terminating those components of facilities that no longer support cutting edge research. The FY 2000 Request for Research Facilities totals $744 million.

Investments in **Education and Training** help ensure an adequate, well-prepared workforce of scientists and engineers that can maintain leadership in science and technology, both now and in the future, and help all students to achieve the mathematics and science skills needed to thrive in an increasingly technological society. NSF's programs produce scientists and engineers knowledgeable about the most recent scientific and technical advances. These highly educated people then reach every sector of society and actively disseminate and use that knowledge in the service of innumerable social goals. They also provide well-prepared teachers and instructional materials and technologies that influence mathematics and science education at all levels. The FY 2000 Request for Education and Training totals $706 million.

The FY 2000 Request for **Administration and Management** of $190 million provides support for salaries and benefits of persons employed at the NSF; general operating expenses, including key activities to advance the agency's information systems technology and to enhance staff training; and audit and Inspector General activities.

NSF is exploring revision of its budget account structure to track more closely with this functional approach to use of funds. The following table describes a crosswalk for the directorates and Integrative Activities with respect to key program function and staffing levels.

Programmatic Organization / Staffing Levels / Key Function Crosswalk
(Estimated Millions of dollars)

	Staff	Key Function				Total
	FTE's & IPA's[3]	Research Project Support	Research Facilities	Education and Training	Administration and Management	
BIO	111	$396	$ 1	$ 16	$4	$417
CISE	75	255	122	7	4	388
ENG	129	350	3	25	5	383
GEO	99	302	178	7	2	489
MPS	128	546	170	39	4	759
SBE	141	128	0	18	2	148
OPP	52	62	187	1	3	253
IA	0	129	0	0	0	129
EHR	148	125	0	594	11	730
Other [4]	439	0	95	0	154	249
TOTAL [5]	1,322	$2,293	$756	$706	$190	$3,945

Just as several investment strategies support progress toward more than one outcome goal, so do the directorates and key functions. The table below provides a picture of the interactions between outcome goals and key functions. The most heavily shaded areas for each outcome goal indicate the key functions that most directly support it; the more lightly shaded areas show the key functions that influence progress toward the outcome goal less directly. By comparing this table with the crosswalk above, it is possible to determine how directorates exert their influence on attaining the outcome goals.

OUTCOME GOAL	Research Project Support	Research Facilities	Education & Training	Admin. & Mgmt.

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[3] FTE's are funded through the S&E and OIG accounts. IPA's are funded through the EHR and R&RA accounts.

[4] Other staff includes all central administration and management. Other budget items include Major Research Equipment ($95 million, Research Facilities); Salaries and Expenses ($149 million, Administration and Management); and Office of Inspector General ($5 million, Administration and Management).

[5] Numbers may not add due to rounding.

	($2,293M)	($756M)	($706M)	($190M)
Discoveries at and across the frontier of science and engineering	▓	▓		
Connections between discoveries and their use in service to society	▓	▓		
Diverse, globally-oriented science and engineering workforce			▓	
Improved achievement in mathematics and science skills needed by all Americans			▓	
Timely and relevant information on the national and international science and engineering enterprise [6]			▓	

Cross-Cutting Areas with Other Agencies

Many other agencies support or conduct research and education activities in science and engineering in support of their missions. Frequently they will define outcome and performance goals that are similar to those NSF has defined. However, an agency's mission will have an impact on the nature of the outcome and performance goals, so, in general, they are not identical. The FY 2000 government-wide performance plan for research and development contains a number of common performance goals related to like sets of activities. These relate to use of merit review in the awarding of funds for research and to construction and operation of research facilities.

Appendix 4 in NSF's GPRA strategic plan discusses cross-cutting areas with other agencies in programs and processes in support of research, education, and development of information systems. It describes the mechanisms NSF and other agencies use to cooperate in addressing the broad spectrum of activities needed to manage the federal science and technology programs while avoiding inappropriate overlap and duplication.

External Factors Bearing on Success

Appendix 1 of NSF's GPRA strategic plan discusses external factors bearing on NSF's ability to achieve the outcome goals. In general, these factors result from changes in the environment for the conduct of research and education activities in the federal sector, the private sector, and in academe. Similar factors have a bearing on success in meeting NSF's performance goals. They stem largely from the fact that NSF does not conduct the research and education activities directly and, therefore, influences outcomes rather than controlling them. Where particular factors could have exceptional impact on individual performance goals, they are discussed in the appendices that accompany this performance plan.

Assessing Agency Progress toward Outcome Goals

The challenge of performance assessment for NSF is that both the substance and the timing of outcomes from research and education activities are largely unpredictable. Moreover, NSF staff do not conduct the research and education projects. They provide support for others to undertake these activities based on proposals for the work to be done, the best information available as to the likely outputs and outcomes, and their knowledge of NSF's outcome goals and the strategies for achieving them. They influence rather than control the outputs and outcomes.

Annual outputs of NSF awards, while in a sense quantifiable and certainly important to the success of individual projects, frequently shed little light on and consistently understate progress toward outcomes. NSF staff and external experts assess the performance of individual projects in the merit review process

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[6] Achieving this outcome goal is primarily the responsibility of the Science Resources Studies division within SBE. Funds are accounted for in the Education and Training key function.

when the principal investigator requests funds for future activities. Assessment of agency performance must integrate across the outputs of many projects and address the impact of those outputs on meeting agency outcome goals, including information on NSF's contribution as compared to that of many other possible factors. Whether assessing an individual project for future funding or assessing performance of the agency, the collective quality of the outputs is generally more important that the quantities. Assessing quality requires expert judgment.

Thus, NSF has developed performance goals for results of NSF's investments in research and education as descriptive standards, under the GPRA option to set performance goals in an alternative format. The descriptive standards characterize successful and minimally effective performance. The stream of data and information on the products of NSF's awards provides the basis for assessing NSF's performance through annual reporting processes and the expert judgment of independent external panels.

Much of this performance assessment is retrospective, addressing investments made at some point in the past. In order to tie this effectively to current issues in management of the programs, the assessments must also address the quality of the set of awards made in the fiscal year under consideration. The focus of this portfolio assessment is the likelihood that the package of awards will produce strong results in the future. Special emphases within the plans for the fiscal year merit special attention in the assessment process.

Another way to tie performance to current issues in management of the programs is to address NSF performance in implementing the strategies articulated in the GPRA strategic plan. NSF staff have control over budget allocations and the decision processes that determine the set of awards. NSF performance goals for investment processes, along with those for management of the agency, are generally quantitative. They refer to processes conducted during the fiscal year that are captured in NSF systems.

Data Collection, Verification, and Validation

During FY 1999, NSF established new reporting systems and procedures, reporting guidelines and templates, to enable the collection, analysis and evaluation of the information and data necessary for reporting performance achievement. It is important to note that NSF makes use of qualitative information as well as quantitative data to determine progress toward achieving its goals. In FY 1999, data sources for each goal, as well as data limitations were identified. Steps to alleviate limitations were also identified. NSF has put in place methods to ascertain data quality problems and to develop qualitative methods for correction of the causes of data quality problems. For many of the goals, the data sources are central systems while some goals have required creation of new data/information systems in order to collect and track programs. NSF will continue striving to improve its data quality and accuracy by improving processes, systems and data input.

Data Collection, Verification, and Validation for NSF's Results Goals

Most of the information base that will underlie assessments of achievement on the descriptive performance standards comes from outside the agency, through two major grantee reporting systems: the Project Reporting System which includes annual and final project reports for all awards, and the Impact Data Base and project monitoring system, designed by the Directorate for Education and Human Resources and built and maintained by a contractor. Through these systems, output indicators such as the following will be available to program staff, third party evaluators, and advisory committees:

- *Related to discoveries*: Results, published and disseminated: journal publications, books, audio or video products; software, newly-developed instrumentation, and other inventions; data, samples, specimens, germ lines, and related products of awards placed in shared repositories; contributions within and across disciplines.

- *Related to connections*: organizations of participants and collaborators (including collaborations with industry); publications; contributions to other disciplines, infrastructure, and beyond science and engineering; use beyond the research group of specific products, instruments, and equipment.
- *Related to S&E workforce*: student participants; demographics of participants; descriptions of student involvement; education and outreach activities under grants; and demographics of science and engineering students and workforce.
- *Related to math and science skills*: numbers and quality of educational models, products and practices and their use in the math and science community; volume and quality of teachers trained and faculty stimulated; student outcomes including enrollments in math and science courses, retention, achievement, and science and math degrees received.

NSF has implemented an electronic project reporting system that permits organized reporting of aggregate information. We anticipate that the reliability of the information in the system will improve over time, as investigators and institutions become comfortable with its use. FY 1999 was the first year of its full implementation. Electronic submission of project reports is required in FY 2000.

The scientific data from the reporting system will be tested for plausibility as a natural part of the external assessment process. In addition, data from the reporting system will be used to address progress under prior support when investigators reapply to NSF. Thus, the investigators have a strong interest in providing accurate information that reviewers may rely upon.

NSF has worked with the university community to ensure that the added reporting and assessment burden will be minimal. This is important to having viable performance information for NSF. More direct efforts to verify and validate information in the project reporting system would add significantly to the cost and to the burden on the grantee community.

For the outcome goal on policy information, the Division of Science Resources Studies will calculate the time between collection and reporting of policy information, and their data will be open for verification and validation. The same is true for reporting on data quality measures.

Data Collection, Verification, and Validation for NSF's Investment Process Goals

Data in support of performance goals under the heading *Proposal and Award Processes* are maintained in NSF's proposal and award systems. These systems are subject to regular checks for accuracy and reliability. One exception is the performance goal on time to prepare proposals. The budget division maintains records for this performance goal that are open to public scrutiny. Another exception is the performance goal on use of merit review criteria. Advisory committees will be provided with summary information developed from random samples of review records as they make their assessments. Background information to validate the accuracy of the summaries will be available upon request.

The performance goals in the categories of *Integration of Research and Education*, and *Diversity* will be supported by examination of materials in the Project Reporting System and, in the case of *Diversity*, review of reliable information on the science and engineering workforce.

Data in support of the performance goals under the heading *Facilities Oversight* are currently reported to NSF electronically through the Project Reporting System. NSF verifies the accuracy and completeness of the information through constant interaction between NSF staff and the management of the facilities.

Data Collection, Verification, and Validation for NSF's Management Goals

All of these performance goals are supported by internal NSF management systems.

The Division of Information Services (DIS/IRM) maintains an extensive database concerned with use of FastLane. They will continue to maintain statistics on submission of full proposals through FastLane and

on submission of project reports through the project reporting system. The Division of Human Resources Management (HRM/IRM) maintains information related to staff recruitment and staff training, under the guidance of the Chief Information Officer.

II. SUMMARY TABLE OF ANNUAL PERFORMANCE GOALS

NSF's annual performance goals for FY 2000 fall into three categories:

- Results (rationale, description of measurement approach, means and strategies, and baseline information found in Appendix 1);
- Investment process (rationale, description of measurement approach, means and strategies, and baseline information found in Appendix 2); and
- Management (rationale, description of measurement approach, means and strategies, and baseline information found in Appendix 3).

ANNUAL PERFORMANCE GOALS FOR RESULTS -- PART A [7] [8]

Outcome Goal	FY 2000 Annual Performance Goal	FY 2000 Areas of Emphasis across NSF
	NSF is judged successful when	
Discoveries at and across the frontier of science and engineering	*NSF awards lead to important discoveries; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries, as judged by independent external experts.* FY 1999 Result: Successful overall	• balance of innovative, risky, interdisciplinary research • new types of scientific databases and tools to use them • life in extreme environments • biocomplexity • nanoscience and engineering
Connections between discoveries and their use in service to society	*the results of NSF awards are rapidly and readily available and feed, as appropriate, into education, policy development, or use by other federal agencies or the private sector, as judged by independent external experts.* FY 1999 Result: Successful, some improvement can be made	• elements of Information Technology Research • global change • research on learning & education • plant genome research • urban communities • Science and Technology Centers: Integrative Partnerships
A diverse, globally-oriented workforce of scientists and engineers	Participants in NSF activities experience world-class professional practices in research and education, using modern technologies and incorporating international points of reference; when academia, government, business, and industry recognize their quality; and when the science and engineering workforce shows increased participation of underrepresented groups, as judged by independent external experts. FY 1999 Result: Successful in most areas; some areas need improvement, such as increasing participation of underrepresented groups	• integrative research and education opportunities • participation of underrepresented groups in integrative research and education
Improved achievement in mathematics and science skills needed by all Americans	NSF awards lead to the development, adoption, adaptation, and implementation of effective models, products, and practices that address the needs of all students; well-trained teachers who implement standards-based approaches in their classrooms; and improved student performance in participating schools and districts, as judged by independent external experts. FY 1999 Result: Successful for programs to which goal applies.	• *K-12 systemic activities* • research on learning & education • graduate teaching fellows in K-12 education • K-16 digital library

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[7] These performance goals are stated in the alternative format provided for by GPRA legislation. A brief description of how performance will be assessed and how the areas of emphasis will be addressed can be found in Appendix 1.

[8] Elements in italics are highlighted in the FY 2000 government-wide performance plan.

ANNUAL PERFORMANCE GOALS FOR RESULTS -- PART B [9]

Outcome Goal	FY 2000 Annual Performance Goal
Timely and relevant information on the national and international science and engineering enterprise.	Maintain FY 1999 gains in timeliness for an average of 486 days the time interval between reference period (the time to which the data refer) and reporting of data. Baseline: 540 days in 1995-1996. FY 1999 Goal: 486 days. FY 1999 Result: 485 days.
	Establish a standard set of data quality measures for reporting of Science Resource Studies products. Prepare reports on these measures for all SRS surveys and publish them in electronic formats to inform users of SRS data quality.

ANNUAL PERFORMANCE GOALS FOR NSF'S INVESTMENT PROCESS [10] [11]

Performance Area	FY 2000 Annual Performance Goal
Proposal and Award Processes	
Use of Merit Review	*At least 90 percent of NSF funds will be allocated to projects reviewed by appropriate peers external to NSF and selected through a merit-based competitive process. FY 1998 Baseline: 90%. FY 1999 Goal: 90%. FY 1999 Result: 95%*
Implementation of Merit Review Criteria [12]	NSF performance in implementation of the new merit review criteria is successful when reviewers address the elements of both generic review criteria appropriate to the proposal at hand and when program officers take the information provided into account in their decisions on awards, as judged by external independent experts. *FY 1999 Result: Largely successful. Needs some improvement.*
Customer service -- General	Identify possible reasons for customer dissatisfaction with NSF's merit review system and with NSF's complaint system; identify best practices and training necessary for NSF staff to conduct merit review and answer questions about the review criteria and process; identify best practices and training necessary for NSF staff to answer questions from the community and to deal with complaints in a forthright manner; improve NSF's overall ACSI index compared to the FY 1999 index of 57 (on a scale of 0-100).
Customer service -- Time to prepare proposals	95% of program announcements and solicitations will be available at least three months prior to proposal deadlines or target dates. FY 1998 Baseline: 66%. FY 1999 Goal: 95%. FY 1999 Result: 75%
Customer service -- Time to decision	Maintain the FY 1999 goal to process 70% of proposals within six months of receipt. FY 1998 Baseline: 59%. FY 1999 Goal: 70%. FY 1999 Result: 58%.
Maintaining Openness in the System	The percentage of competitive research grants going to new investigators will be at least 30%, as provided for in the FY 1999 Performance Plan. FY 1998 Baseline: 27%. FY 1999 Goal: 30%. FY 1999 Result: 27%.

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[9] Additional information on these quantitative annual performance goals is found in Appendix 1.

[10] Additional information on performance goals in this section is found in Appendix 2.

[11] Performance goals comparable to those in italics are highlighted in the FY 2000 government-wide performance plan.

[12] This performance goal is stated in the alternative format provided for in GPRA legislation. See Appendix 2 for the complete statement of the performance goal.

Performance Area	FY 2000 Annual Performance Goal
Integration of Research and Education	
In Proposals	NSF will develop a plan and system to request that Principal Investigators (PIs) address the integration of research and education in their proposals, and develop and implement a system to verify that PIs have done so. (Revised goal.) No baseline.
In Reviews	NSF will develop and implement a system/mechanism to request and track reviewer comments tied to merit review criterion #2, "what are the broader impacts of the proposed activity?" (Revised goal.) No baseline.
Diversity	
NSF Applicants	NSF will identify mechanisms to increase the number of women and underrepresented minorities in the proposal applicant pool, and will identify mechanisms to retain that pool. (Revised goal.) No baseline.
Facilities Oversight	
Construction and upgrade	*Maintain 1999 goal to keep construction and upgrades within annual expenditure plan, not to exceed 110 percent of estimates. FY 1999 Result: majority of facilities were within 110 % of annual spending estimates.*
	Maintain 1999 goal to keep construction and upgrades within annual schedule, total time required for major components of the project not to exceed 110 percent of estimates. FY 1999 Result: majority of facilities on schedule.
	For all construction and upgrade projects initiated after 1996, keep total cost within 110 percent of estimates made at the initiation of construction. FY 1999 Result: no completed projects in FY 1999.
Operations	*Maintain 1999 goal to keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time. FY 1999 Result: substantial majority of facilities were operating efficiently.*

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[13] Performance goals comparable to those in italics are highlighted in the FY 2000 government-wide performance plan.

ANNUAL PERFORMANCE GOALS FOR MANAGEMENT [14]

Critical Factor for Success	FY 2000 Annual Performance Goal
New and emerging technologies	
Electronic proposal submission	NSF will receive at least 60% of full proposal submissions electronically through FastLane. FY 1998 Baseline: 17%. FY 1999 Goal: 25%. FY 1999 Result: 44%.
Electronic proposal processing	By the end of FY 2000, NSF will have the technological capability to take competitive proposals submitted electronically through the entire proposal and award/declination process without generating paper within NSF. (New goal in 2000)
NSF Staff	
Diversity	In FY 2000, NSF will show an increase over 1997 in the total number of hires to S&E positions from underrepresented groups. (Revised goal) FY 1997 Baseline: Of 54 S&E hires, 22% were female and 19% were from underrepresented minority groups.
Capability in use of information technology	By the end of FY 2000, all staff will receive an orientation to FastLane, and at least 80% of program and program support staff will receive practice in using its key modules. FY 1999 Goal: 100% to receive orientation, 95% to receive training. FY 1999 Result: 80% received orientation, 43% received training.
Implementation of management reforms	
Year 2000	NSF will complete all activities needed to address the Year 2000 problem for its information systems according to plan, on schedule and within budget. (Revised goal)
Project Reporting System	During FY 2000, at least 85% of all project reports will be submitted through the new electronic Project Reporting System. FY 1999 Goal: 70%. FY 1999 Result: 59%

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[14] In FY 2000, NSF continues to emphasize the area of managing information technologies.   Information on these performance goals can be found in Appendix 3.

APPENDIX 1

PERFORMANCE GOALS FOR RESULTS

The main text of this performance plan discusses the challenges to performance assessment of results of NSF research and education programs. In response the these challenges, NSF has developed performance goals for results of NSF's investments in research and education as descriptive standards, under the GPRA option to set performance goals in an alternative format. For each of the research and education outcome goals, there is a single alternative format performance goal that covers several elements of performance that NSF regards as most important in the current environment. In some instances there are a few related performance goals stated in a more standard format.   The stream of data and information on the products of NSF's awards provides the basis for assessing NSF's performance through annual reporting processes and the expert judgment of independent external panels.

Much of this performance assessment is retrospective, addressing investments made at some point in the past. In order to tie this effectively to current issues in management of the programs, the assessments must also address the quality of the set of awards made in the fiscal year under consideration. The focus of this portfolio assessment is the likelihood that the package of awards will produce strong results in the future. Budget emphases for FY 2000 merit special attention in the assessment process. These special emphases are noted in the table of the main text and there is added discussion in this appendix. In most instances they refer to assessment of the likelihood that the current portfolio of awards will achieve the objectives of the special emphasis. For a few, NSF has highlighted the activity for several years, and it is possible to include some assessment of results.

Use of Advisory Committees[1] in Addressing Performance Goals for Outcomes in Research and Education

Use of the alternative format performance goals for outcomes in research and education allows for human judgment to consider both quantitative and qualitative information on performance and weigh it in a balanced assessment. The descriptive performance goals are designed to be used as tools in NSF's management process through a combination of internal self-assessment and review by external panels managed through the directorate advisory committees. Members of these committees are highly credible experts in their fields. Because of the need for the judgments of potential users and international perspectives on quality, committee membership will evolve to provide enhanced independence of judgements.

In FY 1997 and early FY 1998, NSF ran a series of experiments with advisory committees and their subcommittees to determine how to adapt existing processes[2] to obtain effective assessments of outcomes. In FY 1999, all advisory committees gave judgments of program effectiveness, describing strengths and weaknesses using the target levels of performance. The credibility of these reports rests on

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[1] NSF manages its research and education activities through eight programmatic organizations, the directorates for Biological Sciences (BIO), Computer and Information Science and Engineering (CISE), Education and Human Resources (EHR), Engineering (ENG), Geosciences (GEO), Mathematical and Physical Sciences (MPS), and Social, Behavioral, and Economic Sciences (SBE) and the Office of Polar Programs (OPP). For simplicity, all are referred to as directorates. Each directorate has an external advisory committee.

[2] NSF has a long-standing practice of reviewing all programs on a three-year cycle for their performance in administering the merit review process. The review is performed by a Committee of Visitors (COV), usually set up as a subcommittee of a directorate advisory committee. The COV members form an independent group of external experts. COV reports are routed through the Advisory Committees to the directorates and NSF's Director. Once approved by the advisory committee, they become public documents and are available upon request. NSF is experimenting with using COVs to assess results as well as process.

the provision of qualitative detail about program results, to demonstrate which of the levels of performance are actually achieved. Advisory committees will have full access to a variety of data sources.

Results from NSF awards appear over time. Thus, in assessing performance toward the outcome goals during a given year, NSF looks carefully at (1) the noteworthy achievements of the year based on NSF awards, (2) the ways in which projects collectively affect progress, and (3) expectations for future performance based on the current set of awards.

As a basis for NSF's annual performance report, each directorate develops an annual self-assessment that addresses the three elements described above, articulating achievements, collective progress, and expectations for the future in understandable terms. The first two of these elements provide means of assessing the performance of past NSF investments; the last, a means of assessing the characteristics of the current investments, with a focus on the likelihood of strong performance in the future. Directorate advisory committees, panels composed of experts external to NSF, take the self-assessment and other available sources of information[3] into account in benchmarking the directorate's performance against the performance standards. The advisory committees are expected to address both strengths and weaknesses of the directorates, including ways in which the performance is exceptionally strong. NSF management, working with the advice and guidance of the National Science Board, integrates the advisory committee recommendations into the GPRA performance report. All of the performance goals are addressed to aggregate activities, and both advisory committee and NSF-wide reports assess progress toward them based on the performance of collections of awards within key program functions.

Outcome Goal 1: Discoveries at and across the frontier of science and engineering

Performance Indicators: importance and quality of discoveries, new ideas, new tools, and new technologies; interplay of disciplinary and interdisciplinary research; balance of the portfolio.

FY 2000 Performance Goal: NSF's performance toward this outcome goal is successful when NSF awards lead to:

- **important discoveries;**
- **new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and**
- **identification of high-potential links across these boundaries;**

as judged by independent external experts.

Baseline: Two years of experiments in the use of expert judgment in performance assessment through Committees of Visitors indicate NSF is successful in meeting this goal. [4]

FY 1999 Results: *Successful.* In FY 1999, 35 COV and 8 AC reports rated NSF for this goal. All reports rated NSF successful or better in achieving this goal.

Elements of exceptionally strong performance include outcomes where NSF awards lead to advances of major scientific or engineering importance. These might, for instance: create new paradigms, stimulate important new areas of inquiry, or otherwise excite national and international attention.

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[3] Advisory Committee assessments, and thus, NSF's performance report, will have a richer information base when there are sources of input for particular parts of the directorate that go beyond the directorate self-assessment. These sources would include the COV reports discussed in Footnote 2. We would expect that at least every three years the advisory committees would cover all aspects of directorate activity in some depth. In FY 1999's performance report, we expect to have external assessments available for approximately 40% of Foundation programs.

[4] During FY 1998 11 of the 14 COV reviews held included new proceeses to assess NSF's performance. While each addressed GPRA they did not sue the same mechanism and a number of reports are still outstanding. However, of the five reports reviewed to-date, performance for this goal was deemed as exceptionally strong.

FY 2000 Resources Supporting Achievement of the Successful Level of Performance:

- Investments made through the Research Project Support and Research Facilities key functions are the principal contributors toward reaching this goal. Resources are allocated to these key functions to ensure they support attainment of the outcome goal.
- FY 2000 plans call for increases of $173 million in Research Project Support and $14 million in Research Facilities for respective totals of $2,316 and $744 million.
- Focused increases for the Information Technology Research initiative, ITR, ($110 million on a base of approximately $700 million) and Biocomplexity ($50 million on a base of approximately $600 million) provide the basis for describing areas of emphasis for consideration within the total portfolio of awards in the assessment process.

Capital Investment to Enhance Future Performance:

- NSF's capital investment is funded through the Major Research Equipment account. The FY 2000 Request for MRE is $85 million.
- Continuing projects include South Pole Station Modernization, Phase I of the Millimeter Wave Array, and the Large Hadron Collider.
- New projects include upgrade of an additional LC-130 for polar air support, initiation of a Network for Earthquake Engineering Simulation, and Terascale Computing Systems.
- (Performance goals for these capital construction projects are found in Appendix 2.)

Areas of Emphasis in FY 2000:

NSF will ask all directorate advisory committees to examine the directorate's entire FY 2000 portfolio of research project support activities, identify activities they would characterize as *high risk, multidisciplinary, or innovative*, and make an assessment of overall scientific quality and balance with respect to these specific characteristics. The focus of this review will be to ensure that NSF is positioned well to attain the discovery-oriented performance goal. Directorates will structure their self-assessments to facilitate this review.

In FY 1999, all COV reports indicated that NSF programs have high scientific quality. Of the 30 COV reports that gave an opinion on balance of projects in the programs under review, 25 reports indicated that the balance was appropriate.

All directorate advisory committees will also be asked to examine the extent and appropriateness of investment in *new types of scientific databases and the tools to use them*. This is a critical component of activity under Knowledge and Distributed Intelligence, one of NSF's areas of emphasis in FY 1999 and related to the ITR emphasis in FY 2000.

Life in Extreme Environments, begun as a focused investment theme in FY 1997, reflects an aspect of Biocomplexity in the Environment. Preliminary results coming from awards made then may be available for assessment in FY 2000. Advisory committees will also be able to examine the active portfolio of awards for their potential influence on progress in this exciting area. Relevant directorates are BIO, GEO, MPS, and OPP.

Biocomplexity represents a new focused investment opportunity in FY 2000. An assessment of the resulting portfolio of investments will be part of the FY 2000 performance report.

In addition, *Nanoscience and Engineering* is just beginning to develop as an area for coordinated investment. Advisory committees in ENG and MPS will be asked to examine the set of awards in this area for their potential influence on progress.

Comment:

Means and Strategies for Successful Performance:

- NSF works toward this outcome goal by using the merit review process to make awards for research and education activities that focus on discovery.
- Factors leading to priority for allocation of resources to directorates include emerging opportunities for major advances.
- Key investment strategies for addressing the outcome goal underlying this performance goal are found in the relevant section of the NSF GPRA strategic plan. Those particularly important to development of FY 2000 plans and use of resources are described in the main text of the performance plan. Appendix 2 lays out performance goals for investment processes that support these strategies.
- The most important single factor in attaining this outcome goal is the quality of the decision process.
- NSF communicates with staff and the community with respect to outcome goals, investment strategies, and expectations for the set of awards.
- Regular reporting requirements for all awards help program staff understand the outputs and outcomes of their portfolio and provide context for decisions on new awards.
- Quality of decision process and award portfolio is fundamental to the performance evaluation of program staff.

External Factors that Affect Performance:

- General factors affecting performance are described in the introduction to this appendix. There are no specific factors relative to this performance goal that merit additional attention.

Cross-Cutting Areas with Other Agencies:

- Facilities, with their large capital construction base and continuing operating costs, are particularly important elements of interagency planning. NSF has both formal and informal agreements with several other agencies to ensure that needed infrastructure is available to U.S. researchers without inappropriate overlap or duplication. For example, NSF and the Department of Energy cooperate in support for U.S. involvement with the Large Hadron Collider at CERN. This is a formal agreement between the two agencies on behalf of the U.S. and with the international partnership building the collider. On a more informal level, generally NSF develops and supports ground-based astronomy facilities, while NASA does the same for space-based facilities.

- Many other agencies support basic research in academic institutions, usually with a mission orientation. Their activities contribute to developing discoveries at and across the frontier of science and engineering. The introduction to this appendix describes NSF's general approach to working with other agencies to ensure complementary sets of activities. Certain interactions are particularly important for fundamental research: National Institutes of Health (biosciences, genomics, biomedical research, chemistry); Department of Energy (high energy and nuclear physics, materials, high end computing, genomics); Department of Defense (engineering, computer and information science and engineering, mathematics); Department of Commerce (ocean and atmospheric sciences, global climate change, meteorology, atomic and molecular physics); National Aeronautics and Space Administration (astronomical sciences, global climate change); Department of Agriculture (biosciences, plant genomics); Department of Education (research on education); Environmental Protection Agency (environmental research).

Outcome Goal 2: Connections between discoveries and their use in service to society

Performance Indicators: outputs and outcomes of NSF awards are made available to and put to use by others; NSF-sponsored activities demonstrate a role in stimulating innovation and policy development.

FY 2000 Performance Goal: NSF's performance toward this outcome goal is successful when the results of NSF awards are rapidly and readily available and feed, as appropriate, into education, policy development, or use by other federal agencies or the private sectoras judged by independent external experts.

Baseline: Two years of experiments in the use of expert judgment in performance assessment through Committees of Visitors indicate NSF is successful in meeting this goal. [5]

FY 1999 Result: *Successful.* **In FY 1999, 35 COV reports and 8 AC reports rated NSF for this goal. Of these, 34 COV reports and all AC reports rated NSF successful in achieving this goal. NSF will review where improvements can be made to more fully achieve this goal in FY 2000.**

Exceptionally strong performance is characterized by NSF staff and grantees actively reaching out to potential users, and NSF-supported work playing critical roles in important innovation or problem solving for society.

FY 2000 Resources Supporting Achievement of the Successful Level of Performance:

- Investments made through the Research Project Support and Research Facilities key functions are the principal contributors toward realizing this goal. Some elements of these key functions lend themselves to fairly immediate connections between discoveries and their use in service to society. Resources may be allocated to these areas to ensure they support attainment of the outcome goal. For other elements, the connections may be less apparent, and the identification of resources supporting those connections less clear.[6]
- Research on education is included in the Education and Training key function. Such activities result in discoveries with potential for almost immediate impact on practitioners, and impact of results of research on the practice of education will be assessed under this performance goal.

Capital Investment to Enhance Future Performance:

- In FY 2000, the requested funding for Terascale Computing Systems and for initiation of a Network for Earthquake Engineering Simulation would provide a means of linking fundamental discovery to immediate service to society.

FY 2000 Areas of Emphasis:

Within NSF's FY 2000 guidance level, a number of multidisciplinary areas of research are identified as ripe for progress and of particular importance for their potential connections to use in service to society. Generally speaking, these fit within the Foundation's broad themes of Information Technology Research (ITR), Biocomplexity in the Environment (BE), and Educating for the Future (EFF). In implementing focused research activities in these areas, NSF works in partnership with other agencies. Relevant directorate advisory committees will be asked to pay particular attention to these areas in their assessments, examining results of past investments, where results are available, and the contents of the current portfolio for (1) appropriateness in meeting the goals of the interagency program; (2) quality of the NSF research and infrastructure activities; and (3) balance among related areas of activity within NSF.

Providing balanced, terascale computing resources access to the academic science and engineering community is critical to educating the next generation of computer and computational scientists. As part of the Foundation's IT theme and the interagency initiative, *Information Technology Research(ITR)*, all

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[5] During FY 1998 11 of the 14 COV reviews held included new processes to assess NSF's performance. While each addressed GPRA they did not use the same mechanism and a number of reports are still outstanding. However, of the five reports reviewed to-date, performance for this goal was deemed as exceptionally strong.

[6] This is an example of how NSF resources may serve multiple purposes. Achievement of this performance goal is dependent on a continuing stream of discoveries. The resources address discovery and connections simultaneously.

parts of NSF will address relevant issues in these areas. Advisory committees will review progress in developing a strong portfolio of activity.

Global Change, fitting within the broad theme of BE, has been an important area of focused research investment at NSF for several years, in conjunction with NSF's participation in the U.S. Global Change Research Program. Advisory committees in BIO, GEO, OPP, and SBE will be asked to address performance in global change, addressing both past results and the current portfolio.

Research on Learning and Education, an element of EFF, was given high priority in the report of the President's Committee of Advisors in Science and Technology on the Use of Technology to Strengthen K-12 Education in the United States (March 1997). NSF, in partnership with the Department of Education, will build on past investments in this area with an initiative in FY 1999 that will continue in FY 2000. While all directorates will participate in this effort, the EHR advisory committee will be asked to provide an assessment of the new investments for NSF as a whole.

Plant Genome Research received a major funding increase in FY 1998. The BIO directorate has initiated a program of support for research and infrastructure development, consistent with the recommendations of the 1998 report of the National Science and Technology Council entitled *National Plant Genome Initiative*. In FY 2000, the BIO advisory committee will review progress in developing a strong portfolio in this area, including interactions with other agencies, other nations, and the private sector. They will pay particular attention to completing sequencing of the model plant *Arabidopsis*.

Urban Communities incorporate a mix of natural and built environments. They are frequently neglected in efforts to obtain baseline information in natural, pristine environments. Yet their impact on quality of life in the U.S. is evident. BIO, ENG, and SBE play the leading roles in addressing issues related to urban environments.

Science and Technology Centers: Integrative Partnerships have responsibilities in the area of knowledge transfer that go beyond those of individual investigators by design. The first new set of STCs in almost a decade will be awarded in FY 2000. Assessments will address both the effectiveness of existing centers in establishing connections and the potential for strong performance in the new class.

Comment:

Means and Strategies for Successful Performance:

- NSF works toward this outcome goal by using the merit review process to make awards for research and education activities that focus on discovery and that create or have the potential for connections with use in service to society.
- Factors leading to priority for allocation of resources to directorates include potential for connections with use in service to society.
- Key investment strategies for addressing the outcome goal underlying this performance goal are found in the relevant section of the NSF GPRA strategic plan. Those particularly important to development of FY 2000 plans and use of resources are described in the main text of the performance plan. Appendix 2 lays out performance goals for investment processes that support these strategies.
- Potential for use in service to society is an element in the merit review criteria used in the decision process.
- Quality of decision process and award portfolio is fundamental to the performance evaluation of program staff. Attention to all relevant merit review criteria is a factor in the quality of the decision process.
- NSF communicates with staff and the community with respect to outcome goals, investment strategies, and expectations for the set of awards. Staff outreach efforts accelerate with activities with strong potential for connections with use in service to society; frequently including specialized program announcements.

- Regular reporting requirements for all awards help program staff understand the outputs and outcomes of their portfolio and provide context for decisions on new awards.

External Factors that Affect Performance:

- General factors affecting performance are described in the introduction to this appendix.
- Many investigators do not think about the possible connections their work might have with use in service to society. Many potential users are not aware that results from NSF awards could be useful to them. NSF can conduct outreach and awareness efforts, but, generally, cannot force the connections.

Cross-Cutting Areas with Other Agencies:

- Many other agencies support basic research in academic institutions, usually with a mission orientation. Their missions contribute to developing connections between discoveries and their use in service to society. The introduction to this appendix describes NSF's general approach to working with other agencies to ensure complementary sets of activities. Certain interactions are particularly important for fundamental research linked to missions of other agencies: National Institutes of Health (biosciences, genomics, biomedical engineering, chemistry); Department of Energy (high end and nuclear physics, materials, high end computing, genomics); Department of Defense (engineering, computer and information science and engineering, mathematics); Department of Commerce (ocean and atmospheric sciences, global climate change, meteorology, atomic and molecular physics); National Aeronautics and Space Administration (astronomical sciences, global climate change, engineering); Department of Agriculture (biosciences, plant genomics); Department of Education (research on education); Environmental Protection Agency (environmental research).

- NSF is an active participant in many interagency planning activities coordinated through the National Science and Technology Council (NSTC) that link fundamental research to national priorities. They include: U.S. Global Change Research Program, High Performance Computing and Communications, Program for the Next Generation of Vehicles, Education Research, Integrative Science for Ecosystem Challenges, Children's Research, Plant Genome Research, among others. In all these activities, NSF's role is at the fundamental end of the research and development spectrum. These interagency planning efforts coordinate among agencies to reap optimal benefit from the federal investment.

- NSF has been designated the lead Federal agency for an initiative on Information Technology Research (ITR) – a six agency initiative including the Departments of Energy and Defense, the National Aeronautics and Space Administration, the National Institutes of Health, and the National Oceanic and Atmospheric Administration. ITR grew from the efforts of several agencies and responds to recommendations made by the President's Information Technology Advisory Committee (PITAC). NSF's FY 2000 investment includes $110 million for research in software systems, scaleable information infrastructure, high-end computing, and socioeconomic and workforce impacts. An additional $36 million for development of terascale computing systems will enable U.S. researchers to gain access to leading edge computational systems.

Outcome Goal 3: A diverse, globally-oriented workforce of scientists and engineers

Performance Indicators: demographic data on participants in NSF-funded activities and in the workforce; character of experiences in NSF-funded activities aimed at educating the next generation of the workforce; outcome data from longitudinal studies as available.

FY 2000 Performance Goal: NSF's performance toward this outcome goal is successful when participants in NSF activities experience world-class professional practices in research and education, using modern technologies and incorporating international points of reference; when academia, government, business, and industry recognize their quality; and when the science and

engineering workforce shows increased participation of underrepresented groups. NSF's success toward meeting this goal is judged by external independent experts.

Baseline: Preliminary efforts to pilot the use of expert judgment in performance assessment indicate NSF is successful in meeting this goal. [7]

FY 1999 Result: *Successful.* **In FY 1999, 36 COV reports and 8 AC reports rated this goal. 33 COV's and 5 AC's rated NSF successful in achieving all or most areas of the goal. Four COV reports and 2 AC reports qualify their rating by indicating that NSF should do more in the area of showing increased participation of underrepresented groups.**

Exceptionally strong performance is characterized by recognition of scientists or engineers who received NSF support during their training; and when the production of degree recipients in science, mathematics, and engineering increases markedly for underrepresented groups.

FY 2000 Resources Supporting Achievement of the Successful Level of Performance:

- The Research Project Support, Research Facilities, and Education and Training key functions all contribute to attaining this outcome goal.[8]
- Within the Research Project Support the Research Experiences for Undergraduates (REU) and Faculty Early Career Development (CAREER) programs are designed to address this goal. In FY 2000, REU will increase by $1.5 million to $37 million, and CAREER will increase by $5.4 million to $98 million.
- Funds supporting research assistants (both undergraduate and graduate) and postdoctoral researchers have a less direct, but noticeable effect on this performance goal.
- Within Education and Training, funding for the Integrative Graduate Education and Research program increases by $1.7 million to $29 million for graduate and postdoctoral activities.
- NSF investments in support of workforce development are based on good information on demographics of the current workforce, the future needs of the public and private sectors for the workforce, and, where appropriate, on valid research on teaching and learning.

FY 2000 Areas of Emphasis:

NSF's activities under the theme of Educating for the Future (an increase of $25 million on a base of about $400 million) describe several areas of emphasis focused on developing the science and engineering workforce.

Providing *opportunities for participation in integrative research and education experiences* is one of NSF's key investment strategies for addressing this outcome goal. In order to influence the development of integrated approaches, NSF has developed a number of programs intended to synergize the integration of research and education. The most prominent of these programs are the CAREER, REU, and IGERT programs. Each of these is aimed at catalyzing new efforts and supporting on-going efforts within academe to more effectively integrate research and education. They are supported in all Directorates. All advisory committees will assess the activities of the directorates they advise in the CAREER and REU programs, examining results of past investments and the level and quality of current investments. IGERT is a newer program that was undertaken in response to a National Science Board recommendation that

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[7] During FY 1998 11 of the 14 COV reviews held included new processes to assess NSF's performance. While each addressed GPRA they did not use the same mechanism and a number of reports are still outstanding. However, of the five reports reviewed to-date, performance for this goal was deemed as successful.

[8] This is an example of how NSF resources may serve multiple purposes. In general, resources provided through the Research Project Support and Research Facilities key functions are not directed at serving this goal, but they influence its achievement. Likewise, the higher education components of Education and Training serve this goal most directly, but the K-12 and informal education activities also have an impact in the quality of the students entering higher education.

NSF experiment with alternative forms of graduate student support and training. It builds on earlier investments in the BIO and EHR directorates. All directorates will address the quality of the current set of awards. The BIO and EHR advisory committees will also assess the results of past related investments and provide guidance on NSF's implementation of IGERT.

The three programs addressed above, along with NSF-supported centers, are key elements of NSF's efforts to *increase the participation of underrepresented groups in integrative research and education experiences.* The program announcements ask proposers to address how the activity proposed will impact diversity in the science and engineering workforce, and participation by members of underrepresented groups is strong. All directorate advisory committees will be asked to include an assessment of the impact of past activities on participation of underrepresented groups and the extent to which the current portfolio can be expected to have an impact on increasing participation.

See Appendix 2 for additional information and performance goals relative to these two areas of emphasis.

Means and Strategies for Successful Performance:

- NSF works toward this outcome goal by using the merit review process to make awards for research and education activities that influence development of the science and engineering workforce, both directly and indirectly.
- Factors leading to priority for allocation of resources to directorates include potential for impact on the science and engineering workforce.
- Key investment strategies for addressing the outcome goal underlying this performance goal are found in the relevant section of the NSF GPRA strategic plan. Those particularly important to development of FY 2000 plans and use of resources are described in the main text of the performance plan. Appendix 2 lays out performance goals for investment processes that support these strategies.
- Means and strategies supporting integration of research and education and increasing diversity in the science and engineering workforce are described in Appendix 2. These strategies are particularly important in development of the workforce.
- NSF encourages participation of students on international projects. More targeted approaches to enhancing the global awareness of the science and engineering workforce are planned for future years.
- Impact on the developing workforce is an element in the merit review criteria used in the decision process.
- Quality of decision process and award portfolio is fundamental to the performance evaluation of program staff. Attention to all relevant merit review criteria is a factor in the quality of the decision process.
- NSF communicates with staff and the community with respect to outcome goals, investment strategies, and expectations for the set of awards.
- Regular reporting requirements for all awards help program staff understand the outputs and outcomes of their portfolio and provide context for decisions on new awards.

External Factors that Affect Performance:

- General factors affecting performance are described in the introduction to this appendix.
- NSF provides very little of the overall investment of the development of the science and engineering workforce. Meeting the outcome goal in the long term implies a gradual change in process and philosophy of educating the workforce. Meeting the performance goal implies a commitment on the part of institutions and their faculties to enhancing the diversity of the science and engineering workforce and to providing a broader range of educational opportunities.

Cross-Cutting Areas with Other Agencies:

- Many other agencies support research and education activities in academic institutions, usually with a mission orientation. Their activities contribute to developing the workforce in science and engineering, both directly and indirectly. Most work indirectly through support of research assistants. The National Institutes of Health, Department of Education, and Department of Defense have dedicated fellowship or traineeship activities for graduate education.
- See Appendix 2 for a discussion of cross-cutting activities related to integration of research and education and enhancing diversity in the workforce.

<u>Outcome Goal 4</u>: Improved achievement in mathematics and science skills needed by all Americans

Performance Indicators: models and practices to improve achievement, teacher training, teacher classroom work, and student achievement.

FY 2000 Performance Goal: NSF's performance toward this outcome goal is successful if NSF awards lead to the development, adoption, adaptation, and implementation of effective models, products, and practices that address the needs of all students; well-trained teachers who implement standards-based approaches in their classrooms; and improved student performance in participating schools and districts. NSF's success toward meeting this goal is judged by external independent experts

Baseline: There is no formal baseline at present. Preliminary efforts to pilot the use of expert judgement in performance assessment either did not address this performance goal or did so in the context of a small base of program activity. The extensive reporting and evaluation elements for Education and Human Resources (EHR) programs provide information that indicates successful progress, but this information needs further assessment before yielding a valid baseline.

FY 1999 Result: *Successful.* In FY 1999, 19 COV reports and 3 AC reports rated NSF for this goal. Of these, 15 COV's and 3 AC's rated NSF successful in achieving this goal in all or most areas of the goal. Three COV reports indicated NSF was not fully successful in some areas of the goal. This goal is viewed by many COV's as more applicable to NSF's educational activities, and therefore rated it only when applied to those programs seen as relevant to this goal.

Exceptionally strong performance is characterized by awards that lead to high impact development, adoption, adaptation, and implementation of effective models, products, and practices that extend beyond the period of NSF investment or beyond the scope of NSF award sites; generate novel approaches with high potential to improve and change the education process; or are associated with significant improvement in student performance.
FY 2000 Resources Supporting Achievement of the Successful Level of Performance:

- This outcome goal is primarily supported through the Education and Training key function, which increases by $22 million to $704 million in FY 2000.[9]
- NSF's activities under the theme of Educating for the Future (an increase of $25 million on a base of about $400 million) describe several areas of emphasis focused on improving achievement in mathematics and science skills.

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[9] The K-12, informal education, and research components of this key function have the most direct impact on this performance goal.

FY 2000 Areas of Emphasis:

The FY 2000 government-wide performance plan contains a performance goal that is particularly relevant to the advisory committee assessments of performance in this area. It is related to NSF's systemic activities in K-12 education. At the start of the decade, NSF initiated major programs for the systemic reform of science, mathematics, engineering, and technology education. Based on the belief that all students can learn and achieve in science and mathematics at much higher levels than then obtained, systemic projects treat whole systems and build much-needed educational capacity at state, urban, rural, school district, and school levels. These projects are unique in their involvement of broad partnerships and development of comprehensive goals, solutions, and actions.

Performance Goal: Over 80 percent of schools participating in a systemic initiative program will (1) implement a standards-based curriculum in science and mathematics; (2) further professional development of the instructional workforce; and (3) improve student achievement on a selected battery of tests, after three years of NSF support.

FY 1999 Result: In 1999, 40 NSF-sponsored projects implemented mathematics and science standards-based curricula in over 81 percent of participating schools, and provided professional development for more than 156,000 teachers. All participating educational systems demonstrated some level of improvement in student achievement in mathematics and science on a battery of system-selected assessment instruments.

This performance goal has a quantitative form that could be addressed without the use of the advisory committee process. However, it will be addressed through the EHR advisory committee so that there will be an assessment of quality as well.

Performance Goal: Through systemic initiatives and related teacher enhancement programs, NSF will provide intensive professional development experiences annually for at least 65,000 precollege teachers.

FY 1999 Result: ***In FY 1999, systemic initiatives and related teacher enhancement programs provided intensive professional development to a total of 82,400 teachers, exceeding the goal of 65,000.***

Research on Learning and Education, an element of EFF, was given high priority in the report of the President's Committee of Advisors in Science and Technology on the Use of Technology to Strengthen K-12 Education in the United States (March 1997). NSF, in partnership with the Department of Education, will build on past investments in this area in FY 1999 and will continue joint activities in FY 2000. While all directorates will participate in this effort, the EHR advisory committee will be asked to provide an assessment of the new investments for NSF as a whole.

The *NSF Graduate Teaching Fellows in K-12 Education* places graduate and undergraduate students in K-12 schools to serve as science and mathematics content resources for teachers. This continues a FY 1999 innovative pilot effort that provides much needed expertise to support high-quality learning and also exposes graduate and undergraduate students to the needs of K-12 education. This is part of a comprehensive approach to workforce development that reaches from grade school through graduate school.

The development of the *National Science, Mathematics, Engineering, and Technology Education Digital Library* will be accelerated in FY 2000. This national resource will increase the quality, quantity, and comprehensiveness of internet-based K-16 educational resources. This virtual facility will link students, teachers, and faculty, and provide broad access to standards-based educational materials and learning tools for schools and academic institutions nationwide.

Means and Strategies for Successful Performance:

- NSF works toward this outcome goal by using the merit review process to make awards for research and education activities that influence math and science achievement, both directly and indirectly.
- Factors leading to priority for allocation of resources to directorates include potential to improve achievement in math and science skills.
- Key investment strategies for addressing the outcome goal underlying this performance goal are found in the relevant section of the NSF GPRA strategic plan. Those particularly important to development of FY 2000 plans include systemic approaches, attention to teacher preparation and development, partnership with other agencies, digital libraries, graduate teaching fellows as content resources in K-12 schools, and developing a strong research base for use by practitioners.
- NSF activities must be developmental and catalytic, given the small fraction of total resources in K-12 education represented by NSF's funding.
- Quality of decision process and award portfolio is fundamental to the performance evaluation of program staff. Attention to all relevant merit review criteria is a factor in the quality of the decision process.
- NSF communicates with staff and the community with respect to outcome goals, investment strategies, and expectations for the set of awards.
- Regular reporting requirements for all awards help program staff understand the outputs and outcomes of their portfolio and provide context for decisions on new awards.
- Rigorous evaluation activities support management of all K-12 education programs.

External Factors that Affect Performance:

- General factors affecting performance are described in the introduction to this appendix.
- NSF provides very little of the overall investment in K-12 education. Meeting the outcome goal for the long term implies a gradual change in structure of education in math and science. Meeting the performance goal implies a commitment on the part of school districts, schools, and their faculty to modifying their approaches to education in order to enhance achievement and availability of resources to do so.

Cross-Cutting Areas with Other Agencies:

- The President's Council of Advisors in Science and Technology has made recommendations with respect to establishing a strong research base for education and learning, particularly in investigation of the role of learning technologies. NSF and the Department of Education have worked to establish a joint research activity to address those recommendations.
- Results from the TIMSS report led to a call for developing an interagency action strategy to optimize the effectiveness of federal funding aimed at increasing achievement in math and science. NSF and the Department of Education shared responsibility for developing and implementing the strategy. Other agencies participated in the process, but none have extensive programmatic activities aimed at K-12 education.

Outcome Goal 5: **Timely and relevant information on the national and international science and engineering enterprise.**

NSF's provision of information on the national and international science and engineering enterprise is a customer-oriented activity, centered in the Division of Science Resources Studies (SRS). Funding is provided through the Education and Training key function. The performance goals for this activity aim for improved quality through enhanced timeliness and enhanced attention to data quality measures.

Timeliness

In a recent survey, a sample of the science and engineering policy community indicated that improving timeliness of data was high priority for them.

Performance Indicator: Average time interval between reference period (the time to which the data refer) and reporting of data.

FY 2000 Performance Goal: 486 days.   Baseline: 540 days in 1995-1996.

FY 1999 Result: *Successful.* Both the timeliness and the relevance goals were achieved. The relevance goal has been replaced by the data quality goal in FY 2000.

Comment:
- FY 1999 performance goal was identical
- Performance is measured as a two-year moving average of the number of days between the end of the data reference period and the public availability of data (usually electronic dissemination) for surveys SRS supports. In FY 2000, performance for FY 1999-2000 will be reported.
- Means for achieving success: Taking advantage of advances in information and communications technologies; regular reporting of status to give ample time to take action to improve performance.
- Cross-cutting areas with other agencies: Many other agencies provide statistical information. At intersection of responsibilities, NSF cooperates with other agencies, rather than duplicate surveys. The performance goal refers only to data reported through the eleven core surveys that SRS supports, but SRS will calculate and report comparison numbers for data it reports from surveys sponsored by other federal agencies and other organizations.
- Data are maintained by SRS.

Data Quality

The value of information on the science and engineering enterprise is highly dependent on its ability to address issues of importance to those who seek to use it in making policy decisions. Measures of data quality help users determine the reliability of the information and the extent of likely variance introduced by sampling processes.

Performance Indicator: Data quality measures and their use in SRS products.

FY 2000 Performance Goal: Establish a standard set of data quality measures for reporting of Science Resources Studies products. Prepare reports on these measures for all SRS surveys and publish them in electronic formats to inform users of SRS data quality.

Baseline: This is a new effort to provide standard measures. Their absence places limits on the usefulness of surveys.

Comment:
- Related FY 1999 performance goal dealt with customer measures of relevance. Data quality is one factor in addressing relevance.
- Means for achieving success: Staff are working to develop a standard set of data quality measures; once in place, procedures will be established to ensure the appropriate information is provided electronically for all surveys.
- Cross-cutting areas with other agencies: Value of the data quality measures is enhanced when similar data are handled in similar ways. Staff will contact relevant statistical arms in other agencies in development of the standard set of measures.
- Information to establish performance toward this goal will be maintained by SRS.

APPENDIX 2

PERFORMANCE GOALS FOR THE NSF INVESTMENT PROCESS

The following sections provide information about the means and strategies NSF uses in support of its outcome goals and articulates performance goals for the investment process by which NSF shapes its portfolio of awards. In FY 2000, NSF will invest $3.9 billion in these areas.

Proposal and Award Processes

NSF's role in achieving its outcome goals for research and education is implemented through program officer selection of projects from among those submitted by the scientific community. The scientists and engineers comprising NSF's program staff take NSF priorities and the advice of the external reviewers into account in developing their portfolio of awards.

Means and strategies for high quality proposal and award processes that support achievement of the outcome goals and meet customer expectations:
- Provide staff resources needed to manage proposal and award processes (see table on page 5 in the main document for planned staff resources in FY 2000).
- Provide electronic information systems that support the processes (systems enhancements expected in FY 2000, as per budget request).
- Provide administrative guidance/requirements that reflect the imperatives of high quality processes.
- Provide needed oversight of management to ensure guidance/requirements are met.
- Provide needed operating expenses to ensure credible processes (see budget request).
- Work with the science and engineering community to provide high quality external review of NSF proposals.

Cross-cutting areas with other agencies and institutional partners:
- NSF is an active participant with other agencies in the Federal Demonstration Partnership, a joint effort of government and academe to address commonality of processes and reporting requirements to facilitate federally funded research and education activities in academe.

Use of merit review.

Performance Indicator: Percent of NSF funds allocated to projects reviewed by appropriate peers external to NSF and selected through a merit-based competitive process.

FY 2000 Performance Goal: 90%.   **Baseline: 89% in FY 1997; 90% in FY 1998.**
                                        FY 1999 Goal: 90%. FY 1999 Result: 95%.

Comments:
- Performance goal is identical to that in FY 1999.
- Projects meeting the criteria for inclusion within the 90% include contracts selected through merit-based, competitive contracting procedures; FFRDCs that undergo external merit review in the process of renewal, even though they may not have direct competition; and continuing grant increments and supplements for projects reviewed in prior years.
- NSF makes a few exceptions to its general requirement for external merit review. These include situations in which objective external reviewers may be difficult to find, when natural phenomena such as volcanic eruptions or earthquakes make an external review process for proposals to study them too lengthy, or when researchers are proposing such new ideas that knowledgeable external reviewers may not exist.
- Data come from NSF's Enterprise Information System.

Implementation of Merit Review Criteria

NSF's generic review criteria were recently reviewed and revised by the National Science Board. Implementation of those criteria is an important, immediate goal in the merit review/project selection process, in order to better support the outcome goals for research and education, as noted in NSF's GPRA strategic plan.

Performance Indicator: Use of merit review criteria by reviewers and program staff.

FY 2000 Performance Goal: NSF performance in implementation of the new merit review criteria is
- **successful when reviewers address the elements of both generic review criteria appropriate to the proposal at hand and when program officers take the information provided into account in their decisions on awards.**

Baseline: New criteria went into effect in FY 1998. External expert judgment will assess performance. The process will be used for the first time during FY 1999.

FY 1999 Result: *Largely successful, needs some improvement.* In FY 1999, two new merit review criteria replaced four existing criteria. For FY 1999, COV's and AC's were asked to use the alternative format to judge how well NSF is implementing the new criteria. In FY 1999, a total of 38 COV reports and 5 AC reports rated NSF programs on their use of the new merit review criteria. NSF was rated successful in achieving this goal by 33 COV's and 3 AC's. In most cases where NSF was not fully successful, it was found that reviewers and applicants were not fully addressing both review criteria.

Comment:
- Data: NSF will use the directorate[1] advisory committees to monitor this performance goal, as they will the performance goals for research and education outcomes. The advisory committees and their subcommittees will address questions on implementation of the new merit review criteria using the samples of reviews and staff analysis that they routinely examine in their judgment of the effectiveness and fairness of the review process. As part of the request to these committees, NSF will ask that they describe in their reports the samples and evidence they used to come to their judgments.
- Means for achieving success: NSF has modified program announcements to encourage proposers to provide information on all relevant aspects of the merit review criteria. Program staff will work with reviewers to stress the importance of addressing both merit review criteria. Performance plans for program staff will include elements related to implementation of merit review criteria.

Customer Service -- General

During FY 1999, NSF volunteered to participate with 30 other agencies in a national assessment of customer satisfaction sponsored by the President's Management Council and the National Partnership for Reinventing Government. The survey, which uses the American Customer Satisfaction Index (ACSI) to gauge results, provides useful information about the impact of NSF's methods and processes on the scientists, engineers, and educators who apply for NSF grants.

The ACSI survey team interviewed a random sample (n=260) of NSF grant applicants in FY 1998 (N=28,000) -- both awardees and declinees. Approximately 68% of the applicants interviewed submitted proposals that were declined by NSF. This is consistent with NSF's overall proposal funding rate.

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[1] NSF conducts most of its business through eight programmatic organizations, the directorates for Biological Sciences, Computer and Information Science and Engineering, Education and Human Resources, Engineering, Geosciences, Mathematical and Physical Sciences, and Social, Behavioral and Economic Sciences and the Office of Polar Programs. For convenience, these are termed directorates for the remainder of the appendix.

The Foundation's ACSI results indicate that NSF grant applicants generally hold NSF in high regard and give it high marks for the accessibility and usefulness of its information. However, the NSF received only mid-level evaluations for its merit review process and for its handling of customer complaints. NSF believes that there is room for improvement and that several factors can be addressed in FY 2000.

Performance Indicator: Results of NSF applicant surveys

FY 2000 Performance Goal: Identify possible reasons for customer dissatisfaction with NSF's merit review system and with NSF's complaint system.

Performance Indicators: Develop models of best practices; train NSF staff, where appropriate

FY 2000 Performance Goal: Identify best practices and training necessary for NSF staff to conduct merit review and answer questions about the review criteria and process. Identify best practices and training necessary for NSF staff to answer questions from the community and to deal with complaints in a forthright manner.

Performance Indicator: Results of the ACSI

FY 2000 Performance Goal: Improve NSF's overall ACSI index compared to the FY 1999 index.

Baseline: 57 (on a scale of 0-100) in FY 1999

Comment:
- This is a new goal for FY 2000.
- Means and Strategies:
    - NSF plans to conduct additional surveys of applicants to confirm the results of the ACSI and to get more detailed information on specific issues related to merit review and customer interaction. The results of these surveys will help focus our efforts to improve service in these areas.
    - NSF is identifying effective practices for handling of customer complaints within NSF and in other organizations with similar customer interactions. The Foundation will disseminate information about these effective practices throughout the agency, identify promising models for customer service systems both inside and outside NSF, and pilot the best of these models in NSF divisions beginning in FY 2001.

Customer Service – Proposal Preparation and Time to Decision

In 1995, NSF adopted a set of customer service standards, primarily related to the proposal review process, treating grantees and potential grantees (*applicants*) as the primary *customers* for NSF's administrative processes. In a survey, applicants valued three standards most highly: (1) clear guidelines for proposal content and preparation, (2) a minimum of three months between program announcements and proposal deadlines, and (3) notification of proposal funding recommendation within six months of proposal submission. The survey measured baseline levels of customer satisfaction, with reference to FY 1995 experiences. A national assessment of customer satisfaction in FY 1999 surveyed FY 1998 grant applicants. Customer service has a potential impact on the number and quality of proposals received and thus on NSF's ability to meet all outcome goals.

For this performance plan, we focus on two of these standards; ones NSF staff have devoted special attention to since the standards were adopted.

Customer Service - Time to Prepare Proposals

Customer Service Standard: Make program announcements and solicitations available to relevant individuals and organizations at least three months prior to the proposal deadline or target date.

Performance Indicator: Percent of program announcements and solicitations available at least three months prior to proposal deadlines or target dates.

FY 2000 Performance Goal: 95% **Baseline: 80% in FY 1997; 66% in FY 1998[2]**
FY 1999 Goal: 95%. FY 1999 Result: 75%.

Comment:
- Means for achieving success: NSF staff work toward this performance goal by limiting the number of special competitions requiring individual program announcements and solicitations, planning for such competitions as far in advance as possible, and initiating clearance processes at least six months prior to the anticipated proposal deadlines.
- Data: NSF maintains records of timing between announcement and deadline. Timing begins when the announcement is placed on the Web for public information.

Customer Service - Time to Decision

Customer Service Standard: For 95 percent of proposals, be able to tell applicants whether their proposals have been declined or recommended for funding within six months of receipt.

Performance Indicator: Percent of proposals processed within six months of receipt.

FY 2000 Performance Goal: 70% **Baseline: 61% in FY 1997; 59% in FY 1998**
FY 1999 Goal: 70%. FY 1999 Result: 58%.

Comment:
-
- For activities with deadline or target dates for receipt of proposals, the stated deadline or target date is set as the date of receipt for purposes of evaluating performance toward the standard.
- Processing proposals within six months of receipt has been a challenging goal for NSF, and we are therefore scaling annual performance targets to reach the customer service standard by FY 2004.
- This customer service standard is applicable to research project support and education and training. The proposal process for research facilities is more extended due to the nature of the projects.
- Means for achieving success: NSF staff work toward this performance goal by making effective use of electronic mechanisms in conducting the review, working cooperatively to eliminate overloads and bottlenecks, and keeping careful track of the stage of processing and age of all proposals.
- Data: Maintained in NSF's proposal and award systems.

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[2] Different mechanisms were used to establish the baselines. The FY 1997 baseline was manually calculated while the FY 1998 baseline was system generated.

Maintaining openness in the system.

NSF must continually keep the proposal and award process open to new people and new ideas.

Performance Indicator: Percent of competitive research grants going to new investigators

FY 2000 Performance Goal: 30%   **Baseline: 27% for FY 1997; 27% for FY 1998**
                                                       FY 1999 Goal: 30%. FY 1999 Result: 27%.

Comment:
- In the early 1990's, NSF had percentages approximating 30 percent of all competitive research grants[3] going to new investigators. The percentage dropped over the mid-1990's and is now rising slightly. NSF's FY 1999 performance goal is to raise that to 30%. The FY 2000 goal is to maintain that level.
- Means for achieving success: Program staff will examine trends over time for both their own programs and the Foundation and establish target levels for the projects they support that are appropriate to the Foundation meeting its performance goal.
- Data: Maintained in NSF's proposal and award systems.

Integration of Research and Education

Integrating research and education appears as part of the investment strategies supporting all of the outcome goals for education and research as described in NSF's GPRA strategic plan. NSF expects to see continuous improvement in the extent to which its research and education functions are accomplished jointly. The long term objective is two-fold: (1) to renew the strong interaction between federally-funded academic research and the development of the science and technology workforce that has characterized the U.S. science and engineering enterprise; and (2) to draw academic scientists and engineers into the challenge of improving K-12 education. We want to see all our awardees pay conscious attention to their effectiveness as both researchers and educators.

Means and strategies for reaching these objectives include:
- Including attention to integration of research and education as one of the elements of merit review criteria.
- Developing and increasing funding for specialized programs designed to effect the integration of research and education (Research Experiences for Undergraduates, Integrative Graduate Education and Research Training, and Faculty Early Career Development).
- Recognition awards to create a set of exemplary activities (FY 1997 and FY 1998).
- Requiring that centers and facilities use their increased visibility and size to enhance the integration of research and education.
- Meetings of awardees to obtain information on what works to share with the community.
- Encouraging all proposers to include information on plans for integrating research and education in their proposals, using outreach efforts and program announcements (FY 1999 performance goal).
- Working with reviewers to ensure they address these issues in reviews.
- Working with staff to ensure they address these issues in decision analyses and in developing award budgets.
- Measuring progress in proposals and reviews; in decision analyses; and in award budgets.
- Providing resources needed to undertake activities aimed at integration of research and education.

Cross-cutting activities with other agencies:
- The President issued a Presidential Review Directive in 1996 asking the National Science and Technology Council to review the government/university partnership. One preliminary conclusion of

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[3] The category of research grants is a subset of awards in the research project support key area that focuses on awards to individual investigators and small groups.

this review is the importance of strengthening the integration of research and education. NSF expects to work with other agencies as appropriate to implement the associated recommendations.

- NSF selects its candidates for the Presidential Early Career Award for Scientists and Engineers from among awardees in the Faculty Early Career Development program, one of those designed to increase integration of research and education.
- Many NSF centers and facilities have partnerships with related activities at other agencies. This provides an opportunity for other agencies to assist in and benefit from integration of research and education.

Proposer Attention to Integration of Research and Education

NSF's generic merit review criteria address the extent to which proposals will advance discovery and understanding while promoting teaching, training, and learning and vice versa. At present, many proposers do not include information that would permit reviewers to address this element. To embed integration of research and education in all aspects of NSF activities NSF now has language in all program announcements encouraging proposers to discuss this aspect of their activity in proposals (FY 1999 performance goal). However, no explicit instructions have been issued to proposers. In addition, no system is currently in place to require reviewers to address this issue, nor is there a readily available mechanism for NSF to use to ascertain whether principal investigators and reviewers are performing as expected.

Performance Indicator: Outreach to community; implementation of system to verify that PI's address the integration of research and education in proposals.

FY 2000 Performance Goal: Develop a plan and system to request that Principal Investigators (PI's) address the integration of research and education in their proposals, and develop and implement a system to verify that PI's have done so.

Baseline: Under development.

Comment:
- This performance goal is applicable to the Research Project Support key program function.
- Means and strategies for success: On September 20, 1999, NSF issued Important Notice #125 to Presidents of universities and colleges, encouraging PI's to address merit review criterion #2 – the broader impacts of the proposed activity – in their proposals and reviews. NSF will continue working with the scientific community to encourage their attention on this area.
- Data: In order to minimize the burden of collecting information, NSF will develop a methodology to systematically sample the data using proposals submitted electronically to enable the use of search software.
- Baseline: NSF will develop key words for search purposes and will begin testing during FY 2000 to establish a baseline.

Reviewer Attention to Integration of Research and Education

Once proposers include information on their plans for integration of research and education, reviewers will be able to address those plans in their reviews. The majority of the 17 Committees of Visitors in FY 1999 reported that merit review criterion #2 -- broader impacts of the proposed activity -- had not been sufficiently addressed in the review process.

Performance Indicator: Outreach to community; implementation of system to track reviewer comments.

FY 2000 Performance Goal: Develop and implement a system/mechanism to request and track reviewer comments tied to merit review criterion #2, "what are the broader impacts of the proposed activity?".

Baseline: Under development.

Comment:
- This performance goal is applicable to the Research Project Support key program function.
- Means and strategies for success: On September 20, 1999, NSF issued Important Notice # 125 to Presidents of universities and colleges, encouraging PIs to address merit review criterion #2 -- the broader impacts of the proposed activity -- in their proposals and reviews. NSF will continue working with the scientific community to encourage their attention on this area. This will give reviewers more reason to address the issue.
- Data: In order to minimize the burden of collecting information, NSF will develop a methodology to systematically sample the data using reviews submitted electronically to enable the use of search software.
- Baseline: NSF will develop some key words for search purposes and will begin testing during FY 2000 to establish a baseline.

Diversity

In 1980, legislation gave NSF explicit responsibility for addressing issues of equal opportunity in science and engineering. This assignment of responsibility reflected the serious underrepresentation of women, minorities, and persons with disabilities in the science and engineering workforce. Recognizing that progress toward all outcome goals for research and education requires maximal diversity of intellectual thought, NSF is emphasizing attention to enhancing the participation of groups currently underrepresented in science and engineering, including women, underrepresented minorities, and persons with disabilities, in all its programs. The long-term objective is to have a science and engineering workforce that mirrors the U.S. population.   This performance goal applies to all key program functions.

Means and Strategies:
- Including attention to promoting diversity as one of the elements of merit review criteria.
- Developing and increasing funding for specialized programs designed to promote diversity.
- Work to embed enhancing diversity in all NSF programs.
- Focus on developing new entrants to the workforce.
- Creating a set of exemplary activities.
- Asking that centers and facilities use their increased visibility and size to promote participation of underrepresented groups and to create ties to minority serving institutions.
- Meetings of awardees to obtain information on what works to share with the community.
- Encouraging all proposers to include information on plans to promote diversity in their proposals, using outreach efforts and program announcements (FY 1999 performance goal).
- Working with reviewers to ensure they address these issues in reviews.
- Working with staff to ensure they address these issues in decision analyses and in developing award budgets.
- Measuring progress in proposals and reviews; in decision analyses; and in award budgets.
- Providing resources needed to undertake activities aimed at mentoring or other methods of increasing diversity.

Cross-cutting activities with other agencies:
- NSF manages the Presidential Award for Excellence in Mentoring in Science and Engineering on behalf of the Executive Office of the President. Award ceremonies involve other agencies, and many awardees draw resources from other agencies.
- NSF plays a leading role in the Interagency Working Group on the U.S. Science and Technology Workforce of the Future of the National Science and Technology Council's Committee on Science.

The group is looking at mechanisms to optimize the effect of the federal investment in the developing workforce, with emphasis on increasing participation of underrepresented groups.

- NSF and all other agencies participate in government-wide efforts to address the needs of minority-serving institutions.
- Many NSF centers and facilities have partnerships with related activities at other agencies. This provides an opportunity for other agencies to assist in promoting diversity.

Diversity of NSF Applicants

Diversity is important to ensuring the future supply of scientists and engineers, but must be obtained through an open system that encourages participation and removes barriers, rather than through establishing "quotas." NSF is committed to the principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

NSF's generic merit review criteria address how well the proposed activity broadens the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic). However, the majority of the COVs in FY 1999 reported that merit review criterion #2 -- broader impacts of the proposed activity -- had not been sufficiently addressed either in proposals or in the review process.

Efforts in FY 2000 will focus on ways to increase the total number of research and education grant proposals submitted from underrepresented groups.

Performance Indicator: Mechanisms to attract proposals from members of underrepresented groups in order to increase the total applicant pool; mechanisms to retain the applicant pool.

FY 2000 Performance Goal: In FY 2000, NSF will identify mechanisms to increase the number of women and underrepresented minorities in the proposal applicant pool, and will identify mechanisms to retain that pool.

Baseline: Under development

Comment:
- This goal is relevant to portions of the Research Project Support and Education and Training key program functions.
- Means and strategies for success: On September 20, 1999, NSF issued Important Notice # 125 to Presidents of universities and colleges, encouraging PIs to address merit review criterion #2 -- the broader impacts of the proposed activity -- in their proposals and reviews. Proposers are encouraged to describe plans for increasing participation of underrepresented groups, and reviewers are encouraged to take these plans into account. NSF will continue working with the scientific community to encourage their attention to this area. Additional outreach efforts to the research and education community will be identified in FY 2000 to encourage more grant applicants from underrepresented groups. NSF will continue to ask program officers to include diversity as an aspect of decision analysis.
- Data and Baseline: Data to establish the baseline number of proposers from underrepresented groups will come from NSF's Enterprise Information System.

Facilities Oversight

The performance goals listed under this heading are applicable to the Research Facilities key program function.

The following comments are relevant to all goals in this section.

Means and Strategies:
- Careful planning ensures that construction and operating plans are realistic and contain needed contingency funds.
- NSF program officers will work closely with the project directors to ensure that the performance goals can be met.
- Where potential problems are identified, the program officer will immediately inform the NSF-wide team assigned to that project so that all appropriate actions can be taken to keep construction projects within cost and schedule and to maintain operating schedules to the extent possible.
- External factors such as extremely adverse weather or failure of partners to act as planned can have a significant effect on construction projects and operating plans.

Data:
- NSF staff has developed a common template for reporting needed information that is being used to develop baselines.
- This will be linked to the Project Reporting System, with project managers entering the information.

Cross-cutting Activities with Other Agencies and Countries:
- NSF consults with other agencies to optimize capabilities available to American researchers with no inappropriate duplication and cooperates with other agencies in construction of facilities where it will facilitate use across broad communities of researchers.
- NSF manages facilities in the Antarctic that are used by all federal agencies for selected projects.
- Many major facilities involve international cooperation.

Construction and Upgrade of Facilities

NSF puts a high premium on professional initial planning for construction and upgrade of facilities. But any planning for unique, state-of-the-art facilities must take into account the exploratory nature of the facilities themselves. Such facilities stretch the limits of technological capability.

Every year, in the President's Budget Request, NSF sets out a cost plan and schedule for major construction and upgrade projects currently underway or planned for initiation in the Major Research Equipment account. NSF has established performance goals and measurements with respect to these plans and expects each construction and upgrade activity to meet these performance goals.

Performance Indicator: Comparison with planned annual cost

FY 2000 Performance Goal: Keep construction and upgrades within annual expenditure plan, not to exceed 110 percent of estimates.

Baseline: FY 1999 Result: majority of facilities were within 110% of annual spending estimates.

Performance Indicator: Comparison with planned annual schedule

FY 2000 Performance Goal: Keep construction and upgrades within annual schedule, total time required for major components of the project not to exceed 110 percent of estimates.

Baseline: FY 1999 Result: majority of facilities were on schedule.

Performance Indicator: Comparison with planned total cost.

Performance Goal: For all construction and upgrade projects initiated after 1996, when current planning processes were put in place, keep total cost within 110 percent of estimates made at the initiation of construction.

Baseline: FY 1999 Result: no projects completed.

Operations and Management of Facilities

Facilities must operate efficiently and reliably and must offer appropriate opportunities, if they are to be valuable to those they serve. NSF program officers work closely with facilities' directors to ensure that facilities have appropriate resources to conduct operations and to provide maintenance that ensures reliable operations.

Performance Indicator: Comparison to scheduled operating time.

Performance Goal: Keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.

Baseline: FY 1999 Result: substantial majority of facilities were operating efficiently.

Comment:
- Data: Performance is measured as the average percentage among all facilities of full capacity "user units" lost during the year to breakdowns or other circumstances considered within the control of the facilities. The average across facilities is used in this instance because, although there should be latitude for some facilities to be run at greater failure rates with good reason, those facilities should be balanced by others operating more reliably. User units are defined separately for each facility, and are typically user-hours or something similar.

APPENDIX 3

PERFORMANCE GOALS FOR MANAGEMENT

Excellence in managing the agency's processes is a NSF goal on a par with our mission-oriented outcome goals. In the GPRA strategic plan, NSF articulated four critical factors in managing for excellence that provide the framework for annual performance goals.

- Operating a viable, credible, efficient merit review system;
- Exemplary use of and broad access to new and emerging technologies;
- A diverse, capable, motivated staff that operates with integrity; and
- Implementation of mandated performance assessment and management reforms in line with agency needs.

Performance goals related to the merit review system, given their role in NSF investment processes, have been addressed in Appendix 2. The following performance goals for FY 2000 represent key indicators that NSF is managing its centrally funded and coordinated administrative activities efficiently and effectively in support of its mission. NSF has chosen to emphasize performance goals related to implementation of information technologies and human resources development in FY 2000. These performance goals are largely accomplished through the Administration and Management key function.

New and emerging technologies

A state-of-the-art communications and technology infrastructure has been essential to NSF's success in managing an increasing workload with approximately level resources. This investment also provides incentives in recruitment and retention of high quality employees.

Means and strategies:
- Continuing experimentation with new means to do business electronically;
- Active leadership among federal agencies in doing business electronically;
- Active leadership in government/university forums for addressing business practices;
- Appropriate use of contractors to bring needed expertise to bear on systems development;
- Testing in contained situations;
- Training for staff;
- Development of implementation plans involving all parts of NSF and issuance of important notices to institutions;
- Movement from mainframe to client server operation; and
- Movement to full implementation in cooperation with proposers, reviewers, staff.

Cross-cutting activities with other agencies:
- Participation in interagency activities to develop a common approach to doing business electronically.
- Cooperation with other agencies in the Federal Demonstration Partnership.

Electronic proposal submission

The research and education communities have worked with NSF staff to build our Web-based interface with grantee institutions, called FastLane. Each FastLane module has gone through a phase of expanding use. The most complex use of FastLane is for the submission of full technical proposals. NSF is the only federal research agency currently receiving proposals electronically on a production basis. In fact, electronic submission is the preferred mode at NSF.

Performance Indicator: Percent of full proposal submissions received electronically through FastLane.

FY 2000 Performance Goal: 60%   **Baseline: 4.4% in FY 1997;**
                                         17.5% in FY 1998
                                         44.0% in FY 1999

Comment:
- Based on very preliminary input from test phases, the FY 1999 performance goal was initially set at 10%. This was modified to 25% once good figures were established for FY 1998.
- Means for achieving success: The performance goal will be met through a combination of increasing user friendliness of the system and programs requiring submission through FastLane and stronger efforts to encourage such submission. Enhanced staff training will enable NSF staff to use the FastLane modules effectively. Additional resources are requested for FY 2000.
- Beginning in FY 2001, NSF will require proposal submission through FastLane.
- Approximately 18,200 proposals need to be handled through this route to meet the FY 2000 goal.
- Data: The FastLane system automatically yields counts on the numbers of proposals submitted through the system. Other proposal and award systems track the total number of submissions.
- External factors: Not all NSF grantees are academic institutions. NSF works with all grantees to ensure they can interface with electronic systems. However, we must also make alternative arrangements available for grantees without the needed interface.

Electronic Proposal Processing

Currently, NSF practice is to move to a paper process once proposals are submitted electronically and initial processing is complete. Our goal is to move to electronic processing for the entire proposal and award process.

Performance Indicator: Technological capability for a paperless process.

FY 2000 Performance Goal: By the end of FY 2000, NSF will have the technological capability of taking competitive proposals submitted electronically through the entire proposal and award/declination process without generating paper within NSF.

Baseline: Some small, focused competitions have been managed largely through paperless processes.

Comment:

- Means for achieving success: NSF has experimented with paperless processes in selected competitions. We are aware of the potential sources of difficulty, and are working with contractors and NSF staff to eliminate them.
- Data: During FY 2000, NSF will work out the barriers to enable piloting full electronic submission/processing in FY 2001.
- External factors: Many reviewers are not comfortable with receiving proposals for review electronically. In order to have quality control on the review process, it may be important to generate hard copies within NSF for reviewers who want them.

<u>**NSF staff**</u>

Diversity

In order to increase the diversity of the U.S. science and engineering workforce, it is particularly important that the program officers at NSF exemplify that diversity. Yet this is the segment of the staff at NSF that shows the highest levels of under-representation of women, those minority groups under-represented in the science and engineering careers, and persons with disabilities. Realistic goals for closing that gap vary from one area to another across research and education. During FY 1999, NSF concentrated on increasing the number of applicants from underrepresented groups in the applicant pool. In the coming

year, we will continue these efforts, but have changed the indicator and goal to something more measurable.

Performance Indicator: Efforts to sufficiently attract applications from members of underrepresented groups in order to increase the numbers hired.

Performance goal: In FY 2000, NSF will show an increase over 1997 in the total number of hires to S&E positions from underrepresented groups.

FY 1997 Baseline: Of 54 S&E hires, 22% were female and 19% were from underrepresented minority groups.

Comment:
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- Means for achieving success: NSF will stimulate members of under-represented groups to apply for NSF's science and engineering positions through increased outreach efforts including targeted advertising, attendance at job fairs, and site visits to minority institutions and organizations. Guidance for outreach is being developed by the Division of Human Resources Management.
- Data: Trend data will be kept both on the actual number of hires to S&E positions and the aggregate numbers of underrepresented group members in the S&E workforce. The data will be compared to a base year of 1997. Over time, NSF expects to see a positive trend both in the number of hires and in the total numbers in the S&E workforce. Data will be maintained by the Division of Human Resource Management.

Capability in use of electronic proposal/award jackets

Electronic communication is changing the character of work for support, administrative, and science and engineering staff. Everyone at NSF must have good computer skills and be able to master new ones on a continuing basis. Since so much of the Foundation's business will be done through FastLane in the future, our goal for FY 1999 focused on that system. Once the technological capability is in place for managing the entire proposal and award/declination process electronically, we will need trained staff to implement these paperless processes.

Performance Indicator: Proportion of relevant staff trained.

Performance goal: By the end of FY 2000, all staff will receive an orientation to FastLane, and at least 80% of program and program support staff will receive practice in using its key modules.

Baseline: FY 1999 Result: 80% of all staff received orientation; 43% of program and program support staff received hands-on training.

Comment:
- Means for achieving success: A range of formal and individual orientation opportunities will be developed to support achievement of this goal as the technological ability advances. Those staff involved in testing of systems will serve as a resource for others.
- Data: the Division of Human Resources Management will maintain the data in support of this performance goal under the guidance of the Chief Information Officer.

Implementation of management reforms

Year 2000

In order to fully support its mission, NSF's information systems must be able to withstand the problems predicted for many systems at the turn of the century. Based on guidance from OMB, NSF has developed

and submitted a plan (May 1997) for evaluating, correcting, and testing its systems. Quarterly updates show that NSF is well on its way to accomplishing its objectives.

Performance Indicator: Operation of systems.

FY 2000 Performance Goal: NSF will complete all activities needed to address the Year 2000 problem for its information systems according to plan, on schedule and within budget.

Comment:
Means for achieving success: NSF's plans comply with OMB guidelines and milestones for assessment, renovation, validation and implementation. There is a regular schedule of testing that should preclude problems.
Data: External validation of NSF systems' compliance with Y2K guidance is underway.

Project Reporting

Assessing results for NSF's outcome goals requires a more accessible database of project results than NSF has previously maintained. A new project reporting system was fully implemented at the beginning of FY 1999. During FY 2000, NSF will continue to monitor the use of the system and the quality of the information gathered, and take appropriate steps to address problems.

Performance Indicator: Percent of eligible project reports submitted through the new Project Reporting System.

FY 2000 Performance Goal: 85%   Baseline: 59% in FY 1999.

Comment:
- For a voluntary program, we feel 59% is a good beginning and shows a high level of acceptance in the community.
- This system will enable NSF to more readily access the outputs and outcomes of NSF-funded activities.
- Means for achieving success: NSF issued changes to its *Grant Proposal Guide* and *Grant Policy Manual* prescribing use of the format of the Project Reporting System and strongly encouraged use of the electronic version in FY 1999. We have also issued an Important Notice to grantees requiring that all project reports be submitted electronically in FY 2000.
- Data: The project reporting system and data on its use will be jointly monitored by the Division of Information Systems and the Budget Division. The information reported in the system will be used in reporting on the results of prior support when investigators reapply to NSF for further funding. This will help address issues of validity in terms of scientific elements, as will program officer perusal of annual and final progress reports and their use in annual assessment processes. We will work with universities and investigators to ensure consistent reporting of demographic information on participants.