National Science Foundation
Strategic Plan
FY 2003 – 2008

September 30, 2003

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PREFACE

NSF ROLE

> "New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life."
>
> - Letter from Franklin D. Roosevelt to Dr. Vannevar Bush, November 17, 1944.

Created in 1950, the National Science Foundation (NSF) is an independent U.S. government agency responsible for advancing science and engineering (S&E) in the United States across a broad and expanding frontier. NSF plays a critical role in supporting fundamental research, education and infrastructure at colleges, universities, and other institutions throughout the country. Although NSF represents less than four percent of the total federal funding for research and development (R&D), it accounts for approximately 13 percent of all federal support for basic research and 40 percent of non-life-science basic research at U.S. academic institutions. NSF's broad support for basic research, particularly at U.S. academic institutions, provides not only a key source of funds for discovery in many fields, but also unique stewardship in developing the next generation of scientists and engineers. NSF is also the principal federal agency charged with promoting science and engineering education at all levels and in all settings, from pre-kindergarten through career development. This helps ensure that the United States has world-class scientists, mathematicians and engineers, and well-prepared citizens.

Except for the South Pole Station and the other Antarctic Program facilities, NSF operates no laboratories or research facilities itself, but rather 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 nation. NSF uses merit review to select about 10,000 new awards each year from more than 35,000 competitive proposals submitted by the science and engineering research and education communities.

NSF is the hub of an extended S&E network. For example, NSF brings different segments of the S&E community together through panel review, workshops, advisory committees, and many other interactions. These collaborations provide benchmarks, leadership, and new frontiers for research and education. NSF also fosters strategic collaborations with key national and international counterparts that address national and global science and engineering priorities. NSF has been designated to lead interagency initiatives in such areas as information technology research and nanotechnology.

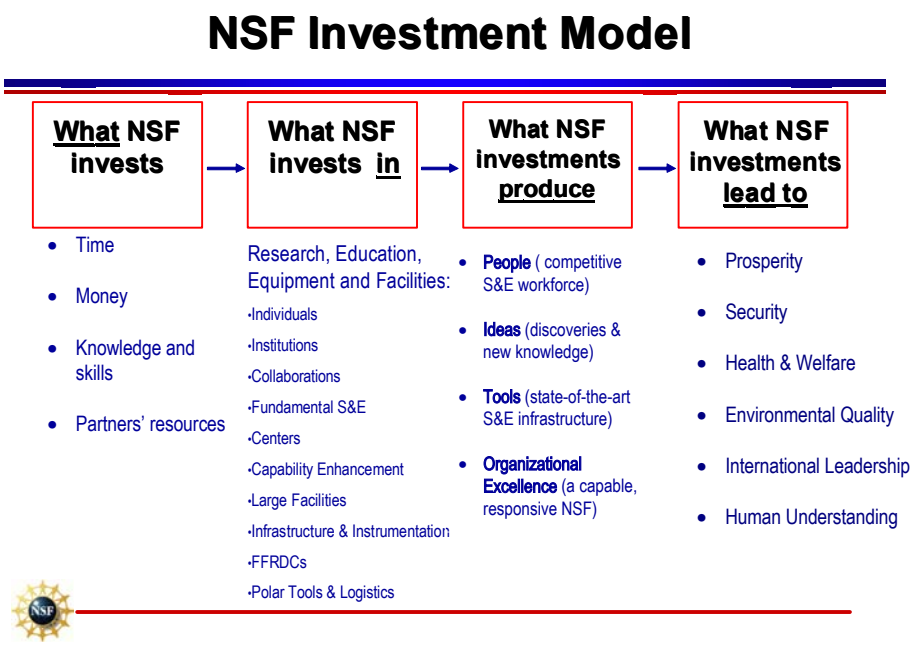
The National Science Board (NSB) is NSF's policymaking board and serves as adviser to the President and Congress on policy matters related to science and engineering research and education. The Board is composed of 24 part-time members, who are appointed by the President and confirmed by the Senate. They are selected on the basis of their eminence in science, engineering, education, and public affairs.

CONTEXT FOR STRATEGIC PLAN

Strategic planning may be described as "a disciplined effort to produce fundamental decisions and actions that shape and guide what an organization is, what it does, and why it does it, with a focus on the future."[1] Within the Federal government, strategic planning has a legal context, defined by the Government Performance and Results Act (GPRA) of 1993.

GPRA mandates Federal agencies to account for program results through the integration of strategic planning, budgeting, and performance measurement. According to the Office of Management and Budget (OMB) Circular A-11, the specific instructions for implementing GPRA in Federal agencies, "the strategic plan is a tool to be used in setting priorities and allocating resources consistent with those priorities." It also provides the framework for the preparation of annual agency performance plans and reports. GPRA requires Federal agencies to prepare strategic plans that address their missions over a six-year period, and to update their plans every three years.

Investment Model. NSF invests in the nation's future. Its strategic outlook reflects the simple model shown below.



Congress appropriates NSF budget resources annually. NSF's intangible, continuing resources are its own human capital, knowledge and skills, technology and tools, and work practices. As prescribed in its enabling legislation, NSF invests its resources in a broad range of education, research, infrastructure and related activities. Investment priorities are established through NSF's planning and budget process (described in Section III). Long-term planning issues, such as those discussed in the next section (Situation Analysis), provide the context for discussing budget priorities with OMB, Congress and the S&E community.

[1] Bryson, J.M. (1995). *Strategic Planning for Public and Nonprofit Organizations.* San Francisco: Jossey-Bass.

The selection of specific projects for funding is guided by NSF's competitive merit review process. NSF evaluates proposals for research and education projects using two criteria: the intellectual merit of the proposed activity and its broader impacts.

The direct products of NSF's investments are best described by its strategic goals: *People, Ideas, Tools*, *and Organizational Excellence.* These goals, along with their associated investment categories and objectives, provide a results-oriented focus for NSF's investments, and a framework for assessing program performance.

The longer-term impacts of NSF investments (i.e. "What NSF investments lead to") are generally specified in NSF's mission statement: *"To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."* Although, in the short term, it is sometimes difficult to link specific research and education projects with these longer term impacts, the overall linkage has been demonstrated time and again, and underpins the public's confidence in the value of S&E research and education.

Organizational Context. This revised strategic plan includes, for the first time, an NSF strategic goal that links what NSF accomplishes in terms of People, Ideas and Tools with how these are accomplished through Organizational Excellence. NSF recently developed a strategic plan specifically for its investments in administration and management (i.e., organizational excellence), the centerpiece of which is an ongoing business analysis.[2] The *Organizational Excellence* goal focuses on the strategies and resources that enable the Foundation to be a leader among Federal agencies in implementing state-of-the-art business and management practices, and providing outstanding customer service. This increased emphasis on administration and management also speaks directly to NSF's efforts under the President's Management Agenda (PMA). The purpose of the PMA is to motivate federal agencies to focus on the achievement of five White House government-wide management initiatives, as shown in this chart. Agencies receive ratings of green, yellow, or red for agency status and progress for each of these initiatives on quarterly PMA scorecards. To date, NSF is the only Federal agency to receive two green ratings, having received one for Financial Performance and one for E-Government. NSF will strive not only to attain green in each of these critical performance areas, but also will continue to strive to move beyond the highest requirements of the PMA - into the next generation of improved government.

President's Management Agenda Scorecard

	Baseline 9/30/2001	Status: 6/30/2002
Strategic Management of Human Capital	R	R
Competitive Sourcing	R	R
Financial Performance	G	G
Expanding E-Gov't.	Y	G
Budget & Performance Integration	R	R

Note: Green represents success; yellow, mixed results; and red, results unsatisfactory. www.whitehouse.gov/omb/budget/fy2004/msr.html.

The PMA initiative Budget and Performance Integration highlights the role of assessment and evaluation in agency planning and budgeting. For this purpose, OMB is now requiring agencies to use the PART, the Program Assessment Rating Tool, to assess program performance in four

[2] The Administration and Management Strategic Plan is available at: http://www..nsf.gov/od/am/

areas: program purpose, strategic planning, program management, and program results. The PART complements and reinforces GPRA by providing quantitative performance ratings for programs identified in an agency's budget, thus emphasizing the link between budget and performance. Resulting PART ratings inform the budget process and highlight areas in need of improvement. The goals, investment categories, and objectives in this document provide a program structure for the PART assessments (described in Appendix A).

For NSF and other Federal agencies with significant R&D portfolios, the PART and other planning and assessment activities are now required to draw heavily upon the R&D Investment Criteria established by OMB and the Office of Science and Technology Policy (OSTP) for the FY 2004 budget process: 1) Quality, 2) Relevance, and 3) Performance. These criteria are consistent with NSF's proposal review criteria, and are reflected in the goals and strategies developed in this plan.

R&D INVESTMENT CRITERIA

- Quality**:** R&D programs must justify *how* funds will be allocated to ensure quality R&D.
- Relevance: R&D programs must be able to articulate *why* this investment is important, relevant, and appropriate.
- Performance: R&D programs must be able to monitor and document *how well* the investment is performing.

http://www.ostp.gov/html/ombguidmemo.pdf

The intent of these requirements is to create a federal government that is responsive and accountable to its citizens – one that is focused on national priorities and executes them well. NSF is responsive to these mandates, in a way that is careful to do no harm to the R&D system that has delivered so much good to the Nation.

SITUATION ANALYSIS

The strategic planning process is a dynamic one. It must acknowledge and respond to many external issues, some of which are concerned with the nature, direction and process of research and education, and others concerned with their potential impacts. In updating its strategic plan, NSF has taken cognizance of these issues, while understanding that they are in flux and must be continually assessed. They include the following:

- **Changing S&E Frontier:** Because the frontiers of science and engineering continually evolve and advance, NSF programs and strategies require constant monitoring and adjustment. This is the principal driver of change for NSF. With hundreds of proposal competitions, meetings with experts, formal workshops and reports from commissions throughout the year, NSF is constantly listening, analyzing and responding to thoughts from the research and education community.

- **S&E Workforce:** The global competition for highly skilled technical workers and S&E professionals is escalating, while fewer U.S. students are choosing to go into graduate science and engineering programs. Since 1993, enrollment of U.S. students in these programs has dropped nine percent. To maintain the technological lead the United States enjoys throughout the world it will be necessary to recruit greater numbers of U.S. students into the

S&E workforce. It will be especially important to tap into the potential evident in previously underutilized groups and institutions of the Nation's human resource pool.

- **Science and Math Skills:** Concerns persist over the state of mathematics and science education in the United States. The Third International Math and Science Study compared American students with students in other countries. It found that U.S. fourth graders did relatively well in both subjects, but by the time they reached their senior year in high school, U.S. students ranked very low compared to students in other countries. The U.S. Department of Labor estimates that 60% of the new jobs being created in our economy today will require technological literacy while only 22% of the young people entering the job market now actually possess those skills.

- **S&E Infrastructure:** Recent concepts of infrastructure are changing from big pieces of hardware on the floor to distributed systems of hardware, software, information bases, and expert systems. The exponential growth in computing power, communication bandwidth, and data storage capacity will continue for the next decade. This will profoundly affect the way research and education are conducted.

- **Internationalization:** Collaborative activities and international partnerships provide increasingly important means of keeping abreast of new insights and discoveries critical to maintaining U.S. leadership in key fields. Increased concerns about homeland security are complicating all aspects of international collaboration.

- **Security:** With the heightened concerns over homeland security, advances in science and technology are needed to prevent and counter potential future threats and attacks. NSF's broad research and education portfolio has and will continue to enable such advances. Moreover, NSF is being called upon to expand its efforts in critical areas such as cybersecurity, trusted systems, complex systems, bioterrorism, and critical infrastructure protection.

- **Environment:** Environmental research and education are central elements of local, national, and global security, health, and prosperity, as discussed in the recent report, *Complex Environmental Systems: Synthesis for Earth, Life, and Society in the 21st Century,* prepared by NSF's Advisory Committee for Environmental Research and Education. The world is also facing the prospect of rapid environmental and climate change and the complicated question of long-term environmental security. Research is needed to improve our understanding of Earth systems and the extreme events that they spawn. Moreover, there is much to be learned from the experience of dealing with natural disasters that can be applied to the technological and human threats that currently hold the nation's attention.

In addition to the above external factors, the NSF strategic planning process also must consider its specific role in ensuring excellence in future research and education activities. The National Science Foundation Authorization Act of 2002, P.L. 107-368, enacted in December 2002, recently underscored NSF's leadership role in U.S. science and engineering. The funding levels authorized in the Act would lead to an NSF investment portfolio of nearly $10 billion by FY 2007.

Among the specific objectives outlined in the Act are expanding the pool of scientists and engineers in the U.S., strengthening both disciplinary and interdisciplinary areas of science and engineering, modernizing the nation's research infrastructure, increasing overall workforce skills, and strengthening innovation at the regional and local levels. Given the sustained investment in *People, Ideas, Tools, and Organizational Excellence* provided by the Act, NSF will meet these and other important national objectives, and continue to be the high-performing organization ready to lead science and engineering in the 21st Century.

I. INTRODUCTION

A. VISION STATEMENT

ENABLING THE NATION'S FUTURE THROUGH DISCOVERY, LEARNING AND INNOVATION

NSF investments – in people, in their ideas, and in the tools they use - will catalyze the strong progress in science and engineering needed to establish world leadership and secure the Nation's security, prosperity, and well-being.

B. MISSION STATEMENT

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 fields of science and engineering, and
- An information base on science and engineering appropriate for development of national and international policy.

Over time, the following additional responsibilities were added to the agency's mission: (1) foster the interchange of scientific and engineering information nationally and internationally; (2) support the development of computer and other methodologies; (3) maintain facilities in the Antarctic and promote the U.S. presence through research conducted there; and (4) address issues of equal opportunity in science and engineering.

C. STRATEGIC GOALS

NSF investments produce outcomes at the core of the research and education enterprise: a world-class science and engineering workforce; new knowledge across the frontiers of science and engineering; and the tools to get the job done efficiently and effectively. Expressed simply as *People, Ideas,* and *Tools (PIT)* these long-term strategic goals reflect the changing role and increased significance of science and engineering in the 21st Century.

NSF introduced the PIT goals in its last strategic plan – developed three years ago and covering FY 2001 to FY 2006. Since then, the PIT framework has had a dramatic impact on both NSF's

internal processes and on its leadership throughout research and education. It has proven to be an agile framework for highlighting NSF's accomplishments in science and engineering. The PIT framework encourages approaches to achieving NSF's mission that reach across and connect the various parts of NSF's discipline-based structure. This is most evident through NSF's emphasis on supporting interdisciplinary activities, such as the priority areas identified in its annual budgets, and through the use of key investment strategies, such as integration of research and education.

This revised and updated strategic plan strengthens the PIT framework by adding a new strategic goal for *Organizational Excellence*, in keeping with the belief that achieving NSF's mission is impossible without sustained excellence in NSF's business processes.

There is considerable synergy among NSF's strategic goals. For example, an NSF investigator-initiated research grant not only supports research at the frontier (Ideas) but also usually helps train the next generation of scientists and engineers (People), and provides new research equipment and instrumentation (Tools). The ability of NSF-supported projects to simultaneously address multiple outcome goals greatly increases the effectiveness and productivity of NSF's investments. NSF's investment in Organizational Excellence assures that it remains the high-performing organization needed to increase the synergy among the goals.

PEOPLE GOAL – A DIVERSE, COMPETITIVE, AND GLOBALLY-ENGAGED U.S. WORKFORCE OF SCIENTISTS, ENGINEERS, TECHNOLOGISTS AND WELL-PREPARED CITIZENS

Leadership in today's knowledge economy requires world-class scientists and engineers and a national workforce that is scientifically, technically and mathematically strong. Investments in *People* aim to improve the quality and reach of science, engineering, and mathematics education and enhance student achievement. Each year, NSF supports more than 200,000 people – teachers, students, and researchers at every educational level and across all disciplines in science and engineering. Embedded in all NSF programs are efforts to build a more inclusive, knowledgeable, and globally engaged workforce that fully reflects the strength of the Nation's diverse population.

IDEAS GOAL - DISCOVERY ACROSS THE FRONTIER OF SCIENCE AND ENGINEERING, CONNECTED TO LEARNING, INNOVATION AND SERVICE TO SOCIETY

Investments in *Ideas* are aimed at the frontiers of science and engineering. They build the intellectual capital and fundamental knowledge that drive technological innovation, spur economic growth, and increase national security and welfare. They also seek answers to the most fundamental questions about the origin and nature of the universe and humankind.

TOOLS GOAL – BROADLY ACCESSIBLE, STATE-OF-THE-ART S&E FACILITIES, TOOLS AND OTHER INFRASTRUCTURE THAT ENABLE DISCOVERY, LEARNING AND INNOVATION

State-of-the-art tools and facilities boost the overall productivity of the research and education enterprise. NSF's strategy is to invest in a wide range of instrumentation, multi-user facilities, distributed networks, digital libraries and computational infrastructure that add unique value to research and are accessible and widely shared among researchers across the nation.

ORGANIZATIONAL EXCELLENCE GOAL - AN AGILE, INNOVATIVE ORGANIZATION THAT FULFILLS ITS MISSION THROUGH LEADERSHIP IN STATE-OF-THE-ART BUSINESS PRACTICES

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

D. GOAL ACHIEVEMENT

ANNUAL PERFORMANCE GOALS

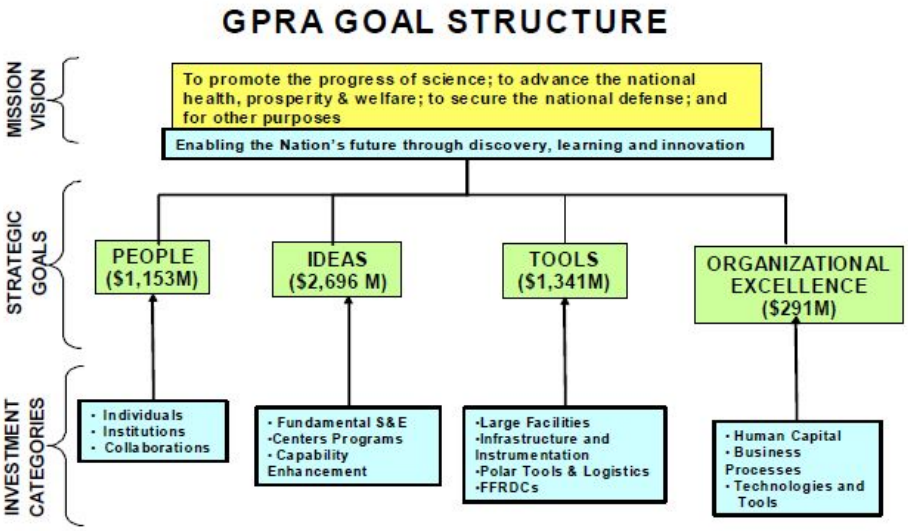
NSF identifies performance goals in its annual budget submissions to OMB and Congress. NSF's first four performance goals are based on the People, Ideas, Tools, and Organizational Excellence strategic goals. The associated performance indicators for each goal are based on the objectives discussed in Section II of this document. The criterion for success for each goal can be stated: "NSF is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of [associated indicators]."

The agency decision for NSF success for each goal is based largely on analysis of statements contained within reports received from external committees that assess NSF programs and activities. These committees are discussed in Appendix A (Performance Assessment.) NSF staff examines ratings or statements of significant accomplishment in the reports to ensure that judgments are justified. In addition, there must be evidence or examples that support such judgments. Selected GPRA goals are verified and validated each year by external third parties.

NSF also establishes a number of annual performance goals, usually stated in a manner that permits quantitative measurement, that are related to the strategic outcome goals. For example, NSF has goals that address the time to process a proposal, average award size and duration, and facility management. All NSF managers, staff, contractors, and grantees are expected to contribute to the achievement of NSF's performance goals.

ALIGNMENT OF BUDGET AND PERFORMANCE GOALS

NSF's goals and investment categories are linked to specific budget resources. The following figure illustrates this structure, using the FY 2004 budget request as an example. NSF deploys funds across its five budget accounts on a program-by-program basis, to address the Foundation's goals and investment categories. Each of NSF's programs is assigned to one of the investment categories based on the program's principal objective, integrated within NSF's holistic investment portfolio. (See Appendix B for a crosswalk of goals, investment categories and NSF programs.)



NSF's strategy for further enhancing *alignment* of budget and performance goals includes a reexamination of its account structure. NSF recognizes that such an effort requires simultaneous consideration of organizational alignment, distribution of budgetary resources, and the allocation of costs both to organizations and to outcomes. The expected added value to NSF managers is central in identifying areas to examine and in deciding whether to add or change existing structures.

The table below shows how NSF's five budget accounts are aligned with NSF's strategic goals.

BUDGET & PERFORMANCE INTEGRATION
FY 2004 Request
(Millions of Dollars)

	STRATEGIC GOALS			
Account	PEOPLE	IDEAS	TOOLS	ORGAN. EXCELL.
Research and Related Activities	388	2,557	1,120	42
Education and Human Resources	765	139	19	15
Major Research Equipment and Facilities Construction	0	0	202	0
Salaries & Expenses	0	0	0	226
Office of the Inspector General	0	0	0	9
Total[a]	$1,153	$2,696	$1,341	$291

[a] Numbers may not add due to rounding.

In FY 2004, for example, approximately 95 percent of NSF's budget request ($5,481M) is designated for investments the agency makes in support of its goals for strategic outcomes – People (21 percent), Ideas (49 percent), and Tools (25 percent). The remaining 5 percent of the budget request is for Organizational Excellence, which provides operating support for the activities of the agency such as processing proposals and overseeing projects.

EXTERNAL FACTORS

External factors affect NSF's ability to achieve its strategic outcomes. The Foundation relies on its many partners in the research and education enterprise to accomplish its strategic goals. While this wide array of institutions shares the agency's commitment to promoting the progress of science through discovery, learning, and innovation, they also face a variety of circumstances that affect their ability to achieve the goals of NSF's investment. NSF's influence and leadership extend well beyond its budget. NSF brings together diverse elements of the larger science and engineering community to achieve its mission. This positions the agency to: (1) establish partnerships that leverage funds and (2) provide leadership that catalyzes new directions for research and education. Factors beyond NSF's control include appropriations, indirect cost rates, government-wide policies, inflation, the budget and plans of other R&D agencies, the uncertainty and risk inherent in research, the availability of technology and the pace of technological innovation.

II. STRATEGIC GOALS

A. PEOPLE GOAL

A DIVERSE, COMPETITIVE, AND GLOBALLY ENGAGED U.S. WORKFORCE OF SCIENTISTS, ENGINEERS, TECHNOLOGISTS AND WELL-PREPARED CITIZENS

NSF's investments in People enable the Foundation to meet its mission of promoting the progress of science, while facilitating the creation of a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens.

Statutory Authority:

"The Foundation is authorized and directed to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels . . ." (NSF Act of 1950)

"The Foundation is authorized to support activities designed to … encourage women to consider and prepare for careers in science and engineering …" (Science & Engineering Equal Opportunities Act; 42USC 1885)

"The Foundation is authorized to undertake and support a comprehensive science and engineering education program to increase the participation of minorities in science and engineering . . ." (Science & Engineering Equal Opportunities Act; 42USC 1885)

"The Foundation is authorized to undertake and support programs and activities to encourage the participation of persons with disabilities in the science and engineering professions." (Science & Engineering Equal Opportunities Act; 42USC 1885)

Investment Categories: The following long-term investment categories link directly to NSF programs and budget resources. They provide the framework for development of more specific and time-dependent performance goals, and for other assessments, such as the PART:

- **Individuals:** Investments that ensure development of world-class scientists, engineers, mathematicians, technologists and educators.

- **Institutions:** Investments that enable colleges, universities and other institutions to attract increased numbers of students to S&E fields and enhance the quality of S&E education at all levels.

- **Collaborations:** Investments that foster partnerships with colleges, universities, school districts, and other institutions – public, private, state, local, and Federal – to strengthen S&E education at all levels and broaden participation in S&E fields.

Math and Science Partnership Awards

In September 2002, NSF and the Department of Education announced the first awards under the new Math and Science Partnership program. NSF and Education made 24 awards worth an anticipated $240 million over five years, which will affect at least two million students in 11 states. A key part of President Bush's *No Child Left Behind* education plan, these new awards aim to enhance the performance of U.S. students in mathematics and science.

Objectives: The means and strategies NSF uses to successfully accomplish the People Goal include the three NSF integrative strategies, the investment strategies discussed in Section III, and the following specific objectives:

- Promote greater diversity in the science and engineering workforce through increased participation of underrepresented groups and institutions in all NSF programs and activities. (Applies to the following investment categories: **(Individuals; Institutions; Collaborations)**

- Support programs that attract and prepare U.S. students to be highly qualified members of the global S&E workforce, including providing opportunities for international study, collaborations and partnerships. **(Individuals; Institutions; Collaborations)**

- Develop the Nation's capability to provide K-12 and higher education faculty with opportunities for continuous learning and career development in science, technology, engineering and mathematics. **(Individuals; Institutions; Collaborations)**

- Promote public understanding and appreciation of science, technology, engineering, and mathematics, and build bridges between formal and informal science education. **(Institutions; Collaborations)**

- Support innovative research on learning, teaching and mentoring that provides a scientific basis for improving science, technology, engineering and mathematics education at all levels. **(Institutions; Collaborations)**

External Factors: The characteristics of the U.S. workforce of scientists and engineers are highly dependent on the systems in which they are educated and trained. For example, math and science achievement directly depends on programs managed in a variety of state and local educational systems. While NSF programs greatly impact educational systems and the public that supports them, they are but one influence among many.

B. IDEAS GOAL

DISCOVERY ACROSS THE FRONTIER OF SCIENCE AND ENGINEERING, CONNECTED TO LEARNING, INNOVATION AND SERVICE TO SOCIETY

NSF's research and education mission requires it to push at frontiers of science and engineering. Agency investments promote the emergence of new disciplines, fields, and technologies, along with the development of scientists and engineers able to embrace them and create the next generation of results. Fundamental research can yield important discoveries that boost economic growth and enhance the quality of life through advances such as better weather forecasting, laser technology, earlier detection of cancer, and the creation of the Internet. Research in emerging fields such as nanotechnology will provide new capabilities and generate more discoveries that

will further improve the quality of life. Through investments in research and education, NSF contributes to the health and vitality of the U.S. research and education enterprise and enhances the Nation's capacity for sustained growth and prosperity.

Statutory Authority:

"The Foundation is authorized and directed to initiate and support basic scientific research and . . . research fundamental to the engineering process . . ." (NSF Act of 1950)

". . . The Foundation is authorized to initiate and support specific scientific and engineering activities in connection with matters relating to scientific and engineering applications upon society. . ." (NSF Act of 1950)

Investment Categories: The following long-term investment categories link directly to NSF programs and budget resources. They provide the framework for development of more specific and time-dependent performance goals, and for other assessments, such as the PART.

- **Fundamental Science and Engineering:** Investments that support the best new ideas generated by scientists and engineers working at the forefront of discovery. These funds support single investigators and small groups, and provide the primary support for early career faculty and students. They are extremely important in invigorating the research community since they promote emergence of new ideas and fields, especially in areas where disciplines are blurred, peer consensus is nascent, and new technologies emerge. Investments in these activities ensure the vitality of a broad array of scientific and engineering fields that are needed for the U.S. to maintain leadership in science and engineering.

Nobel Prizes for 2002

Physics: Raymond Davis Jr., of the University of Pennsylvania and Brookhaven National Laboratory, was honored for his detection of solar neutrinos. The number of neutrinos his experiment detected was significantly less than predicted. This result played a major role in development of the theory that neutrinos change from one type to another. NSF has supported Davis' work since 1985.

Chemistry: John B. Fenn of the Virginia Commonwealth University was honored for his work developing mass-spectrometric analysis tools that allow scientists to "weigh" and identify large biological molecules. The technique now allows researchers to identify proteins rapidly and analyze hundreds of potential drugs and biological samples per day. Fenn has received 13 research awards from NSF since 1975.

Economics: Vernon L. Smith of George Mason University was honored for founding the field of experimental economics. Smith pioneered the use of controlled laboratory experiments to test predictions from economic theory. Smith's work has been used in designing markets for trading pollution rights, auctioning the broadband communication spectrum, deregulating electricity utilities, and allocating landing slots at airports. NSF has supported Vernon Smith's work since its very beginnings.

- **Centers Programs:** Investments that enable organizations to integrate people, ideas, and tools on scales that are large enough to significantly impact important S&E fields and cross-disciplinary areas. NSF supports a variety of individual centers and centers programs, which contribute to NSF's investment in Ideas. The centers play a key role in furthering the advancement of science and engineering in the U.S., particularly through their encouragement of interdisciplinary research and the integration of research and education.

While the programs are diverse, the centers generally share common intellectual characteristics and commitments to coordination and team-based cross-disciplinary research.

- **Capability Enhancement:** Investments that enhance the capability of individuals and institutions to conduct high quality, competitive research, education, and technological innovation. For example, the Small Business Innovation Research (SBIR) program, pioneered by NSF, stimulates technological innovation in the private sector by strengthening the role of small business in conducting high quality S&E research. The Experimental Program to Stimulate Competitive Research (EPSCoR) promotes the development of the states' science and technology resources through partnerships involving a state's universities, industry, and government.

Objectives: The means and strategies NSF uses to successfully accomplish the Ideas Goal include the three NSF integrative strategies, the investment strategies discussed in Section III, and the following specific objectives:

- Enable people who work at the forefront of discovery to make important and significant contributions to science and engineering knowledge. **(Fundamental S&E; Centers; Capability Enhancement)**

- Encourage collaborative research and education efforts – across organizations, disciplines, sectors and international boundaries. **(Fundamental S&E; Centers; Capability Enhancement)**

- Foster connections between discoveries and their use in the service of society. **(Fundamental S&E; Centers; Capability Enhancement)**

Enabling Research Grants

Making larger research grants of longer duration will enable Principal Investigators to focus on more complex research problems. It will also increase productivity by minimizing the time researchers spend writing proposals. Longer grants will also increase the continuity and stability of graduate student support. NSF's goal is to increase the average (mean) annualized research grant from the FY 2004 estimate of $128,000 to $250,000, and the average grant duration grant from three to five years. Achieving these targets, which are supported by the findings of the recent survey of NSF-supported PIs and institutions (Mathematica Policy Research, Inc., July 2002), will require substantial additional investments over several years.

- Increase opportunities for underrepresented individuals and institutions to conduct high quality, competitive research and education activities. **(Fundamental S&E; Centers; Capability Enhancement)**

- Provide leadership in identifying and developing new research and education opportunities within and across S&E fields. **(Fundamental S&E; Centers)**

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

External Factors: NSF does not conduct research and education activities directly (i.e., NSF does not manage its own laboratories other than those in the Antarctic) but supports others who do. In particular, the circumstances of institutional partners in academe, the private sector, and the government affect how individuals and groups are able to respond in both proposing and conducting research and education. As with all basic research, the outcomes associated with NSF investments are likely to be unpredictable in content and timing. Many of these activities require years to develop and the outcomes can only be judged retrospectively. For such research activities, it is difficult to link long-term outcomes directly to annual budgets.

C. TOOLS GOAL

BROADLY ACCESSIBLE STATE-OF-THE-ART S&E FACILITIES, TOOLS, AND OTHER INFRASTRUCTURE THAT ENABLE DISCOVERY, LEARNING AND INNOVATION

NSF investments provide state-of-the art tools for research and education, such as laboratory instrumentation and equipment, multi-user research facilities, distributed instrumentation networks and arrays, accelerators, telescopes, research vessels, aircraft, and earthquake simulators. In addition, investments in Internet-based and distributed user facilities, advanced computing resources, research networks, digital libraries, and large databases are increasing as a result of rapid advances in computer, information, and communication technologies. NSF's investments are coordinated with those of other organizations, agencies and countries to ensure complementarity and integration.

Statutory Authority:

"The Foundation is authorized and directed to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels . . ." (NSF Act of 1950)

"The Foundation is authorized and directed to foster and support the development and use of computer and other scientific and engineering methods and technologies, primarily for research and education in the sciences and engineering; . . ." (NSF Act of 1950)

Investment Categories: The following long-term investment categories directly link to NSF programs and budget resources. They provide the framework for development of more specific and time-dependent performance goals, and for other assessments, such as the PART.

- **Facilities:** Investments in the development, construction, and operation of state-of-the-art facilities and platforms that enable communities of researchers and educators to work at the S&E frontier.

- **Infrastructure and Instrumentation:** Investments in state-of-the-art instruments, platforms, information technology, databases, and other tools that uphold U.S. S&E leadership and that enable diverse communities of researchers, educators and students working at the S&E frontier.

- **Polar Tools, Facilities and Logistics:** Investments that provide state-of-the-art tools, facilities and other infrastructure to enable world-class polar research, education and operations.

- **Federally Funded R&D Centers (FFRDCs):** Investments in research, development, and R&D policy that create unique, important and long-term capabilities for the Federal government, in response to law, mandate or widely recognized need.

Objectives: The means and strategies NSF uses to successfully accomplish the Tools Goal include the three NSF integrative strategies, the investment strategies discussed in Section III, and the following specific objectives:

- Expand opportunities for U.S. researchers, educators, and students at all levels to access state-of the-art S&E facilities, tools, databases, and other infrastructure. **(Facilities; Infrastructure and Instrumentation; Polar Tools, Facilities and Logistics)**

- Provide leadership in the development, construction, and operation of major, next-generation facilities and other large research and education platforms. **(Facilities; FFRDCs)**

- Develop and deploy an advanced cyberinfrastructure to enable all fields of science and engineering to fully utilize state-of-the-art computation. **(Infrastructure and Instrumentation)**

- Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation. **(Infrastructure and Instrumentation; FFRDCs)**

- Support research that advances instrument technology and leads to the development of next-generation research and education tools. **(Infrastructure and Instrumentation)**

External Factors: With few exceptions, NSF does not operate the facilities that it supports. Typically, it makes awards to external entities to undertake construction, management and operation of facility projects. NSF's relationship with these organizations is often collaborative in nature and defined in cooperative agreements between NSF and those organizations.

D. ORGANIZATIONAL EXCELLENCE GOAL

AN AGILE, INNOVATIVE ORGANIZATION THAT FULFILLS ITS MISSION THROUGH LEADERSHIP IN STATE-OF THE-ART BUSINESS PRACTICES

Excellence in managing NSF's activities is an objective on par with the Foundation's mission-oriented outcome goals. It is critical to achievement of all NSF goals. In addition, this goal addresses the President's Management Agenda and focuses on management challenges and reforms identified by

Ninety-five percent of the federal funds NSF receives goes to educational and research institutions and contractors. NSF's direct overhead amounts to only five percent. Funding for the agency has grown significantly in the past decade, while the agency's staffing level has remained flat.

OMB or the General Accounting Office, in NSF's annual review of financial and administrative systems as required by the Federal Managers' Financial Integrity Act, or by the NSF Office of Inspector General.

Investment Categories: The following long-term investment categories directly link to NSF programs and budget resources.

- **Human Capital:** Investments that produce a diverse, agile, results-oriented cadre of NSF knowledge workers committed to enabling the agency's mission and to constantly expanding their abilities to shape the agency's future.

- **Business Processes**: Investments that produce effective, efficient, strategically aligned business processes that integrate and capitalize on the agency's human capital and technology resources.

- **Technologies and Tools**: Investments that produce flexible, reliable, state-of-the-art business tools and technologies designed to support the agency's mission, business processes, and customers.

Objectives: Excellence in managing the agency's activities underpins all of NSF's goals. The following objectives are especially critical to NSF's goal achievement.

- **Operate a credible, efficient merit review system.** NSF's merit review process is the keystone for award selection, through which NSF achieves its goals. All proposals for research and education projects are evaluated using two criteria: the intellectual merit of the proposed activity and its broader impacts. Specifically addressed in these criteria are the creativity and originality of the idea, the development of human resources, and the potential impact on the research and education infrastructure. Ensuring a credible, efficient system requires constant attention and openness to change.

During the fall of 2000, NSF initiated development of an Administration and Management (A&M) Strategic Plan. The plan is based on enterprise-wide resource planning, with large components focused on the NSF workforce and information technology. The document addresses resource needs and conveys the critical role of administration and management in ensuring continuing success in the agency's outcomes. A final version was submitted to OMB in April 2002.

- **Utilize and sustain broad access to new and emerging technologies for business application.** NSF has moved aggressively to adopt new technologies in our business processes. NSF must sustain and further develop exemplary mechanisms to streamline business interactions, enhance organizational productivity, ensure accessibility to a broadened group of participants, and maintain financial integrity and internal controls.

- **Develop a diverse, capable, motivated staff that operates with efficiency and integrity.** NSF is dependent on the capability and integrity of its staff. Innovative methods of recruitment, development, retention and employee recognition are needed to meet future challenges.

Over one half of NSF's Program Officers are non-permanent employees, either "on loan" from their host institutions as visiting scientists, engineers, and educators (VSEEs) or employed through grants to the home institutions under the terms of the Intergovernmental Personnel Act (IPA). These employees are a unique set of human resources, providing NSF with increased flexibility, new ideas and fresh science and engineering perspectives.

- **Develop and use performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.** An organization that is dependent on public funds must be accountable to the public. The development and use of effective indicators of agency performance -- measuring NSF's ability to meet mission-oriented goals, its competent use of resources in the investment process, and its efficiency and effectiveness as a reliable partner to others -- are needed to better explain the agency's role to the public.

III. STRATEGY – THE LONG VIEW

A. INTEGRATIVE STRATEGIES

NSF employs three *integrative strategies* that guide the entire agency in establishing priorities, identifying opportunities, and designing new programs and activities. They cut across all NSF programs and activities, and each is critical to accomplishing NSF's strategic goals.

(1) Develop Intellectual Capital

NSF invests in projects that enhance individual and collective capacity to perform - to discover, learn, create, identify problems and formulate solutions. It seeks investments that tap into the potential evident in previously underutilized groups and institutions of the Nation's human resource pool. This strategy is key to developing a competitive S&E workforce. In all of NSF's research programs, developing new knowledge goes hand-in-hand with educating and mentoring students, and informing the public through outreach.

> The work of very successful programs, such as the Louis Stokes Alliances for Minority Participation (LSAMPs), and of the individual and institutional winners of the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring provides increasing evidence of the pervasive importance of mentoring.

(2) Integrate Research and Education

NSF invests in activities that integrate research and education, and that develop reward systems to support teaching, mentoring and outreach. Effective integration of research and education at all levels infuses learning with the excitement of discovery. It also ensures that the findings and methods of research are quickly and effectively communicated in a broader context and to a larger audience. This strategy is vital to the accomplishment of its strategic goals.

(3) Promote Partnerships

Collaboration and partnerships between disciplines and institutions and among academe, industry and government enable the movement of people, ideas and tools throughout the public and private sectors. Furthermore, these partnerships optimize the impact of people, ideas and tools on the economy and on society.

> *International partnerships* are vital to achieving NSF's goals. The very nature of the science and engineering enterprise is global, often requiring access to geographically dispersed materials, phenomena, and expertise. It requires open and timely communication, sharing, and validation of findings. NSF integrates international cooperation in all S&E programs in order to ensure U.S. access to worldwide talent, ideas, information, S&E infrastructure, and partnerships.

B. INVESTMENT STRATEGIES

The majority of NSF's research funds support the best new ideas generated by scientists and engineers working at the forefront of discovery. This broad and highly flexible support ensures the vitality of a broad array of scientific and engineering fields that are needed for the U.S. to maintain leadership in science and engineering. This support is also extremely important in invigorating the research community since they promote emergence of new ideas and fields, especially in areas where disciplines are blurred and new technologies emerge. These investments also foster the development of new mechanisms for supporting research and education and require a continuing commitment to agile and flexible business processes.

NSF PRIORITY AREAS

In implementing its goals, NSF also invests in selected areas of high priority that hold exceptional promise for accelerating S&E progress, advancing the frontiers of knowledge, and addressing national interests. In close collaboration with the NSB and the S&E community, NSF identifies priority areas in which to make a sustained level of investment – usually five years – to move research forward rapidly while training a new cadre of scientists and engineers who can transform fields and spur industrial innovation. Each priority area contributes to strengthening U.S. world leadership in areas of global economic and social significance, as is evidenced by their natural overlap with the R&D priorities established by the Administration. NSF's current priority areas are:

- ***Biocomplexity in the Environment (BE):*** The BE priority area is a multidisciplinary effort that draws on new scientific and technological capabilities to investigate the interactions among biological, ecological, social, engineered and earth systems. The primary goals are to: synthesize knowledge across disciplines; improve science-based forecasting capabilities for complex environmental systems; and advance a broad range of methods, tools, and infrastructure to support interdisciplinary activities.

- ***Human and Social Dynamics (HSD):*** This investment seeks to better understand the causes and ramifications of change in order to increase our collective ability to anticipate and prepare for its effects on us as individuals and our institutions. HSD will also support research on the dynamics of the human mind. Through understanding the cognitive and social structures that create and define change, people and organizations will be better able to manage the profound and rapid changes that define our world.

- ***Information Technology Research (ITR):*** This priority area exploits and deepens fundamental research on the challenges facing the expansion and utilization of IT across science and engineering. From the investigation, development, and strengthening of large-scale networks to the creation of new integrative software and advanced architectures for high-end computing, IT will continue to be essential in the growth of our economy and in solving critical problems facing our nation.

- ***Mathematical Sciences:*** The mathematical sciences provide both powerful tools for insight and a common language to enable S&E progress in such areas as genomics, climate science, and information technology and allow scientists and engineers to tackle a broad range of

important challenges long considered intractable. This investment supports fundamental research in the mathematical sciences and the integration of mathematical and statistical research and education across the full range of science and engineering disciplines.

- ***Nanoscale Science and Engineering:*** This priority area encompasses the systematic organization, manipulation and control of matter at atomic, molecular and supramolecular levels. With the capacity to manipulate matter at this scale, science, engineering, and technology are realizing revolutionary advances, in areas such as individualized pharmaceuticals, new drug delivery systems, more resilient materials and fabrics, and order of magnitude faster computer chips.

- ***Workforce for the 21st Century:*** NSF will actively pursue research and education efforts that create a deeper understanding of what draws students to S&E careers, how to ensure broader participation, how to better prepare students to pursue S&E careers, how to address critical S&E workforce needs, and how to put all of this knowledge into practice.

FEDERAL CROSS-CUTTING ACTIVITIES

In addition to the priority areas, NSF participates in a wide range of cross-cutting activities. An important set of these activities are identified annually by the Office of Science and Technology Policy and the Office of Management and Budget as the Administration's interagency research and development priorities. The FY 2004 priorities are described below.

- **Networking and Information Technology Research & Development (NITRD):** Networking and computing technologies are increasingly important technologies for the American economy, national and homeland security, and progress across science and engineering. The most recent government-wide plan for research in this area is available athttp://www.itrd.gov.

- **National Nanotechnology Initiative (NNI):** This initiative holds great promise broadly across many scientific fields and most sectors of the economy. NSF emphasizes long-term fundamental research aimed at discovering novel materials, phenomena, processes and tools; addressing NNI Grand Challenges; supporting new interdisciplinary centers and networks of excellence, including shared user facilities; supporting research infrastructure; and addressing research and educational activities on the societal implications of advances in nanoscience and nanotechnology. The most recent information on NNI is available at http://www.nano.gov.

- **Climate Change Science:** A key aspect of the Administration's science-based climate change policy is investment in research and development (R&D) that will address major climate policy decisions and provide a framework for understanding and addressing long-term climate change. Priority funding areas include understanding the cycling of carbon in and around North America, research on climate change risk management, developing sensors to measure carbon dioxide and methane, and measuring and understanding the impact of black carbon. Additional information on this initiative is available at <http://www.climatescience.gov.

- **Homeland Security and Antiterrorism R&D:** Data mining to support antiterrorism analysis requires the ability to construct patterns from multiple, heterogeneous, data sources, some of which occur as massive streaming data sources in multiple languages. NSF will support research on ways to identify portions of these data that should be saved for analysis, or that contain new information on a developing knowledge structure. Of equal importance, NSF will support research on sharing data across agencies and from data sets that are separated by policy and by law. In these circumstances, research will explore methods to share data that either preserve privacy or include "probable cause" as a part of the data representation to be enriched by mining. Additional effort is being planned via workshops to engage the university research community in management of knowledge-intensive, high technology organizations, biometrics, geospatial information fusion, and biological sensors and sensor networks.

- **Molecular-level Understanding of Life Processes:** The past few years have seen major advances in our ability to sequence, analyze, and utilize complex genomic information from plants, animals, and microorganisms. Coupling such sequence and structural data to modern computational power and new experimental approaches that permit molecular manipulation of biological systems has the potential to unravel the complexity of life at all structural levels. Sequence data has already proven itself to be critical for homeland security forensic purposes.

  Efforts such as the Interagency Microbe Project, a microbe sequencing and physiology effort; the Interagency Working Group on Metabolic Engineering; the National Plant Genome Initiative; and The Ecology of Infectious Diseases Program all address fundamental patterns of molecular interactions that are reflected in function and behavior at the cellular, tissue, organismal, and population levels. NSF will focus on many of these areas; for instance, the 'Living Networks' area of emphasis will foster a molecular understanding of life at all levels of biological organization from genes to ecosystems. Other interdisciplinary programs such as 'Frontiers in Integrative Biological Research' specifically seek the most innovative approaches to understanding the complexity and integration of life processes across all levels of organization.

- **Education Research:** Continuing as a high priority of the Administration, the No Child Left Behind (NCLB) Act of 2002 calls for research that enables the successful development and implementation of science-based programs and practices in K-12 education. Information on the government-wide Interagency Education Research Initiative is available at http://www.ed.gov/about/offices/list/ies/ncer/pgms.html .

It is important to note that there is considerable synergy among NSF's investments in investigator-initiated research and education programs, the priority areas, and the cross-cutting activities. For example, much of the research in the cross-cutting activities is actually supported through investigator initiated grants within NSF's disciplinary programs. Also, results from these broader investments help identify prospects for more intensive investment - the priority areas. In turn, the priority areas lift the capabilities of the disciplines, enabling them to advance in new directions.

C. ESTABLISHING PRIORITIES

NSF establishes priorities through a process that integrates broad-based input provided by the science and engineering community with the overall strategic direction set by the Foundation's leadership, through interactions with the NSB, OMB, OSTP, Congress, and other R&D agencies and institutions. With hundreds of proposal competitions, meetings with experts, formal workshops and reports from commissions throughout the year, NSF is constantly listening, analyzing and responding to thoughts from the research and education community. External advice, information, and recommendations are also formally sought through interactions with Committees of Visitors (COVs) and Advisory Committees. Indeed, a key mechanism for identifying emerging opportunities is through more than 35,000 solicited and unsolicited proposals that NSF evaluates annually through its competitive merit-review process.

NSF's budget process focuses on identifying the most promising opportunities and giving them increased attention. In establishing budget priorities, NSF works very closely with the NSB, which has the responsibility for establishing NSF policies. In particular, the NSB Committee on Strategy and Budget closely works with NSF management to develop budget policies and strategies. The full NSB reviews and approves NSF's budgets and long-range plans, as well as new programs and major projects. The final stage of priority setting occurs when OMB considers NSF's request in the context of the overall Administration budget. Congressional guidance is manifested through hearings, testimony, committee reports, and other interactions reflected in authorization and appropriations legislation.

NSF and the NSB consider many factors in determining budget priorities. Most important are NSF's merit review criteria of *intellectual merit* and *broader impacts* and OMB/OSTP's investment criteria of *quality, relevance* and *performance*. Other considerations include readiness, technical feasibility, response to national needs, affordability, international benchmarks and balance with existing programs of NSF and other agencies. Consideration is also given to resource limitations, policy concerns, and GPRA performance goals and results.

> The independent studies carried out by various scientific and engineering communities - often funded in part by NSF - provide valuable guidance in setting priorities within a discipline and can even provide information useful in setting cross-disciplinary priorities and balancing the nation's investment among various scientific endeavors.

One issue that has been raised in a number of settings, including the PART assessments, is the transparency of NSF's priority-setting process. NSF is currently addressing this issue. For example, for the first time the FY 2004 budget justification includes a rank-ordered priority list of projects funded through the Major Research Equipment and Facilities Construction Account (MREFC). In addition, NSF has entered into a contract with the National Academy of Public Administration for a major organizational review that will include an analysis of NSF's investment processes.

APPENDIX A
PERFORMANCE ASSESSMENT

Implementing GPRA has been a challenge for NSF and other agencies with missions involving research and education because the substance and timing of the outcomes of such activities are unpredictable. Many require years to develop and can only be judged retrospectively. As a result, NSF requested and received OMB approval for use of an alternative, non-quantitative reporting format in assessing agency progress toward achieving its Strategic Goals. Use of this alternative format enables NSF to use a retrospective qualitative approach in its annual GPRA assessments of the strategic goals.

The agency has traditionally used various types of assessments and evaluations to monitor *non-quantitative* research and education outcomes, the quality of its investments, and its processes. Formalized examination by members of the external community takes place during merit review of proposals, COV and AC/GPA assessments, and development of agency performance reports. Additionally, programs and plans are assessed and evaluated throughout the year on a continuing basis by NSF staff.

NSF uses internal data systems to monitor and report progress in achieving the *quantitative* management goals. The assessment process for the quantitative goals is straightforward. NSF collects relevant data using internal corporate data systems and compares the results with the performance levels targeted for the fiscal year.

Project Assessment During NSF Merit Review

The merit review process provides a rigorous, first phase of assessment of NSF's research and education portfolio. At the onset, this process selects for support only the most competitive one-third of proposals submitted for consideration.

During NSF merit review, applicants and grantees provide results from previous NSF support, information about existing facilities and equipment available to conduct the proposed activity, biographical information on the Principal Investigators, and information on other sources of support, federally required certifications and certifications specific to NSF. Such information is required at the time of application, at the time of an award, and in annual and final project reports. It is reviewed by NSF staff, used during merit review, and made available to external committees (COVs and the AC/GPA) conducting performance assessment.

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

Program Assessment by Committees of Visitors (COVs)

NSF's Committees of Visitors provide external program assessments that are used in both program management and annual GPRA reporting. COVs conduct detailed reviews of the materials associated with individual proposal actions. They have traditionally assessed the integrity and efficiency of the processes for proposal review. With the full implementation of GPRA in FY 1999, NSF added a retrospective GPRA component to their responsibilities.

Each COV typically consists of five to twenty external experts who review actions for one or more programs over a two or three day period. These experts are selected to ensure independence, programmatic coverage, and balanced representation. They typically represent academe, industry, government, and the public sector.

All COVs are asked to complete a report template with questions addressing how programs contribute to NSF goals. Their retrospective assessments of accomplishments related to the People, Ideas, and Tools strategic outcome goals are based on their collective experience-based norms. COV members are asked to justify their judgments and provide supporting examples or highlights that illustrate success and progress toward performance goals.

Each year, COVs assess approximately one-third of NSF's programs. Therefore, the full NSF portfolio of approximately 220 programs is assessed over a three year period.

Advisory Committees (ACs) Reporting on Directorate/Office Performance

Advisory committees advise the seven directorates and the Office of Polar Programs. They are typically composed of 18-25 external experts who have broad experience in academe, industry and government. The role of the ACs is to provide advice on priorities, address program effectiveness, review COV reports, and examine directorate/office responses to COV recommendations.

In FY 2001 and previous years, directorate/office advisory committees assessed directorate/office progress in achieving NSF-wide GPRA goals. With the advent of the Advisory Committee for GPRA Performance Assessment (see below), advisory committees no longer assess directorate progress toward these goals.

Advisory Committee for Business and Operations

In FY 2002, NSF established the Advisory Committee for Business and Operations. The committee is composed of 15 members selected from the research administration, education management and business communities, including business professionals and academics in the field. The committee is charged with providing advice on issues related to NSF's business practices and operations, including innovative approaches to the achievement of NSF's strategic goals.

Advisory Committee for GPRA Performance Assessment (AC/GPA)

During FY 2002, NSF determined that a more efficient and effective process for the assessment of agency performance with respect to annual performance goals associated with the strategic goals was to charge a single external committee of experts with review of all Foundation accomplishments. That decision resulted in the chartering of a new advisory committee on July 15, 2002. The committee's first meeting was held in September 2002. The AC/GPA is comprised of about 20-25 independent external experts representing academia, industry, and government.

The AC/GPA looks at Foundation-wide portfolios linked to the agency's strategic goals related to People, Ideas, and Tools. Committee discussions and decisions are based on information provided by the NSF Directorates and the Office of Polar Programs. Committee members have access to a variety of information, including COV reports. After its meetings, the AC/GPA provides NSF with a report concerning NSF performance with respect to the indicators associated with each annual performance goal. The recommendations developed by the AC/GPA are used, along with other qualitative information and quantitative management results, to prepare NSF's Performance and Accountability Report.

Agency GPRA Reporting

The AC/GPA and the COV reports address a broad set of issues, ranging from staffing and quality of merit review to specifics of a scientific project to agency progress related to outcome goals. NSF staff use the GPRA components of these reports in assessing the success of NSF in achieving its annual performance goals. The criterion for success for each of NSF's annual performance goals associated with the strategic goals can be stated:

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

The agency decision for NSF success for each goal is based on analysis of statements contained within the AC/GPA and COV reports. NSF staff examines individual ratings or statements of significant accomplishment in the reports to ensure that judgments are justified. In addition, there must be evidence or examples that support such judgments. Selected GPRA goals are verified and validated each year by external third parties.

Assessment Utilizing the Program Assessment Rating Tool (PART)

The Program Assessment Rating Tool was developed by the Office of Management and Budget to assess program performance in four areas: Program Purpose and Design, Strategic Planning, Program Management, and Program Results / Accountability. For the purposes of PART assessment, each of the investment categories under the People, Ideas and Tools Strategic Goals is considered a "program." The PART instrument also is being used to assess the performance of each of the priority areas. In FY 2003, assessments were completed on the "Individuals" and "Facilities" programs and on the Information Technology Research and Nanoscale Science and Engineering priority areas. Each year, additional programs will be assessed for the first time and previous assessments will be updated to reflect new information and actions taken to enhance program management and results. All NSF programs and current priority areas will be assessed by the end of FY 2006.

APPENDIX B
CROSSWALK OF GOALS, INVESTMENT CATEGORIES, AND NSF PROGRAMS

PEOPLE: A DIVERSE, COMPETITIVE, AND GLOBALLY ENGAGED U.S. WORKFORCE OF SCIENTISTS, ENGINEERS, TECHNOLOGISTS AND WELL-PREPARED CITIZENS

Individuals: Investments that ensure development of world-class scientists, engineers, mathematicians, technologists and educators.

Faculty Early Career Development Program (CAREER)
Distinguished Teaching Scholars
Graduate Research Fellowships (GRF)
Integrative Graduate Education and Research Traineeships (IGERT)
Postdoctoral Programs
Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)
Research Experiences for Undergraduates (REU) Supplements
Robert Noyce Scholarship Program
Scholarship for Service (SFS) / Cybercorps
Teacher Professional Continuum (STEM Teacher Preparation and Teacher Enhancement)
Vertical Integration of Research and Education (VIGRE)
Other Individuals Support

Institutions: Investments that enable colleges, universities and other institutions to attract increased numbers of students to S&E fields and enhance the quality of S&E education at all levels.

ADVANCE / Professional Opportunities for Women in Research and Education (POWRE)
Advanced Technological Education (ATE)
Course, Curriculum and Laboratory Improvement (CCLI)
Engineering Education Reform
Instructional Materials and Assessment Development
STEM Talent Expansion Program
Other Institutions Support

Collaborations: Investments that foster partnerships with colleges, universities, school districts, and other institutions – public, private, state, local, and Federal – to strengthen S&E education at all levels and broaden participation in S&E fields.

Centers for Learning and Teaching (CLT)
Evaluation
Graduate Research Fellows in K-12 Education (GK-12)
Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)
Informal Science Education
Louis Stokes Alliances for Minority Participation
Math and Science Partnership (MSP)
Minority Graduate Education (MGE) / Alliances for Graduate Education and the Professoriate (AGEP)
Minority Institutions of Excellence (MIE)
Partnerships for Innovation (PFI)

Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM)
Program for Gender Equity (PGE)
Program for Persons with Disabilities (PPD)
Research Experiences for Undergraduates (REU) Sites
Rural Systemic Initiatives (RSI)
Statewide Systemic Initiatives (SSI)
Tribal Colleges
Urban Systemic Program (USP)
Other Collaborations Support

IDEAS: DISCOVERY ACROSS THE FRONTIER OF SCIENCE AND ENGINEERING, CONNECTED TO LEARNING, INNOVATION AND SERVICE TO SOCIETY

Fundamental Science and Engineering: Investments that support the best new ideas generated by the S&E community.

Disciplinary Research
Arctic Research Commission
Innovation Fund
Interagency Education Research Initiative (IERI)
Plant Genome Research (excluding Centers)

Centers Programs: Investments that enable organizations to integrate people, ideas, and tools on scales that are large enough to significantly impact important S&E fields and cross-disciplinary areas.

Centers for Analysis and Synthesis
Centers for International Collaboration
Chemistry Centers
Earthquake Engineering Centers
Engineering Research Centers and Groups
Information Technology Centers
Long-Term Ecological Research sites
Materials Centers, Collaboratives and Institutes
Mathematical Sciences Research Institutes
Nanotechnology Centers
Physics Centers
Plant Genome Centers
Science and Technology Centers
Science of Learning Centers
Social, Behavioral and Economic Sciences Centers
Other Geosciences Centers

Capability Enhancement: Investments that enhance the capability of individuals and institutions to conduct high quality, competitive research, education, and technological innovation.

Centers of Research Excellence in Science and Technology (CREST)
Experimental Program to Stimulate Competitive Research (EPSCoR)
Research Opportunity Awards (ROA)
Research in Undergraduate Institutions (RUI)
Small Business Innovation Research (SBIR)
Small Business Technology Transfer (STTR)

Industry / University Cooperative Research Centers (I/UCRC)
State / Industry / University Cooperative Research Centers (S/I/UCRC)

TOOLS: BROADLY ACCESSIBLE STATE-OF-THE-ART S&E FACILITIES, TOOLS AND OTHER INFRASTRUCTURE THAT ENABLE DISCOVERY, LEARNING AND INNOVATION

Facilities: Investments in the development, construction, and operation of state-of-the-art facilities and platforms that enable communities of researchers and educators to work at the S&E frontier.

Academic Research Fleet
Advanced Modular Incoherent Scatter Radar (AMISR)
Alaska Regional Research Vessel (ARRV)
Atacama Large Millimeter Array (ALMA)
Cornell Electron Storage Ring (CESR)
EarthScope: US Array, San Andreas Fault Observatory at Depth (SAFOD), Plate Boundary Observatory (PBO)
GEMINI
George E. Brown, Jr., Network for Earthquake Engineering Simulation (NEES)
High-performance Instrumented Airborne Platform for Environmental Research (HIAPER)
IceCube
Integrated Ocean Drilling Program
Incorporated Research Institutions for Seismology (IRIS)
Large Hadron Collider (LHC)
Laser Interferometer Gravitational-Wave Observatory (LIGO)
MSU Cyclotron
Nanofabrication (National Nanofabrication Users Network (NNUN) / National Nanotechnology Infrastructure Network (NNIN))
National Ecological Observatory Network (NEON)
National High Field Mass Spectrometry Center
National High Magnetic Field Laboratory (NHMFL)
Network for Computational Nanotechnology (NCN)
Ocean Observatories
Ocean Drilling Program Facilities
Partnerships for Advanced Computational Infrastructure (PACI)
Rare Symmetry Violating Processes (RSVP)
Scientific Ocean Drilling
Terascale Computing Systems
Other CISE, GEO and MPS Facilities

Infrastructure and Instrumentation: Investments in state-of-the-art instruments, platforms, information technology, databases, and other tools that uphold U.S. S&E leadership and that enable diverse communities of researchers, educators and students working at the S&E frontier.

Advanced Networking Infrastructure
Digital Library
Major Research Instrumentation (MRI)
Research Resources
Science Resources Statistics (SRS)

Polar Tools, Facilities and Logistics: Investments that provide state-of-the-art tools, facilities and other infrastructure to enable world-class polar research and education.

Antarctic Facilities and Operations
Antarctic Logistics
Arctic Logistics
South Pole Station

Federally Funded R&D Centers (FFRDCs): Investments in research, development, and R&D policy that create unique, important and long-term capabilities for the Federal government, in response to law, mandate or widely recognized need.

National Astronomy and Ionosphere Center (NAIC)
National Center for Atmospheric Research (NCAR)
National Optical Astronomy Observatory (NOAO)
National Radio Astronomy Observatory (NRAO)
Science and Technology Policy Institute (STPI) / RaDiUS

APPENDIX C
NSF VALUES AND ATTRIBUTES

OUR ATTRIBUTES

We continually refresh our plans and strategies to assure that the agency will be:

OPEN - NSF is committed to the sharing of information and a free marketplace of ideas. It demonstrates an openness and facility for relating to all key constituents within and outside the organization.

INCLUSIVE – NSF takes a holistic view of opportunities and challenges, embracing diversity in all activities and at all levels.

INSPIRING – Through leadership and creative flair, NSF inspires agency staff and the community it serves to strive for the greatest levels of accomplishment. The community seeks out NSF for its quality and reliable perspective, insights and offerings. NSF has earned an international reputation that makes the agency a benchmark for other science and engineering agencies throughout the world.

PACE-SETTING – In identifying and supporting ideas with the greatest creativity, embracing new thinking, and using information technologies in innovative ways, NSF helps chart new paths for the science and engineering community.

INFLUENTIAL – In both the global community and the corridors of science and technology policymakers, NSF is viewed as a creative catalyst – credible, relevant and timely – as well as an excellent, statesperson-like organization that brings together other high-level decision makers.

AGILE – NSF quickly and effectively responds to changing needs and opportunities. It embraces change through effective systems-thinking and appropriate feedback mechanisms. NSF is a learning organization that is committed to self-improvement.

ACCOUNTABLE – NSF builds public trust by being professional, practical and orderly in its operating standards and how it manages its business. NSF and its staff are committed to excellence as a personal and an organizational standard.

HOW WE OPERATE

WE ENABLE people to perform by investing in their creative ideas, providing them with cutting-edge research and education tools, and supporting an infrastructure for education and learning.

WE PARTNER with a dynamic and diverse education and research community, working in a close trusting partnership while maintaining an independent perspective. We encourage partnerships among agencies, industry, academe, the states, and other nations when collaborative efforts further our goals.

WE INTEGRATE and synergize the knowledge and skills of diverse disciplines and constituencies. We promote the mutual sharing of knowledge and resources. We integrate the processes of discovery, innovation and learning, and connect them to societal use.

WE EMBRACE competitiveness in all of our programs and activities. We optimize the efficiency and effectiveness of our investments through the use of the competitive merit review process and peer evaluation of programs and activities.

WE MANAGE AND COMMUNICATE in a professional and effective manner. We listen intently to our customers, valuing their ideas and opinions. We effectively build consensus for new ideas and directions. We clearly articulate and communicate our values, plans, and activities so that customers and constituencies know what to expect of us. We provide the very best service possible to our customers.

WE INCLUDE all citizens, groups and constituencies, and promote equal opportunity for all. We work to ensure that the scientific and engineering workforce is as extensive and diverse as possible in order to create a more inclusive and robust enterprise.