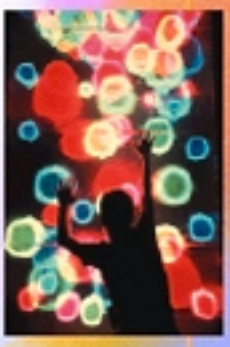
FY 2001
Budget Request to Congress

National
Science
Foundation

Celebrating 50 Years



Summary of the FY 2001 Budget Request to Congress

National Science Foundation

Celebrating 50 Years

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Fiscal Year 2001 Budget Request Overview

The National Science Foundation requests $4.572 billion for Fiscal Year 2001, $675 million or 17.3% over FY 2000. The FY 2001 Budget Request will invest in the innovative ideas, outstanding people and cutting-edge tools that our nation needs for a 21st Century research and education enterprise – an enterprise that paves new roads to discovery, addresses national science and engineering priorities, and commits itself to a world-class science, engineering, and technology workforce. NSF's investments reflect the Foundation's three strategic goals:

- Ideas - Discovery at and across the frontier of science and engineering, and connections to its use in the service of society.
- People - A diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens.
- Tools - Broadly accessible, state-of-the-art information bases and shared research and education tools.

NSF's investments in Ideas, People and Tools work in concert to support the agency's mission to maintain U.S. leadership in all aspects of science and engineering research and education. Funding levels associated with the Foundation's three strategic goals are shown in the table below.

NSF Funding by Strategic Goal
(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Percent Change
Ideas	1,972.62	2,424.92	22.9%
People[1]	801.06	887.54	10.8%
Tools	934.41	1,044.83	11.8%
Administration and Management	189.09	215.11	13.8%
Total, NSF	$3,897.18	$4,572.40	17.3%

[1] Does not include $33 million in FY 2000 and $31 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees.

These goals are implemented through NSF's five appropriation accounts. Funding levels for each of NSF's appropriation accounts are shown in the table below.

NSF Funding by Appropriation
(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Percent Change
Research and Related Activities	2,958.46	3,540.68	19.7%
Education and Human Resources [1, 2]	690.87	729.01	5.5%
Major Research Equipment	93.50	138.54	48.2%
Salaries and Expenses	148.90	157.89	6.0%
Office of Inspector General	5.45	6.28	15.2%
Total, National Science Foundation	$3,897.18	$4,572.40	17.3%

[1] Does not include $33 million in FY 2000 and $31 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees.
[2] While EHR is the major focus of NSF's investment in education and training and increases by 5.5%, NSF's total investment in People increases by 10.8%.

Everyone marvels at the speed and vitality of today's powerful, high-tech economy that has created unprecedented wealth and millions of new, high paying jobs. The United States today is in the midst of the longest peacetime economic expansion in our history. In a speech last spring, Federal Reserve Chairman Alan Greenspan said that the "phenomenal" performance of the U.S. economy, with its strong growth, low inflation, low unemployment, and high business profits, is due in large part to technological innovations.

Today's innovations are the outgrowth of discoveries made in the fundamental scientific and engineering disciplines over the last quarter century or longer. For example:

- Microelectronics and related industries, enabled by 50 years of discoveries in condensed matter physics, materials science and engineering, and electrical engineering and computer science, account for millions of jobs in the United States today.

- Understanding the structure and properties of DNA — a process that has been on-going since the 1950's — is today the basis for a new and dynamic biotechnology industry that has made dramatic contributions to agriculture, the environment, and human health.

- Information technology — from its infancy with the computer ENIAC in the 1940's, to bar code scanners in supermarkets, to the Internet — is in the process of transforming all sectors of life, leisure, learning, research, and the economy.

NSF investments in ideas, people, and tools have produce world-class achievements throughout the latter half of the 20th century. NSF-supported researchers have been awarded over 100 Nobel Prizes in physics, chemistry, physiology, and economics; and over half of the Turing awardees have received NSF support. (The Turing Award recognizes contributions of lasting and major technical importance to the computer field.) Just as today's economic success is fueled by yesteryear's science and engineering achievements, so our dreams for tomorrow will be enabled by today's achievements. As Vannevar Bush wrote 50 years ago, *"Science is an endless frontier;"* there will be more exciting opportunities in the future because of research investments made today. For example:

- Nanoscale science and engineering is allowing us to build nanometer machines so small that they are rapidly approaching the scale of human cells. A nanometer is to an inch what an inch is to 400 miles. We are on the verge of building machines on the nanometer scale — atom by atom, molecule by molecule.

- Quantum computing or DNA computing may revolutionize the way in which we collect, process, store and distribute information in the future.

- Advances in the mathematical sciences increasingly underpin and enable advances in all areas of science, engineering and technology. For example, mathematics is expanding the impact of digitalization afforded by powerful computational tools, increasing the ability to analyze massive data collections, increasing the richness of simulation models, and providing powerful new ways to handle probability and uncertainty issues.

- The rapid pace at which new technologies are deployed is having a dramatic social and cultural impact. Understanding the impacts of technological change could change the scope and manner in which new technologies are deployed, improving our lives and the lives of our children.

In the new century, NSF faces daunting challenges and breathtaking possibilities: responding to emerging opportunities, broadening scientific participation by all members and regions of our nation, strengthening the connections between scientific discovery and technological innovation, modernizing the nation's research and education infrastructure, and positioning the U.S. to benefit from the global investment in science, engineering, and technology. The FY 2001 Budget Request will allow the NSF to meet these challenges with a combination of strengthened support of core investments and focused initiatives that address particular opportunities.

Highlights and Priorities

The FY 2001 Budget Request builds on NSF's strength as the only agency of the federal government exclusively devoted to promoting basic research and education at all levels and across all fields of science and engineering.

Investing in People

People are NSF's most important product. At NSF, placing research and learning hand in hand is our highest priority, and the people involved in our projects represent both the focus of our investments and the most important products of them. Across the Foundation's programs, NSF provides support for almost 200,000 people, including teachers, students, researchers, post-doctorates, and trainees. Support for programs specifically addressing NSF's Strategic Goal of "People — A diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens" totals more than $887 million in FY 2001, an increase of almost 11 percent over FY 2000. A major focus for these activities is in the Education and Human Resources (EHR) account. The EHR efforts are integrated with complementary activities across the Foundation where the research directorates contribute over $300 million of the $887 million toward the People goal. Moreover, about 40 percent of the funding for research grants — an amount approaching $1 billion in FY 2001 — provides support for researchers and students, including more than 61,000 post-doctorates, trainees, and graduate and undergraduate students.

Strengthening Core Investments

The request devotes $320 million to increases in core disciplinary research that extends the frontiers of science and engineering. These activities sustain the flow of new discoveries that fuel the development of new technologies, lead to new markets and new tools for discovery and learning, and make possible interdisciplinary initiatives. For example, we are now relying increasingly on fundamental mathematics to understand key aspects of living systems – such as how microbes develop drug resistance and how viruses (e.g. HIV) can become dormant and undetectable for long periods.

Examples of investment in core research include:

- Links between quantum theory and fundamental mathematics: mathematicians and physicists together are gaining insight into diverse topics, such as the fundamental makeup of matter, the nature of the chemical molecular bond, and the development of new materials.

- Research on the key physical, chemical and geologic cycles within the Earth System: including improved understanding of the primary processes involved in the large-scale water cycle, which will provide knowledge of the regional distribution of water and enhance the ability to predict and prepare for droughts and floods.

- Research in the psychological, cognitive, and language sciences: to provide a sharper picture of how human language is acquired and how it is used, both for thought and communication, thus laying the foundation for progress in many areas of national importance, from teaching children how to read to building computers that can talk.

- Research in functional genomics: developing and applying methods for linking genetic sequence data to intercellular and organismal functions has great practical value for biotechnology applications.

These funds will support merit-reviewed research across the full NSF portfolio and will help provide balance across all science and engineering fields. The $320 million increase, coupled with the $355 million increase for focused initiatives, described below, will support a greater number of researchers and educators who will help enable tomorrow's breakthroughs. Grant size and duration will also be increased to improve the efficiency and effectiveness of the academic research enterprise. In addition, NSF will pay increased attention to broadening and diversifying participation in all of its programs, including increasing the proportion of research grants going to new investigators – an ongoing goal for the Foundation.

Focused Initiatives

In FY 2001, in addition to support for core research, education and tools, NSF will emphasize priority investments in four interdependent initiative areas - **Information Technology Research (ITR), Nanoscale Science and Engineering, Biocomplexity in the Environment (BE),** and **21st Century Workforce.** These areas combine exciting opportunities in research and education with immense potential to generate important benefits to society. Because the Foundation is committed to these areas, $135 million has been reallocated from the base to be added to $355 million of new funding.

- **Information Technology Research (ITR).** NSF is the lead agency for the multi-agency IT R&D program. Advances in software, networking, scalability, high-end computing, mathematics, research applications, wireless networking, communications and remote sensing will enable the entire science and engineering community to work more productively and to examine issues that were previously

too complex to address with the existing information technology. Investments in IT will deliver tools and capabilities that will benefit every field, every discipline and people at every level of education. For example, sophisticated techniques for designing and constructing software could ultimately be used by the private sector to develop new markets and to speed reliable and robust information appliances to consumers and information systems to industry. Understanding the social and cultural impacts of technological change could change the scope and manner in which new technologies are deployed, improving our lives and the lives of our children.

- **Nanoscale Science and Engineering.** Nanoscale science and engineering promise to yield a dominant technology for the 21st Century because the control of matter at the nanoscale underpins innovation in critical areas from information technology and medicine to manufacturing and the environment**.** To capitalize on this opportunity advances in fundamental knowledge, innovation, and technique must be made before many of the practical benefits can be realized. Possible future uses of nanotechnology include artificial photosynthesis for clean energy and computer chips capable of storing trillions of bits of information on an area the size of a pinhead.

- **Biocomplexity in the Environment (BE).** BE is a multidisciplinary approach to understanding our world's environment. The FY 2001 BE budget request capitalizes upon FY 1999 and FY 2000 investments in support of focused initiatives aimed at understanding the many complex systems that are structured or influenced by living organisms or biological processes. Due to the advent of new tools and technologies, investigators are poised to gain a better understanding of how these systems function together across widely varying scales of time (milli-seconds to epochs) and space (individual cells to large ecosystems). This investment will have enormous payoff in the years ahead, including increased understanding of the relationship between the environment and human health, discoveries relevant to growing industries such as biotechnology, and enhanced predictability of environmental systems that will assist environmental decision makers.

- **21st Century Workforce.** This initiative builds on NSF's FY 2000 theme of *Educating for the Future: A 21st Century Workforce*. The long-term goal is to generate a 21st Century workforce that is second to none, and to bring increased understanding of science, mathematics and technology to citizens of all ages. Research on the science of learning, development of the instructional workforce and diversifying the general workforce are the foci of this initiative. Improving understanding of how people think and learn will establish a knowledge base for educators to use in developing more effective teaching/learning methods for citizens of all ages and cultures. Fully engaging the broad spectrum of America's diversity is necessary to create this 21st Century science and engineering workforce.

Funding levels for each of these initiative areas are shown in the table below:

NSF Funding by Initiative
(Dollars in Millions)

Initiative	FY 2000 Current Plan	FY 2001 Base Reallocation	FY 2001 New Funding	FY 2001 Request	Percent Change
Information Technology Research	126.00	20.91	180.00	326.91	159.5%
Nanoscale Science and Engineering	97.30	50.35	69.00	216.65	122.7%
Biocomplexity in the Environment	50.00	20.31	66.00	136.31	172.6%
21st Century Workforce	73.66	43.39	40.00	157.05	113.2%
Total, Initiatives	$346.96	$134.96	$355.00	$836.92	141.2%

Additional FY 2001 Highlights

Major Research Equipment. In the Major Research Equipment account we will add over $45 million including almost $30 million to begin two new projects - EarthScope: USArray and San Andreas Fault Observatory at Depth (SAFOD) and the National Ecological Observatory Network (NEON). EarthScope: SAFOD/USArray is an array of instruments that will allow scientists to observe earthquake and other earth processes at much higher resolution. NEON is a pole-to-pole network with state-of-the-art infrastructure platforms and equipment to enable 21st Century ecological and biocomplexity research. In addition, support will be provided to continuing projects.

Cyber Security for the 21st Century – Critical Infrastructure Protection (CIP). In FY 2001 NSF, in partnership with the Office of Personnel Management, is developing a new program that will offer college scholarships to students with concentrations in information security in exchange for their public service after graduation. This program will create a new generation of computer security specialists who will work to defend our nation's computer systems and networks. For this interagency initiative, NSF will invest $11.2 million. In addition, NSF will invest approximately $33 million for research on computer security.

GLOBE. NSF continues its participation in the interagency Global Learning and Observations to Benefit the Environment Initiative (GLOBE) program, providing $2 million in FY 2001. GLOBE provides environmental science education to K-12 students in more than 3,500 schools and 45 countries.

H1-B Nonimmigrant Petitioner Fees. As provided in recent legislation to strengthen the technology workforce, $31 million is provided from H1-B nonimmigrant fees for scholarships, enrichment courses, and systemic reform activities, consistent with other NSF investments in advanced technological education.

EPSCoR. Funding for EPSCoR (the Experimental Program to Stimulate Competitive Research) will total up to $73 million. This includes $48 million provided through the Education and Human Resources appropriation, and up to $25 million provided through NSF's Research and Related Activities account, to enable EPSCoR researchers to participate more fully in NSF research activities.

Celebrating 50 Years

When NSF was founded, we understood very little about many things that we take for granted today. For example, we did not know what biological mechanisms controlled genetic changes; computers — the handful that existed — were made from vacuum tubes; much of the inner workings of the brain were a mystery; lasers, if they could be imagined at all, were subjects only of science fiction; and most of the revolutionary knowledge that we have today about the cosmos has been discovered in the last 25 years.

In May 2000, NSF will celebrate its 50th birthday, and in so doing, will celebrate the outcomes of investments made during its lifetime. In commemoration of its 50th birthday, NSF is compiling fifty examples of societal achievements that span its existence. This compilation will be published and placed on NSF's website later this year.

With such a broad range of accomplishment over the years it has been difficult to select just fifty specific examples, let alone one. The following case in point describes one of the many outstanding successes that is the culmination of work by several NSF supported researchers over a period of time.

NSF's role in addressing fundamental problems can be traced back to its first cohort of five grants made in 1951. One of these awards — for $5,000 — entitled "Mechanisms Underlying Genetic Recombination in Bacteria", went to Dr. Max Delbruck, a physicist who had been studying genetic changes in the most simple of organisms, bacteria.
The results of Delbruck's work and teaching contributed to the rise of modern molecular genetics. Delbruck won the Nobel Prize in 1969. One of Delbruck's students, Dr. James Watson, went on to discover the structure of the DNA molecule — for which he and Francis Crick won the Nobel Prize in 1962. Another Delbruck student, Renato Delbecco, with David Baltimore and Howard Temin, won a Nobel Prize in 1975 for their adaptation of Delbruck's techniques to the study of animal viruses.

Today we are reaping the fruits of this important early work. We are in the midst of an age of genomics, the biotechnology industry is a multibillion-dollar industry, and the United States is the world leader in biotechnology with applications from agriculture to aquaculture to pharmaceuticals. The genomics revolution is enabling the study of whole genomes rather than single genes, giving us a perspective on living systems that we've never had before.

Fundamental questions such as the mystery of the genome were unlocked only through the imagination, daring, and dedicated work of very talented scientists and engineers. Such work required long-term support, much of it by the National Science Foundation and other federal agencies. Indeed, history has demonstrated that many federally supported discoveries have echoed throughout the years, spawning even greater breakthroughs and innovations.

The National Science Policy Report — endorsed by the House of Representatives in 1998 — captured this very point.

The federal investment in science has yielded stunning payoffs. It has spawned not only new products, but also entire industries. To build upon the strength of the research enterprise we must make federal research funding stable and substantial, maintain diversity in the federal research portfolio, and promote creative, groundbreaking research.

Looking ahead, NSF will continue to invest in the most promising areas of science and engineering research and education. We can be certain that the results will enhance the nation's future in profound and as yet unimagined ways.

Summary of NSF Accounts

Research and Related Activities

The Research and Related Activities (R&RA) account supports activities that enable the U.S. to provide leadership and promote progress across the expanding frontiers of scientific and engineering research and education. These activities support areas of inquiry critical to long-term U.S. economic strength, security, and quality of life. Research activities spur new knowledge, ideas, tools and approaches that open doors to understanding and solving problems and offer increased opportunities for economic growth. Moreover, as students work alongside senior staff performing research activities, there is a natural integration of research and education as students acquire the skills necessary to perform world class research and become members of the next generation's workforce of scientists and engineers. NSF investments in R&RA reflect the Foundation's three strategic goals: Ideas, People and Tools.

The FY 2001 Request for R&RA totals $3.54 billion, a 19.7 percent increase over FY 2000. In FY 2001, support is provided for NSF initiatives in Information Technology Research, Nanoscale Science and Engineering, Biocomplexity in the Environment, and 21st Century Workforce. NSF will also emphasize increasing the average size and duration of awards. Within R&RA:

- The **Biological Sciences** (BIO) Activity provides support for research to advance understanding of the underlying principles and mechanisms governing life. Research ranges from the study of the structure and dynamics of biological molecules, such as proteins and nucleic acids, through cells, organs and organisms, to studies of populations and ecosystems. It encompasses processes that are internal to the organism as well as those that are external, and includes temporal frameworks ranging from measurements in real time through individual life spans, to the full scope of evolutionary time. The FY 2001 Request for BIO totals $511.14 million, a 23.3 percent increase over FY 2000. BIO will continue to support fundamental academic research on biodiversity, environmental biology, and plant biology, including providing leadership for the Multinational Coordinated *Arabidopsis* Genome Project.

- The **Computer and Information Science and Engineering** (CISE) Activity supports research on the theory and foundations of computing, system software

and computer system design, human-computer interaction, as well as prototyping, testing and development of cutting-edge computing and communications systems to address complex research problems. CISE also provides the advanced computing and networking capabilities needed by academic researchers for cutting-edge research in all science and engineering fields. The FY 2001 request for CISE totals $529.10 million, a 36.2 percent increase over FY 2000, including $190.0 million as part of NSF's Information Technology Research initiative.

- The **Engineering** (ENG) Activity seeks to enhance the quality of life and national prosperity by investing in research and education activities that spur new technological innovations and create new products and services and more productive enterprises. ENG also makes critical investments in facilities, networks, and people to assure diversity and quality in the nation's infrastructure for engineering education and research. The FY 2001 Request for ENG totals $456.50 million, a 19.6 percent increase over FY 2000. ENG will support research in areas including information technology, nanotechnology, biotechnology, and microelectronics. Funds are included to meet the mandated level for the Foundation-wide Small Business Innovation Research (SBIR) program.

- The **Geosciences** (GEO) Activity supports research in the atmospheric, earth, and ocean sciences. Basic research in the geosciences advances our scientific knowledge of the Earth and advances our ability to predict natural phenomena of economic and human significance, such as climate change, earthquakes, weather, fish-stock fluctuations, and disruptive events in the solar-terrestrial environment. The FY 2001 Request of $583.0 million, a 19.5 percent increase over FY 2000, will support the operation and enhancement of national user facilities as well as fundamental research across the geosciences, including emphases on the U.S. Weather Research Program and National Space Weather Program; the U.S. Global Change Research Program; and research on the key physical, chemical and geologic cycles within the Earth System.

- The **Mathematical and Physical Sciences** (MPS) Activity supports research and education in astronomical sciences, chemistry, materials research, mathematical sciences and physics. Major equipment and instrumentation such as telescopes, particle accelerators, synchrontron light sources and neutron facilities are provided to support the needs of individual investigators. The FY 2001 Request of $881.16 million, a 16.3 percent increase over FY 2000, will support fundamental research, state-of-the-art instrumentation, facilities, groups and centers, and the education and training of the future workforce, including bringing scientific discovery to the public.

- The **Social, Behavioral and Economic Sciences** (SBE) Activity supports research to build fundamental scientific knowledge about human characteristics and behavior. SBE also supports the Foundation's international activities, providing U.S. scientists and engineers with access to centers of excellence in science and engineering research and education throughout the world. To improve understanding of the science and engineering enterprise, SBE provides informational tools for tracking the human and institutional resources that make up the nation's science and engineering infrastructure. The FY 2001 Request includes $175.14 million for SBE, a 19.8 percent increase over FY 2000.

- **Polar Programs**, which include the U.S. Polar Research Programs and U.S. Antarctic Logistical Support Activities, support multi-disciplinary research in Arctic and Antarctic regions. These geographic frontiers – premier natural laboratories – are the areas predicted to be first affected by global change. They are vital to understanding past, present, and future responses of Earth systems to natural and man-made changes. Polar Programs support provides unique research opportunities ranging from studies of the earth, ice and oceans to research in atmospheric sciences and astronomy. In FY 2001, Polar Programs increases to $285.41 million, 12.8 percent over FY 2000. Increases are provided for integrated interdisciplinary studies of the Arctic system as well as for

research on Antarctic ice sheets and oceans. Support is also provided to sustain the science facilities and operations that make Arctic and Antarctic research possible, with FY 2001 emphases including increased access to both regions through improvements in weather forecasting systems and air navigation systems.

- **Integrative Activities** (IA) supports emerging cross-disciplinary research and education efforts and major research instrumentation, and provides support for the Science and Technology Policy Institute. The FY 2001 Request of $119.23 million for IA, a decrease of $10.0 million from FY 2000, includes $50.0 million for major research instrumentation, $32.0 million for the Opportunity Fund, and $20.0 million in continued support of Science and Technology Centers.

Education and Human Resources

The FY 2001 Request for Education and Human Resources (EHR) is $729.01 million, an increase of 5.5 percent over FY 2000. In addition, $31.0 million will be provided in FY 2001 from H-1B Nonimmigrant Petitioner Fees. EHR supports a cohesive and comprehensive set of activities which encompass every level of education and every region of the country. EHR also plays a leadership role in the Foundation's 21st Century Workforce initiative by virtue of its extensive programming in education and human resource development. Highlights within EHR include:

- Centers for Learning and Teaching which address comprehensive, long-term approaches to learning and teaching by strengthening the content knowledge of the diverse science and mathematics teaching corps and developing the next generation of experts to guide the development of instructional materials, classroom and large-scale assessments, education research, and informal education

- The Graduate Teaching Fellows in K-12 Education program allows K-12 teachers to utilize graduate and advanced undergraduate students as science and mathematics resources for their classrooms. These Fellows will assist teachers in the science and mathematics content of their teaching, demonstrate key science and mathematics concepts, and gain necessary pedagogical skills.

- The Scholarships for Service program will award scholarships for the study of information security in return for a commitment to work for a specified time for the federal government.

- The Tribal Colleges program will provide awards to enhance the quality of SMET instructional and community outreach programs through curricular reform and enhancement, faculty development, research and other out-of-classroom educational experiences for students, upgrading of scientific instrumentation, and improvement of research infrastructure.

In FY 2001, H-1B Nonimmigrant Petitioner fees for NSF are projected to be $31.0 million for the following activities: Computer Science, Engineering, and Mathematics Scholarships; Grants for Mathematics, Engineering, or Science Enrichment Courses; and Systemic Reform Activities.

Major Research Equipment

The FY 2001 Request for Major Research Equipment (MRE) is $138.54 million, an increase of $45.04 million, or 48.2 percent over FY 2000. The Major Research Equipment account provides funding for the construction and acquisition of major research facilities that provide unique capabilities at the cutting edge of science and engineering. Operations and maintenance costs of the facilities are provided through R&RA.

In FY 2001, funding for seven projects is requested through the Major Research Equipment account: EarthScope:USArray and SAFOD, the Large Hadron Collider (LHC), the Millimeter Array (MMA), the National Ecological Observatory Network (NEON), the Network for Earthquake Engineering Simulation (NEES), the modernization of the South Pole Station, and Terascale Computer Systems.

Salaries and Expenses

The FY 2001 Request for Salaries and Expenses (S&E) is $157.89 million, an increase of 6.0 percent over FY 2000. The Salaries and Expenses appropriation provides funds for staff salaries and benefits, and general operating expenses necessary to manage and administer the NSF. The requested level supports 1,150 full-time equivalents (FTEs), provides for current administrative services, and enhances the agency's investment in information technology to increase productivity.

Office of Inspector General

The Office of Inspector General (OIG) was established to promote economy, efficiency, and effectiveness in administering the Foundation's programs; to detect and prevent fraud, waste, or abuse within NSF or by individuals that request or receive NSF funding; and to identify and resolve cases of misconduct in science. The FY 2001 Request for OIG is $6.28 million, an increase of 15.2 percent over FY 2000. The requested level supports 50 FTEs.

NSF Investments and Strategic Goals

NSF's investments reflect the Foundation's three strategic goals:

- Ideas – Discovery at and across the frontier of science and engineering, and connections to its use in the service of society.
- People – A diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens.
- Tools – Broadly accessible, state-of-the-art information bases and shared research and education tools.

NSF's investments in Ideas, People and Tools work in concert to support the agency's mission to maintain U.S. leadership in all aspects of science and engineering research and education.

NSF Budget by Strategic Goal

(Millions of Dollars)

	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate
Ideas	1,849	1,973	2,425
People	800	801	888
Tools	865	934	1,045
Administration and Management	177	189	215
Total, NSF	$3,690	$3,897	$4,572

Does not include $33 million in FY 2000 and $31 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees.

Ideas

Funding related to the strategic goal of Ideas totals $2,425 million in FY 2001, an increase of 22.9 percent over FY 2000. This includes support for individuals and small groups devoted both to disciplinary and cross-disciplinary research. Also

included is funding for centers that provide a platform to address those scientific and engineering questions and research problems that require the long-term, coordinated efforts of many researchers. Support for centers totals $334 million in FY 2001.

Investments in Ideas support cutting edge research that yields new and important discoveries and promotes the development of new knowledge and techniques within and across traditional boundaries. These investments help to maintain the nation's capacity to excel in science and engineering, particularly in academic institutions. The results of NSF-funded research projects also provide a rich foundation for broad and useful applications of knowledge and the development of new technologies. Support in this area also promotes the education and training of the next generation of scientists and engineers by providing them with an opportunity to participate in discovery-oriented projects. NSF-funded centers provide an enhanced environment for broad interdisciplinary education at all levels.

People

At NSF, placing research and learning hand in hand is our highest priority, and the people involved in our projects represent both the focus of our investments and the most important products of them. Across the Foundation's programs, NSF provides support for almost 200,000 people, including teachers, students, researchers, post-doctorates, and trainees. Support for programs specifically addressing the People goal totals almost $888 million in FY 2001, an increase of 10.8 percent over FY 2000. A major focus for these activities is in the Education and Human Resources (EHR) account. The EHR efforts are integrated with complementary activities across the Foundation where the research directorates contribute another $300 million toward the People goal. Moreover, about 40 percent of the funding for research grants – an amount approaching $1 billion in FY 2001– provides support for researchers and students, including more than 61,000 post-doctorates, trainees, and graduate and undergraduate students.

NSF is committed to facilitating the creation of a diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens. In order to achieve this goal, NSF supports formal and informal science, mathematics, engineering and technology (SMET) education at all levels – preK-12, undergraduate, graduate, professional development, and public science literacy projects that engage people of all ages in life-long learning. NSF also supports programs that integrate research and education, such as Integrative Graduate Education and Research Training (IGERT), Research Experiences for Undergraduates (REU) and the Faculty Career Early Development Program (CAREER). In partnership with the research and education community, state and local education agencies, civic groups, business and industry, and parents, NSF fosters the invigoration of research-informed standards-based SMET education at all levels.

NSF is also committed to enhancing diversity in the science and engineering workforce. The Foundation believes that an increased emphasis on enhancing the participation of groups currently underrepresented in the science and engineering workforce will further scientific progress by promoting diversity of intellectual thought.

Tools

Support related to the strategic goal of Tools totals $1,045 million in FY 2001, an 11.8 percent increase over FY 2000. As the research issues we face increasingly involve phenomena at or beyond the limits of our measurement capabilities, many of these research areas can only be studied and solved through the use of new generations of powerful tools. NSF investments provide state-of-the-art tools for research and education, such as instrumentation and equipment, multi-user facilities, digital libraries, research resources, accelerators, telescopes, research vessels and aircraft and earthquake

simulators. In addition, resources support large surveys and databases as well as computation and computing infrastructures for all fields of science, engineering, and education. 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. Investments in research facilities provide physical and institutional capabilities necessary for scientists and engineers to carry out world-class research. NSF-supported facilities also stimulate research-driven technological breakthroughs in instrumentation, and are the site of research and mentoring for many science and engineering students. Because of their visibility and accomplishments, facilities also enhance public awareness of science and the goals of scientific research.

Administration and Management

Administration and Management totals $215 million in FY 2001, an increase of 13.8 percent over FY 2000. This provides the operating funds to support the NSF workforce in implementing activities to meet all of NSF's strategic goals.

Administration and Management encompasses efforts to adopt advanced information technologies, enhance customer service, and ensure financial integrity. These investments are critical to NSF's performance as it faces a workload that is increasing in quantity and complexity.

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BUDGET PRESENTATION

NSF has previously organized its budget presentation around four key program functions – Research Project Support, Research Facilities, Education and Training, and Administration and Management. In order to link the FY 2001 Budget Request more closely to the NSF Strategic Plan, we have now organized the FY 2001 Budget Request around the strategic outcome goals of Ideas, People and Tools, as well as the Administration and Management activities necessary to achieve these goals. There is not a one to one correspondence between the key program functions and the strategic goals but it is largely the case that those activities that fell within Research Project Support can now be found in Ideas, those that fell within Research Facilities are now in Tools and those that fell within Education and Training now support the People goal. There are exceptions to this. For example, MRI instrumentation and Research Resources, which had been classified as Research Project Support, support the Tools goal. Likewise, REU and CAREER, which had been classified as Research Project Support, support the People goal .

The table below provides an FY 2001 crosswalk between funding for the strategic goals and the key program functions.

FY 2001 Budget Request for NSF
Key Program Function vs. Strategic Goal
(Millions of Dollars)

	Ideas	People	Tools	A&M	Total, NSF
Research Project Support	2,425	183	174		$2,782
Facilities			830		$830
Education & Training		705	41		$746
Administration & Manaqement				215	$215
Total, NSF	$2,425	$888	$1,045	$215	$4,573

Does not include $33 million in FY 2000 and $31 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees.

National Science and Technology Council (NSTC) Crosscuts

NSF will continue its active participation in the NSTC crosscut areas in FY 2001, supporting research including the Information Technology R&D program (totaling $740 million); the U.S. Global Change Research Program (totaling $187 million); and the Partnership for a New Generation of Vehicles (totaling $47 million).

Investments in Selected Priority Areas

Just over half of the Foundation's $675 million increase for FY 2001 is devoted to core disciplinary research that extends the frontiers of science and engineering. In addition, priority multidisciplinary areas for FY 2001 include Information Technology Research, Nanoscale Science and Engineering, Biocomplexity in the Environment and 21st Century Workforce. These initiatives are described on the following pages. Many of the activities within these initiatives are interrelated. Each of these initiatives make investments that address all three of NSF's strategic goals.

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Information Technology Research (ITR)

Recent advances in computing, communications, and the collection, digitization and processing of information related to people's everyday life experiences and interactions are undeniable indicators that the horizons of the Information Technology field are much wider, and its impact on society far greater, than anticipated by even the most optimistic amongst us.

Long-term Goals: For the next five years, NSF will emphasize research and education on a broad range of topics in Information Technology. This $327 million initiative is based on past investments and accomplishments in this broad field. The goals of the effort are:

- Advancing computer system architecture: research on software, hardware, system architectures, operating systems, programming languages, communication networks, as well as systems that acquire, store, process, transmit, and display information.

- Improving information storage and retrieval: research on how we can best use the vast amount of information that has been digitized and stored. This will require partnerships among computer, information, behavioral, mathematical, and social scientists to develop and test scientific theory in this area.
- Connectivity and access for all: studies that aim to overcome the digital divide separating the information "haves" from the "have-nots" and research on inequality of access to and use of computing and communications technology.

- Scalable Networks of Embedded Systems: As the scale of integration of systems that may be achieved continues to grow, systems must be designed with both hardware and software aspects treated from a unified point of view.

- Novel approaches: new models of computation and physical processes such as molecular, DNA and quantum computing. These efforts are deeply anchored in the mathematical, physical and biological sciences. In particular, a close symbiosis between computer science and mathematics must be enhanced. Success in this arena may prove essential to extending the present era of economic well-being into the future.

FY 2001 Initiative: Investments in FY 2001 will emphasize the following research areas as the second year of this initiative unfolds.

- Information Technology Research: Approximately $133 million will be used to support fundamental research in computer system architecture, information storage and retrieval, connectivity, scalable networks, and new approaches to computation.

- Information Technology Education: Approximately $19 million will be used in FY 2001 to strengthen education in information technology, including programs that provide scholarships, fellowships and traineeships; facilitate undergraduate research participation; encourage graduate students to participate in K-12 education; and develop new curriculum. In addition, support will be provided for research aimed at understanding the causes of underrepresentation of various segments of society in the workforce.

- Information Technology Applications: About $74 million in FY 2001 will be used for research on applications of IT across fields of science and engineering, including simulation to tackle research problems:

- In biology, there are challenging problems in modeling protein folding, cellular structures, communication and transduction among cells, in immunology, and in understanding larger structures and functions such as neurons and genome expression in organs and organisms.
- Climate modeling is now an established field, but the ability to model finer spatial and temporal resolutions is needed in order to predict changes more accurately and quickly.
- Modeling earthquakes is a special challenge which requires very powerful computers to handle the complexity of strongly coupled physical systems.
- The modeling of ocean systems is becoming more feasible as more observables become available, but integration with the biological organisms that dynamically interact with these systems must be incorporated into models.
- Modeling the interactions of humans and machines involves major challenges such as integrating the modeling of distribution and transport systems with the design of information networks and developing a semantic framework for managing information flow in an enterprise network.
- Black Hole collisions in the universe represent a stringent test of all aspects of Einstein's General Theory of Relativity which cannot be understood without advanced scientific computation.
- Finally, understanding how people communicate, interact and learn using Information Technology is at the heart of collaborative research by sociologists, psychologists, and other social scientists and educators. We must improve our ability to model human systems in order to effectively study this area.

- Information Technology Infrastructure: Approximately $101 million will be used to support infrastructure including computing facilities ranging from single workstations to clusters of workstations to supercomputers of various sizes and capabilities; large databases and digital libraries, the broadband networking, data mining and database tools for accessing them; appropriate bandwidth connectivity to facilitate interactive communication and collaboration and software to enable easy and efficient utilization of networked resources; and networks of large and small physical devices.

Funding for the ITR initiative by appropriation is as follows:

(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Change Amount	Change Percent
Biological Sciences	0.00	8.30	8.30	N/A
Computer and Information Science and Engineering	90.00	190.00	100.00	111%
Engineering	0.00	12.44	12.44	N/A
Geosciences	0.00	16.60	16.60	N/A
Mathematical and Physical Sciences	0.00	45.10	45.10	N/A
Social, Behavioral and Economic Sciences	0.00	5.81	5.81	N/A
Polar Programs	0.00	1.66	1.66	N/A
Subtotal, Research and Related Activities	$90.00	$279.91	$189.91	211%
Education and Human Resources	0.00	2.00	2.00	N/A
Major Research Equipment	36.00	45.00	9.00	25%
Total, ITR	$126.00	$326.91	$200.91	159%

Nanoscale Science and Engineering

Nanotechnology is the creation and utilization of functional materials, devices and systems with novel properties and functions that are achieved through the control of matter atom by atom, or molecule by molecule, on a scale of a fraction of a nanometer to tens of nanometers. A nanometer is to an inch what an inch is to 400 miles. A revolution has begun in science, engineering and technology, based on the ability to systematically organize, characterize, and manipulate matter at the atomic and molecular levels. Far-reaching outcomes for the 21st century are envisioned for both scientific knowledge and a wide range of technologies in many industries. Nanoscale science and engineering underpins innovation in critical areas ranging from information technology and medicine to materials and manufacturing.

NSF's initiative in Nanoscale Science and Engineering is the Foundation's FY 2001 contribution to the Administration's National Nanotechnology Initiative (NNI). NSF will serve as the lead agency for this interagency effort.

Support for Interagency Program: The National Science and Technology Council Interagency Working Group on Nanoscience Engineering and Technology (NSTC/IWGN) is coordinating individual agency activities to identify research directions, fund activities of centers and networks of excellence, and develop partnerships. Opportunities for collaborative activities identified with other agencies in FY 2001 include research on molecular electronics and spin electronics, advanced materials, nanoscale modeling and simulation, devices and system architectures, bioengineering, laboratory on a chip, quantum computing, and use of university-based and national laboratory-based user facilities for advanced tools and manipulation at the nanoscale.

NNI was recommended by the NSTC/IWGN, and was endorsed by the Presidential Committee of Advisors on Science and Technology (PCAST) Nanotechnology Panel. The Panel found that "nanotechnology will have a profound impact on our economy and society in the early 21st century." Partner agencies include the Department of Commerce, Department of Defense, Department of Energy, Department of Transportation, National Aeronautics and Space Administration and National Institutes of Health. An NNI total federal investment of approximately $495 million is requested in FY 2001.

Formidable challenges exist in the areas of fundamental understanding, device design, manufacturing, and systems-level integration and deployment which must be addressed before the potential of nanotechnology becomes a reality. NNI will ensure that investments in this area are made in a coordinated and timely manner and will accelerate the pace of revolutionary discoveries now occurring in nanoscale science and engineering.

Long-term Goals: Over the next five years, NSF will emphasize research investment in five inter-related areas at the frontiers of nanoscale science and engineering: (a) biosystems at the nanoscale, (b) nanoscale structures and quantum control, (c) device and system architecture, (d) environmental nanoscale processes, and (e) modeling and simulation. Support will be focused on small, interdisciplinary teams of researchers and on exploratory research projects to stimulate creativity and cross-fertilization of fields.

FY 2001 Initiative: NSF's planned investment for NNI in FY 2001 is $216.7 million, building on an FY 2000 investment of $97.3 million. This investment will strengthen critical fields and help to establish the science and engineering infrastructure and workforce in this area.

In FY 2001, NSF will emphasize research and education in five programmatic activities:

- Fundamental research at nanoscale. The request of $122 million in FY 2001 will fund awards to single investigators and small groups. The following interrelated topics will be emphasized:
  - Biosystems at the Nanoscale: The FY 2001 Request includes approximately $20 million to support research to develop fundamental understanding of novel nanobiostructures and processes at nanoscale, cells, nanobiotechnology, therapeutics and diagnostics. Research will stimulate progress in biologically-inspired studies of the relationships among chemical composition, physical shape, and function. Applications include improved drug or gene delivery and nanoscale sensory systems, such as miniature sensors for earlier detection of cancer.
  - Nanoscale Structures and Quantum Control: Approximately $45 million is included in the FY 2001 Request for the study of novel phenomena and structures which appear on the nanoscale and must be explored, understood, simulated and exploited in order to overcome physical limits to miniaturization. Applications may include "quantum computing" and computer chips capable of storing trillions of bits of information on an area the size of a pinhead. Research is needed into models for quantum computation, languages for expressing quantum algorithms, and means for fault tolerance and error correction in quantum information systems.
  - Device and System Architecture: The FY 2001 Request includes $27 million to develop new concepts to understand interactions among nanoscale devices in complex systems, the design of nanoscale systems and their integration into architectures for various operational environments. Collaborative research among physicists, chemists, biologists, material scientists, computer science theorists, design automatists, and engineers will be emphasized.
  - Nanoscale Processes in the Environment: Approximately $15 million is included for research that will focus on probing nanostructures of relevance in the environment, nanoscale processes at interfaces among biological tissues and mineral surfaces, development of environmental biotechnology, study of transport of ultrafine colloidal particles and aerosols, and study of interplanetary dust particles. Research offers great promise in understanding molecular processes in the environment reducing pollution, and applications such as water purification and artificial photosynthesis for clean energy.
  - Multi-scale, Multi-phenomena Modeling and Simulation at Nanoscale: Approximately $15 million is included for theory, modeling, and large-scale computer simulation in order to understand, control and accelerate the development of new nanoscale phenomena and regimes.

- Grand challenges. Approximately $12 million will fund interdisciplinary research and education teams that work on major, long-term objectives: nanostructured materials 'by design,' nanoscale-based manufacturing, nano-electronics, optoelectronics and magnetics, and advances in healthcare.

- Centers and networks of excellence. Approximately $37 million will provide support for new centers, networking and shared academic user facilities. Centers will play an important role in fundamental research, grand challenges and education, in development and utilization of tools, and in promoting partnerships in the next decade.

- Research infrastructure. Approximately $24.7 million will support instrumentation and facilities for improved measurements, processing and manipulation at nanoscale, and equipment and software for modeling and simulation. University-industry-national laboratory and international collaborations will be encouraged, particularly for expensive instrumentation and facilities.

- Education and training for nanotechnology. Approximately $21 million will support student fellowships and traineeships, curriculum development on nanoscience and engineering, and development of new teaching tools. The impact of nanotechnology on society will be analyzed from legal, ethical, social and economic perspectives.

Funding for the Nanoscale Science and Engineering initiative within the R&RA appropriation is as follows:

(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Change Amount	Change Percent
Biological Sciences	0.30	4.90	4.60	N/A
Computer and Information Science and Engineering	0.00	5.00	5.00	N/A
Engineering	30.00	87.50	57.50	192%
Geosciences	6.00	7.84	1.84	31%
Mathematical and Physical Sciences	61.00	111.41	50.41	83%
Total, Nanoscale Science and Engineering	$97.30	$216.65	$119.35	123%

Biocomplexity in the Environment (BE)

Biocomplexity refers to phenomena that arise as a result of dynamic interactions that occur within biological systems, including humans, and between these systems and the physical environment. From individual cells to ecosystems, these systems exhibit properties that depend not only on the individual actions of their components, but also on the interactions among these components and between these components and the environment.

Biocomplexity is a timely area for intensified research because our understanding of many systems components is sufficiently advanced to provide the groundwork for understanding how these components interact in complex systems. For example, what are the components and processes needed for a well-functioning ecosystem? How do these systems respond to multiple environmental stresses? Addressing such questions requires a new interdisciplinary approach, one that is able to integrate information across spatial and temporal scales, and consider multiple levels of organization and connectivity. The development of molecular-scale tools, genomics, advanced sensing techniques, modeling and information technologies now make this approach possible.

Understanding the Earth's environment is of immense scientific interest as well as profound national and international importance. Using a biocomplexity approach for investigations of the environment will open the way to a more complete understanding of natural processes, the effects of human behavior and decisions on the natural world, and ways to use new technology effectively. Special efforts must be made to enable investigators to adopt a biocomplexity-based approach since it will require assembly of interdisciplinary teams of workers as well as acquisition and development of new skills and methodologies.

Long-term Goals: For the next five years, NSF will emphasize research and education on the role of *Biocomplexity in the Environment*. This initiative is based on investments and accomplishments within NSF's current environmental investment portfolio of over $650 million. The intellectual goals of the effort are:

- Development of new theories, methods and computational strategies for modeling complex systems.

- Development of genetic and nano/molecular level capabilities for investigation of complex processes in the environment and increased understanding of the relationship between genetic information and functioning of ecosystems.

- Increased understanding of: (1) the role of living organisms in biogeochemical cycles, e.g., global carbon, nitrogen and water cycles; and (2) the influences, both positive and negative, of human behavior on natural processes and of natural processes on human behavior.

- Utilization of biological or biocomplexity-inspired design strategies for discovery of new materials, sensors, process engineering and other technologies, especially those that are environmentally beneficial.

FY 2001 Initiative: In FY 2001, NSF's investment in BE will total $136.3 million. This builds on the Biocomplexity special competitions held in FY 1999 and FY 2000 that focused on bringing together interdisciplinary teams of scientists to model the complexity that arises from the interaction of biological, physical, and social systems.

In FY 2001, NSF will emphasize the following areas within BE:

- Microscale systems. FY 2001 funding of $49.8 million will support: (1) development of functional genomics tools and knowledge that leads to a greater understanding of the functioning of cellular- and organismal-level biosystems; (2) development of genetic and molecular level capabilities for investigation of complex nano-molecular scale processes in the environment; and (3) molecular-level studies relevant to ecosystems and processes, such as self-replication and biosynthesis. Research in this area will also expand our knowledge of geomicrobiology and examine the Earth's crust as a microbial habitat, including research activities examining the transport of microorganisms (viruses, bacteria, and protozoa) in the subsurface environment.

- Ecosystems. FY 2001 funding of $30.3 million will support research on complex interactions among human, biological, geological and climatic systems in an extended chronological framework. Investigations will be supported to understand how biological systems play a major role in ocean systems dynamics, climate/ocean interactions, carbon cycling, biodiversity, evolution, and the replenishment of nutrients. Research will also focus on paleobiology to examine the evolution of biocomplexity.

- Planetary Systems. FY 2001 funding of $23.2 million will support research aimed at understanding the characteristics and dynamics of the Earth's cycles. This effort will address the biogeochemistry of carbon and related nutrients, and the hydrological cycle. Research will be aimed at understanding life in deep biospheres and its relation to the origin and history of life on Earth. Research on biogeochemical dynamics at environmental interfaces will include activities designed to understand photochemical and photoecological processes at or near the land-air and water-air boundaries; the energetics and kinetics of sorption/desorption of bioessential and exotic substances at the mineral-water-air, cell-water-air, and mineral-microbe interfaces; and studies of the exchange of gases and aerosols between the Earth's surface and atmosphere in terrestrial and oceanic environments.

- Research platforms. FY 2001 funding of $33.0 million will support (1) the initial construction phases of the National Ecological Observatory Network (NEON), a pole-to-pole network of sites in terrestrial and marine environments that provides state-of-the-art research tools and infrastructure, including computational and communications facilities, for understanding the biosphere, with $12 million provided through the MRE account, (2) research, education and operational activities relevant to or carried out at NEON that facilitates research across disciplines and at various scales of biological, physical, and social organization, and (3) operations of other research platforms required for the conduct of biocomplexity research.

Support for Interagency Programs: NSF works through the National Science and Technology Council (NSTC) to cooperate in the development of interagency programs that require fundamental science and engineering research for their success. Two such programs are related to BE:

- U.S. Global Change Research Program (USGCRP). NSF-supported USGCRP research is directed towards understanding and modeling global and regional environmental change and its processes on multiple temporal and spatial scales; addressing the potential for abrupt changes in the global environment; determining the origins, rates and likely future courses of global environmental changes; and understanding and assessing the impacts of global environmental change for the U.S. FY 2001 support for USGCRP totals $187.45 million.

- Integrated Science for Ecosystem Challenges (ISEC). ISEC focuses on how multiple stressors affect ecosystems, with an emphasis on research involving problem areas such as invasive species, harmful algal blooms, and ecosystem restoration. ISEC research utilizes and must be supported by appropriate infrastructure, including cutting-edge research tools and informatics resources. Funding for the BE initiative includes $16 million for ISEC in FY 2001, bringing the total ISEC investment to $125 million. The increase will fund both research and the operations costs of research platforms, including NEON and the academic research fleet.

Funding for the BE initiative by appropriation is as follows:

(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Change Amount	Change Percent
Biological Sciences	0.00	84.81	84.81	N/A
Geosciences	0.00	39.50	39.50	N/A
Integrative Activities	50.00	0.00	-50.00	N/A
Subtotal, Research and Related Activities	$50.00	$124.31	$74.31	149%
Major Research Equipment	0.00	12.00	12.00	N/A
Total, Biocomplexity in the Environment	$50.00	$136.31	$86.31	173%

21st Century Workforce

The workforce of the 21st century will require individuals who are educated to unprecedented levels of scientific, mathematical, engineering, and technological (SMET) expertise.
Long-term Goals: The long-term goals of the 21st Century Workforce initiative are:

- To generate the knowledge, people, and tools needed to develop a 21st century workforce that is second to none in its ability to use, adapt, and create SMET concepts in the workplace; and
- A SMET workforce that fully reflects the strength of America's diversity.

While emphasizing the long-term objectives, the initiative also includes elements that address the needs of an American workforce able to make an immediate transition to a more technologically-oriented workplace.

FY 2001 Initiative: In FY 2001, NSF's investment in the 21st Century Workforce Initiative will total $157.05 million, an increase of $83.39 million over FY 2000. The initiative grows from NSF's previous emphases on Educating for the Future: A 21st Century Workforce and the agency's strong base of programming in SMET education and human resource development at all levels.

The Science of Learning. The National Research Council's 1999 report, *How People Learn: Brain, Mind, Experience, and School*, assigns high priority in the national agenda to advancing research on learning and linking it to the development of learning and information technologies as well as educational models for our schools. A research program leveraging these opportunities will address two objectives:

- Significant improvement and expansion of the knowledge base for the understanding and application of learning, linked to longitudinal research on biological, environmental, social, and behavioral factors contributing to children's growth and development; and
- Significant improvement in the effectiveness and efficiency of both formal SMET education at all levels and informal and continuous learning environments.

Funding for research on learning and education will increase by $8 million over FY 2000 to a total of almost $52 million. This includes $25 million for continuation of the Interagency Education Research Initiative, a joint activity with the Department of Education and the National Institutes of Health.

Enhancing Educational Performance. The most effective means of translating increased understanding about learning into practice is through improved education of the instructional workforce.

- Centers for Learning and Teaching will involve the diverse groups who educate teachers – both pre-service and in-service – in collaborations aimed at enhancing teacher content knowledge and understanding of the latest research on learning processes, while addressing broader participation of currently underrepresented groups and nurturing a new generation of leaders. An additional $14 million will expand prototype efforts initiated in FY 2000 to total $20 million in FY 2001.
- Graduate Teaching Fellows in K-12 Education addresses instructional workforce issues by placing graduate students in K-12 classrooms as resources for teachers. Funding for this activity will be about $28 million in FY 2001.

- The Distinguished Teaching Scholars program will recognize and reward undergraduate faculty whose integration of research and education enhances the quality of the future workforce and the general public. Funding for this activity will be $1.8 million.

- Research using NSF programs as testbeds will help add to our knowledge base about learning and its connections to formal and informal education processes.

Broadening Participation. Through its emphasis on improving achievement for all students in SMET and on building capacity for SMET across the nation, NSF is setting the stage for a concerted effort to broaden and diversify the SMET workforce. At the collegiate, graduate, and professional levels, NSF aims at new strategies for improving diversity while maintaining the suite of current targeted programs that are achieving results.

- A $10 million initiative for tribal colleges will encourage Native Americans to pursue information technology and other science and technology fields of study, as well as increase the capability of tribal colleges to offer relevant courses and enhance K-12 education in feeder school systems.
- NSF will focus on broadening participation of groups underrepresented in their fields through mechanisms that will explore reasons for lower participation; create networks to improve diversity; partner with existing targeted programs; and enhance partnerships between rural college campuses and research institutes through interactive distance courses, laboratories, and workshops.

Addressing Immediate Workforce Requirements. The Advanced Technological Education (ATE) program is the vehicle for addressing immediate workforce requirements. All NSF initiatives have workforce components that reflect the need for expanded human resources. ATE provides opportunities for developing the workforce for technological positions that do not require full undergraduate programs of study. Funding for ATE will increase by $10.0 million, bringing the total investment in ATE to $39.25 million, with emphases on information technology, manufacturing, and teacher development in related areas.

Networking and Access. Opportunities for networking and access to SMET resources help enhance instructional processes and broaden participation in the science and engineering enterprise, particularly for those regions or institutions where local resources are limited. The key element in this activity is development of the National SMET Digital Library. The increase for FY 2001 is $12 million, for a total of $27 million. This will lay the foundation for a national effort to increase the quality, quantity, and comprehensiveness of internet-based SMET educational resources.

Funding for the 21st Century Workforce Initiative by appropriation is as follows:

(Millions of Dollars)

	FY 2000 Current Plan	FY 2001 Request	Change Amount	Change Percent
Biological Sciences	1.00	1.70	0.70	70.0%
Computer and Information Science and Engineering	1.15	1.25	0.10	8.7%
Engineering	2.70	2.10	-0.60	-22.2%
Geosciences	1.25	1.55	0.30	24.0%
Mathematical and Physical Sciences	3.00	3.30	0.30	10.0%
Social, Behavioral and Economic Sciences	4.50	5.40	0.90	20.0%
Polar Programs	1.06	1.10	0.04	3.8%
Subtotal, Research and Related Activities	$14.66	$16.40	$1.74	11.9%
Education and Human Resources	59.00	140.65	81.65	138%
Total, 21st Century Workforce	$73.66	$157.05	$83.39	113%

Strategic Goals and NSF Budget Structure

The following table provides an FY 2001 crosswalk between funding for the strategic goals and the budget accounts.

NATIONAL SCIENCE FOUNDATION BY STRATEGIC GOAL AND ACCOUNT
FY 2001 REQUEST

(Millions of Dollars)

			FY 2001 Request					
NSF Accounts	FY 1999 Actual	FY 2000 Current Plan	**Ideas**	**People**	**Tools**	**Administration & Management**	FY 2001 Request	% Change FY 2001/ FY 2000
FY 1999 Actual	**$3,690**		**$1,849**	**$800**	**$865**	**$177**		
FY 2000 Current Plan		**$3,897**	**$1,973**	**$801**	**$934**	**$189**		
Biological Sciences	392	414	391	50	64	6	511	23.3%
Computer & Information Science & Engineering	299	388	363	38	121	7	529	36.2%
Engineering	370	382	373	73	4	7	457	19.6%
Geosciences	478	488	343	18	217	4	583	19.5%
Mathematical & Physical Sciences	734	758	579	106	190	6	881	16.3%
Social, Behavioral & Economic Sciences	142	146	132	9	29	5	175	19.8%
Polar Programs	246	253	79	1	202	3	285	12.8%
Integrative Activities	162	129	52	13	54	0	119	-7.7%
Research & Related Activities	**$2,822**	**$2,958**	**$2,312**	**$308**	**$881**	**$39**	**$3,541**	**19.7%**
Education & Human Resources[1]	**$662**	**$691**	**$112**	**$579**	**$25**	**$12**	**$729**	**5.5%**
Major Research Equipment	**$57**	**$94**	**$0**	**$0**	**$139**	**$0**	**$139**	**48.2%**
Salaries & Expenses	**$144**	**$149**	**$0**	**$0**	**$0**	**$158**	**$158**	**6.0%**
Office of Inspector General	**$5**	**$5**	**$0**	**$0**	**$0**	**$6**	**$6**	**15.2%**
Total, National Science Foundation	**$3,690**	**$3,897**	**$2,425**	**$888**	**$1,045**	**$215**	**$4,572**	**17.3%**
Percent Increase over Prior Year			**22.9%**	**10.8%**	**11.8%**	**13.8%**		

[1] Does not include $33 million in FY 2000 and $31 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees.

Ideas

In order to achieve the NSF mission, one of the agency's key strategies is to support the most promising ideas in research and education. The expected outcomes of these investments are a robust and growing fundamental knowledge base that enhances progress in all science and engineering areas and partnerships that connect discovery to innovation, learning and societal advancement.

(Millions of Dollars)

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
Ideas	$1,849	$1,973	$2,425

FY 2001 support for Ideas totals $2,425 million, an increase of $452 million, or 22.9 percent, above FY 2000. This provides funding for research projects that include researchers and postdoctoral associates as well as undergraduate and graduate assistants. Funds are also provided for items necessary for performing research, such as instrumentation and supplies, and for related costs such as travel and conference support. Research in core disciplinary areas as well as studies within NSF's four initiative areas are included within funding for Ideas. Through outreach activities, NSF seeks out and supports excellent proposals from groups and regions that traditionally have not fully participated in science, mathematics, and engineering.

Support provided primarily to further NSF's other strategic goals, People and Tools, is essential for facilitating Ideas — discovery at and across the frontier of science and engineering. NSF's investment in People promotes the integration of research and education and ensures that the U.S. has world class scientists and engineers, a workforce that is scientifically and mathematically strong, and a public that understands and can take full advantage of basic concepts of science, mathematics, engineering and technology. Support for Tools provides access to state-of-the art facilities and platforms which are essential for world-class research.

In FY 2001, NSF will continue its efforts to increase the average size and duration of awards. These efforts will contribute to increasing the efficiency of the Foundation's merit review process and achieve greater cost-effectiveness for both NSF and the

university community. In accord with the Foundation's FY 2001 Performance Plan, NSF will continue to provide increased attention to the participation of new investigators in all our programs.

The FY 2001 Request provides for substantial increases in **core disciplinary research** that extend the frontier of science and engineering across the board. These activities sustain the flow of new discoveries that fuel the development of new technologies.

Areas of emphasis within NSF's core research will include:

- Exploration of links between quantum theory and fundamental mathematics: mathematicians and physicists together are gaining insight into diverse topics, such as the fundamental makeup of matter, the nature of the chemical molecular bond, and the development of new materials.

- Research on the key physical, chemical and geologic cycles within the Earth System: including improved understanding of the primary processes involved in the large-scale water cycle, which will provide knowledge of the regional distribution of water and enhance the ability to predict and prepare for droughts and floods.

- Research in the psychological, cognitive, and language sciences: provides a sharper picture of how human language is acquired and how it is used, both for thought and communication, thus laying the foundation for progress in many areas of national importance, from teaching children how to read to building computers that can talk.

- The Experimental Program to Stimulate Competitive Research (EPSCoR), a State-NSF partnership, will continue to support improvements in academic research competitiveness. In FY 2001, funding for EPSCoR through the Education and Human Resources appropriation totals more than $48 million. Linkages between EPSCoR and other NSF-supported research activities are expected to result in an additional $15-25 million directed to research in EPSCoR states.

- Support for plant genome research will increase by $22.5 million to total $102 million in FY 2001. NSF will use increases in funding to begin the "2010 Project." With the completion of the sequencing of the genome of the model plant *Arabidopsis,* researchers will begin a systematic effort to determine the functions of the 20,000 to 25,000 genes of this flowering plant. Continued support for this research area will advance understanding of the structure, organization and function of plant genomes, with particular attention to economically significant plants, and accelerate utilization of new knowledge and innovative technologies toward a more complete understanding of basic biological processes in plants. The focus in plant genome research will continue to be on functional genomics and on graduate and undergraduate training in plant genomics.

- The Small Business Innovation Research (SBIR) program is supported at the mandated level of at least 2.5 percent of extramural research. The program will total approximately $74.7 million, an increase of approximately $13 million over FY 2000.

Included within support for Ideas are also funds for fundamental research within the Foundation's four initiative areas:

Information Technology Research: Advances in software, networking, scalability, high-end computing, mathematics, research applications, wireless networking, communications and remote sensing will enable the entire science and engineering community to work more productively and to examine issues that were previously too complex to address with the existing technology. Investments in IT will deliver

tools and capabilities that will benefit every field, every discipline and people at every level of education. For example, sophisticated techniques for designing and constructing software could ultimately be used by the private sector to develop new markets and to speed reliable and robust information appliances to consumers and information systems to industry. Understanding the social and cultural impacts of technological change could change the scope and manner in which new technologies are deployed, improving our lives and the lives of our children.

Nanoscale Science and Engineering: Nanoscale science and engineering will have a far-reaching impact on technology for the 21st century. The control of matter at the atomic level underpins innovation in critical areas from manufacturing to materials to the environment. Nanotechnology is allowing us to build machines so small that they are rapidly approaching the scale of human cells. For example, nanoscale science and engineering will allow the development of a machine smaller than the head of a pin that could be placed in a person's bloodstream to monitor the health of the heart and blood vessels, thereby obviating strokes and heart attacks.

Biocomplexity in the Environment (BE): Understanding biocomplexity – the dynamic interactions among the Earth's living and physical systems – will help us better understand our environment. Furthermore, such investigations will accelerate cutting-edge capabilities – such as genomics, molecular sequencing, informatics, robotics, remote sensing, and advanced mathematics and modeling. The discoveries emerging from this work will contribute to improved environmental stewardship and will promote innovation in such areas as biotechnology and public health.

21st Century Workforce: We now live in an economy based on knowledge and innovation. The greatest job growth is in areas that demand a solid grounding in science and technology. In this Request, NSF will inaugurate Centers for Learning and Teaching. These investments will fully engage the broad spectrum of America's diverse population to create a science and engineering workforce second to none.

Centers

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 a common commitment:

- To address scientific and engineering questions with a long-term, coordinated research effort. Center programs involve a number of scientists and engineers working together on fundamental research addressing the many facets of complex problems;

- To include a strong educational component that establishes a team-based cross-disciplinary research and education culture to train the nation's next generation of scientists and engineers to be leaders in academe, industry and government; and

- To develop partnerships with industry that help to ensure that research is relevant to national needs and that knowledge migrates into innovations in the private sector.

The center programs which contribute to the Ideas goal are listed below.

(Millions of Dollars)

	Year of Program Initiation	FY 1999 No. of Centers	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
Engineering Research Centers and Groups	1985	18	$57	$60	$69
Science & Technology Centers	1987	23	$51	$53	$44
Industry/University Cooperative Research Centers	1973	52	$5	$5	$5
State/Industry/University Cooperative Research Centers	1991	6	$2	$1	$1
Centers of Research Excellence in Science and Technology	1987	10	$9	$9	$9
Plant Genome Virtual Centers	1998	23	$31	$31	$31
Materials Research Science and Engineering Centers	1994	28	$48	$52	$58
Center for Ecological Analysis and Synthesis	1995	1	$2	$2	$2
Long-Term Ecological Research Program	1980	21	$16	$17	$17
Earthquake Engineering Research Centers	1988	3	$6	$6	$6
Chemistry Centers	1998	4	$7	$10	$11
Mathematical Sciences Research Institutes	1982	3	$2	$8	$9
Information Technology Centers	2000	NA	$0	$30	$63
Other Centers[2]	NA	4	$5	$3	$10
TOTAL[1]		196	$242	$287	$334

[1] Numbers may not add due to rounding.

[2] Other Centers include the Research Centers on the Human Dimensions of Global Change, the National Consortium on Violence Research, the National Center for Geographic Information and Analysis and Physics Frontiers Centers.

FY 2001 support for centers is $334 million, an increase of approximately $47 million over FY 2000.

- Information Technology Centers, initiated in FY 2000, support fundamental research in information technology that incorporates scientific applications or addresses social, ethical and workforce issues. An increment of $33 million for this program will provide support for an additional 10-11 awards in FY 2001.

- FY 2001 funding for the Engineering Research Centers and Groups (ERC) will increase by approximately $8.7 million to support up to two virtual ERCs and 3-5 groups in nanoscale science and engineering. The ERCs will link cross-disciplinary teams of investigators across institutional boundaries to advance fundamental knowledge in nanoscale science and engineering, develop a wide range of new technologies, and prepare model curricula to educate new generations for this emerging field. The Engineering Research Groups will be formed in nascent areas of nanoscience and engineering that are too immature for a full-scale center investment.

- NSF will continue support for the Science and Technology Centers program. Funding for the second cohort of 23 STCs is being phased down in accordance with plans, while support for the five new centers initiated in FY 1999 will continue.

- Funding for Materials Research Science and Engineering Centers will increase by $6.0 million to support up to four new centers focusing on critical areas such as nanoscience and engineering, information technology, and the interface between materials and biology. An increase of $750,000 in FY 2001, in addition to $3.0 million in redirected funds, will support up to three new Chemistry centers for advanced molecular characterization. The Physics Centers program will be initiated in

FY 2001 at a level of $5 million. This will support up to three centers to catalyze new areas such as atom lasers, quantum information science, computational physics, biological physics, and astrophysics. Within the Mathematical Sciences Research Institutes activity, funding of approximately $8.5 million will provide support for three national institutes.

Additional information for selected centers supported by NSF is provided below:

1999 Estimates for Selected Centers
(Millions of Dollars)

	Number of Participating Institutions	Number of Partners	Total NSF Support	Total Leveraged Support	Number of Participants
Engineering Research Centers and Groups	126	505	$57	$111	8,700
Science & Technology Centers	72	340	$51	$97	3,910
Industry/University Cooperative Research Centers and State/Industry/University/Cooperative Research Centers	98	902	$7	$72	2,550
Centers of Research Excellence in Science and Technology	10	70	$9	$9	2,900
Plant Genome Virtual Centers	50	27	$31	$3	2,800
Materials Research Science and Engineering Centers	75	275	$48	$53	5,500
Long Term Ecological Research Program	153	106	$16	$27	2,290
Earthquake Engineering Research Centers	39	105	$6	$11	382
Chemistry Centers	8	12	$7	$10	350

Number of Participating Institutions: all academic institutions which participate in activities at the centers.
Number of Partners: the total number of non-academic participants, including industry, states, and other federal agencies, at the centers.
Total Leveraged Support: funding for centers from sources other than NSF.
Number of Participants: the total number of people who utilize center facilities; not just persons directly supported by NSF.

FY 2001 Performance Goal for Ideas

The following table summarizes NSF's FY 2001 Performance Goal for Ideas. For additional information, see the FY 2001 Performance Plan.

Outcome Goal	FY 2001-2005 GPRA Strategic Plan	FY 2001 Areas of Emphasis
	NSF is successful when results reported in the period demonstrate sufficient progress in achieving:	
Ideas -- Discovery at and across the frontier of science and engineering, and connections to its use in the service of society.	❖ A robust and growing fundamental knowledge base that enhances progress in all science and engineering areas. ❖ Discoveries that expand the frontiers of science, engineering, and technology. ❖ Partnerships connecting discovery to innovation, learning, and societal advancement. ❖ Research and education processes that are synergistically coupled.	Balance of innovative, risky, interdisciplinary research across all NSF programs. Investments in four initiatives: ◗ Information Technology Research ◗ Nanoscale Science and Engineering ◗ Biocomplexity in the Environment ◗ 21st Century Workforce Investments in non-initiative fundamental research: ◗ Mathematical Research ◗ Functional Genomics ◗ Cognitive Neuroscience

Highlights

NSF investments in fundamental research provide support for cutting-edge research in many fields and help to maintain the nation's capacity to conduct research in science and engineering. Selected examples of accomplishments of NSF-supported investments are described below.

Advances in Computer Security: Researchers are contributing in important ways to solving problems in computer security. Detecting the activities of unauthorized and malicious users of a computer system remains difficult. By combining new profiling and instrumentation techniques researchers have been able to provide convincing evidence that there can be much more sophistication in the identification of intrusive activities than current methods allow. This work has already attracted the attention of industry, as well as security experts at NIST and DARPA.

Early Cancer Detection: An NSF-funded researcher at the University of Texas at Austin has applied fluorescence spectroscopy to the detection of pre-cancerous cells. Her work has led to publication of more than 50 peer-reviewed journal articles, 12 patents, and patent licensing by a start-up company. This new knowledge has led to applications in clinical trials which have demonstrated significantly improved efficacy in detection of early stage cervical cancer as compared to existing technologies. It is this type of breakthrough research that positions the U.S. at the forefront of healthcare delivery worldwide, with potentially significant effects in both developed and developing nations.

Improving Consumer Products: The 1998 National Medal of Science was awarded to an NSF grantee for pioneering work in colloidal and surface phenomena, catalysis, and advanced materials. His research resulted in basic understanding that can be used in a wide range of everyday consumer products that are made up of microscopic particles. As a result of this advanced knowledge we now have improved and stable adhesives, paints, cosmetics, and memory and display devices in electronic products. The research on these very minute particles has led to the development of unique materials that enable petroleum refineries and chemical manufacturing plants to produce improved gasoline and other consumer chemicals. These materials help reduce the unnecessary waste of raw materials, energy, and pollution.

Dinosaurs in the Antarctic: Research supported by NSF's Office of Polar Programs led to the discovery of fossil bones of Hadrosaur and Mosasaur dinosaurs on the Antarctic Peninsula. This finding was awarded "Discovery of the Year" by the Royal Geographic Society of London. The findings are important because current knowledge about these dinosaurs is based mostly on North American fossil sites. Finding the remains of the Hadrosaur, a large terrestrial herbivore, is important because the presence of this animal implies a robust and productive vegetation component of the Antarctic ecosystem.

Discoveries in How the Young Learn: NSF-supported findings in infant cognition have radically altered our picture of early development. To probe the infant's mind, researchers have used innovative methods that rely on a simple and reliable behavior: infants will look longer at unexpected events. Using this principle, researchers have examined infants' concepts of the "object," and of everyday things (such as a cat, dog, or chair). The research shows that infants can track objects through space and time, even as they move behind a screen and then become visible again. They can also enumerate small numbers of objects, suggesting they develop some basic knowledge of numbers at an early age.

Predicting Storms: High-impact weather causes economic losses in the U.S. that average $300 million per week. The mission of the NSF-funded Center for the Analysis and Prediction of Storms is to demonstrate the practicability of numerical weather prediction of storms and to develop, test, and

validate a regional forecast system appropriate for operational, commercial, and research applications. The May 3, 1999 tornado outbreak in Central Oklahoma was used to test the storm model. The storm-scale forecast showed substantially increased precision. The project generated short-range high-resolution forecasts that dramatically out-performed the National Weather Service forecast during the tornado outbreak. As this forecasting capability is further developed, it will become a critical tool in determining which areas will be most severely hit by storms thereby allowing timely warnings to be issued to persons in affected areas. The commercial airlines industry, power and communications industries, surface transportation, agriculture, defense and space flight, construction, insurance and recreation industries will clearly benefit, as well as the National Weather Service and the general public.

Biomaterial to Extend the Life of Heart Valves: Over 60,000 artificial valves are implanted every year in the U.S., and this has led to extended productive life spans for millions. Despite considerable achievements in the development of both tissue and metallic valve prostheses, the formation of calcium deposits progressively reduces the flexibility of both types of valves and limits their functional lives. A team of biologists and bioengineers at the NSF-supported Engineering Research Center for Engineered Biomaterials has discovered that osteopontin, an adhesive protein, is a potent inhibitor of calcification. These findings suggest that osteopontin may not simply block crystal growth, but may promote mineral regression through active cellular processes. A practical solution to the bioprosthetic calcification problem would save as much as $25 million annually from eliminated valve replacement operations, with annual sales of improved heart valves in the range of $100 million.

Long-Term Environmental Research Impacts Urban Planning: Long-term research on stream ecosystems at the Luquillo LTER site established a strong cause and effect relationship between freshwater shrimp production and streamflow. Based on their studies, LTER scientists advised land planners that a proposed plan to dam streams to create a drinking water reservoir for the city of San Juan, Puerto Rico, would prevent the movement of shrimp upstream and decimate the shrimp fishery. Working together, scientists and planners devised a new plan to install intake pipes and reduce the amount of water to be diverted from the streams that not only provided the water needed for San Juan but also allowed for the sustained production of shrimp. This example demonstrates how long-term research and an understanding of biocomplexity can inform policy and management decisions resulting in a compromise that benefits both natural and social systems.

Sustainability of Arctic Villages: Results from an NSF-supported long-term interdisciplinary study involving eight natural and social science disciplines have provided a combined assessment of the effects of predicted global warming, oil development, tourism, and government cutbacks on the sustainability of Arctic villages in the range of the Porcupine Caribou Herd. The effects of global change on the tundra food sources for caribou on the Alaskan North Slope and elsewhere are critically important to Native villages where a subsistence lifestyle is practiced either as a necessity for survival or as a cultural choice. The study has gone to great lengths to involve both Western and local traditional ecological knowledge to develop a synthesis model to produce a regional integrated assessment that can be accepted by the Native communities and used to examine future scenarios for change in an area undergoing rapid climate and cultural changes.

Laser Sources for Surgical Applications: When ultrafast laser pulses interact with materials, they can remove an area with minimal collateral damage, creating a narrow, well-defined “cut” within the material. Simple, compact femtosecond laser sources, when used in surgical procedures, offer the potential for performing highly controlled and targeted incisions, thereby increasing the efficiency and safety of the surgical procedure. Researchers at the Center for Ultrafast Optical Science have pursued exploratory studies in the use of femtosecond lasers for eye surgery. Now, a spin-off company from the Center has developed the first such commercial product, a laser system for use in refractive surgery that is currently undergoing clinical trials.

World-Wide Web Searching: The leading approaches to searching the World Wide Web (WWW) were developed with NSF support. The Excite search engine was initiated in the Webcrawler project at the University of Washington. The Lycos search engine was the result of an NSF funded project at Carnegie Mellon University. The Inktomi search engine, now used in products by Yahoo!, HotBot, Snap! and other consumer engines, was developed on an innovative cluster supercomputer built at the University of California at Berkeley. Infoseek resulted from an NSF-supported project at the University of Massachusetts. Specialized search engines, such as Thomas, used by the Library of Congress, also have their origins in NSF-funded research at Cornell University. The browsers that access the data resources of the WWW also owe their origins to a project at NCSA, an NSF-funded Supercomputer Center at the University of Illinois.

People

People are NSF's most important product. At NSF, placing research and learning hand in hand is our highest priority, and the people involved in our projects represent both the focus of our investments and the most important products of them. Across the Foundation's programs, NSF provides support for almost 200,000 people, including teachers, students, researchers, post-doctorates, and trainees. Support for programs specifically addressing NSF's Strategic Goal of "People — A diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens" totals about $888 million in FY 2001, an increase 10.8 percent over FY 2000 (H-1B Nonimmigrant Petitioner Fees will increase total support to over $917 million).

Support by Level of Education

(Millions of Dollars)

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
PreK-12	281	283	276
Undergraduate	193	189	237
Graduate & Professional	255	258	301
Other Support[1]	71	71	73
Total, People[2]	$800	$801	$888

[1] Excludes $31.5 million in FY 2000, and $29.5 million in FY 2001 from H-1B Nonimmigrant Petitioner Fees

[2] Totals may not add due to rounding.

NSF's investments in ideas and tools also create investments in people. Education is an integral component of all research projects in that the skills and training needed for the next generation of scientists, engineers, and technologists are provided within the context of the research experience. Almost 40 percent of the funding for research grants — an amount approaching $1 billion in FY 2001 — provides support for

researchers and students, including more than 61,000 post-doctorates, trainees, and graduate and undergraduate students. The Foundation places a high priority on formal and informal science, mathematics, engineering, and technology (SMET) education at all levels — preK-12, undergraduate and graduate, professional, and public science literacy that engages people of all ages in life-long learning. NSF activities are also aimed at enhancing the diversity of the science and engineering workforce and increasing participation and achievement of underrepresented groups, with particular attention to the development of those who are beginning careers in science and engineering. NSF programs are increasing the opportunities for all students to learn mathematics and science, prepare for and complete higher education, join the workforce as competent and contributing members, and become well-informed, science-literate citizens of the United States.

Each of the four interdependent initiative areas makes a major investment in people. For example, approximately $19 million will be used in FY 2001 to strengthen information technology education and workforce development. A critical national need is educating our citizens to fill the estimated one million vacant positions in the information technology industry. Addressing the shortage of IT workers will require development of innovative educational technologies, such as highly interactive computer science courseware that is multilingual, multicultural and multimedia, with the capability to operate over distributed environments such as the Internet. Eliminating the digital divide will require research in the social, economic and cultural factors that inhibit minority participation in the IT.

Many of the following activities are also part of the 21st Century Workforce initiative. Research on the science of learning, development of the instructional workforce, and diversifying the workforce are the three focus areas of this initiative.

PreK-12 Education

The FY 2001 Request for PreK-12 programs is $276 million, a decrease of $7 million from FY 2000. NSF will initiate a new program for Centers for Learning and Teaching (CLT) at a funding level of $20 million, an increase of $14 million over the FY 2000 pilot program. CLTs address two components of quality SMET education: strengthening teacher content knowledge and developing the next generation of experts to guide the development of instructional materials, classroom and large-scale assessments, education research and evaluation, and informal education. This increase will be offset by reductions in ongoing programs such as systemic reform, instructional materials development, teacher enhancement and teacher preparation activities.

Undergraduate Education

The FY 2001 Request for programs to improve undergraduate education is $237 million, an increase of $48 million over FY 2000.

- Funding for the Advanced Technological Education program will total $39 million, an increase of $10 million over FY 2000, to strengthen the science and mathematics preparation of technicians for the high-performance workplace.

- A new effort for improving education at Tribal Colleges will be funded at $10 million. This program will encourage Native Americans to pursue information technology and other science and technology fields of study, as well as increase the capacity of tribal colleges to offer relevant science and technology courses and enhance K-12 education in feeder school systems.

- The Request also includes $11.2 million for a new Scholarships for Service program to recruit and educate the next generation of federal information technology managers by awarding scholarships for the study of information security.

- NSF will provide $1.8 million to initiate a new program for Distinguished Teaching Scholars to recognize undergraduate faculty whose integration of research and education enhances the quality of the future workforce and the general public.

- The Undergraduate Mentorships in Environmental Biology (UMEB) will be expanded by $800,000, to total $2 million in FY 2001; this program seeks to address concerns about participation rates of underrepresented groups in environmental biology.

- The Network for Diversity and Education in the Geosciences is initiated at $3 million and aims to make high-quality geoscience education widely available.

- Other efforts for undergraduate activities include the Louis Stokes Alliances for Minority Participation, the Historically Black Colleges and Universities – Undergraduate Program, and the Model Institutions of Excellence program. In addition, Course, Curriculum, and Laboratory Improvement will have a new emphasis on undergraduate assessment.

Graduate & Professional Education

The FY 2001 Request for graduate and professional programs totals $301 million, an increase of approximately $44 million over FY 2000.

- Funding for the Graduate Teaching Fellows in K-12 Education (GK-12) program, which supports graduate and advanced undergraduate SMET students as content resources for K-12 teachers in the classroom, will increase by $16 million to a total of nearly $28 million.

- Support for the Integrative Graduate Education and Research Training (IGERT) program will increase by nearly $3 million to total over $31 million. IGERT is distinguished from other training programs in that it has a strong emphasis on interdisciplinary training, innovation in graduate education, and broadening participation through the involvement of underrepresented groups. In its first two years of operation, the program attracted a large number of proposals representing the full range of NSF science and engineering disciplines.

- Support for the Faculty Early Career Development (CAREER) program will total nearly $114 million, an increase of $12.3 million.

- Funding for ADVANCE, to increase the participation and advancement of women in all fields of science and engineering, will total $20.2 million, an increase of nearly $8 million over FY 2000.

Other Support

The FY 2001 Budget Request for these activities is $73 million. Included in this total is support for such activities as informal science education, evaluation efforts, and programs for gender equity and for persons with disabilities. An additional $29.5 million from H-1B nonimmigrant petitioner fees will be made available to NSF for computer science, engineering, and mathematics scholarships; grants for mathematics, engineering, and science enrichment courses; and systemic reform activities.

NSF also supports international research and training experiences for U.S. researchers in both developed and developing nations. The rapid globalization of science and technology challenges traditional assumptions about how we prepare our scientists, engineers, and educators to succeed. Training must include an understanding of the global environment – the technologically advanced countries of Europe and Japan, as well as others. A unique opportunity exists in the dynamic newer economies of East Asia, which invest heavily in scientific and engineering research and are rapidly developing knowledge-intensive economies.

FY 2001 Performance Goal for People

The following table summarizes NSF's FY 2001 Performance Goal for People. For additional information, see the FY 2001 Performance Plan.

Outcome Goal	FY 2001-2005 GPRA Strategic Plan	FY 2001 Areas of Emphasis
	NSF is successful when results reported in the period demonstrate sufficient progress in achieving:	
People -- A diverse, internationally-competitive and globally-engaged workforce of scientists, engineers, and well-prepared citizens.	❖ Improved mathematics and science achievement for U.S. students at the K-12 level leading to levels of skill and understanding for all citizens that make them competitive in a technological ❖ A science and technology workforce that draws on the strengths of America's diversity and has global career perspectives and opportunities. ❖ Globally engaged science and engineering professionals who are among the best in the world. ❖ A public that understands the processes of and benefits that accrue from science and engineering.	K-12 systemic activities Investments in 21st Century Workforce: ◗ Enhancing instructional workforce - Centers for Learning and Teaching - Graduate Teaching Fellows in K-12 Education ◗ Broadening participation. ◗ Addressing near-term workforce needs.

Highlights

Examples of accomplishments resulting from support for People are discussed below.

Informal Science Education (ISE) provides rich and stimulating opportunities outside formal classroom settings. Exhibits at museums, aquaria, zoos, IMAX films, television, and community programs increase appreciation, interest, and understanding of science for individuals of all ages, interests, and backgrounds. Most ISE projects are designed to reach large audiences and have the potential for significant regional or national impact. Annually, these projects reach over 150 million individuals. For example, an estimated 50 million people visit ISE-supported exhibits and projects at science and technology centers and museums, and television, radio, and film projects reach over 100 million people. *A Science Odyssey*, sponsored by ISE, is a ten-hour PBS television serial that allows viewers to survey 100 years of scientific pursuits, recast their perceptions of science and scientists, and be inspired by a view of science as a never-ending and deeply human quest for answers and solutions.

The **Integrative Graduate Education and Research Training (IGERT)** program fosters a multidisciplinary framework in which faculty and students may work together across traditional boundaries, sharing knowledge, instrumentation, and a willingness to build new and unique intellectual capital. One IGERT project at Cornell University is bringing together scientists from many disciplines to investigate the nonlinear mathematical behavior of various systems including applications in physics, mechanical engineering, medicine, and finance. Until now, a mathematics student studying dynamical systems was unlikely to cross paths with an immunologist studying AIDS or an electrical engineer studying blackouts in the power grid, yet they are all investigating nonlinear phenomena. The Cornell project enables such interaction, and students and faculty at this IGERT site have had the opportunity to work with mathematicians and scientists who discovered that nonlinear dosages of drugs are especially effective in the treatment of AIDS.

Systemic Education Reform. In FY1999, 48 of the 68 active systemic initiatives under the **Urban Systemic Program** (USP), **Statewide Systemic Initiatives** (SSI), and **Rural Systemic Initiatives** (RSI) have implemented standards-based mathematics and science curricula in over 81% of the participating schools. The initiatives have provided high-quality professional development for over 150,000 teachers, more than 1/3 of the science and math teachers in participating school systems during FY 1999. All participating educational systems in systemic reform programs demonstrated some level of improvement in student achievement in mathematics and science on a battery of system-selected instruments. For example, in Detroit, a urban systemic initiative city, students showed significant gains in academic achievement in science and mathematics on the *Michigan Educational Assessment Program* between 1994 and 1998: in grade 5 science, an increase from 18% to 33%; in grade 7 mathematics, an increase from 16% to 33%; and in grade 4 mathematics, an increase from 33% to 68%.

Outreach to Teachers. During the past five summers, hundreds of Houston area educators have attended the annual **GirlTECH** computational science training program at Rice University's Center for Research on Parallel Computation (CRPC) which is supported by NSF. Participating teachers receive intensive technology training and explore innovative teaching strategies that impact gender equity in the classroom. GirlTECH's web site features research on girls and technology and makes available a large and diverse collection of online lesson plans generated by participants over several years. Lesson and project plans suitable for early elementary through high school levels can be found that span the physical, mathematical, biological and natural sciences, often emphasizing scientific observation and computer/Internet usage. In the first year of the program, GirlTECH documented approximately 1,000 teachers indirectly trained by the program though knowledge transfer by GirlTECH participants. The current total is estimated to be about 10,000.

Chickscope is an interdisciplinary program that puts magnetic resonance imaging (MRI) technology into K-12 classrooms via the Web. Teachers and students can access and operate a MRI system to peer inside a chick embryo and observe its development over the 21 days it takes the egg to mature. The National Computational Science Alliance, one of the organizations which supported development of Chickscope, is funded through NSF's Partnerships for Advanced Computational Infrastructure program.

Program for Persons with Disabilities. Rosie Talamantes, an industrial engineering major at New Mexico State University (NMSU) and single mother of two, is a student researcher doing computer programming work in support of molecular modeling at Los Alamos National Laboratory. She has been named a 1999 Employee of the Year by *Careers and the Disabled* magazine. Talamantes, a quadriplegic since 1987, wants to teach math following graduate school, mentors other disabled students by telephone or over the Internet, and has been a peer counselor within her community. Her activities and opportunities are part of a project at NMSU, sponsored by NSF's Program for Persons With Disabilities, which has established a regional alliance of 21 two- and four-year universities and community colleges in New Mexico, West Texas, and Oklahoma in order to alleviate the lack of representation in science, mathematics, engineering, and technology by students with disabilities.

Technology-Enabled Research Concepts in K-12 Classrooms. Use of technology in classroom settings and research on its application and effectiveness is an important component of NSF education research programs. For example, researchers in atmospheric sciences at the University of Michigan have developed and implemented a modular year-long program for middle school science known as ***One Sky, Many Voices*****.** Its content focus is on the weather, and through an Internet enabled CD-ROM, it is now being used in over 240 schools nationwide. It permits students to conduct inquiry-based projects in collaboration with students in other parts of the world. Students who participated in the project's activities consistently scored higher on standardized test items in the subject area than students who took more traditional classes. The easy to use technology works across platforms and is connected to the curriculum required by state and local authorities.

The **Interagency Education Research Initiative (IERI)**, supported by NSF, the Department of Education, and the National Institutes of Health, focuses on identifying education strategies that improve the teaching and learning of reading, mathematics and science from pre-kindergarten through grade 12. For example, at the University of Texas Health Center-Houston, an interdisciplinary study will use multiple interventions and assessment methods to address questions of how to best tailor, sequence and integrate early reading instruction to promote literacy. A particularly exciting component of this study involves the use of advanced brain imaging technology to track changes in neural function of students receiving different types of instruction as they learn to read. The results of this project will inform efforts aimed at the prevention, early identification, and remediation of early reading difficulties.

Numbers of People Involved in NSF Activities

Nearly 200,000 people are directly involved in NSF programs and activities, receiving salaries, stipends, or participant support.

In addition, many millions of people are indirectly impacted by NSF programs. These programs reach PreK-12 students, PreK-12 teachers, and researchers through activities including workshops; informal science activities such as museums, television, videos, and journals; outreach efforts; and dissemination of improved curriculum and teaching methods.

	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate
Senior Researchers	24,330	25,480	28,380
Other Professionals	8,869	9,490	10,710
Postdoctoral Associates	4,386	4,610	5,320
Graduate Students	20,519	21,400	24,350
Undergraduate Students	28,775	30,000	32,000
K-12 Students	12,370	11,330	11,390
K-12 Teachers	89,640	82,880	80,830
Total Number of People [1]	188,889	185,190	192,980

[1] Does not include an estimated 8,800 researchers and students anticipated to be funded through H-1B Nonimmigrant Petitioner Fees in FY 2000 and FY 2001.

Senior Researchers include scientists, mathematicians, engineers, and educators receiving funding through NSF awards. These include both researchers who are principal or co-principal investigators on research and education projects, and researchers working at NSF-supported centers and facilities.

Other Professionals are individuals who may or may not hold doctoral degrees or its equivalent, who are considered professionals, but are not reported as senior researchers, postdoctoral associates, or students. Examples are technicians, systems experts, etc.

Postdoctoral Associates are individuals who have received Ph.D., M.D., D.Sc., or equivalent degrees less than five years ago, and who are not members of the faculty of the performing institution. Most of these postdoctoral associates are supported through funds included in research projects, centers or facilities awards. The balance of these, less than five percent, are recipients of postdoctoral fellowships.

Graduate Students include students compensated from NSF grant funds. Up to 20 percent of these students receive support through programs such as the NSF Graduate Fellowships, Integrative Graduate Education and Research Training Program (IGERT), and NSF Graduate Teaching Fellows in K-12 Education. The balance assist senior researchers or postdoctoral associates in performing research, and are supported through funds included in research projects, centers, or facilities awards. NSF provides support for approximately five percent of the science and engineering graduate students in the U.S.

Undergraduate Students include students enrolled in technical colleges or baccalaureate programs compensated from NSF grant funds. They may either be assisting senior researchers or postdoctoral associates in performing research, or participating in NSF programs specifically aimed at undergraduate students, such as Research Experiences for Undergraduates or the Louis Stokes Alliances for Minority Participation.

K-12 Students are those attending elementary, middle, and secondary schools. They are supported through program components that directly engage students in science and mathematics experiences such as teacher and student development projects.

K-12 Teachers include teachers at elementary, middle, and secondary schools. These individuals actively participate in intensive professional development experiences in sciences and mathematics. The number of teachers participating in NSF programs and activities is expected to decrease in FY 2001 due to reductions in systemic reform activities and in Teacher Enhancement activities.

Tools

In pursuit of its mission to provide a widely accessible, state-of-the-art science and engineering infrastructure, NSF invests in Tools. NSF provides support for large, multi-user facilities which provide access to state-of-the-art research facilities essential to the progress of research. Support for these unique national facilities is necessary to advance U.S. research capabilities required for world-class research. NSF also invests in Internet-based and distributed user facilities, advanced computer resources, research networks, major research instrumentation, research resources, digital libraries, and large databases, all of which contribute toward a state-of-the-art science and engineering infrastructure resource. Facilities and resources supported include:

(Millions of Dollars)

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
Academic Research Fleet	42	47	54
Advanced Networking Infrastructure	42	44	45
National SMETE Digital Library	1	15	27
Gemini Observatories	7	8	9
Incorporated Research Institutions for Seismology	11	13	13
Laser Interferometer Gravitational Wave Observatory	21	21	19
Major Research Equipment	57	94	139
Major Research Instrumentation	50	50	50
National Astronomy Centers	70	71	71
National Center for Atmospheric Research	72	70	77
Ocean Drilling Program Facilities	31	30	30
Partnerships for Advanced Computational Infrastructure	69	71	71
Polar Science, Operations and Logistics	179	186	202
Research Resources	100	104	118
Other Tools[1]	111	111	121
Total, Tools[2]	$865	$934	$1,045

[1] Includes physics, materials research, ocean sciences, atmospheric sciences, and earth sciences facilities, CESR, the National High Field Mass Spectrometry Center, the MSU Cyclotron, the National High Magnetic Field Laboratory (NHMFL), the Science and Technology Policy Institute, Science Resource Studies, and the National Nanofabrication Users Network.

[2] Totals may not add due to rounding.

The FY 2001 Request for tools such as facilities and research resources totals $1,045 million, about a $111 million increase over FY 2000. Operations and maintenance of multi-user facilities and research resources are funded through the Research and Related Activities (R&RA) and the Education and Human Resources (EHR) accounts; major construction projects are funded through the Major Research Equipment (MRE) account.

In FY 2001, funding for projects within the MRE account will include: $17.44 million to initiate construction of EarthScope; $16.4 million to continue construction of detectors for the Large Hadron Collider; $6.0 million for additional research and development of the Millimeter Array; $12.0 million to initiate construction of the National Ecological Observatory Network (NEON); $28.2 million to continue construction of the Network for Earthquake Engineering Simulation (NEES); $13.5 million to continue the modernization of South Pole Station; and $45.0 million for Terascale Computing Systems. Additional information regarding these projects can be found in the Major Research Equipment section.

Academic Research Fleet

The Academic Research Fleet includes ships, submersibles and large shipboard equipment necessary to support NSF-funded research and the training of oceanographers. Twenty-eight ships are included in the U.S. academic fleet, operated on behalf of the research community, primarily through NSF funding. Large ships are used for distant-water, expeditionary projects such as global change research; intermediate-sized ships support individual investigator research; and smaller regional ships are available for local and coastal research. Special purpose ships are used for submersible and remotely operated vehicle studies. NSF's FY 2001 support for the Academic Research Fleet totals $53.60 million, a $7.0 million or 15 percent increase over FY 2000 to support resources necessary for research in fields related to biocomplexity.

Advanced Networking Infrastructure (ANI)

ANI activities enable and expand scholarly communication and collaboration by providing network access for researchers and educators to high performance, remote scientific facilities including supercomputer facilities and information resources. The very high performance Backbone Network Service (vBNS), together with the high performance connections program, has led to the development of a new level of networking for the nation's research universities. ANI participates in the interagency Next Generation Internet activity to complement the university-led Internet 2 effort jointly supported by the participating universities and the private sector. In the Next Generation Internet initiative, ANI focuses on advanced, high performance network connectivity between research institutions and contributes to the basic infrastructure for high-end research applications. NSF's FY 2001 support for ANI facilities is about $45.40 million, an increase of $1.5 million, or 3.4 percent, over FY 2000.

Gemini Observatories

The two Gemini Telescopes will offer world class capabilities and unique opportunities to the scientific community. In particular, these telescopes are optimized for operation in the infrared region of the telescope and will be able to use adaptive optics, which will provide a resolving power almost twice that of the Hubble Space Telescope. The northern telescope, located on Mauna Kea in Hawaii, achieved first light in December 1998 and is expected to be ready for operational handover in June 2000. First light at the southern observatory at Cerro Pachon, Chile is expected in FY 2000. Normal science operations at the Hawaii site are expected to commence in June 2000 and at the Chilean site in FY 2001. Emphasis in FY 2001 will be on increased support for operations at the two sites. The FY 2001 Budget Request includes $8.65 million for the Gemini Observatories, $600,000 or 7.5 percent over FY 2000.

Incorporated Research Institutions for Seismology (IRIS)

IRIS was created in 1986 to install a global network of seismometers, provide portable seismometers for regional studies, and establish a data management system to provide on-line, distributed access to data on global seismic activity. The IRIS facility serves the needs of the national and international seismology community by making available seismic sensors and data acquisition systems. In addition, the Global Seismic Network operated by IRIS is a backup system for test ban treaty monitoring. NSF's FY 2001 support for IRIS totals about $12.80 million, $200,000 or 1.6 percent over FY 2000.

Laser Interferometer Gravitational-Wave Observatory (LIGO)

The LIGO construction project began in FY 1992 as a collaboration between physicists and engineers at the California Institute of Technology and the Massachusetts Institute of Technology to test the dynamical features of Einstein's theory of gravitation and to study the properties of intense gravitational fields from their radiation. Today, several other institutions are also involved. LIGO consists of identical, but widely separated detectors, one in Hanford, Washington, and the other in Livingston, Louisiana, that will be used for fundamental physics experiments to directly detect gravitational waves and gather data on their sources. In FY 2001, $19.10 million is requested, in accordance with the funding schedule, for LIGO operations funding as it continues its projected three-year instrumentation commissioning phase.

Major Research Equipment (MRE)

A total of $139 million is requested through the MRE account for the following projects:

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
Earthscope	--	--	17
HIAPER	--	9	--
Large Hadron Collider	22	16	16
Millimeter Array	9	8	6
National Ecological Observatory Network	--	--	12
Network for Earthquake Engineering Simulation	--	8	28
Polar Aircraft Modernization (LC-130s)	20	12	--
South Pole Station	6	5	14
Terascale Computing Systems	--	36	45
Total, Major Research Equipment Account[1]	$57	$94	$139

[1] Totals may not add due to rounding.

The current and proposed projects within the MRE account are briefly described below. Additional information can be found in the MRE section.

- EarthScope: USArray and SAFOD: a distributed, multi-purpose geophysical instrument array that will make major advances in our knowledge and understanding of the structure and dynamics of the North American continent.

- Large Hadron Collider (LHC): planned to be the world's highest energy accelerator facility. NSF participation includes contributing to the construction of two high energy particle detectors, ATLAS (A Toroidal Large Angle Spectrometer) and CMS (the Compact Muon Solenoid).

- Millimeter Array (MMA): the design and development phase of a planned aperture-synthesis radio telescope operating in the wavelength range from 3 to 0.4 mm.

- National Ecological Observatory Network (NEON): will establish 10 observatories nationwide that will serve as national research platforms for integrated, cutting edge research in field biology.

- Network for Earthquake Engineering Simulation (NEES): will upgrade, modernize, expand and network major facilities including shake tables used for earthquake simulations, large reaction walls for pseudo-dynamic testing, centrifuges for testing soils under earthquake loading, and field testing facilities.

- South Pole Station: Amundsen-Scott South Pole Station, completed in 1975, has code and safety deficiencies that left uncorrected will pose risks to personnel and negatively impact operations. This project was initiated in FY 1998 and is scheduled to be completed by FY 2005.

- Terascale Computing Systems: will provide access to scalable, balanced, terascale computing resources for the broad-based academic science and engineering community served by NSF.

Major Research Instrumentation (MRI)

The Major Research Instrumentation Program (MRI) is designed to improve the condition of scientific and engineering equipment for research and research training in our nation's academic institutions. This program seeks to improve the quality and expand the scope of research and research training in science and engineering, and to foster the integration of research and education by providing instrumentation for research-intensive learning environments. In FY 2001, NSF requests $50.0 million for this ongoing program to support the acquisition and development of research instrumentation for academic institutions.

National Astronomy Centers

There are three National Astronomy Centers, which receive approximately 93 percent of their funding from NSF. The FY 2001 Request includes approximately $71.0 million to support the National Astronomy Centers:

The main facility of the National Astronomy and Ionosphere Center (NAIC) is the 305-meter-diameter radio and radar telescope located at Arecibo, Puerto Rico. NAIC is a visitor-oriented national research center devoted to scientific investigations in radio and radar astronomy and atmospheric sciences. NAIC provides telescope users with a wide range of research and observing instrumentation, including receivers, transmitters, movable line feeds, and digital data acquisition and processing equipment. A major upgrade to the radio telescope and radar was recently completed. The FY 2001 Request includes $9.04 million for NAIC, level with FY 2000, and emphasis will be on extending the high frequency capabilities of the upgraded telescope.

The National Optical Astronomy Observatories (NOAO) is the national center for research in ground-based optical and infrared astronomy. NOAO includes Kitt Peak National Observatory, outside Tucson, Arizona; Cerro Tololo Inter-American Observatory, in Chile; and the National Solar Observatory, in Arizona and New Mexico. Large optical telescopes, observing equipment, and research support services

are made available to qualified scientists. In FY 2001, the Global Oscillation Network Group (GONG) at NOAO will continue monitoring small-scale oscillations of the sun, permitting studies of the sun's interior structure. The instrumentation for the Synoptic Optical Long-term Investigation of the Sun (SOLIS), will begin refined studies of the Sun's atmosphere and surface, including determining conditions which give rise to solar flares. The FY 2001 Request includes $29.69 million for NOAO, level with FY 2000.

The National Radio Astronomy Observatory (NRAO) is headquartered at Charlottesville, Virginia, and operates radio telescopes at sites in Arizona, New Mexico, and West Virginia. NRAO makes radio astronomy facilities available to qualified visiting scientists and provides staff support for use of the large radio antennas, receivers, and other equipment needed to detect, measure, and identify radio waves from astronomical objects. In FY 2001, the Green Bank Telescope will transition from commissioning to operations. The FY 2001 Request includes $32.53 million for NRAO, level with FY 2000.

National Center for Atmospheric Research (NCAR)

NCAR facilities serve the entire atmospheric sciences research community and part of the ocean sciences community. Facilities available to university, NCAR, and other researchers include an advanced computational center providing resources and services well suited for the development and execution of large models and for the archiving and manipulation of large data sets. NCAR also provides research aircraft which can be equipped with sensors to measure dynamic, physical, and chemical states of the atmosphere. In addition, one airborne and one portable ground-based radar and other surface sensing systems are available for atmospheric research. Roughly 25 percent of the funding for NCAR facilities is provided by non-NSF sources. In FY 2000, more than 1,500 researchers and students will use the facilities, and approximately 150 visiting scientists will stay for extended periods. NSF's FY 2001 support for NCAR totals approximately $77.02 million, an increase of about $6.90 million, or 9.8 percent over FY 2000. This increase will enhance usability of high-end computer systems and research activities related to Earth's natural cycles.

National SMETE Digital Library

A National SMETE Digital Library (NSDL) responds to needs articulated by the NSF, the academic community, and corporate leaders for accelerating much needed improvements in science, mathematics, engineering, and technology education (SMETE). The NSDL, capitalizing on recent developments in digital libraries, will provide: a forum for the merit review and recognition of quality educational resources; a mechanism for electronic dissemination of information about high-quality educational materials, pedagogical practices, and implementation strategies; a centralized registry and archive for educational resources; and a resource for research in teaching and learning. In addition, the NSDL will provide an infrastructure to support and accelerate the impact of NSF programs. For example, developers of curricula and courses will benefit from awareness and knowledge of extant instructional materials, as well as information on their implementation. NSF support for the NSDL will total $27.0 million, an increase of $12.0 million or 80 percent over FY 2000.

Ocean Drilling Program Facilities

The Ocean Drilling Program is a multinational program of basic scientific research in the oceans which uses drilling and data from drill holes to improve fundamental understanding of the role of physical, chemical, and biological processes in the geological history, structure, and evolution of the oceanic portion of the Earth's crust. Operational support for this activity is shared by six international partners, comprising 18 countries. NSF's FY 2001 support for Ocean Drilling Program facilities totals $30.10 million, level with FY 2000.

Partnerships for Advanced Computational Infrastructure (PACI)

Partnerships for Advanced Computational Infrastructure provides access to, and support for, high-end computing for the national scientific and engineering community, and the development and application of the necessary software, tools and algorithms for their use on scalable, widely distributed resources. The $70.83 million requested in FY 2001 will permit the PACI network, now in its third year, to enter the era of terascale computing. In FY 2001, emphasis will be on scaling applications codes to be ready for transitions to the Terascale Computing Systems and access and visualization techniques for very large data resources to support research in disciplinary areas. The education, outreach and training component of PACI will continue to broaden and accelerate the capability of the nation to utilize the advanced computational capabilities being developed.

Polar Science Operations and Logistics

Polar facilities make research possible in the remote and hazardous Antarctic continent, where all infrastructure must be provided. In accord with U.S. Antarctic policy, three year-round Antarctic research stations are operated and maintained — McMurdo Station on Ross Island, Palmer Station on Anvers Island, and Amundsen-Scott South Pole Station. In addition, necessary facilities include ski-equipped and fixed-wing aircraft, helicopters, research vessels (including a specially constructed ice-breaking research vessel), and an ice-strengthened supply and support ship. Logistical support for polar facilities is supplied in part by the Department of Defense. Over 650 researchers and students utilize the Antarctic facilities each year.

Arctic facilities include camps and sites for studies of greenhouse gases, monitoring stations for research on ultra-violet radiation, ice coring sites for studies of global climate history, high latitude radar observatories and magnetometers for upper atmospheric research, use of the U.S. Coast Guard Cutter Healy, and the use of a vessel from the academic research fleet for oceanographic research in the Arctic Ocean. NSF's FY 2001 support for Polar Science Operations and Logistics totals $201.53 million, 8.2 percent over FY 2000.

Research Resources

Research Resources supports a range of activities throughout the Research and Related Activities account, including: multi-user instrumentation; the development of instruments with new capabilities, improved resolution or sensitivity; upgrades to field stations and marine laboratories; support of living stock collections; facility-related instrument development and operation; and the support and development of databases and informatics tools and techniques. These various resources provide the essential platforms and tools for effective research in all areas of science and engineering. In FY 2001, funding for Research Resources increases $13.73 million to a total of $118.06 million.

Other Tools

This category includes:

- funding for the final year of a five year-upgrade of the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University;

- continued support for the operation and maintenance of the newly upgraded Cornell Electron Storage Ring (CESR) at Cornell University;

- continued support for the Science and Technology Policy Institute to continue to provide analytical support to the Office of Science and Technology Policy (OSTP) to identify near-term and long-term objectives for research and development and identify options for achieving those objectives;

- continued support for the National High Magnetic Field Laboratory (NHMFL), operated by Florida State University, the University of Florida, and Los Alamos National Laboratory; and

- an increase of $2.0 million for Science Resource Studies to provide policymakers, researchers and other decision makers with high quality data and analysis for making informed decisions about the nation's science, engineering, and technology enterprise.

Other items within this category include the National High Field FT-ICR Mass Spectrometry Center, and physics, materials research, ocean sciences, atmospheric sciences, and earth sciences facilities

FY 2001 Performance Goals for Tools

The following tables summarize NSF's FY 2001 Performance Goals for Tools. For additional information, see the FY 2001 Performance Plan.

Annual Performance Goals For Results – Tools

Outcome Goal	FY 2001-2005 GPRA Strategic Plan	FY 2001 Areas of Emphasis
	NSF is successful when results reported in the period demonstrate sufficient progress in achieving:	
Tools -- Broadly accessible, state-of-the-art information bases and shared resarch and education tools	❖ Shared-use platforms, facilities, instruments, and databases that enable discovery and enhance the productivity and effectiveness of the science and engineering workforce. ❖ Networking and connectivity that takes full advantage of the Internet and makes SMET information available to all ❖ Information and policy analyses that contribute to the effective use of science and engineering resources.	Investments in Major Research Equipment Continue investments in: ◗ Terascale Computing System ◗ Major Research Instrumentation ◗ K-16 SMETE digital library ◗ S&E information/reports/databases ◗ New types of scientific databases & tools for using them
Strategic Outcome Goal	FY 2001 Annual Performance Goal	
Tools -- Data Relevance and Quality	Determine what data are needed to better reflect the 21st century S&T enterprise. Develop, assess, and begin implementation of design options for recasting SRS S&E resources data collections. (New Goal)	
	Determine the aspects of each SRS survey most needing improvement, based upon the standard set of data quality measures for reporting SRS products. Improve the quality of at least one half the core SRS surveys.	

Annual Performance Goals For NSF's Investment Process

Performance Area	**FY 2001 Annual Performance Goal**
Facilities Oversight	
Construction and upgrade	Maintain FY 2000 goal: keep construction and upgrades within annual expenditure plan, not to exceed 110 percent of estimates. FY 1999 result: majority of facilities within 110% of spending estimates.
	Maintain FY 2000 goal: 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.
	Maintain FY 2000 goal: 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 projects completed in FY 1999.
Operations	Maintain FY 2000 goal: 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.

Highlights

Most accurate galaxy distance: Researchers at the National Radio Astronomy Observatory have used the Very Long Baseline Array (VLBA) to make measurements of water emission from the central regions of the galaxy NGC 4258. The measurements yielded a *direct* measurement of the distance to this object, about 23.5 million light-years. This result differs significantly from the inferred distance of about 28 million light years obtained by astronomers using the Hubble Space Telescope. There may be previously-unrecognized systematic errors in the Hubble distance scale for the Universe and this will affect current estimates of the age of the Universe.

New vistas for high magnetic field research: A team of researchers from the National High Magnetic Field Laboratory (NHMFL) has conducted the first experiments in continuous magnetic fields of 45 tesla (one million times the Earth's magnetic field) in a new hybrid magnet, one of the crown jewels of this national user facility. The 45-tesla hybrid magnet consists of two very large magnets. The total magnet system weighs 34 tons and stands 22 feet tall. A huge superconducting magnet forms the outside layer and is the largest magnet of its type ever built and operated to such high field. It is cooled to within a few degrees of absolute zero temperature using a superfluid helium cryogenic system. A large resistive magnet (electromagnet) sits in the center of the superconducting magnet, and the two magnets work in tandem to provide the most intense constant magnetic field on Earth. This new magnetic field strength gives scientists a new scale of magnetic energy to create new states of matter and probe deeper into electronic and magnetic materials than ever before.

CESR Continues World-Class Performance: The Cornell Electron-positron Storage Ring achieved a new high for colliding beam luminosity and brought scientists a step closer to understanding the matter-antimatter asymmetry in the universe as well as a fundamental asymmetry of nature called CP violation. Both CESR and its associated particle detector CLEO were upgraded to achieve new levels of sensitivity for study of rare B-meson decays thought to be central to understanding CP violation. CESR achieved a record peak luminosity in February 1999 – 8 times the previous CESR design value – through a combination of innovations in accelerator physics and technology pioneered at Cornell. CLEO reported the first observation of an elusive decay mode that was once thought to be a channel to access a full description of CP violation. The weakness of this decay will now force us to devise a new strategy. Measurements of radiative decay of the b quark to the s quark (first reported several years ago) have improved greatly in accuracy thanks to CESR advances. The results agree well with the Standard Model predictions and now place tight restrictions on the range of possible effects beyond the Standard Model.

South Pole Station Modernization: SPSM is currently on schedule and within budget. The acceleration of funding has made it possible to move up procurement of materials and construction of the Dark Sector Lab, a 3000 square foot building which will support astrophysics research. The accelerated funding has made it possible to combine previously separate procurements for major components – structural steel, wall panels, and other construction materials - into several large purchases instead of a greater number of smaller purchases. In addition to providing for consistency of materials for the station (simplifying long-term maintenance), this approach will likely result in saving labor costs (for procurement) and inflation. Also, perhaps most importantly, the acceleration helps guard against possible procurement-associated delays in the future, and thus against schedule-driven cost increases.

South Pole Airdrop: On July 11, 1999 - essentially the middle of the Antarctic winter - the Air Force conducted a mission to airdrop medical supplies and equipment at Amundsen-Scott South Pole Station to assist in the treatment of the station doctor who discovered a lump in one of her breasts. Station personnel braved extreme cold to safely retrieve the bundles. All critical medical supplies and most of the electronic equipment, including microscopes, cameras, and equipment to improve communications,

survived the drop. These allowed the patient, in consultation with medical experts in the United States, to begin an appropriate course of treatment.

Supercomputing Excellence: The NSF Supercomputer Centers Program, and its PACI successor, have led the way in adding computational modeling to theory and experiment as means for developing scientific understanding. These centers have changed the way scientific phenomena are analyzed, modeled and visualized. A striking example of the importance of advanced computation in basic scientific research was recognized in 1998 with the award of the Nobel Prize for Chemistry to John Pople and Walter Kohn for laying the foundations to a new approach to research in chemistry. This approach is in the same mode as the *ab initio* computations performed on the CRAY T90 at the San Diego Supercomputer Center (SDSC).

The Search for Extra-Solar Planets: A long-standing aim of National Center for Atmospheric Research's High Altitude Observatory (HAO) astrophysics program has been to detect and characterize Sun-like pulsations in distant stars. The technology required to make such studies involves extremely precise measurements of the line-of-sight velocity or brightness of the target stars. It turns out that these measurements are precisely those needed to detect planets circling other stars. A researcher has recently exploited these techniques to identify new, extra-solar planets. An exciting result of this effort was the discovery in April that the star Upsilon Andromedae is orbited by three planets, all with masses comparable to that of Jupiter, located at distances from their star that range from .05 to 2.5 astronomical units. This discovery was the result of a collaboration involving scientists from NCAR, the Harvard-Smithsonian Center for Astrophysics, and San Francisco State University, using the Anglo-Australian Telescope. It is the first detection of a multiple-planet solar system outside our own, and has been widely interpreted as evidence that solar systems like ours may be fairly common companions to Sun-like stars.

Administration and Management

The FY 2001 request for Administration and Management (A&M) of $216.62 million provides support for salaries, benefits, and training of persons employed at the NSF, general operating expenses, including key initiatives to advance the agency's information systems technology, and audit and Inspector General activities. The workforce includes Federal employees, Intergovernmental Personnel Act (IPA) assignees, detailees, and contractors performing administrative functions.

(Millions of Dollars)

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
General Management and Administration	$171.64	$185.14	$210.34
Salaries and Expenses	144.08	148.90	157.89
IPA and Program Support in Program Accounts	27.15	35.91	52.10
Financial Statement Audit	0.41	0.33	0.35
[Travel]	[11.00]	[13.00]	[14.00]
Office of the Inspector General [1]	5.18	5.45	6.28
Total Administration and Management	$176.82	$190.59	$216.62
NSF Workforce:			
Federal Employees	1,194	1,199	1,204
Intergovernmental Personnel Act FTE	111	126	140
Detailees	8	8	10
Administrative Contractors	195	193	210
Total Workforce	1,508	1,526	1,564

[1] Within OIG, $24,000 was carried over from FY 1999 to FY 2000.

FTE

	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate
Total[1]	1,194	1,199	1,204
Office of Inspector General	46	46	50
Salaries and Expenses	1,144	1,150	1,150
Arctic Research Commission	3	3	4

[1]Totals may not add due to rounding.

The Administration and Management function includes administrative costs that are funded through the Research and Related Activities (R&RA) account and the Education and Human Resources (EHR) account as well as the Salaries and Expenses and Office of the Inspector General accounts.

The FY 2001 request for Administration and Management is an increase of 13.7 percent over FY 2000. The increase will fund additional IPA assignees, detailees and contractors performing administrative functions, comparability and locality pay increases for federal employees, a space increase that covers existing and newly-acquired space, staff training, and improved productivity of our staff through investments in information and communications technology. Such investment in information systems technology has been crucial to NSF in the past, as the agency has handled significant increases in program funds and corresponding increases in the quantity and complexity of its workload without equivalent increases in administrative funds.

A&M includes the following components:

Program Accounts

IPA costs and administrative contracts funded by R&RA and EHR are included within A&M. An increase in IPAs and contractor personnel is crucial in order for NSF to provide the workforce necessary to carry out program initiatives and maintain the efficient management of our increasingly complex programs. Also, new activities substantially increase the need for coordination and result in heavy demands on the staff. A single coordinated program can involve dozens of program managers from throughout NSF. A few examples of the increased workload are:

- Research investment requires more coordination within NSF and between NSF and our partners in the research enterprise. NSF's partners include other federal agencies and the academic community both within the United States and internationally. These partnerships continue to increase as the research enterprise looks to pool resources and talent in search of discovery. But these partnerships also require a considerable amount of oversight and coordination by agency staff in addition to normal program activities especially in an effort to avoid duplicating, but rather complementing other federal research programs.

- The agency has placed a high priority on the integration of research and education. The proposal review process has been modified to explicitly include this component as part of the overall process. The complexity of the proposals the agency receives continues to increase as applicants respond to new opportunities that involve increased collaboration. This also has an impact on the workload of NSF program officers, as these proposals require more time and effort to review. The Foundations' program officers manage a merit review process involving over 100,000 requests to active researchers and educators review proposals.

- In implementing the performance plan the Foundation needs to collect information on the results of NSF-supported projects. The agency is requesting more detailed information from awardees and has implemented a new web-based Project Reporting System. Also, NSF has reoriented the Committee of Visitors review process to provide assessments on the performance of NSF programs.

An increase in travel funds in FY 2001 is necessary to continue to support the merit review process while increasing the ability for oversight and outreach travel. Beginning in FY 2001, all travel by staff in the program offices will be funded through R&RA and EHR instead of the Salaries and Expenses account. This change is requested to directly associate oversight and outreach travel with the appropriate program. Good management is critical to the success of the research and education activities that we support, and proper and sufficient oversight is vital to this process. Without an increase in total travel authority, the Foundation will be unable to ensure both a reliable merit review process and the oversight recommended by the agency's Inspector General. Inspector General reports continue to cite the lack of travel funds for oversight of NSF awards as a major management challenge. In addition, management reviews call for more oversight travel.

Salaries and Expenses

- Personnel Compensation and Benefits (PC&B) provides support to maintain the current FTE level of 1,150, including comparability and locality pay increases and higher benefit costs. The FTE distribution by account is shown below:

- General Operating Expenses (GOE) support the entire range of operating expenses necessary for the agency to administer its programs. The GOE level for FY 2001 provides for advances in the agency's information systems technology and administration and increased rental payments to the General Services Administration for existing and newly acquired space.

Office of the Inspector General

- OIG activities include resources to support the Office of Inspector General. An FTE increase of 4 is requested in FY 2001. Funding for the financial statement audit contract is charged to the appropriations being audited. OIG support costs such as rent and communications are provided in the Salaries and Expenses appropriation.

Highlights

Highlights of the FY 2001 A&M request include the following major initiatives that support improvements to the Foundation's information technology infrastructure in areas such as management of proposal submission, review, award and financial activities.

Electronic Administration

The recent enactment of the Federal Financial Assistance Management Improvement Act of 1999 has significant implications for NSF's activities and development of electronic systems. The new act sets tight deadlines for planning and implementation of a wide variety of functions that are critical to NSF's mission, including streamlining basic assistance processes, participation in interagency efforts for electronic initiatives, and assisting award recipients in their abilities to meet reporting requirements. While NSF has been a leader in many of these activities, the accelerated deadlines of this Act require accelerated system development and greater concentration of resources in activities supporting

interagency consistency and customer support. Increased funding is necessary to ensure that the Foundation has the resources not only to meet these challenging deadlines, but also to provide a leadership role in this federal effort.

NSF's business has been changing, and Administration and Management funding has not kept pace with program increases. Therefore, in spite of an aggressive use of technology, NSF has found that it takes a significant effort on the part of the agency staff to implement the complex, interdisciplinary programs that are becoming more inevitable and prevalent. These programs require coordination within the Foundation, with other Federal agencies, and among the numerous and diverse science and engineering communities. The scientific complexity that results from these interdisciplinary programs is reflected in the management of proposal submission, review, award and financial activities. It is critical that the Foundation makes further investments in the agency's information systems that will enable NSF to handle its increasing workload. To meet this growing workload, the Foundation has actively pursued the use of advanced information technologies to improve the way NSF does business and to reduce the administrative burden on NSF customers and staff. The key initiatives to advance NSF's information systems technology are:

FastLane

With the FastLane project, NSF has moved toward more streamlined, paperless electronic administrative activities. The Foundation initiated FastLane as a research project in 1994 to test the feasibility of complete electronic handling of proposal processing and grant administration and to explore the capability of electronic processing to reduce the workload burden on both NSF and the research community. FastLane enables NSF and its customer community to conduct and facilitate business transactions and exchange information electronically using the World Wide Web.

In September 1998, the Director of NSF issued Important Notice 123 to university and college presidents and the heads of other grantee organizations. It contains NSF's vision for paperless proposal and award processing. In addition to outlining the steps NSF is taking to bring the vision to reality, the Important Notice included a schedule of when five basic functions will be required for use by our grantees. This notice is NSF's public commitment to using electronic processing for its standard business processes. The major and final deadline in the Important Notice is October 1, 2000 (proposal and review submissions required).

In addition to increased efficiency and reduced administrative burden, the benefits to be derived from FastLane are increased access by researchers and the public to information about NSF-supported research, and reduced proposal and award processing time. Since its inception, FastLane has been tremendously successful and award-winning, and continued to experience substantial growth in all areas in FY 1999. The system that began as an experiment with 16 university partners currently has 3000 registered organizations (up from 1500 in FY 1998).

To date, 41 FastLane functions have been developed that handle the processing associated with proposal preparation and submission, proposal review, proposal status inquiry, award notification, project reports, and award search. These modules were used by grantee institutions to submit 12,734 proposals in FY 1999 (NSF receives about 30,000 proposals each year).

Today, NSF handles over $2.5 billion in cash transactions on FastLane. FastLane features include electronic capabilities for cash requests, Federal Cash Transaction Reports (FCTRs) and no cost award extensions. Among the enhancements added in FY 1999 were new means for preparing proposals, allowing principal investigators control over editing their own contact information and professional affiliations, new reports for NSF grantees, interactive ways for panel reviewers to coordinate evaluations of proposals, allowing organizations control of adding new principal investigators to NSF's

official lists, support of Portable Document Format (PDF) files in our project reporting function, and Electronic Data Interchange (EDI) for proposal submission. In FY 1999, a FastLane Help Desk was established to provide centralized, dedicated support to our external users.

Currently, FastLane is NSF's preferred method of proposal submission, and our goal under the Results Act is for 60% of all NSF proposals to be received and processed via FastLane during FY 2000. In order to handle the increased FastLane operational workload expected from this initiative, we must continue to support and enhance FastLane operations and maintenance, expand the Help Desk, and train personnel in its use. The required infrastructure includes high-speed servers, additional file space, scanning equipment, monitors, software, and other equipment. It also includes system security and contracts to maintain and enhance the FastLane computer programs.

The FastLane system is being continuously enhanced and updated as new technologies emerge and based on feedback from the research community. When the project began in 1994, we recognized that the opportunities presented by advances in the Internet and World Wide Web would have a significant impact on how work is accomplished. The initial project was based on what was known of the capabilities of the Internet and Web at that time. Based on their experience with FastLane, the user community has identified new opportunities that were not envisioned in 1994. We expect the requirement for new enhancements to continue as new opportunities emerge and as the Web continues to evolve.

Budget Internet Information System (BIIS) and Enterprise Information System (EIS)

The Budget Internet Information System (http://ntalpha.bfa.nsf.gov) contains information on GPRA issues such as processing time and award size. It is easily accessible to the public via the Web and is used extensively by the university community and R&D press. Information currently available includes:

- Funding Rate by State and Organization: Contains information on number of competitive proposals and awards, funding rate, NSF processing time, award duration and award size. The information can be obtained by discipline and includes ten years of trend data.

- Award Listings, by Organization, State, and Institution: Includes information on funding by state and institution, broken out by academic and industrial performers with detail by discipline and award.

- Award Summary, by Top Institutions: Shows information on funding by the top institutions, broken out by academic and industrial performers with detail by discipline and award for the past five years.

The Enterprise Information System (EIS) is an internal NSF, user-friendly system that informs and empowers NSF program and financial managers as they make budget and planning decisions. The EIS includes financial and personnel information. For example, a summary of grant budgets for all NSF awards is available. This includes budgets for investigator salaries, funding for undergraduates and graduates, indirect costs and equipment costs. Trends and current status of projects also are available.

FinanceNet

NSF is the innovator, developer, and custodian for FinanceNet (www.financenet.gov), the government's Internet "home page" for financial management improvement initiatives and the government-wide Internet portal site for information on all Federal, state and local surplus, abandoned and unclaimed property. The Chief Financial Officers' Council is FinanceNet's sponsor through Memoranda of Agreement with

its member agencies and departments. In FY 1999, FinanceNet World Wide Web visits increased to the rate of 30 million "hits" per year with subscriptions to its more than 100 topical and organizational Internet list servers increasing to over 100,000. The Foundation also further broadened FinanceNet's outreach. In FY 1999 FinanceNet integrated all of its collaborative Internet tools, developed for more than two dozen governmental organizations, into one seamless turnkey web application. In response to tasking within OMB's "FY 2000 Financial Management Status Report and Five Year Plan," FinanceNet is expanding the scope of its government-wide asset sales web portal to include the development of an interagency support team, government-wide data warehouse and pilot auction site.

Migration to Client-Server Environment

NSF is replacing its aging central mainframe computer by migrating to a client-server computing environment that allows more processing to be performed at individual workstations rather than on the mainframe. This migration is scheduled for completion in FY 2001.

FY 2001 Performance Goals for Administration and Management

The performance goals for NSF's investment process 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. Performance goals for management address whether centrally funded and coordinated administrative activities are managed efficiently and effectively in support of NSF's mission. See the FY 2001 Performance Plan included in this justification for further detail.

Annual Performance Goals for Management[1]

Critical Factor for Success	Performance Goal
NSF Business Practices	
Electronic proposal submission	NSF will receive at least 95% of full proposal submissions electronically through FastLane, improving upon the FY 1998 baseline of 17.5%, the FY 1999 achievement of 44% and the FY 2000 goal of 60%.
Electronic proposal processing	NSF will conduct ten pilot paperless projects that manage the competitive review process in a totally electronic environment. (New Goal)
Project reporting	During FY 2001, at least 95% of eligible project reports will be submitted through the electronic Project Reporting System, improving on the FY 1999 baseline of 59% and the FY 2000 goal of 85%.
Video-conference/long distance	By the end of FY 2001, NSF will increase usage of a broad-range of video-conferencing/long distance communications technology by 100% over the FY 1999 level, from 50 VTC's to 100. (New Goal)
NSF Staff	
Diversity	NSF will maintain the FY 2000 goal: 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 hires, 22% were female and 19% were from underrepresented groups.
Work Environment	In FY 2001, NSF will strive to provide NSF staff with a physical environment that is safe and well equipped with current technology tools, and a work culture that promotes high performance, life-long learning, and recognition of high achievement. (New Goal)

[1] In FY 2001, NSF continues to emphasize the area of managing information technologies.

Annual Performance Goals for NSF's Investment Process

Performance Area	FY 2001 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, maintaining the FY 1999 and FY 2000 goal of 90%. FY 1999 result: 95%.*
Implementation of Merit Review Criteria [1]	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 acount in their award decisions. FY 1999 result: Largely Successful
Implementation of Merit Review Criteria - Integration of Research and Education in Reviews [1]	NSF performance is successful when reviewers of research grant proposals address elements of both generic review cirteria, and explicitly address the integration of research and education. (New Goal)
Implementation of Merit Review Criteria - Integration of Research and Education in Proposals	In a pilot effort, at least 50% of research grant proposals will explicitly address elements of both generic review criteria, and explicitly address the integration of research and education. (New Goal)
Customer Service - General	NSF's overall customer satisfaction rating on applicant surveys will show continued improvement over FY 2000 applicant survey results. FY 2000 goal: American Customer Satisfaction Survey (ACSI) of 58+
Customer Service - Time to prepare proposals	Maintain the FY 2000 goal that 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	Process 75% of proposals within six months of receipt, improving upon the FY 1998 baseline of 59% and FY 1999 and 2000 goal of 70%. FY 1999 result: 58%
Award Size	NSF will increase the average award size for research projects to $108,000. (New Goal) FY 1998 baseline: $90,000. FY 1999 data: $94,000. FY 2000 estimate: $98,000.
Award Duration	NSF will increase the average duration of awards for research projects from an FY 1998 base of 2.7 years to at least 3 years. FY 1999 goal: 2.8 years. FY 1999 result: 2.8 years. (Goal dropped in FY 2000)
Broadening Participation	
Underrepresented Groups - Women and Minorities	NSF will begin to implement the mechanisms/approaches developed in FY 2000 for increasing the number of women and underrepresented minorities in the proposal application pool. (New Goal)
	NSF will begin to implement the approaches identified in FY 2000 for retaining women and underrepresented minorities in the proposal applicant pool. (New Goal)

[1] These performance goals are stated in the alternative format provided for in GPRA legislation.

NSF Funding Profile

The Number of Requests for Funding is a count of all proposals, fellowship applications, and requests for additional funding on continuing awards. Additional funding on continuing awards is contingent upon availability of funds and whether the results achieved are determined to warrant further support. Dollars Requested includes all dollars associated with the requests for funding.

Total Number of Awards is a count of the awards funded in the fiscal year. It includes both new awards and the second and subsequent years of a continuing award.

Approximately half of the awards that are supported in a particular fiscal year are competitively reviewed in that year through NSF's merit review process. The other awards are continuations of projects that were competitively reviewed in a prior year. The funding rate is the number of competitive awards made during a year as a percentage of total proposals competitively reviewed. It indicates the probability of winning an award when submitting proposals to NSF.

The annualized award size displays the annual level of research grants provided to awardees by dividing the total dollars of each award by the number of years over which it extends. Both the average and the median annualized award size for competitively reviewed awards are shown.

Average duration is the length of the award in years. The duration calculation is limited to research projects and excludes other categories of awards which fund infrastructure-type activities such as equipment and conference awards, which do not require multi-year support.

The Quantitative Data Tables, provided under a separate tab, are based on all proposals and awards, including competitive awards, contracts, cooperative agreements, supplements and amendments to existing grants and contracts.

NSF FUNDING PROFILE

	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate
Number of Requests for Funding [1]	37,106	39,490	43,510
Dollars Requested (in billions) [1, 3]	$13.95	$15.78	$17.25
Total Number of Awards	19,518	19,910	21,200
Statistics for Competitive Awards			
Number	8,279	8,470	9,600
Funding Rate	32%	31%	31%
Median Annualized Award Size[2]	$74,756	$78,300	$85,000
Average Annualized Award Size[2]	$94,194	$98,400	$108,900
Average Duration (yrs.) [2]	2.8	2.9	3.0
Percent of Competitive Research Grants to New Investigators	27%	30%	30%

[1] FY 2000 and FY 2001 data does not include an estimated 30,000 additional requests for funding for H-1B scholarship activity.
[2] Statistics for award size and duration are for research grants only.
[3] Does not include approximately $2.0 billion in preproposals received during FY 1999.

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
BIOLOGICAL SCIENCES						
MOLECULAR AND CELLULAR BIOSCIENCES						
Molecular & Cellular Biosciences Research Projects	$101,274	$105,010	$105,260	$133,150	$27,890	26.5%
Total	101,274	105,010	105,260	133,150	27,890	26.5%
INTEGRATIVE BIOLOGY AND NEUROSCIENCE						
Integrative Biology & Neuroscience Research Projects	90,683	94,255	94,630	119,690	25,060	26.5%
Total	90,683	94,255	94,630	119,690	25,060	26.5%
ENVIRONMENTAL BIOLOGY						
Environmental Biology Research Projects	86,178	89,450	89,832	119,230	29,398	32.7%
Total	86,178	89,450	89,832	119,230	29,398	32.7%
BIOLOGICAL INFRASTRUCTURE						
Research Resources	48,535	47,821	49,440	62,710	13,270	26.8%
Human Resources	15,107	17,084	15,640	16,730	1,090	7.0%
Total	63,642	64,905	65,080	79,440	14,360	22.1%
PLANT GENOME RESEARCH						
Plant Genome Research Projects	50,325	55,000	59,630	59,630	0	0.0%
Total	50,325	55,000	59,630	59,630	0	0.0%
Total, BIO	$392,102	$408,620	$414,432	$511,140	$96,708	23.3%

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
COMPUTER AND INFORMATION SCIENCE AND ENGINEERING						
COMPUTER-COMMUNICATIONS RESEARCH						
Computer-Communications Research	$60,344	$62,230	$60,160	$69,160	$9,000	15.0%
Total	60,344	62,230	60,160	69,160	9,000	15.0%
INFORMATION AND INTELLIGENT SYSTEMS						
Information and Intelligent Systems Research	41,216	43,050	41,620	53,700	12,080	29.0%
Total	41,216	43,050	41,620	53,700	12,080	29.0%
EXPERIMENTAL AND INTEGRATIVE ACTIVITIES						
Experimental and Integrative Activities	57,573	59,870	57,620	63,320	5,700	9.9%
Total	57,573	59,870	57,620	63,320	5,700	9.9%
ADVANCED COMPUTATIONAL INFRASTRUCTURE AND RESEARCH						
Advanced Computational Infrastructure	69,046	77,800	70,830	75,830	5,000	7.1%
Advanced Computational Research	8,999	7,600	7,270	8,320	1,050	14.4%
Total	78,045	85,400	78,100	84,150	6,050	7.7%
ADVANCED NETWORKING INFRASTRUCTURE AND RESEARCH						
Advanced Networking Infrastructure	42,265	44,560	43,900	45,400	1,500	3.4%
Advanced Networking Research	19,109	17,420	17,020	23,370	6,350	37.3%
Total	61,374	61,980	60,920	68,770	7,850	12.9%
INFORMATION TECHNOLOGY RESEARCH (ITR)						
Information Technology Research (ITR)	0	110,000	90,000	190,000	100,000	111.1%
Total	0	110,000	90,000	190,000	100,000	111.1%
Total, CISE	$298,552	$422,530	$388,420	$529,100	$140,680	36.2%

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
ENGINEERING						
BIOENGINEERING AND ENVIRONMENTAL SYSTEMS						
Bioengineering and Environmental Systems	$32,111	$34,020	$34,270	$42,050	$7,780	22.7%
Total	32,111	34,020	34,270	42,050	7,780	22.7%
CHEMICAL AND TRANSPORT SYSTEMS						
Chemical and Transport Systems	41,888	44,040	44,320	54,390	10,070	22.7%
Total	41,888	44,040	44,320	54,390	10,070	22.7%
CIVIL AND MECHANICAL SYSTEMS						
Civil and Mechanical Systems	48,076	48,330	48,240	56,190	7,950	16.5%
Total	48,076	48,330	48,240	56,190	7,950	16.5%
DESIGN, MANUFACTURE, AND INDUSTRIAL INNOVATION						
Design, Manufacture, and Industrial Innovation	45,335	46,510	47,280	58,660	11,380	24.1%
Small Business Innovation Research	58,646	59,850	61,830	74,700	12,870	20.8%
Total	103,981	106,360	109,110	133,360	24,250	22.2%
ELECTRICAL AND COMMUNICATIONS SYSTEMS						
Electrical and Communications Systems	42,668	45,060	45,358	58,870	13,512	29.8%
Total	42,668	45,060	45,358	58,870	13,512	29.8%
ENGINEERING EDUCATION AND CENTERS						
Engineering Education and Centers	101,403	100,720	100,538	111,640	11,102	11.0%
Total	101,403	100,720	100,538	111,640	11,102	11.0%
Total, ENG	$370,127	$378,530	$381,836	$456,500	$74,664	19.6%

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
GEOSCIENCES						
ATMOSPHERIC SCIENCES						
Atmospheric Sciences Research Support	$94,470	$95,850	$95,961	$118,260	$22,299	23.2%
National Center for Atmospheric Research	70,527	68,150	68,850	75,750	6,900	10.0%
Total	164,997	164,000	164,811	194,010	29,199	17.7%
EARTH SCIENCES						
Earth Sciences Project Support	63,213	62,830	65,905	78,000	12,095	18.4%
Instrumentation and Facilities	26,944	29,250	26,950	31,000	4,050	15.0%
Continental Dynamics	8,770	9,120	8,800	9,510	710	8.1%
Total	98,927	101,200	101,655	118,510	16,855	16.6%
OCEAN SCIENCES						
Ocean Sciences Research Support	117,628	125,000	125,002	153,700	28,698	23.0%
Oceanographic Centers and Facilities	52,167	48,490	49,330	62,780	13,450	27.3%
Ocean Drilling Program	44,298	46,790	47,000	54,000	7,000	14.9%
Total	214,094	220,280	221,332	270,480	49,148	22.2%
Total, GEO	$478,018	$485,480	$487,798	$583,000	$95,202	19.5%

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY 00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY 00 Curr Plan PERCENT
MATHEMATICAL AND PHYSICAL SCIENCES						
ASTRONOMICAL SCIENCES						
Astronomy Research and Instrumentation	$40,956	$43,790	$43,560	$59,790	$16,230	37.3%
Facilities	77,586	78,420	79,310	79,910	600	0.8%
Total	118,542	122,210	122,870	139,700	16,830	13.7%
CHEMISTRY						
Chemistry Research Project Support	113,504	117,700	118,120	130,120	12,000	10.2%
Instrumentation & Infrastructure	21,837	20,800	20,870	31,870	11,000	52.7%
Total	135,341	138,500	138,990	161,990	23,000	16.5%
MATERIALS RESEARCH						
Materials Research Project Support	93,725	97,330	102,972	125,840	22,868	22.2%
Materials Research Science and Engineering Centers	56,757	53,730	53,870	59,450	5,580	10.4%
National Facilities and Instrumentation	35,885	39,460	34,320	35,320	1,000	2.9%
Total	186,367	190,520	191,162	220,610	29,448	15.4%
MATHEMATICAL SCIENCES						
Research Project Support	69,514	73,340	74,290	91,290	17,000	22.9%
Infrastructure Support	31,235	32,000	32,000	38,920	6,920	21.6%
Total	100,749	105,340	106,290	130,210	23,920	22.5%
PHYSICS						
Physics Research Project Support	99,580	103,490	106,720	142,770	36,050	33.8%
Facilities	63,160	63,910	61,630	55,880	-5,750	-9.3%
Total	162,740	167,400	168,350	198,650	30,300	18.0%
MULTIDISCIPLINARY ACTIVITIES						
Research Project Support	29,913	30,000	29,940	30,000	60	0.2%
Total	29,913	30,000	29,940	30,000	60	0.2%
Total, MPS	$733,652	$753,970	$757,602	$881,160	$123,558	16.3%

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES						
SOCIAL AND ECONOMIC SCIENCES						
Social and Economic Sciences	$60,129	$63,610	$61,084	$72,060	$10,976	18.0%
Total	60,129	63,610	61,084	72,060	10,976	18.0%
BEHAVIORAL AND COGNITIVE SCIENCES						
Behavioral and Cognitive Sciences	40,445	42,450	45,380	59,290	13,910	30.7%
Total	40,445	42,450	45,380	59,290	13,910	30.7%
INTERNATIONAL COOPERATIVE SCIENTIFIC ACTIVITIES						
International Cooperative Scientific Activities	27,033	22,050	24,810	26,880	2,070	8.3%
Total	27,033	22,050	24,810	26,880	2,070	8.3%
SCIENCE RESOURCES STUDIES						
Science Resource Studies	14,428	14,900	14,870	16,910	2,040	13.7%
Total	14,428	14,900	14,870	16,910	2,040	13.7%
Total, SBE	$142,035	$143,010	$146,144	$175,140	$28,996	19.8%
UNITED STATES POLAR RESEARCH PROGRAMS	$182,971	$188,030	$190,400	$222,810	$32,410	17.0%
UNITED STATES ANTARCTIC LOGISTICAL SUPPORT ACTIVITIES	$62,600	$62,600	$62,600	$62,600	$0	0.0%
INTEGRATIVE ACTIVITIES	$161,551	$161,230	$129,230	$119,230	-$10,000	-7.7%
Subtotal, RESEARCH AND RELATED ACTIVITIES	$2,821,608	$3,004,000	$2,958,462	$3,540,680	$582,218	19.7%
Carryover [1]			1,352		-1,352	-100.0%
Total, RESEARCH AND RELATED ACTIVITIES	$2,821,608	$3,004,000	$2,959,814	$3,540,680	$580,866	19.6%

[1] Carryover excludes $26.3 million of H-1B Nonimmigrant Petitioner fees, that funds will be obligated through the EHR activity.

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
EDUCATION AND HUMAN RESOURCES						
EDUCATIONAL SYSTEM REFORM						
Educational System Reform	$113,181	$114,200	$113,400	$109,510	-$3,890	-3.4%
Total	113,181	114,200	113,400	109,510	-3,890	-3.4%
OFFICE OF INNOVATION PARTNERSHIP						
Innovation Partnership Activities	0	0	8,500	0	-8,500	-100.0%
Experimental Program to Stimulate Competitive Research (EPSCoR)	48,720	48,410	51,388	48,410	-2,978	-5.8%
Total	48,720	48,410	59,888	48,410	-11,478	-19.2%
ELEMENTARY, SECONDARY AND INFORMAL EDUCATION						
Instructional and Assessment Materials Development	35,574	34,900	37,000	33,800	-3,200	-8.6%
Teacher & Student Development	101,008	104,520	101,390	111,700	10,310	10.2%
Informal Science Education	46,045	46,000	46,000	46,000	0	0.0%
Total	182,627	185,420	184,390	191,500	7,110	3.9%
UNDERGRADUATE EDUCATION						
Curriculum, Laboratory & Instructional Development	48,403	60,420	60,130	75,710	15,580	25.9%
Teacher and Technician Development	55,319	56,980	56,180	64,850	8,670	15.4%
Total	103,722	117,400	116,310	140,560	24,250	20.8%
GRADUATE EDUCATION						
Graduate Student Support	80,181	77,150	78,160	89,450	11,290	14.4%
Total	80,181	77,150	78,160	89,450	11,290	14.4%
HUMAN RESOURCE DEVELOPMENT						
Undergraduate/ Graduate Student Support	32,379	32,850	34,234	44,850	10,616	31.0%
Research & Education Infrastructure	23,336	23,810	22,990	23,010	20	0.1%
Opportunities for Women and Persons with Disabilities	17,606	17,020	20,020	14,020	-6,000	-30.0%
Total	73,321	73,680	77,244	81,880	4,636	6.0%
RESEARCH, EVALUATION AND COMMUNICATION						
Research	48,676	49,200	49,030	55,160	6,130	12.5%
Evaluation	12,049	12,540	12,450	12,540	90	0.7%
Total	60,725	61,740	61,480	67,700	6,220	10.1%
Subtotal, EHR	662,477	678,000	690,872	729,010	38,138	5.5%
H-1B Nonimmigrant Petitioner Fees	261	33,000	33,000	31,000	-2,000	-6.1%
Carryover [1]			56		-56	0.0%
Total, EHR	$662,738	$711,000	$723,928	$760,010	$36,082	5.0%

[1] Carryover excludes $26.3 million of H-1B Nonimmigrant Petitioner fees; these funds will be obligated through the EHR activity.

LEVEL OF FUNDING BY PROGRAM

(Dollars in Thousands)

PROGRAM	FY 1999 ACTUAL	FY 2000 REQUEST	FY 2000 CURRENT PLAN	FY 2001 REQUEST	CHANGE FY 2001 Req/FY00 Curr Plan AMOUNT	CHANGE FY 2001 Req/FY00 Curr Plan PERCENT
MAJOR RESEARCH EQUIPMENT	$56,705	$85,000	$93,500	$138,540	$45,040	48.2%
Carryover [1]			67,963		-67,963	0.0%
Total, MRE	$56,705	$85,000	$161,463	$138,540	-$22,923	0.0%
SALARIES AND EXPENSES	$144,080	$149,000	$148,900	$157,890	$8,990	6.0%
OFFICE OF INSPECTOR GENERAL	$5,410	$5,450	$5,450	$6,280	$830	15.2%
Carryover			24		-24	0.0%
Total, OIG	$5,410	$5,450	$5,474	$6,280	$806	14.7%
Subtotal, NATIONAL SCIENCE FOUNDATION	$3,690,541	$3,954,450	$3,930,184	$4,603,400	$673,216	17.1%
Carryover [2]			69,395		-69,395	0.0%
TOTAL, NATIONAL SCIENCE FOUNDATION	$3,690,541	$3,954,450	$3,999,579	$4,603,400	$603,821	15.1%

[1] In FY 1999 $34.67 million was carried over into FY 2000 largely in support of the South Pole Station Modernization project.

[2] Carryover excludes $26.3 million of H-1B Nonimmigrant Petitioner fees; these funds will be obligated through the EHR activity.

About the National Science Foundation

NSF is an independent federal agency created by the National Science Foundation Act of 1950 (P.L. 81-507). Its aim is to promote and advance progress in science and engineering in the United States. The idea of such a foundation was an outgrowth of the important contributions made by science and technology during World War II. From those first days, NSF has had a unique place in the Federal government: it is responsible for the overall health of science and engineering across all disciplines. In contrast, other federal agencies support research focused on specific missions, such as health or defense. The Foundation is also committed to ensuring the nation's supply of scientists, engineers, and science and engineering educators.

NSF funds research and education in science and engineering. It does this through grants and cooperative agreements to almost 2,000 colleges, universities, K-12 schools, businesses and other research institutions in all parts of the United States. The Foundation accounts for about one-quarter of federal support to academic institutions for basic research.

NSF receives approximately 30,000 proposals each year for research and education and training projects, of which approximately 10,000 are funded, and several thousand applications for graduate and postdoctoral fellowships. These typically go to universities, colleges, academic consortia, nonprofit institutions, and small businesses. The agency operates no laboratories itself but does support national research centers, user facilities, certain oceanographic vessels, and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, U.S. participation in international scientific efforts, and educational activities at the K-12 level as well as universities and colleges.

The Foundation is led by a presidentially appointed Director and governed by the National Science Board (NSB). The Board is composed of 24 members, representing a cross section of American leadership in science and engineering research and education; appointed by the President to 6-year terms, with one-third appointed every 2 years; and selected solely on the basis of established records of distinguished service. The NSF Director is a member ex-officio of the Board. In addition to governance of the Foundation, the Board serves the President and the Congress as an independent advisory body on policies affecting the health of U.S. science and engineering and education in science and engineering.

NSF is structured much like a university, with grants-making divisions for the various disciplines and fields of science and engineering, and for science, math, engineering and technology education. NSF also uses a variety of management mechanisms to coordinate research in areas that cross traditional disciplinary boundaries. The Foundation is helped by advisors from the scientific community and from industry who serve on formal committees or as ad hoc reviewers of proposals. This advisory system, which focuses on both program direction and specific proposals, involves approximately 50,000 scientists and engineers a year. NSF staff members who are experts in a specific field or area make award recommendations; applicants get anonymous verbatim copies of peer reviews.

Awardees are wholly responsible for doing their research and preparing the results for publication; the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals on behalf of all qualified scientists and engineers and strongly encourages women, minorities, and people with disabilities to compete fully in its programs. In accordance with federal statutes and regulations and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from NSF.

For more information on NSF programs and plans, see NSF's website at http://www.nsf.gov/.