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.