People

"A diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens"

The linkage of research and learning is a defining characteristic of all NSF investments. Across the Foundation's programs, NSF activities involve over 200,000 people. This includes researchers, graduate students and post-doctorates engaged in cutting edge research, as well as teachers and students at all grade levels who benefit from NSF-supported projects aimed at developing and implementing high quality math and science education. Support for programs specifically addressing NSF's Strategic Goal of People totals $1.09 billion in FY 2003, an increase of 9.4 percent over FY 2002. (H-1B Nonimmigrant Petitioner Receipts will increase total support to $1.18 billion.)

Support by Level of Education
(Millions of Dollars)

	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate
PreK-12	277	327	374
Undergraduate	236	245	242
Graduate & Professional	281	325	376
Other Support	100	97	94
Total, People[1]	$894	$994	$1,087

Totals may not add due to rounding.
[1] Excludes $76.81 million in FY 2001, and estimates of $90 million in FY 2002, and $92.5 million in FY 2003 from H-1B Nonimmigrant Petitioner Receipts.

The funds associated with the Foundation's People goal primarily address education and training opportunities for the nation's current and future scientists and engineers and the instructional workforce that influences the science and math capabilities of the citizenry. Funds associated with NSF's other strategic goals, Ideas and Tools, also advance the People goal. Education is an integral component of all research projects as the skills and training needed for the next generation of scientists, engineers, and technologists are provided within the context of the research experience and the state-of-the-art tools used in these efforts.

The Foundation places a high priority on formal and informal science, technology, engineering, and mathematics (STEM) education at all levels -- preK-12, undergraduate, graduate, professional, and public science literacy that engages people of all ages in lifelong learning. NSF programs are intended to increase 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.

PreK-12 Education

The FY 2003 NSF Request for preK-12 programs is $374.26 million, an increase of $47.52 million or 14.5 percent over FY 2002.

- The Math and Science Partnership (MSP) will provide funds for preK-12 schools to unite with institutions of higher education and other partners (including industry) in strengthening preK-12 math and science education. The President is requesting $200.0 million for MSP for FY 2003, an increase of $40.0 million from the FY 2002 level. Schools will establish partnership agreements with colleges, universities, and community colleges. The success of partnerships will be measured through performance indicators such as increasing student participation in advanced courses in math/science and their success in passing advanced placement exams, and increasing the numbers of prospective teachers who major in math or science.

- Support for NSF's Centers for Learning and Teaching (CLT) program, initiated in FY 2001, totals $28.0 million, an increase of $6.86 million over FY 2002. CLTs address two critical components of STEM education: (1) strengthening teacher content knowledge, and (2) developing the next generation of experts to guide development of instructional materials, classroom, and large-scale assessments, education research and evaluation, and informal education.

- Funding of $9.0 million (proposed to be transferred from the Environmental Protection Agency) will be used to establish and enhance environmental science education activities. At NSF, this will complement and expand existing environmental education programs. In addition, NSF will develop a comprehensive program that will fund a broad suite of environmental science education activities in the preK-12 levels, in informal education venues and at the undergraduate level.

- K-12 private-public partnership programs, funded through the H-1B visa program, support activities in a range of areas such as materials development, student externships, and math and science teacher professional development. Funds for these activities are expected to be about $37.50 million.

Undergraduate Education

The FY 2003 Request for programs to improve undergraduate education is $242.21 million, $2.86 million less than the FY 2002 Request. Highlights in FY 2003 include:

- NSF's Foundation-wide Research Experiences for Undergraduates (REU) program requests funding of $44.83 million for FY 2003, an increase of $800,000. REU supports active research participation by undergraduate students and seeks to expand student participation in science and engineering research areas supported by NSF, whether disciplinary, interdisciplinary, or educational in focus.

- Funding for the Advanced Technological Education (ATE) program, which improves technological education at the undergraduate and secondary school levels, is $38.16 million, a $950,000 decrease from FY 2002. ATE supports activities such as curriculum development, preparation and professional development of college faculty and secondary school teachers, and internships and field experiences for faculty, teachers, and students. With an emphasis on two-year colleges, the program focuses on the education of technicians for high-technology fields.

- The Request includes $11.18 million for Federal Cyber Service: Scholarship for Service to recruit and educate students entering the fields of information assurance and computer security and to increase the capacity of the United States higher education enterprise to continue to produce professionals in these fields. Students receiving scholarships will, upon graduation, work for a federal agency as their Federal Cyber Service commitment.

- The Course, Curriculum, and Laboratory Improvement (CCLI) program improves the quality of science, technology, engineering, and mathematics education for all students, and targets activities affecting learning environments, course content, curricula, and educational practices. Dissemination, adaptation,

and implementation activities are also key elements of this program. Funding requested for the CCLI program and other related activities decreases by $870,000 to $55.53 million.

- Enhancing diversity is key to all NSF activities, and several of the Foundation's programs target groups that are currently underrepresented in the STEM community. NSF's Tribal Colleges and Universities Program ($9.98 million in FY 2003), the Historically Black Colleges and Universities – Undergraduate Program ($13.97 million), the Louis Stokes Alliances for Minority Participation program ($26.53 million), and the Model Institutions of Excellence program ($9.81 million) are examples of this agency-wide focus on diversity.

- The Noyce Scholarship activity, designed to encourage talented mathematics, science and engineering students to pursue teaching careers in elementary or secondary schools, is funded at $4.0 million for FY 2003. In addition to scholarships for individual students, universities and colleges will provide in-service and pre-service training and support.

- The new Science, Technology, Engineering and Mathematics Talent Expansion Program (STEP) established in FY 2002 is funded at $2.0 million in FY 2003. Grants will be provided to colleges and universities to undertake steps necessary to increase the number of undergraduate math and science majors.

- In addition, an estimated $55.0 million from H-1B nonimmigrant petitioner receipts will be made available to NSF for the Computer Science, Engineering, and Mathematics Scholarships (CSEMS) program. CSEMS provides scholarships for academically talented, financially disadvantaged students, enabling them to enter the high-technology workforce following completion of an associate, baccalaureate, or graduate level degree in computer science, computer technology, engineering, engineering technology, or mathematics.

Graduate & Professional Education

The FY 2003 Request for graduate and professional programs totals $376.40 million, an increase of $51.69 million over FY 2002.

- Increasing stipends for students in the three NSF-supported graduate education programs is the highest priority for the Foundation in FY 2003. NSF Fellows and Trainees in the Graduate Research Fellowships (GRF) program, the Integrative Graduate Education and Research Traineeships (IGERT) program, and the Graduate Teaching Fellowships in K-12 Education (GK-12) program currently receive $21,500 per year. For FY 2003, NSF is proposing an increase of $37.43 million to raise stipends to an annual amount of $25,000, starting in academic year 2003-2004, and to increase the number of students in these programs.

    - NSF's GRF program will increase by $8.86 million overall to $80.56 million in FY 2003. This flagship program selects and supports the most promising science and engineering students in the U.S. and provides support for stipends and cost of education allowances for their graduate education. Approximately 2,350 students will be supported.

    - The GK-12 program supports graduate and advanced undergraduate students in science and engineering as content resources for K-12 teachers while providing students the opportunity to develop teaching skills. Funding will increase by $14.90 million to a total of $41.44 million. A new competition, which will bring the program to a planned level of about 800 students, is supported with this increase.

- Support for the IGERT program will increase by $13.67 million to $53.79 million in FY 2003. In addition to raising the stipend for IGERT students, this increase will provide for approximately 220 new trainees in the program. IGERT is distinguished from other training programs in that it has a strong emphasis on interdisciplinary training, innovation in graduate education, and broadening participation of underrepresented groups.

- The Vertical Integration of Research and Education (VIGRE) program will increase by $10.0 million to $26.0 million. VIGRE supports preparation of students for the wide range of career opportunities available in the mathematical sciences and encourages a greater readiness on the part of departments in the mathematical sciences to initiate or improve education activities that lend themselves to integration with research, especially activities that stimulate interaction among scholars across academic and departmental boundaries.

- Support for the Faculty Early Career Development (CAREER) program will total $122.68 million, an increase of $1.75 million. This NSF-wide activity emphasizes the early development of academic careers by presenting this award to new faculty who are poised to become academic leaders of the future.

- Funding for ADVANCE, to increase the participation and advancement of women in all fields of science and engineering, will increase by $1.14 million to $17.14 million in FY 2003. ADVANCE is an integral part of the Foundation's multifaceted strategy to help realize a diverse science and engineering workforce.

Other Support

The FY 2003 Budget Request for the activities below is $93.83 million, a decrease of $3.16 million.

- Informal Science Education activities will be supported at $55.0 million in FY 2003, a decrease of $920,000. Projects included in this activity promote the general public's understanding of science, technology, engineering, and mathematics through media (e.g., print, film, television) and informal science organizations (e.g., museums, parks, zoos, libraries, community groups). Priorities include outreach to smaller communities and underrepresented groups.

- The Partnerships for Innovation (PFI) program will be funded at $5.0 million in FY 2003 for a total of $34.49 million since the inception of the program in FY 2000. The PFI program builds innovation capacity by linking new knowledge and knowledge-rich workforce to economic growth and other societal benefits through the partnership endeavors of a diverse range of colleges and universities, private sector firms, local, state, and federal government entities and other organizations.

- Evaluation efforts will be funded at $12.64 million. Evaluation has gained currency throughout government and within the education enterprise as a part of a move toward greater accountability, oversight, and management of public resources. NSF's evaluation program is designed to support evaluative studies that build the knowledge base about effective STEM education policy and practice, and to increase the size and capacity of the evaluation community.

- The Program for Gender Equity in Science, Mathematics, Engineering, and Technology (PGE) will be funded at $10.51 million. The generally low participation of women in science, technology, engineering, and mathematics is a national concern. PGE is committed to overcoming barriers that have discouraged the early and continuing interest in STEM, and to developing interest, knowledge, and involvement of girls and young women in these fields.

- The Program for Persons with Disabilities (PPD) will be funded at $5.28 million. PPD supports efforts to increase the participation and achievement of individuals with disabilities in STEM education and research by emphasizing projects building and strengthening alliances among higher education, K-12 educational systems, and business and industry.

FY 2003 Performance Goal for People

The following table summarizes NSF's FY 2003 Performance Goal for People. For additional information, see the FY 2003 Performance Plan.

Strategic Outcomes	No.	Annual Performance Goals for Strategic Outcomes[1]	FY 2003 Areas of Emphasis: For investment in emerging opportunities	FY 2003 Areas of Emphasis: For GPRA reporting
PEOPLE **<u>Outcome Goal:</u> Developing "a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens."**	**III-1a**	***NSF's performance[2] for the People Strategic Outcome is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of the following indicators:*** • Development of well-prepared researchers, educators or students whose participation in NSF activities provides experiences that enable them to explore frontiers or challenges of the future; • Contributions to development of a diverse workforce through participation of underrepresented groups[3] in NSF activities; • Development or implementation of other notable approaches or new paradigms[4] that promote progress toward the PEOPLE outcome goal.	❑ Math and Science Partnership ❑ Priority Areas: - Learning for the 21st Century Workforce: - Centers for Learning & Teaching ❑ Graduate Student Stipends: - Increasing stipends for GRF, IGERT and GK-12	❑ PreK-12 Education, e.g., - Systemic Reform ❑ Undergraduate Education, e.g., - REU ❑ Graduate and Professional Development, e.g., - IGERT, GK-12 - CAREER ❑ Priority Areas, e.g., - Learning for the 21st Century Workforce - Centers for Learning & Teaching ❑ Broadening Participation, e.g., - Partnerships for Innovation - Programs that serve under-represented groups
	III-1b	NSF will significantly enhance the quality of preK-12 mathematics and science education available to all students in Math and Science Partnership schools. Performance Indicators: • Evidence of high quality programs addressing issues related to teacher workforce capacity, including preservice education and inservice professional development of math and science teachers as well as alternative routes into the profession (e.g., scientists and engineers becoming teachers). • Evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement, i.e., the adoption of standards-based curricula and of appropriate assessments of student achievement, as well as the initiation of the collection of achievement data that can be disaggregated by ethnicity, socioeconomic status, gender, etc.		

1 These performance goals are stated in the alternate form provided for in GPRA legislation.
2 For individual programs performance assessment in practice refers to a majority of relevant indicators only.
3 For example, women, underrepresented minorities, or persons with disabilities.
4 For example, broad-based, program-wide results that demonstrate success related to improved math and science performance for preK-12 students, or professional development of the STEM instructional workforce, or enhancement of undergraduate curricular/laboratory/instructional infrastructure, or highly synergistic education and research activities, or international collaborations, or communication with the public regarding science and engineering.

Highlights of Recent Accomplishments (People)

Examples of accomplishments of NSF-supported education and training programs are described below.

For students who might not otherwise consider a career in science or engineering, the chance to work in a active research laboratory can make a difference. At Fort Valley State University in Georgia, a group of ten women and/or minority undergraduates worked last summer with research scientists through NSF's **Research Experiences for Undergraduates** (REU) program in biology. The students, who were selected competitively from small schools in the Southeast, are getting ten weeks of hands-on lab experience in fields such as cell biology, genetic engineering, tissue culture, molecular genetics, environmental sciences, entomology and biochemistry. Each student is conducting a research project and preparing a scientific presentation.

NSF Scholarship for Service Awards were presented to six universities as part of an interagency, public/private effort to meet the nationwide needs for computer security and information assurance professionals. Under the scholarship program, students selected by universities will be prepared to receive bachelors' degrees in information assurance and computer security. The students will have internship opportunities with federal agencies, and then upon graduation, work for the federal government on the basis of one year of service for each year of scholarship education received. The demand for information security professionals is high, and many graduates are expected to stay with the government, providing a cadre of young professionals to make a significant contribution to federal security programs over the long term. The federal Office of Personnel Management will manage the placement of interns and graduates from the scholarship program. The universities selected to receive the NSF scholarship monies have been named Centers for Excellence by the National Security Agency, as established by Presidential directive.

U. S. preeminence in today's world demands the kind of graduate education in science and engineering that is exemplified in **Integrative Graduate Education and Research Traineeships (IGERT)** projects. For example, ongoing IGERT projects have focus areas that are proving critical to national security areas such as smart sensors, wireless networking, and computational analysis of social and organizational systems. The work in this last area was conducted by an IGERT project at Carnegie-Mellon University, and was cited in national news reports for its contribution in the nation's response to the terrorist attacks of September 11, 2001. The work involves developing software to analyze how organizations interact and to identify key links in an organization. It is being applied to analysis of terrorist organizational networks.

Texas A&M University's Information Technology in Science **Center for Learning and Teaching** is becoming a model of cross-campus collaboration on key educational research projects. In its first year, the Center has developed its first cohort of science education specialists and created five teams that involve 17 faculty members and their graduate students in biology, chemistry, geoscience, and physics. Each project is developing a specific technology that will be introduced in secondary classrooms, addressing science topics in areas where students have difficulties mastering key concepts as identified by statewide assessments. Examples of the project teams include the Environmental Science team, which applies information technology to the fundamental concepts of the risk assessment process to evaluate best practices for minimizing human and ecological risk.

City students make gains in math and science, according to a summary report on urban programs making up NSF's Urban Systemic Initiatives (USI). Eight years ago, NSF undertook the USI program, a bold initiative to encourage and invest in system-wide reform of K-12 mathematics and science education in some of the most disadvantaged urban school systems. Students in these systems were performing poorly in mathematics and science, with wide gaps evident between minority and majority students. USI was designed to enable cities to implement wide-ranging reforms through standards-based curricula, professional development for teachers, and accountability for achievement through data collection and assessment. Now, an external evaluation team reports some dramatic payoffs from these investments. The external evaluation,

Academic Excellence for All Urban Students, found that in most of the 22 USI cities, students are taking more math and science courses and increasing achievement levels, as demonstrated through various assessment tools. Minority students, meanwhile, are making even greater gains in enrollments and performance, reducing the "achievement gap" between themselves and majority students.

An **Advanced Technological Education (ATE)** project led by Texas' College of the Mainland, in collaboration with the Gulf Coast Process Technology Alliance, is leading the development of a competency-based curriculum driven by industrial needs that provides a portable national credential for process technicians – in particular, those in the petrochemical and refining industries. Process technology programs also serve other chemical industries as well as pharmaceuticals, pulp and paper, and power generation. In this effort, 29 community colleges and universities in 13 states are collaborating with 22 industrial partners such as ExxonMobil, Chevron, Dupont, Dow Chemical, and Shell Chemical. More than 150 process technicians, supervisors, and trainers are involved in developing the process technology curriculum. Over 10,000 high school students will be involved in outreach activities. Pathways are being developed to four-year programs for process technicians. During the first three years of Center operations, it plans to involve more than 5,000 students in associate degree programs in process technology. Activities include curriculum development, professional development, capacity building, dissemination, and evaluation. The industry partners show that hiring an associate degree graduate from these programs results in a 65 percent reduction in basic training time (about $3,400 per hire), a 40 percent reduction in qualification time, and a 37 percent improvement in safety performance.

The second wave of graduate students is now enriching K-12 classrooms through NSF's **Graduate Teaching Fellowships in K-12 Education** (GK-12) program, an innovative educational program enabling talented graduate and advanced undergraduate students in science, technology, engineering and mathematics to teach their younger peers in K-12 schools. Planned as a pilot effort in 1999, the GK-12 program received positive responses from colleges and universities, as well as from elementary and secondary schools. The 25 new awards will significantly expand the program nationwide. Under GK-12, institutions are responsible for recruiting the teaching fellows from their campus science, mathematics and engineering departments. Graduate students in the program receive annual stipends plus a cost-of-education allowance. Undergraduate students will receive as much as $5,000 per academic year, plus up to an additional $5,000 for service during the summer.

Web Site Links Classrooms and Scientists During Major Expedition: In the spring of 2001, NSF funded an interdisciplinary team of 34 scientists, technicians, and engineers to explore a newly discovered vent field in the Indian Ocean. The team mapped the area and collected biological samples, samples of vent and smoker fluid and plumes, and rocks and sediment samples from the seafloor. Findings of new hydrothermal vent animals and ancient bacteria may help scientists better explain how and whether the fauna living at hydrothermal vents in the Atlantic and Pacific Oceans are genetically related. The research expedition was fully integrated with an educational component called "Dive and Discover," co-funded with the Woods Hole Oceanographic Institution and Ohio's Center of Science and Industry. "Dive and Discover" involved live web casts, interactive links between students and scientists, and companion materials that assisted teachers in explaining the science and technology behind the cruise. The Indian Ocean expedition was one of a series of field expeditions in the Pacific and Indian Oceans.

An educational materials development project based at Hampshire College and sponsored by the **Course, Curriculum, and Laboratory Improvement** (CCLI) program is bringing together the educational community, a leading scientific organization and the National STEM Education Digital Library. It builds upon the expertise of the Ecological Society of America (ESA) to create a peer-reviewed, Digital Library-based resource to help faculty become more innovative teachers and students become active participants in learning ecology. The project establishes a process for creating an evolving collection of contemporary issues, experiments and resources in ecology and making it widely available electronically through ESA. The project should serve as a catalyst in enhancing scholarship in science teaching.

For one group of high school teachers, the summer curriculum includes experiments with such high-tech wonders as space rockets, surgical robots and water quality monitoring instruments. A group of 25 teachers gathered last summer at Johns Hopkins University in Baltimore, Maryland for an introduction to engineering, offered through NSF's **Research Experiences for Teachers (RET)** in engineering. The program encourages professional development by involving the teachers in NSF projects and promoting relationships between local school districts and the engineering research community. In addition to tutorials on engineering design, manufacturing techniques and lab safety, the teachers conduct hands-on research alongside professional engineers in projects encompassing physics, genetics, robotics, biology and environmental quality.

The first **"Director's Awards for Distinguished Teaching Scholars"** were presented to seven scientists and engineers who have excelled in their research and have communicated the results to their students and the general public. Each recipient shares NSF's "highest honor for excellence in both teaching and research" and receives $300,000 over four years to continue and expand their work beyond their institutions. The awards recognize and encourage scientists and engineers to be more involved in education, both in the classroom on subjects in which they are already well-versed, or by engaging students and citizens in public forums on contemporary issues.

Numbers of People Involved in NSF Activities

Over 200,000 people are directly involved in NSF programs and activities, receiving salaries, stipends, or participant support. In addition, NSF programs indirectly impact many millions of people. These programs reach preK-12 students, preK-12 teachers, the general public 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 2001 Actual	FY 2002 Estimate	FY 2003 Estimate
Senior Researchers	27,601	28,810	29,700
Other Professionals	9,904	10,250	10,675
Postdoctoral Associates	5,608	5,935	6,115
Graduate Students	25,461	26,525	27,555
Undergraduate Students	31,044	31,940	32,255
K-12 Students	11,335	11,350	11,405
K-12 Teachers	83,401	84,460	84,580
Total Number of People [1]	194,354	199,270	202,285

[1] Does not include individuals to be funded through H-1B Nonimmigrant Petitioner Receipts.

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 are recipients of postdoctoral fellowships.

Graduate Students include students compensated from NSF grant funds. Some of these students receive support through programs such as the NSF Graduate Research Fellowships, Integrative Graduate Education and Research Traineeship Program (IGERT), and NSF Graduate Teaching Fellowships in K-12 Education. The balance assists 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 and 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.