



People

People are NSF's most important product. At NSF, linking research and learning is our highest priority, and the people involved in our projects represent both the focus of investment and our most important product. Across the Foundation's programs, NSF provides direct 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 \$1,002 million in FY 2002, an increase of nearly 13 percent over FY 2001 (H-1B Nonimmigrant Petitioner Receipts will increase total support to over \$1,146 million).

Support by Level of Education (Millions of Dollars)

	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate
PreK-12	278	273	363
Undergraduate	190	233	230
Graduate & Professional	269	284	321
Other Support ¹	78	98	89
Total, People	\$816	\$888	\$1,002

Totals may not add due to rounding.

¹ Excludes estimates of \$25 million in FY 2000, \$121 million in FY 2001, and \$144 million in FY 2002 from H-1B Nonimmigrant Petitioner Receipts.

NSF's investments in ideas and tools also create investments in people. 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. 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 special attention paid to development of those who are beginning careers in science and engineering. 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 of the United States. The rapid globalization of science and technology also provides expanded opportunities for NSF-supported U.S. researchers to train internationally.



PreK-12 Education

The FY 2002 NSF Request for PreK-12 programs is \$363.02 million, an increase of \$89.69 million or nearly 33 percent over FY 2001.

- In FY 2002, NSF will initiate the President's Math and Science Partnership Initiative (MSPI) to provide funds for states to join with institutions of higher education in strengthening K-12 math and science education. More than 20 states have begun to form partnerships with colleges and universities for the purpose of raising math and science standards for students, providing math and science training for teachers, and creating innovative ways to reach underserved schools. The President is requesting \$200.0 million for MSPI for FY 2002, and \$1.0 billion over five years. States that access these funds will establish partnership agreements with state colleges, universities, community colleges, and school districts, with the goal of improving student achievement in K-12 math and science. The success of partnerships between states and institutions of higher education will be measured through performance indicators such as improving student performance on state assessments, increasing student participation in advanced courses in math/science and their success in passing advanced placement exams, and increasing the numbers of teachers that major in math or science.
- As part of the Math and Science Partnership Initiative (MSPI), \$110.0 million is redirected from NSF education programs toward the initiative's \$200.0 million level in FY 2002. Investments from the Foundation's systemic reform efforts, which have partnerships similar to those envisioned for the MSPI program, will provide about \$65.2 million for the Initiative. Additional support comes from programs linked to teacher enhancement (\$32.02 million), instructional materials development (\$5.10 million), and teacher preparation (\$8.0 million).
- Support for NSF's Centers for Learning and Teaching (CLT) program, initiated in FY 2001, totals \$20.17 million, the same as FY 2001. CLTs address two components of SMET 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.

Undergraduate Education

The FY 2002 Request for programs to improve undergraduate education is \$229.7 million, \$3.19 million less than the FY 2001 Request. The decrease is due to the completion of two Engineering Education Coalition Programs. Highlights in FY 2002 include:

- Funding for Advanced Technological Education, with emphasis on the nation's community colleges to strengthen science and mathematics preparation of technicians for a high-performance workplace of the future, is \$39.16 million, as in FY 2001.
- Minority Serving Institutions (MSIs) encourage members of underrepresented groups to pursue SMET education. NSF supports several MSI programs including the Tribal Colleges Undergraduate Program, funded at \$9.98 million in FY 2002, the Historically Black Colleges and Universities – Undergraduate Program, with requested funding of \$14.97 million, and the Model Institutions of Excellence at \$10.02 million.
- NSF's Foundation-wide Research Experiences for Undergraduates program requests funding of \$41.96 million for FY 2002, an increase of \$2.66 million. This program promotes active research participation by undergraduates in all scientific areas supported by NSF.



- Course, Curriculum, and Laboratory Improvement activities focus on identification, development, adaptation, and implementation of curricular and laboratory education materials and instructional models. Funding requested for these activities increases by \$1.36 million to \$57.54 million.
- The Request also includes \$11.18 million for Scholarship for Service to recruit and educate the next generation of information technology managers for the federal government by awarding scholarships for the study of information security.

Graduate & Professional Education

The FY 2002 Request for graduate and professional programs totals \$320.53 million, an increase of \$36.55 million over FY 2001.

- Increasing stipends for graduate students is a priority for the Foundation in FY 2002. NSF Fellows and Trainees in the Graduate Research Fellowship program, the Integrative Graduate Education and Research Training (IGERT) program, and the Graduate Teaching Fellows in K-12 Education (GK-12) program currently receive \$18,000 per year. For FY 2002, NSF is proposing an increase in stipends to an annual amount of \$20,500, starting in academic year 2002-2003.
- NSF's Graduate Research Fellowship program will increase by \$4.78 million overall to \$63.15 million in FY 2002. The increase will bring the number of students selected under this program to 900 annually. This program selects the most promising science and engineering students in the U.S. and provides support in terms of stipends and cost of education allowances for their graduate education.
- 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 \$3.4 million to a total of \$26.17 million.
- Support for the Integrative Graduate Education and Research Training (IGERT) program will increase by \$8.57 million to \$39.18 million in FY 2002. In addition to raising the stipend for IGERT students, this increase will provide for about 240 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 through the involvement of underrepresented groups. The program attracts 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 \$118.84 million, an increase of \$3.20 million. This NSF-wide activity emphasizes the early development of academic careers by presenting this prestigious award to new faculty who are most likely 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 total \$16.0 million, an increase of \$6.99 million over FY 2001. ADVANCE is an integral part of the Foundation's multifaceted strategy to help realize a diverse science and engineering workforce.

Other Support

The FY 2002 Budget Request for the activities below is \$88.95 million, a decrease of \$9.18 million with phasing out of the Partnerships for Innovation program.

- Informal Science Education activities will be supported at \$56.0 million in FY 2002. Projects included in this activity promote the general public's understanding of science, mathematics, engineering, and technology through media (e.g., print, film, television) and informal organizations (e.g., museums, parks, zoos, libraries, community groups). Priorities include outreach to smaller communities and underrepresented groups.
- Evaluation efforts will be funded at \$12.64 million in FY 2002, focusing on accountability, e.g., monitoring, impact studies, and program evaluations, pursued with an orientation to measurement, data collection, and reporting requirements necessary to support GPRA.
- The Program for Gender Equity (PGE) will be funded at \$11.19 million. PGE supports education and research activities fostering increased participation of women and girls in SMET.
- The Program for Persons with Disabilities (PPD) will be funded at \$5.28 million for FY 2002. PPD supports efforts to increase the participation and achievement of individuals with disabilities in SMET education and research by emphasizing projects building and strengthening alliances among higher education, K-12 educational systems, and business and industry.
- In addition, an estimated \$144.0 million from H-1B nonimmigrant petitioner fees will be made available to NSF for computer science, engineering, and mathematics scholarships and K-12 activities.

FY 2002 Performance Goal for People

The following table summarizes NSF's FY 2002 Performance Goal for People. For additional information, see the FY 2002 Performance Plan.



FY 2002 Performance Goals for People

Strategic Outcomes	No. Annual Performance Goals ¹ for Strategic Outcomes	FY 2002 Areas of Emphasis
<p>PEOPLE</p> <p>Outcome Goal: To develop “a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens.”</p>	<p>III-1a</p> <p><i>NSF’s performance for the People Strategic Outcome is successful when, in the aggregate, results reported in the period demonstrate significant achievement for the majority (4 of 7) of the following indicators:</i></p> <ul style="list-style-type: none"> • Development of well-prepared scientists, engineers or educators whose participation in NSF activities provides them with the capability to explore frontiers of the future. • Improved science and mathematics performance for U.S. K-12 students involved in NSF activities; • Professional development of the SMET instructional workforce involved in NSF activities; • Expansion of NSF contributions to development of a diverse workforce through increased participation of underrepresented groups (women, underrepresented minorities, persons with disabilities) in NSF activities; • Participation of NSF scientists and engineers in international studies, collaborations, or partnerships; • Enhancement of undergraduate curricular, laboratory, or instructional infrastructure; and • Communication with the public in order to provide information about the process and benefits NSF-supported science and engineering activities. 	<p>President’s Math and Science Partnership initiative: K-12 Education</p> <p>Priority area: Learning for the 21st Century Centers for Learning and Teaching (CLT)</p> <p>Graduate Teaching Fellows in K-12 Education (GK-12)</p> <p>Broadening Participation: Minority-Serving Institutions (MSI) programs</p>
	<p>III-1b</p> <p>At least half of the states will activate partnerships with institutions of higher education aimed at strengthening K-12 math and science education through the President’s Math and Science Partnership initiative. These partnerships can involve local school districts, and will address issues such as preparation and professional development of math and science teachers, implementation of high standards for math and science, and gaps in performance between majority and minority and disadvantaged students.</p>	<p>Graduate Student Stipends: Increasing stipends for GRF, GK-12, and IGERT</p>
	<p>III-1c</p> <p>After three years of support, over 80 percent of schools participating in systemic initiative programs will:</p> <ol style="list-style-type: none"> (1) implement a standards-based curriculum in science and mathematics; (2) further professional development of the instructional workforce; and (3) improve student achievement on a selected battery of tests. 	

¹ These performance goals are stated in the alternate form provided for in GPRA legislation.

Highlights (People)

In order to build capacity in schools and school districts to implement science and mathematics standards-based instruction, the **New Jersey Statewide Systemic Initiative (NJ SSI)** has organized seven regional centers and collaborating specialty sites with institutions of higher education and professional organizations. The specialty sites—institutions or organizations that provide special expertise, such as curriculum implementation, technology, parental involvement, and equity—are assisting with the systemwide scale-up. In coordination with the regional centers, the specialty sites have developed programs focused on reaching teachers, schools or districts that have not previously been involved with the NJ SSI. The NJ SSI has furthered professional development for teachers in mathematics in 317 or 95% of the 332 participating schools for three years or more and in science in 311 or 94% of the schools.

Solving a Murder: Students participating in the NSF-supported Research Experiences for Undergraduates Site in Rapid Prototyping at the Milwaukee School of Engineering helped solve a local murder case that had been unsolved for two years. By developing a technique for creating a facial image from a skull, police were able to identify the victim which lead to apprehension of the perpetrator. The FBI is now interested in working with the School to develop advanced forensic techniques based on the method.

The World We Create, an exhibit at the Louisville Science Center, features 40 hands-on science activities and over 400 graphic panels highlighting science careers, inventors, and problem-solving strategies. Developed with direct participation of private sector partners, the exhibit both serves visitors to the Center and reaches out across the State of Kentucky. Exhibit experiences encourage teamwork and cooperative learning, and focus on physical science, engineering, and mathematics. Since opening in June 1997, the exhibit and associated programs have reached almost 1.5 million visitors in this rural state of only four million. Twelve science demonstrations, 30 inquiry-based gallery activities, a training video for staff and volunteers, a Teacher's Guide, a Family Guide, an Inventor Book, and four in-depth curriculum guides have been prototyped, tested, and revised to enhance and extend the interactive exhibits.

Antarctic Integrative Biology Course. This month-long, international, advanced-level training course is taught in Antarctica at the Crary Science and Engineering Center, McMurdo Station, Antarctica. The goal is to introduce both graduate students and faculty to interdisciplinary modes of research through the study of the unique characteristics of Antarctic marine organisms that allow them to succeed in such extreme environments. The course includes lectures emphasizing physiological, biochemical, and molecular adaptations as well as laboratory investigations and field work in the nearby marine and terrestrial environments. The course attracts an extremely competitive group of students and scientists and introduces new researchers to Antarctica. The participants for January 2000 included 15 graduate students, five postdocs, and five faculty. Of these, 14 were from the U.S. and 11 from other countries.

Project Increases Participation of Women in Computer Science Education and Career Paths. NSF supports activities in computer and information science and engineering designed to expand opportunities for women, minorities, and persons with disabilities. Among its most successful projects is the Distributed Mentor Project (DMP) from the Computer Research Association. A longitudinal evaluation by the University of Wisconsin shows the DMP to be spectacularly successful at meeting its primary goal of increasing the number of women entering graduate school in Computer Science and Engineering (CS&E). Of the DMP participants – about 25 women a year — over 50% were enrolled in graduate or professional school the year following their graduation. This compares to results of a 1994 Baccalaureate & Beyond study which found that 29% of men and 3% of women entered graduate or professional school within one year of graduation. Both studies focused only on graduates with GPA's greater than or equal to 3.5.



Research on the Matanuska Glacier: Augustana College is a Research Experience for Undergraduates award site which allows undergraduate students to conduct research for six weeks on the Matanuska Glacier, a large valley glacier in south central Alaska. Students participate in field work that involves collecting water samples, maintaining equipment, downloading data, filtering water for suspended sediment, and tabulating data. Students complete their undergraduate thesis projects at their home institutions and present their results at a national meeting.

Summer Internships Abroad: Summer Institute in Japan for American Graduate Students in Science and Engineering and the Research Experience Fellowships for Young Foreign Researchers provide opportunities for U.S. graduate students in science and engineering to participate in summer programs in Asia. Since their start in Japan in 1990 and in Korea in 1995, the programs have enabled a total of 756 American graduate students to gain first-hand experience in a Japanese, Korean or Taiwanese research laboratory. In addition to a research internship, these programs provide introductory foreign language training and exposure to science and science-policy infrastructure. The goals of the program are to introducing them to Japanese, Korean and Taiwanese science and engineering research laboratories and to initiate personal relationships that will better enable students to collaborate with foreign counterparts in the future. A long-term goal of the program is to enable the U.S. to gain maximum benefit from international scientific and technical interactions.

The **Quarknet** program partners high school physics teachers and their students with particle physics research groups at 60 U.S. universities and laboratories. It is also associated with the collider experiments at FermiLab. Students are learning fundamental physics, investigating particle physics through live, online data and collaborating with students worldwide. QuarkNet is a new program just beginning its second year. Twenty-three lead teachers completed eight-week research appointments last year; 25 teachers hold appointments this year. All have attended a one-week orientation workshop at FermiLab. The QuarkNet program is having a broad impact as well, with 107 teachers attending three-week workshops offered by last year's lead teachers. One of the successes of QuarkNet is building the confidence of teachers to the point where they are making substantial contributions to the research enterprise.

The Administrators Working for Change project developed and validated a year-long course (equivalent to two graduate level courses) for K-12 administrators. The courses were shown to improve administrators' ability (a) to communicate the mathematics that students should be taught; (b) to better analyze mathematics instruction that they observed, and (c) to communicate the essential elements of mathematics reform. The courses are being used by NSF Local Systemic Change projects and are being made available to universities and school districts.

Electronic Classrooms. Prof. Gregory Abowd, Georgia Institute of Technology, a CAREER awardee, is developing a prototype classroom environment named *eClass* which captures the rich interaction that occurs in a typical university lecture. Lectures are captured on an electronic whiteboard or on top of prepared slides using ZenPad, a Java applet. The electronic annotations, audio, video, and even Web browser activity are all automatically recorded and time-stamped. After the lecture, ZenPad automatically weaves the captured events together into a set of standard HTML Web pages. The need for note taking is reduced and students can focus their energies on engaging in and better understanding of the classroom discussion. A collaborative discussion space, CoWeb, has also been incorporated so that discussions are now anchored to relevant parts of the lecture, and the lecture extends into other activities outside of the classroom experience.

Virtual Community Links Critically Ill and Children with Disabilities: NSF's Collaborative Research on Learning Technologies Program, supports the Center for Innovative Learning Technologies (CILT), whose research activities address the assessment and improvement of mathematics and learning



skills through the development of collaborations between highly interdisciplinary teams of individuals and organizations and the development and diffusion of leading-edge technologies into learning environments. As one of its activities, CILT launched PatchWorx, a website connecting critically ill and children with disabilities all over the world in an online community. The site (<http://www.patchworx.org>) enables critically ill youngsters to share hopes and experiences through chatrooms, discussion boards, email and interactive activities.

Materials Research Science and Engineering Centers (MRSECs). In FY 2000, the MRSECs supported K-12 science and engineering outreach activities that reached about 360 teachers and 18,000 students. The MRSEC at Northwestern University, directed by Robert P.H. Chang, developed the Materials World Modules (MWM) program, which provides inquiry-based educational modules on materials topics to supplement the middle and high school science and math curricula. The modules have been used by over 9,000 teachers in 14 states and in U.S. Army base schools in nine foreign countries. An advanced, Internet-based version of the current MWM program that meets the national science standards is currently being developed with co-support from NSF. (<http://mwm.ms.northwestern.edu/index.html>)

Research on Speech Used at School for the Hearing Impaired. At the University of Colorado, Boulder, NSF-supported researchers are working on a 3-D animated conversational agent, BALDI, that combines speech recognition, understanding, and synthesis with facial animation technologies to converse with students. BALDI helps children who are profoundly deaf to develop their conversational skills by showing them how to understand and produce spoken language. In addition to helping students accurately produce expressive speech, the interactive system's curriculum development software lets teachers and students customize classwork. This project is the first to integrate emerging language technologies to create an animated conversational agent, and to apply this agent to learning and language training. Results from this project can be incorporated into animated conversational agents for non-hearing impaired applications such as learning new languages, e.g., English as a Second Language. They may also be useful for diagnosing or treating speech and reading disorders.

University Addresses the Transition from High School to College. In an effort to increase minority student participation in research, Florida A&M University, under a NSF Minority Institutional Infrastructure Program award, has created an outreach effort that has led to a significant increase in student enrollment. The project targeted pre-college students from local and regional schools and community organizations with outreach activities to encourage students to get involved in computing as a career. Activities included "roadshow" presentations such as *Introduction to Voice Activated Computer Systems*, *Introduction to Robots*, and *Careers in Computing*.

Assessing Genetic Damage. The Mathematical and Theoretical Biology Institute (MTBI) at Cornell University focuses on supporting research opportunities for underrepresented minorities who have expressed interest in conducting research in applied mathematics or related fields. These research experiences are offered to undergraduate students who have had no prior research experiences and who have completed their sophomore or junior year of college in a mathematically related discipline. One of the many successes of this program was that a group of students developed a mathematical model for assessing genetic damage on HIV populations after anti-retroviral therapy.

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, 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 2000 Actual	FY 2001 Estimate	FY 2002 Estimate
Senior Researchers	25,100	27,010	26,660
Other Professionals	8,471	9,140	8,970
Postdoctoral Associates	4,782	5,250	5,130
Graduate Students	21,834	24,630	24,500
Undergraduate Students	29,849	31,940	31,840
K-12 Students	11,598	11,690	11,710
K-12 Teachers	82,999	84,050	84,090
Total Number of People ¹	184,633	193,710	192,900

¹ Does not include individuals to be funded through H-1B Nonimmigrant Petitioner Receipts in FY 2001 and FY 2002.

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. 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 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 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.