

**SOCIAL, BEHAVIORAL  
AND ECONOMIC SCIENCES**

## SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES

**\$224,710,000**

The FY 2005 Budget Request for the Social, Behavioral, and Economic Sciences (SBE) Activity is \$224.71 million, an increase of \$20.92 million, or 10.3 percent, above the FY 2004 Estimate of \$203.79 million.

### Social, Behavioral, and Economic Sciences (Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Social and Economic Sciences	71.01	81.02	88.52	7.50	9.3%
Behavioral and Cognitive Sciences	62.32	68.50	76.00	7.50	10.9%
Science Resources Statistics	25.31	26.15	26.15	0.00	0.0%
<b>Total, SBE without OISE</b>	<b>\$158.63</b>	<b>\$175.67</b>	<b>\$190.67</b>	<b>\$15.00</b>	<b>8.5%</b>
Office of International Science and Engineering (OISE) <sup>1</sup>	\$39.97	\$28.12	\$34.04	\$5.92	21.1%
<b>Total, SBE with OISE</b>	<b>\$198.60</b>	<b>\$203.79</b>	<b>\$224.71</b>	<b>\$20.92</b>	<b>10.3%</b>

Totals may not add due to rounding.

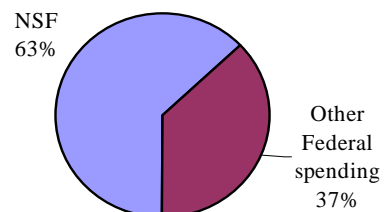
<sup>1</sup>FY 2003 Actual includes a transfer of \$12.83 million from the Department of State for an award to the U.S. Civilian Research and Development Foundation.

The Social, Behavioral, and Economics Sciences (SBE) Activity supports research, infrastructure and education in the social, behavioral, cognitive and economic sciences, primarily through grants to investigators at universities and other institutions. The research it supports has resulted in substantial advances in our understanding of human and social development and of how people behave, both as individuals and as parts of groups and other more formal organizations. SBE also supports the collection and dissemination of statistics on the science and engineering enterprise. In addition, NSF's Office of International Science and Engineering is based in the SBE Directorate, and the FY 2005 Request is discussed later in this section.

## RELEVANCE

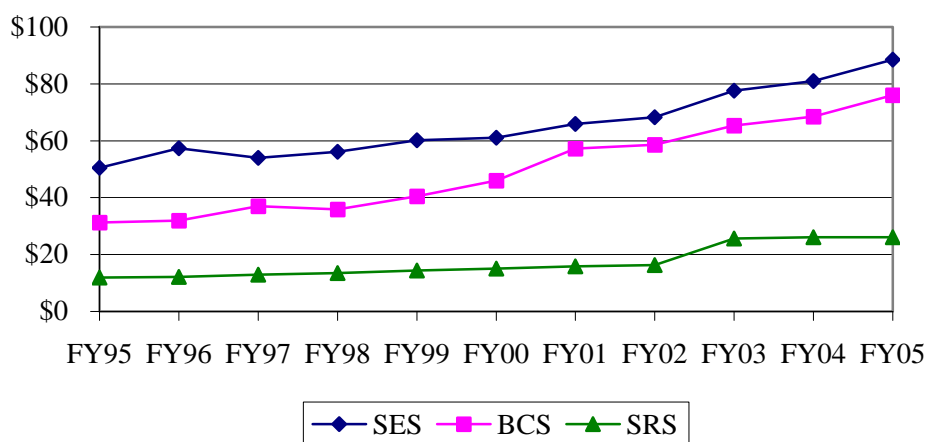
SBE is a principal source of federal support for fundamental research on human cognition and behavior and social structures and social interaction, as well as for research on the intellectual and social contexts that govern the development and use of science and technology. Overall, SBE accounts for 63 percent of federal support for basic research in the social sciences at U.S. academic institutions. In some fields, including anthropology, archaeology, political science, economics, sociology and the social aspects of psychology, it is the predominant or exclusive source of federal support for basic research and infrastructure development. Critical federal research and development (R&D) investment priorities, including homeland and national security, economic prosperity, integrating research and education, and environmental quality are rooted in the kinds of behavior the SBE sciences seek to understand.

### Federal Support for Basic Research in the Social Sciences at Academic Institutions (excludes the Psychological Sciences)



The Science Resources Statistics subactivity within SBE is the Federal statistical agency responsible for the compilation and analysis of data on the science and engineering enterprise. Major components are surveys of the science and engineering workforce and their education and on the nation’s research and development portfolio. The results of this work are used to assess the state of the nation’s domestic workforce in S&E, its ability to compete globally and the outlook for the nation’s research capacity, as well as providing critical benchmarking information on cyberinfrastructure in the research and biomedical communities. Findings from SRS studies have long been important to the development of the nation’s educational and science policy agendas.

**SBE Subactivity Funding**  
(Dollars in Millions)



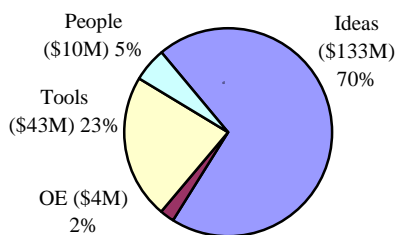
Note: Excludes funding for the Office of International Science and Engineering (OISE).

## STRATEGIC GOALS

SBE works to advance the Activity’s programs by linking NSF’s four strategic outcome goals of People, Ideas, Tools, and Organizational Excellence:

**PEOPLE:** SBE seeks to advance its mission by creating research experiences for undergraduates that engage them in the SBE sciences, by providing graduate students with funds to improve their dissertation research, by helping junior faculty become innovative researchers and teachers, and by funding mid-career training of social scientists in emerging, cutting-edge methodologies. Graduate training also is supported. SBE seeks to enhance diversity through special fellowship competitions; outreach to Historically Black Colleges and Universities (HBCUs), Hispanic, and other minority-serving organizations; and through programs that respond to the need for women in science. SBE’s mission supports the overall national goal of maintaining the adequacy, supply and capacity of the R&D enterprise, as well as the broader S&E workforce.

**FY 2005 SBE Strategic Goals**



**IDEAS:** SBE supports fundamental, cutting-edge research in the social, behavioral and economic sciences to better understand individual, collective and organizational behavior. Research in economics,

sociology, political science, decision-making, and risk analysis yields theories and information that advance basic science and provide important social benefits in the form of better-informed public policy, more efficient business management, sensible economic and regulatory action, and knowledge that enables wiser individual behavior. Research findings in the psychological, cognitive, anthropological, and geographic sciences yield a sharper picture of human cognition, action, and development, with diverse implications ranging from knowledge regarding how people interact with the environment to groundwork for devices that help disabled individuals overcome their handicaps and become more independent and productive members of society.

**TOOLS:** SBE seeks to develop knowledge and resource infrastructures that will allow better measurement and analysis of variables that shape and reflect human and organizational decision-making and behavior. SBE also works to meet the statistical demands of a diverse user community interested in the nation’s science, engineering, and technology enterprise by providing and disseminating knowledge through survey development, data collection and analysis, information compilation and dissemination, and customer service.

**ORGANIZATIONAL EXCELLENCE:** Organizational Excellence provides for administrative activities necessary to enable NSF to achieve its mission and goals. These investments include support for Intergovernmental Personnel Act appointments and for contractors performing administrative functions.

SBE’s support for ongoing core and new activities contributes to NSF’s efforts to achieve its strategic goals and to the administration and management activities necessary to achieve these goals.

**Funding by Strategic Goal: Summary**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
People	9.49	10.44	10.44	0.00	0.0%
Ideas	107.05	122.27	133.27	11.00	9.0%
Tools	38.96	39.44	43.44	4.00	10.1%
Organizational Excellence	3.13	3.52	3.52	0.00	0.0%
<b>Total, SBE</b>	<b>\$158.63</b>	<b>\$175.67</b>	<b>\$190.67</b>	<b>\$15.00</b>	<b>8.5%</b>

**PEOPLE (unchanged at \$10.44 million)**

**SBE People Investments**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Individuals	8.27	8.49	8.49	0.00	0.0%
Institutions	0.80	1.43	1.43	0.00	0.0%
Collaborations	0.42	0.52	0.52	0.00	0.0%
<b>Total, SBE People</b>	<b>\$9.49</b>	<b>\$10.44</b>	<b>\$10.44</b>	<b>\$0.00</b>	<b>0.0%</b>

SBE regards research and education as mutually reinforcing. The people supported represent both the focus of our investments and important products of them. In FY 2005, it is estimated that SBE programs will provide support for about 4,360 people, including students, researchers, postdoctorates, and trainees.

### INDIVIDUALS

Major SBE investments in FY 2005 include Integrative Graduate Education and Research Traineeships (\$4.30 million), Faculty Early Career Development Program Awards (\$2.65 million), and providing Research Experiences for Undergraduates Supplements (\$1.54 million).

### INSTITUTIONS

In the area of institutional support, SBE continues funding ADVANCE awards at a level of \$1.43 million to enable increased representation and advancement of women in academic science and engineering careers, thereby contributing to the development of a more diverse science and engineering workforce.

### COLLABORATIONS

In FY 2005, funding for Model Institutions of Excellence continues at \$420,000 and SBE also continues support for the GK-12 program at \$100,000.

### **IDEAS (+\$11.00 million, for a total of \$133.27 million)**

**SBE Ideas Investments**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Fundamental Science and Engineering	100.68	113.37	120.87	7.50	6.6%
Centers Programs	5.93	8.20	11.70	3.50	42.7%
Capability Enhancement	0.44	0.70	0.70	0.00	0.0%
<b>Total, SBE Ideas</b>	<b>\$107.05</b>	<b>\$122.27</b>	<b>\$133.27</b>	<b>\$11.00</b>	<b>9.0%</b>

SBE promotes NSF's strategic outcome goal of Ideas through a broad range of research support encompassing the social and behavioral science disciplines. Support for discoveries at and across the frontiers of science and engineering, connected to learning, innovation and service to society extends over SBE's entire portfolio.

### FUNDAMENTAL SCIENCE AND ENGINEERING

SBE will provide \$59.80 million for fundamental research in the social and economic sciences in FY 2005, an increase of \$4.50 million over FY 2004. Research in the social and economic sciences explores the complexities of economic, legal, political, and social behavior, advances risk analysis and the science of decision-making, examines the evolution and social implications of science and technology, and develops and disseminates research methods and data resources across the social and behavioral sciences. During FY 2005, areas of emphasis will include causes, consequences and responses to social system shocks; cognitive aspects of decision-making; innovation in the development of mathematical models;

dynamic aspects of organizations, the economy and other social institutions; and building and maintaining infrastructure, with special attention to longitudinal and repeated cross-section surveys.

In FY 2005, SBE will provide \$59.07 million for fundamental research in the behavioral and cognitive sciences, an increase of \$3.0 million over FY 2004. Fundamental research supported by SBE in the behavioral and cognitive sciences advances basic scientific knowledge, methods, and capabilities in the behavioral, cognitive, anthropological, and geographic sciences. Special emphases for FY 2005 include research on cognition, the disparate involvement of members of different groups in the scientific workforce of the nation, explorations of what makes people human, and human interactions with the natural environment over space and time.

Funding for the Interagency Education Research Initiative (IERI) will continue at the FY 2004 funding level of \$2.0 million. Across SBE activities, there will be an increase in the average award size to \$95,829 and average duration to 2.4 years, from \$93,248 and 2.4 years in FY 2004.

**CENTERS PROGRAMS**

In support of the Ideas goal, SBE funds the following centers:

**SBE Centers**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Long-Term Ecological Research Sites	0.20	0.20	0.20	0.00	0.0%
Children's Research Initiative Centers	2.50	2.50	2.50	0.00	0.0%
National Consortium for Violence Research	1.00	1.00	1.00	0.00	0.0%
Human Dimensions of Global Change Centers	2.23	0.00	0.00	N/A	N/A
Environmental Social and Behavioral Science Centers	0.00	0.00	3.50	3.50	100.0%
Climate Change Research Initiative Centers	0.00	4.50	4.50	0.00	0.0%
<b>Total, Centers Support</b>	<b>\$5.93</b>	<b>\$8.20</b>	<b>\$11.70</b>	<b>\$3.50</b>	<b>42.7%</b>

Totals may not add due to rounding.

In partnership with the Directorate for Biological Sciences, SBE will maintain combined support in FY 2005 at a level of \$200,000 for the two Urban Long-Term Ecological Research (LTER) sites. These Urban LTER sites examine the complex interactions of human activity and the natural environment in the Baltimore and Phoenix metropolitan areas.

The Children's Research Initiative (CRI) supports a variety of research activities, including small research centers, individual investigator awards, collaborative proposals, and workshops. Five CRI research centers, each of which receives approximately \$500,000 per year for five years, represent a new thrust in the field of integrative developmental science; supporting cutting-edge research about children and media, developmental science, and the integration and dissemination of developmental science to inform both research and policy.

The National Consortium on Violence Research (NCOVR), based at Carnegie Mellon University, is engaged in a program that focuses on training the next generation of researchers in interdisciplinary approaches to understanding interpersonal violence and on increasing the participation of underrepresented groups in research on violence. NCOVR also seeks to facilitate collaborative methodological and cross-disciplinary research.

Following a new competition, NSF will provide support for two or three centers that advance fundamental knowledge about Environmental Social and Behavioral Science; promote education and training at levels ranging from undergraduate to postdoctoral; and foster interdisciplinary and multidisciplinary research collaborations. Activity in these centers will build on groundwork laid by the Human Dimensions of Global Change centers and represents a \$1.20 million increase from the level that supported these centers in FY 2003, the final year of their core funding.

Social and Economic Sciences will continue support for three to five centers focusing on Decision Making Under Uncertainty related to climate variability and change as part of the government-wide Climate Change Research Initiative. These centers involve interdisciplinary teams that advance understanding of all facets of decision-making processes related to climate change and other problems for which information exists but uncertainty remains. Centers also increase knowledge of the content and form of information needed by decision makers, increase their ability to make sound decisions over multiple time scales, and facilitate interaction among researchers and decision makers, thereby increasing the speed with which new research findings are adopted and used by decision makers.

#### CAPABILITY ENHANCEMENT

IN FY 2005, SBE will continue funding capability enhancement activities, which include Research in Undergraduate Institutions funding at \$600,000 and Research Opportunity Awards funding at \$100,000.

#### **TOOLS (+\$4.00 million, for a total of \$43.44 million)**

##### **SBE Tools Investments** (Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	Percent
Infrastructure and Instrumentation	38.96	39.44	43.44	4.00	10.1%
<b>Total, SBE Infrastructure &amp; Instrumentation</b>	<b>\$38.96</b>	<b>\$39.44</b>	<b>\$43.44</b>	<b>\$4.00</b>	<b>10.1%</b>

SBE promotes the development of Tools as it directs resources to research-enhancing investments such as web-based collaboratories, digital libraries, and databases, including science resources data and analysis. Special attention is paid to enhancements permitted by new information technologies.

#### INFRASTRUCTURE AND INSTRUMENTATION

SBE provides \$23.92 million for the Tools part of the Science Resources Statistics Subactivity, level with FY 2004. This enables NSF to fulfill its statutory mandate to produce data and analysis on the scientific and engineering enterprise. In FY 2005, funds will support ongoing statistical data collections on the S&E enterprise, including implementing quality improvements to surveys on the S&E workforce. Funds will support the development of an ongoing data collection program on research instrumentation, as mandated by Congress. Support will be provided to begin researching means of implementing necessary enhancements to the Industry R&D Survey as well as to continue activities to establish an ongoing data series on postdoctorates.

SBE will provide an additional \$4.0 million for a total of \$19.52 million for research resources. These funds will support fundamental research infrastructure, including major longitudinal and repeated cross-section surveys and secure data enclaves. These resources are crucial to understanding the causes of such

phenomena as changing patterns of employment, attitude formation, and patterns of family formation. These funds will also support investments in cyberinfrastructure, including digital libraries, collaboratories, and other applications of modern information technology that link scholars and students with databases and with each other, across universities and internationally. Such links allow people in predominantly undergraduate institutions, HBCUs, other minority serving institutions and institutions in EPSCoR states to participate in research that was once largely confined to major research universities.

**ORGANIZATIONAL EXCELLENCE (unchanged at \$3.52 million)**

Organizational Excellence provides for administrative activities necessary to enable NSF to achieve its mission and goals. These investments include support for Intergovernmental Personnel Act appointments and for contractors performing administrative functions.

**PRIORITY AREAS**

In FY 2005, the SBE Activity will continue support of research and education efforts related to each of the NSF priority areas.

**SBE Investments in Priority Areas**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	FY 2004 Percent
Biocomplexity in the Environment	0.95	2.00	2.00	0.00	0.0%
Nanoscale Science and Engineering	2.32	1.56	1.50	-0.06	-3.8%
Mathematical Sciences	1.43	1.50	1.50	0.00	0.0%
Human and Social Dynamics	4.46	15.90	15.90	0.00	0.0%

**Biocomplexity in the Environment:** In FY 2005, SBE will maintain its support for BE at \$2.0 million. These funds will contribute to NSF’s centralized competition to support research on complex interactions among coupled human and natural systems at diverse spatial, temporal, and organizational scales.

**Nanoscale Science and Engineering:** Support for this priority area decreases slightly from the FY 2004 level of \$1.56 million to \$1.50 million. This will continue support for research in the social, behavioral and economic sciences on factors that stimulate nanoscientific discovery, ensure the responsible development of nanotechnology, and enhance human performance.

**Mathematical Sciences:** In FY 2005, SBE continues funding for Mathematical Sciences at \$1.50 million, level with FY 2004. These funds will support development of collaborative teams of social/behavioral and mathematical/statistical scientists to develop new mathematical statistical techniques that will advance research in the social and behavioral sciences. Innovative training activities also will be supported.

**Human and Social Dynamics:** In FY 2005, SBE maintains support for the Human and Social Dynamics priority area at a level of \$15.90 million. With other NSF Directorates, SBE will promote major scientific advances through the use of new research tools and new data and by extending prior research of proven utility using new methods or different perspectives. Support will be provided for research that focuses on



one or more of the following thematic areas: agents of change, the dynamics of human behavior, and decision-making and risk. Support will be provided also for methodological capabilities in spatial social science and for instrumentation and data resources infrastructure.

## **QUALITY**

SBE maximizes the quality of the R&D it supports through the use of a competitive, merit-based review process. Ninety-seven percent of SBE's basic and applied research funds were allocated to projects that underwent merit review in FY 2003, the last year for which complete data exist.

NSF uses various internal and external mechanisms to review the relevance of proposed and existing programs to help the Directorate identify emerging opportunities and goals for the future. The Advisory Committee for the Social, Behavioral and Economic Sciences provides advice on such issues as: the mission, programs, and goals that can best serve the scientific community; how SBE can promote quality graduate and undergraduate education in the social, behavioral, and economic sciences; and priority investments in these research areas. The committee meets twice a year and members represent a cross-section of social, behavioral, and economic sciences; a cross-section of institutions including industry; broad geographic representation; and balanced representation of women and minorities.

To ensure the highest quality in processing and recommending proposals for awards, SBE convenes Committees of Visitors (COVs), composed of qualified external evaluators, to review each program every three years. These experts assess the integrity and efficiency of the processes for proposal review and provide a retrospective assessment of the quality of results of NSF's investments. In FY 2003, SBE had a COV for the programs in the BCS Subactivity and SRS commenced a COV with the Committee on National Statistics of the National Academy of Sciences to review the existing R&D data collection and analysis program. In FY 2004, the Social and Economic Sciences subactivity will have COV reviews for each of its programs. Internal and external review mechanisms also include National Academy of Sciences reports, blue ribbon panels, workshops, long-range planning documents, and other reviews.

## **PERFORMANCE**

### **Recent Research Highlights**

**Auctions for Multiple Items.** Lawrence Ausubel, Peter Cramton, and Paul Milgrom have analyzed the theoretical properties of existing multiple-item auction formats, proposed new efficient auction formats for multiple items, designed new applications for multiple-item auctions, and empirically evaluated recent applications of auctions for spectrum and electricity. In particular, they have developed the properties of package bidding, a new, efficient ascending auction for heterogeneous commodities; and they have extended the analysis of auctions for homogenous commodities in environments with interdependent values. The project contributes to a new and important area of market design. A theory of multiple items auction can be applied to several industries: sale of radio spectrum, emission trading and greenhouse gases, e-commerce, electricity, and new financial securities. This work enhances our ability to use auctions efficiently to allocate scarce resources and has influenced the Federal Communication Commission's auction design and the design of other high stakes auctions throughout the world.



Research Results Used in  
FCC Spectrum Auction  
Design

**Eyewitness Identification.** In a series of experiments involving staged "crimes," Gary Wells explores the implications of confirming feedback on the certainty with which eyewitnesses identify innocent suspects. Wells found that when given confirming feedback, half of those eyewitnesses who had mistakenly identified someone reported they were very certain of their wrong identifications compared to only 12 percent of those in the no feedback condition. These findings were used to help New Jersey reform its police lineup procedures so that now lineups in New Jersey are conducted by people who do not know which person in the lineup is the suspect, and other police departments are considering similar changes. Earlier NSF-supported work by Wells, which revealed that sequential lineups did as well at identifying true suspects as simultaneous lineups but with fewer wrong identifications, has also improved lineup procedures in New Jersey and in other jurisdictions. Practices derived from this research diminish the chance that innocent persons will be wrongly convicted of crimes and increase the likelihood that the police will keep investigating until they identify true perpetrators.



**Advanced Training Institutes in Social Psychology.** SBE is supporting Advanced Training Institutes in Social Psychology that provide quality training in new methodologies, statistical procedures, and other tools to support and enhance social psychological research. NSF funding helps to establish training institutes where researchers can spend time acquiring basic skills and knowledge. One institute provides training in the use and development of immersive virtual environment technology. Another institute focuses on the use of Internet technology to conduct social and behavioral science research. A third institute offers instruction in newly developed statistical methods for understanding social relations.

**Predicting Avalanches.** The SBE geography program is supporting research that examines how spatial variations in snow stability and snowpack properties affect the stability of the snow, thereby increasing basic understanding and increasing capabilities to predict avalanches. NSF-supported researchers at Montana State University are using a new snow stability test and a sensitive instrument to measure temporal changes in snow stability. Through their analyses, the researchers will add to knowledge about how the snowpack evolves and how avalanches release. The research will provide critically relevant insights for avalanche professionals working to protect life and property. The researchers are working with a U.S. Forest Service-related network of snow specialists at ski areas throughout the nation. The results of this research will be transmitted to these snow specialists, thereby improving avalanche mitigation efforts that protect ski areas and highway corridors.



Geographer Karl Birkeland uses a new microsensor to determine spatial patterns of snow stability

**Strengthening Protection of the Confidentiality of Data Collected by SRS Surveys.** The Division of Science Resources Statistics (SRS) ensures the confidentiality of respondents who provide information to SRS surveys. Historically, SRS data collected from individuals have been covered under the Privacy Act. SRS data collected from establishments have been, to some extent, covered under the National Science Foundation Act. Working with Foundation legal staff, the recently enacted revision to the NSF Act, as well as the newly enacted Confidential Information Protection and Statistical Efficiency Act, has improved confidential protection covering all data collected by SRS. The legislation also provides clearer language to justify providing researchers the opportunity to work with micro data files under a secure and

structured agreement. The results of these efforts will include broader and more complete data usability for researchers and stronger penalties for misuse of confidential data.

**Other Performance Indicators**

The tables below show the growth in the number of people benefiting from SBE funding, and trends in award size, duration and number of awards.

**Number of People Involved in SBE Activities**

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
Senior Researchers	1,726	1,847	1,951
Other Professionals	324	347	366
Postdoctorates	114	122	129
Graduate Students	1,136	1,216	1,284
Undergraduate Students	559	598	632
<b>Total Number of People</b>	<b>3,859</b>	<b>4,130</b>	<b>4,362</b>

**SBE Funding Profile**

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
<b>Statistics for Competitive Awards:</b>			
Number	894	925	951
Funding Rate	25.6%	26.0%	26.0%
<b>Statistics for Research Grants:</b>			
Number of Research Grants	516	534	549
Funding Rate	21.0%	21.0%	21.0%
Median Annualized Award Size	\$79,000	\$81,700	\$84,000
Average Annualized Award Size	\$90,131	\$93,248	\$95,829
Average Award Duration, in years	2.3	2.4	2.4

**SOCIAL AND ECONOMIC SCIENCES**

**\$88,520,000**

The FY 2005 Budget request for the Social and Economic Sciences (SES) Subactivity is \$88.52 million, an increase of \$7.50 million, or 9.3 percent, over the FY 2004 Estimate of \$81.02 million.

**Social and Economic Sciences Funding**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	Amount	Percent
Social and Economic Sciences	71.01	81.02	88.52	7.50	9.3%
Total, SES	\$71.01	\$81.02	\$88.52	\$7.50	9.3%

The SES Subactivity supports the scientific study of economic, legal, political, and social systems and the institutions that comprise them, including business, governmental and voluntary organizations, job and product markets, and social networks that range from family relationships to terrorist cells. It also supports research on risk analysis and decision-making, on the social and ethical aspects of scientific and technological production and on methods and models that apply across the social and behavioral sciences. SES also fosters education and builds and maintains core social science infrastructure.

The issues SES researchers investigate are complex, challenging and important because the aim is to unravel the causes of collective behavior and understand the ways that social forces impinge on, shape and are shaped by individual and organizational action. Working toward these aims increasingly requires the use of cutting edge quantitative and qualitative methods, meticulously gathered large data sets and interdisciplinary approaches that cross not just the social sciences but behavioral and other science boundaries as well. The payoff is high, as important social problems can be informed by the research of SES scientists. To give just a few examples:

- Robert Engle of New York University and Clive Granger of the University of California at San Diego, the most recent Nobel Prize winners in Economics, each received SES support at crucial points in their careers. This support led to major breakthroughs in statistical methods for estimating time variant economic relationships, and paved the way for fundamental advances in our understanding of the relations between wealth and consumption, exchange rates and price levels, and short and long-term interest rates. Practical manifestations include providing financial institutions with tools to compute market risks for their securities portfolios and enabling international arrangements that control bank capital requirements to reduce the danger of international financial crises.
- Duncan Watts, a sociologist at Columbia University, is using an NSF CAREER award to advance the science of network analysis. His published work relates network structures to such national concerns as terrorism and disease and suggests ways to counter network-dependent threats. His work also contributes to fields as far removed from the social sciences as biology and physics.
- Jennifer Lerner, a psychologist and decision scientist at Carnegie Mellon University, is engaged in a series of studies aimed at better understanding the role of emotion in how people evaluate and respond to risk. For example, she and several of her colleagues found that action preferences following 9/11 differed dramatically depending on whether one was made mostly angry or mostly fearful by what transpired. Her line of research should lead to a more adequate theory on the role of emotions in risk evaluation and decision-making and promises to substantially enrich our

understanding of why individuals decide differently when confronted with similar risks and risk data.

- Robert Axelrod, a political scientist at the University of Michigan, is using agent-based models to explore why in-group preferences and out-group antagonisms arise and endure. His work is likely to open new vistas in understanding ethnic solidarity and cross-ethnic tensions at home and abroad, just as his earlier SES-supported work revolutionized thinking about how cooperation could arise in situations fraught with the potential for conflict.

SES is also deeply concerned with educating future generations of social scientists. SES programs regularly provide support for undergraduate research experiences and graduate fellowships as well as workshops and training institutes. Particularly innovative are the EITM (Empirical Implications of Theoretical Models) summer institutes started by the Political Science Program, which teach students the skills needed to combine formal modeling with empirical testing to better understand the causes of social action. The EITM program sets the stage for a new generation of young faculty who realize that both theoretical and empirical models are deficient without each other.

In FY 2005, the SES Request of \$88.52 million will support a range of activities, including:

- Support for the development, integration and utilization of large scale and innovative social, economic, and demographic databases, including the development of more adequate cyberinfrastructure. (\$17.0 million, an increase of \$3.0 million over FY 2004)
- Research on decision-making under uncertainty in support of the Climate Change Research Initiative. (\$5.0 million, level with FY 2004)
- Research on social system shocks and extreme events, including research into their causes and consequences, factors that make for vulnerabilities and resiliency, and modes of analyzing and communicating the risks they entail. (\$1.50 million, level with FY 2004)
- Funding to support the development and use of cutting edge social and behavioral science methods, including support for cross-disciplinary work teams, conferences and education. (\$8.0 million, level with FY 2004)
- Funding to investigate drivers of social change, such as population shifts, the economy, ethnic conflict, terrorism, technology, scientific discoveries, political upheavals, legislation, the mass media, economic and environmental change. Also funding to examine the value issues raised by nanotechnology and other scientific advances. (\$12.0 million, level with FY 2004)

Investments in the above areas will occur both through special competitions and the normal competitions of existing programs. In addition, SES will maintain the health of its core through expanded funding of existing disciplinary and cross-disciplinary programs. Core programs regularly fund a wide variety of peer-reviewed, investigator-initiated research aimed at expanding extant knowledge while pushing disciplinary frontiers. They also support graduate and undergraduate education, workshops that set research priorities and programs to enhance academic careers, often with special attention to women and minorities. Expanded funding for the core is important in order to increase the size and duration of grants (\$44.33 million, an increase of \$4.50 million over FY 2004).

**BEHAVIORAL AND COGNITIVE SCIENCES**

**\$76,000,000**

The FY 2005 Budget Request for the Behavioral and Cognitive Sciences (BCS) Subactivity is \$76.0 million, an increase of \$7.50 million, or 10.9 percent, over the FY 2004 Estimate of \$68.50 million.

**Behavioral and Cognitive Sciences Funding**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004 Amount	Percent
Behavioral and Cognitive Sciences	62.32	68.50	76.00	7.50	10.9%
Total, BCS	\$62.32	\$68.50	\$76.00	\$7.50	10.9%

The BCS Subactivity supports research and related activities that advance fundamental understanding in the behavioral, cognitive, anthropological, and geographic sciences. The Subactivity seeks to develop and advance scientific knowledge and methods focusing on human cognition, perception, behavior, and development, including neural mechanisms, social behavior, language, and learning. The Subactivity also supports research and related activities that focus on social, cultural, and biological variation in humans and how these patterns developed over time. BCS also supports efforts to increase basic understanding and capabilities to explore geographic distributions and interactions of human, physical, and biotic systems on the Earth's surface as well as the dynamics of human activity as people interact with the natural environment.

Strong core disciplinary programs are complemented by an increased emphasis and support for collaborative and interdisciplinary projects to advance knowledge and build capacity across multiple fields. For example, recent advances in the behavioral and cognitive science have produced new insights into how people learn. Through a convergence of new technologies and theoretical development, behavioral and cognitive scientists are discovering how the human brain acquires, organizes, and retains knowledge and skills; how linguistic, social, cultural, and biological processes relate to children and adolescents' learning in formal and informal settings; and how a deeper understanding of these mechanisms can be used to improve educational outcomes and enhance productivity in the workplace. Rooted in the disciplines of behavioral and cognitive science, this activity provides the foundation for even larger-scale efforts in the science of learning, science education, and development of the scientific workforce of the 21st century. Support for children's research centers already is yielding valuable new insights. Sandra Calvert of Georgetown University and collaborators from Northwestern University, the University of Texas-Austin, and the University of California-Los Angeles are studying how digital interactive entertainment media affects children. At New York University, Catherine Tamis-LeMonda and colleagues are identifying pathways to learning success for all children, with a particular emphasis on African American, Asian, and Caucasian children from diverse backgrounds.

Behavioral and cognitive scientists also address the disparate involvement of members of different groups in the scientific workforce of the nation. Research on social and behavioral processes includes an examination of factors that attract and inhibit members of different groups from pursuing careers in science and engineering. Beth Kurtz-Costes of the University of North Carolina and Stephanie Rowley of the University of Michigan are collaborating in a longitudinal study of the socialization processes that affect racial and ethnic identity development as well as achievement striving in African American adolescents. William Wakefield of California State University-Northridge is leading a multidisciplinary project examining African American and Latina/o adolescents' perceptions of and responses to racial discrimination. Ronald Seifer of Bradley Hospital in Rhode Island is examining links between the

processing of emotion and the development of social competence in low-income children who are enrolled in Head Start. Carol Dweck and Catherine Good of Columbia University are investigating ways to close the achievement gap between men and women in mathematics courses. Sarah Elwood of DePaul University is exploring how the use of geographic information systems can be used by community-based organizations to facilitate urban change and neighborhood revitalization.

Researchers supported by the BCS Subactivity are exploring what makes people human. Among the questions being investigated: What are the genes that allow for human cognitive abilities? How have diverse cultures addressed human issues such as family, work, health, and conflict? What does the archaeological record tell us about the pace at which human biological and cultural change occurred? Researchers also have developed synergies across disciplinary boundaries. Morris Goodman of Wayne State University is working with colleagues from molecular biology and neuroscience to discover the genetic changes that shaped humankind's enlarged brain and complex cognitive abilities. Under the supervision of Nicholas Toth at Indiana University, doctoral candidate Dietrich Stout is using positron emission tomography to examine the brain activity associated with the production of simple stone tools to gain insights into the cognitive abilities of early humans.

BCS-supported scientists also are advancing knowledge about complexities associated with human interaction with the natural environment, viewing these over time and space and through the collaborative use of tools and ideas from many disciplines. J. Stephen Lansing of the University of Arizona is collaborating with colleagues from the biological and ocean sciences, showing how stable cooperative networks encompassing tens of thousands of farmers in local Balinese watersheds can be explained through self-organizing ecological models. Jeffrey Johnson of East Carolina University and colleagues from the social and ecological sciences are studying environmental understanding in terms of both scientific and traditional ecological knowledge of indigenous people in Alaska. Robert Walker of Michigan State University and Stephen Perz of the University of Florida are examining the social processes of road extensions and the resulting spatial architecture of expanding road networks in a tropical forest frontier in the Brazilian Amazon, to better understand the complex interactions between road building, human land use, and forest fragmentation.

In FY 2005, the BCS Request of \$76.0 million will support a range of activities, including:

- Core disciplinary and interdisciplinary research in the geographic, anthropological, archaeological, cognitive, psychological, and linguistic sciences, totals \$42.40 million, an increase of \$3.0 million over FY 2004.
- Research on the behavioral and cognitive science of human learning and research and related activities on human diversity at \$16.0 million, an increase of \$2.20 million over FY 2004, including \$6.0 million for the Children's Research Initiative.
- Research on human origins and development over time and space, which will be increased by \$1.50 million over FY 2004 to \$8.50 million. This funding includes \$3.50 million for the Human Origins (HOMINID) special competition.
- Research and related activities on human-environmental interactions, will increase by \$800,000 over FY 2004 to a level of \$8.50 million. Funding includes an increase of \$3.50 million over FY 2004 for the establishment of a new set of centers focusing on environmental social and behavioral science.

**SCIENCE RESOURCES STATISTICS**

**\$26,150,000**

The FY 2005 Budget Request for the Science Resources Statistics (SRS) Subactivity is \$26.15 million, unchanged from the FY 2004 Estimate.

**Science Resources Statistics**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	FY 2004 Percent
Science Resources Statistics	25.31	26.15	26.15	0.00	0.0%
Total, SRS	\$25.31	\$26.15	\$26.15	\$0.00	0.0%

The legislative mandate for the Division of Science Resources Statistics (SRS), as stated in the National Science Foundation Act of 1950, as amended, is, "...to provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the federal Government...." To meet this mandate, SRS provides policymakers, researchers, and other decision makers with high quality data and analysis for making informed decisions about the nation's science, engineering, and technology enterprise. The work of SRS involves survey development, methodological and quality improvement research, data collection, analysis, information compilation, dissemination, and customer service to meet the statistical demands of a diverse user community, as well as preparation of the congressionally mandated *Science and Engineering Indicators* and *Women, Minorities and Persons With Disabilities in Science and Engineering* biennial reports.

SRS continues to make improvements in the relevance and quality of its products. Priorities for FY 2005 are implementing the results of prior methodological and planning activities directed toward improving the quality, relevance, timeliness, and accessibility of SRS products, including implementing redesigns of major components of ongoing SRS data collections, and continuing the development of new data collection efforts initiated in FY 2004.

- Every decade a redesign of the samples and surveys used to collect data on the scientific and engineering workforce is necessary to reflect the results of the Decennial Census. Extensive redesign activities were conducted in FY 2000 through FY 2003. SRS began the 2003 cycle of data collection for the redesigned National Survey of College Graduates, National Survey of Recent College Graduates, and the Survey of Doctorate Recipients in FY 2004. In FY 2005, data processing will occur, including development of preliminary data files as well initial analysis.
- In FY 2004, SRS began a multi-year comprehensive study of the feasibility of developing a new ongoing survey to collect information about individuals in postdoctorate positions, including individuals with foreign doctorates. This developmental activity will continue in FY 2005 and is expected to lead to an ongoing survey and much needed statistical information on individuals in postdoctorate positions.
- In FY 2005, to fill critical data gaps about other countries' highly educated S&E personnel, SRS will continue to participate in efforts to encourage the development of internationally comparable basic data on S&E personnel and postdoctorates through the support of activities with the UNESCO Institute for Statistics and the Organization for Economic Cooperation and Development.



- A major National Academy of Sciences review of the SRS R&D portfolio of surveys is nearing completion and is expected to propose significant revisions to components of the R&D survey portfolio. This multi-year (FY 2003-FY 2005) review is in compliance with the NSF/GPRA requirement for a Committee of Visitors review of NSF programs to be conducted on a rotating basis. The NAS review is also in compliance with Section 25 of Public Law No. 107-368 (NSF Authorization Act of 2002) for a review of discrepancies in the R&D data collection. The results of this review will be received as a Letter Report in FY 2004 and a Final Report in FY 2005. Upon receipt of the Letter Report, SRS will begin to undertake research and methodological activities in response to the recommendations.
- During FY 2004, efforts to improve and redesign the Survey of Research and Development Expenditures at Universities and Colleges and the Survey of Graduate Students and Postdoctorates in Science and Engineering will continue. In FY 2005, additional improvements to both surveys will be implemented on an ongoing basis concurrent with major multi-year redesign efforts underway for both surveys.
- In FY 2005, SRS will continue feasibility and design work leading towards the development of an ongoing data collection program for information on research instrumentation as mandated by the NSF Authorization Act of 2002. This information, in conjunction with the newly redesigned Facilities Survey being implemented in FY 2004, will provide critical benchmarking information on the cyberinfrastructure of the U.S. academic research and biomedical enterprise.
- In FY 2005, SRS will begin implementation of components of proposed new procedures to obtain high quality information on public understanding of science and technology.
- In FY 2005, SRS will begin exploratory research related to the possibility of a state R&D survey to provide more robust data for the new State chapter introduced in the 2004 edition of *Science and Engineering Indicators*.

SRS will continue in FY 2005 to conduct all its other surveys and analytical activities that produce the information for carrying out the NSF statutory mandate, for meeting the Tools strategic outcome goal to, “Provide for the collection and analysis of the scientific and technical resources of the U.S. and other nations to inform policy formulation and resource allocation,” and for developing *Science and Engineering Indicators* and *Women, Minorities, and Persons With Disabilities in Science and Engineering*. In FY 2005, SRS will also continue to engage in activities designed to improve the relevance and quality of the data it collects and the information it disseminates. Such activities will lead to further needed quality improvements and additions to current activities in subsequent years.

**OFFICE OF INTERNATIONAL SCIENCE AND ENGINEERING      \$34,040,000**

The FY 2005 Budget Request for the Office of International Science and Engineering (OISE) is \$34.04 million, an increase of \$5.92 million, or 21.1 percent, over the FY 2004 Estimate of \$28.12 million.

**Office of International Science and Engineering Funding**

(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	FY 2004 Percent
Office of International Science and Engineering	39.97	28.12	34.04	5.92	21.1%
<b>Total, OISE</b>	<b>\$39.97</b>	<b>\$28.12</b>	<b>\$34.04</b>	<b>\$5.92</b>	<b>21.1%</b>

Totals may not add due to rounding.

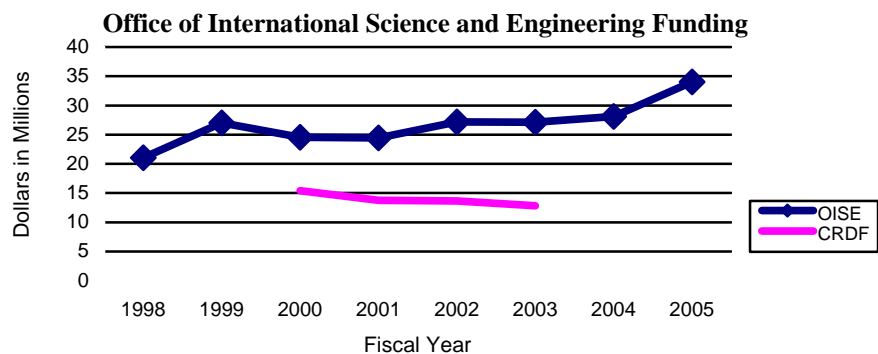
<sup>1</sup>FY 2003 Actual includes a transfer of \$12.83 million from the Department of State for an award to the U.S. Civilian Research and Development Foundation.

The Office of International Science and Engineering (OISE) serves as the focal point, both inside and outside NSF, for international science and engineering activities. OISE promotes the development of an integrated, Foundation-wide international strategy, and manages international programs that are innovative, catalytic, and responsive to a broad range of NSF interests. It is essential that American scientists and engineers have opportunities to engage with the world’s top researchers, to lead major international collaborations, and to have access to the best research facilities throughout the globe and across all the frontiers of science and engineering. In November 2001, after an extensive examination of the Foundation’s and the U.S. Government’s international role, the National Science Board called on the Foundation to make international leadership a high priority for NSF and a much stronger programmatic focus both in core disciplines and in NSF-wide activities. The Office carries out its functions through close partnership with the NSF Directorates and through its own program activities. The Office is housed within the Social, Behavioral and Economic Sciences (SBE) Directorate, but its role is Foundation-wide.

**RELEVANCE**

Science and engineering are, and will continue to be, international enterprises critical to American competitiveness and security. The NSF – as the nation’s core source of academic support for fundamental science, mathematics and engineering research and education – plays a unique role in leading the worldwide efforts of the U.S. science, engineering, and education communities. It is responsible for helping ensure that American scientists and engineers are at the forefront of world research, and equipped to pursue U.S. collaborative and competitive interests directed at solving the country’s and the globe’s complex array of 21<sup>st</sup> century challenges.

OISE programs support the Foundation’s strategic goals of People, Ideas, and Organizational Excellence. America’s next generation of scientists and engineers must be able to work effectively in the global research arena and marketplace. The Office maintains a range of activities that enables researchers to experience and engage in international research throughout their training. Bold exploration at the frontiers of science and engineering requires international partnerships. OISE programs are designed to complement and enhance the Foundation’s broader research and education portfolio and to overcome the barriers involved in international collaboration.

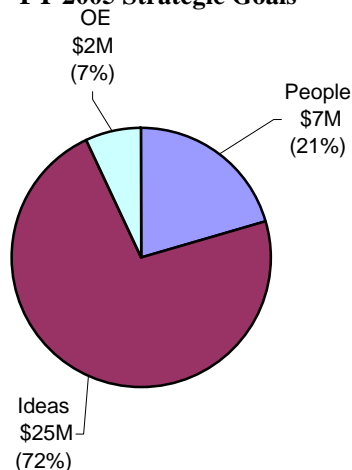


Note: Additional funding was provided to NSF by the U.S. State Department for an award to the U.S. Civilian Research and Development Foundation (CRDF) in FY 2000 (\$15.40 million), FY 2001 (\$13.75 million), FY 2002 (\$13.66 million), and FY 2003 (\$12.83 million).

## STRATEGIC GOALS

Three strategic outcome goals guide the activities of the Office of International Science and Engineering:

### Office of International Science and Engineering FY 2005 Strategic Goals



- **PEOPLE:** For the United States to remain at the forefront of world science and technology, it needs an educated science and engineering workforce capable of operating in an international research environment and a global market. OISE provides U.S. students and junior researchers the opportunity to participate in high quality international collaborative research. It supports activities that seek to broaden the participation of underrepresented groups by providing opportunities to work in foreign settings with the diverse international community of scientists and engineers.

- **IDEAS:** Discoveries emerge from across the globe and are vital links for the best and the brightest U.S. scientists and engineers to their counterparts. Through investments in collaborative efforts in core disciplines, center

efforts, and NSF priority areas, the U.S. research community is able to further its own research goals and objectives. In addition, it is only through international collaborative efforts that the larger scale issues of global concern (e.g., terrorism, infectious disease, biodiversity) can be addressed.

- **ORGANIZATIONAL EXCELLENCE:** Promoting and supporting the U.S. research community's ability to partner with the best scientists and institutes worldwide requires innovative mechanisms and effectively managed portfolios. OISE's staff and management must be well-equipped to meet the challenge of a dynamic, international scientific and engineering enterprise in order to ensure that the U.S. community is well-served.

**Funding by Strategic Goal: Summary**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
People <sup>1</sup>	1.28	4.75	7.00	2.25	47.4%
Ideas	37.65	21.52	24.69	3.17	14.7%
Tools	0.00	0.00	0.00	0.00	N/A
Organizational Excellence	1.04	1.85	2.35	0.50	27.0%
<b>Total, OISE<sup>2</sup></b>	<b>\$39.97</b>	<b>\$28.12</b>	<b>\$34.04</b>	<b>\$5.92</b>	<b>21.1%</b>

<sup>1/</sup> Note: In FY 2003, the subtotal for "Ideas" includes funding of \$3.5 million for postdoctorates. In FY 2004 and 2005, funding support for postdoctorates is included under the category "People."

<sup>2/</sup>Note: In FY 2003, \$12.83 million was provided to NSF by the U.S. State Department for an award to the U.S. Civilian Research and Development Foundation.

The FY 2005 Request for the Office of International Science and Engineering Activity is \$34.04 million. The OISE seeks to reshape its program by increasing investment in People (including expanding activities with developing countries), developing an innovative institutional approach to international collaboration, and improving management efficiency. Within the Ideas investment, reshaping of the program is proposed to accommodate investments in cyberinfrastructure and to explore new mechanisms for supporting partnerships for international research and education.

**PEOPLE (+\$2.25 million, for a total of \$7.0 million)**

**OISE People Investments**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Individuals	1.28	4.75	7.00	2.25	47.4%
<b>Total, OISE People</b>	<b>\$1.28</b>	<b>\$4.75</b>	<b>\$7.00</b>	<b>\$2.25</b>	<b>47.4%</b>

**INDIVIDUALS**

- Support for postdoctoral fellows will be increased by \$600,000 for a total of \$3.50 million. Included in the increase are: \$100,000 for the existing International Research Fellowship Program, to bring it to a total of \$3.0 million, and \$500,000 for a fellowship program for junior researchers directed toward developing countries. For the latter, the U.S. scientists and engineers will have the opportunity to participate in unique research opportunities, contribute to capacity building, and establish the foundation for future collaboration.
- Investments in the Foundation's highly successful programs, Research Experiences for Undergraduates (REU) and the Integrative Graduate Education and Research Traineeship (IGERT) program, will be slightly expanded. The investment in IGERT will increase by \$850,000 for a total of \$1.50 million.
- Support for other individuals, particularly through research experiences for graduate students, will be increased by \$800,000 to a total of \$1.50 million. This expansion will include an extension of the East Asia graduate research summer institute model to other countries. Currently, this program exists in Japan, Taiwan, Korea, China, and Australia. This program will be increased by \$550,000. The second component is a new \$250,000 fellowship program for

senior researchers pursuing collaborative research with scientists and engineers in developing countries.

**IDEAS (+\$3.17 million, for a total of \$24.69 million)**

**OISE Ideas Investments**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004	Percent
Fundamental Science and Engineering	37.65	21.52	24.69	3.17	14.7%
<b>Total, OISE Ideas</b>	<b>\$37.65</b>	<b>\$21.52</b>	<b>\$24.69</b>	<b>\$3.17</b>	<b>14.7%</b>

Note: In FY 2003, additional funding (\$12.83 million) was provided to NSF by the U.S. State Department for an award to the U.S. Civilian Research and Development Foundation.

The Office requests \$24.69 million to invest in collaborative activities that support the highest quality research and provide U.S. scientists and engineers the opportunity to partner internationally and have access to the best research facilities around the world. Reflecting the overall reshaping of OISE’s portfolio as well as the establishment of new programs (e.g., Partnerships for International Research and Education), the Office expects that the average award size and duration of awards will increase in FY 2005. Average award size is expected to almost double from FY 2003 levels – i.e., from \$20,566 to \$40,000. Likewise, OISE expects the award duration to increase approximately 25 percent from FY 2003 levels – from 2.1 years in FY 2003 to 2.8 years in FY 2005.

**FUNDAMENTAL SCIENCE AND ENGINEERING**

- *Disciplinary Research.* OISE will continue to support the Foundation’s core research investment through highly meritorious research and education activities that present unique risks and offer potentially high payoff because of the critical and integral nature of the foreign collaboration.
  - *Partnerships for International Research and Education.* A significant new (\$5.0 million) effort will be mounted to create a leading-edge activity for international science and engineering collaboration. These partnerships will be established in U.S. research institutions and universities working at the most promising frontiers of new knowledge. The awards will invest in U.S. researchers who pursue a well-defined research agenda with top international collaborators and develop a program that involves U.S. researchers at all career levels. It will enhance America’s ability to maintain and strengthen international connections, and to provide a context where students and faculty are able to accelerate the achievement of fundamental research objectives through combined international talent, ideas, and tools. In addition, it will provide opportunities for U.S. researchers, at all career levels, to participate in international research.
- *Cyberinfrastructure.* A new \$1.0 million cyberinfrastructure investment is proposed for FY 2005. Working in partnership with the CISE Directorate, OISE’s objective is to identify and link communities of researchers across international boundaries to facilitate communication and collaboration between the United States and the international scientific community. Efforts in global networking will support the following:
  - Developing and strengthening regional networks that facilitate U.S. collaborative interests;
  - Identifying and strengthening links to communities of researchers not normally served by existing regional networks; and
  - Supporting domain-specific network applications that fundamentally involve international science and engineering.

**ORGANIZATIONAL EXCELLENCE (+\$500,000, for a total of \$2.35 million)**

Organizational Excellence supports Intergovernmental Personnel Act appointments (IPAs), IPA travel and the administrative contracts necessary to conduct the level of program activity at the requested level.

Specifically, additional funds are requested to improve management efficiency of the graduate summer research institutes as they expand and increase. Funds also support NSF’s overseas offices in Paris, Tokyo, and China. FY 2005 will be the first full year of support to the NSF China office that is planned to open during FY 2004.

**PRIORITY AREAS**

In FY 2005, OISE will invest in the following priority areas: Biocomplexity in the Environment and Nanoscale Science and Engineering. These investments will be made to support the integration of international collaboration into priority research activities. Many of our international partners are significantly investing in similar priorities and collaborative efforts can contribute to leveraging of funds, to expanding expertise and to enhancing scientific progress. OISE works closely with other NSF directorates engaged in these areas.

**OISE Investments in NSF Priority Areas**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Biocomplexity in the Environment	0.35	0.50	0.50	0.00	0.0%
Nanoscale Science and Engineering	0.00	0.00	0.26	0.26	100.0%

**QUALITY**

The Office of International Science and Engineering maximizes the quality of the R&D it supports through the use of a competitive, merit-based review process. Within the existing portfolio, the percent of funds that were allocated to projects that undergo merit review was 44 percent in FY 2003. However, the majority of projects that did not undergo external merit review were supplements that added an international dimension to projects already reviewed and funded in the disciplinary research programs of the Foundation.

The Office of International Science and Engineering employs several internal and external mechanisms to ensure the highest standards of work and quality service as well as to identify potential future opportunities. The three key mechanisms are: the Committee of Visitors (COV), the Advisory Subcommittee for International Science and Engineering, and the Foundation’s International Coordinating Committee (ICC). COVs, which are used throughout the Foundation as a method of assessing and processing of proposals, review and provide a retrospective assessment of the quality of results of NSF’s investments. The most recent COV for the international portfolio was conducted in March 2002. The report of that group of experts is being used to reshape the portfolio. The next COV is planned for FY 2005.

Given that the role and program of the Office has been elevated within the Foundation, an advisory body was established in FY 2004. As the Office is still organizationally a part of the SBE Directorate, an Advisory Subcommittee for International Science and Engineering has been established. The

Subcommittee is comprised of approximately 12 members from across the science and engineering community. The group meets twice a year and advises the Office on strategic directions, program development, and program performance.

Since its establishment by the NSF Director in FY 2003, the ICC meets regularly to ensure that the various international investments across the Foundation are coordinated and effective. Comprised of representatives from across NSF's directorates and offices and chaired by the Director of the Office of International Science and Engineering, the ICC maintains an inventory of the Foundation's investment in international activities in order to develop a Foundation-wide strategic approach to international investments and to address priority international issues as they arise.

## **PERFORMANCE**

**Hydrogeochemistry of Copahue Volcano.** Scientists know the basic facts about volcanoes – that they erupt because magma (liquid or molten rock) is buoyant within the Earth's crust and contains dissolved gasses that are rapidly released as magma reaches shallow depth. But many critical questions remain unanswered or unclear: the mechanisms of rock melting, the regions and conditions of melt storage in the crust, the trigger for final rise to the surface, the cause of cessation of that rise, and the controls that lead to explosive or nonexplosive behavior. Copahue is an active volcano on the eastern end of the Southern Andes, located in one of the world's most active volcano zones. Copahue has an extensive acid hydrothermal system with a crater lake, acid springs that draw fluids from deep sources, and a geothermal system on its northeast flank. It showed signs of life during the 1990s with small steam eruptions, which culminated in July 2000 with an eruptive period lasting about 6 months. Explosive eruptions spread ashes more than 100 km from the volcano and fire fountains lit up the skies. This multi-year, NSF-funded research is conducted in Argentina's Neuquen province by scientists and students from Connecticut's Wesleyan University, working alongside their Argentine partners from the National University of Comahue and a national research agency, CONICET. The project focuses on long-term data collection aimed at improving how to predict and monitor volcanic eruptions, especially the nature of eruption triggers. It is assessing the significant environmental and health effects of releases of these toxic "earthy fluids," particularly the severe impact they may have on the local acidified watershed, and it is training young U.S. researchers to explore the frontiers of volcanology and to collaborate internationally.

**China: Capitalism Without Democracy?** Free enterprise is usually defined as the practice of capitalism under representative government. But for over twenty years, Communist Party-led China has embarked on a process of economic reform that moves toward private or corporate ownership of capital goods and toward investment decisions determined by prices, production and competition in a free market. A Johns Hopkins University social scientist in NSF's International Research Fellowship Program is examining the political orientation of private entrepreneurs in China and testing the hypothesis that private industrialists and merchants make up the basis for a pro-democratic class in contemporary China. In collaboration with a colleague at the Chinese Academy of Social Sciences in Beijing, she has designed and conducted a remarkable, in-depth survey of over 250 interviewees who are leading private entrepreneurs, government and party officials, academics and business experts working in China's major economic centers like Shanghai and Beijing. She has presented her findings at numerous academic and public forums both in China and America including the Senate Foreign Relations Committee.



Temple University and the University of Bremen scientists collaborate to push the frontiers of robot mapping and self-location.

**Robotics: U.S.-German Cooperative Research.** Robots are computer-controlled machines that can be programmed to move or carry out work. They are especially useful doing repetitive tasks in manufacturing, or in situations dangerous to people like defusing bombs or exploring outer space and the deep ocean floor. Robots can “see” and “hear” for humans. One day, they will be intelligent enough to “know” when to move and stop without any input from people, recognizing objects and shapes, and adjusting their mobility accordingly. Some of the world’s top research to develop elaborate, cognitively motivated geometric representation and reasoning formalism for robot localization and mapping is being done at the University of Bremen, Germany. There, in cooperation with Philadelphia’s Temple University, American and German scientists use complementary expertise and equipment from both schools to focus on problems of self-location (which allows a robot to determine its position using its internal spatial representation) and to advance robot mapping (which uses mobile robots to acquire spatial models of physical environments). In addition, the project offers U.S. students an

existing, cutting-edge research and international training opportunity. Results of this research area could impact virtually every sector of society in the future. But the practical applications will be particularly important for homeland security monitoring and protection where consistent, accurate shape recognition is vital.



International research team member collects data in order to assess the impact of climate change on Lake Tanganyika’s plants and fish.

**East African Food Supply Threatened by Climate Change.**

An important new study provides evidence that climatic warming is diminishing Lake Tanganyika’s populations of aquatic plants and the fish that feed on them. This deep East African lake holds 18 percent of the world’s liquid freshwater. It is a critical food source for the countries that border it, providing approximately 200,000 tons of fish per year. Reporting in the journal *Nature* (August 14, 2003), an international team that included scientists from Tanzania’s University of Dar es Salaam as well as NSF-funded researchers from Vassar College, the University of Arizona, University of Washington, and Tulane University, announced that climate change had decreased fish stocks by as much as 30 percent over the last 80 years. The researchers examined recent and historical records of air temperature, wind velocity and water temperature, estimates of aquatic plant growth derived from lake sediment cores, and recent historical fisheries records. They were able to rule out overfishing and conclude that higher surface water temperatures and lower wind velocities have decreased the amount of mixing of lake waters, decreasing the amount of nutrient-laden water to reach the surface and nourish aquatic plants. The reduced plant growth has, in turn, led to reductions in fish numbers.

This ongoing Nyanza Project has long been supported by NSF as a Research Experience for Undergraduates Site through the University of Arizona. This project not only offers valuable training opportunities for a new generation of cross-disciplinary and internationally-skilled young scientists, but



the students' contributions have played a major role in developing these new insights into the impact of climate change.

**IT International Partnership Fights Disease.** The battle to contain the SARS virus – which emerged in China in November 2002 and spread to 32 countries killing more than 800 people – enlisted the high-powered resources of a unique partnership of computer researchers around the Pacific Rim led by the San Diego Supercomputer Center at the University of California-San Diego (UCSD). This partnership of 14 high-performance computing institutions and the Pacific Rim Applications and Grid Middleware Assembly (PRAGMA), promotes cooperation in grid technology and regional standards development to make grid-enabled computing and resource-sharing a reality. In the case of the SARS outbreak, it showed that the NSF's cyberinfrastructure and international linkages – made possible through collaboration between OISE and NSF's Computer Information Science and Engineering Directorate – is not only transforming scientific research and learning on a global scale but also building a powerful tool to safeguard human health. Because quarantine and isolation are the primary means of slowing the spread of SARS, Taiwan's hospitals faced a communications crisis. In May 2003, responding to an urgent request from Taiwan's National Center for High-performance Computing (NCHC), scientists led by UCSD assisted Taiwan in developing a cutting-edge communication access grid among quarantined Taiwanese hospitals. This linked hospitals to each other and to the most up-to-date global sources of health information. It went beyond the standard video- and teleconferencing and allowed physicians to share detailed x-ray images, patient data, and other information in on-line meetings among several sites. According to NCHC's director, this partnership assisted in fighting the disease, relieving the epidemic, and ultimately saved lives.



University of California and Taiwanese scientists worked to link SARS-quarantined Taiwanese hospitals with outside health experts.

### Other Performance Indicators

The table below shows the number of people for whom OISE provides salary/stipend support. OISE also funds other research-supporting activities for postdoctorates, graduate students and undergraduates. In FY 2003, awards funded solely by OISE supported a total of 410 postdoctorates, 533 graduate students and 194 undergraduates.

#### Number of People Receiving OISE-funded Salary/Stipend Support

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
Senior Researchers	92	100	110
Other Professionals	19	25	25
Postdoctorates	10	35	35
Graduate Students	51	100	120
Undergraduate Students	29	40	50
<b>Total Number of People</b>	<b>201</b>	<b>300</b>	<b>340</b>

**OISE Funding Profile**

	FY 2003	FY 2004	FY 2005
	Estimate	Estimate	Estimate
<b>Statistics for Competitive Awards:</b>			
Number	373	340	325
Funding Rate	56.0%	49.0%	45.0%
<b>Statistics for Research Grants:</b>			
Number of Research Grants	256	220	200
Funding Rate	58.0%	49.0%	45.0%
Median Annualized Award Size	\$9,977	\$9,100	\$15,000
Average Annualized Award Size	\$20,556	\$30,000	\$40,000
Average Award Duration, in years	2.1	2.5	2.8

