SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES

SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES $211,740,000

The FY 2004 Budget Request for the Social, Behavioral and Economic Sciences (SBE) Activity is $211.74 million, an increase of $16.13 million, or 8.2 percent, above the FY 2003 Request of $195.61 million.

SBE Funding
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
Social and Economic Sciences	68.29	77.61	83.92	6.31	8.1%
Behavioral and Cognitive Sciences	58.56	65.30	71.12	5.82	8.9%
Science Resources Statistics	16.28	25.70	26.70	1.00	3.9%
Total, SBE without INT	143.13	168.61	181.74	13.13	7.8%
Office of International Science and Engineering (INT)[1]	40.84	27.00	30.00	3.00	11.1%
Total, SBE with INT	$183.97	$195.61	$211.74	$16.13	8.2%

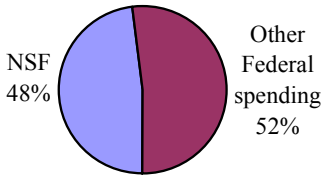
Totals may not add due to rounding.
[1]FY 2002 includes a transfer of $13.66 million from the Department of State for an award to the U.S. Civilian Research and Development Foundation.

The Social, Behavioral and Economics Sciences 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, over the past several decades, 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, through its Science Resources Statistics (SRS) Subactivity, the collection and dissemination of statistics on science resources, and the Office of International Science and Engineering (INT), the focal point for NSF's international science and engineering activities.

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 48 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 the exclusive source of federal support for basic research and infrastructure development.

Federal Support for Basic Research in the Social Sciences at Academic Institutions in the U.S. (FY2000)
(excludes the Psychological Sciences)



SBE programs advance knowledge about human behavior and society. SBE activities span a wide variety of fields ranging from basic research related to understanding the human mind to studies of the root causes of the nation's most serious social problems such as the determinants of perception, the ways that children learn, how the economy functions, the structure of language, the genesis of crime, and the spread of

democracy. Every critical national problem, including terrorism, business failures, and global warming, is rooted in the kinds of behavior the SBE sciences seek to understand.

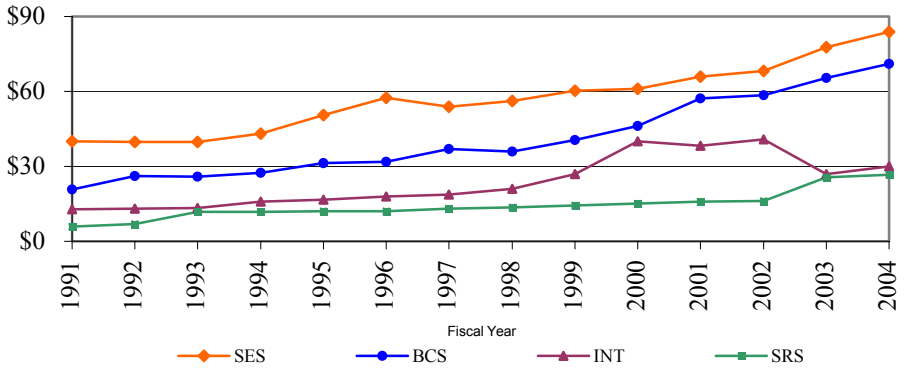
Because SBE-supported research is often national in scope and because many of the findings derived from SBE-supported research advance basic scientific knowledge or have their most natural applications in the public policy arena, private-sector firms have few incentives to invest in SBE studies. Moreover, the basic nature of most SBE-supported research means that its most likely outputs often appear too far removed from immediate application to interest federal agencies with more focused missions.

NSF maintains the high quality of research it funds by rigorous merit review, including in almost all cases external merit review. Both within and across programs, SBE maintains a mixed portfolio of projects. Some of these involve large investments that will pay off over the long run by supporting not just the work of the investigator but also the work of other researchers who will draw on data the investigator has gathered or on methods the investigator has pioneered. Other SBE-supported work will have more direct short-term benefits or will be high-risk research that may not have obvious benefits at all, but, if it does, has the potential to reshape thinking about a problem or even a field.

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 on the education of the science and engineering workforce and 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 science and engineering, its ability to compete globally and the outlook for the nation's research capacity, over both the near and longer term. Findings from SRS studies have long been important to the development of the nation's educational and science policy agendas.

In January 2002, SBE's Division of International Programs was re-established as the Office of International Science and Engineering in response to the National Science Board's recommendation that international science and engineering be "a high priority for NSF, with a much stronger focus and a much higher level of visibility." The Office serves as a visible focal point, both inside and outside NSF, for international science and engineering activities; promotes the development of an integrated, Foundation-wide, international strategy; and manages international programs that are innovative, catalytic, and responsive to the broad range of NSF interests. INT's enhanced role will support the Foundation's international science and engineering investments in new and vigorous ways.

SBE Subactivity Funding
(Dollars in Millions)



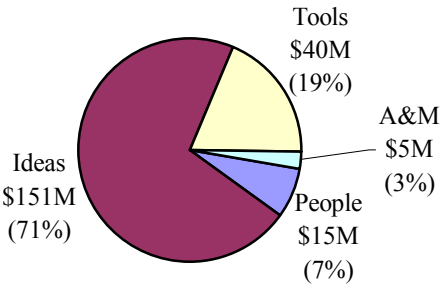
In FY 2000, FY 2001 and FY 2002, INT includes transfers of $15.40 million, $13.75 million, and $13.66 million, respectively, from the U.S. State Department for an award to the U.S. Civilian R&D Foundation.

STRATEGIC GOALS

SBE works to advance the Directorate's programs by linking NSF's three strategic outcome goals of People, Ideas and Tools:

- 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 with the encouragement of CAREER awards and by funding mid-career training of social scientists in emerging, cutting-edge methodologies. Graduate training also is supported through the IGERT program. SBE seeks to enhance diversity through special fellowship competitions; outreach to HBCUs, Hispanic, and other minority serving institutions; and through programs that respond to the need for women in science (e.g., ADVANCE).

FY 2004 SBE Strategic Goals



The Office of International Science and Engineering: INT supports the advancement of NSF's strategic outcome goal of People by developing and maintaining a diverse, internationally competitive and globally engaged workforce of scientists and engineers. INT will support international research and training experiences, especially for students and researchers early in their careers, which promote NSF interests and contribute to strengthening the U.S. scientific enterprise.

- IDEAS: SBE supports fundamental, cutting-edge research in the social, behavioral and economic sciences to better understand individual, collective and organizational behavior. The directorate also seeks to facilitate interdisciplinary work across the SBE sciences and with non-SBE sciences

in order to clarify complexities of human behavior that cannot be understood from the perspective of only one discipline. SBE's broad range of research is directly aimed at advancing NSF's strategic outcome goal of Ideas. 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, and knowledge that enables wiser individual action. Research findings in the psychological, cognitive, and language sciences yield a sharper picture of human behavior and cognition with diverse implications ranging from advancing general knowledge of how human civilizations spread to laying the groundwork for devices that assist disabled individuals in becoming more independent.

The Office of International Science and Engineering: INT will continue to promote partnerships among U.S. scientists and engineers and their colleagues in foreign nations. The National Science Board has noted that, "Collaborative activities and international partnerships provide increasingly important means of keeping abreast of new insights and discoveries critical to maintaining U.S. leadership position in key fields." Research at the frontier requires partnerships with the world's best scientists and engineers and access to the unique research facilities and opportunities found throughout the world. The investigation of global scale problems and phenomena requires international understanding and collaboration.

- 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. These include large-scale longitudinal surveys, international and organizational databases, laboratories and collaboratories, Internet networks, new methods for modeling behavior, and techniques for incorporating spatial and biological information in models of human activity. The SRS Subactivity of SBE 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.

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.

Summary of SBE Funding by Strategic Goal
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	Change Amount	Change Percent
People	11.51	11.02	15.23	4.21	38.2%
Ideas	134.86	143.35	151.15	7.80	5.4%
Tools	33.04	37.99	39.99	2.00	5.3%
Administration and Management	4.56	3.25	5.37	2.12	65.2%
Total, SBE	$183.97	$195.61	$211.74	$16.13	8.2%

People (+$4.21 million, for a total of $15.23 million)

SBE, like other NSF Directorates, regards research and education as mutually reinforcing. The generation of new knowledge and its dissemination so that others may benefit from new scientific understanding go hand in hand. The people supported through SBE-funded projects represent both the

focus of our investments and important products of them. Support for programs specifically addressing NSF's Strategic Outcome Goal of People totals $15.23 million in FY 2004, an increase of $4.21 million over FY 2003. Major SBE increases in FY 2004 include IGERT Traineeships, increasing by $1.27 million to $4.88 million, above the FY 2003 Request of $3.61 million; ADVANCE awards, increasing by $460,000 to $1.28 million, above the FY 2003 Request of $820,000; and support for post-doctorates, increasing by $1.50 million, to $2.90 million above the FY 2003 Request of $1.40 million. New initiatives include the selection of up to 100 U.S. graduate students for a new Summer Institute in China for $500,000; and new support for other graduate student and professional participation in international collaborative activities for $200,000. In FY 2004, it is estimated that SBE programs will provide support for about 5,000 people, including students, researchers, post-doctorates, and trainees. People-oriented support includes increased efforts to strengthen the global orientation of the nation's science and engineering workforce by supporting internationally collaborative research as well as research and training abroad.

SBE People Investments
(Dollars in Millions)

	FY 2003 Estimate	FY 2004 Estimate	Change Amount	Change Percent
Undergraduate	2.22	2.72	0.50	22.5%
Graduate and Professional	8.80	12.51	3.71	42.2%
Total, People	$11.02	$15.23	$4.21	38.2%

The Office of International Science and Engineering facilitates the Foundation's strategic outcome goal of People by providing valuable international experiences for U.S. researchers, particularly those in the early stages of their careers. Participation in collaborative international research and education programs prepares U.S. students and researchers for careers in an increasingly interconnected world. In FY 2004, INT will increase its support for the international dimensions of REUs (Research Experiences for Undergraduates), IGERTs (Integrative Graduate Education and Research Traineeships), and postdoctoral research fellowships. Two programs of special note are the Summer Institutes for U.S. graduate students in Japan, Korea, and Taiwan, which will expand to China in FY 2003; and the Advanced Studies Institutes, which bring together graduate students and postdoctoral fellows from the United States and selected developing countries to explore cutting-edge areas of research.

Ideas (+$7.80 million, for a total of $151.15 million)

SBE promotes NSF's strategic outcome goal of Ideas through a broad range of research support encompassing the social and behavioral science disciplines. Research in economics, political science, sociology, decision-making, and risk analysis yields important societal benefits in the form of increased understanding of cooperation and conflict, better informed public policy and more efficient business management. Research findings in psychological, cognitive, and language sciences are yielding a sharper picture of how human language is acquired and how it is used, both for thought and communication, thus laying the foundation for progress in many areas of major national importance, ranging from teaching children how to read to building computers that can talk. 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. In FY 2004, funding for research in this category is at $151.15 million, an increase of $7.80 million over the FY 2003 Request of $143.35 million.

- SBE will provide support for fundamental research in the social and economic sciences in FY 2004 at $83.92 million, an increase of $6.31 million from the FY 2003 Request of $77.61 million. Fundamental research supported by SBE in the social and economic sciences develops and advances

scientific knowledge focusing on economic, legal, political, and social systems as well as on organizations and institutions. Support will be provided for the development of new research methods applicable across social and behavioral science disciplines and for research on the intellectual and social contexts that govern the development and use of science and technology. During FY 2004, areas of emphasis in the social and economic sciences will include understanding the social causes and consequences of social system shocks, such as market collapses, ethnic violence, floods, earthquakes, and terrorist assaults; risk analysis and decision-making with special attention to extreme events and to the problems of climate change; innovation in the development of mathematical models including the coupling of formal and empirical modeling; integrating qualitative and quantitative methods; building and maintaining longitudinal databases and other fundamental research infrastructure; and furthering our understanding of organizations and other social institutions.

- In FY 2004, SBE will provide support for fundamental research in the behavioral and cognitive sciences at a level of $71.12 million, an increase of $5.82 million from the FY 2003 Request of $65.30 million. Fundamental research supported by SBE in the behavioral and cognitive sciences develops and advances scientific knowledge and methods focusing on human cognition, cognitive neuroscience, language, and learning; children's development, learning, and literacy; social behavior and culture; human social, demographic, and cultural variation; human evolution and contemporary human biological variation; geographic patterns and processes and geographic information science; and interactions between humans and the natural environment. Special emphases for FY 2004 include research on human cognition including work in the multidisciplinary field of cognitive neuroscience; computational linguistics; and research that traces human biological and behavioral changes over time.

- As the focal point for international activities, the Office of International Science and Engineering will provide leadership across the Foundation for the development of new and challenging ways to pursue knowledge across the frontier. INT, as well as other parts of SBE, will invest in NSF priority science and engineering areas by providing support for collaborations in Biocomplexity in the Environment, Information Technology Research, Nanoscale Science and Engineering, Mathematical Sciences, and Human and Social Dynamics. INT will also foster mutually beneficial international collaborations among NSF-supported centers and centers of excellence in other countries.

- Across all of its programs, SBE will continue efforts to increase the average size and duration of the awards, thus enabling scientists to devote a greater portion of their time to actual research. This may contribute to increasing the efficiency of NSF's merit review process and achieving greater cost-effectiveness for both NSF and the scientific community.

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

SBE Centers
(Dollars in Millions)

	FY 2003 Estimate	FY 2004 Estimate	Change Amount	Change Percent
Long-Term Ecological Research Sites	0.20	0.20	0.00	0.0%
Children's Research Initiative Centers	1.50	4.00	2.50	166.7%
National Consortium on Violence Research	1.00	1.00	0.00	0.0%
Research Centers on the Human Dimensions of Global Change	2.30	0.00	-2.30	N/A
Environmental Social and Behavioral Science Centers	0.00	3.50	3.50	N/A
Climate Change Research Initiative Centers	0.00	4.50	4.50	N/A
Total, Centers Support	$5.00	$13.20	$8.20	164.0%

- In partnership with the Directorate for Biological Sciences, SBE will maintain combined support in FY 2004 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. Together, the 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; individually, they support leading-edge research about children and media, developmental science, and the integration and dissemination of developmental science to inform both research and policy. In FY 2003, up to three new centers are proposed, with up to an additional three centers proposed in FY 2004.

- The National Consortium on Violence Research (NCOVR), based at Carnegie Mellon University, is engaged in a program of capacity building in the violence research community. The Consortium's activities focus 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 research and the promotion of intellectual exchanges that cut across disciplines. NSF is providing about $1.0 million in support for the Consortium in FY 2003. Support in FY 2004, contingent on review of a renewal proposal in 2003, will be $1.0 million.

- Following a new competition, NSF intends to continue providing support for 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. NSF's FY 2004 support for two or three new Environmental Social and Behavioral Science Centers is expected to total $3.50 million, a $1.20 million increase from the level that supported the Human Dimensions of Global Change Centers in FY 2003 during their final year of funding.

- SES intends to fund three to five centers focusing on Risk Analysis and Decision-making in relation to global climate change as part of the government-wide Climate Change Research Initiative. The FY 2004 investment in these centers is expected to total $4.50 million, with the expectation that continuing support at this level will be available yearly for three additional years. The centers will involve interdisciplinary teams that will push the frontiers of research on risk analysis and decision-making in ways that will enhance our nation's capacity to evaluate the risks associated with climate change and to develop policies and decisions based on realistic appraisals of risks. Centers will be expected not just

to engage in basic research on risk analysis and decision-making with implications for climate change, but also to link with stakeholders as they develop their research activities. In addition to advancing the science of risk analysis and our understanding of decision-making, center agendas may include developing and testing ways of communicating risks to stakeholders and cross-culturally, exploring methods for incorporating stakeholders in decision-making processes, and educational components that focus on professionals in training, community risk managers and/or ordinary citizens.

Priority Areas

- In FY 2004, SBE will support research and education efforts related to broad, Foundation-wide priority areas in Biocomplexity in the Environment, Information Technology Research, Nanoscale Science and Engineering, Mathematical Sciences, and Human and Social Dynamics. SBE also will support the formation of collaborative international research teams to address each of these priority areas.

SBE Investments in Priority Areas
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
Biocomplexity in the Environment	3.00	1.65	2.50	0.85	51.5%
Information Technology Research	4.36	4.65	5.15	0.50	10.8%
Nanoscale Science and Engineering	0.00	1.11	1.50	0.39	35.1%
Mathematical Sciences	N/A	1.10	1.50	0.40	36.4%
Human and Social Dynamics	N/A	10.00	15.90	5.90	59.0%

- **Biocomplexity in the Environment (BE):** In FY 2004, SBE will increase its level of support for BE by $850,000 to $2.50 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.

- **Information Technology Research (ITR)**: In FY 2004, SBE will provide $5.15 million for ITR, an increase of $500,000 over the FY 2003 Request. These funds will support fundamental research using a wide array of new information technology research methods in the social and behavioral sciences, including fundamental research on geographic information science. In addition, these funds will support fundamental research of social, economic, and workforce issues associated with computational social science and will assemble international collaborative teams to conduct ITR research.

- **Nanoscale Science and Engineering (NSE):** In FY 2004, SBE will provide $1.50 million for NSE, an increase of $390,000 over the FY 2003 Request. This funding for NSE will support 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 2004, SBE continues its support for Mathematical Sciences at $1.50 million, an increase of $400,000 over the FY 2003 Request. These funds will support development of collaborative teams consisting 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 2004, SBE will provide $15.90 million, an increase of $5.90 million over the FY 2003 Request, to expand the Human and Social Dynamics priority area. SBE will support basic research that is primed for major 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 aims at enhancing human performance, understanding the social, economic and behavioral implications of technology and other drivers of societal change, and advancing the scientific study of risk analysis and decision-making in the face of uncertainty. The priority area will also work to build capacity in the social, economic and behavioral sciences by advancing spatial social science, supporting cutting-edge mathematical and statistical modeling, and investing in needed data sets and other fundamental social and behavioral science infrastructure. Priority area funding aimed at these last three goals bridges the Ideas and Tools categories, although some proposals and initiatives will fall more into one area than the other.

Tools (+$2.0 million, for a total of $39.99 million)

SBE promotes the development of Tools by taking advantage of new information technologies as it directs resources into research-enhancing investments such as web-based collaboratories, digital libraries, and databases, including the science resources data and analysis produced by the Science Resources Statistics Subactivity. In FY 2004, SBE will provide $39.99 million to support the development of tools to enhance the conduct of research and education. This is an increase of $2.00 million from the FY 2003 Request level of $37.99 million.

- SBE will provide $26.70 million for support of the Science Resources Statistics Subactivity, an increase of $1.0 million over FY 2003. This enables NSF to fulfill its statutory mandate to produce data and analysis on the scientific and engineering enterprise. In FY 2004, $8.50 million will support the implementation of survey redesign activities for the 2003 National Survey of College Graduates based on the 2000 Decennial Census.

- In FY 2004, SBE will increase by $890,000, to $15.52 million, support for the development of widely accessible research databases, web-based collaboratories, and other projects that provide fundamental infrastructure for large, diverse scientific communities. These tools are essential components of the research agenda of the social and behavioral sciences. Building on new computational and communications technology, new products will collect and integrate economic, cultural, cognitive, psychological, social, political and geographic data and provide more powerful tools for analysis and dissemination. Some efforts will allow new scientific gains to be extracted from existing data, while others will extend new methodologies from the narrow areas where they are being developed to broader application or multiple research sites. Additions to science and technology databases will illuminate research on critical issues like globalization, the development of new industries, and factors that shape the scientific workforce.

Administration and Management

Administration and Management provides for administrative activities necessary to enable NSF to achieve its strategic goals. Requested funding for FY 2004 is $5.37 million, an increase of $2.12 million over the FY 2003 Request of $3.25 million. This includes the increased costs of Intergovernmental Personnel Act appointments and contractors performing administrative functions. The increase in FY 2004 represents new A&M costs associated with the expansion of the Human and Social Dynamics priority area and establishing an international office in Beijing, China.

QUALITY

SBE maximizes the quality of the research and development (R&D) it supports through the use of a competitive, merit-based review process. The percent of basic and applied research funds that were allocated to projects that undergo merit review was 84 percent for SBE in FY 2002, the last year for which complete data exist. Within the BCS and SES subactivities, 97 percent of all projects undergo merit review.

SBE uses various internal and external mechanisms to review the relevance of proposed and existing programs to help identify emerging opportunities and goals for the future. These include the SBE Advisory Committee, which meets semiannually to provide ongoing reviews of the Directorate's activities and to advise on potential future directions. Other internal and external review mechanisms include Committees of Visitors, National Academy of Sciences reports, blue ribbon panels, workshops, and long-range planning documents, among others.

PERFORMANCE

Recent Research Highlights: Examples of significant discoveries or advances resulting from SBE-supported research include:

- With NSF support, Tim White of the University of California at Berkeley and colleagues are studying *Homo erectus*, a fossil hominid that may have originated approximately two million years ago. Studying fossils in Ethiopia, White found *Homo erectus* fossils from about a million years ago that are similar to contemporaries in Asia, Europe and sub-Saharan Africa. The researchers determined that, like other large mammals, *H. erectus* was a species comprising local populations that differed slightly but as a result of gene flow did not branch into independent species. Subsequent climatic changes likely played a critical role in splitting this widespread species into *Homo sapiens* in Africa and Neanderthals, an evolutionary dead end, in Europe. (Award #9910344) http://www.eurekalert.org/pub_releases/2002-03/uoc--efs031802.php

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- Researchers conducted a study on the costs and benefits of bank bailouts, with a focus on how bailouts affect the economy. The authors established that there is a reciprocal relationship between bank bailouts and aggregate liquidity, and that depending on the characteristics of banks in danger of failing, their failure can either add to or subtract from the aggregate pool of liquidity. The implication is that under some defined conditions, an economic system that would otherwise stabilize with a few bank failures could collapse completely as a result of bank bailouts. (Award #9975209) http://gsb.uchicago.edu/fac/douglas.diamond/ or http://gsb.uchicago.edu /fac/raghuram.rajan/

- The Survey of Undergraduate Programs in the Mathematical and Statistical Sciences in the United States has examined four-year college and university undergraduates and found that fewer mathematics bachelor's degrees have been awarded since 1995 (down 14 percent), part-time faculty has increased substantially since 1990 (up 35 percent) and statistics course enrollments have gone up 45 percent since 1990. The survey also found that since 1995, there has been a 600 percent increase in temporary full-time faculty at the two-year college level and an 8 percent drop in full-time permanent faculty. The report comes out at a time when both the scientific community and the general public are becoming more aware that mathematics is the foundation for the other sciences. (Award #9900736)

- As part of the East Asia Summer Institute Program, Sarah Albano, a graduate student at the University of Washington, spent the summer of 2002 at the University of Tokyo analyzing groundwater data near two active Japanese volcanoes. These data, combined with analogous data that Albano obtained previously on Mt. Pinatubo in the Philippines, will offer insight into how changes in groundwater levels may predict volcanic eruptions. Sean Duffy, a graduate student at the University of Chicago, spent the summer of 2002 at Kyoto University extending and refining his study of differences in the ways that Americans and Japanese perceive objects relative to their environment. The studies that Duffy and his Japanese colleagues conducted will reveal how human cognitive functions are conditioned by cultural factors. Albano and Duffy were among 102 American graduate students who spent the summer of 2002 conducting research in Japan, Korea and Taiwan in NSF's East Asia Summer Institute Program, which will be expanded in 2003 to include China.

Other Performance Indicators

Key SBE performance metrics include the number of people supported by SBE awards and the funding profile for the directorate. The tables below show the growth in the number of people benefiting from SBE's funding and trends in growth of award size, duration and number.

Number of People Supported in SBE Activities

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate
Senior Researchers	1,751	1,875	2,030
Other Professionals	335	345	375
Postdoctorates	100	130	140
Graduate Students	1,334	1,405	1,520
Undergraduate Students	640	860	930
Total Number of People	4,160	4,615	4,995

Totals may not add due to rounding.

Social, Behavioral and Economic Sciences Funding Profile

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate
Number of Requests for Funding	4,536	4,430	4,790
Dollars Requested (in millions)	$1,462	$1,500	$1,620
Total Number of Awards	1,869	2,060	2,230
Statistics for Competitive Awards:			
Number	1,265	1,415	1,500
Funding Rate	33%	32%	32%
Statistics for Research Grants:			
Number of Research Grants	814	882	900
Median Annualized Award Size	$50,130	$55,795	$60,000
Average Annualized Award Size	$63,770	$73,394	$80,000
Average Duration (yrs.)	2.3	2.6	2.7

SOCIAL AND ECONOMIC SCIENCES $83,920,000

The FY 2004 Budget request for the Social and Economic Sciences (SES) Subactivity is $83.92 million, an increase of $6.31 million, or 8.1 percent, from the FY 2003 Request of $77.61 million.

Social and Economic Sciences Funding
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
Social and Economic Sciences	68.29	77.61	83.92	6.31	8.1%
Total, SES	$68.29	$77.61	$83.92	$6.31	8.1%

The SES Subactivity supports research to develop and advance scientific knowledge, focusing on human activity in the context of economic, legal, political and social systems, and governments, business organizations, and other institutions. SES also supports inquiry into the social aspects of science and technology and participates in NSF-spanning multidisciplinary research and educational activities.

SES includes the fields of economics; decision, risk and management sciences; political science; law and social science; sociology; ethics and values studies; science and technology studies; methodology, measurement and statistics, and cross-disciplinary activities, including a program in Innovation and Organizational Change, co-funded by Engineering. Knowledge arising from SES-supported research is disseminated to, and used by, many branches of the federal government, as well as by state and local governments, private corporations, charitable organizations, and other institutions.

SES sponsored research has fundamentally advanced the methods and theories of the social and economic sciences, while yielding important practical results and societal benefits. For example, SES supported the Nobel Prize winning research of Daniel Kahneman and of Vernon Smith that laid the groundwork for behavioral economics and experimental economics. As importantly, SES fostered research building on Kahneman and Smith's path-breaking contributions. This body of work helped give these approaches to economics the importance they have today. Benefits to society have been immense. For example, implications of auction theory were tested at an NSF-funded experimental economics laboratory building on methods Smith pioneered. This testing supplied scientific support for the design of the Spectrum Auction, which returned more than $10 billion to the United States Treasury.

SES supported research is just as significant in fields without Nobel Prizes. Archbishop Desmond Tutu welcomed James Gibson's study of political tolerance in South Africa, saying, "This groundbreaking study…is timely in looking for solutions to what could so easily subvert what so many laboured so valiantly for and [for which] many others gave their lives." Other important work draws on SES supported shared-use databases and research platforms that deal with cyclical, intergenerational, and life-course measures of economic and social behavior. This infrastructure is central to research that advances fundamental understandings of such socially important phenomena as income dynamics, teenage childbearing, divorce, the social implications of race and gender, consumer spending and saving, political preferences, and education and job choices. Other important SES-sponsored research has pushed the frontiers of risk analysis and decision-making with practical societal benefits as diverse as improved medical diagnostic systems and more effective monitoring of nuclear plant safety.

In FY 2004, the SES Request of $83.92 million will support a range of activities, including:

- Research on decision-making under uncertainty in support of the Climate Change Research Initiative. This research investment, proposed to begin in FY 2003, is aimed at producing new understandings of how to analyze and manage risks associated with climate change as well as tools, perspectives, and information to assist individuals, groups, and organizations in the development of public policies and in private-sector decision-making. ($5.0 million)

- Research on social system shocks and extreme events, including research into their causes and aftermaths and their implications for risk analysis and decision-making. We will add to our store of knowledge on an array of vital topics, such as terrorism; the consequences of economic and social shocks for people, markets and organizations; and the formation and trajectories of beliefs, trust, and cooperation in the face of newly-sensed threats and vulnerabilities and their implications for risk assessments and precautionary decision-making. ($3.0 million)

- Support for key social, economic, and demographic databases and for research on human and social capital. Supported research will collect, organize and disseminate large data sets that allow researchers to explore the effects of beliefs, families, educational institutions, businesses, and communities on the acquisition of skills and education and their deployment in work, family and leisure activities. Knowledge gained from these databases will advance our understanding of social behavior and is likely to inform private, state, and federal approaches to investing in human and social resources. These infrastructure investments also can be expected to form the empirical bases for doctoral dissertation research across the social and economic sciences. ($12.0 million)

- Funding to support the development and use of cutting-edge methodologies in the social and behavioral sciences. One aspect of this investment, already underway, is a major effort to promote the linkage of formal theory and empirical research in understanding specific social, political, and economic issues. This research emphasis has and will continue to involve cross-disciplinary work teams, conferences, educational activities, and training institutes. In addition, SES will foster active collaborations between mathematical scientists and social and behavioral scientists as part of NSF's Mathematical Sciences priority area and will support efforts to advance the science of evaluation research and to make better use of qualitative data. ($8.0 million)

- Funding for inquiries into the social implications of modern technologies (e.g., nanotechnology and the Internet) and other drivers of social change. Supported research will examine sources of scientific discovery and technological innovation, the processes by which innovations diffuse through society, the social impact of new technology, and the ethical and value implications of scientific discoveries in both historical perspective and contemporary life. Other agents of change likely to be the subject of new research include mass migrations, political upheavals, ethnic conflict, legislation, the mass media, economic policies, and terrorist and environmental threats. ($10.0 million)

- Investments in the above areas will occur both through special competitions and existing programs. In addition, SES will maintain the health of its core disciplines through its support of existing disciplinary and cross-disciplinary programs. This support will fund a wide variety of peer-reviewed, investigator-initiated research that promises to expand extant knowledge bases while pushing disciplinary frontiers, as well as smaller high risk/high payoff proposals funded as Small Grants for Exploratory Research (SGER). Program funds will also support workshops designed to set future research priorities, major long-term grants to promote the integration of teaching and research by the nation's most able new investigators, programs to enhance the progress of women and minorities in the academic disciplines, and education at the graduate and undergraduate levels. ($45.92 million)

BEHAVIORAL AND COGNITIVE SCIENCES $71,120,000

The FY 2004 Budget Request for the Behavioral and Cognitive Sciences (BCS) Subactivity is $71.12 million, an increase of $5.82 million, or 8.9 percent, from the FY 2003 Request of $65.30 million.

Behavioral and Cognitive Sciences Funding
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
Behavioral and Cognitive Sciences	58.56	65.30	71.12	5.82	8.9%
Total, BCS	$58.56	$65.30	$71.12	$5.82	8.9%

The BCS Subactivity supports research and related activities that develop and advance scientific knowledge and methods focusing on human cognition; cognitive neuroscience; language; children's development, learning and literacy; social behavior and culture; human social, demographic, and cultural variation; human origins and contemporary human biological variation; geographic patterns and processes; geographic information science; and interactions among individuals, societies and the natural and built environment. Programs include archaeology, cultural anthropology, physical anthropology, geography and regional science, cognitive neuroscience, developmental and learning sciences, human cognition and perception, linguistics, and social psychology.

An expanding set of strong core disciplinary programs is balanced by an increased emphasis placed on collaborative, interdisciplinary projects that build capacity across multiple fields. One group of activities will focus on human cognition and computational linguistics and their relationship to improvements in human performance. The understanding of the fundamental processes that support basic and higher level cognitive functions, such as perceiving, reasoning, interacting, learning, and communicating, will be improved by coupling theoretical insights with sophisticated experimentation using modern instrumental techniques, including on-line behavioral and physiological data capture, virtual reality and other simulations of social interactions, and computer-based displays of complex information, such as visual flow fields. These approaches encourage partnerships to contribute to the development of new methods for understanding and enhancing performance in the home, classroom, workplace, and elsewhere.

Human communication and man-machine interaction will be improved through the convergence of new technologies and theoretical advances in the study of human behavior, cognition, and language and their social, cultural, and developmental context. Lines of inquiry related to human language that hold special promise include language processing, corpus linguistics, pragmatics, multi-modal communication, and language documentation and preservation. Another rapidly emerging field is cognitive neuroscience. Because of the scale and complexity of work in these and other areas, BCS will fund larger-scale projects and innovative technical developments that will also help train future generations of behavioral and cognitive scientists. These projects will focus on strengthening our understanding of the basic mechanisms of cognition, perception, action, language structure and use, and social and affective behavior, and will help explain when and how children and adults learn new knowledge and skills.

Research in the developmental and learning sciences will support integrative studies of cognitive, linguistic, social, cultural, and biological processes related to children and adolescents' learning in formal and informal settings. Ongoing support will be provided for the Children's Research Initiative for research that incorporates multidisciplinary, multi-method, microgenetic, and longitudinal approaches. This initiative will help develop new methods and theories; examine the transfer of knowledge from one

domain to another and from one situation to another; assess peer relations, family interactions, social identities, and motivation; examine the impact of family, school, and community resources; assess adolescents' preparation for entry into the workforce; and investigate the role of demographic characteristics and cultural influences on children's learning and development.

BCS will continue its support of research on the essential shared characteristics of human beings within a broad chronological and spatial context. The Humans Origins emphasis (HOMINID) will support several large-scale awards. This emphasis will rely heavily on powerful genetic technology and on the details of human and other species' genome sequences, and it will pay increasing attention to comparative genomics.

BCS is helping establish a strong infrastructure for future research by supporting projects such as the establishment of the National Historical Geographic Information System (NHGIS), which will provide free public access to U.S. Census databases from 1790 to the present, including the digitization of all census geography so that place-specific information can be readily used in geographic information systems. Through these activities, the NHGIS will become a resource that can be used more widely for secondary education and training and become a reference resource used by policy makers.

In FY 2004, the BCS Request of $71.12 million will support a range of activities, including:

- Funding for the Cognitive Neuroscience program, maintained at a level of about $7.0 million. In order to enhance understanding of the relationship between human behavior and brain function, emphasis will be on supporting state-of-the-art work that is informed by theoretical advances in cognition, perception, social psychology, linguistics and human development. Support also will be provided for large-scale meta-analysis of data from multiple subjects.

- Funding for the Human Origins emphasis (HOMINID), maintained at a level of $2.0 million. This emphasis area will continue to expand knowledge of the origins and development of the human species, the relationship of humans and the world's environments, and human adaptation processes over the last five million to six million years.

- Disciplinary and interdisciplinary research on human-environmental interactions, which totals about $10.0 million. This area includes support for two or three new environmental social and behavioral science centers, for Long-Term Ecological Research sites, and for research on the Dynamics of Coupled Natural and Human Systems, a major emphasis of the Biocomplexity priority area.

- Support for special emphasis in the areas of enhancing human performance, agents of change, spatial social science, modeling, and infrastructure and data resource development at a level of $6.0 million.

- Support for the Children's Research Initiative, maintained at a level of $5.0 million. Research related to enhancing literacy and improving math and science skills will be emphasized.

- Funding will be maintained for core disciplinary and interdisciplinary research in the geographic, anthropological, archaeological, cognitive, psychological, and linguistic sciences ($40.0 million). These funds will also support workshops designed to set future research priorities, grants to promote the integration of teaching and research by the nation's most able new investigators, programs to enhance the progress of women and minorities in the academic disciplines, and education at the graduate and undergraduate levels.

SCIENCE RESOURCES STATISTICS $26,700,000

The FY 2004 Budget Request for the Science Resources Statistics (SRS) Subactivity is $26.70 million, an increase of $1.0 million, or 3.9 percent, from the FY 2003 Request of $25.70 million.

Science Resources Statistics Funding
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
Science Resources Statistics	16.28	25.70	26.70	1.00	3.9%
Total, SRS	$16.28	$25.70	$26.70	$1.00	3.9%

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 research and analysis, 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 *Science and Engineering Indicators* and *Women and 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 2004 build on prior efforts to improve the quality, relevance, timeliness, and accessibility of SRS products, continue the redesign of major components of SRS data collections, and implement such redesigns.

- 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 fiscal years 2000, 2001, and 2002. Implementation of the redesign was undertaken in FY 2002 and FY 2003. SRS will begin data collection of the *National Survey of College Graduates 2003* in October 2003. Data collection will continue through much of FY 2004 and initial data processing will also be undertaken. In FY 2004, data processing will be completed, as will release of the data files, and initial analysis of the data.

- At the end of FY 2002, a major National Academy of Sciences (NAS) review of the SRS R&D portfolio of surveys was initiated which is expected to lead to proposed major revisions of the R&D survey portfolio. This multi-year (2003-2005) review is in compliance with NSF policy requiring a Committee of Visitors review of NSF programs on a rotating basis. The NAS review is also in compliance with Section 25 of Public Law No. 107-368 for a review of discrepancies in the R&D data collection.

- During FY 2003, 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 continued. Improvements to both surveys will be implemented on an ongoing basis during FY 2004 concurrent with major multi-year redesign efforts for both surveys.

- In FY 2004, SRS will begin a comprehensive study of the feasibility of developing a new ongoing survey to collect information about individuals in postdoctorate positions.

- SRS will continue in FY 2004 to conduct its other surveys and analytical activities that produce the information for carrying out the NSF statutory mandate, for meeting the Tools strategic outcome goal of providing "broadly accessible, state-of-the-art and shared research and education tools," and for developing *Science and Engineering Indicators* and *Women, Minorities, and Persons with Disabilities in Science and Engineering*.

- In FY 2004, SRS will continue to explore options for the redesign of an ongoing mechanism to obtain current information on public attitudes toward science and engineering for inclusion in the *Science and Engineering Indicators* report.

INTERNATIONAL SCIENCE AND ENGINEERING $30,000,000

The FY 2004 Budget Request for the Office of International Science and Engineering (INT) is $30.0 million, an increase of $3.0 million, or 11.1 percent, from the FY 2003 Request of $27.0 million.

International Science and Engineering Funding
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
International Science and Engineering[1]	40.84	27.00	30.00	3.00	11.1%
Total, INT	$40.84	$27.00	$30.00	$3.00	11.1%

[1]FY 2002 includes a transfer of $13.66 million from the U.S. Department of State for an award to the U.S. Civilian Research and Development Foundation.

The Office of International Science and Engineering (INT) supports the advancement of NSF's strategic outcome goals of Ideas and People. By its nature the scientific enterprise is global. To ensure the generation of new knowledge across the frontiers of science and engineering, it is essential that U.S. scientists have opportunities to be engaged with the best collaborators and access to facilities found throughout the world. INT supports cooperative research activities with developed and developing countries in all fields of science and engineering supported by the Foundation. INT complements and enhances the Foundation priority areas and program approaches by providing the opportunity for international engagement. INT supports activities that provide access to critical research conducted outside the United States and that broaden the base of knowledge about mutually beneficial science and technology opportunities abroad.

INT facilitates the advancement of NSF's strategic outcome goal of People – to develop and maintain a diverse, internationally competitive and globally engaged workforce of scientists and engineers. INT supports research and related activities that promote partnerships between U.S. and foreign researchers. INT supports U.S. participation in both bilateral and multilateral workshops and symposia, the initial phases of collaborative research, key selected multinational scientific bodies, and individual and small group research training.

INT provides valuable international experiences to U.S. researchers, particularly those in the early stages of their careers. Specific INT-supported activities include:

- Summer research experiences for students in selected regions of the world;
- Postdoctoral research opportunities abroad;
- Inclusion of students in international cooperative research projects; and
- Opportunities for U.S. researchers to develop collaborations with their counterparts in other countries.

Together, these activities will promote progress in research and education. These activities will also enable the next generation of U.S. researchers to experience the international nature of research and to maintain U.S. leadership in an increasingly global research environment.

With the continuing growth of scientific expertise and resources worldwide, there are increasing opportunities for international cooperation in areas of mutual interest or concern. For example, to ensure that the U.S. research community stays at the forefront of the fast-changing area of nanoscale science and engineering, INT is supporting several centers as well as interdisciplinary research teams in this field. In

the area of information technology research, INT supports U.S. researchers in collaborations on international standards, cross-cultural communication, and comparison of research methods. In the area of biocomplexity in the environment, some of the most challenging scientific questions are best studied in environmental systems outside the United States. INT supports a range of projects in the dynamics of coupled natural and human systems, including a study of people, policies, and pandas in China's Wolong Nature Reserve and a comparative study on how human activities influence forest dynamics in Venezuela and Texas.

Ensuring that the next generation of scientists and engineers understands and experiences the global nature of research and development is an objective of many of INT's investments. In FY 2002, INT supported 37 international postdoctoral fellowships. These fellowships support postdoctoral research in a foreign laboratory and involved researchers from 24 states working in 19 different countries.

The summer institutes in Japan, Korea, and Taiwan provide an opportunity for U.S. graduate students to conduct a summer research project in a host lab. The program is also supported by the National Institutes of Health. In FY 2002, 102 U.S. students participated in these summer institutes, investigating research topics that included: high intensity laser techniques for particle acceleration, the design of a new wheeled omnidirectional robot, and a comparison of the cancer screening services in the United States and Japan. In FY 2003, the summer institute program will be expanded to China, and up to 100 U.S. students may participate in FY 2004.

Cooperation with China has been an area of increasing interest and opportunity for U.S. scientists and engineers. In FY 2004, INT plans to open an office in Beijing to accommodate the expected increase in collaborative activity.

In FY 2004, INT will emphasize:

- Investing in NSF priority science and engineering areas by providing support for international collaborations in Biocomplexity in the Environment, Information Technology Research, Nanoscale Science and Engineering, Mathematical Sciences, and Human and Social Dynamics.

- Developing new types of international research and training experiences that promote NSF interests and contribute to strengthening the U.S. scientific enterprise.

- Fostering mutually beneficial collaborations between NSF-supported research centers and equivalent research institutions in other countries.

- Encouraging opportunities that provide future U.S. scientists and engineers with international research experiences early in their careers.

- Promoting international networking and connectivity in research and education collaboration through the use of advanced information technology.

- Supporting international scientific organizations that are of high priority to the interests of the U.S. scientific community.

- Promoting a Foundation-wide vision of international research and education.