HUMAN AND SOCIAL DYNAMICS

The Human and Social Dynamics (HSD) investment area supports multidisciplinary approaches to understanding change in human and social systems and their environments. HSD aims at scientific breakthroughs that will aid people, policy makers, and organizations as they seek to understand, manage, and adapt to change.

Almost every major challenge this country faces, ranging from climate change, to terrorism, to the need for a competitive and innovative workforce, has at its core important human and social dynamics. New technologies, such as high-speed computers, remote sensing and functional magnetic resonance imaging machines, and new methods for collecting and analyzing data have dramatically increased the contributions that the social, behavioral, and economic sciences can make towards understanding the processes that shape individual, organizational, and social action. HSD builds upon unprecedented opportunities for fruitful synergies across the social and behavioral sciences and with other fields of science and engineering. Together the NSF directorates can push the frontiers of knowledge, where discovery and innovation are likely.

The title *Human and Social Dynamics* captures the investment area's crucial defining elements. HSD focuses on human beings, with special attention to both individual behavior and cognition and to groups, organizations, societies, and institutions, as they influence and are affected by changes in social and physical environments. HSD focuses on understanding systems that are constantly changing. Interactions and feedbacks in these dynamic systems are not adequately captured by standard linear models and transcend traditional disciplinary boundaries, mandating collaborations across the breadth of the sciences.

This focus on the dynamic aspects of human and social behavior promises to bring about important advances in what is known about human action and development as well as organizational, cultural, societal, and technological adaptation and change. The HSD investment area requires research by interdisciplinary teams, and encourages international collaborations that link researchers from SBE science disciplines with those from other science and engineering disciplines.

Human and Social Dynamics Funding

(Dollars in Millions)

	FY 2006 Actual	FY 2007 Request	FY 2008 Request	Change over FY 2007 Amount	Change over FY 2007 Percent
Biological Sciences	$0.50	$0.50	$0.50	-	-
Computer and Information Science and Engineering	3.02	5.00	2.00	-3.00	-60.0%
Engineering	2.00	2.00	1.50	-0.50	-25.0%
Geosciences	1.35	1.35	1.35	-	-
Mathematical and Physical Sciences	0.50	0.50	0.50	-	-
Social, Behavioral and Economic Sciences	31.40	31.40	31.40	-	-
Office of International Science and Engineering	0.50	0.50	0.50	-	-
Office of Polar Programs	0.20	0.20	0.20	-	-
Total, Human and Social Dynamics	$39.47	$41.45	$37.95	-$3.50	-8.4%

Totals may not add due to rounding.

This investment area began in FY 2003 within the Social, Behavioral, and Economic Sciences Directorate (SBE). In FY 2004, the first full year of HSD, it expanded to reach across all NSF science and engineering disciplines. In response to the large number of meritorious submissions, NSF has increased the funds available in each subsequent year until FY 2007.

Increased funding allowed NSF and HSD to respond quickly to the East Indian Tsunami in December 2004 and Hurricane Katrina in August 2005. Several HSD awards were made using the NSF Small Grants for Exploratory Research (SGER) mechanism, which is designed to allow researchers to engage in time-sensitive data collection and research. After Hurricane Katrina, 187 HSD SGER proposals were received, resulting in 33 awards. Funded projects included studies investigating ways to improve disaster response efforts; how the physical/built environment influences a region's vulnerability to hurricanes; which populations evacuate and which do not; and how schools in nearby regions cope with large, sudden influxes of students.

In the FY 2006 competition, 342 Exploratory Research and Research Community Development (ERCD) and Full Research proposals were considered, and SBE made 90 awards, yielding a success rate of 26 percent. This most recent set of HSD awards includes research on how the interplay of federal and state government policies influence responses to extreme events, including terrorist activities; how humans respond to natural, technological, and human disasters, with the goal of better planning for disasters and improving management and recovery efforts; how institutions and organizations can learn from and respond to environmental threats; how computer-mediated environments affect the production and practices of deception in order to improve methods for detecting and countering deception; and how distance and leadership configurations influence team dynamics in partially distributed teams.

Annual Principal Investigator meetings, which began in FY 2005, are showing substantial results and interesting insights across many domains.

Long-term Goals: The Foundation is emphasizing interdisciplinary research that will:

- Improve decision making through research that focuses on individual, group, and societal attempts to identify, characterize, evaluate, and manage situations that call for choices and decisions and involve changing perceptions of uncertainty and risk.

- Explore the causes and consequences of large-scale social transformations, including globalization, democratization, scientific and technological innovation, and the changing development of human societies and their institutions and subsystems over time.

- Advance understanding of changes in human behavior and performance, at the individual, social, and population levels, by exploring the biological, neurological, sensory-motor, psychological, informational, and social and organizational systems that produce or impede coordinated efforts within and between individuals.

- Develop new methods, tools, and enhancements in cyber and other scientific infrastructure needed to promote path-breaking disciplinary and interdisciplinary contributions in the natural and physical sciences, as well as in the social and behavioral sciences and engineering.

- Encourage researchers to "think big" about integrated research questions, through grants of a size and duration that allow substantial coordination across researchers, disciplines, and project areas.

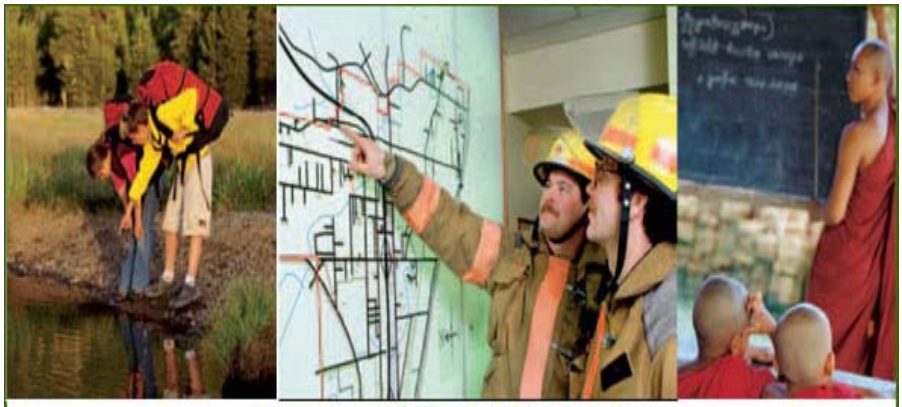
- Significantly advance data resources and stimulate new problem definitions and framings within which novel research techniques can be tested and put into practice.

Long-term Funding for Human and Social Dynamics
(Dollars in Millions)

FY 2003 Actual	FY 2004 Actual	FY 2005 Actual	FY 2006 Actual	FY 2007 Request	FY 2008 Request	FY 2009 Estimate
$4.46	$30.07	$38.31	$39.47	$41.45	$37.95	$37.95

Estimate for 2009 does not reflect policy decisions and is for planning purposes only.

FY 2008 Areas of Emphasis: In FY 2008, NSF plans to invest $37.95 million in interdisciplinary research on *Human and Social Dynamics*, a $3.50 million decrease compared to the FY 2007 Request of $41.45 million. Team efforts and international collaborations will be encouraged and a mixed portfolio will be funded, including major research projects and exploratory projects aimed at research community development, education, and improvement of tools and infrastructure. Change remains the focus of the FY 2007 – FY 2008 competition, which will continue to support research at various scales, including individual, group, and organizational behavior as structured phenomena that develop over time. This focus continues with the substantive themes of prior HSD competitions: dynamics of human behavior; decision making, risk, and uncertainty; and agents of change.


Human and Social Dynamics

- **Dynamics of Human Behavior –** A wide range of intertwined sciences contributes to this research, which explores social, cognitive, linguistic, developmental, organizational, cultural, and biological processes that affect behavior. Relevant research includes work on the development of human communication, the cognitive as well as organizational requisites for innovative action, and the resilience of individuals, groups, and organizations to unexpected, exogenous shocks. Such research can model ways to improve human interaction in settings ranging from research laboratories to neighborhoods to school classrooms to the work place.

- **Decision Making, Risk, and Uncertainty –** Research on decision making, risk, and uncertainty enables a better understanding of such matters as the cognitive neuroscience of risk assessment, hypothesis construction and testing in the face of biases, distributed versus centralized decision making, the construction of effective decision support systems, and risks posed by extreme events, such as natural disasters and terrorist attacks. Development of testbeds can examine vulnerability and resilience, and extrapolate and predict future losses and loss mitigation possibilities.

- **Agents of Change –** HSD research examines the dynamics and consequences of large-scale social transformations, such as the interactions of science and technology with globalization and

democratization, and more focused systemic changes, such as the interactions of political, economic, environmental, and educational systems with agents of change. One goal is to gain a better understanding of how social systems and their constituent parts react to different drivers of change, ranging from ideology to the internet.

In these focal areas, HSD also supports advances in the infrastructure, tools, education, and resources needed to achieve breakthroughs. These include cybertools such as sensors and modes of connectivity; advances in modeling, including agent-based modeling, network analysis, and non-linear dynamics; improved methods to organize and analyze complex datasets; and projects to improve such infrastructure as instrumentation, virtual collaborations and laboratory networks, and data resources. Developments in spatial social science, for instance, have led to the use of geo-spatial tools to integrate locational information with other social data to shed light on effects of neighborhood on crime, diffusion of innovations, and growth of virtual, regional, and global networks. Educational efforts aim at promoting interdisciplinary approaches, instructing user communities in the use of promising tools and models, and communicating the fruits of the HSD investment area to students at all levels.

In FY 2009, the last year of the HSD program, NSF plans to invest $37.95 million in HSD activities as shown above. In future years, these activities will be part of ongoing programs in the participating areas. There is strong commitment for continuation of interdisciplinary HSD related-partnerships.

Recent Research Highlight

► **The Eyes Have It Over Words for Rapid, Complex Communication:** Speech is the single most-powerful mode for coordinating human activities. But it is not always the best mode, especially in time-critical situations that require conveying complex messages or spatial information. Words must still be said one after the other, no matter how fast one talks, and spatial information is notoriously difficult to articulate.

This can create problems during natural disasters or terrorist attacks, when responders must interact as a coordinated unit, when decisions need to be made quickly, and when collaborations are occurring at a distance via the Internet and multimedia devices.

To help meet that challenge, Stony Brook University psychologist Gregory Zelinsky and his coworkers have developed a method that allows remotely located collaborators to monitor each other's focus of attention by tracking their eye movements. Lightweight head-mounted eye-trackers transmit the users' gaze positions to their partners' computer displays, where the positions appear as moving cursors. Each collaborator is therefore able to see, in near real time, where everyone else is looking.

Using this shared gaze technology, the researchers established that collaborators quickly learn to coordinate their looking behavior. Moreover, when shared gaze was pitted against speech in a time-critical task, shared gaze was the clear winner—by 30 percent in one experiment. In another experiment, shared gaze halved the time that it took one collaborator to verbally communicate a target’s location to her partner.

Zelinsky and his coworkers envision the day when eye-trackers located unobtrusively on desktops or integrated into wearable displays will allow teams of analysts, decision makers, soldiers, secret service agents, search and rescue workers, or first responders to collaborate more efficiently.