



## Social, Behavioral and Economic Sciences

### The National Science Foundation's Social, Behavioral, and Economic Sciences Directorate

The social, behavioral and economic sciences illuminate many aspects of human behavior, from how we think and learn to how we interact individually and in groups. SBE-funded researchers develop and use scientific methods to discover fundamental principles of human behavior, at levels ranging from cells to society, from neurons to neighborhoods, and across space and time. Such fundamental principles help us understand patterns of stability, change, conflict, and cooperation which can be applied to promote the progress of science; to advance the national health, prosperity and welfare. From cybersecurity to social security, the results of SBE research will provide a deeper understanding of what we can do to ensure a more prosperous future.

### Human Behavior in Time and Space: Where Did We Come From? Where Are We Going?

Time and space exert enormous influence on the human experience, including how people interact with each other and their environments. We can learn from the successes and failures of human populations in different environments worldwide and in different historical periods, and use that knowledge to improve our future.

#### The Past: Our Genetic History

Biological anthropologists supported by SBE are looking back in time, collecting genetic information from multiple modern human populations and comparing it with that of ancient populations, including Neanderthals.



Researchers including Harvard Medical School

geneticist David Reich<sup>1</sup> have found that present-day people of non-African ancestry trace approximately 2 percent of their genomes to Neanderthals. This genetic legacy is due to interbreeding between populations of ancient humans and the now-extinct Neanderthals between 40,000 and 80,000 years ago. The research brings us one step closer to understanding our own genetic history, but it also has significant implications for the humans of today.

Parts of our DNA inherited from Neanderthals appear to affect risk for several diseases, including Type 2 diabetes, Crohn's disease, lupus and cirrhosis of the liver.

Human genetic variants known to be likely inheritances from Neanderthals can even affect behaviors, such as the ability to stop smoking. Reich's study was the first survey of Neanderthal ancestry across the human genome.

#### The Present: High-Tech Navigation

Research at the SBE-funded National Center for Geographic Information and Analysis catalyzed the development of the multi-billion-dollar Geographic Information Systems (GIS) industry, the technology that enables the GPS in your car and the digital map you check on your computer.

In the mid-1980s, SBE funded the National Center for Geographic Information and Analysis, a basic research enterprise at three universities. The research at the centers



helped build technologies used to map out crime statistics, improve private sector deliveries and design disaster planning and response systems.

Moreover, many years ago, psychologists began to recognize that spatial representations of information — such as maps, graphs and images — were often unmatched in their ability to aid in problem-solving. Research examining how people use spatial data was essential in creating the spatial-choice algorithms that are built into the mapping technologies in our smartphones and GPS devices.

### **The Future: Researching a Safer Cyberspace**

Humanity no longer travels only in physical space; the cyber world is increasingly becoming an important place where people interact. Considering society's increasing reliance on computerized communications and the ever-increasing variety of threats that come along with those technological innovations, SBE has made cybersecurity research a top priority.

Through its Secure and Trustworthy Cyberspace Program, SBE has invested in projects that address some of the biggest cybersecurity questions facing businesses and governments.

At a time when state and federal agencies are trying to determine when and how companies should disclose data breaches to customers, SBE supports research at Carnegie-Mellon University looking at how consumers respond to data breach notifications.<sup>2</sup>

Organizations ranging from Fortune 500 companies to government offices rank insider threats — employees

or affiliates creating cyber-vulnerabilities, whether intentionally or unintentionally — at the top of their security concerns. SBE-backed research at universities in New York and Texas examines the insider threat issue by combining data collected from computer systems with survey and focus group data, placing it among the first projects that assesses both the technical and human behavioral elements of risk.<sup>3</sup>



SBE is also looking at the threats posed by outsiders, supporting research from the University of Arizona<sup>4</sup> that seeks to answer important questions about hacker behaviors, markets and community structures. By collecting and analyzing data on hackers, the project aims to help policymakers and security professionals make better decisions on how to prevent or respond to attacks.

Other basic SBE research can make fundamental contributions to understanding how technology is shaping society. Social media is rapidly making once-private information available to the public. NSF-supported research can, in real time, investigate changes in people's notions of privacy and provide the foundation for a more secure society.

### **SBE Investments**

SBE supports fundamental research across the social, behavioral, and economic sciences and collaborates with other scientific disciplines, providing an invaluable perspective on the human dimension of complex challenges facing our nation: cybersecurity, disaster response, sustainability, national security and inequalities. The directorate accomplishes this work through its Division of Behavioral and Cognitive Sciences, Division of Social and Economic Sciences, Office of Multidisciplinary Activities, and the National Center for Science and Engineering Statistics (NCSES), which is the nation's premier source for data on science and engineering.

<sup>1</sup>NSF awards 1357622, 1461493 “The genomic landscape of Neanderthal ancestry in present-day humans,” *Nature* 507, 354–357. 2014 <http://www.nature.com/nature/journal/v507/n7492/full/nature12961.html> <http://hms.harvard.edu/news/neanderthals-genetic-legacy-1-29-14>

<sup>2</sup>NSF award 1359632

<sup>3</sup>NSF awards 1419856, 1420758

<sup>4</sup>NSF award 1314631