



National Science Foundation
WHERE DISCOVERIES BEGIN



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NSF AT WORK

Neuroscientists: Consumers' Decisions May Require Less Than a Second

Neuroscientists measuring directional eye movements report that consumers can correctly identify the display location of their preferred product--at a better than chance level--in as little as a third of a second (i.e., 313 milliseconds (ms)). This is faster than scientists had previously thought. Caltech scientists, who have been funded by NSF, using eye-tracking methodology are trying to gain insight into people's purchasing decisions in everyday retail contexts.



Consumers can make accurate everyday preference choices significantly faster than previously thought. Credit: © 2011 JupiterImages Corporation

Research subjects were able to identify the location of a preferred/valued food item with more than 70-percent accuracy at average speeds of 404 ms. Requiring subjects to slow down their responses (by requiring increased choice confidence or a response with relatively slower hand movements) increased accuracy about 10 percent.

Because consumers make hundreds of decisions every day, many of them extremely quickly and without much explicit deliberation, the researchers undertook these behavioral studies to learn the minimum time required to make choices with above-chance accuracy and the accuracy impact of additional decision-making time.

This eye-tracking method is being used to answer many questions about consumer decisions. For example, these researchers have also examined the influence of display features on choice. Consumers exhibit a significant bias toward items placed in certain regions of a display. Retailers can use such knowledge to influence purchasing decisions. See the **full article**.

NSF-Funded Research Underlies Method to Capture the Wisdom of the Masses



Approximately 20 years of *The New York Times* were digitized in less than three months through reCAPTCHA, a web-based security technology used to help ensure the authenticity of various online transactions. Any time you are required to decipher and enter a set of graphically distorted alphanumeric characters on a webpage, you are likely engaging in a reCAPTCHA effort.

Create your own reCAPTCHA.

One sequence of characters (the CAPTCHA) is used to prevent automated software from filling out the online form and to authenticate that the keying

is actually generated by a person, not by automated software. "CAPTCHA," an acronym derived from **C**ompletely **A**utomated **P**ublic **T**uring test to tell **C**omputers and **H**umans **A**part, helps prevent spam and disruption of online commerce. The other sequence, called a "reCAPTCHA," provides an image from a large body of text being systematically digitized and that character-recognition software was unable to decipher. Luis von Ahn, who developed this innovative methodology, is a pioneer of Human Computation, which others call "Crowdsourcing." His work to harness the combined power of humans and computers to solve problems has been funded by NSF. See the videos "**Human Computation**" and "**Conversation With Luis von Ahn**" in the NSF Special Report "Voices From the Future" and the **TED lecture**.

Prosthetic Retina Helps With Blindness

NSF support for fundamental and translational engineering research has led to restored vision for formerly blind patients. NSF's Biomimetic MicroElectronic Systems Engineering Research Center (BMES ERC) at the University of Southern California was founded to coordinate groundbreaking research into the development of biomimetic devices. Now, retinal prostheses developed by Mark Humayun of the Doheny Retina Institute in conjunction with BMES ERC have been implanted in more than 35 patients, successfully restoring some visual function.

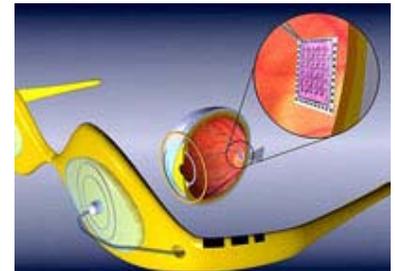
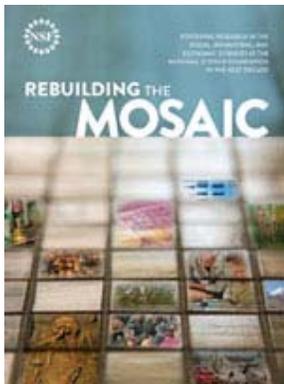


Illustration of a retinal prosthetic system. Credit: Jerry Lim

Second Sight Medical Products was founded to translate this retinal prosthesis research into products, resulting in the Argus I and Argus II implants. The Argus II received the **2010 Popular Mechanics Breakthrough Award** and the **2011 World Technology Award for Health** by the World Technology Network. Argus II has also received the CE Mark in Europe and is on track for FDA approval, pending results of a 30-patient study in the United States and Europe. See NSF's **Science Nation** for more details.

The Promise of Future NSF Social/Behavioral Research



Credit: NSF

The NSF Directorate for Social, Behavioral and Economic (SBE) Sciences released a report that will help chart the future course of federally funded social science fundamental research.

The report, released this month, titled *Rebuilding the Mosaic: Fostering Research in the Social, Behavioral and Economic Sciences at the National Science Foundation in the Next Decade*, concludes NSF's existing programs serve the social science communities well. It describes new topics, especially multidisciplinary ones, that may foster a more flexible structure for future research funding.

The report was informed by 252 white papers submitted from the field on a variety of subjects and in response to an NSF open invitation. *Rebuilding the Mosaic* describes how behavioral, social and economic sciences can contribute significantly to understanding critical issues ranging from brain and behavior; creativity and innovation; crisis and disaster prevention/management; education and learning; social network dynamics and many other topics of significant importance to increasingly interconnected world communities.

"*Rebuilding the Mosaic* is a commendable outcome of a herculean and very timely effort," said NSF Director Subra Suresh. "The information and thinking within the community reflected in this report promise significant impact on science, NSF and the nation's well-being."

"We have the opportunity to catalyze SBE research over the next decade by creating a new generation of researchers and by providing them with the research programs, data and working environments in which to answer critical questions," said Myron Gutmann, NSF assistant director for SBE.

Rebuilding the Mosaic is available **online** together with the 252 white papers, supporting materials and an archived **webcast** in which Gutmann discussed the report and its implications.

DID YOU KNOW?

Numbers of U.S. Doctorates Declined in 2010

Academic institutions in the United States awarded 33,141 science and engineering doctorates in 2010. This is 1 percent fewer than in 2009 but an increase of 28 percent since 2000.

Doctoral awards were down from 2009 in five of the eight major science fields of study, with agricultural sciences showing the largest decrease (15.7 percent) and much smaller decreases (none greater than 2 percent) in physical sciences; psychology; social sciences; and earth, atmospheric and ocean sciences. Computer sciences posted the largest gain (3.5 percent). For more information on the production of S&E doctorates, see the NSF **InfoBrief**.

FACES OF NSF RESEARCH

Career of Renowned Atmospheric Scientist Has Humble Origins

A Massachusetts Institute of Technology profile states that, as an undergraduate, National Academy of Sciences President Ralph Cicerone was a bit unprepared when he arrived at MIT in 1961. Apparently, the public high school in his small Western Pennsylvania town didn't offer calculus or a full course in physics, and he'd never taken a final exam. But, as the saying goes, "Despise not the day of humble beginnings."

Cicerone would later become an eminent atmospheric scientist whose groundbreaking research in global climate change is recognized around the world. Cicerone is Chair of the National Research Council and chancellor emeritus and professor emeritus of the earth system science department in the School of Physical Sciences at the University of California–Irvine. His research centers on plasma physics of Earth's ionosphere, the chemistry of the ozone layer, radiative forcing of climate change by greenhouse gases and sources of atmospheric methane and methyl halide gases. In 2005, Cicerone was recognized in the citation for the 1995 **Nobel Prize** in chemistry.

In this ScienceLives video, Cicerone explains how he was inspired to pursue research with its societal benefits. Credit: LiveScience and NSF

NSF IN THE NEWS

Senate Okays Changes to Program for High-Tech Start-Ups (*Science*) Of the many jobs bills competing for support this month on Capitol Hill, one would have a direct impact on the U.S. research community. Senate bill (S. 493) would allow three agencies--NIH, NSF and DOE--to change Small Business Innovation Research (SBIR) rules.

Leaner Model for Start-Ups Reaches Further Afield (*New York Times*) NSF is betting on a new model to improve the rate and likelihood of commercialization of the university-based technology research the agency supports. NSF recently announced the first series of grants in its Innovation Corps (I-Corps) initiative.

Teaching Scientists to Become Entrepreneurs, One Cold Call at a Time (*Wall Street Journal*) NSF and Stanford University, through I-Corps, are helping scientists and engineers become entrepreneurs to launch start-ups.

THE RIPPLE EFFECT

President Signs NSF Appropriations Bill

On November 18, President Obama signed into law the *Consolidated and Further Continuing Appropriations Act*, which includes the Commerce, Justice, Science (CJS) appropriations bill. This "minibus" legislation, which combined appropriations bills for several agencies, funds NSF through FY 2012. This is the earliest in the congressional process that an NSF appropriations bill has been signed into law in 11 years. The bill provides \$7.033 billion to NSF.



Credit: NSF

This is a \$173-million increase (2.5 percent) above the FY 2011 enacted level but \$734-million (10.4 percent) below the President's request. More details, including a table of comparing House, Senate and conference reports, are available in this NSF **Congressional Highlight**.

NSF Assists Wounded Warriors in Pursuit of STEM Education and Careers



Wounded Warrior Kara Hayes presents a Transition Success Story at Transition STEM. Credit: Alexis Petri, Institute for Human Development, University of Missouri-Kansas City

Many veterans emerge from the military with advanced skills in cutting-edge technology that could be adapted to science, technology, engineering and mathematics (STEM) careers. However, the transition to post-military education and employment presents challenges that are magnified for veterans who have disabilities related to military service.

NSF recently sponsored "Transition STEM: A Wounded Warriors Think Tank," to identify transition issues and outline policies aimed at supporting Wounded Warriors in translating their skills for mainstream employment.

The event was hosted by the Alliance for New Careers in STEM and the University of Missouri-Kansas City Institute for Human Development and School of Computing and Engineering. For more details on the event, visit this NSF

Discovery.

NSF Newsletter to Support Computer Science Education

In recognition of Computer Science Education Week (CSEdWeek) 2011, NSF is rolling out *CS Bits & Bytes*, a one-page biweekly newsletter highlighting innovative computer science research.

The first issue was available December 5; publication will continue through the end of the 2011-2012 academic year. CSEdWeek, December 4-10, is the week of computing pioneer Grace Hopper's birthday, and it recognizes the transformative role of computing and the need to bolster computer science at all educational levels.



Credit: Georgia Computes!, Georgia Tech

To receive *CS Bits & Bytes*, visit the **website**.



*The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year (FY) 2011, its budget is about \$6.9 billion. NSF funds reach all 50 states through grants to nearly 2,000 universities and institutions. Each year, NSF receives over 55,000 competitive requests for funding, and makes more than 13,000 new funding awards. NSF also awards more than \$400 million in professional and service contracts yearly. Contact **NSF's Office of Legislative and Public Affairs** for more information or for permission to reuse newsletter images. Editor: Lee Herring. Contributors: Rachel Bernard, Jennifer Boehme, Neysa Call, Ellen Ferrante, Craig Fisher, Jessica Foley, Gera Jochum, Christina Jones, Christine Hamel, Steve Lonker, Bobbie Mixon, Mayra Montrose, and Cheryl Roesel.*



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