National Science Foundation
WHERE DISCOVERIES BEGIN

NSF CURRENT
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NSF AT WORK

Emotion in the Marketplace

NSF-funded research is revealing that the impact of emotions on decision making may have played a major part in the recent economic downturn. This research may explain why classical economic theories about the stability of markets failed to predict the recent collapse, since these theories assume that decisions have a rational basis.


New York Stock Exchange. Credit: State of New York

Jennifer Lerner, professor at Harvard University and director of its Decision Science Laboratory says, "Being in a fearful state propels us toward risk-averse choices, whereas being in an angry state propels us toward risk-seeking choices." Lerner's work provides insight not only into how our brains work when we make decisions, but also improves our understanding of how public officials communicate risk. Her work on the role of emotion in decision making was **recognized in 2003** by the White House through a Presidential Early Career Award for Scientists and Engineers (PECASE).

In one experiment, Lerner and her colleagues wired up high-profile executives to see how their decision-making processes compared to people with less stressful careers. Electrodes to track heart rate and a respiration band to measure breathing rate were monitored while the subjects played a gambling game. The game was designed to test the impulse to throw good money after bad, such as to continue putting quarters into a slot machine even though one is losing.

One question Lerner and other scientists hope to answer with their research is whether those who keep their emotions in check will make better decisions. Her work and that of other NSF-funded researchers is profiled in a **new episode** of the PBS science program NOVA. Read more about it **here**.

Supervolcanoes Shape the Earth

About a dozen very large volcanoes, known as supervolcanoes, exist on the Earth, including a massive one forming the caldera of geysers in Yellowstone National Park. These huge volcanoes have been blamed for multiple mass extinctions in Earth's history, but the source of their enormous eruptions is still unknown.

NSF-funded scientists are exploring the origins of one of these giant volcanoes. The Integrated Ocean Drilling Program (IODP) Expedition 324 studied the Shatsky Rise Formation, located off the coast of Japan, last fall. Results of the study are now beginning to emerge.

JOIDES Resolution departs on Shatsky Rise expedition from Yokohama, Japan. Credit: John Beck, IODP/TAMU

The IODP Shatsky Rise expedition focused on deciphering the relationship between supervolcano formation and the boundaries of tectonic plates. "Shatsky Rise is one of the best places in the world to study the origin of supervolcanoes," says William Sager of Texas A&M University, who co-led the expedition with Japanese scientists.

Sediments and microfossils collected during the expedition show that the Shatsky Rise plateau was, at one time, above sea level. "What makes Shatsky Rise unique is that it's the only supervolcano to have formed during a time when Earth's magnetic field reversed frequently," explains Sager. Read more about this work **here**.

New Research Leads to Energy-Efficient Solutions

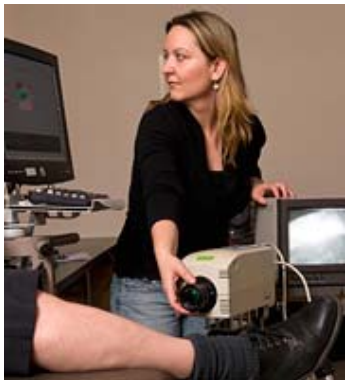
Luminescent multi-color phosphors. Credit: PhosphorTech Corp.

PhosphorTech Corp. of Lithia Springs, Ga., has brought to the market new materials and structures, which can be used in the next generation of light-emitting diodes, or LEDs. The new phosphor-based materials are more efficient at creating light and enhance the performance of traditional LEDs. PhosphorTech's research has been funded in part through an NSF Small Business Innovation Research (SBIR) **grant** and was recently honored with the Department of Energy's **award** for significant achievements in solid-state lighting R&D.

Sustainable Innovations' Energy Storage System. Credit: Sustainable Innovations, LLC

Another energy efficiency advance has been made by **Sustainable Innovations** of Glastonbury, Conn. In partnership with **Harvard University**, this small business has created a novel energy storage system using a hydrogen/chlorine electrochemical cell. Through the use of a high efficiency energy storage system, renewable energy sources, such as solar energy, can be used to provide power at all times, not just when the sun is shining. Sustainable Innovations' research is funded in part through NSF's **SBIR** program and is helping to support several university students.

Scanning for Cancer



Infrared scanning system for cancer detection. Credit: Johns Hopkins University

NSF-funded researchers at Johns Hopkins University have developed a noninvasive scanning system for the detection of deadly melanoma. This lethal form of skin cancer killed nearly 9,000 Americans last year, deaths that might have been averted if the cancer had been detected sooner. The new device, which detects heat given off by the cancerous cells, may lead to better treatments for the disease and earlier detections of this deadly cancer.

Cila Herman, professor of mechanical engineering at Johns Hopkins, worked with Rhoda Alani, professor at Hopkins' Kimmel Cancer Center, and graduate student Muge Pirtini to develop the device, based on an infrared scanning system. The team carried out a pilot study on 50 patients, with promising results.

Because cancer cells generate more metabolic activity than do normal cells, the diseased cells release more heat. To enhance the small differences in temperature between normal cells and melanoma cells, the investigators developed a method in which the skin was cooled, then rapidly tested. Since melanoma cells reheat more quickly than healthy tissue, the diseased cells were easily detected.

The researchers are cautiously optimistic that their device may, one day, become a useful tool for helping to diagnose early-stage cancer. Read more about the work **here**.

Did You Know?

On Wednesday, April 7, 2010, NSF published the **NSF Open Government Directive Plan**. It will serve as the roadmap for the agency's plans to improve transparency, better integrate public participation and collaboration into its core mission, and become more innovative and efficient.

The OpenNSF **dialog site** has also been recently reopened and is currently accepting public input on the plan. NSF fully expects to update the plan and make adjustments along the way to becoming a more transparent, participatory and collaborative agency.

Faces of NSF Research

NSF and the National Science Board Announce 2010 Awardees

Subhash Khot. Credit: New York University

Subhash Khot of the Courant Institute of Mathematical Sciences at New York University has been chosen as the recipient of NSF's **2010 Alan T. Waterman Award**. This award, given annually to an outstanding researcher under the age of 36 in any of the science and engineering fields supported by NSF, includes a half-million-dollar grant to help support the recipient's research. Khot, a computer scientist, has made significant advances in understanding a phenomenon known as computational intractability, which has great implications for the field of cybersecurity.

Bruce M. Alberts. Credit: Tom Kochel, AAAS

Bruce M. Alberts has been named the recipient of the **2010 Vannevar Bush Award**, an annual award given by the National Science Board (NSB) in recognition of lifetime achievements. The award honors exceptional, lifelong leaders in science and technology who have made substantial contributions to the country in science, technology and public policy. Alberts is a biochemist at the University of California, San Francisco, and currently serves as editor-in-chief of *Science* magazine, published by the American Association for the Advancement of Science (AAAS). He also served two six-year terms as president of the U.S. National Academy of Sciences.

Nalini Nadkarni. Credit: The Evergreen State College

The NSB also announced two winners of its **2010 Public Service Award**: ecologist Nalini M. Nadkarni and the educational network Expanding Your Horizons (EYH) that organizes and coordinates conferences aimed at developing an interest in mathematics and science among young girls.

Young scientists at work during an EYH conference. Credit: EYH

Nadkarni, of The Evergreen State College in Olympia, Wash., who teaches environmental studies and does research on the ecology of forest canopies, is committed to engaging people in real scientific work who might otherwise have limited access to it. One of her programs provides opportunities for men and women in Washington State prisons to participate in conservation and sustainability research projects.

EYH is a non-profit network of organizations that brings hands-on science experiences to girls in 33 states and around the world. Since its founding in 1976, the organization has mentored more than 775,000 young women, many of whom are now professional scientists.

All awardees will be honored on May 4, 2010, at an NSB dinner to be held at the U.S. State Department in Washington, D.C.

NSF in the News

Tattletale Pills (*Scientific Computing*) NSF-funded researchers have developed a pill that includes a tiny microchip and digestible antenna. When swallowed, the pills can automatically alert doctors that patients have taken their medicine.

Drought and Flooding Led to Collapse of Ancient City (*LA Times*, *US News & World Report*) A prolonged drought punctuated by intense monsoons destroyed the ancient city of Angkor's water infrastructure, leading to the city's collapse in the 15th century, according to a new study funded by NSF.

Gender Gap in Science and Engineering (*Washington Post*, *Boston Globe*) Stereotypes can lower girls' aspirations for science and engineering careers, according to a new report funded in part by NSF.

Katrina Caused Onshore Petroleum Releases (*UPI*) An NSF-funded study suggests that Hurricane Katrina caused more than 200 onshore releases of hazardous materials along the Gulf Coast. The releases were mostly due to storage tank failure and the restart of production processes.

The Ripple Effect

Celebrating 60 Years of Discovery

Sixty years ago, on May 10, 1950, President Harry S. Truman signed a bill establishing NSF as the federal agency charged with advancing the scientific enterprise of the U. S. The National Science Board and NSF are commemorating this sixtieth anniversary in a variety of ways, including a symposium held in February at the annual meeting of the American Association for the Advancement of Science. The symposium featured a panel discussion by NSF's five most recent directors and the current Chair and Vice Chair of the NSB. Additional activities, including a "Voices From the Future" lecture series are planned throughout the year. Read more **here**.

L to R: Former NSF directors Erich Bloch, Neal Lane, Rita Colwell, Walter Massey and current director Arden L. Bement, Jr.; Patricia Galloway, NSB Vice-Chair, and Steven Beering, NSB Chair. Credit: National Science Board

Former NSF Director Receives 2010 Stockholm Water Prize

Rita Colwell. Credit: Sam Kittner

Rita Colwell, who served as director of NSF from 1998 to 2004, has been named as this year's recipient of the Stockholm Water Prize, presented annually to an individual or organization for outstanding leadership in activities related to water.

Colwell was chosen for this award for her work on the spread of infectious diseases, particularly cholera, a waterborne pathogen that causes an estimated 120,000 deaths worldwide each year. Colwell's work has shown how changes in climate, weather, ocean circulation and other ecological shifts can create conditions that allow disease to spread. Her work has led to policies designed to pre-empt the spread of disease and, thus, minimize outbreaks.

The award will be presented by the King of Sweden

USA Science & Engineering Expo

The country's first national science festival is scheduled for Oct. 23-24, 2010, on the National Mall in Washington, D.C. and it promises to be the ultimate "celebration of science" in the U.S.

NSF is one of dozens of partner organizations drawn from government, private industry and academe that are helping organize the festival. NSF will sponsor exhibits highlighting the work of 15 awardees, including projects on robotic fish, earthquake-resistant buildings, mobile radar systems for tornado tracking, optical communication systems and forensic science. All exhibits will include hands-on interactive components.

For more information about the inaugural

to Colwell this fall at a ceremony scheduled for Sept. 9, 2010, in Stockholm. Read more **here**.

Science & Engineering Festival, or to sign up to volunteer, visit the event's **Web site**.

Mark Your Calendar: National Lab Day is May 12!

NSF is one of many scientific and educational organizations sponsoring National Lab Day, which is scheduled for May 12 this year. The nationwide initiative brings together students, educators and professional scientists and engineers to involve kids in discovery-based science experiences. Activities are planned in dozens of communities across the U. S. Read more about it **here**.

*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 2010, its budget is $6.9 billion. NSF funds reach all 50 states through grants to over 1,900 universities and institutions. Each year, NSF receives about 48,000 competitive requests for funding, and makes over 11,300 new funding awards. NSF also awards over $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.*

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