



National Science Foundation
WHERE DISCOVERIES BEGIN



August 2012

Each month, the *NSF Current* newsletter highlights research and education efforts supported by the National Science Foundation. If you would like to automatically receive notifications by e-mail or RSS when future editions of *NSF Current* are available, please use the links below:

[Subscribe to NSF Current by e-mail](#) | [RSS](#) [What is RSS?](#) | [Print this page](#) | [Return to NSF Current Archive](#)

NSF AT WORK

Better Than Braille: App Helps Blind Students Learn Complex Math

Teaching math concepts such as geometric shapes, parabolas and asymptotes depends heavily on visuals. For blind and visually impaired students, keeping pace with such instruction can be difficult. They require tactile aids like pins and pipe cleaners on a bulletin board to reproduce complex mathematical shapes. **Jenna Gorlewicz**, a mechanical engineering student at Vanderbilt University in Nashville, Tenn., developed a touch-pad application to help blind and visually impaired students master algebra, graphing and other subjects. She is funded by an NSF Graduate Research Fellowship.



Students at Hillsboro High School test the app. Credit: Pat Slattery, Vanderbilt University

Gorlewicz used haptic technology, which takes advantage of a user's sense of touch by applying forces, vibrations or motions to enhance remote control of machines, devices or virtual objects. The tablet vibrates or generates a specific tone when a student touches a line, curve or shape displayed on the screen, allowing blind students to "visualize" the image using other senses. The device can generate vibrations of different frequencies and hundreds of different sounds.

Gorlewicz is working with blind and visually impaired students at Hillsboro High School in Nashville to refine and add features to the device. She plans to network the tablets wirelessly to a teacher's computer so that visuals on a screen at the front of the class will also appear on the tablet. Gorlewicz also hopes to work with teachers to develop educational curricula for the touchscreen app. Learn more [here](#).

Historical Ship Logs and Social Media: An Unlikely Couple To Improve Climate Models



Old Weather project participants are compiling

In the mid 1800s, U.S. Navy midshipman Matthew Fontaine Maury spent years studying thousands of ships' logs and charts in order to chart the winds and currents that affect ocean voyages. Today, crowd-sourcing and social media are expediting similar projects.

Citizen volunteers are helping to comb through century-old British Royal Navy logs for historical weather data. With a better understanding of past weather patterns, scientists can improve their ability to predict and model the earth's future climate. Because 70 percent of the planet's surface is ocean, which has a major impact on weather worldwide, sea data are particularly critical. However,

weather data from the logbooks of ships such as the *H.M.S. Achilles*, in service from 1905 to 1921. *Source: Library of Congress*

the historical record is full of gaps, particularly before 1920.

Old Weather is one of many large-scale citizen science projects in the portfolio of **Zooniverse**, a framework partly supported by NSF that allows people to participate in web-based research and discovery. Volunteers have been "trawling" the scanned pages of

British World War I-era ship logs to extract daily, and sometimes hourly, observations of air temperature and pressure, wind direction and rainfall. Since the project's launch, 28,000 volunteers have completed more than a million logbook pages. The project is also examining logs from U.S. Arctic expeditions.

The effort includes a social media aspect: volunteers are assigned to a particular ship, and a "crew member's" rank depends on the number of weather readings he or she has digitized. Turning an otherwise mundane process into a game has significantly increased the speed of the work over more traditional methods. The project's founders estimate that it would take one person working full time without holidays 28 years to digitize these records; yet the participants completed the initial dataset in just under a year. Volunteers are still needed. [Jump aboard here!](#)

What Wins: Strategy or Luck?

Some online auctions are taking advantage of a common mentality: the desire to pay a little for a lot.

A review of hundreds of online auctions found that players intuitively use the best strategy for winning, turning the process into a game of chance. The study by NSF-supported researchers focused on lowest unique bid auctions, in which the winning bid for a valuable item, such as a car or boat, is the lowest one unmatched by other participants when the auction closes. Participants do not know how many bids are placed on each value until the bidding closes.



Some online auctions are a game of chance. *Source: morgueFile*

It turns out that the winning strategy involves what the researchers call "bursty behavior"--a participant places a cluster (or "burst") of bids that are close in value, then jumps to a higher value and places a number of bids in that vicinity. The strategy is particularly effective when trying to identify a moving target--in the case of these online auctions, the value of the winning bid.

"We couldn't identify a single person who was not using this strategy," said **Luís Amaral**, a complex systems researcher at Northwestern University in Evanston, Ill. Because everyone is using the same methodology, no one has an advantage, and participants fail to optimize their chances for financial gain. For each bid placed, the participant must pay a fee, typically \$1.00.

Online auctions are a relatively new phenomenon that have enjoyed vast popularity. However, Amaral predicts that people will eventually stop entering lowest bid auctions when they discover that they are participating in a game of chance. "Humans are smart about recognizing the deck is stacked against them," he said. More information about the NSF-supported study can be found [here](#).

DID YOU KNOW?



Doctoral student at Virginia Tech.

More Women Earning Doctoral Degrees

The number of women earning doctorates has grown rapidly over the past 20 years. In 2010 women earned the majority or near majority of doctorates in nearly every broad field of study (education, 69 percent; social sciences, 57 percent; humanities, 52 percent; life sciences, 55 percent; other non-science and engineering fields, 50 percent; physical sciences, 30 percent; and engineering, 23 percent).

Physical sciences and engineering doctorates continue to be dominated by male recipients. However, that pattern is starting to shift. The number of women earning doctorates in physical sciences increased 73 percent from

Credit: John McCormick; Virginia Tech

2000 to 2010, and the number of female engineering Ph.D. recipients more than doubled during the decade.

More trends in doctoral education are available in "**Doctorate Recipients from U.S. Universities: 2010**," a report from NSF's National Center for Science and Engineering Statistics.

FACES OF NSF RESEARCH

From Small Ponds to the White House: NSF Nominee Among PECASE Winners

Meghan Duffy's work has taken her from small ponds in Michigan to a heavily polluted lake in central New York--and even as far as Antarctica. She is **studying parasites**, tiny organisms that feed on their hosts. Much of Duffy's research focuses on the parasites that feed on small freshwater crustaceans, called *Daphnia*. "[*Daphnia*] are very important links in lake food webs, but, just as important, they are a great model system for understanding host-parasite interactions in general," said Duffy.

Duffy, an assistant professor of biology at the Georgia Institute of Technology in Atlanta, Ga., is one of 20 individuals nominated by NSF to receive this year's Presidential Early Career Award for Scientists and Engineers (**PECASE**). Those nominated by NSF were among 100 total recipients of the award, the U.S. government's highest honor for scientists and engineers in the early stages of their independent research careers. The winners traveled to Washington, D.C., in late July, where they received their awards from the White House and met with NSF officials.

The awards, established by President Clinton in February 1996, are coordinated by the White House Office of Science and Technology Policy. Award nominees are considered against two criteria: their pursuit of innovative research at the frontiers of science and technology, and their commitment to community service as demonstrated through scientific leadership, public education or community outreach.

Duffy, who earned her Ph.D. from Michigan State University in 2006, previously received NSF's Faculty Early Career Development (**CAREER**) award for her research on the evolution of host-parasite interactions. Duffy hopes that what her laboratory learns from studying *Daphnia* and their parasites will have broader application "to systems that are economically important," she explained.

In addition to recognizing her research, the PECASE award commends Duffy for providing educational opportunities for college students in underrepresented minority groups and inner-city K-12 students in Atlanta.



Meghan Duffy, PECASE awardee, taking samples in Congaree National Swamp. Credit: Meghan Duffy, Georgia Tech

Engineering for Mobility: Helping Disabled Athletes Compete

At the 2012 Paralympics Games, which will follow the regular Olympics in London, hundreds of elite athletes with disabilities will rely on strength, speed, skill--and technology--as they go for the gold in 21 different sporting events.



Rory Cooper participated in four wheelchair racing events, winning a bronze medal, in the 1988 Paralympic Games in Seoul, South Korea. Now, he is an NSF-supported biomechanical engineer at the University of Pittsburgh, helping other disabled athletes compete.

In this **video**, Cooper demonstrates how custom wheelchair features such as bumpers and tilted wheels are helping wheelchair athletes maximize their performance in such diverse sports as wheelchair rugby, basketball and racing.



Left: Paralympic racers using specially engineered wheelchairs. Above: Engineer Rory Cooper,

The video is part of the 10-part video series "**Science of the Summer Olympics: Engineering In Sports**," produced by NSF in partnership with NBC Learn and NBC Sports.

University of Pittsburgh. Credit: NSF/NBC Learn

NSF IN THE NEWS

Search for Higgs Boson at Large Hadron Collider Reveals New Particle (*Science Daily*) - NSF supports the detectors and experiments at the CERN particle physics laboratory used in the search for the elusive particle.

Upgrades to U.S. Antarctic Facilities Will Require Research Funding Cuts (*Science*) - A panel commissioned by the White House and NSF determined that facilities are in dire need of repair and upgrade, and that paying for them could temporarily reduce U.S. Antarctic research funding.

Telescope Opens a Brand New Window on Discovery (*MSNBC*) - Images produced by the new Discovery Channel telescope in Arizona will be even more spectacular when a 36-megapixel imager funded by NSF is installed.

NSF Expands Program To Teach Researchers To Be Entrepreneurs (*Chronicle of Higher Education*) - On the first anniversary of I-Corps, NSF outlined plans to aggressively expand the program.

THE RIPPLE EFFECT

Coral Reef Crustacean Named for Reggae Performer Bob Marley



A Caribbean fish infested with tiny gnathiids. Credit: Elizabeth Brill

Paul Sikkel, an NSF-supported marine biologist at Arkansas State University in Jonesboro, Ark., named a **newly discovered crustacean** after reggae singer Bob Marley--partly, Sikkel said, because the species is "as uniquely Caribbean as was Marley." *Gnathia marleyi* is the first new species to be identified in the Caribbean in more than two decades.

The species is a gnathiid isopod--a small parasitic blood feeder that infests fish inhabiting the coral reefs of the shallow eastern Caribbean. Sikkel's team is researching possible relationships between gnathiid populations and the declining health of coral reef communities.

STEM Summit Brings Together Educators and Employers

Leaders from education, business, industry and philanthropy met at the *US News* **STEM Solutions Summit** in Dallas, Texas, June 27-29 to explore how to better prepare students in science, technology, engineering and mathematics (STEM) subjects. NSF's assistant director for education and human resources, Joan Ferrini-Mundy, spoke about the importance of improving STEM education and the need to be strategic about collective work in this area, by creating partnerships, networks and new ways of doing business together.

The 1,500 attendees were also informed about the NSF-funded report recently completed by the National Research Council, "**Successful K-12 STEM Education**," which makes recommendations for school administrators and policymakers. A series of regional workshops, including one September 19 in Las Vegas, Nev., are taking the report findings directly to educators, school districts and policymakers.



High school science students. Credit: InSTEP Program, Florida Institute of Technology



*The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. Its Fiscal Year 2012 budget is \$7.0 billion. NSF funds reach all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives more than 50,000 competitive requests for funding, and makes about 11,000 new funding awards. Contact NSF's **Office of Legislative and Public Affairs** at 703-292-8070 for more information or for permission to reuse newsletter images. Editor: Amber Jones. Contributors: Christine Hamel, Jacinta Leyden, Megan Powell, Devon Rule, Maria Zacharias.*



The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749