



National Science Foundation
WHERE DISCOVERIES BEGIN



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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:

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NSF AT WORK

Readers' Favorites: A Year in Review

As we come to the end of the National Science Foundation's 60th anniversary year, we take a look back at the highlights from 2010. The following are among the most popular news stories, based on visits to the NSF website.

A Star Is Born ... But How?

How did the first stars come to be? It all hinges on hydrogen atoms coming together to form hydrogen molecules. New research from Columbia University revealed the simple, key chemical formula enabling the formation of early stars.



Biodiversity Loss: Detrimental to Your Health

Plant and animal extinctions are detrimental to your health. That's the conclusion of a paper published in the journal *Nature* by scientists who studied the link between biodiversity and infectious diseases. Species loss in ecosystems such as forests and fields results in increases in pathogens, or disease-causing organisms, the researchers found.

Study Validates Factors That Enhance the Intelligence of a Group

Quantifying group intelligence is more complex than determining the sum or average of individual members' cognitive abilities. Researchers discovered that group intelligence instead relies on the right kind of internal dynamics. A group's intelligence is positively linked to higher levels of "social sensitivity," a more equal distribution of member participation levels, and to the number of women in a group.



Bringing Engineering to K-12 Classrooms

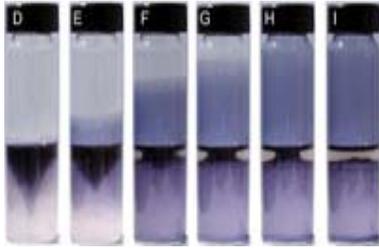
Chris Rogers at Tufts University is working to improve science education by bringing engineering into K-12 classrooms. Rogers and his colleagues think it is important to start teaching engineering early since the engineering principles of building and designing to solve problems motivate young students to pursue science and math.

Stressed Out: Teens and Adults Respond Differently

Adriana Galván, a neuroscientist at the University of California, Los Angeles (UCLA), is studying the effect of stress on brain function in adolescents and adults. Data suggest that there are several differences; for example, teens show greater cognitive impairment when stressed than adults.



NSF Small Business Support Leads to New Nanofiber Film Technology



These images show the growth of a nanofiber film that combines plastic-like flexibility and transparency with electrical conductivity. Credit: Julio D'Arcy, UCLA.

Fibron Technologies Inc., a California-based high-tech small business, has developed a versatile method to create thin transparent plastic films that can conduct electricity. These conductive polymer coatings can be used on a variety of surfaces, and therefore, have a wide range of applications. For example, the film can potentially be used to create "smart glass" windows that use electrical current to switch from opaque to transparent. The film has the capability to dramatically enhance other electronic components, such as solar cells, sensors and light-emitting diodes (LEDs).

Fibron scientists, in collaboration with University of California, Los Angeles (UCLA) chemists, created this material by combining water, dense oil and polymer nanofibers through vigorous mixing. NSF not only supported this research, but also the formation of Fibron Technologies. The research began in 2005 under a Nanoscale

Integrative Research Team grant (**award number 0507294**). The scientists then received funding from the NSF Small Business Technology Transfer (STTR) program (**award number 1010450**) to found the company and continue this research.

Dr. Christian Behrenbruch, Fibron's chief executive officer said, "The NSF has been a major part of our success, primarily because the STTR funding enabled our start-up to pursue an aggressive program of R&D in concert with funds raised from angel investors. By using the NSF STTR program as a way to bridge the academic divide with UCLA, the originator of much of Fibron's technology, we were also able to much more seamlessly transfer the technology out of the university setting."

University of Iowa Study Sheds Light on How the Human Brain Processes Fear

A patient with a rare brain disorder has helped shed light on how the human brain processes fear. Researchers from the University of Iowa, in collaboration with the California Institute of Technology and the University of Southern California, studied a patient with damage to the region of her brain known as the amygdala. In the face of common fear-provoking situations, the patient expressed a lack of fear. She likewise did not respond with fear or anxiety when reviewing past traumatic, life-endangering events. Even though she cannot experience fear, she was able to experience other emotions and feelings. This study supports non-human primate studies that indicate that the amygdala is critical to experiencing fear.

The researchers suggest that this brain region is affected in patients suffering from post-traumatic stress disorder (PTSD), and that dampening amygdala function could alleviate PTSD symptoms. The research paper, titled "The Human Amygdala and the Induction and Experience of Fear," appeared in the December 2010 issue of *Current Biology*, and the work was supported by the National Institutes of Health and an NSF Graduate Fellowship.



Processing of fear-provoking situations, as shown above, relies on a the part of the brain known as the amygdala. Credit: © 2011 Jupiter Images Corporation.

DID YOU KNOW?

The Division of Science Resources Statistics (SRS) at NSF reports that there is an overall increase in diversity in the federal government's science and engineering (S&E) workforce over

the past decade. The percentage of women in the federal S&E workforce rose from 21 percent in 2000 to 27 percent in 2009. Additionally, the percentage of minorities rose from 18 percent in 2000 to 22 percent in 2009. For more information and details read the **full InfoBrief online**.

FACES OF NSF RESEARCH

PAEMST a "Real Opportunity" for Improving Science and Math Education



New York City public school teacher Camsie Matis (center) receives the PAEMST certificate from NSF director Subra Suresh (left) and the President's Science and Technology Advisor John Holdren (right). Credit: Philippe Nobile for NSF.

In December, the White House formally recognized recipients of the 2009 Presidential Awards for Excellence in Mathematics and Science Teaching, or **PAEMST**. This award is the highest recognition that a K-12 math or science teacher may receive for outstanding teaching in the United States. Awardees attended recognition and professional development events in Washington, D.C., including meetings with President Obama and U.S. Secretary of Education Arne Duncan. Awards were given to 103 science and math teachers representing 50 states and four U.S. jurisdictions.

The application and review process is rigorous and highly selective. Applications are organized around a specific science and math education topic, and teachers are required to submit both written materials and an unedited video recording of their teaching in the classroom. Potential awardees are selected by committees at state and national levels before the White House Office of Science and Technology policy makes the final selection. This program, enacted by Congress in 1983, is administered by the NSF Directorate for Education and Human Resources.

Camsie Matis, a math teacher at East Side Community High School in Manhattan, was one of the recent PAEMST winners. Matis described participation in the PAEMST program as an exciting chance to learn from and to meet with leaders in science and math education policy. She commented, "A real awakening happens when you leave the classroom. Teachers come [for the PAEMST program] and their eyes are opened and filled with the opportunities and resources available to them."

Matis believes that the PAEMST program and awardees could make a great impact on science education at the national level. "The PAEMST group is currently not being utilized to its full potential," she remarked. "We could do something more substantial." Matis has initiated discussion of organizing PAEMST recipients into an advisory board or mentoring group, and has presented her ideas to the President's Council of Advisors on Science and Technology (PCAST). Not only could PAEMST awardees offer expertise, but they also provide a network for disseminating information among the education community. "We have a cadre of over 4,000 PAEMST winners to tap into to help leverage the opportunities presented by the NSF, Department of Education, and other Federal agencies," she said.

Matis is currently serving as an Albert Einstein Distinguished Educator Fellow at NSF, where she is primarily working on computer science education initiatives. She remains active in discussing ways that PAEMST recipients can shape science and math education. She commented, "Given the recent recommendations [from PCAST] to form a science and math teachers corps, I think we have a real opportunity here."

NSF IN THE NEWS

IceCube Complete Just in Time for Christmas (*Discovery News*) The final strand of particle detectors was lowered into the Arctic ice, completing construction of the IceCube Neutrino Observatory.

How to Turn Your Tech Dreams Into Business Reality (*Business News Daily*) NSF program director Errol Arkilic speaks about the Small Business Innovation Research (SBIR) program, and how NSF helps small businesses.

Flying Machines, Amazing at Any Angle (*The New York Times*) The University of Montana

Flight Laboratory, supported by the NSF, studies how birds fly and how they inspire advances in human flight.

THE RIPPLE EFFECT

NSF Partners With NBC and *DISCOVER* Magazine for "Changing Planet" Town Halls

NBC News, in partnership with NSF and *DISCOVER* magazine, will produce town hall events about the "Changing Planet" at three major American universities throughout 2011. The goal of these forums is to inform the public about the facts of climate science, discuss its impact, and brainstorm solutions. Each town hall event will focus on a distinct aspect of the issue and be moderated by NBC News anchors such as Tom Brokaw.



At each event, the audience will be pre-screened to proportionately represent the attitudes of Americans about climate change as divided into six distinct groups identified in a survey by Tony Leiserowitz, Director of the Yale Project on Climate Change.

The first town hall at Yale University took place on January 25. The event's title was "Changing Planet: the Impact on Lives and Values." Participants explored four themes: human health, economic opportunity and competitiveness, moral and religious values, and the impact on youth.

Other town hall events are scheduled for George Washington University in April 2011, and at an Arizona university in the fall of 2011.

NSF "Crosses Into the Future" at the AAAS Meeting



NSF will showcase its communication skills at one of the broadest gatherings of scientists, engineers and educators in the country, the annual meeting of the American Association for the Advancement of Science (AAAS), February 17-21, 2011, in Washington, D.C. NSF Director Subra Suresh's topical lecture, "Collaboration and

Competition: Each Requires Excellence," on Friday at noon will launch a weekend of NSF activities. Besides serving as a primary meeting sponsor, the Foundation will host an extensive and engaging exhibit located at Booth #601 in the exhibit hall. Four NSF awardees will provide meeting participants and local families attending Family Science Days with hands-on science and engineering experiments and learning opportunities. Visitors will be able to build and test model bridges, explore the evolution of life, and experience the sensations of a virtual World's Fair. In keeping with NSF's exhibit theme of "Crossing into the Future," the Foundation will host a workshop with Einstein Fellows (K-12 math and science teachers) as well as other events featuring novel ways of teaching and communicating science. Be sure to visit NSF at Booth #601 for an entertaining weekend.

"Chemistry Now" Celebrates the International Year of Chemistry

To celebrate the International Year of Chemistry, NSF is partnering with NBC Learn, the education arm of NBC News, to produce "Chemistry Now," packages of original and archival news, videos, multimedia content and lesson plans for K-12 science teachers. Content will be distributed online each week throughout the school year. Themes will concentrate on the presence and function of chemistry in everyday life and in the world around us, and on the lives and work of those at the frontiers of modern chemistry. The series can be found on the **NBC Learn** 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 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. Editor: Nicole J. Garbarini. Contributors: Amber Jones, Karen Sandberg, Ellen Weir.*



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