



National Science Foundation  
WHERE DISCOVERIES BEGIN



September 2010

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## NSF AT WORK

### Hydrocarbon Plume Detected in Gulf

Scientists funded by the National Science Foundation (NSF) and affiliated with the Woods Hole Oceanographic Institution (WHOI) have detected a plume of hydrocarbons at least 22 miles long and more than 3,000 feet below the surface of the Gulf of Mexico, a residue of the BP Deepwater Horizon oil spill.

The 1.2-mile-wide, 650-foot-high plume of trapped hydrocarbons was detected during a 10-day subsurface sampling effort from June 19-28, 2010, near the wellhead. The results provide a snapshot of where the oil has gone as surface slicks shrink and disappear. "These results create a clearer picture of where the oil is in the Gulf," said Christopher Reddy, a WHOI marine geochemist and one of the authors of a report on the results that appeared in the August 20 issue of the journal *Science*.

The study--which was enabled by three rapid response grants from NSF's chemical oceanography program, with additional funding from the U.S. Coast Guard and the National Oceanic and Atmospheric Administration (NOAA) through the Natural Resource Damage Assessment Program--confirms once again that a continuous plume was found "at petroleum hydrocarbon levels that are noteworthy and detectable," Reddy said. Read more about the new findings [here](#).



The autonomous underwater vehicle *Sentry*, used to investigate an underwater oil plume, is loaded onto the research vessel. Credit: Rich Camilli, WHOI

### Fossil Record Extended



Stromatolite column of bacterial mats in Australia;

Scientists may have recently discovered the oldest fossils of animal bodies. These findings push back the clock on the scientific world's thinking regarding when animal life appeared on Earth. The results suggest that primitive sponge-like creatures lived in ocean reefs about 650 million years ago.

The fossils, found beneath a 635-million-year-old glacial deposit in South Australia, represent the earliest evidence of animal body forms in the current fossil record, predating other evidence by at least 70 million years.

"These scientists have found that animals may have appeared on Earth 90 million years earlier than previously known," said H. Richard Lane of NSF's Division of Earth Sciences, which funded the

sponge fossils are located between stromatolites. Credit: Adam Maloof, Princeton University

research. Previously, the oldest known fossils of hard-bodied animals were from two reef-dwelling organisms that lived around 550 million years ago.

The findings, published in the August 17 issue of the journal *Nature Geoscience*, provide the first direct evidence that animal life existed before--and probably survived--the severe "snowball Earth" event known as the Marinoan glaciation that left much of the globe covered in ice at the end of the Cryogenian period, about 635 million years ago. Read more about these new results [here](#).

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## Creating Artificial Silk

Silk is a natural fiber spun by spiders and silkworms that has been used throughout history for items as varied as stockings, parachutes and surgical sutures. It is tougher than steel, yet remarkably flexible. Scientists and engineers would like to be able to create synthetic versions of this useful fiber, yet the exact mechanism by which spiders and silkworms spin the amazing threads remains unknown.

In the July 30 issue of the journal *Science*, two NSF-funded researchers, Fiorenzo G. Omenetto and David L. Kaplan, both of Tufts University, review what scientists understand about how silk is made in nature, and consider ways that artificial versions of it might be created.

One goal of silk research, the authors write, is to find a way to genetically engineer other organisms to produce custom-designed silk proteins that could then be used to produce synthetic silk for specific purposes on a large scale. This has led to genetically modified mushrooms, bacteria and even goats that are able to produce silk protein, yet none of the actual silk produced from these modified organisms matches the quality of the stuff produced by spiders and silk worms. Once these issues are overcome, however, the scientists believe that someday plants could be modified to produce silk as a crop, in much the way cotton is harvested today.

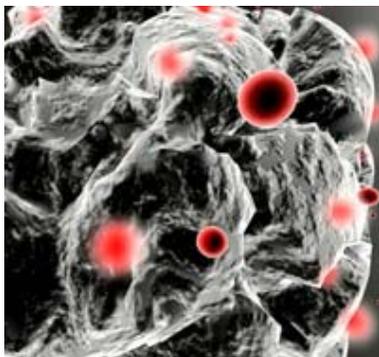
Read more about the research [here](#).



A spider spins its web from natural silk. Credit: David T. Wright, NSF

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## Decontaminating Dangerous Drywall



Artist's interpretation of FAST-ACT absorbing and destroying toxins in drywall. Credit: Trent Schindler, NSF

A nanomaterial originally developed to fight toxic waste is now helping reduce debilitating fumes in homes with **corrosive drywall**. Developed by Kenneth Klabunde of Kansas State University, and improved over three decades with support from NSF, the **FAST-ACT** material has been a tool of first responders since 2003.

Now, **NanoScale Corporation** of Manhattan, Kan.--the company Klabunde co-founded to market the technology--has incorporated FAST-ACT into a cartridge that breaks down corrosive substances in the drywall.

Homeowners have reported that these substances, particularly sulfur compounds such as hydrogen sulfide and sulfur dioxide, have caused respiratory illnesses, wiring corrosion and pipe damage in thousands of U.S. homes with sulfur-rich, imported drywall.

"It is devastating to see what has happened to so many homeowners because of the corrosive drywall problem, but I am glad the technology is available to help," said Klabunde. "We've now adapted the technology we developed through years of research for FAST-ACT for new uses by homeowners, contractors and remediators." Read more about this work [here](#).

Latest survey figures from NSF show that research and development (R&D) expenditures by all federally funded R&D centers (FFRDCs) totaled \$14.7 billion in FY 2008. FFRDCs are privately operated R&D organizations that are exclusively or substantially financed by the federal government. The new figures show that FFRDCs account for about 35 percent of all federal R&D performance and 4 percent of all U.S. R&D in FY 2008, the most recent data available. Read more [here](#).

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## FACES OF NSF RESEARCH

### Enhancing American Competitiveness Through Research

The Division of Materials Research at NSF will soon announce the third group of recipients of its American Competitiveness and Innovation (ACI) Fellowships. The ACI program, established in 2008, seeks to identify and promote high-risk, high-payoff research that is expected to lead to innovations and, thus, enhance American competitiveness in the global economy.

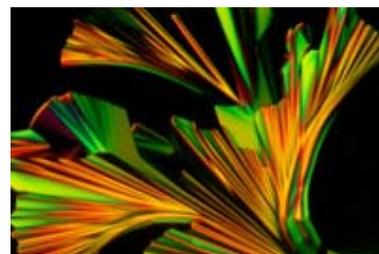
ACI fellows are selected from among a group of recent NSF awardees whose proposals have already risen to the top via peer review and received funding. The fellows receive an additional two years of support to allow them to attack adventurous projects that, while high-risk, would also lead to large payoffs if they were to succeed.

Additional criteria for selection as an ACI fellow include a demonstrated effort to broaden the participation in scientific research by women, members of underrepresented minority groups and persons with disabilities.

ACI Fellows in previous years have developed programs to bring research experiences to high school students through weekend or summer programs; increase communication of scientists with the general public through special presentations and outreach programs; and enhance the recruitment of young women and members of under-represented minorities into scientific research groups.

Half of the previous ACI fellows are themselves women and most are young investigators early in their careers. A wide variety of research projects are represented among the nearly 20 previous recipients, including investigations of new electronics materials, research into ways of using computation to design innovative materials, the development of new types of polymers and ceramics, and a wide array of nanotechnology investigations.

Previous years' awardees and more detail about their individual research projects can be found [here](#). This site will also include an announcement of the 2010 awardees when the names become available.



Photomicrograph of a liquid crystal produced at one of NSF's Materials Research Science and Engineering Centers (MRSEC). Credit: University of Colorado, Boulder

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## NSF IN THE NEWS

**Caterpillar Studies Suggest New Robot Possibilities** (*Boston Globe*) NSF-funded scientists have discovered that a caterpillar's internal organs move forward before the outer body does, suggesting new design possibilities for small, soft-bodied robots that might be able to access tight spaces.

**Bats Face Extinction** (*The New York Times*) An NSF-funded researcher who co-authored a recent report in the journal *Science*, which concludes that a beneficial bat species may be wiped out in 20 years by a spreading fungal infection, answers questions posed by the *Times'* *Dot Earth* blog.

**Citizen Scientists Discover Unusual Pulsar** (*MSNBC*) Three ordinary folks from Iowa and Germany have discovered an unusual radio pulsar, which may have once been part of a binary star system that exploded, by analyzing data on their home computers through a citizen science project partially funded by NSF.

**Mushrooms Used for Eco-Friendly Packaging** (*Christian Science Monitor*) A new material, made from agricultural waste and mushroom roots, is being used to create custom packaging material. The material was developed through research partially supported by NSF.

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## THE RIPPLE EFFECT

### Radiolab Explores the World

Radiolab is a project, partially funded by NSF, that explores topics blurring the boundaries between science, philosophy and the human experience. Produced by WNYC, a public radio station in New York City, and airing on public radio stations around the country, episodes are also available via podcast every two weeks. Recent programs have considered what it feels like to have the language center of your brain wiped out by a stroke, an investigation of famous tumors, including the one that killed President Ulysses S. Grant, and an exploration of the mental and physical limits to human experience. Radiolab received a **2007 National Academies Communication Award** "for their imaginative use of radio to make science accessible to broad audiences." Read more about Radiolab [here](#).

### Eyes on the Sky



The Very Large Array.  
Credit: NRAO/AUI and  
photographer Kelly Gatlin;  
digital composite, Patricia  
Smiley

mountaintops in Chile and Hawaii, also include powerful radio antennas such as those at the National Radio Astronomy Laboratory (NRAO).

One of the NRAO observational facilities is known as the Very Large Array (VLA) and consists of 27 radio antennas arranged in a Y-shaped configuration about 50 miles west of Socorro, N.M. Visitors are welcome. For more information, see the [NRAO website](#).

A recent **NSF Special Report** explores the many ways that astronomers are using NSF facilities to study the sky and make advances in understanding the nature of the universe.

NSF's ground-based facilities, such as the twin telescopes of the Gemini Observatory located on

### Girls Energy Conservation Corps



GECCo participants make door-draft blockers to conserve energy. Credit: TERC

Junior girl scouts, ages 8-13, can participate in the Girls Energy Conservation Corps (GECCo), funded by NSF, to learn more about topics related to energy use and conservation. Through activities on the [GECCo website](#), participants explore ways in which they and their families use energy, find new ways to save energy and earn badges in the process. Scouts learn how collective action, working together with their peers, families and communities, can help solve the world's pressing energy problems. Learn more [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.*



