

NSF AT WORK



*With new technology, researchers hope to save vast quantities of time, money and water by having plants "tell" farmers what they need and when. Credit: © 2007 Jupiter Images Corporation.*

**Turning a New Leaf**

Working with a \$150,000 Small Business Technology Transfer research grant from the National Science Foundation (NSF), Richard Stoner and others at his high-tech company, AgriHouse, are developing a technology that will enable plants to communicate with humans.

The technology uses sensors to record a plant's moisture content. The sensors are simply clipped to plant leaves to monitor the plant's water deficiency and accompanying stress. The resulting data is transferred from the sensors to computers linked to irrigation systems. Hence, the sensors ensure timely watering of plants and cut down on excessive watering.

Agricultural activity accounts for about 40% of freshwater use in the United States and techniques utilized by these sensors will decrease overall water consumption, potentially saving farmers millions of dollars per year.

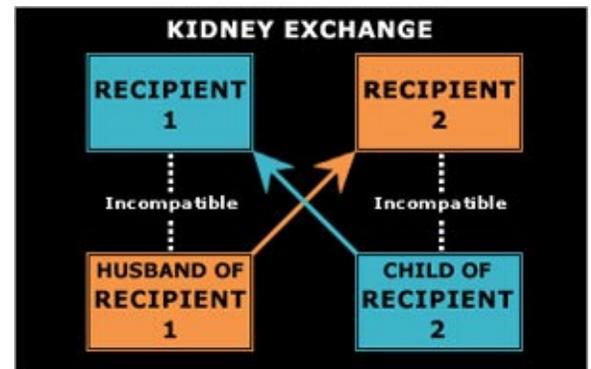
To date, the technology has been used only with cowpea, a legume, but researchers believe that this leaf-sensor technology could be transferred to a variety of crops including corn, wheat, potatoes, sugar beets and pinto beans, and even be extended to grass and fields, which would aid park and field maintenance.

Yet another case of NSF research and technology turning a new leaf! See the [press release](#) from the University of Colorado at Boulder for more information.

**New Algorithm May Increase Kidney Transplants**

Of the 70,000 some Americans awaiting kidney transplants, about 4,000 will die each year. Currently in the United States, kidney exchanges are considered the best way to increase the number of kidney transplants.

Computer scientists at Carnegie Mellon University have developed a new method that can match living kidney donors with kidney disease patients, and increase the number of kidney transplants. Matches between kidney donors and recipients are determined by a specific algorithm that can search through the large national pools of donors and recipients. According to computer scientist Tuomas Sandholm, the revolutionary new algorithm creates matches for three- and four-way exchanges as well as two-way exchanges. This means that three or four donors can be matched with three or four recipients.



*An exchange performed because of blood type incompatibility. The husband of Recipient 1 donates to Recipient 2 and the adult child of Recipient 2 donates to Recipient 1. Credit: S2N Media.*

The Alliance for Paired Donation, a kidney exchange program, already uses the new algorithm, and many scientists are pleased with the potential it holds. Alliance Director, Dr. Michael Rees of the University of Toledo Medical Center said that if the national pool could include 3,000 donor-patient pairs and accumulate 1,000 to 1,500 pairs each year, as many as 2,000 transplants could be performed if three- and four-way exchanges are incorporated. See the [news release](#) from Carnegie Mellon for more information.

## Power Transfer Goes Unplugged



Researchers demonstrated that power levels high enough to run a laptop can be transferred over the distance of a room, even with objects obstructing the sending and receiving units. Credit: © 2007 Jupiter Images Corporation.

See MIT's [press release](#), "Goodbye Wires..." for more information.

Recently, a team of researchers from the Massachusetts Institute of Technology experimentally demonstrated an important step for the wireless transfer of power that could be used for everyday cordless devices. In the world of laptops, iPods and cell phones, charging heavy batteries becomes a hassle. In addition, batteries significantly add to the total weight of a device and are expensive to replace.

The researchers' novel concept of "WiTricity" is based on the notion of magnetically coupled resonance. The team coupled a system of two electromagnetic resonators through their magnetic fields, which created an efficient power transfer. Their design consists of two self-resonant copper coils, a sending unit and a receiving unit. The sending unit is attached to the power source, and fills the space around itself with a non-radiative magnetic field. The receiving unit resonates with the field, producing a strong connection between the two units.

The team identified the strongly coupled regime through this interaction, which functioned even when the two objects were separated by a large distance. This specific regime allows for the highly efficient transfer of power. This discovery could revolutionize the wireless industry and leave batteries as a thing of the past.

## Unraveling the Secrets of the Black Widow's Unique Silk

The identification of the genes encoding two key proteins in the unique silk of the black widow spider may lead to advances in new materials for industrial, medical and military uses. Biologists at the University of California, Riverside, have identified the ingredients and the genetic blueprint of the spider's "dragline silk." This new knowledge may make it possible to one day artificially spin silk fibers for use in lightweight, super-strong body armor, components of medical devices and high-tech athletic attire.

Dragline silk--one of seven different silks that a spider produces--is used to lay the groundwork of webs and also supports the spider as it moves around. The dragline silk of the black widow spider is one of the strongest and toughest spider silks. For more on the secrets of the black widow spider's silk, see UCR's [press release](#).



The foundation of the black widow spider's web is made from their strong dragline silk. Credit: morgueFile.

## DID YOU KNOW?



NSF uses FastLane to process and document all of its grant activity. Now, NSF is charged with the task of bringing the paperless system to the rest of the government. Credit: © 2007 Jupiter Images Corporation.

## In the driver's seat, NSF rides in the FastLane.

Since 1996, a vast majority of NSF's interactions with the external grantee community have been conducted electronically through the agency's interactive Web site, FastLane. In collaboration with NSF, more than 250,000 people use FastLane each year. For example, 41,500 grant applications were processed via FastLane in FY 2005, leading to approximately 9,500 awards. In FY 2005, 192,000 reviews, 26,000 technical progress reports, 15,800 cash requests, and distributions of \$4 billion in grant funds were also handled via the interactive Web site.

Because of FastLane, NSF was among six government agencies to receive an "A" rating from the U.S. House Committee on Government Reform in March 2006. FastLane has driven NSF into a leadership position as it is one of only three initial "Consortia" service providers to help develop a government-wide solution of public and comprehensive grants management.

## FACES OF NSF RESEARCH

Winning a world championship is the ultimate goal of any soccer player, whether it be man, woman or... robot? Nearly 300 teams from 37 countries recently competed in RoboCup 2007 World Championship in Atlanta, Ga., from July 1-10. RoboCup is an international project to foster advances in artificial intelligence and intelligent robots research. The ultimate goal of RoboCup is to develop, by 2050, a team of fully autonomous humanoid robots that can beat the human world champion soccer team.

Advised by NSF-funded researcher Manuela Veloso, researchers at Carnegie Mellon University recently won first place at the competition with their team, the CMDragons'07. After a tie in the final game, the robots won in penalty shots.

The remarkable team was a by-product of the University's multi-robot CORAL Lab (Cooperate, Observe, Reason, Act, and Learn), where Veloso and her students program teams of robots to make plans, carry out tasks, and learn from their successes and failures. Veloso became involved in robot soccer because it served as a test platform for her research.

Over the years, the research efforts of Veloso and her students have transformed Carnegie Mellon into a robot soccer powerhouse. At the RoboCup American Open in 2003, their teams finished in first place in the small-size robot league and the four-legged robot league that features teams of four Sony AIBO robot dogs, donated by Sony, with each team relying on superior programming to beat the competition.

See the [RoboCup Web site](#) for more information on the competition. More information on the CMU team is available on the [CMU CORAL site](#).



*Members of the Carnegie Mellon Sony 4-legged-robot RoboCup team, CMPack'02, which won first place at RoboCup 2002 in Fukuoka, Japan. Credit: CMPack'02 research team: Manuela Veloso, Scott Lenser, Douglas Vail, Maayan Roth, Ashley Stroupe and Sonia Chernova.*

## NSF IN THE NEWS

[Science, Tech Advocates Eye Increased Federal Resources](#) -- *National Journal's Technology Daily (07/13/07)* -- Washington is starting to focus more on science, technology, engineering, and mathematics (STEM) education. Education advocates say efforts such as the president's budget request are needed, considering students and teachers involved in STEM programs continue to struggle. "The budget request contained the first meaningful increase for the National Science Foundation's education programs in many years, something the STEM ed community has really made a high priority," says James Brown, co-chairman of the STEM Education Coalition.

[China Dust Shows Up on U.S. Peaks](#) -- *Caspar Star-Tribune (AP) (7/17/2007)* -- Research by University of Washington at Bothell professor of atmospheric and environmental chemistry Dan Jaffe shows that pollutants from China have reached the peaks of U.S. mountains. China now emits more carbon dioxide--the atmospheric pollutant that is primarily responsible for global warming--than any other nation. The research was funded by the NSF.

[Study: Keep Families Intact](#) -- *Oxford Press (OH) (07/16/07)* -- MIT economics professor Joseph Doyle has conducted what child welfare experts are calling the largest study ever conducted on the impact of foster care. With NSF funding, he tracked 15,000 children in Illinois. Doyle found children who stayed with their families were less likely to become juvenile delinquents or teen mothers and were more likely to keep a job or earn a better salary.



## House and Senate Appropriators Recommend 10% Increase for NSF

### HOUSE RECOMMENDATIONS

On July 12, 2007, the House Appropriations Committee passed the fiscal year 2008 Commerce, Justice, Science and Related Agencies Appropriations bill and provided \$6,509 million for NSF. The appropriation is \$80 million (1.2%) above the President's request and \$591.84 million (10%) above the FY 2007 Continuing Resolution (CR).

The **Research and Related Activities** account was provided \$5,139.7 million, \$8 million above the request and \$372 million (7.9%) above the CR.<sup>1</sup>

The **Education and Human Resources** account is funded at \$822.6 million. The account appropriation is \$72 million (9.6%) above the request and \$124.6 million (17.9%) above the CR.<sup>1</sup> The \$72-million increase is directed to the Robert Noyce Scholarship, the Math and Science Partnership, and the Graduate Teaching Fellows in K-12 Education programs, as well as undergraduate and graduate student support. The language also includes funding for a new climate change education activity.

The Committee provided the requested \$244.7 million for the **Agency Operations and Award Management** account.<sup>2</sup> The appropriation is \$53.9 million, or 28.2%, above the CR. The **Major Research Equipment and Facilities Construction** account was provided the requested level of \$285.6 million, or \$38.8 million (15.7%) above the CR. The bill funds the **National Science Board** and the **Office of Inspector General** at the requested levels of \$4 million and \$12.4 million, respectively.

### SENATE RECOMMENDATIONS

The Senate Appropriations Committee passed the fiscal year 2008 Commerce, Justice, Science and Related Agencies Appropriations bill and provided \$6,553.4 million for the National Science Foundation. The appropriation is \$124.4 million (1.9%) above the President's request and \$637.8 million (10.8%) above the FY 2007 Continuing Resolution (CR).

The **Research and Related Activities** account is funded at \$5,156.1 million, \$24.4 million above the President's request and 8.2% above the CR.<sup>1</sup>

The **Education and Human Resources** account is funded at \$850.6 million, \$100 million (13.3%) above the President's request and \$152.6 million (21.9%) above the CR.<sup>1</sup> The appropriation includes funding increases for the Robert Noyce Scholarship; the Math and Science Partnership; the Louis Stokes Alliances for Minority Participation; the Historically Black Colleges and Universities Undergraduate; the Science, Technology, Engineering, and Mathematics Talent Expansion; and the NSF Academies for Young Scientists programs.

The **Agency Operations and Award Management** account is funded at the requested level of \$285.6 million, \$38.8 million (15.7%) above the CR.<sup>2</sup> The **Major Research Equipment and Facilities Construction** was provided the requested \$244.7 million, which is \$53.9 million (28.2%) above the CR. The bill funds the **National Science Board** and the **Office of Inspector General** at the requested levels.

### NSF Funding by Appropriation Account

<i>(Dollars in Millions)</i>	FY 2007 Estimate	FY 2008 Request	House Mark	Senate Mark
<b>NSF Overall</b>	<b>5,917.2</b>	<b>6,429.0</b>	<b>6,509.0</b>	<b>6,553.4</b>
Research & Related Activities <sup>1</sup>	4,768.0	5,131.7	5,139.7	5,156.1
Education & Human Resources <sup>1</sup>	694.7	750.6	822.6	850.6
Major Research Equipment & Facilities Construction	190.9	244.7	244.7	244.7
Agency Operations & Award Management <sup>2</sup>	248.3	285.6	285.6	285.6
National Science Board	4.0	4.0	4.0	4.0
Office of Inspector General	11.4	12.4	12.4	12.4

Totals may not add due to rounding. <sup>1</sup> Total funding for the FY 2008 Research and Related Activities (RR&A) and Education and Human Resources (EHR) Accounts reflect a transfer of Experimental Program to Stimulate Competitive Research (EPSCoR) program funding (\$102 million) from the EHR Account to the RR&A Account. <sup>2</sup> Formerly termed Salaries and Expenses.



The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science with an annual budget of nearly \$5.92 billion. NSF funding reaches all 50 states through grants to over 1,700 universities and institutions. Each year, NSF receives about 42,000 competitive requests for funding and makes over 10,000 new funding awards. The NSF also awards over \$400 million in professional and service contracts yearly. Contact [NSF's Office of Legislative and Public Affairs](#) for more information, to unsubscribe, or for permission to reuse newsletter images.