

NSF AT WORK

New Wi-Fi Network Brings Eye Care to Thousands in India

Researchers at the University of California, Berkeley, have developed a new technology for low-cost rural connectivity. As a result, thousands of residents from rural villages in India are receiving quality eye care for the first time.

Based on "Wi-Fi" wireless networks, the technology allows eye specialists to examine patients in five remote clinics via a high-quality videoconference using simple, inexpensive software and hardware. The system provides villages with a high-bandwidth connection to computer networks in cities as far as 50 miles away.

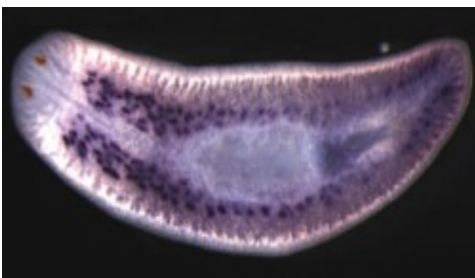
The researchers implemented the Technology and Infrastructure for Emerging Regions (TIER) pilot program in 2005. Because of the initial success, TIER will soon expand to include five hospitals linked to 50 clinics that will annually serve an expected half a million patients in the southern Indian state of Tamil Nadu. The research may also have application in other developing countries as well as in rural areas of the U.S.



A nurse and doctor from Aravind Eye Hospital examine a patient at the Periakulum rural vision center, which is usually staffed by a single nurse who uses a computer network designed by researchers at UC Berkeley to teleconference with an eye specialist at a hospital 10 miles away. Credit: Aravind Eye Hospital.

Much of this work was developed in conjunction with Intel via its research lab in Berkeley. Funding for this computer science research came primarily from NSF. For more, see the UC Berkeley News' [press release](#).

No Matter How You Slice It: the Flatworm's Regenerative Gene is Revealed



Freshwater flatworms, called planaria, possess extraordinary regenerative capabilities by virtue of a population of stem cells they maintain throughout their lives. Researchers recently identified a key gene that maintains planarian stem cells. Credit: Ricardo Zayas and Phillip Newmark, University of Illinois, Urbana-Champaign.

Phillip Newmark and his colleagues at the University of Illinois at Urbana-Champaign have identified a gene in planaria--freshwater flatworms renowned for their regenerative abilities--that is key for maintenance of their stem cells. Because planarian stem cells share characteristics with those of humans, the work will aid scientists striving to understand how stem cells can be used to completely repair damaged tissues and organs.

Planaria are popular for introductory biology experiments because if one is chopped in half, two grow back. In fact, only 1/279th of a planarian is needed to regenerate a complete worm. Scientists studied the worm's ability to regenerate with a cutting-edge technique called "RNA interference," which stops a particular gene from producing its encoded protein. Without the protein, the planaria's stem cell population died out, and they lost the ability to regenerate. Now researchers will see if the gene plays a similar role in stem cells from other organisms.

Newmark's research is supported by NSF's CAREER program, which is designed to support the early career-development of those researcher-educators who are deemed most likely to become the academic leaders of the 21st century. Read NSF's press release, "[Flatworms at Forefront of Regeneration Research](#)" for more details.

Communications Lifeline Critical to Battling California Wildfires

When an abandoned campfire in Cleveland National Forest erupted into a 7,000-acre wildfire, communications expert Hans-Werner Braun and his collaborators from the NSF-supported High Performance Wireless Research and Education Network (HPWREN) came to the rescue. The team was recruited by the California Department of Forestry and Fire Protection to assist with battling the blaze, known as "Horse Fire," that was threatening the San Diego, Calif. area.

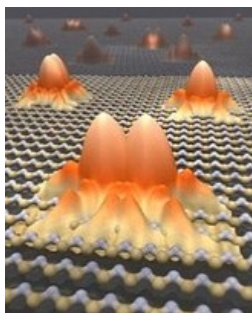
The HPWREN team set up computer hardware to allow firefighters in remote locations to communicate via a wireless link from the incident command post to the Internet. The critical lifeline, using Voice-over-IP technology, allowed firefighters at the scene to coordinate with reinforcements and resources miles away. The HPWREN team will remain on call throughout the fire season.

The HPWREN collaboration involves researchers from the San Diego Supercomputer Center, Scripps Institution of Oceanography and San Diego State University. For more information on "Horse Fire," see NSF's "[Communications Team Erects Lifeline for Firefighters Battling California Wildfires](#)." More on HPWREN efforts is available in NSF's [Special Report on Disasters](#).



An HPWREN automated digital camera on Lyons Peak captured an image on July 23, 2006, that shows the extent of "Horse Fire." Credit: HPWREN.

Scientists Tailor Semiconductors at the Atomic Scale



In a stride that could hasten the development of computer chips that both calculate and store data, scientists have turned semiconductors into magnets by the precise placement of metal atoms within a material from which chips are made. Credit: A. Yazdani, Princeton University.

A team of scientists has turned semiconductors into magnets by precisely replacing individual metal atoms in the material used to make computer chips. The ability to manipulate semiconductors at the atomic level could eventually revolutionize computers.

Computers use two different kinds of technology to calculate results and store data. Semiconductor chips do the calculating, while data storage has generally been accomplished with magnetic materials within floppy disks or reels of tape. By combining these two functions into a single device, the size and energy requirements of computer hardware could be significantly reduced--a perennial goal of the industry.

The researchers used a scanning tunneling microscope to move single atoms in the chip material to give it magnetic properties. They will now perform experiments to see how additional atomic maneuvers affect the semiconductor's performance.

The team, composed of researchers from Princeton University, the University of Illinois at Urbana-Champaign and the University of Iowa, was supported by NSF and the U.S. Army Research Office. See Princeton University's press release "[Scientists Build 'Magnetic Semiconductors' One Atom at a Time](#)" for more information.

DID YOU KNOW?

Since its inception, the Louis Stokes Alliances for Minority Participation (LSAMP) program has been developing strategies to increase the quality and quantity of minority students who successfully complete bachelor's degrees in science, technology, engineering and mathematics (STEM) and also matriculate students into STEM graduate programs.

Since its inception in 1991, minority enrollment in STEM majors at LSAMP-participating institutions increased from 35,670 to more than 205,000 in 2003. To date, the 34 LSAMP Alliances have produced over 24,000 STEM graduates with bachelor's degrees.

NSF's Directorate for Education and Human Resources-Division of Human Resource Development manages the [LSAMP program](#). For more on the evaluation of LSAMP, visit the [Urban Institute Web site](#).



Students at the University of North Carolina at Pembroke conduct a research experiment as part of the NSF-supported Louis Stokes Alliances for Minority Participation program. Credit: LSAMP, University of North Carolina at Pembroke.

Same Face, New Place -- Collins Sustains NSF Ideals for the Long-Term



In 1992, Dr. Scott Collins came to NSF as a program director in ecological studies. In 2003, he left his NSF position to head the University of New Mexico's Sevilleta Long-Term Ecological Research Project (LTER). He departed NSF with a deep respect for both the NSF proposal review process and the care with which reviewers and panelists evaluate proposals. Now planted firmly back in research, Collins is studying--among other things--plant community dynamics and fire ecology in the desert. We recently asked Collins to see if his time at NSF had long-term impacts on his research.

NSF: What was the most important insight you gained at NSF? **Collins:** While working at NSF, I had the opportunity to interact with scientists from a very broad array of disciplines outside ecology. That experience helped me understand important connections between subdisciplines within ecology, as well as the importance of collaboration among disciplines. I also gained a better understanding of how the federal government works and the role federal agencies play in shaping science and science policy.

NSF: What is the next "big thing" on the horizon for ecology? **Collins:** A few things really. First is the desire to develop genuine long-term research collaborations with social scientists, including economists, anthropologists, sociologists, geographers, political scientists, etc. Second, we are just beginning to see the emergence of 'ecological genomics,' which will unify disparate groups within the biological sciences. Finally, as technology continues to develop, sensors and sensor networks are going to play a huge role in ecological research. This will require strong collaborations between ecologists and engineers, mathematicians and computer scientists.

NSF: What research project at the Sevilleta LTER do you foresee having an immediate impact on ecological research? **Collins:** Water is everything in the desert southwest. Climate change models are notoriously bad at predicting regional changes in precipitation, but they all seem to suggest that our climate will become more variable. We have three experiments at the Sevilleta that manipulate different aspects of rainfall variability in combination with other drivers, for example, temperature or nitrogen pollution. We are 'simulating the future' in our region to better understand the consequences of global change on arid-land ecosystems.

NSF: What has been the highlight of your professional career? **Collins:** I learned early on at NSF that my job was to help make other people successful. That was our operating philosophy. I use that same philosophy here at UNM through working with students and through the Sevilleta LTER program.

NSF: What advice would you give to young researchers who are interested in pursuing the same or similar paths? **Collins:** As I said to a former UNM student heading off to a tenure track job, 'just do it because you love it.'

"Human-caused environmental change is having a significant impact on ecological systems. Yet, the public relies on technology to solve problems."

NSF IN THE NEWS

[Georgia Tech Develops a 'SWAN' Suit](#) -- *United Press International (08/15/06)* -- Researchers at Georgia Tech are developing the System for Wearable Audio Navigation suit -- consisting of a small laptop, a proprietary tracking chip, and bone-conduction headphones -- designed to guide the blind as well as firefighters and soldiers when their vision is obscured. The effort is supported by a \$600,000 National Science Foundation grant.

[Agencies Still in the Red on Financial Performance](#) -- *Federal Computer Week (08/14/06)* -- Financial performance remains one of the weaknesses of federal agencies under the Office of Management and Budget's quarterly Executive Branch Management Scorecard. The National Science Foundation is an exception, consistently scoring the highest mark, green, in the category.

[Taking the Nanopulse -- Nano by the Numbers](#) -- *Industry Week (08/09/06)* -- The 2005 National Center for Manufacturing Sciences Survey of Nanotechnology in the U.S. Manufacturing Industry funded by the National Science Foundation asked 600 industry executives about nanotech trends. What's new? To begin, there's been a rise in urgency about nanotechnology in the two years since the last report. A majority of respondents (52%) now say nanomanufacturing is a high priority for them.



Excerpts from
Dr. Arden L. Bement Jr.'s remarks

before the
**Education, Early Childhood and
Workforce Committee**

at the
National Governor's Meeting

As delivered on Aug. 6, 2006

A strategic outcome goal of NSF and the nation is to cultivate a world-class, broadly inclusive science and engineering workforce and expand the scientific literacy of all citizens. We do this by working with education, state, and industry partners. NSF's mission and its stated role in the American Competitiveness Initiative brings me here as a partner.

Today, the world is too small and too connected not to collaborate. NSF wants to partner with you to attract, educate, and train future scientists and engineers.

Students should be continuously educated to the variety of career options that STEM education opens to them and the relevance of their studies to society. They deserve an answer to the question, "Why do I need to learn this stuff?"

We must commit to our teachers if we expect them to commit to our children. Teachers are underpaid and overworked with responsibilities that have nothing to do with teaching. Worse yet, many do not have a quality education in the STEM subject they are teaching.

At NSF, we are ready to work with all parties to build a stronger S&E workforce to keep the U.S. at the head of the pack. Although our different sectors have unique roles, we must work together to achieve this common goal.

***NSF's "Top Gun" Speaks to "The GrantDoctor" on
Frontier Science***

"If we at NSF stop short in our pursuit of high-risk endeavors, it seems to me that we leave an absolute vacuum. In a science and technology-based world, to divert our focus from the frontier is to put the nation at peril," said NSF Director Arden L. Bement, Jr.

Bement offered up NSF's SGER (Small Grants for Exploratory Research) as a vehicle to procure support for ambitious frontier science. "Doing research at the frontier is not new for NSF. This is a reaffirmation of what NSF has been doing since its founding," continued Bement. See the Grant Doctor's full story "[No More Boring Science](#)" from *Science* (08/11/06) for more.

NSF's Bill Watch



H.R. 5356	<i>Research for Competitiveness Act</i>
Sponsor	Rep. Michael T. McCaul [TX-10] (introduced 5/11/2006)
Latest Action	6/22/2006: Placed on Union Calendar No. 294
Authorizes NSF to allocate at least 3.5 percent of Research and Related Activities funding to early-career researcher awards. Also authorizes industry matching funds and the support of high-risk, high-return research for this group.	
H.R. 5358	<i>Science and Mathematics for Competitiveness Act</i>
Sponsor	Rep. John "Joe" Schwarz [MI-7] (introduced 5/11/2006)
Latest Action	6/22/2006: Placed on Union Calendar No. 293
Authorizes funds for the Robert Noyce "Teacher" Scholarship Program and increases scholarship amounts. Authorizes School and University Partnerships for Science and Math Education; Centers for Undergraduate Education; and the STEM Talent Expansion and IGERT programs.	
S. 2802	<i>American Innovation and Competitiveness Act of 2006</i>
Sponsor	Sen. John Ensign [NV] (introduced 5/15/2006)
Latest Action	7/19/2006: Reported out of Commerce, Science, and Transportation Committee and placed on Senate Legislative Calendar No. 524
Authorizes NSF appropriations, which escalate from \$6.44 to \$11.42 billion from FY 2007 to FY 2011. Authorizes funding for an additional 1,250 GK-12 fellowships and 1,250 IGERT traineeships, and for pilot professional science Master's degree programs.	
S. 2198	<i>PACE-Education Act</i>
Sponsor	Sen. Pete Domenici [NM] (introduced 1/26/2006)
Latest Action	3/1/2006: Senate Committee on Health, Education, Labor, and Pensions Subcommittee on Education and Early Childhood Development held hearings
Authorizes funds to recruit and train math or science teachers via scholarships, and for the professional development of teachers. Authorizes funds for early-career research grants, Advanced Research Instrumentation, and for NSF's Research and Related Activities account.	



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 \$5.58 billion. NSF funding reaches all 50 states through grants to roughly 1,700 universities and institutions. Each year, NSF receives about 40,000 competitive requests for funding and makes about 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.