

NSF AT WORK



Follow the "Green" Brick Road

New bricks made from fly ash--fine ash particles captured as waste by coal-fired power plants--may revolutionize the construction industry. Once colored and shaped, these "green" bricks are similar to their red clay counterparts, both in appearance and in meeting or exceeding construction-material standards.

"Manufacturing clay brick requires kilns fired to high temperatures," said Henry Liu, a longtime NSF awardee and the president of Freight Pipeline Company, which developed the bricks. "That wastes energy, pollutes air and generates greenhouse gases that contribute to global warming. In contrast, fly ash bricks are manufactured at room temperature. They conserve energy, cost less to manufacture, and don't contribute to air pollution or global warming."

Supported by NSF's Small Business Innovation Research (SBIR) program, Liu has been working since 2004 on engineering bricks to be resistant to freezing and thawing due to weather.

"Green manufacturing is a focus for the nation," said Tom Allnutt of NSF's SBIR program. "Liu's innovation use of fly ash to manufacture high quality building materials will potentially decrease some of the negative environmental impact of coal-fired power generation while meeting increasing demands for greener building materials."

Henry Liu led the development of fly ash bricks, a potential "green" alternative to clay bricks (top). Assortment of the "new" bricks crafted from fly ash, a waste produced by coal-fired power plants (bottom). Credit: Henry Liu, Freight Pipeline Company.

For more on fly ash bricks, see [NSF's news release](#).

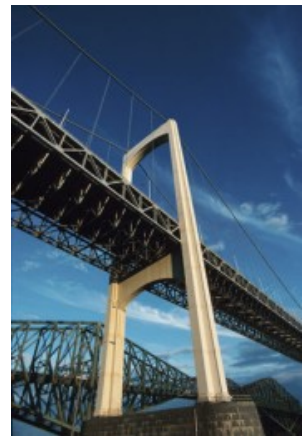
Safety First! Hand-Held Radar Sees the Hidden

NSF-supported engineers at the Massachusetts Institute of Technology (MIT) have developed a new technique for detecting damage in concrete bridges and piers that could increase the safety of aging infrastructure by allowing easier and more frequent onsite inspections. The advantage of the new technique is that it allows a rapid inspection from a distance and provides computerized visualization of the internal damages.

The new technique, called far-field airborne radar nondestructive testing (FAR-NDT), involves the use of a hand-held radar device that can "see" through the fiberglass-polymer wrapping often used to strengthen aging concrete columns.

The device provides inspectors with computerized visualization of internal damages and can be used onsite from a distance of more than 10 meters. Furthermore, FAR-NDT allows engineers to perform reliable, in-situ inspection for visualizing and characterizing hidden damages from distances without having to endanger the structure by taking specimens from it or disturbing the traffic or service.

For more information on this cool civil engineering gadget, visit [MIT's press release](#) "Handheld Device 'Sees' Damage in Concrete Bridges, Piers."



Engineers have developed a new technique for detecting damage in concrete bridges and piers that could increase the safety of aging infrastructure by allowing easier, more frequent, onsite inspections. Credit: 2007 Jupiter Images Corporation.

Eyeing Hurricanes in Real Time



Forecasters will monitor the intensity of land-falling hurricanes every six minutes using a new technique -- Vortex Objective Radar Tracking and Circulation (VORTRAC). Credit: NOAA.

In 2004, parts of Florida were caught by surprise when Hurricane Charley suddenly intensified just six hours before hitting the state's southwest coast. This summer, NSF-funded researchers at the National Center for Atmospheric Research (NCAR) and the Naval Research Laboratory (NRL) will experiment with a new technique that could help forecasters determine whether a storm is gathering strength as it nears land. Meteorologists will be able to quickly alert coastal communities if an approaching hurricane suddenly intensifies or weakens.

The technique, Vortex Objective Radar Tracking and Circulation (VORTRAC), relies on the existing network of Doppler radars along the Southeast coast to provide a 3-D view of approaching hurricanes every six minutes. Each individual radar can measure winds blowing toward or away from it, but no single radar could provide a 3-D picture of hurricane winds before now.

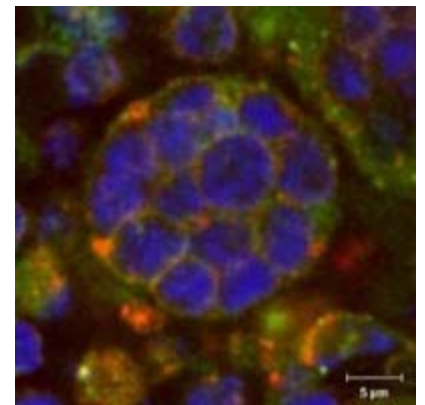
For more on this research, see [NCAR/UCAR's press release](#), "New Technique Provides 3-D View of Approaching Hurricanes."

"Nurse Cells" Make Life and Death Decisions for Infection-Fighting Cells

Thymic nurse cells were given their name because of their intimate relationship with developing T cells, or thymocytes--cells that fight infection. Individual nurse cells can internalize as many as 50 destined-to-die thymocytes into their own cell bodies. Early studies suggested that these thymic nurse cells only "cleaned up" abnormal thymocytes.

NSF-funded researchers recently reported, however, that nurse cells function as more than just storage for non-functioning T cells. They also have the capacity to help determine which T-cells "live or die" and can take up thymocytes that have been selected to live via positive selection.

For more on this research helping us understand immune system function, see [NSF's press release](#).



Thymocytes, cells that fight infection, are taken up by thymic "nurse" cells. Credit: Jerry Guyden, CUNY.

DID YOU KNOW?



The extrasolar planet Gliese 436 b and its star. Credit: Lynette Cook.

...that NSF is the primary supporter of ground-based astronomy?

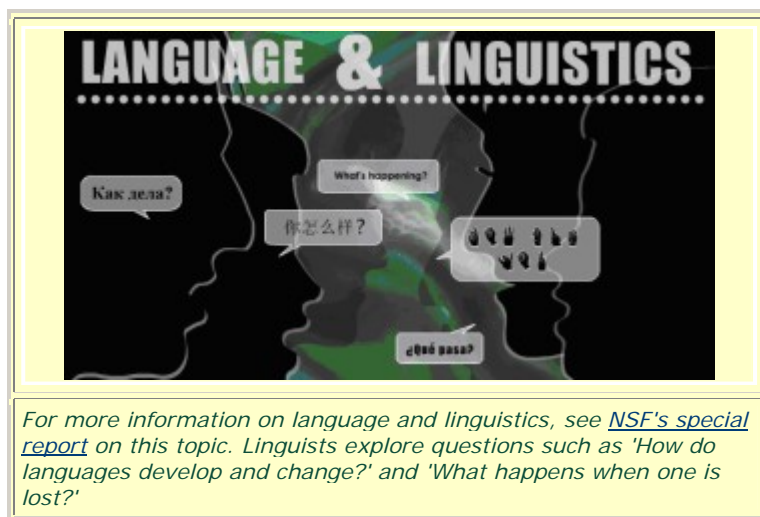
In fact, the agency anticipates supporting \$215.11 million of astronomy research in FY 2007.

Recently, NSF astronomy research funding helped support the discovery of 28 planets. The planets were discovered by the California and Carnegie Planet Search and Anglo-Australian Planet Search teams--the world's largest team of planet hunters. Together, these teams have discovered more than half of all known exoplanets.

The teams' latest finding increases the number of known planets outside our solar system to 236 and the number of objects discovered by the team in the past year to 37. For more information, see the [press release from the University of California, Berkeley](#).

Speaking Face to Face: Understanding the Complexity of Audition and Speech

Speech is arguably our most valuable social skill. Yet, perceiving speech and language requires intricate neural pathways to decode, interpret, and perceive information. Currently, NSF-supported researcher Josef Rauschecker of Georgetown University is studying speech perception in mammals. By using non-invasive techniques in primates, he has discovered that different areas of the brain process distinct sounds. He is "mapping" how different sound information travels through the nervous system to the brain, and which cortical regions, or areas of the brain, interpret and process distinctive sounds. His work will give more insight into the organizational principles of higher auditory pathways in humans as well as the organizational structure of the brain.



Another NSF-supported researcher, Dr. Lisa Davidson, studies the production of unfamiliar sounds. She studies why non-native speakers have trouble eliminating their native accent when learning a new language. Her research suggests that coordination and timing are language-specific. Hence, non-native learners have difficulty producing sounds such as the "v" in the German pickle brand, "Vlasic," which sounds more like "Velasic" in non-native speakers.

According to a recent NSF report, "not only must speakers learn which sounds can be combined into sequences, but they must also learn how such sequences are temporally coordinated." Davidson will be using acoustic recordings and ultrasound imaging of tongue movements to investigate why foreign language learners have difficulty pronouncing words like a native.

NSF IN THE NEWS

[Science Teacher Awarded Scholarship for Graduate Work](#) -- *Rapid City Journal* (06/13/07) -- The National Science Foundation is funding the Life Sciences for a Global Community program at Washington University in St. Louis. The program will provide up to 100 teachers with scholarships to pursue degrees intended to boost secondary biology education.

[Investing in Education](#) -- *Dunn County News* (06/13/07) -- The new Innovation Agenda bills that passed through the House last week will boost funding for the NSF, which in turn will benefit university research efforts. To help achieve the goal of producing more engineers, the Innovation Agenda will provide enhanced scholarship opportunities to educate an additional 25,000 K-12 math and science teachers.

[Higher Pay Urged to Fight Dearth of Math and Science Teachers](#) -- *Washington Post* (06/12/07) -- The Business-Higher Education Forum has released a report urging higher starting salaries and increased teacher training to draw math and science teachers to the U.S. education system. The release of the report coincides with the debate over the NSF budget.

[Powershift](#) -- *Government Computer News* (06/09/07) -- With the help of funding from NSF, researchers at MIT have come up with a way to transmit power wirelessly. The researchers reported that they had transmitted 60 watts over a distance of two meters with 40 percent efficiency. The trick? Something called magnetically-coupled resonance.



Excerpts from remarks at the

Federation of American Societies for Experimental Biology (FASEB) Board Meeting

by
Arden L. Bement, Jr.
June 4, 2007

Large scale science is a topic of pivotal interest to the National Science Foundation. Two developments are driving large scale science: the continuing revolution in computer and communication science, and the growing convergence among disciplines in science and engineering.

The broad and complex questions posed by 21st Century inquiry require access to new information technology capabilities. They are critical for convergence among disciplines that is another defining feature of today's large scale, transformative research.

More and more, fundamental research at the interface among disciplines is proving to be the most fertile territory for discovery. Interdisciplinary research and collaboration are becoming the norm, rather than the exception, in many research endeavors.

The nation's science and engineering enterprise has reached a tipping point. If we embrace the new paradigms for conducting research and education--including large scale science, interdisciplinary collaboration and cutting-edge cyberinfrastructure--we have every reason to believe that America will remain on the frontline of transformative research in the years ahead.

Honoring Excellence: A "Teaching" Breakfast

2006 Presidential Awards for Excellence in Mathematics and Science Teaching

Keynote Speaker:
The Honorable Daniel Lipinski



Each year, the U.S. President recognizes outstanding kindergarten–6th-grade mathematics and science teachers by bestowing upon them the [Presidential Awards for Excellence in Mathematics and Science Teaching](#) (PAEMST). The weeklong celebration for the 2006 awardees was held May 14-19, 2007, in Washington, D.C.

One of the most prestigious events during the week was a congressional breakfast that provided an opportunity for awardees to meet their respective members of Congress. Representative Daniel Lipinski served as the keynote speaker for the breakfast and congratulated the awardees for receiving the Nation's highest honor for teaching mathematics and science. He thanked the teachers for their commitment to education and stated that "teachers have the greatest impact on young people and that it takes a lifetime of dedication to be a teacher." He challenged the awardees to continue their commitment to helping keep the U.S. competitive in a rapidly changing world.

The award recipients received a citation signed by the U.S. President, gifts from sponsors of the program from around the country, and a \$10,000 award from NSF. NSF administers the PAEMST program on behalf of the White House.

Keeping a Pulse on the Poles

International Polar Year (IPY) is a collaborative effort of scientists from all over the world who are banding together to advance scientific knowledge and geographical exploration in the polar regions.

The current IPY promises to advance our understanding of how the Earth's remote polar regions affect global climate systems; to bring about fundamental advances in many areas of science; and to enthruse young men and women regarding careers in science and engineering.

NSF is the lead federal agency for IPY and maintains an interagency web portal. The portal now offers RSS (short for "Real Simple Syndication") feeds allowing immediate access to timely educational material. Teachers can sign up for e-mail alerts to notify them when news about federally funded educational materials, classroom resources and information about opportunities to assist scientists in the field are added to the portal. Visit <http://www.us-ipy.gov> for more information.



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.