CURRENT
NATIONAL SCIENCE FOUNDATION

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NSF AT WORK

Rice is the main food staple of more than half of the world's human population. Credit: Nicolle Rager-Fuller, NSF

Donated Computer Time Combats World Hunger

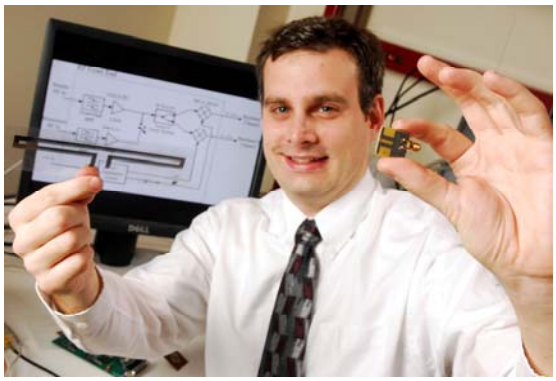
As concerns of a global hunger crisis mount, the University of Washington and IBM have launched a new program to develop stronger strains of rice that could produce crops with larger and more nutritious yields.

With the processing power of 167 teraflops, equivalent to one of the top three supercomputers in the world, IBM's World Community Grid will harness unused and donated power from nearly one million individual PCs to study rice at the protein level and then combine that information with traditional cross breeding techniques.

Ultimately, this project, jumpstarted by a $2 million grant from NSF, could enable rice-producing countries to become more immune to future climate changes because those nations would be able to quickly find the right plants for cross breeding, and create "super hybrids" that would be more resistant to changing weather patterns.

For more information on the project, see the UW press release.

Breakthrough Technology to Speed RFID Antenna Screening



Georgia Tech professor Gregory Durgin displays two different types of RFID antennas. Credit: Gary Meek, Georgia Tech

Radio frequency identification (RFID) tags are making it easier for businesses to track a wide range of items, including inventory, packages, auto tolls, passports and luggage at airports, just to name a few.

To keep up with the demand for improved RFID technologies, Gregory Durgin, an assistant professor in Georgia Tech's School of Electrical and Computer Engineering, and his students have designed a system capable of simultaneously measuring hundreds of RFID tags and rapidly testing new RFID tag prototypes.

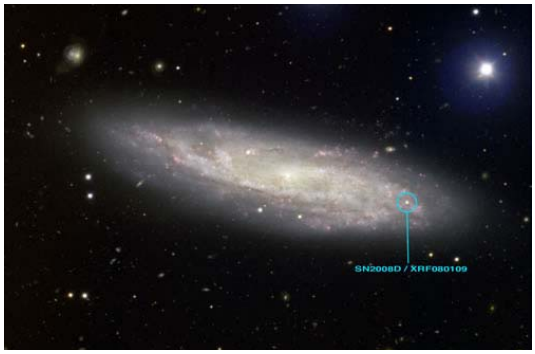
Passive tags include an integrated circuit for storing and processing information and an antenna that responds to radio waves transmitted from an RFID reader.

If several RFID tags are near a reader, the reader usually communicates with the tag transmitting the most powerful signal first and then puts it to ''sleep'' to prevent that tag from transmitting again. Then the reader moves to the next most powerful signal. This process can be very time-consuming.

Durgin's method allows up to 256 RFID tag antennas to be tested simultaneously. His method also allows tags to be tested in varying configurations, which is important because RFID readability and antenna power strength can be affected by the relative position and orientation of the tag antenna and the reader.

For more on Durgin's research, see the Georgia Tech press release.

Gemini Observatory Captures Death of a Star



Optical image of host galaxy NGC 2770 obtained with the Gemini North telescope. The brand-new supernova is circled in blue. Credit: The Gemini Observatory

For the first time, astronomers have witnessed the earliest moments of a massive star collapsing into a supernova.

In January 2008, Princeton University researchers Alicia Soderberg and Edo Berger were monitoring an older supernova when they detected a mysterious X-ray flash from elsewhere in the same galaxy, located about 90 million light years away from earth.

Soon afterward, the NSF-funded Gemini North telescope was able to capture the earliest optical spectrum ever obtained of a supernova explosion outside of our galaxy's neighborhood.

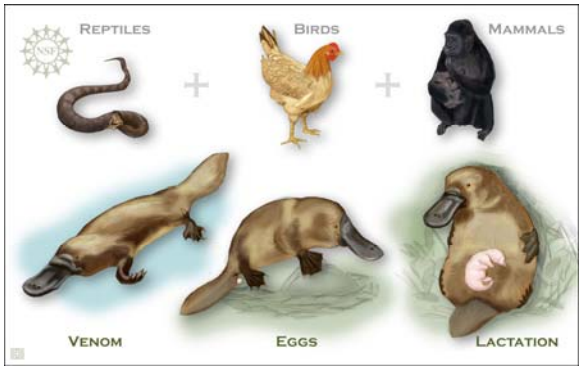
"We were in the right place at the right time with the right telescope on January 9, and witnessed history," said Soderberg. "Thanks to the unique capabilities of the Swift satellite and the rapid response of the Gemini telescope, we were able to observe a star in the act of dying."

See the Gemini press release for more information.

Patchwork Platypus Genome Decoded

The first descriptions of a duck-billed, egg-laying, otter-footed, beaver-tailed, venomous platypus in Australia in 1798 were so strange to naturalists that they suspected the “creature” was a result of an elaborate hoax.

But new research proves that the platypus' oddness isn't just skin-deep. Platypus DNA contains traces of avian, reptilian and mammalian lineages, and may prove useful for human disease prevention by revealing the function of ancient genes.



The platypus genome contains traces of reptilian, avian and mammalian lineages, resulting in its unusual characteristics. Credit: Zina Deretsky, NSF

NSF-funded researcher Mark Batzer of Louisiana State University was among the group of scientists led by Wes Warren at Washington University in St. Louis, Mo. that recently completed the first draft sequence and analysis of the platypus genome.

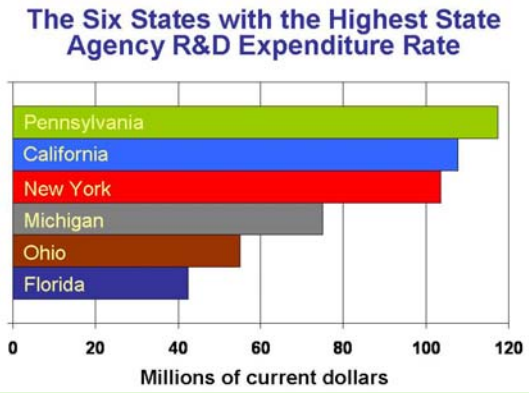
"Their genomic organization was strange and a little unexpected," says Batzer. "It appeared much more bird- and reptile-like than mammalian, even though it is indeed classified as a mammal."

For more, see the NSF press release.

Did You Know?

State agency expenditures for research and development (R&D) and R&D facilities topped $1 billion in fiscal year 2006. Expenditures of six states, Pennsylvania, California, New York, Michigan, Ohio and Florida, accounted for 49% of all state-agency research and development. Pennsylvania, California and New York led all other states in terms of total R&D state agency expenditures, each reporting more than $100 million of R&D expenditures in FY 2006.

Check out NSF's new InfoBrief, "Six States Account for Nearly Half of State Agencies' R&D Expenditures," for more statistics on state R&D expenditures.



Six states accounted for nearly half of the state-agency R&D total in the US.

Faces of NSF Research

Researchers study the flight of lesser short-nosed fruit bats to learn more about the kinematics and aerodynamics of bat flight. Credit: Nick Baker

The Furry Faces of Flight

The aerial aerobatics of a bat in flight puts even Harry Potter's winning quidditch performance to shame. These mammals have highly jointed skeletons and flexible wings that allow them to generate lift and undergo enormous shape changes during flight, distinguishing them from their avian counterparts.

Brown University biologist Sharon Swartz and engineer Kenneth Breuer received an NSF grant to collaborate and conduct research on the dynamics of bat flight with computer visualization tools. They used four high-speed video cameras to record the 3D wing and body movements of flying lesser short-nosed fruit bats in a wind tunnel. They discovered that the down stroke of the bat wings is similar to that of birds, but the upstroke the bat almost collapses its wings.

"They can generate different wing shapes and motions that other creatures can't," said Breuer. "We want to understand bat flight and be able to incorporate some of the features of bat flight into an engineered vehicle."

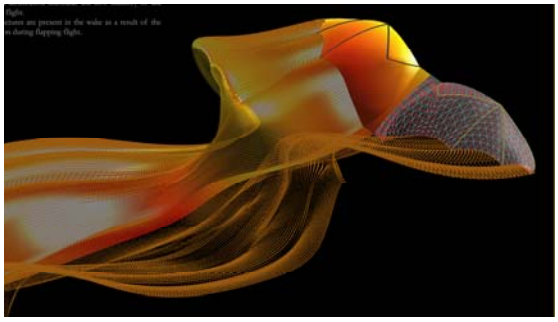


Illustration of the dynamics of bat flight. Credit: Kenneth S. Breuer, David J. Willis, Mykhaylo Kostandov, Daniel K. Riskin, Jaime Peraire, David H. Laidlaw, Sharon M. Swartz

Aircraft designers are searching for ways of dramatically increasing the payloads of current aircraft. The aerodynamics of flexible, articulated wings is extremely complex and poorly understood, but could lead to new ideas in aircraft design.

Bat wings could provide design inspiration for the military and civilian aircraft of the future. Credit: PurpleHz

"We know a lot about the aerodynamics of large things moving very fast. There is almost nothing known yet about the basic physics of bat flight," said Swartz.

Some of the broader impacts for this research not only include military applications, but also include training and mentoring a number of undergraduate and graduate students from the areas of biology, engineering and computer science.

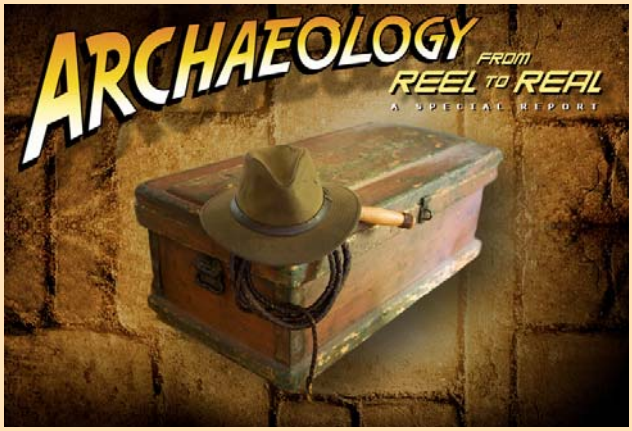
Swartz and Breuer's research is even crossing into the artistic realm with portions of the research bat videos appearing in a new documentary film, Spinning Toward Green.

NSF in the News

Nanotechnology Tries to Keep Growing Amid Negative Economic Conditions (*Medill Reports, Chicago, 5/22/2008*) -- Northwestern University's Institute for Nanotechnology is worried the economy's pain may soon make it hard to find corporate partners, but at the same time it is getting queries from companies interested in farming out R&D to cut costs as their own businesses weaken.

MIT Crafts Bacteria-resistant Films - Team Finds That Microbe Adhesion Depends On Surface Stiffness (*Medical News Today, 5/18/2008*) -- MIT engineers have created ultrathin polymer films that could be applied to medical devices and other surfaces to control microbe accumulation.

Can Competitions Increase 'Cool' Factor of Math, Science? (*Christian Science Monitor, 5/16/2008*) -- Math bees and science smackdowns for teen brainiacs are on the rise, along with efforts to fuel interest in those fields.



From Reel to Real: NSF's Special Report Focuses on Real-Life Professor Joneses

Although a day in the life of a real archaeologist may not involve daring car chases or death-defying stunts, NSF-supported archaeologists do find some similarities between their work and the exploits of Hollywood's favorite archaeologist, according to a new special report.

Some of the scenarios described by archaeologists do seem to echo the plot of an *Indiana Jones* movie. As one researcher notes, "We have to travel constantly, occasionally deal with disease and poisonous snakes, and people shooting at you from time to time." Archaeologists discover lost cities in the field. They seek rare and precious artifacts that tell important stories about the past, even if those artifacts are as unglamorous as tiny snail shells or the scrapings of ancient teeth. And they do frequently encounter native peoples who are, more often than not, eager partners in uncovering clues to the lives of their ancestors.

The new special report features tales of the scientific work being done by NSF-funded archaeologists working as far afield as the Aleutian Islands, Egypt, China, and the deserts of Mexico, and as close to home as Mississippi.

NSF-Funded Researchers Honored with First-ever Kavli Prize

The Kavli Prize-agreement was signed by Fred Kavli (foreground), Kristin Clemet, the Minister of Education and Research (center), and Jan Fridthjof Bernt, President of the Norwegian Academy of Science and Letters in 2005 (far left). Credit: Tor Richardsen/Scanpix

Four researchers with NSF ties are among the inaugural recipients of the new Kavli prizes, a partnership between the Norwegian Academy of Science and Letters, The Kavli Foundation and the Norwegian Ministry of Education and Research. The biannual Kavli prizes in nanoscience, neuroscience and astrophysics will complement the Nobel Prizes, which since 1901 have been given for achievements in physics, chemistry, physiology or medicine, literature and peace. This year's Kavli prize winners include nanoscience prize winner **Louis E. Brus** of Columbia University; astrophysics prize winner **Maarten Schmidt** of the California Institute of Technology; and neuroscience prize winners **Sten Grillner** of the Karolinska Institute in Sweden and **Pasko Rakic** of the Yale University School of Medicine.