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NSF AT WORK

Decoding the Genetic Secrets of a Plant Killer

Scientists have cracked the genetic code of an unusual parasitic organism that attacks living plants and causes "downy mildew disease." Other similar organisms cause major damage to crops as diverse as potatoes and grapes, and to forest species such as oak. The organism sequenced, *Hyaloperonospora arabidopsidis*, causes "downy mildew disease" in the highly studied model plant, *Arabidopsis thaliana* (thale cress).

Downy mildew is a type of parasitic organism, called an oomycete, which grows like fungi (filaments that invade tissue; powdery reproductive spores) but is actually more related to marine algae. Unlike algae, oomycetes cannot make energy from the sun, and live off their host plant tissue. The downy mildew damages its host but, unlike some other oomycete pests, keeps it alive. Its genome sequence may reveal how the organism can invade a plant and act stealthily while using the tissue to nourish. "Now that we have the genome sequence of an obligate parasite member of this family of destructive pathogens, we can use that information to zero in on common genes that could be targeted to create new, widely effective control strategies," says Brett Tyler, professor at Virginia Tech and a lead author of the study published in *Science*.

This project was funded by NSF grants **EF-0412213**, **IOS-0744875**, **IOS-0924861** and **MCB-0639226**.



This image shows *Arabidopsis thaliana* plants with downy mildew disease. This plant disease is highly similar to organisms that cause major damage to crops as diverse as grapes and potatoes. Credit: Ryan Anderson and John McDowell, Department of Plant Pathology, Physiology and Weed Science, Virginia Tech

Glass Powder Absorbs Oil, Hazardous Waste From Water and Air



During his research in explosives detection, Paul Edmiston, professor of chemistry at the College of Wooster in Wooster, Ohio, created a remarkable glass powder called **Osorb**. Named for its ability to absorb organic compounds, Osorb can extract 20,000 times its weight in petroleum, pesticides and other hazardous substances from water and air. In 2008, Edmiston founded his company **ABSMaterials, Inc.**, to commercially produce Osorb and continue his research in

Employees of ABSMaterials, Inc., look on at the production of water that has been cleaned and purified by Osorb. Credit: Sarah Pollock, ABSMaterials

water remediation methods and systems. The company is headquartered in Wooster, Ohio, and has a branch office in Houston, Texas. Its work focuses on the treatment of produced water, the single largest pollutive byproduct of petroleum production. Osorb showed promising results in removing oil from the Gulf of Mexico following the 2010 oil spill, work supported by NSF funding (**award number 1047699**). Watch Edmiston demonstrate Osorb on a **NSF webcast** and on the *Popular Mechanics website*.

Bonobo Research Provides Insight Into Human Cognition and Behavior

Bonobos, a close relative of the chimpanzee, are the least known wild great ape. These forest dwellers also are genetically close to humans, intelligent, social, and similar to us in many behaviors. Because of these similarities, studies of bonobo behavior can provide insight into human cognition and behavior. Additionally, since researchers have observed that bonobos are much less aggressive than chimpanzees, understanding what makes them different could help us understand social problems such as group violence and rape.

Brian Hare, assistant professor of evolutionary anthropology at Duke University, is working with semi-wild (sanctuary) bonobos to better understand social problem-solving. In one experiment, bonobos proved to be natural sharers, consistently opening a one-way door to allow other bonobos to enter and share a food pile. In the same scenario, young chimps opened the door to share, but older chimps hoarded the food.

Like other nonhuman great apes (chimpanzees, gorillas, orangutans) bonobos are endangered. Researcher Vanessa Woods, who works with Hare, has had unparalleled success in raising the bonobo's public profile since the release of her 2010 book, *Bonobo Handshake*. Woods speaks about what is at stake if by losing these close relatives that show little of the aggression seen in chimpanzees.

For more information about Hare's and Woods's research, watch a related **Science Nation episode** online.



Male bonobo at Lola ya Bonobo, the sanctuary where Hare and Woods have conducted bonobo research. Credit: Wikimedia Commons

International Research Partners Come to NSF



On Feb. 15, NSF and its Office of International Science and Engineering (OISE) showcased its highly successful program, Partnerships in International Research and Education (PIRE). This symposium was attended by principle investigators from PIRE projects underway, as well as from 15 **recently funded** PIRE projects.

Credit: NSF

At the symposium entitled "Globalizing U.S. Science and Education," presentations were heard from four projects with partnerships on four continents (Africa, Asia, Europe and South America), highlighting the global reach of PIRE. The projects assemble researchers from 26 countries: Algeria, Australia, Belgium, Brazil, Botswana, Cameroon, China, Democratic Republic of Congo, Denmark, Finland, Germany, Ireland, Malawi, Mozambique, Namibia, Nigeria, Portugal, Rwanda, South Africa, Swaziland, Sweden, Tanzania, the Netherlands, Uganda, Zambia and Zimbabwe.

The projects--encompassing biology, geosciences, engineering, education and chemistry--spotlight PIRE's wide disciplinary spread. Each project involves cutting-edge research. AfricaArray, for instance, an innovative program to promote, strengthen and maintain a highly trained workforce of African geoscientists, not only conducts research using seismic stations across Africa, but also is serving as a foundation for broader environmental monitoring.

View **links** to award abstracts and project websites funded under the PIRE program, and view videos of presentations by **Scott Saleska** and **Susannah Scott** during the PIRE Symposium.

DID YOU KNOW?

An NSF report shows that the recent economic recession had less effect on doctoral degree holders in science, engineering and health (SEH) fields than it did on the general population.

According to a January NSF report, the unemployment rate in October 2008 for SEH doctorate recipients was 1.7 percent, whereas the unemployment rate for the total U.S. labor force was 6.6 percent.

More information from this **report** can be found on the NSF website.



Credit: © 2011 JupiterImages Corporation

FACES OF NSF RESEARCH

Innovative Program Promotes Science and Mentorship in Alaska



Herb (Ilisaurri) Schroeder of the University of Alaska is the founder and executive director of ANSEP.
Credit: Mike Dinneen

"Is America losing its edge?" is a troubling question for the country. While the U.S. share of the world's science and engineering graduates is declining rapidly, NSF continues to address this growing problem through several programs. One such program is the **Alaska Native Science & Engineering Program (ANSEP)**. Using a longitudinal model of mentoring students from middle school all the way to graduate school, ANSEP has achieved an impressive success rate of 60 to 65 percent of university recruitment and retention among Alaska Native American students. ANSEP's success comes from hands-on middle and high school outreach initiatives, rigorous summer bridging programs, focused academic learning communities, organized student cohorts, networks of peer and professional mentors, community-based learning, professional internships, and undergraduate and graduate research projects.

Herb (Ilisaurri) Schroeder of the University of Alaska is the founder and executive director of ANSEP. At the early stages of his career, he was disheartened to see that very few Alaska Native American students enrolled or succeeded in college. Determined to increase mentorship opportunities for this underrepresented group, he founded ANSEP in 1995 with one student. The program has since grown to 250 enrolled students. In 2002, ANSEP graduated its first ANSEP Alaska Native engineer. Since then, ANSEP graduated 168 Alaska Native scientists and engineers. The ANSEP mentorship network now consists of higher education institutions, industrial partners, philanthropic organizations and government agencies.

Schroeder has won several awards for his work, including the 2004 Presidential Award for Excellence in Mathematics, Science and Engineering Mentoring. NSF has supported ANSEP through funding from the **Partnerships for Innovation program**. This funding helps high school students in ANSEP to build computers. The students then use those computers to learn chemistry, physics and trigonometry with educational software packages. Upon successfully completing these courses prior to graduation, the students earn the right to keep the computers. Once the students from middle or high school enter in this program, they remain with the network until they graduate from the university, thereby benefitting from the ANSEP support programs that help ensure their success at college.

NSF IN THE NEWS

Gravity of Disaster Registers With U.S. Scientists (*Philadelphia Inquirer*) Researcher Clay J. Naito, associate professor of structural engineering at Lehigh University, is among those working with Japanese researchers on better tsunami evacuation centers. He is part of a multi-university

team with NSF funding.

Special Coverage: Quake Tsunami Disaster (*CNN Breaking News*) Civil engineer Dan Cox, director of the Hinsdale Wave Lab at Oregon State, speaks about tsunami research. The lab is part of NSF's Network for Earthquake Engineering Simulation (NEES).

A Big Surprise Beneath the Ice (*The New York Times*) Surprising new research results show that ice melts and re-freezes extensively at the base of the Antarctic ice sheet, changing the shape and elevation of the ice sheet at the surface.

THE RIPPLE EFFECT

Science360 Publishes 500th News Service Issue, Launches Audio Stream

Science360 News Service is sponsored by NSF and provides breaking science news from around the world. The news service is published daily, Monday to Friday, and gathers news from many sources including college and university press offices, government agencies, peer-reviewed journals and blogs.



The Science360 News Service recently published its 500th issue on March 9. Additionally, it now features an audio stream, Science360 Radio, that runs 24 hours a day, seven days a week, and features science and engineering radio shows and podcasts from around the world. Science360 Radio can also be found on the **Science 360 Knowledge Network website**.



Credit: EERI/Ken Elwood

Earthquake Reconnaissance Workers Chronicle Christchurch Activities

The Earthquake Engineering Research Institute (EERI) is a nonprofit society of engineers, geoscientists, architects, planners, public officials, and social scientists. EERI conducts earthquake investigations and disseminates earthquake risk reduction information in the U.S. as well as globally through its international partners. The EERI Christchurch Earthquake Clearinghouse Learning From Earthquakes program, funded by NSF grant **0758529**, has maintained a team field blog to chronicle the team's activities following the New Zealand earthquake in February, and to provide information about what researchers are learning from studies of this earthquake. Visit the **blog** online.

Alan Alda Speaks to NSF About Communicating Science

On March 1, six-time Emmy Award-winner Alan Alda visited NSF to speak about the importance of effective science communication. He helped found Stony Brook University's Center for Communicating Science in 2009. He is a visiting professor at Stony Brook and a member of the Center's national advisory board. He also received the Public Service Award from the National Science Board in 2006.

Alda's talk, titled "Helping the Public Get Beyond a Blind Date With Science," drew upon his long-time interest in science, his career in acting, writing, and directing, and his work in promoting a greater public understanding of science. He discussed his current work with scientists, and described how teaching acting techniques improved scientists' communication skills. **View his talk online.**



NSF director Subra Suresh (left) greets actor Alan Alda during his visit to NSF. Credit: Sandy Schaeffer



*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. Editor: Nicole J. Garbarini. Contributors: Jacqueline Conciatore, Michael S. Kim, Malathi Srivatsan, Marcelo Vinces, Lisa Joy Zgorski.*



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