

NSF AT WORK



New Center Seeks to Power the Planet

With the assistance of a five-year \$20 million award from NSF, the California Institute of Technology (Caltech) Chemical Bonding Center (CBC) project, called "Powering the Planet," will increase its efforts to efficiently and economically convert solar energy and water into hydrogen and oxygen fuels.

The hydrogen and oxygen gases produced could be used to power fuel cells, where they would react to reform water, generating electricity for powering electric cars or other devices. The gases could be used as a source of energy after the sun goes down, and would generate a carbon-neutral source of energy scalable to meet future global energy demands.

Scientists participating in Caltech's Chemical Bonding Center project are researching the efficient and economical conversion of water and solar energy into hydrogen and oxygen. Credit: 123 Royalty Free, www.123rf.com

One of the center's key goals is to enhance U.S. economic competitiveness in the area of renewable energy. According to Harry B. Gray, Arnold O. Beckman professor

of chemistry at Caltech, "We already have several industrial partners, and we intend to add more, as we want to move the new materials and processes invented by our center into the commercial arena as rapidly as possible."

For more information on the Powering the Planet CBC, see the [NSF press release](#).

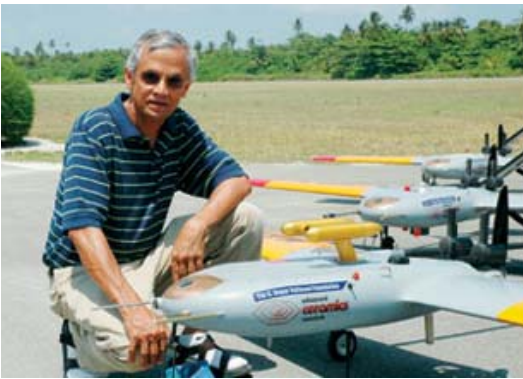
Innovative Small Business Provides Virtual Empowerment

NSF [Small Business Innovation Research](#) (SBIR) grant recipient [WTRI](#) (Workplace Technologies Research Inc.), a San Diego, Calif., company, fuses cognitive science research with leading business and management practices to create virtual environments that can be used in a variety of business settings.

Based on studies of how individuals learn, the researchers developed a way to train workers to make mission critical decisions and learn the impact of those decisions. The virtual environment gives the teams, including some from top-tier Fortune 500 companies, an opportunity to test strategies without the risk of real-world failure. Just as athletic teams and orchestras practice to perform better, corporate teams can also improve their performance through virtual rehearsals of real-life business scenarios. The virtual worlds can also train new employees on corporate culture, or allow seasoned employees to run through "what-if" scenarios, such as handling excess inventory or conducting crisis management.



An image representing a simulated headquarters in WTRI's "Lynchpin Auto Parts" virtual environment, a testing ground for ideas where businesses run through scenarios before carrying them out. Credit: WTRI



V. Ramanathan, accompanied by several autonomous unmanned aerial vehicles. Credit: Scripps Institution of Oceanography, UC San Diego

2008 Olympics Provides Rare Opportunity to Atmospheric Scientists

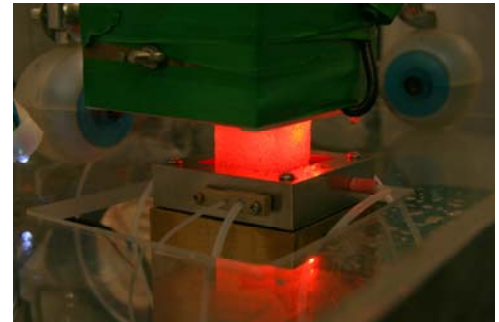
A team of atmospheric scientists from the United States, Korea and China took advantage of the Chinese government's efforts to improve air quality in Beijing for the 2008 Summer Olympics by measuring pollution levels before, during and after the games. The "great shutdown" restricted traffic and manufacturing in and around Beijing. Researchers anticipated this reduction would lead to measurable differences in downwind pollution levels. V. Ramanathan, an NSF-funded researcher from the Scripps Institution of Oceanography at the University of California, San Diego, led the team of researchers along with S. C. Yoon from Seoul National University.

With autonomous unmanned aerial vehicles, satellite and ground measurements, the researchers monitored changes in pollution, including atmospheric brown clouds (ABC), the particulate-laden haze and clouds that result from the emissions of automobiles, power plants, factories and other sources. For more details of the project, see the [Beijing Olympics Campaign Web site](#). For more information on the study of ABC, see the NSF [press release](#).

Greenland Ice Cores Reveal History of Pollution

New research finds that coal burning, primarily in North America and Europe, contaminated the Arctic and potentially affected human health and ecosystems in and around the Arctic region.

"Conventional wisdom held that toxic heavy metals were higher in the 1960s and '70s, the peak of industrial activity in Europe and North America, and certainly before implementation of Clean Air Act controls in the early 1970s," said lead researcher Joe McConnell, "but it turns out pollution in southern Greenland was higher 100 years ago when North American and European economies ran on coal, before the advent of cleaner, more efficient coal burning technologies."



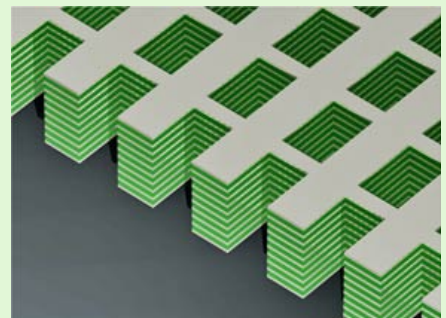
An ice core sample sitting on a melter head in the research facility. Credit: Joe McConnell, Desert Research Institute

Continuous, monthly and annually averaged pollution records taken from the Greenland ice core dating from 1772-2003 produced the results. And although data showed heavy-metal pollution in the North Atlantic sector of the Arctic is substantially lower today than a century ago, McConnell and his research partner, Ross Edwards, said there is still cause for concern for the polar ecosystem in the future, because of the rapid coal-driven growth of Asian economies. For more on this research, see the [NSF press release](#).

DID YOU KNOW?

Scientists at the University of California, Berkeley, have for the first time engineered 3-D materials that can reverse the natural direction of visible and near-infrared light, a development that could help form the basis for higher resolution optical imaging, nanocircuits for high-powered computers, and, to the delight of science-fiction and fantasy buffs, cloaking devices that could render objects invisible to the human eye.

To read more about these composite materials with extraordinary capabilities to bend electromagnetic waves, see the University of California, Berkeley, [press release](#).



A schematic of the first 3-D "fishnet" metamaterial that can achieve a negative index of refraction for visible light.

FACES OF NSF RESEARCH

Undergraduate Scientists Learn Marine Biology With a Man's Best Friends!

Marine biologist Brendan P. Kelly and undergraduate researchers at the University of Alaska Southeast (UAS) use his certified seal-sniffing Labrador retrievers to locate ringed seals at their snow-covered breathing holes.

For more than 20 years, Kelly has been studying the behavioral ecology of ringed seals. And, needless to say, he has developed creative methods for locating and tracking the seals. Kelly learned how to use the Labradors to find ringed seals from an Inuit hunter in the Northwest Territories of Canada.

And in the same tradition of the Inuit native with whom Kelly works, he makes a special effort to pass knowledge on to the next generation. Kelly mentors undergraduate researchers studying marine mammals as part of the [Research Experiences for Undergraduates](#) program at the University of Alaska Southeast.



Brendan Kelly is pictured here with Lil, Zydeco and Blue, his seal-sniffing Labradors. The dogs' sensitive noses have located thousands of seal holes in the ice cover of the Bering, Chukchi, Beaufort and Baltic seas. Credit: Brendan P. Kelly



Undergraduate researcher Orianna Badajos developed exceptional skill at capturing ringed seals at their breathing holes in the sea ice. Credit: Brendan P. Kelly

"I was part of the first group to ever research ringed seals' foraging and feeding behavior using underwater video," said Stephanie Sell, an undergraduate researcher who worked with Kelly as part of her research assignment. Sell helped Kelly equip a seal with an underwater camera so the researchers could study the animal's behavior while swimming underwater. More than 75 students have completed research assignments as part of the [Marine Biology Research Experience for Undergraduates in Alaska program](#). Each student conducts 10 weeks of hands-on research under the guidance of UAS faculty in the Arctic, Glacier Bay National Park, or near the shore waters in southeastern Alaska.

"There is no greater sense of satisfaction than helping to prepare our country's next generation of scientists and engineers," said Kelly. "The Arctic environment offers the perfect natural laboratory in which these students can learn about climate change and species adaptation."

NSF IN THE NEWS

[Multi-core Chip Research to Lead to Performance Gains, Power Reduction for High- and Low-End Computing With \\$6M Support From SRC, NSF](#) (*Centre Daily, PA Times*, 09/03/2008)

NSF and Semiconductor Research Corporation leaders announced a \$6-million initiative for multi-core chip design and architecture research.

[U-M Study Examines Connection Between 'Exurbs,' Climate Change](#) (*Market Watch*, 08/14/2008) With a \$1.5-million NSF award, University of Michigan researchers are examining how "exurban" areas outside of urban and suburban areas can absorb more carbon from the atmosphere.

[More Women at the Top](#) (*The Scientist*, 08/12/08) While women are entering the sciences and health professions in record numbers, the percentage achieving leadership positions lags far behind that of male scientists. Several programs, including NSF's ADVANCE program, have been successful in training and supporting women at the beginning to mid-level stages of their careers.

THE RIPPLE EFFECT



The U.S. team shows its awards after a successful showing at the 2008 International Linguistics Olympiad in Bulgaria. Credit: Drago Radev, University of Michigan

Update: International Linguistics Olympiad US Team Takes Gold, Again

The summer games in Beijing brought many gold medals to United States athletes, but the U.S. can also claim gold medal bragging rights in linguistics. The sixth International Linguistics Olympiad was held in Slanchev Bryag, Bulgaria, and U.S. high school students captured 11 out of 33 awards, including gold medals in individual and team events. This was only the second time the U.S. has ever competed in the event. The team's achievements bring a new focus on computational linguistics.

For more information, see the [NSF press release](#).

September Events on Capitol Hill

Luncheon Briefing

September 9, 2008, Noon -1:30 p.m.
2325 Rayburn House Office Building
Greenland's Shrinking Ice Sheet: Images, Measurements and Implications



Luncheon Briefing

September 24, 2008, Noon
Location: TBD
Green Gasoline

Briefing

September 24, 2008, 3:30 p.m.
1116 Longworth House Office Building
Engineering is Elementary

Hosted by: The Museum of Science, Boston & the House STEM Education Caucus
Featuring Dr. Cora Marrett, Assistant Director, Education & Human Resources, NSF

Large Hadron Collider to Start Up Sept. 10

The Large Hadron Collider (LHC), soon to be the world's most powerful particle accelerator, is scheduled to circulate its first beam on September 10, 2008. The LHC is located near Geneva, Switzerland at the CERN laboratory. Pictured below is the ATLAS detector, an LHC detector partially funded by NSF.



National Science and Technology Summit



August 18-20, 2008, Oak Ridge, Tennessee

On August 18, 2008, NSF Director Arden L. Bement, Jr., (pictured, left) delivered opening remarks at the National Science and Technology Summit, a meeting called for in the America COMPETES Act of 2007 (ACA) to examine the health and direction of the United States' science, technology, engineering and mathematics (STEM) enterprises.

According to Bement, "America's prosperity, global competitiveness and the well being of our citizens depend, more than ever before, on a steady stream of new ideas and highly skilled STEM talent."



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 about \$6.06 billion. NSF funding reaches all 50 states through grants to over 1,900 universities and institutions. Each year, NSF receives about 45,000 competitive requests for funding and makes over 11,500 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.