BUILT TO LAST

Engineers test foundations for freshwater wind farms.

Civil engineers at the Case School of Engineering are putting reinforced concrete to the test to build a stronger wind turbine.

Professor of civil engineering Arthur Hucklebridge Jr. and other engineers at the Richard '39 and Opal Vanderhoof Infrastructure Research and Education Facility have been stress testing a 9,000-pound concrete slab that serves as a model for a wind turbine foundation—simulating the kind of forces the slab would be subjected to as the base of an offshore turbine.

By measuring how the material responds to stress, researchers hope to help build cost-effective, offshore wind farms that can stand up to freezing freshwater lakes.

Fresh water takes a toll on the strongest of structures. Researchers are working on wind turbines that can stand up to the challenge.

NEWS AND BREAKTHROUGHS
FROM THE CASE SCHOOL OF ENGINEERING

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DIAMONDS ARE FOREVER

Diamond-studded electrodes can be implanted for life.

For most materials, it's hell inside the human body. But two Case School of Engineering researchers are using the world's hardest material to design medical implants that last a lifetime.

Heidi Martin, associate professor of chemical engineering, and Christian Zorman, associate professor of electrical engineering and computer science, are in the early stages of building electrodes combining lab-grown diamond and flexible polymer that could better identify chemical or electrical changes in the brains of patients with neural disease and stimulate nerves.

Unlike standard metal electrodes, the diamond film-coated conductors won't break down inside the body's harsh environment. Integrating diamond with a polymer support makes the device flexible and better suited to survival in the body's soft tissue.

Martin and Zorman's work is years away from human trials, but early success is drawing attention from around the world.

"The potential to help make a device that can help clinically and advance research would be so thrilling," Martin says. "The time scale is long, but I think we have a good chance at it."

A doctor's best friend? Diamond-studded medical implants could last a lifetime in the human body.

CASE SCHOOL OF ENGINEERING
CASE WESTERN RESERVE UNIVERSITY

EYE ON INNOVATORS

New engineering faculty member wins Ohio Third Frontier photovoltaics grant.

Optical materials expert Roger French, the newly appointed F. Alex Nason Professor of Materials Science at Case Western Reserve University's Case School of Engineering, has been awarded a $900,000 grant from Ohio's Third Frontier program.

The grant will support French's research on using mirrors to increase the power output of solar panels.

French is the first faculty member appointed under Case Western Reserve's Engineering Strategic Hiring Initiative. He joined the faculty in the fall of 2010 after spending more than 25 years as a scientist at DuPont. He says he chose to leave the private sector to pursue the rich opportunities for interdisciplinary collaboration he sees on campus.

"This is an opportunity to accomplish things that are bigger than just what I can accomplish myself," he says.

The hiring initiative seeks out exceptional researchers to enhance the Case School of Engineering's stature, diversity and research impact.

A SHOW OF SUPPORT

Supporting the Case School of Engineering's efforts to attract the best and brightest faculty are leadership donors like **Tom Seitz (CIT '70),** whose recent gift will create the Thomas W. and Nancy P. Seitz Professorship in Advanced Materials and Energy — the first major gift under the new hiring initiative and the university's second energy-related endowed professorship.

KEEPING PACE

Researchers use laser to control embryonic heart.

Speeding up the pitter-patter of the heart may not require any extra time on the treadmill. According to researchers, an infrared laser could do the trick.

Using pulsed light, a team of researchers led by Case School of Engineering biomedical associate professor Andrew Rollins and Michael Jenkins, a postdoctoral researcher in the biomedical engineering department, paced contractions in an avian embryonic heart, with no apparent damage to the tissue. This non-invasive device could help researchers learn more about the relationship between heart rate while the heart develops and heart problems later in life.

Jenkins and Rollins collaborated with researchers in the Case Western Reserve University School of Medicine and partners at Vanderbilt University.

Rollins' lab is now conducting experiments to see whether the laser could be used as an implantable pacemaker or to keep a heart beating during surgery.

GOT FOAM?

Scientists use milk protein to develop biodegradable Styrofoam substitute.

Long recognized as a key part of a balance diet, milk is moving beyond the food pyramid and finding a new use as environmentally friendly packaging.

David Schiraldi, professor and chair of the Department of Macromolecular Science and Engineering, and his team took casein—the protein found in cow's milk—and fortified it with clay and glyceraldehyde to create a strong, ultra-light plastic foam substitute that could be used in a variety of products from furniture cushions to insulation to packaging.

Almost a third of the material breaks down every 30 days, giving the biodegradable milk-based product a green edge over its plastic counterparts.

Students in the Schiraldi group are now converting milk itself into the bio-friendly foam, offering a potential cost savings over using purified casein.

REWIRING A DAMAGED BRAIN

Researchers look for ways to bridge gaps left by injury.

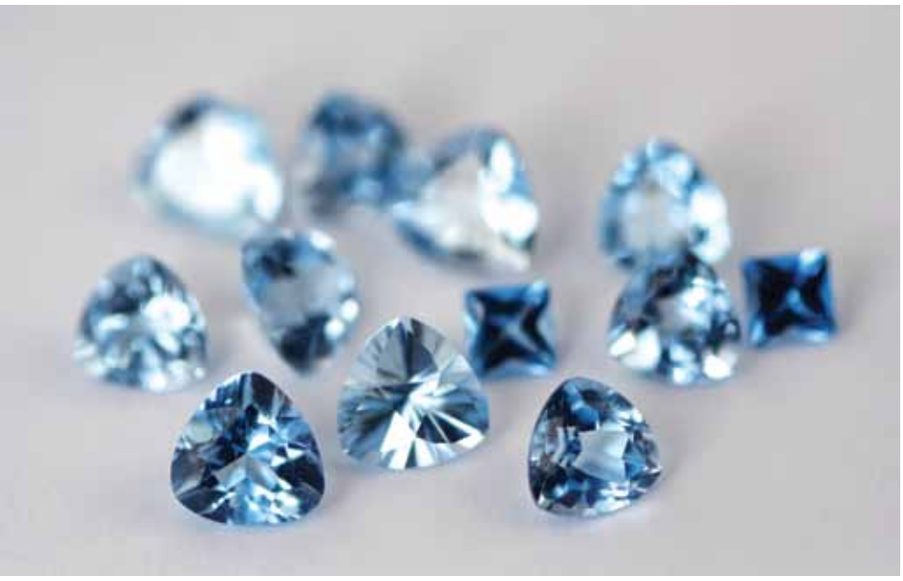
A microchip helps researchers spark new connections in the brain.

In traffic, detours help drivers get around obstructions, and now, researchers are looking for ways to navigate around brain trauma with the help of microelectronic circuitry.

Inspired by the traumatic brain injuries suffered by ground troops in Iraq and Afghanistan, Pedram Mohseni, assistant professor of electrical engineering and computer science, has been building a device that uses a microchip to artificially connect populations of neurons in different parts of the brain.

Mohseni and research partner Randolph J. Nudo, professor of molecular and integrative physiology at Kansas University Medical Center, believe repeated communication between distant neurons after an injury may spark long-reaching axons to form and connect—but timing is critical.

"The month following injury is a window of opportunity," Mohseni says. "We believe we can do this with an injured brain, which is very malleable."



>> SCIENTISTS ZOOM IN >>>> ON SAPPHIRES

Engineers capture atomic-level images during high-temperature experiments.

An international team of materials scientists and engineers led by Case Western Reserve University Distinguished University Professor and Kyocera Professor of Ceramics Arthur Heuer is getting an atomic-level view of man-made sapphire and noting minute structural changes brought on by exposure to high temperatures.

In the orderly world of crystals, tiny structural disruptions called dislocations can control electrical, chemical and magnetic properties, as well as strength and durability.

By examining how atoms move in relation to one another in synthetic sapphire crystals, researchers can gain a better understanding of their behavior, insight that applies to material properties in all crystalline solids. These materials are used in everything from microchips to thermal protection systems that shield jet engines.

GETTING DOWN <<<<< TO BUSINESS

NSF grant helps research make the journey to the marketplace.

Research projects are getting a business world makeover with the help of a National Science Foundation Partnerships for Innovation grant.

The program provides technical and business support by means of funding and personnel—giving researchers the resources to run their projects like mini companies, says project lead Alexis Abramson, associate professor of mechanical and aerospace engineering.

A lack of business-savvy is a common hurdle in moving promising ideas from the research realm to the marketplace, Abramson says.

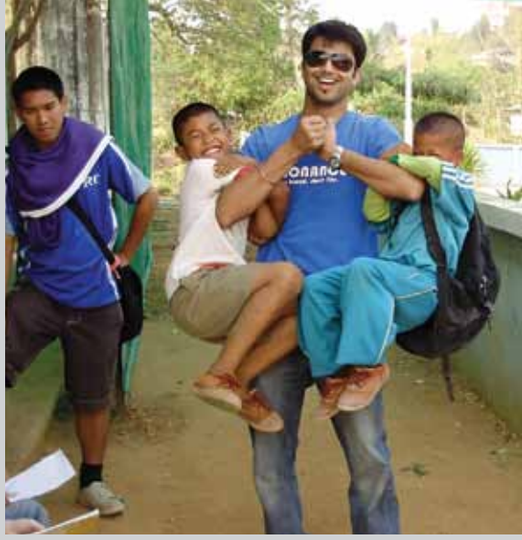
"Research can lead you in many different directions," she says. "One path will show you some very interesting science, while others will put you on the road to commercialization. This effort guides you down the commercial path."

The projects in development are focused in biomedical applications, but involve a variety of researchers from multiple disciplines, from civil engineering and advanced materials to medical researchers.

STUDENT FOCUS

HELPING HANDS

Case Western Reserve's chapter of Engineers Without Borders brings cleaner water to Thai community.



More than 1,250 students at a rural school in Thailand have access to cleaner, safer drinking water thanks to the Case School of Engineering chapter of Engineers Without Borders.

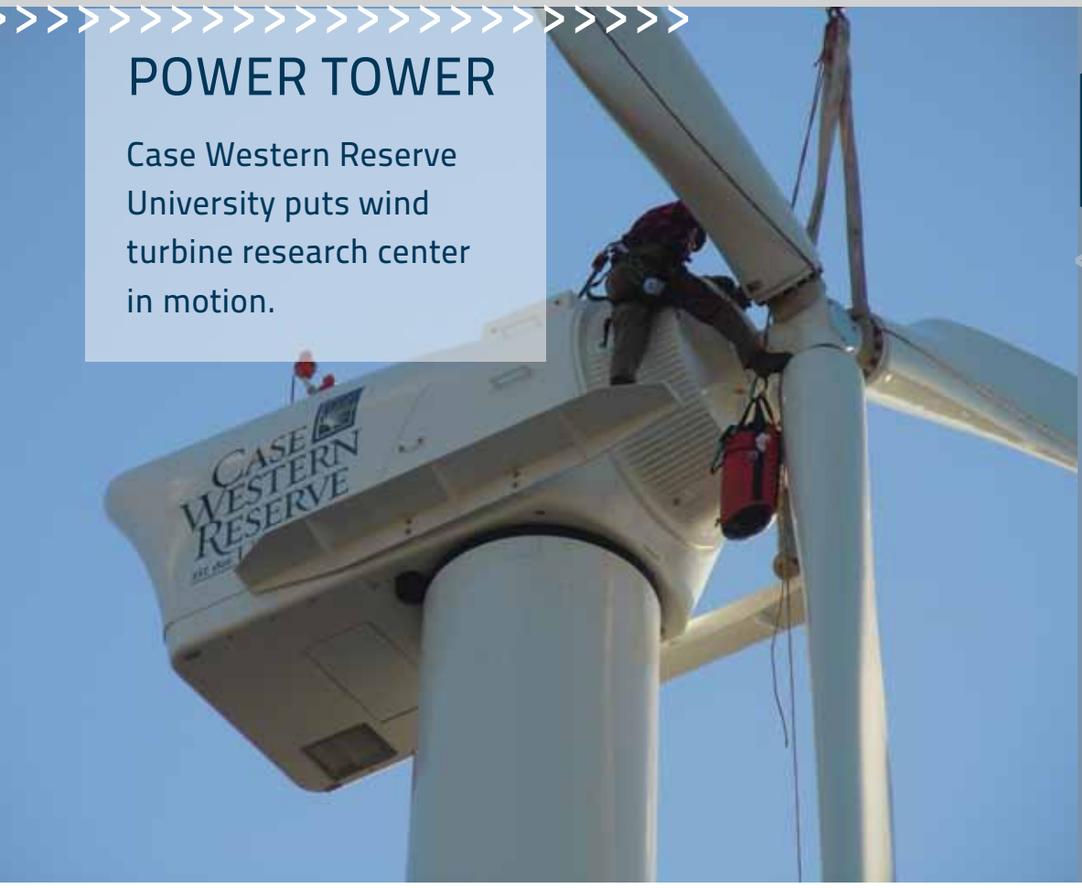
EWB-Case students traveled to Piang Luang in northern Thailand in August to implement a water filtration system project, which included two shallow wells and a filtration system.

The group is continuing to monitor the performance of the system and is working to provide the school access to its own water source—rehabilitating an existing well that's independent from the mountain water source that supplies the rest of the community, says Sanchit Goyal, a senior electrical engineering major and project chair.

EWB-Case is working on two other international projects in Cameroon and the Dominican Republic, as well as several local initiatives.

POWER TOWER

Case Western Reserve University puts wind turbine research center in motion.



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