### >> RESTORING MOVEMENT>>>>>>

## BME researchers refine nerve cuff technology that activates paralyzed lower limbs.

A team of researchers at Case Western Reserve University and the Louis Stokes Cleveland Department of Veterans Affairs won a \$2.6-million grant from the National Institutes of Health to develop nerve cuff technology that will allow people paralyzed by spinal cord injuries to stand and take steps.

The high-resolution nerve cuff electrodes are fitted around the actual nerves themselves, and have multiple contact points for activating individual fascicles within the nerve. The cuff is made from a very thin layer of biocompatible plastic, so it's flexible enough to bend and move with the nerve as the hips, knees or ankles bend and straighten.

Dustin Tyler, associate professor of biomedical engineering, and Ronald Triolo, professor of orthopaedics and biomedical engineering, are leading the effort. They will use the funding to put the device to the test in its first in-human clinical application.

#### Learn more at engineering.case.edu/CWRU-VA-nerve-cuff-electrodes.

FALL 2014



# <<<<<<><<<<><<<<<>CASE WESTERN RESERVE<<<<<</p> HIGHLIGHTED AT FIRST NATIONAL MAKER FAIRE

### White House announces fall groundbreaking for expanded think[box] innovation center.

President Obama declared June 18 the National Day of Making, and the White House tapped Case Western Reserve University to be part of the celebration.

Along with Carnegie Mellon University and eight other universities, Case Western Reserve co-led an effort to bring together more than 150 leaders in higher education to join the president's initiative to help develop a "Nation of Makers" by committing to a wide range of activities in support of makers on campus, from the opening of public innovation spaces to the development of scholarships specifically for student makers.

Case School of Engineering Dean Jeffrey L. Duerk and Associate Dean for Strategic Initiatives Lisa Camp personally attended the National Maker Faire held at the White House, and, back in Cleveland, Case Western Reserve marked the day by joining the region's other top makerspaces in hosting events celebrating maker culture.

The White House also shared some exciting news for the maker community—announcing the fall groundbreaking for the first phase of Case Western Reserve's expanded think[box] facility—a seven-story, 50,000-square-foot innovation hub designed to give visitors the space, technology and expert advice to imagine, prototype and transform their creations into actual products.

Learn more at engineering.cae.edu/National-Maker-Faire.

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### Case Western Reserve University launches master's track for wearable computing in San Diego.

The latest technology isn't just on our desks—it's on us. To help prepare students to be leaders in this growing field, Case Western Reserve University has launched a master's degree track in wearable computing in San Diego.

The nine-course, 27-credit-hour program gives students a chance to hone their expertise in multiple aspects of this growing industry. From design challenges, such as miniaturization and power delivery, to the supply chain and manufacturing processes, the curriculum covers the gamut of building wearable tech and bringing new products to market.

Learn more at engineering.case.edu/sandiego.



### Researchers win DOE grant to improve lifetime performance of ceramic fuel cells.

Fuel cells start out strong, but as they age, their efficiency decreases. This decline in performance is cutting their competitive edge over conventional power technologies. Materials science researchers at Case Western Reserve University have won an \$800,000 grant from the Department of Energy to study how to make solid oxide fuel cells last longer.

These fuel cells operate at high temperatures and use a ceramic electrolyte, a ceramic cathode and a nickelbased cermet anode to produce electricity from fuels. A research team led by Mark De Guire, associate professor of materials science and engineering, and Arthur Heuer, Distinguished University Professor and Kyocera Professor of Ceramics, will use an accelerated testing technique to uncover why fuel cell performance suffers over time.

They'll replicate 5,000 hours of use in about one-tenth the time, looking to identify what changes take place in the components during use, and how those changes can be arrested to extend the lifetime performance of the fuel cell.

Learn more at engineering.case.edu/ ceramic-fuel-cells.



### BUILDING NEW TENDONS Researchers win NIH grant to grow replacement tendon tissue.

Researchers at Case Western Reserve University have won a \$1.7-million grant from the National Institutes of Health to grow replacement rotator cuffs and other large tendon groups.

A team led by Ozan Akkus, professor of mechanical and aerospace engineering, has developed a technique to reconstitute collagen—the building blocks of tendons into tough fibers to serve as scaffolds for growing new tendon tissue from adult stem cells.

Akkus' lab uses electrical currents to align collagen threads, mimicking the natural tendon and making the threads as dense and as strong as those found in nature. In a related project funded by Switzerland's AO Foundation, these heavy-duty threads alone are being used as sutures to repair lacerated tendons. In more serious injuries where more tissue is needed, adult mesenchymal stem cells are placed on biotextiles woven from the collagen threads where they differentiate into new tendon cells.

Learn more at engineering.case.edu/replacement-rotator-cuffs.



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## Flexible supercapacitor holds promise for wearable tech.

An international research team, including scientists at Case Western Reserve University, has developed a flexible, fiber-like supercapacitor that could be woven into clothing to power medical implants or communications devices.

According to Liming Dai, professor of macromolecular science and engineering and co-author on the project, the team's device offers both high-power density and high-energy density, making it durable and powerful. A flexible fiber made from a tightly packed network of graphene and carbon nanotubes, the supercapacitor boasts the highest-reported energy storage capacity—or energy density—by volume for a device of its kind, rivaling some thin-film lithium batteries, which typically dominate the market when it comes to storage capacity.

Learn more at engineering.case.edu/flexible-supercapacitor.

### >> HELP WITH HEALING

# Nanoparticles boost survival rate after blast trauma.

Biomedical researchers at Case Western Reserve University have developed artificial platelets that help the body form clots faster—boosting its natural healing power.

In preclinical tests, these hemostatic nanoparticles developed by Erin Lavik, the Elmer Lincoln Lindseth Associate Professor of Biomedical Engineering, were injected into models of blast trauma, where they increased the survival rate to 95 percent, compared with 60 percent for the untreated models.

Furthermore, the nanoparticle-powered platelets dramatically increased survival rates without unwanted side effects like an accumulation of foreign matter, free-floating clots or aberrant healing.

Learn more at engineering.case.edu/clot-buildingnanoparticles.

### The Department of Chemical Engineering is now the Department of Chemical and Biomolecular Engineering.

The name change better reflects the integrated nature of biological and chemical systems and better describes the breadth and depth of the department's research programs and academic offerings. The department is also in the midst of a search effort to recruit new faculty members in biomolecular engineering.



Kenneth Loparo, chair of the Department of Electrical Engineering and Computer Science, at the chairing ceremony.

### PARTNERS IN INNOVATION Parker Hannifin Foundation endows department chair in electrical engineering

and computer science.

The Parker Hannifin Foundation has committed \$2 million to create an endowed department chair in electrical engineering and computer science in honor of Parker Hannifin Corporation founder and Case Institute of Technology alumnus Arthur L. Parker.

Kenneth Loparo, chair of Case Western Reserve's Department of Electrical Engineering and Computer Science, will be the first person to hold the Arthur L. Parker Endowed Chair.

The endowment will provide salary support as well as discretionary funds to kick-start special initiatives and opportunities, support graduate student travel to conferences and more.

Learn more at engineering.case.edu/Parker-Hannifin-chair-announcement.



STUDENT FOCUS

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# Students provide renewable power for Botswana family.

A family in the village of Mmanoko in Botswana has access to safe, renewable electric power thanks to the efforts of engineering students from Case Western Reserve University and the University of Botswana.

The prohibitively high cost of running power lines to remote villages has left 85 percent of Botswana's rural households without access to electricity. As part of a National Science Foundation-funded research initiative that addresses sustainability issues in the region, students installed a 100-watt solar electrical system in a one-room hut shared by a single mother and her three children.



Joe Toth, a senior chemical engineering major at Case Western Reserve, designed the system, and he and his fellow students in the research program teamed up for the installation. The project is just one example of a number of international initiatives at the Case School of Engineering, including collaborative courses taught in Myanmar, study abroad experiences in India and multiple programs in China. Learn more at engineering.case.edu/Botswana-solar-installation.



Engineering meets art: The Waterfall Swing, created by CWRU alumni Ian Charnas, Mike O'Toole, Andrew Witte and Cleveland Institute of Art alumnus Andrew Ratcliff, was on display from June to October at the OK Center for Contemporary Art in Linz, Austria. Charnas is the manager of CWRU's think[box], O'Toole is the founder of Dash 7 Design and Witte is the chief engineer of the Pebble smart watch.

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Will you be at the Consumer Electronics Show in Las Vegas January 5-9? So will our student entrepreneurs! Learn more at **engineering.case.edu/** 

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