

NEW APPROACH TO NETWORKS

Using ultrabroadband connectivity to keep digital footprints closer to home.

Thanks to cloud storage, most digital information can be accessed essentially any time from anywhere. The downside to this accessibility? Users rely on a combination of scattered service providers to maintain and protect their data.

Researchers at Case Western Reserve University think the unprecedented capacity of ultrabroadband technology could shift storage to home-based networks, giving people more control over their information.

Michael Rabinovich, professor of electrical engineering and computer science, has won a National Science Foundation grant to explore the potential of establishing residential data hubs using ultrabroadband networks.

OPTIMIZING ADDITIVE MANUFACTURING OF METALS

NSF CAREER award help create computational tools for manufacturers.

Additive manufacturing has the potential to produce complex metal components quickly and cost-effectively, but the resulting parts are often of lower strength, and fatigue faster than their traditionally molded counterparts.

Bo Li, assistant professor of mechanical and aerospace engineering, has won a National Science Foundation Faculty Early Career Development award to develop theoretical analysis and computational tools to understand what's going wrong in the process. By running thousands of simulations simultaneously in the design space, Li hopes to predict quantitatively what combinations of metals, processing parameters and more will lead to the optimal product.

Learn more at engineering.case.edu/CAREER-2017.



>STICKING WITH IT>>>>>>>>>>>>>>>>

Gecko-inspired adhesive stays sticky in extreme temperatures.

Researchers from Case Western Reserve University, Dayton Air Force Research Laboratory and China have developed a new dry adhesive that maintains its bonds even in extreme temperatures.

Inspired by a gecko's unique sticking abilities, Liming Dai, the Kent Hale Smith Professor of Macromolecular Science and Engineering, used carbon nanotubes to replicate the microscopic hairs on the reptile's feet that give it wall-walking abilities. The resulting adhesive loses no traction in temperatures as cold as liquid nitrogen or as hot as molten silver, and it actually gets stickier as things heat up.

Because the adhesive holds over such a wide range of temperatures, the inventors say it's a great fit for a variety of applications in environments prone to drastic temperatures swings, including use in outer space.

Learn more at engineering.case.edu/dry-adhesive.

BLOCK BY BLOCK

High-tech building blocks detect cognitive issues.

Researchers at Case Western Reserve University are outfitting traditional building blocks with high-tech sensors to help provide a clearer view of cognitive problems, including developmental delays, brain trauma or dementia.

In tests of young children and college-aged adults, these Sensor-Integrated Geometric Blocks, or SIG-Blocks, developed by Kiju Lee, assistant professor of mechanical and aerospace engineering, detected behavioral differences and revealed the problem-solving strategies used by test subjects. The sensors also detected performance accuracy and the time each user took to complete given tasks.

The blocks are fully automated, wirelessly relaying data to a computer. The technology could potentially allow a parent or other caregiver at home to administer tests while a trained clinician hundreds of miles away completes the assessment by internet.

Learn more at engineering.case.edu/blocks-cognition.



RESTORING SENSATION

Enhanced prosthetic system restores multiple levels of pressure—from light to intense.

A prosthetic system developed by researchers at Case Western Reserve University, the Louis R. Stokes Cleveland VA Medical Center and the University of Chicago allows amputees to feel the same intensity of pressure in their prosthetic hands as they feel with their intact hands.

The scientists and engineers found how the nervous system encodes the intensity of tactile perception—essential knowledge to restoring the sense of touch and dexterity.

This work, led by biomedical engineering professor and principal investigator Dustin Tyler and PhD student Emily Graczyk, builds on earlier research that showed varying patterns of electrical signals provide the amputees with familiar sensations, such as the touch of a cotton ball or the press of the tip of a ball-point pen.

Learn more at engineering.case.edu/prosthetics-intensity.



Photo by Russell Lee



LIVING LAB

Campus to become test bed for advanced energy technology and grid integration.

Case Western Reserve University will be one of three Northeast Ohio institutions serving as living laboratories exploring integrating distributed energy sources into the power grid as part of a U.S. Department of Energy initiative.

Administered by the Pacific Northwest National Laboratory, the Northern Ohio Building-to-Grid Integration Demonstration project will develop and demonstrate strategies to explore transactive control—constantly managing energy in buildings

and their connection to the grid, shifting the timing and quantity of energy use within a network of multiple power generators and energy-consuming devices.

Alexis Abramson, director of the university's Great Lakes Energy Institute, Kenneth Loparo, chair of the Department of Electrical Engineering and Computer Science, and Mingguo Hong, associate professor of electrical engineering and computer science, will lead the university's efforts on the project. NASA Glenn Research Center and the University of Toledo will also use their campuses as similar grid-integration test beds.

Learn more at engineering.case.edu/living-lab-energy.

ADVANCED ALLOYS

New surface engineering techniques could improve biomedical implant performance.

Cobalt–chromium alloys are frequently chosen for medical implants replacing load-bearing joints, such as hips. Recently, however, these alloys have come under scrutiny for the adverse effects they may have on human health because of decomposing debris. Researchers in the departments of materials science and engineering, biomedical engineering, and mechanical and aerospace engineering are working together to develop new methods of surface engineering based on low-temperature carburization and low-nitridation to improve implant performance by reducing wear and corrosion.

HONORS AND ACCOLADES

- Xiong “Bil” Yu, professor of civil engineering, was elected a fellow of the American Society of Civil Engineers.
- Four engineering faculty members were elected fellows of the American Institute for Medical and Biological Engineering: M. Cenk Cavusoglu, professor of electrical engineering and computer science; Jeffrey Capadona, associate professor of biomedical engineering; Nicole Steinmetz, associate professor of biomedical engineering; and Dustin Tyler, the Kent H. Smith Professor of Biomedical Engineering.
- Robert Gao, chair of the Department of Mechanical and Aerospace Engineering, was elected a fellow of the International Academy for Production Engineering.
- Jeffrey L. Duerk, dean of the Case School of Engineering, was elected a fellow of the National Academy of Inventors.



>> FASTER SCREENING FOR >>>>>>>> CONCUSSIONS

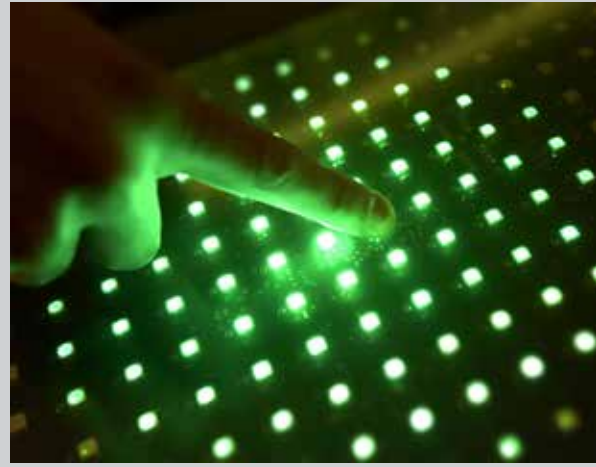
Student entrepreneur develops quick, cost-effective test for concussions.

According to mounting research, there's no such thing as a "minor" concussion. A sophomore computer engineering major at Case Western Reserve University has launched a company to develop a new test for these dangerous brain injuries.

Matt Campagna co-founded Reflexion Technologies LLC along with two high school friends. The team developed a touch screen device that tests for concussions in as little as 30 seconds and can be administered on the sidelines. At a fraction of the cost of alternative screening systems on the market, Campagna's device is a much more affordable option for school districts looking to better protect student athletes and provide parents peace of mind.

The company showcased the system at CES in January and has picked up a number of business competition wins, including second place at PITCH U, third place at the Cleveland Medical Hackathon and third place at South by Southwest's Student Startup Madness contest.

Learn more at engineering.case.edu/SXSW-Startup-Madness.



>> THE BIG SHOW >>



Photo by Ed Carreon

Case Western Reserve University packed 10 booths with student, alumni and faculty startups at CES 2017, where the innovators got the chance to rub elbows with potential investors and pitch their products to more than 170,000 show attendees. Big ideas on display included a sideline test for concussions, a low-cost maker machine, digital hug-transmitting teddy bears and more. Read more about CWRU's experience at the show at engineering.case.edu/CES-2017.

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