ADD IT UP

Case Western Reserve part of $30 million federal additive manufacturing initiative.

Case Western Reserve University is among the leaders of a consortium that secured a $30 million federal grant to demonstrate ways to improve and expand manufacturing in the United States.

Along with Carnegie Mellon University and the National Center for Defense Manufacturing, Case Western Reserve helped forge partnerships among more than five dozen organizations across Ohio, Pennsylvania and West Virginia. After an extensive evaluation process involving the Departments of Defense and Commerce, the group won the competition to become the pilot effort of an ambitious initiative to transform manufacturing across the country.

Together the organizations now comprise the National Additive Manufacturing Innovation Institute. The potential advantages of additive manufacturing, which involves layering materials (sometimes referred to as 3D printing) are energy reductions of more than 50 percent and cost savings of at least 10 percent. The consortium's mission is to identify and execute innovations in this area that enhance efficiency, create new products and advance economic growth.

Learn more at **engineering.case.edu/additive-manufacturing**.

NEWS AND BREAKTHROUGHS
FROM THE CASE SCHOOL OF ENGINEERING

FALL 2012

next

A FOCUSED FACULTY OUTREACH

Strategic hiring initiative features clustered themes within advanced materials, energy and human health.

When optical materials expert Roger French joined the faculty of the Case School of Engineering in 2010, he was moving from 25 years at DuPont to a full-time career in academia. Seemingly a drastic career shift, it was one French had been considering for some time.

"I knew there were things I could pursue in a university setting that I couldn't in industry," said French. That included moving from the rapid cycle of technology development to focusing on the lifetime degradation of products and materials. "Most faculty postings I saw were simply looking to replace a specific department member who had left. That wasn't what I wanted."

When French heard about the engineering strategic hiring initiative at Case Western Reserve, it caught his attention. "The cluster hiring approach was more flexible and didn't look to keep same-minded people together."

French joined the school within the materials department, but also he sits within the Photovoltaics and Lifetime Degradation Cluster, along with macromolecular science professors Liming Dai and Lei Zhu, electrical engineering professor Hongping Zhao (another strategic hire) and physics professor Ken Singer.

"That's the idea behind the strategic hiring clusters—to bridge departmental walls and bring together different perspectives to invent solutions to real-world challenges," said engineering school dean Jeffrey L. Duerk. The clusters are centered around themes of advanced materials, energy, and human health and technology, and also team senior faculty with mid-level and junior faculty to leverage fresh perspectives.

Learn more about the initiative at **engineering.case.edu/strategichiring**.

A LEANER AND MEANER BME

Biomedical engineering curriculum updates streamline offerings, provide even more experiential opportunities.

Both the undergraduate and graduate biomedical engineering curricula received an overhaul this year, streamlining coursework and integrating more experiential learning and research.

The undergraduate coursework was shifted from nine sequence options to four tracks to focus on core skills and keep graduates more marketable when job hunting. The new tracks, which align well with minors, are: biomedical devices and instrumentation, biomechanics, biomaterials, and biomedical computing and analysis. At the same time, the school received an NIH grant* to integrate even more active, interdisciplinary learning across the undergraduate curriculum, including a summer clinical-immersion fellowship.

At the graduate level, the curriculum was also streamlined to allow students to start their thesis research sooner, as well as increase emphasis on cellular and molecular biology, as evidenced by a new core consistent with the School of Medicine's curriculum.

* NIH grant R25 EB014774

COMPUTING FROM A CLOUD

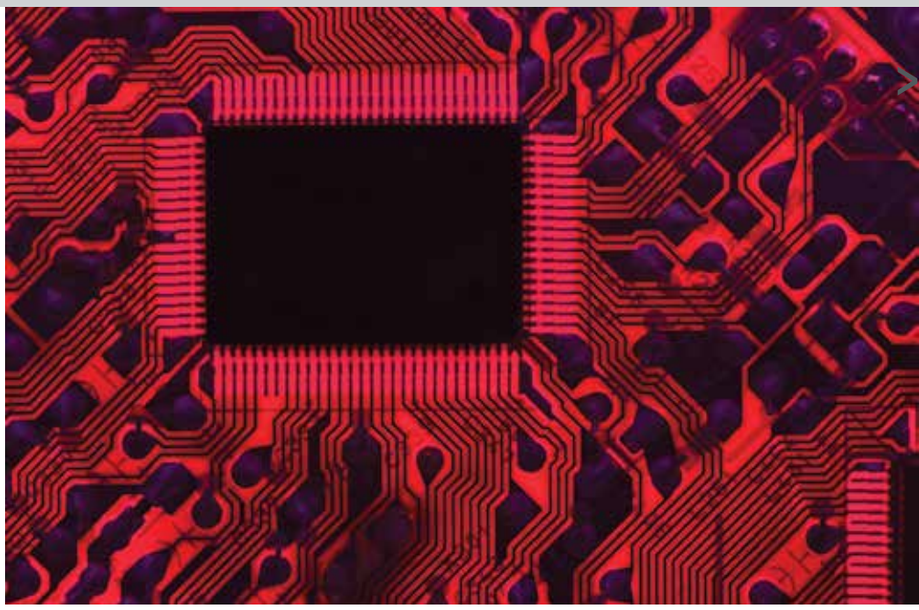
New IT system uses virtual desktops.

The Case School of Engineering rolled out 175 virtual desktops in student labs and to faculty and staff members—and they require only a network connection. The desktops are streamed from a local cloud using Citrix XenDesktop technology and provide a personalized desktop to users, who can access their software and files from any device, including "thin client" network interfaces or any computer, tablet or smartphone.

The Xen technology simplifies administration and provides access to virtualized applications while controlling licensing.

The initial investment into the server architecture was supported by a $50,000 gift from Rockwell Automation.

Next steps include piloting virtual student labs in place of physical ones.



TAKING THE HEAT

High-temperature-resistant circuits function up to 600 degrees Celsius.

A team of Case Western Reserve University engineers has designed and fabricated integrated amplifier circuits that operate under extreme temperatures—up to 600 degrees Celsius—a feat that was previously impossible.

The integrated circuits, constructed using silicon carbide on a wide-band-gap semiconductor, have applications in both aerospace and energy industries, such as collecting data inside nuclear reactors and rocket engines.

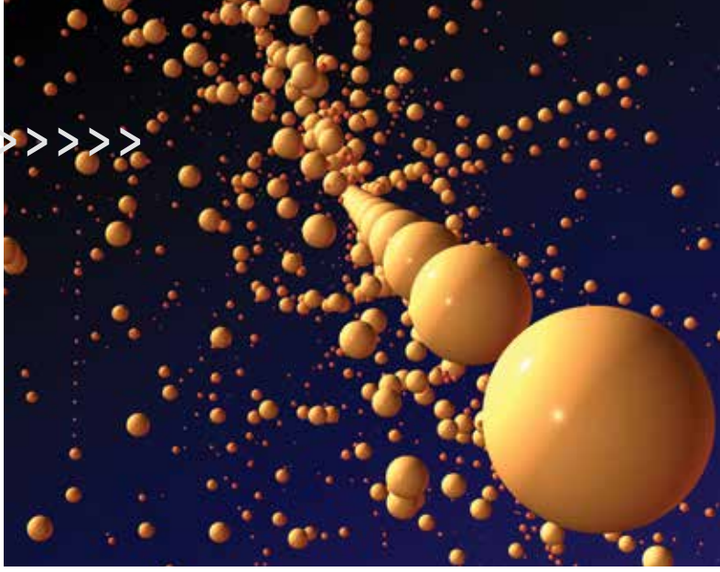
The wide-band-gap semiconductor enables circuits that can co-exist with the "dumb" sensors currently used in high-temperature applications, eliminating the long wires that are typically needed to connect them to the high-temperature zone. The resulting "smart" sensors are less susceptible to interference, which can make signals unclear and difficult to decipher.

By integrating the amplifier and sensor into one discrete package and placing it directly where data is being collected, the circuits developed by electrical engineering and computer science professors Steven L. Garverick and Mehran Mehregany, along with a team of graduate students including PhD candidate Chia-Wei Soong, boast improved signal strength and clarity and can provide more reliable information. This could ultimately result in more accurate monitoring and safer control of jet engines, nuclear reactors and other high-temperature operations.

BME RESEARCHER RECEIVES PRESIDENTIAL AWARD

President Obama honored Case Western Reserve biomedical engineering associate professor Jeffrey R. Capadona with a Presidential Early Career Award for Scientists and Engineers (PECASE). Capadona was one of only 96 scientists to receive the prestigious award from the White House on July 31.

THE SHAPE OF NANOWIRES TO COME



Shaped gold catalysts grow nanowires fast and twice as long.

The standard process for growing nanowires uses spherically shaped catalyst metal nanoparticles. But chemical engineer R. Mohan Sankaran, physicist Xuan Gao and their research team have discovered that triangular, cubic and other higher-order-shaped gold catalysts are capable of growing nanowires about two times faster and longer.

The findings, published in *Nano Letters*, pave the way to grow nanowires for sensors that can detect changes in white and red blood cells, and thus determine different types of cancer. These tiny nanowires also hold potential for advanced 'invisible' computer chips.

THE BIG 5-0

Macromolecular Science & Engineering celebrates milestone.

In 1963, the country's first stand-alone polymer science and engineering department was organized at the Case Institute of Technology, with polymers expert Eric Baer as the first chair. The department's 50-year history, including nearly 300 BS, 400 MS and 500 PhD graduates, has included many breakthroughs in the understanding of biological soft matter and semicrystalline polymers; polymer spectroscopy; polymer rheology and processing; new methods for synthesizing polymers, and composite materials. It is home of the first ABET-accredited BS in Polymer Science & Engineering, and the only materials-focused NSF Science and Technology Center.

THINK HANDS ON

New innovation center and experiential classes get students designing and building from the start.

Case Western Reserve University's new inventor's playground, think[box] 1.0, opened this past spring, offering students, faculty and staff space to tinker and creatively invent. The initial space is a 3,000-square-foot design and development lab available for carrying out classroom assignments and entrepreneurial side projects.

This past spring semester, three first-year-student seminars used think[box] to bring their classroom learning to life. The classes were so well received, the 2012-13 academic year will offer more than 25 first-year classes that utilize think[box] and industry software to give students the chance to work through design challenges and actually fabricate products to reinforce theoretical lessons.

The new think[box] space and curricular updates help students understand what engineers actually do, and allows them to go through the engineering process and actually "make something" during their first year of studies.

Learn more at **engineering.case.edu/thinkbox**.

TACKLING CONCUSSIONS

CWRU, Cleveland Clinic partner on head injury consortium.

Experts in medical research, engineering, materials science and imaging are coming together to shed some light on a common but poorly understood injury—concussions. The new Cleveland Traumatic Neuromechanics Consortium is co-directed by mechanical and aerospace engineering professor Vikas Prakash and Adam Bartsch, CWRU mechanical engineering PhD graduate and current head of Cleveland Clinic's Head, Neck and Spine Research Laboratory.

A better understanding of the forces that cause injuries to the head, brain, neck and spine can lead to the development of better designed helmets for athletes and military personnel.

STUDENT FOCUS

POTHOLE FIX IS IN THE BAG

Case Western Reserve students invent pothole patch that quickly and easily repairs damaged roads.

A quick fix for potholes? A bag of batter-like liquid, called a non-Newtonian fluid, that turns rigid under pressure. Toss in as many bags as needed to fill the chasm. The fluid-filled bags settle into the hole and harden when a car tire crosses them, providing a smooth ride.

For this solution to a real problem, an interdisciplinary team won the 2012 Saint-Gobain Student Design Competition at Case Western Reserve, including $9,000 in prize money. They also bested teams from eight other Northeast Ohio universities to win the Entrepreneurship Education Consortium's ideaLabs competition and a $6,500 award this year.

Their product, Hole Patch, is reusable and environmentally benign, quick and easy. The status quo: filling the hole multiple times with tar and gravel, costing, nationwide, up to $5 billion annually.

The student team plans to fine-tune and broadly test the fix this school year.

NEW TURBINES

Case Western Reserve's Wind Energy Research & Commercialization Center (WERC) added two new turbines—a Vestas V-27 225-kilowatt turbine and a utility-scale Nordex N-54 1-megawatt turbine—to be used as platforms for the development of wind power supply chain products and long-term educational and training opportunities.

next

INSIDE THIS ISSUE

engineering.case.edu

UMC-2536_2012

CASE SCHOOL OF ENGINEERING
CASE WESTERN RESERVE UNIVERSITY
10900 Euclid Avenue
Cleveland, Ohio 44106-7220