>> CUTTING-EDGE COMPUTING >>>

CWRU launches Silicon Valley Think Tank.

Case Western Reserve University has created a think tank in one of the country's best-known hubs for high-tech innovation to help fine-tune the school's strategic direction in education and research in the computational sciences.

Case School of Engineering Dean Jeffrey L. Duerk invited 15 of the school's industry-leading alumni—academic leaders, software pioneers, computer engineers and others—to participate in the Silicon Valley Computing Think Tank. The group has convened twice since its December 2012 launch, meeting to discuss the next areas of innovation and what the university can do to remain on the forefront.

The group identified a number of priority areas for the university to focus its research and academic efforts, including cloud computing, big data, human-computer interfaces and a number of fields in medicine, from deployment of electronic medical records to brain mapping. At its next meeting, scheduled for the fall, electrical engineering and computer science department chair Kenneth Loparo will discuss the department's strategic vision.

>>>>>> **NEWS AND BREAKTHROUGHS** >>>>>>>>>>>>>
FROM THE CASE SCHOOL OF ENGINEERING

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Photo by Russell Lee

CASE WESTERN RESERVE LANDS ADDITIVE MANUFACTURING GRANTS

Inaugural NAMII funding helps extend machine tool life and analyze manufacturing processes.

The Case School of Engineering at Case Western Reserve University and its partners have won two awards from the National Additive Manufacturing Innovation Institute (NAMII) in the organization's first round of funding.

Last year, the federal government established NAMII to accelerate the implementation of additive manufacturing technologies in the United States. The $70-million initiative is led by Case Western Reserve, Carnegie Mellon, Penn State, Youngstown State, University of Akron and the National Center for Defense Manufacturing and Machining, along with five-dozen organizations across Ohio, Pennsylvania and West Virginia.

The first grant will fund a project led by David Schwam, research professor of materials science and engineering, that aims to develop methods to extend the life of heavy machine tools using techniques like 3-D printing rather than spending millions of dollars on brand new equipment.

The second award supports a joint effort between Case Western Reserve University and Carnegie Mellon University that will study the microstructure and mechanical properties of two key additive manufacturing processes of metals—EOS laser sintering and Arcam electron beam melting (EBM). John J. Lewandowski, the Arthur P. Armington Professor of Engineering II, has been leading the university's efforts in this area.

The two Case Western Reserve-led projects are among seven to earn funding in NAMII's inaugural round of research and development grants. Learn more at **engineering.case.edu/manufacturing-grants**.

COOLER STREETS

Thermochromic asphalt binders control road surface temperatures, which could make streets more durable.

Mother Nature is rough on roads. But civil engineers at Case Western Reserve University found that adding thermochromic materials to asphalt binder helps control surface temperature, which could lead to longer-lasting streets.

Black asphalt soaks up the summer sun, and the spiking surface temperatures can damage roadways. Thermochromic materials can change their colors in response to temperature—they reflect solar energy when it's hot and absorb it when it's cooler.

Researchers led by Bill Yu, associate professor of civil engineering, found that adding these materials to asphalt binder decreased the surface temperature of roads in hot weather and also slowed down the temperature drop in cold weather.

Controlling temperatures could help reduce weather-related degradation, researchers say.

NEW LEADERS

Nord Professor of Engineering Kenneth A. Loparo has been named chair of the Department of Electrical Engineering and Computer Science. A well-respected scientist and award-winning educator, he brings extensive research expertise in systems and control engineering to his new role, as well as leadership experience as a member of numerous key university organizations and committees.

In addition, associate professor of mechanical and aerospace engineering Alexis Abramson has been appointed faculty director of the university's Great Lakes Energy Institute. She is a well-known researcher and has proven experience engaging academic and industry partners. Since 2011, she has served as chief scientist of the Department of Energy's Building Technologies Office, overseeing the investment of about $90 million per year in the research and development of energy-efficient and cost-effective building technologies.

UP TO THE CHALLENGE

Students, faculty join international team to tackle DARPA Robotics Challenge.

Case Western Reserve University has one of nine teams advancing to the final round of the DARPA Robotics Challenge—an international contest aimed to spur the design of advanced disaster-response robots.

The team, led by professor of electrical engineering and computer science Wyatt Newman, finished ninth out of an original field of 120 teams in the competition's first round held in July—the Virtual Robotics Challenge—where they tested their software in a simulated robot.

For the next stage of the competition, the Case Western Reserve team will collaborate with Team-K Japan along with researchers at Hong Kong University and the University of Edinburgh to apply the software in a real ATLAS robot to see how it performs in real-word scenarios. Finals for the competition will take place in December 2014.

Learn more at **theroboticschallenge.org**.

SQUID-INSPIRED BIOMATERIAL

New substance could move researchers closer to more biocompatible implants.

A team led by engineers at Case Western Reserve University has found an unlikely model for the next generation of cutting-edge medical implants: the squid.

Many medical devices require hard materials to connect or pass through soft body tissues, and the mismatch between the mechanical properties of the tissue and device can create problems for the technology and its users. To address this, the research team developed a material that mimics the mechanical gradient used in the squid beak to join its stiff tip to its more malleable body.

In nature, the gradient in the squid beak acts as a shock absorber, allowing the animal to bite down with bone-crushing force without damaging the delicate tissue of its mouth. The research team's material mimics the beak's architecture and water-enhanced mechanical gradient properties, which they believe can lead to safer, more biocompatible implants for people.

The team was led by Stuart J. Rowan, the Kent Hale Smith Professor of Engineering in macromolecular science and engineering and faculty director of the Institute for Advanced Materials; Jeffrey R. Capadona, assistant professor of biomedical engineering; and their colleagues, including Paul D. Marasco at the Louis Stokes Cleveland VA Medical Center.

Learn more at **engineering.case.edu/squid-beak**.

BIG FUTURE FOR SMALL WIRES

Case Western Reserve, Atotech partner to develop new chemistries to build the world's smallest semiconductors.

Pushing the limits of miniaturizing semiconductors is crucial to the fabrication of more powerful and more capable computers, phones and other electronics. The smallest semiconductors on the market today measure about 22 nanometers, and current production methods don't seem up to the task of shrinking them any further.

But the Case School of Engineering and global chemical manufacturer Atotech Deutschland GmbH have launched a joint research venture aimed at developing new chemistries that will allow researchers to build even smaller semiconductors—less than half the size of today's tiniest devices.

They will explore a metallization technology called electroless deposition, which uses a chemical reaction instead of an electric current to create the copper-wire network that distributes the current within the semiconductor device.

Learn more at **engineering.case.edu/Atotech-agreement**.

MORE think[box]

University's inventor's studio expands to 4,500 square feet.

Budding entrepreneurs and inventors in the Case Western Reserve University community now have even more room and resources to bring their ideas to life with the expansion of think[box], the university's innovation hub.

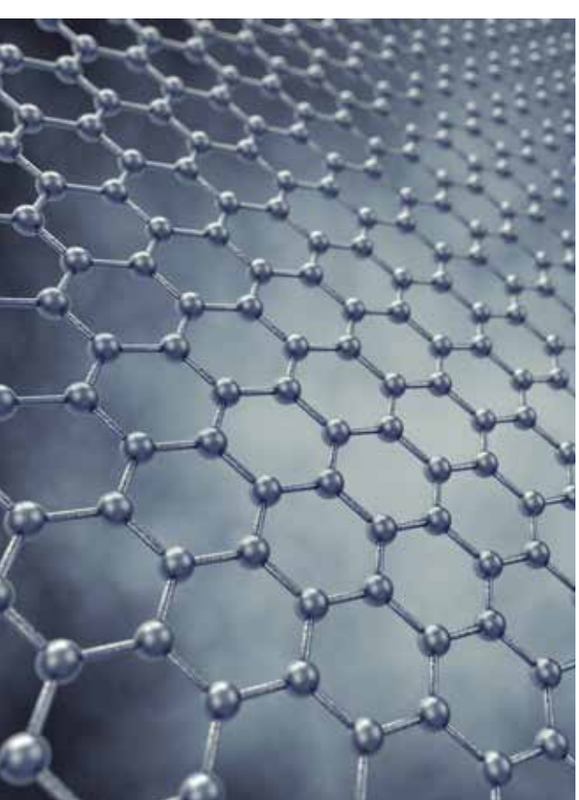
The recent renovation adds 1,500 square feet to the invention center, bringing its total space to 4,500 square feet.

The expansion introduces dedicated creative, collaborative design space to think[box]. Users will have access to multiple design bays with movable whiteboard walls, as well as multimedia meeting desks where teams can connect multiple personal laptops to an oversized LCD screen.

In May, the university's Board of Trustees approved the concept for the next iteration of think[box], its seven-story, 50,000-square-foot home on campus.

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

The Orthopaedic Research Society honored Clare Rimnac, associate dean of research and the Wilbert J. Austin Professor of Engineering, with its 2013 Women's Leadership Award.



OUTPERFORMING PLATINUM

Researchers find cheaper, more powerful alternative for fuel cell catalysts.

A discovery by a team of researchers, including macromolecular engineers from Case Western Reserve University, could eliminate one of the largest obstacles to large-scale commercialization of fuel cell technology: pricey platinum catalysts.

The scientists discovered a catalyst made from graphene nanoparticles edged with iodine performs better than platinum in oxygen-reduction reactions. The metal-free version is cheaper, easier to produce and generated 33 percent more current than its platinum counterpart in initial tests.

The technology to make the alternative catalysts builds on previous work by team member Liming Dai, the Kent Hale Smith Professor of macromolecular science and engineering, who, in collaboration with professor Jong-Beom Baek at South Korea's Ulsan National Institute of Science and Technology, developed a cheap industrial process to make graphene sheets from graphite.

Learn more at **engineering.case.edu/metal-free-catalyst**.

BRAIN FOOD

CWRU students make room for Jell-O in the classroom.

A team of Case Western Reserve University students is using Jell-O to teach middle schoolers about engineering—and their efforts won them a $2,500 prize at the Biomaterials Education Challenge at the Society of Biomaterials national meeting this spring.

The popular snack is also among the nation's best-known biomaterials. Its primary ingredient—gelatin—is derived from the protein collagen, which makes up connective tissues.

In the body—and in Jell-O—collagen degrades over time, which makes it a valuable teaching tool for young people, according to the team of students who put together the winning lesson plans.

Julia Samorezov, Christa Modery-Pawlowski and Amy Wen, all PhD candidates in biomedical engineering, along with fourth-year biomedical engineering undergraduate major Sarah Gleeson, designed experiments for eighth-graders to perform on the dessert. Students tested whether more collagen could help a Jell-O sample hold more weight before collapsing and whether water or a solution of water and meat tenderizer would degrade Jell-O faster. The experiments were designed to give students a taste of the scientific method—and a taste of their test material afterwards.

DIAGNOSTIC VEST

Photo by Russell Lee

Researchers in the electrical engineering and computer science department, including graduate students Abhishek Basak and Vaishnavi Ranganathan and their adviser Swarup Bhunia, associate professor of electrical engineering, are developing a vest fitted with ultrasound sensors and other high-tech gear that can detect cancer before symptoms set in.

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