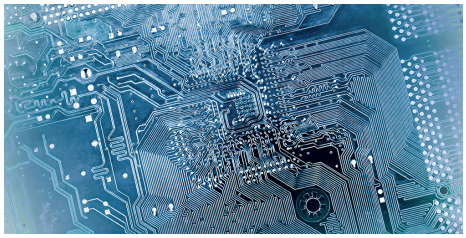
UC San Diego
JACOBS SCHOOL OF ENGINEERING

MONTHLY NEWS AUG 2018

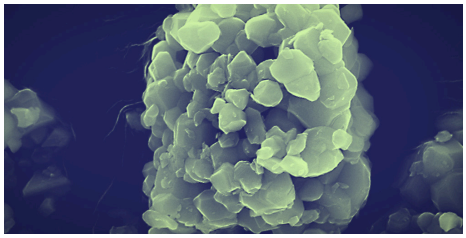
UC San Diego awarded $11.3M from DARPA to improve chip design



UC San Diego will be awarded $11.3 million over four years from DARPA to lead a multi-institution project that aims to develop electronic design automation tools for 24-hour, no-human-in-the-loop hardware layout generation. Professor Andrew Kahng, who is on the faculty of both the computer science and electrical engineering departments, will lead the project, called OpenROAD. “For the U.S. to be the vanguard of innovation we need to fully leverage semiconductor technology,” Kahng said. “There’s an incredible delta between what’s possible with silicon versus what people are actually able to afford or bring themselves to risk attempting—we’re trying to narrow that gap.”

Learn more: bit.ly/OpenROAD

What’s causing the voltage fade in Lithium-rich NMC cathode materials?



UC San Diego researchers have explained what’s causing the performance-reducing “voltage fade” that currently plagues a class of cathode materials that holds promise as rechargeable batteries for electric vehicles. The cathode materials are called Lithium-rich NMC (nickel magnesium cobalt) layered oxides. Knowing the origin of voltage fade, the team showed that heat treating the cathode materials eliminated most of the defects and restored the original voltage. UC San Diego nanoengineering professor Shirley Meng and physics professor Oleg Shpyrko are the senior authors on the new Nature Energy paper. They lead the Sustainable Power and Energy Center at the UC San Diego Jacobs School of Engineering.

Learn more: bit.ly/VoltageFade

Protein keeps fly hearts young

Bioengineers from UC San Diego discovered that maintaining high levels of the protein vinculin—which sticks heart muscle cells to one another—helps keep aging fruit fly hearts young. Their research shows that fruit flies bred to produce 50 percent more vinculin enjoyed better cardiovascular health and lived a third of their average life span longer. The group hopes to one day see their work lead to pharmaceutical solutions for humans that boost vinculin expression.

Learn more: bit.ly/Vinculin

New solid-state laser material

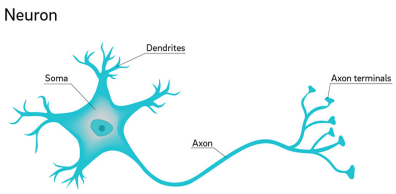
By doping alumina crystals with neodymium ions, mechanical engineers have developed a new laser material that is capable of emitting ultra-short, high-power pulses. The work could yield smaller, more powerful lasers with superior thermal shock resistance, broad tunability and high-duty cycles. The new neodymium-alumina laser gain medium has 24 times higher thermal shock resistance than one of the leading solid-state laser gain materials.

Learn more: bit.ly/NdAlumina

Charles Lee Powell Foundation: Empowering the Jacobs School for Three Decades

When you drive across a highway bridge in California, there is a good chance that your safety depends on a piece of technology that has been developed and tested at UC San Diego. One of the long-time supporters of this work is the Charles Lee Powell Foundation, which has contributed more than $35 million in support to the Jacobs School of Engineering during the past three decades. The foundation has funded research in the Department of Structural Engineering and the Charles Lee Powell Laboratories and established the Powell Fellows program for doctoral students, the H. Kunzel Endowed Scholarship/Fellowship Fund, and endowed faculty chairs to help recruit and retain stellar scholars.

Learn more: bit.ly/PowellFoundation



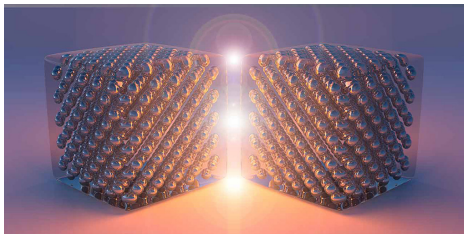
From axon insights to machine learning

Bioengineers at UC San Diego have answered an intriguing question: Why are axons— the spindly arms extending from neurons that transmit information from neuron to neuron in the brain— designed the way they are? This question has long puzzled neuroscientists, and may hold a key to better understanding the complexities of neurological disorders. The researchers, led by Professor Gabriel Silva, director of the UC San Diego Center for Engineered Natural Intelligence, found that axons are optimized to balance the speed that information flows into the neuron relative to the time it takes the neuron to process that information—a figure they called the refraction ratio. Silva is currently applying these insights to build better artificial neural networks and improve machine learning.

Learn more: bit.ly/AxonDesign

Record-breaking electron tunneling

Engineers at UC San Diego have built a nanosized device out of silver crystals that generates light with record-breaking efficiency by "tunneling" electrons through a 1.5-nanometer-wide barrier. The DARPA-funded work brings plasmonics research a step closer to realizing ultra-compact light sources for high-speed, optical data processing and other on-chip applications. The team's computational and chemistry-based fabrication techniques offer atomic-level control of materials and the ability to dictate the size and shape of crystals in solution. "We're exploring a new way to generate light," said electrical engineering professor Zhaowei Liu. The collaboration between electrical and nanoengineers appears in Nature Photonics.



Learn more: bit.ly/TunnelingElectrons

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