UC San Diego
JACOBS SCHOOL OF ENGINEERING

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New battery recycling R&D center

The Jacobs School of Engineering is a key part of the new U.S. DOE lithium-ion battery recycling R&D center. The goal of the center, called ReCell, is to help the United States grow a globally competitive recycling industry and reduce reliance on foreign sources of battery materials. Nanoengineering professor Zheng Chen has developed a better way to restore and reuse cathodes from spent lithium-ion batteries. He is a member of ReCell and of the UC San Diego Sustainable Power and Energy Center. ReCell is a collaboration between Argonne National Laboratory; the National Renewable Energy Laboratory; Oak Ridge National Laboratory and several universities including UC San Diego, Worcester Polytechnic Institute and Michigan Technological University.

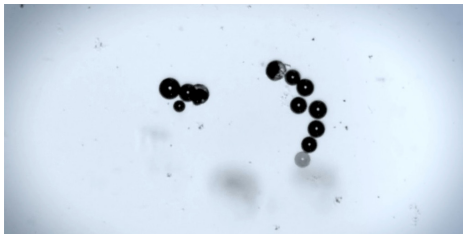
Learn more: bit.ly/UCSDReCell

A soft robotics perception system inspired by humans

UC San Diego mechanical engineers are leading the development of a new perception system for soft robots. The work, which appears in Science Robotics, is inspired by the way humans process information about their own bodies in space and in relation to other objects and people. "The advantages of our approach are the ability to predict complex motions and forces that the soft robot experiences (which is difficult with traditional methods) and the fact that it can be applied to multiple types of actuators and sensors," said mechanical engineering professor Michael Tolley. He's a member of the UC San Diego Contextual Robotics Institute.

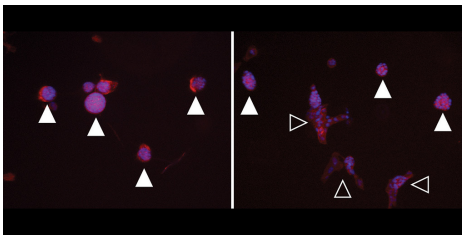
Learn more: bit.ly/RobotPerception

Micromotors to deliver oral vaccines



Oral vaccines must survive digestion in the stomach and then reach immune cells within intestinal walls in order to be effective. To enable this journey, UC San Diego nanoengineers have developed micromotor-powered oral vaccines. The motors turn on when they reach the intestine and then drive into the mucus-layered walls of the intestine, transporting oral vaccines where immune cells reside. The research is a collaboration between professors Joseph Wang and Liangfang Zhang who are both part of a new center at the Jacobs School combining nanotechnology and immune engineering.

Learn more: bit.ly/VaccineMicromotors



Understanding breast cancer development

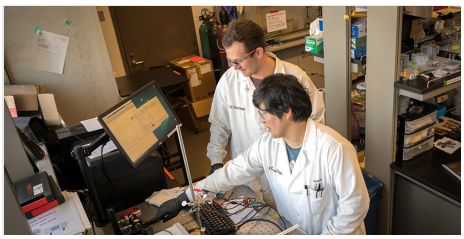
Bioengineers at UC San Diego have generated new insight into how the stiffening of breast tissue plays a role in breast cancer development. By examining how mammary cells respond in a stiffness-changing hydrogel, they discovered that several pathways work together to promote the transformation of breast cells into cancer cells. The work, published in PNAS, could inspire new approaches to treating patients and inhibiting tumor growth. "By dynamically modulating the stiffness of the microenvironment, we can better mimic what happens during the transformation of breast cells to a malignant state in a dish," said bioengineering professor Adam Engler.

Learn more: bit.ly/BreastTissueStiffening

Feathers: better than Velcro?

Have you ever run your hand along a feather's barbs and watched as the feather unzips and zips, seeming to miraculously pull itself back together? That "magical" zipping mechanism could provide a model for new adhesives and aerospace materials. Researcher Tarah Sullivan, who earned a Ph.D. in materials science in Marc Meyers' lab at the Jacobs School, developed 3D-printed structures that mimic the feathers' vanes, barbs and barbules to better understand their properties. The work, published in Science Advances, could serve as inspiration for an interlocking one-directional adhesive or a material with directionally tailored permeability. The images serve as the visuals for Research Expo 2019.

Learn more: bit.ly/FeatherStructure

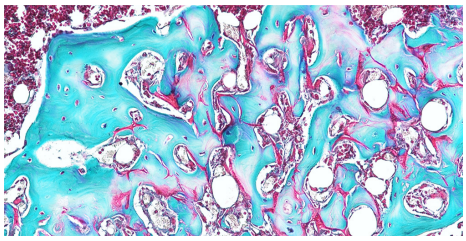


Adding a bit of salt improves perovskite solar cells

New findings about perovskites published in Science could pave the way for lower-cost, higher-efficiency solar cells. Using high-intensity X-ray mapping, the researchers explain why adding small amounts of cesium and rubidium salt improves the performance of the class of solar cell materials called lead-halide perovskites. "We're looking deeper into some of the state-of-the-art chemistries to understand what drives perovskite performance and why they work so well," said nanoengineering professor David Fenning, a member of the UC San Diego Sustainable Power and Energy Center. Read coverage in Electronics Weekly.

Learn more: bit.ly/PerovskiteCations

Injectable gel enhances the quantity, quality of T-cells



Bone marrow transplants are life-saving treatments for aggressive diseases, such as leukemia and multiple myeloma, and infections such as HIV. The procedure entails infusion of blood stem cells from a matched donor into the patient to "reset" the blood and immune system. Now, engineers and stem cell biologists have developed an injectable sponge-like gel that enhances the production of T-cells after a bone marrow transplant, increasing the quantity and diversity of these key components of the immune system. This bioengineered device can be injected under the skin at the same time of the transplant to help revive the immune system after bone marrow transplantation.

Learn more: bit.ly/BetterTcells

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