UC San Diego
JACOBS SCHOOL OF ENGINEERING

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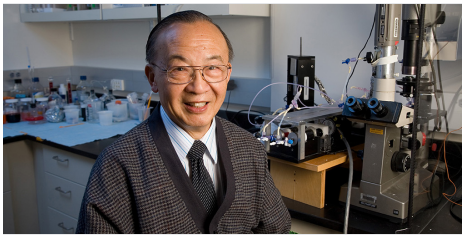
Engineers and Physicians

We collaborate to improve human health

Here at UC San Diego, our engineers and computer scientists work directly with physicians every day. Engineers and clinical researchers working together is certainly not new, but at UC San Diego we have the distinct advantages of proximity and collaborative culture. UC San Diego Health, with its world class schools of medicine and pharmacy, cancer center and clinical research enterprise is right next door to the Jacobs School of Engineering. In terms of research at the interface of engineering and medicine, I'm proud to report that we are launching a new agile research center at the Jacobs School that will develop and leverage nano-scale tools to engineer the immune system for a wide range of preventive and therapeutic applications. More details on this new center to come. It is one the many ways that we work across disciplines to make bold possible.

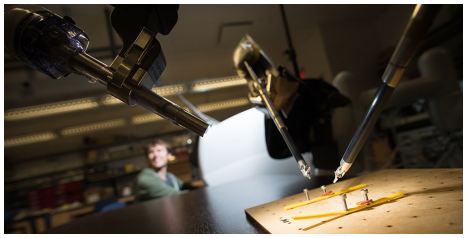


Institute of Engineering in Medicine turns 10

One of the ways researchers at the Jacobs School of Engineering and UC San Diego Health connect to solve problems together is the Institute of Engineering in Medicine, which recently celebrated 10 years of great work. This institute builds on UC San Diego's cross-disciplinary research culture. It connects engineers and physicians with the goal of improving health care delivery through next-generation tools and technologies. "The Institute is a campus-wide initiative to synergize our unique strengths in engineering and medicine—two fields in which we have top-ranking faculty and resources at UC San Diego," says Shu Chien, MD, PhD, professor of bioengineering and medicine, and founding director of the Institute of Engineering in Medicine.

Learn more: bit.ly/IEM10th

Funding engineering-physician research teams



Matching physicians and engineers, and then providing seed funding, are two critical tasks that take place through UC San Diego's Galvanizing Engineering in Medicine (GEM) program. UC San Diego clinicians identify unmet needs in patient care and then work with teams of engineers to solve the problem and move the technology to the clinic. Each year, four physician-engineer teams from UC San Diego are funded. The latest projects include removing the time-lag in telerobotic surgery, improving pancreatic cancer treatment, and developing a neuro-electronic spinal cord implant to treat paralysis.

Learn more: bit.ly/GEMteams

We train clinical engineers

Jacobs School undergraduates have opportunities to identify and then address real needs in clinical settings. One example: our "Clinical Bioengineering" course. In this class, engineering undergraduates shadow physicians, learn about problems in their clinical practice, and develop engineering-based solutions to bridge the gap between bench and bedside. Students have obtained funding to turn their solutions into reality. A smart shoe insole called SoleMate, which optimizes lower-extremity rehabilitation, is one example.

Learn more: bit.ly/ClinicalEngineers

Tech transfer: engineering + medicine

While breakthroughs are great, at the Jacobs School, we are focused on transferring our innovations to the real world where they can benefit people. The Institute for the Global Entrepreneur is the hub for entrepreneurship education and commercialization programs at the Jacobs School. Current companies at the interface of engineering and medicine include the following: BioJam Technologies is developing a low-cost medical device to reduce surgical trauma to patients while advancing the capabilities of surgeons during minimally invasive surgery. Cari Therapeutics is a digital health company developing bio-sensor technologies to improve treatments for substance abuse. Veocor Diagnostics is developing personalized diagnosis of stroke risk technologies which analyze echocardiographic images through the cloud.

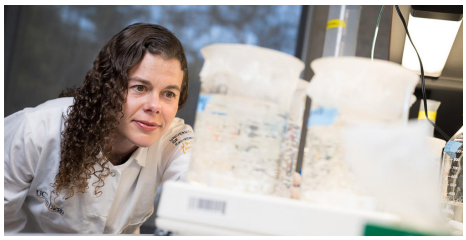
Learn more: bit.ly/IGEUCSD

Spinal cord injury reversal

A team of nanoengineers and neuroscientists at UC San Diego have developed 3D printed implants that could one day help restore neural connections and lost motor function in patients with spinal cord injury. The implants, filled with neural stem cells, serve as soft bridges that guide new nerve cells to grow across a tear or break in an injured spinal cord. New work, published in *Nature Medicine*, shows promise in rats with severe spinal cord injury. Press coverage included Wired, IEEE Spectrum, The San Diego Union Tribune and Chemical & Engineering News.

Learn more: bit.ly/3Dprintedspinal

Biomaterials for regenerative medicine



Biomaterials that can promote tissue repair and regeneration on their own without the need for delivering cells or other therapeutics have emerged as a potentially powerful paradigm for regenerative medicine. That's one of the key statements in a Perspective piece written by Jacobs School bioengineering professor Karen L. Christman in the Jan. 24 issue of the journal *Science*. Christman's lab has a strong translational focus with the main goal of developing minimally invasive therapies for cardiovascular disease. Projects are highly interdisciplinary and involve collaborations with basic scientists, engineers and physicians. Christman is also a co-founder of Ventrix, a startup that is bringing to the clinic some of the technologies developed in her research group.

Learn more: bit.ly/BiomaterialsChristman

Long-distance surgery

An engineering-surgery team at UC San Diego is working to extend the reach of surgeons by allowing them to operate remotely on patients located across a city, country, or even the globe. This kind of telesurgery, however, is not performed today. The major hurdle? The signal delay when transmitting commands from a surgeon's console to the robot at the patient's bedside, and the video back to the surgeon. The team is working on augmented reality systems that could eliminate the delay roadblock. The team is also working on visual-haptic feedback that predicts and displays how much force remotely controlled instruments are applying to tissues.

Learn more: bit.ly/TelesurgeryAR