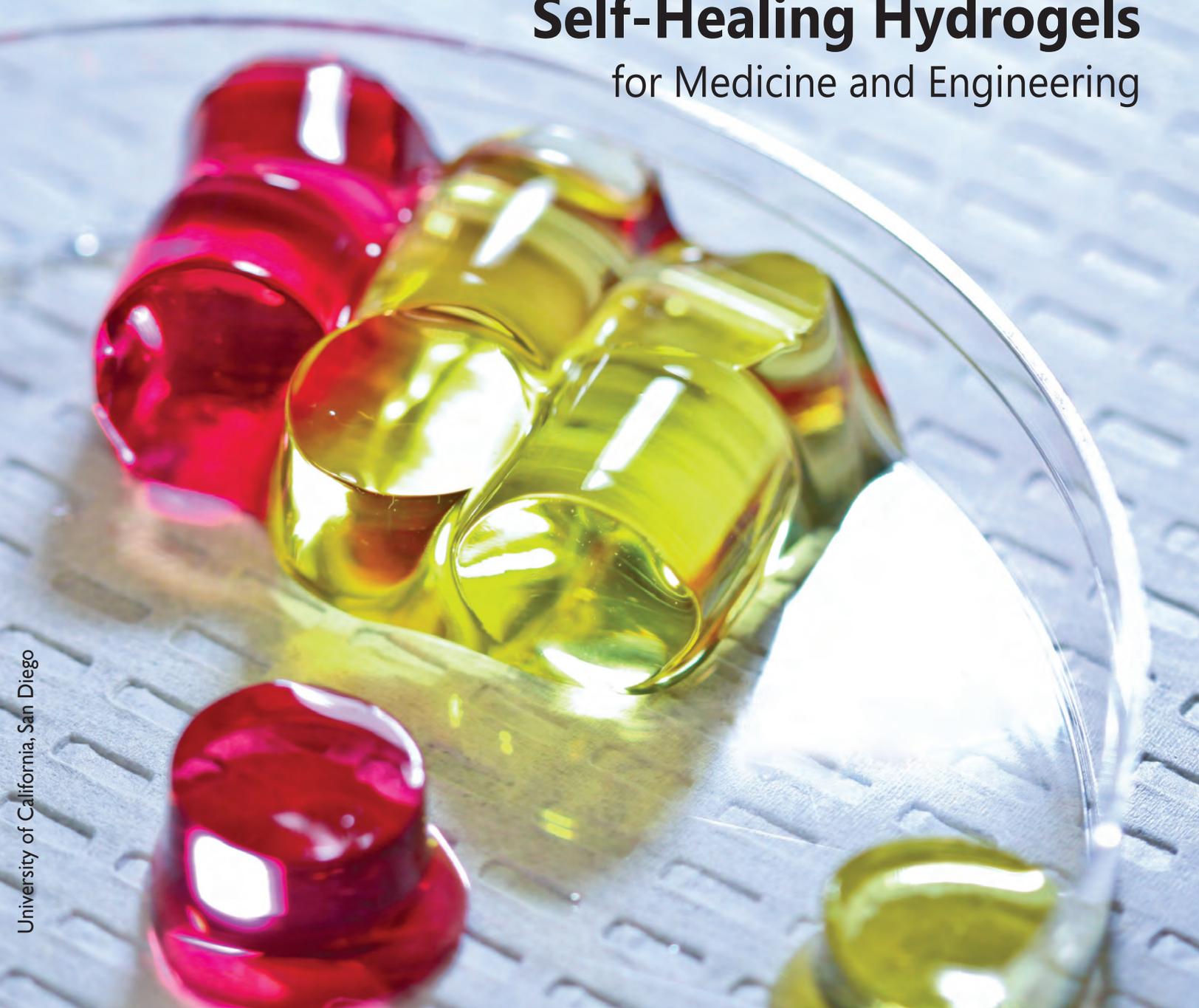


Jacobs School of Engineering News
Summer 2012

Pulse

Self-Healing Hydrogels
for Medicine and Engineering



New Business Incubator for Undergraduates

This fall we will launch the Moxie Center, an undergraduate incubator aimed at helping our Jacobs School students turn their ideas into products and companies. The Moxie Center will encourage the entrepreneurial spirit amongst our undergraduates by providing resources ranging from dedicated laboratories, where students can work on their prototypes, to mentoring by experienced engineering entrepreneurs. In addition, we will offer a technical elective in which students will design projects while learning about product development and commercialization. The most promising ideas and teams will be offered the Zahn Prize to help seed further development of their products.

I would like to extend a most heartfelt thanks to Irwin Zahn, his family, and their Moxie Foundation for investing in our undergraduates and making the Moxie Center possible. Seeing the Moxie Center come together is especially gratifying because Irwin Zahn is such a terrific role model for our students. In 1954, shortly after he earned a bachelor's degree in mechanical engineering from the City University of New York, Zahn founded an industrial staple company, General Staple. Zahn built this one-man venture into AUTOSPLICE, an innovative international enterprise that produces connectors for electronics, including the ubiquitous pin and socket. Zahn sold AUTOSPLICE in 2011.

Much of Zahn's success can be traced back to innovation and problem solving through engineering — as well as the fortitude to keep working until difficult and important problems are solved. This captures the spirit of the Moxie Center and underscores some of what I hope Jacobs School undergraduate students will gain.

The Moxie Center will complement the Jacobs School's von Liebig Entrepreneurism Center, which primarily focuses its efforts on entrepreneurship education, business mentoring and proof-of-concept grants for faculty and graduate students. Together, the Moxie Center and the von Liebig Center offer a comprehensive suite of services that will enable the Jacobs School community to develop and transfer ideas and discoveries for the benefit of society.

At the Jacobs School, we strive to provide our students with the technical and theoretical foundations they need to succeed in the engineering workforce. By getting involved in student organizations and Jacobs School programs within our engineering talent pipeline, our students can apply their technical knowledge and develop the confidence necessary to take calculated risks, work in interdisciplinary teams, follow through on unconventional ideas, and even learn from failure. The Moxie Center will provide students with the opportunity to leverage all these hard and soft skills developed at the Jacobs School in order to turn their ideas into products and companies — ventures that have the potential to contribute to our economy and improve lives. If the Moxie Center inspires you, please join The Moxie Challenge, our matching-funds initiative described on page 4.

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Dream, Design, Develop



Injectable Hydrogel



Seismic Tests



Send Update, Get a Shirt



Cover shot: Bioengineers have developed a self-healing hydrogel that binds in seconds, as easily as Velcro, and withstands repeated stretching. The material has numerous potential applications, including medical sutures, targeted drug delivery, industrial sealants and self-healing plastics. See story on Pg. 6

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Structural and Materials Engineering
Building Dedication

Dream Design Develop

Moxie Foundation Gift Creates Undergraduate Incubator

“Engineering is not just an exercise in thinking about something. You do it. That’s the critical thing. I would like to galvanize, motivate and encourage engineering students to take risks, develop products, and go into business for themselves,” said Irwin Zahn.

A new undergraduate incubator at the Jacobs School — the Moxie Center — will do just this, thanks to Irwin Zahn and his family who made a gift to create the Moxie Center through their Moxie Foundation.

Dreaming, designing and developing products — and ultimately bringing them to market — is near and dear to Zahn, who founded General Staple, an industrial stapling company, in 1954. Zahn grew the company into electrical/electronic connectors powerhouse AUTOSPLICE, which he sold in 2011.

The Moxie Center will include two student workspaces — one in Computer Science and Engineering, and one in Mechanical and Aerospace Engineering — designed for prototyping as well as meetings and brainstorming.

“As students see their peers taking advantage of the opportunities offered by the Moxie Center, our entrepreneurial culture will grow,” said Rajesh Gupta, professor and chair, Department of Computer Science and Engineering.

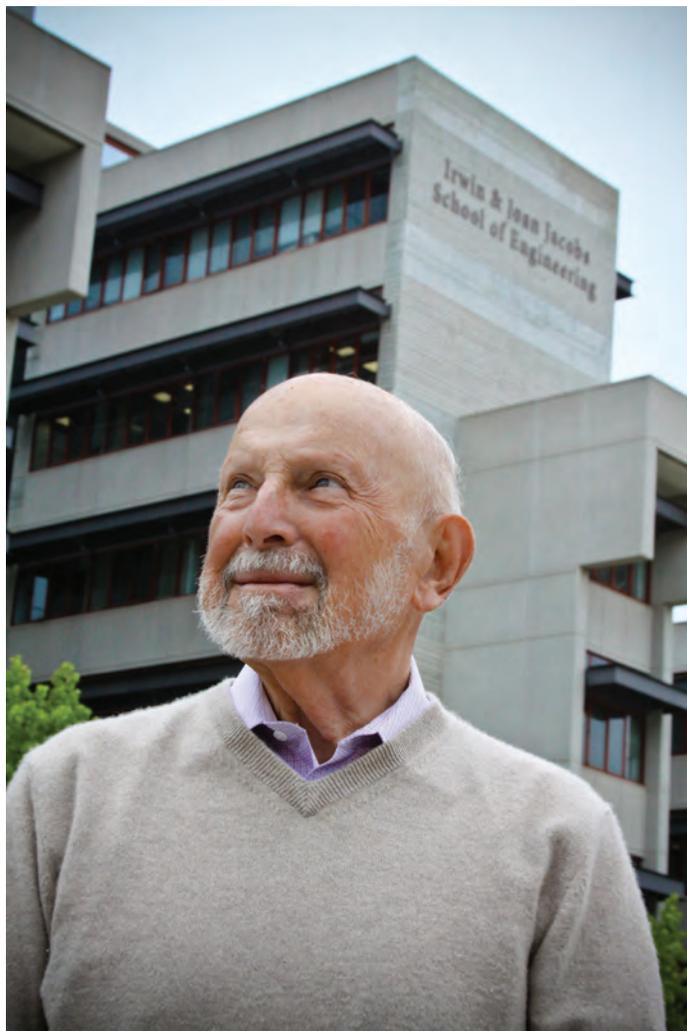
A seasoned entrepreneur will serve as Center director and provide business and engineering guidance. A new technical elective — Product Design and Entrepreneurship — and the Zahn Prize will engage students and incentivize entrepreneurship at the Jacobs School.

“Many Jacobs School students have the entrepreneurship gene, and the Moxie Center will give our undergraduates a powerful way to reach their potential,” said Sutanu Sarkar, professor and chair, Department of Mechanical and Aerospace Engineering.

The Moxie Center complements the Jacobs School’s von Liebig Entrepreneurism Center, which provides faculty and graduate students access to entrepreneurship education, proof-of-concept grants and business mentoring programs.

As an undergraduate incubator, the Moxie Center will help students develop some of the skills that have served Zahn so well. For example, after spending a year solving a problem for a small manufacturer in New Jersey — and losing money on the project in the process — Zahn leveraged that work to get his first contract with General Electric, which helped ensure his company’s place in the electrical/electronic connectors business.

“It was a great idea. It didn’t work the first time. It didn’t work the 10th time. But it finally worked.”



Irwin Zahn (pictured) envisions a wide range of student ventures will emerge from the Moxie Center, including life-enhancing technologies, disease-reducing and poverty-eliminating efforts, cutting-edge applications rooted in computer science, and convenience products. Zahn and his family, through the Moxie Foundation, made the Moxie Center possible.

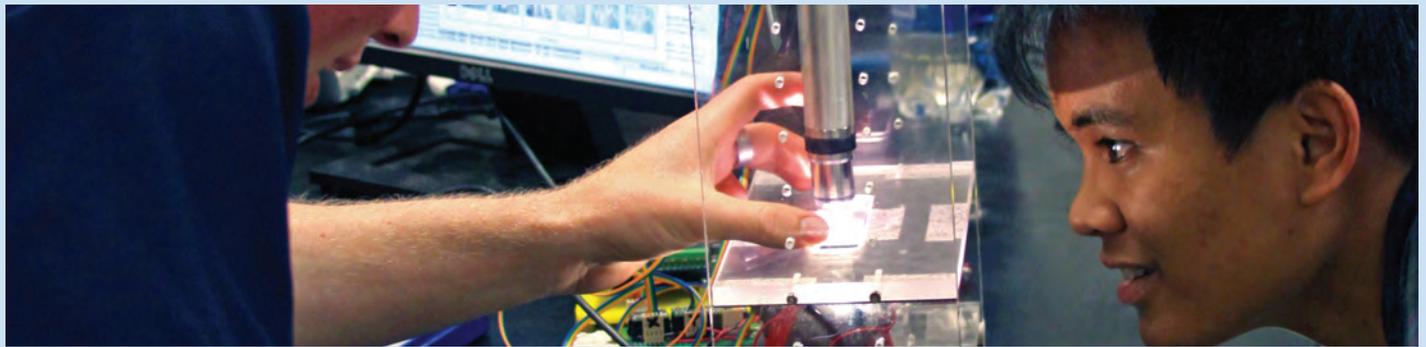
The Moxie Challenge

If you share the vision and passion of Irwin Zahn and the Moxie Foundation and want to make a transformational impact on undergraduate engineering students at the Jacobs School, please join The Moxie Challenge. All gifts will be matched by the Moxie Foundation 1:1 up to \$250,000. For more information, please contact Lisa French: lfrench@ucsd.edu or (858) 246-0593. To make an online gift, go to the Jacobs School website www.jacobsschool.ucsd.edu and click on the “Give Now” button. The Moxie Center Fund number is 3965.

“Opportunities disguised as problems are everywhere. Take a chance and solve the problem!” – Irwin Zahn

In the blue jean craze of the 1960s, Irwin Zahn found an opportunity. Already supplying industrial stapling machines to watch and belt manufacturers, Zahn noticed that the stopper at the bottom of blue jean zippers was nothing more than a brass staple. He envisioned a machine that would create these “bottom stops” by cutting, forming and crimping continuous lengths of brass around the bottoms of zipper chains.

“It was a terrific idea, except I didn’t have any machining capability at that time. The company was maybe three people, so I started dealing with local machine shops in Brooklyn and the Bronx,” said Zahn. The result: a commercially successful machine that put a bottom stop on the zippers of blue jeans. The Moxie Center will give Jacobs School undergraduates, like those featured below, access to state-of-the-art prototyping facilities along with engineering and business mentoring, entrepreneurship coursework, incentives and more. There is no telling where their ideas will lead.



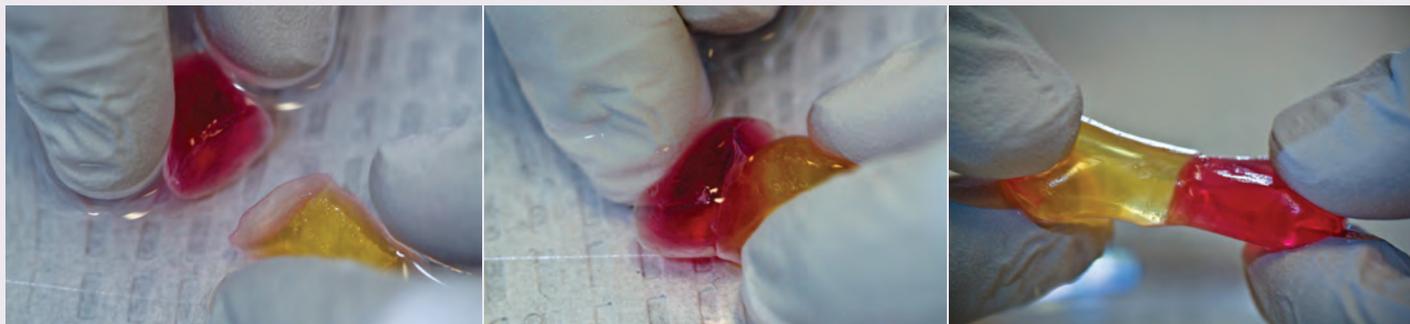
Jacobs School students are developing a cheaper, lighter, multi-function microscope to be used in developing countries. Their prototype will be flown to Mozambique to be field tested at a local clinic. It functions as a spectroscope as well as a brightfield and fluorescent microscope. Similar devices can cost up to \$50,000. “We are aiming for under \$500,” said UC San Diego physician scientist and project sponsor Dr. Eliah Aronoff-Spencer.



“I like thinking about the kinds of problems that computers can solve,” said computer science undergraduate Elizabeth Chaddock, the new vice president of the undergraduate chapter of Women in Computing @UCSD. Chaddock is interested in artificial intelligence and data mining to analyze the content on social networks. As Jacobs School undergraduates learn to solve problems, the Moxie Center will prepare them to turn solutions into companies.



Undergraduate students participating in the Engineering World Health program at UC San Diego are building kits designed to test electrosurgical units in resource-poor countries. The project gives students hands-on experience in engineering design and teamwork as well as the opportunity to see how engineering can be used for the benefit of society. It’s one of many opportunities Engineering World Health students have to build and design medical equipment locally that will be used in the developing world.



New Hydrogels Mimic Body's Ability to Heal

After Being Cut, Gels Form Instant, Strong Bonds Thanks to Dangling Side Chains

Cut your finger chopping onions and you may wince (or cry), but with a little care, your wound will heal itself soon enough. Jacobs School bioengineers have invented a hydrogel that mimics this self-healing ability of biological tissue, opening up a wide range of applications including medical sutures, targeted drug delivery, self-healing plastics and industrial sealants.

The self-healing hydrogel binds in seconds, as easily as Velcro, and forms a bond strong enough to withstand repeated stretching, professor Shyni Varghese's research team reported recently in the *Proceedings of the National Academy of Sciences*.

Hydrogels are made of linked chains of polymer molecules that form a flexible, gelatin-like material similar to soft tissues. But their ability to mimic living tissue has stopped short of self-healing, limiting their potential applications. Until now, researchers have been unable to develop hydrogels that can sustain repeated damage and rapidly repair themselves. Varghese's team overcame this challenge with the use of "dangling side chain" molecules that extend like fingers on a hand from the primary structure

of the hydrogel network and enable them to grasp one another. "Self-healing is one of the most fundamental properties of living tissues that allows them to sustain repeated damage," says Varghese. The research team wondered whether it could mimic self-healing in synthetic, tissue-like materials such as hydrogels. "The benefits of creating such an aqueous self-healing material would be far-reaching in medicine and engineering," Varghese said.

To design the side chain molecules of the hydrogel that would enable rapid self-healing, Varghese turned to professor Gaurav Arya in the Department of NanoEngineering, who performed computer simulations of the hydrogel network. The simulations revealed that the ability of the hydrogel to self-heal depends critically on the length of the side chain molecules, or fingers. Hydrogels having an optimal length of side chain molecules exhibit the strongest self-healing. If the molecules are too short, they can't reach across two hydrogel surfaces facing each other. If the molecules are too long, they collapse back into the hydrogel through a phenomenon called hydrophobicity. Just as oil can't mix with water, long side chain molecules can't interact with water molecules, which means they can't reach across the hydrogel surface to form bonds.

When two cylindrical gel pieces featuring these optimized fingers were placed together in an acidic solution, they stuck together instantly. Varghese's lab further found that simply adjusting the solution's pH levels caused the gels to bind (low pH) and separate (high pH) very easily. Repeated pH fluctuations did not reduce bond strength.

The hydrogel's strength and flexibility in an acidic environment such as the stomach makes it ideal as an adhesive to heal stomach perforations or for controlled drug delivery to ulcers. Varghese said this new self-healing hydrogel could also be useful in industrial plants. The hydrogel, for example, could be applied like a spray paint to the inside of a hazardous materials container where it would act like a sealant when cracks form in the container. To test this theory, students cut a hole in the bottom of a plastic container, "healed" it by sealing the hole with the hydrogel and demonstrated that the gel prevented leakage.



Bioengineering professor Shyni Varghese at work in her lab.

Repairing Heart Attack Damage

A new injectable hydrogel developed in the laboratory of bioengineering professor Karen Christman could be an effective and safe treatment for tissue damage caused by heart attacks.

The hydrogel would be a welcome development, according to Christman, since there are an estimated 785,000 new heart attack cases in the United States each year, with no established treatment for repairing the resulting damage to cardiac tissue. Christman's research, reported earlier this year in the *Journal of the American College of Cardiology*, shows that the gel can be injected through a catheter, a method that is minimally invasive and does not require surgery or general anesthesia. Christman has co-founded a company, Ventrix, Inc., to bring the gel to clinical trials within the next year.

The hydrogel is made from porcine cardiac connective tissue that is stripped of heart muscle cells through a cleansing process, freeze-dried and milled into powder form, and then liquefied into a fluid that can be easily injected into the heart. Once it hits body temperature, the liquid turns into a semi-solid, porous scaffold that encourages cells to repopulate areas of damaged cardiac tissue and to preserve heart function. The hydrogel may also provide biochemical signals that prevent further deterioration in the surrounding tissues.

"It helps to promote a positive remodeling-type response, not a pro-inflammatory one in the damaged heart," Christman said.



Tissue spins in a beaker at the end of the cleansing process that removes the cells. The process retains the tissue's structural proteins, a key component of the semi-solid, porous hydrogel. The gel forms a scaffold to encourage cells to repopulate areas of the heart damaged by heart attack.

How Do You Stop Multi-Organ Failure in Shock Patients?

Bioengineering research from the Jacobs School is at the center of a 200-patient Phase 2 clinical pilot study now under way. The trial is testing the efficacy and safety of a new use and method of administering an enzyme inhibitor to stop multi-organ failure in shock patients.

This new use of an FDA-approved drug is based on decades of research by bioengineering professor Geert Schmid-Schönbein on the microvascular and cellular reactions that lead to multi-organ failure after a patient has gone into shock, which is the second-leading cause of in-hospital deaths in the United States.



(L-R) Bioengineering professor Geert Schmid-Schönbein, Inflammagen Therapeutics Chief Executive Officer John Rodenrys, Inflammagen Therapeutics President Hank Loy, and Dr. Erik Kistler, assistant clinical professor in the Department of Anesthesiology and Critical Care at the UC San Diego School of Medicine and the VA San Diego Healthcare System and Jacobs School alumnus in bioengineering (M.S. '94, Ph.D. '98).

Schmid-Schönbein and his colleagues discovered that under conditions of shock, the epithelial cell barrier that lines the small intestine becomes permeable causing potent digestive enzymes to be carried into the wall of the intestine, bloodstream and lymphatic system where they digest and destroy healthy tissue, a process he named autodigestion. His method of blocking the enzymes with an enzyme inhibitor was licensed to Inflammagen Therapeutics in 2005. The company has since developed the Inflammagen Shok-Pak, a drug/delivery platform that delivers the drug through a nasogastric tube directly into the stomach and lumen of the intestine.

"We are testing for the first time whether it is possible to help severely ill patients by blocking autodigestion, a condition in which digestive enzymes not only break down food inside the intestine but also the intestine itself," Schmid-Schönbein said. "We have pre-clinical results that this treatment can save lives."

Dr. Erik Kistler, the study's principal investigator and a Jacobs School bioengineering alumnus (M.S. '94, Ph.D. '98), believes the treatment protocol might also improve patients' long-term outcomes and reduce the time patients spend in intensive care.

Inflammagen Shok-Pak has been used successfully outside the United States as a rescue therapy in 15 patients, most of whom were diagnosed with life-threatening conditions. Pre-clinical studies of the technology in two animal species have demonstrated significant increases in long-term survival.

Groundbreaking Tests for 5-Story Building on Shake Table

Structural engineers at the Jacobs School have just completed an unprecedented series of major earthquake simulation tests to gauge the performance of nonstructural components in a building, such as working elevators, piping, air conditioning and fire barriers.

Researchers built a five-story building equipped with all these features, plus a surgery suite, an intensive care unit, computer servers and more. Then they put the structure through a series of high-intensity earthquake simulations on the world's largest outdoor shake table at the Englekirk Structural Engineering Center.

During the first phase of testing, the building was placed on a base isolation system — large cylindrical rubber bearings that isolate structures from most of the lateral motion they would normally experience during a temblor. This was the first time such a system was tested under a full-scale building outfitted with nonstructural components on a shake table in the United States. For the second phase of testing, the building's foundation was anchored directly on the shake table.

With base isolation, critical systems, such as the elevator, stairs, hospital equipment and fire sprinklers, remained operational, even after putting the building through simulated motions from the 6.9-magnitude 1994 Northridge earthquake to the 8.8-magnitude 2010 Chile earthquake.

“It was very much like putting the building on roller skates,” said Tara Hutchinson, the lead researcher on the project and a professor of structural engineering at the Jacobs School. “The base isolation system uncoupled the building from the motions of the ground during the earthquakes we simulated,” said Hutchinson, who is working with a multi-disciplinary team of academics and industry representatives, including structural engineering professors Jose Restrepo and Joel Conte.

With the base fixed onto the shake table, the building suffered extensive damage to its contents and interior, while the structural skeleton remained in good condition following motions the building and its contents were designed to withstand. But under extreme motions, a number of beam reinforcing bars fractured and punching shear mechanisms developed at the interface of column and slab. Hospital beds overturned and stairs suffered repairable failures. During all fixed base tests, equipment powered by electricity remained functional.

The overarching goal of the \$5 million project, supported by a coalition of government agencies, foundations and industry partners, is to understand what can be done to keep high-value buildings, such as hospitals and data centers, operational after going through an earthquake. Researchers also assessed whether the building's fire barriers have been affected by the shakes. Engineers from the Worcester Polytechnic Institute ignited live fires in selected areas of the structure to see how fire suppression systems would function in an earthquake-damaged building — another first.

Engineers monitored the structure's performance with more than 500 high-fidelity sensors and over 70 cameras that recorded the movement of key elements and components inside. Researchers will spend the coming year analyzing data from the project before publishing their complete findings.

“What we are doing is the equivalent of giving a building an EKG to see how it performs after an earthquake and a post-earthquake fire,” said Hutchinson.

The tests made the national evening news on NBC, ABC and CBS, as well as CNN and other major media outlets, including The New York Times, USA Today and BBC News.

Watch and read the media coverage: <http://bit.ly/INwXU7>

Watch a video of the tests: <http://bit.ly/KttS1W>

Find out more about the project: <http://bncs.ucsd.edu/>

Academic Partners

San Diego State University: Professor Ken Walsh;
Worcester Polytechnic Institute: Professor Brian Meacham; and Howard University: Professor Claudia Marin

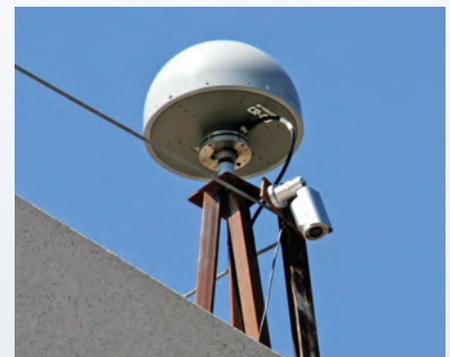
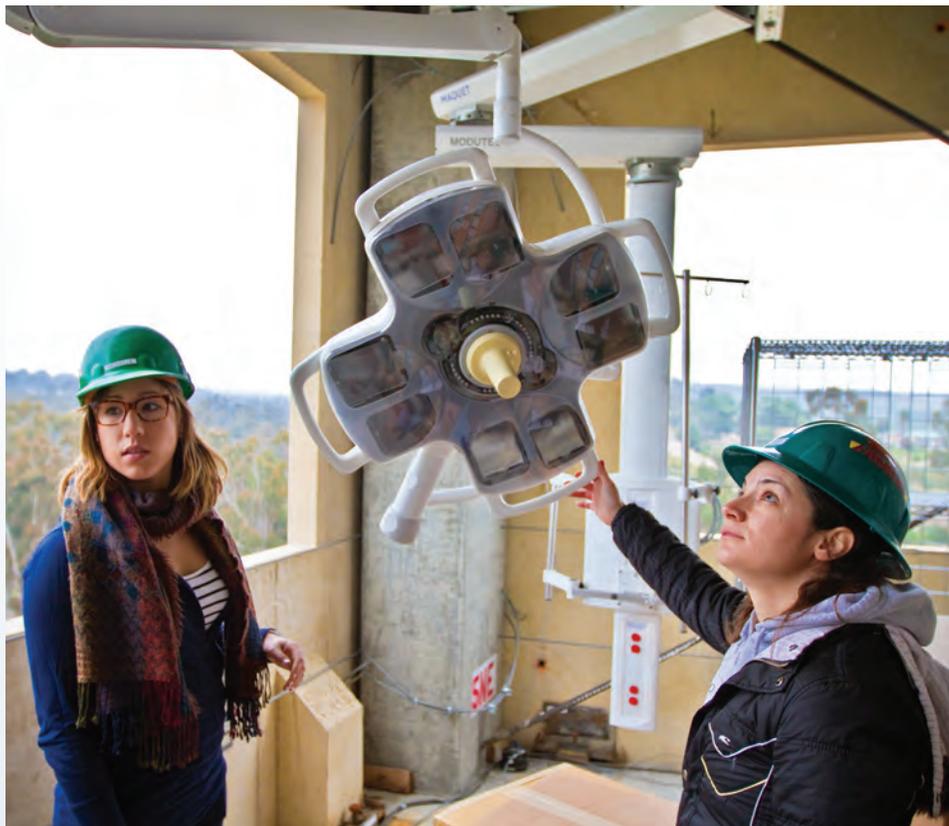
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National Science Foundation, Network for Earthquake Engineering Simulation, California Seismic Safety Commission, Charles Pankow Foundation and Englekirk Advisory Board

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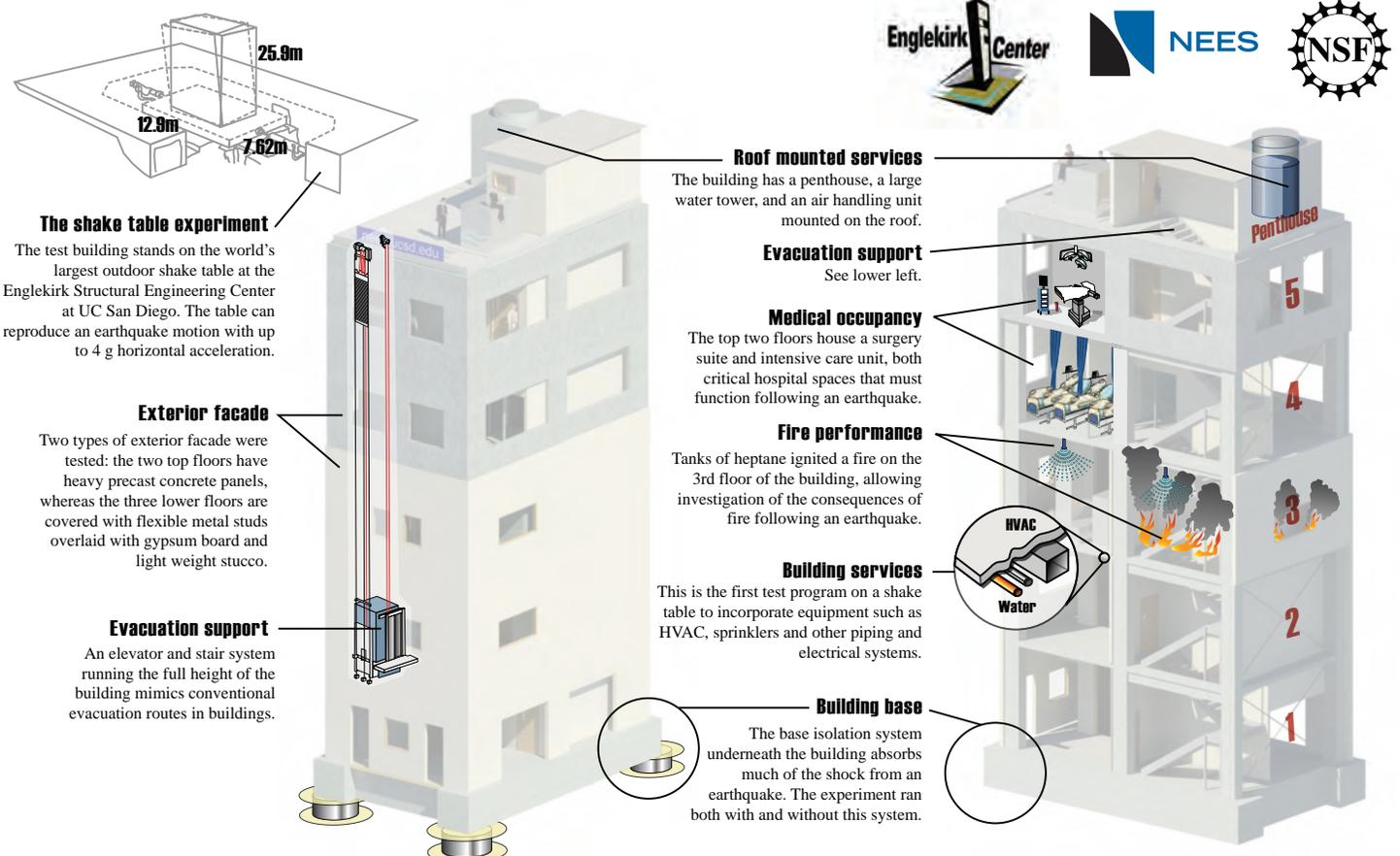
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Structural engineering graduate students Michelle Chen, (left), and Elide Pantoli, inspect one floor set up as an operating room. Pantoli checks the surgery lights. The building's top two floors were set up as a mock hospital.

Top: Water splashes from a water tower on the roof during a test. Bottom: GPS units tracked the building's motions.



A Nanowire Forest for Clean Fuel

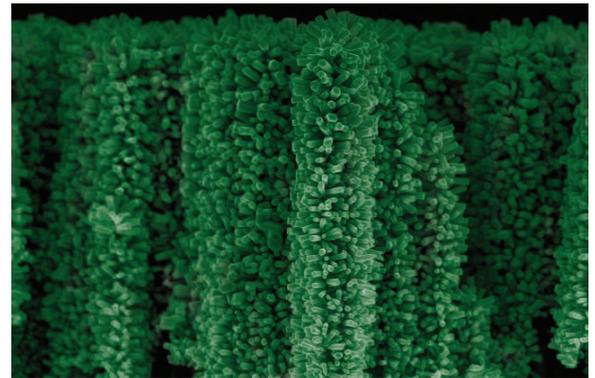
Electrical engineers are growing forests of nanowire trees that capture solar energy and then use that clean energy to generate hydrogen fuel from water without using fossil fuels. The nanowires, which are made from abundant natural materials like silicon and zinc oxide, suggest a cheap way to generate eco-friendly hydrogen fuel at large scale.

“This is a clean way to generate clean fuel,” said electrical engineering professor Deli Wang.

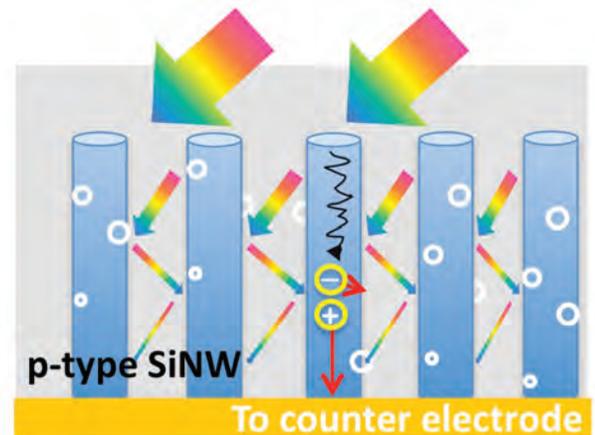
The vertical structure of trees grabs and adsorbs light more efficiently than flat surfaces. Within the vertical nanotree structure, photons bounce between single nanowires, which eventually absorb them. The nanowires’ vertical branches also maximize hydrogen gas output, said Ph.D. candidate Ke Sun. For example, on the flat wide surface of a pot of boiling water, bubbles must become large to come to the surface. In the nanotree structure, nano-scale bubbles of hydrogen gas can be extracted much faster. This “3D branched nanowire array” structure has enhanced the surface area for chemical reactions by 400,000 times.

The array uses a process called photoelectrochemical water-splitting to produce hydrogen gas. Water splitting refers to the process of separating water into oxygen and hydrogen in order to extract hydrogen gas to be used as fuel.

Long-term, the team’s research is focused on a larger energy goal: artificial photosynthesis. In photosynthesis, as plants absorb sunlight they also collect carbon dioxide (CO₂) and water from the atmosphere to create carbohydrates to fuel their own growth. The team wants to mimic this process to also capture CO₂ from the atmosphere, reducing carbon emissions, and convert it into hydrocarbon fuel.



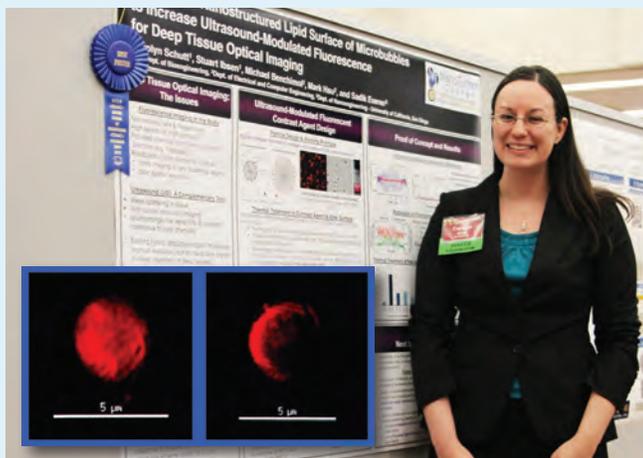
Electron microscope image of a nanowire forest, or “3D branched nanowire array.” Nanoforests suggest a way to capture solar energy and use it to generate clean hydrogen fuel.



The vertical nanotree structure allows photons to bounce between single nanowires, which absorb them.

Blinking Microbubbles Win at Research Expo

What if you could build a bridge between optical imaging and ultrasound imaging? Could you harness the chemical sensitivity of visible light and the tissue penetrating properties of ultrasound? These kinds of questions drive Carolyn Schutt, a graduate student in bioengineering, who is developing a new imaging technique that could lead to highly-sensitive light imaging deeper inside the body, improving the way we diagnose breast cancer. Schutt’s research, which she entered in the nanoengineering category, received the grand prize April 12 at Research Expo, the annual research and networking event of the Jacobs School.



Bioengineering graduate student Carolyn Schutt won the Jacobs School-wide Rudee Outstanding Poster Award for her research into a new imaging technique for breast cancer research.

Schutt’s “blinking” gas-filled microbubble contrast agents would render biological tissue effectively transparent to light and enable highly sensitive light imaging deeper inside the body, improving cancer diagnosis technologies.

Conventional X-ray mammography can only show the density of tissue, indicating the presence of a mass, but cannot determine any of the biochemical differences between a benign mass and a malignant tumor such as hypoxia or increased blood vessel formation.

“There is a very high false positive rate with just X-ray mammography,” said Schutt, who won the Jacobs School-wide Rudee Outstanding Poster Award. “By being able to extract chemical information we hope to avoid unnecessary biopsies that are done on benign lesions.”

Schutt’s work is advised by professor Sadik Esener.

A Smart Wildlife Camera

Great images of animals in the wild don't just happen by chance. They're usually the result of long waits for nature photographers looking for the perfect shot. A team of electrical engineering undergraduates at the Jacobs School is hoping to help them by developing a "camera trap" through Engineers for Exploration, a collaboration between Calit2 at UC San Diego and National Geographic.

Their new, improved device uses low-power piezoelectric vibration sensors placed around the turret holding a camera. The piezoelectric sensors convert ground movement into voltage, so if an animal comes close enough to trip a sensor, the turret automatically swings around to face in that direction.

A processor also begins to run a computer-vision algorithm looking for groups of similarly colored pixels. The camera can lock on to the pixel grouping and begin tracking it. The resulting system has 360-degree coverage, so the digital SLR camera in the turret can track and record an animal walking around it.



Rikey Yeakle and fellow ECE students Perry Naughton, Kyle Johnson and Chris Ward developed a smart camera for animal photography. Here the team tests the camera with a dog in the engineering courtyard.

Arapaima vs. Piranha

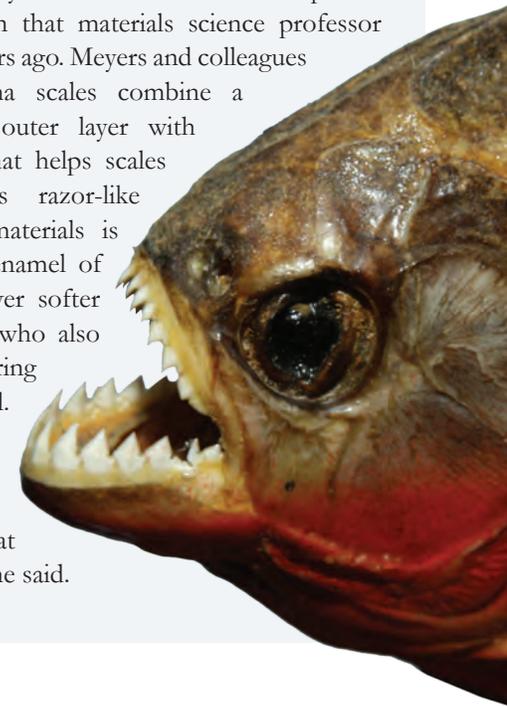


In the dry season in the Amazon basin, big fleshy fish share extremely cramped watery quarters with hungry piranha — and their notorious guillotine-like bite.

How does Brazil's massive Arapaima fish survive?

The secret to Arapaima's success lies in its intricately designed scales (above), which could provide "bioinspiration" for engineers looking to develop flexible ceramics.

The inspiration to study the scales came from an expedition in the Amazon basin that materials science professor Marc Meyers took years ago. Meyers and colleagues found that Arapaima scales combine a heavily mineralized outer layer with an internal design that helps scales resist the piranha's razor-like bite. The mix of materials is similar to the hard enamel of a tooth deposited over softer dentin, said Meyers, who also teaches nanoengineering at the Jacobs School. "We have used our ingenuity to the maximum, but one way to overcome that is to look at nature," he said.



Birds: an Interactive Field Guide

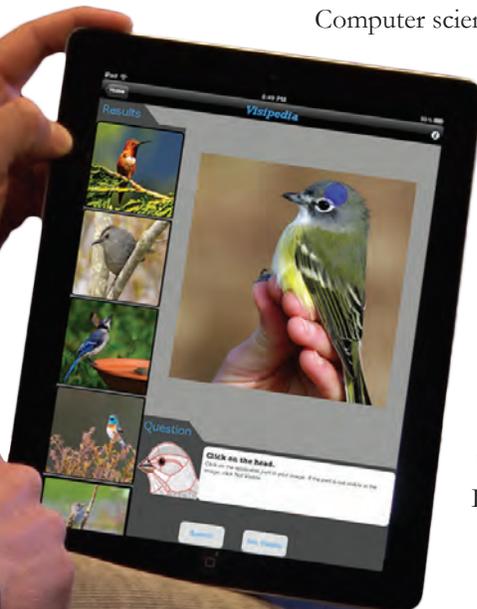
An experimental iPad app identifies most North American birds, with a little help from a human user. The app is essentially an interactive field guide, where computer vision algorithms analyze user-submitted bird photos, ask questions and display images and information about bird species that are likely matches.

Computer science professor Serge Belongie is leading the project, which is part of a larger move to fill a gap in the world of online search. While text-driven search, such as Google and Wikipedia, has been wildly successful, identifying images has so far proven much more difficult.

Jacobs School computer scientists are working with UC Berkeley and Caltech as well as Cornell's Laboratory of Ornithology, which contributed images of more than 500 North American species of birds.

Belongie hopes the app will ignite a movement among other enthusiasts, who will partner with computer scientists to create similar apps for everything from flowers, to butterflies, to lichens and mushrooms.

Learn more at: visipedia.org



Four Engineers Elected to National Academy of Engineering

One of the highest professional honors accorded an engineer is election to the National Academy of Engineering. “I am very pleased that the research contributions of four engineers affiliated with the Jacobs School have been recognized by the academy this year,” said Frieder Seible, Dean of the Jacobs School of Engineering at UC San Diego.



Juan C. Lasheras

Juan C. Lasheras’ contributions to the field of mechanics have led to major advances in the efficiency of jet engine propulsion; 44 patents in medical device technology; and increased understanding of some of the biological processes that contribute to diseases. Lasheras led the

mechanical and aerospace engineering department’s foray into non-traditional medical and biological applications and helped to create the new Master of Advanced Study (MAS) program in Medical Device Engineering. Lasheras is the director of the Center for Medical Devices and Instrumentation at the Institute of Engineering in Medicine at UC San Diego. He is the Stanford S. and Beverly P. Penner Professor of Applied Sciences at the Jacobs School.



Robert Skelton

Robert Skelton is a leading theorist, whose work combines the disciplines of structures and controls. His research has focused on unifying structures and controls through a discipline called tensegrity. The term, derived from tension and integrity, describes

combinations of strings and rods of various materials and sizes, assembled to create deformable bridges, buildings and other alternatives to current structural technologies. Skelton has been involved with Skylab and the Hubble Space Telescope as well as a variety of projects here on Earth, from robots to red blood cells. He is a professor emeritus in the Department of Mechanical and Aerospace Engineering.



Mike Baskes

Mike Baskes uses computational methods to investigate material properties. He has developed models that predict the behavior of helium in metals as well as a model that explains hydrogen isotope recombination. An adjunct professor in the Department of Mechanical

and Aerospace Engineering, Baskes is also a laboratory associate-fellow at Los Alamos National Laboratory. He and researcher Murray Daw developed the embedded atom method, which allows scientists to describe the cohesive energy of solids and liquids. This method has now become the standard used for calculating complex applications in materials science, especially for fission, fusion and nuclear weapons materials. Baskes co-authored more than 190 technical publications that have been cited more than 13,670 times — three have more than 1,000 citations.



Peter C. Farrell

Peter C. Farrell has been elected to the academy for research and development of devices for treatment of sleep-disordered breathing. Farrell is the founder, chairman and CEO of San Diego-based ResMed, a leading developer, manufacturer and distributor of

medical equipment for treating, diagnosing, and managing sleep-disordered breathing and other respiratory disorders. ResMed is dedicated to developing innovative products to improve the lives of those who suffer from these conditions and to increasing awareness among patients and healthcare professionals of the potentially serious health consequences of untreated sleep-disordered breathing. Farrell is a member of the Council of Advisors of the Dean of the Jacobs School.

New Chair in Management, Engineering Leadership

Ingolf Krueger, a professor of computer science and engineering, has been appointed to the new Jacobs Family Chair in Management and Engineering Leadership. This endowed chair builds on a well-developed Jacobs School program to foster students' capacity for leadership and entrepreneurship as well as deep technical knowledge. Krueger has taken on a leadership role in this effort, having served as the founding director of the Gordon Engineering Leadership Center and co-director of the Master of Advanced Study in Architecture-Based Enterprise Systems Engineering (AESE). Krueger said his priorities for the chair include expanding joint curriculum offerings between the Jacobs School and the Rady School of Management, where he has an adjunct appointment. "I am humbled and grateful for this honor," said Krueger. This endowed chair is made possible by a generous gift from Irwin and Joan Jacobs.



"It's about recognizing a pressing problem in society, having the vision and engineering knowledge to solve it, and then leading development of a product that meets the market's needs - to completion." - Ingolf Krueger.

Busy Year Ahead for Diversity-Minded Engineer

Structural engineering faculty member Lelli Van Den Einde is a dedicated advisor and mentor who won an outstanding faculty advisor award from the California Chapter of the American Society of Civil Engineers in 2011. As a woman in structural engineering, Van Den Einde said she has a particular interest in underrepresented students —



Structural engineering professor Lelli Van Den Einde

and based on the acceptance numbers for the 2012-13 academic year, she will be busy. The number of underrepresented graduate students set to attend the Jacobs School this fall has gone up by 50 percent compared to 2011. They now make up 12.4 percent of incoming domestic graduate students, compared to 9.6 percent in fall 2011. Underrepresented students often have a hard time identifying with others on campus, said Van Den Einde, who plans to reach out and let them know she is there to listen. The chair of the faculty board advising the IDEA Student Center, Van Den Einde believes that diversity is important for the student body as a whole. "We need a student population that reflects the population of the world around us," she said.

Frieder Seible Inducted into Chinese Academy of Engineering

On June 11, Jacobs School Dean Frieder Seible was inducted into the Chinese Academy of Engineering, as a foreign member. The honor recognizes his "outstanding achievements in engineering and technological sciences, as well as remarkable contributions to China's engineering and technological developments."

Seible was inducted into the U.S. National Academy of Engineering in 1999, for contributions to research, development, and applications in seismic analysis, and the design, construction, and retrofitting of bridges.

Foreign membership to the Chinese Academy of Engineering recognizes Seible's lifetime of



Dean Frieder Seible at the Self-Anchored Suspension Span (SAS), part of the new East Span of the San Francisco-Oakland Bay Bridge.

achievements as a structural engineer, as well as his efforts to share knowledge and expertise with engineers around the world.

Soon after the 2008 Wenchuan earthquake, for example, Seible gave a series of seminars on earthquake design, the response of bridges to earthquakes, and seismic retrofit technologies to engineers at China Rail, the agency developing China's high speed train infrastructure. Since

then, Seible has also helped make connections between China Rail and California's high-speed rail projects. Seible is a member of the California High-Speed Rail Peer Review Group.

As an advisor to Caltrans, Seible has reviewed and consulted on constructability issues at the manufacturing site in China for the Self-Anchored Suspension Span of the new East Span of the San Francisco-Oakland Bay Bridge.

On June 12, Seible gave a talk to the general assembly of the Chinese Academy of Engineering titled "Global Innovation and Collaboration to Mitigate Natural and Man-made Disasters."

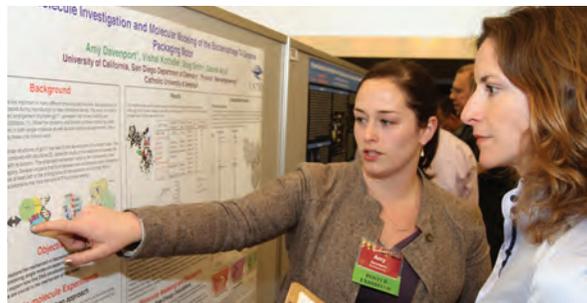


Meet Mix Mentor

More than 50 graduate and undergraduate students met up with 10 Jacobs School alumni on May 21 at a mentoring event here on campus. They talked shop and brainstormed about how to find great internships and land jobs — and how to stand out to your employer once you are hired. The event is part of JUMP, a tiered mentoring program in which Jacobs School undergrads, graduate students and alumni meet regularly in both small and large groups. Conversation threads and questions from JUMP events make their way to the Jacobs School Alumni LinkedIn group by way of the Jacobs School Alumni Council. To serve as a JUMP mentor, contact Tatis Cervantes tcervantes@ucsd.edu or (858) 822-6968

Bay Area Tech Talk

Tuesday, Aug. 14 5:00 – 7:30 p.m. at Facebook
Computer science professor Stefan Savage's talk:
**Buying Drugs for Science:
Understanding the Economics of Cybercrime**
www.jacobsschool.ucsd.edu/events/facebook



Research Expo 2012

A big thanks to Silvia De Dea (right), a staff scientist at Cymer, and the other 100 alumni and Jacobs School corporate partners and friends who judged graduate student posters at Research Expo. Interested in judging posters at Research Expo 2013? Contact Tatis Cervantes tcervantes@ucsd.edu or (858) 822-6968.

Matt Newsome Connects Cubic Transportation to Campus

When Matt Newsome was a mechanical engineering undergraduate, he took a structural engineering course from professor Gil Hegemier. It was 1989. That October, the Loma Prieta earthquake hit, and Hegemier and other faculty members were called to San Francisco to assess the damage. Hegemier returned to campus with vivid illustrations of how structural engineering relates to real life.

Fast-forward two decades, and Newsome, now a vice president and regional director at Cubic Transportation Systems, has forged connections between the real-life challenges related to the next generation of intelligent travel technologies for cities and some of the research strengths of the Jacobs School.

“We have excellent teams that build some of the best system solutions in the world,” he said. “But you can only take R&D so far. What UC San Diego brings is the ability to think way outside the box and way into the future.”

The fast-paced evolution of technology requires that Cubic teams have access to researchers with a wide range of skills, Newsome said. They can work together to evaluate, propose and in some cases develop solutions using these emerging technologies. Working with UC San Diego will provide insights in areas Cubic sees as challenging. It also will help apply theories and methods for technology concepts the company predicts will dominate the future.

In addition to the Cubic and Jacobs School connection, Newsome will serve as president of the Board of Directors of UC San Diego Alumni as of July 1, 2012.

The university taught him a precious lesson, he said: “I learned how to learn here.”

There were more lessons, outside the classroom: “I learned how to grow,” Newsome said. “I learned how to work. I learned how to make friends. I learned true relationships.” During Newsome’s five years on campus, Earnie Mort, then the dean of Revelle College, became a mentor. “He’s just one of the most giving, fantastic men I’ve ever met,” Newsome said. “He’s been a real inspiration for me to come back to the campus and give back.”



Matt Newsome, Vice President and Regional Director at Cubic Transportation Systems

Class Notes



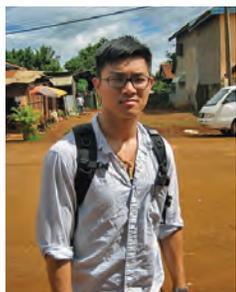
Daren Deffenbaugh
B.S. 1998, M.S. 1999 Bioengineering
Staff Engineer, DePuy Orthopaedics

I just reached a milestone: 10 years with DePuy. DePuy is in the process of launching a new knee platform that I have had a key role in developing. I am now transitioning to a leadership role for development of a line extension to this new knee platform product. In November 2011, my wife and I moved into a home in the historic district of Winona Lake, Indiana.



Joshua Hu
B.S. Aerospace Engineering 2003
General Manager, Thai Grill

I'm now the General Manager of Thai Grill restaurant in Floresville, Texas. We serve authentic Thai/Laos/Chinese/Vietnamese dishes to our customers in South San Antonio.



William San Hin
B.S. Electrical Engineering 2005
Sales Engineering Mgr, LC&D, an Acuity Brands Co.

Since graduating in 2005, I've been busy working for Lighting Control & Design, a leading manufacturer of energy management and lighting control systems for a sustainable world.

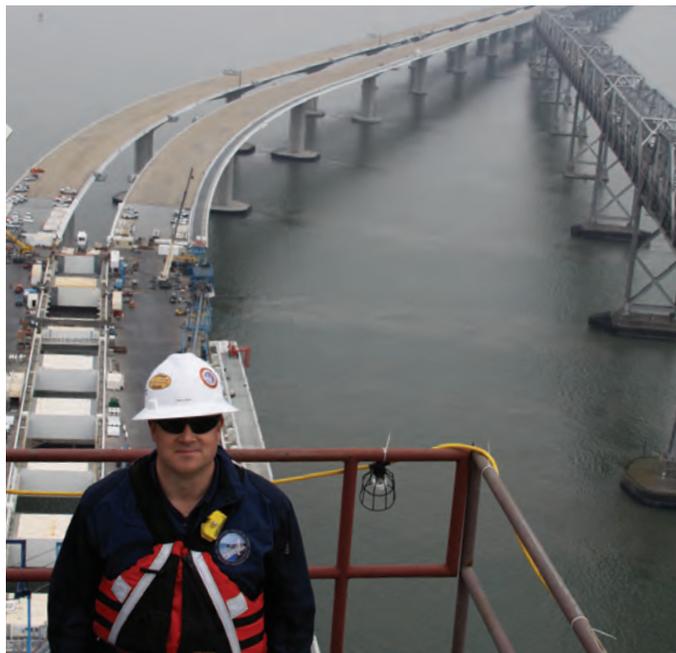
Numerous UCSD buildings and facilities are controlled by our lighting systems. I sure miss America's Finest Campus — will visit soon. Proud to be a Triton!

Michael Meadows
B.S. Computer Engineering 1991
Vice President, Technology Solutions, Coley & Associates

Michael Meadows was honored by the California Psi Chapter of Tau Beta Pi at the University of California, San Diego, which selected Michael as an "Eminent Engineer." This recognition is granted to distinguished engineers 10 years or more after graduation.

Jon Haller
B.S. Structural Engineering 1996; MBA, University of Michigan
Production Lead, Lockheed Martin

I am in Denver working for Lockheed Martin in manufacturing. I'm happily married with two boys who are 7 and 5.



Kevin Smith
B.S. Structural Engineering 1993
Technical Director, American Bridge / Fluor Enterprises, Inc., A Joint Venture

After Labor Day Weekend 2013, you'll be able to test out Kevin Smith's bridge building skills — that's when the Self-Anchored Suspension Span of the new East Span of the San Francisco-Oakland Bay Bridge is scheduled to open. It will replace the existing span which suffered a collapsed upper deck during the 1989 Loma Prieta earthquake. As Technical Director, Smith determines what tools, systems and infrastructure — the "temporary works" — need to be designed and built in order to construct the bridge. The system that hauled 137 pre-fabricated parallel wire strands, each almost one mile long, over the bridge tower is just one example. Read more about Smith's work in a feature in the UCSD Alumni Magazine: <http://bit.ly/LgXXgW>

What's new with you?

Jacobs School Alumni, we want to hear from you! Send us updates on your professional activities and personal achievements. Your class note will be included in our next Pulse newsletter and posted on our alumni website. While supplies last, we'll send you a Jacobs School "Future Alum" T-shirt, available in toddler sizes listed on the website.

Send to soecomm@soe.ucsd.edu or visit:
www.jacobsschool.ucsd.edu/alumni





Structural and Materials Engineering Building Dedication

September 14, 2012 4:30 – 7:30 p.m.

Explore our new spaces for Structural Engineering, NanoEngineering, Medical Devices and Visual Arts. Visit the Cymer Conference Center and more.

Tours, contemporary art and remarks by science fiction author and UC San Diego alumnus David Brin.

More information: www.JacobsSchool.ucsd.edu/SME