

Winter 2009

# Engineering News, Winter 2009

School of Engineering

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# HORIZONS IN ENGINEERING

School of Engineering

WINTER 09

## SANTA CLARA UNIVERSITY

### DEAN'S MESSAGE

A recent editorial in the *San Jose Mercury News* commended Barack Obama on his selection of two Santa Clara University graduates to top-level posts: Arizona Governor Janet Napolitano '79, as Director of Homeland Security, and former California Congressman Leon Panetta '60, as head of the CIA. The article points out the President's turn toward an emphasis on values, stating, "It's not surprising that Obama would entrust national security to products of a Jesuit education..."

It is always nice to see that values are being valued, and reading this editorial caused me to reflect on how we, in SCU's School of Engineering, are contributing to this mindset and to the pool of ethical leaders of tomorrow. At the very core of a Jesuit education is the desire to instill in students a sense of compassion toward those less fortunate, but compassion without action is of limited value. In educating our engineering students, we strive to inspire the head and the heart to guide the hands toward action. When this is achieved, enormous good can be accomplished in the world, and engineers, with their ability to create products, services, and devices that directly improve the lives of many, are in the perfect position to do just that.

President Obama has shown great faith in our two SCU alumni. I have great faith, also, in our corps of engineering students to go out into the world as leaders of competence, conscience, and compassion, ready and able to make a difference.

Godfrey Mungal  
Dean  
School of Engineering

Read more of the dean's reflections on engineering at a Jesuit University:  
[www.scu.edu/ignatiancenter/publications/explore/fall2008/section06.cfm](http://www.scu.edu/ignatiancenter/publications/explore/fall2008/section06.cfm).



Photo: Charles Barry

Back from D.C. and raring to go, Andrew Smith, left, and Dan Ruffoni provide details about their wooden mockup of the steel moment frame to fellow solar decathletes.

### ...3 - 2 - 1 - Build!

In early January more than a dozen SCU and California College of the Arts (CCA) students and faculty advisors headed to Washington, D.C., for a workshop to prepare them for the U.S. Department of Energy's Solar Decathlon. SCU's School of Engineering, third-place finisher in the 2007 event, has teamed up with CCA to participate in the October competition against 19 other college and university teams to design, build, and operate the most attractive and energy-efficient solar-powered house.

Student project manager Allison Kopf related the team's excitement: "With all the hard work we have already put in, and with the competition looming, it was inspiring to stand on the spot where we will display our house and see the Capitol and the Washington Monument. It was very motivating being in D.C. and it was important also from an educational standpoint. We got a lot of good input from people who will actually be judging the competition. They really liked our design and were interested to see how different this entry is from our 2007 house. Plus, they loved the collaboration

between our team of engineers from SCU and architects from CCA; it's sort of an idealization of how things should be in real life."

Dr. Tim Hight, faculty project leader, agrees that the team returned with renewed enthusiasm for the project. "The reality of the scope of the competition and the challenges it brings really set in and there is a heightened level of activity as we prepare to begin construction in mid-March," he said. Students are hard at work finalizing every aspect of the design and continue to research and implement innovative technologies.

"In the next few weeks, we will be busy obtaining permits, working with vendors, and preparing the construction site," said Kopf. "We are so excited. We're ready, too!"

For more information: [www.scu-cca-solar.org](http://www.scu-cca-solar.org) and [www.scu.edu/engineering/solardecathlon.cfm](http://www.scu.edu/engineering/solardecathlon.cfm)  
For sponsorship opportunities, contact **Leman Ethem 408-554-2724**.

## NVIDIA FOUNDER SHARES SECRETS OF SUCCESS

As part of Global Entrepreneurship Week, SCU's Center for Innovation and Entrepreneurship and the School of Engineering recently welcomed NVIDIA cofounder and senior vice president of engineering and operations, Chris Malachowsky (M.S. computer science '86) back to campus to receive the School of Engineering's 2008 Distinguished Alumni Award, and to share his experiences and advice with students, faculty, and fellow alums.

Malachowsky, a recognized authority on I.C. design and methodology, has been instrumental in managing, defining, and driving NVIDIA's core technologies as the company has grown from a startup in 1993 to a global Fortune 1000 company (and the Forbes 2007 Company of the Year) with a worldwide reputation for engineering and product excellence.

Addressing the audience of business and engineering innovators, Malachowsky reported he never "set out to be an entrepreneur, but engineers tend to go in whole hog and they don't accept failure. No, I didn't set out to start a company," he said, "I set out to have a job." And his job, along with his fellow NVIDIA cofounders, evolved into trying to "solve life's most difficult visual computing challenges" by developing graphic processors (aka GPUs) capable of generating stunning 3D graphics that ultimately created the visual computing industry. From the start, he said, they defined themselves as atypical, creating a broader category for their work than had previously existed. "At the time, there was no consumer-oriented 3D graphics market; we had to figure out who our customer was; we had to sell them a product they didn't know how to buy; and then, ultimately, we had to make them successful in order for us to succeed."

His experience led to the following "take-aways" he shared:

### About starting a company

- Who you surround yourself with matters. Look beyond "good times" behavior. How your colleagues respond when confronted by seemingly insurmountable problems or during a crisis could easily make the difference between your business's success or failure.
- Have a vision of where you want to ultimately go, what you want to become or accomplish—be bold and set your sights or goals way out there—and then use it as a guide for assessing your decisions along the way.
- People ultimately invest in people, not simply ideas; they make a value judgment about those they invest in; they're looking for smart people with a track record of finishing what they set out to do.

### About success in business

- Within a company, recognize your competitive weapons; make every department or functional area a weapon. There should not be any group that isn't vital within the organization.
- Who you hire matters; recruit to raise the average; surround yourself with those who are smarter than you.
- Know when to "get off the train;" assess your plan, reality, and assumptions continually to ward off disaster; be objective enough to change course.
- The only shame in failure is not learning from it; don't be over-conservative; manage the risks, but take some; his favorite quote is "experience leads to good decisions, bad decisions lead to experience."

Photo: Adam Hays



Chris Malachowsky (left), co-founder of NVIDIA, and Godfrey Mungal, dean of the School of Engineering.

### About personal success

- Stand for something; know what's important to you and stay true to it.
- Don't underestimate what you don't know.
- Treat everyone respectfully; don't burn bridges.
- Set the example you'd like to see from others; resolve to be an optimist, it's contagious!

Much of NVIDIA's success stems from the ethical leadership of its founders. Echoing the tenets that reside at the heart of Santa Clara's values-based education, Malachowsky sums up his leadership philosophy: "We feel responsible to our families, employees, and shareholders to not be a fly-by-night operation, and instead to build a company that gives us all a sense of pride and delivers lasting value. As it's not our style to let anyone one-up us in the marketplace, it's also not our

style to be victims of our own success within the company. The ingenuity and creativity required to keep our products flying off the shelves does not allow us time to sit back on any accomplishments or to do anything that isn't straightforward and honest."

Spoken like a true Bronco!



## CIVIL ENGINEERING AND LAW SCHOOL TEAM UP FOR NEW COURSE

In the past when civil engineers and attorneys got together, they often faced off as adversaries on opposite sides of a legal issue, but this quarter Gilson Riecken, visiting professor in the School of Law, hopes to change that with his new course, Engineering and the Law. Riecken, who has a varied background as a design professional in both architecture and city planning and as an attorney focusing on design and construction law and loss prevention, sees a great opportunity for solving problems before they become legal issues by bringing engineering and law students together.

“The legal system has a tremendous impact on what engineers do, but they do not always understand it, and attorneys generally do not understand engineers,” said Riecken. In this course, students from civil engineering, engineering management, and law will examine principal aspects of a law school education—risk, contracts, how litigation works—from the perspective of how it relates to design professionals, exposing engineering students to different issues lawyers are involved with and giving law students a sense of how their body of knowledge relates to engineers.

SCU Civil Engineering Chair Steven Chiesa notes, “As the process of project development becomes more integrated through the increased use of Building Information Modeling (BIM) software, our students need to be forward-looking in terms of how this is going to work out technically and legally. This course will help them be aware of possible legal entanglements that result from new integrated design and construction strategies.”

Engineering and the Law, offered at the graduate level, is intended for advanced students with work experience. “This course allows engineering students to focus on some of the more nontechnical issues that are nonetheless part of doing business, and complements our civil engineering offerings while furthering the School of Engineering’s goal to promote collaborative education across disciplines,” said Chiesa.

“Twenty years ago, no one had any idea how the computer would change the design process,” said Riecken; “The world of BIM and how it could contribute to integrated project delivery is in its infancy now and planning for the future is essential. This course is a first step in preparing both engineers and the legal community to open their eyes to their role in shaping this future. My goal is to have each come away with a better understanding of the other and how to best work together.”

*“This course will help [engineering students] be aware of possible legal entanglements that result from new integrated design and construction strategies.”*

*Steven Chiesa, chair of civil engineering*

## GREEN BUILDING FOR GHANA

Three senior civil engineering students experienced a Christmas break unlike any other they had known when they traveled to Africa to help members of Gambigbo, a rural village in Ghana, begin the process of building sustainable housing.

Betsy Leaverton, Jessica Long, and Julianne Padgett took on the task of designing durable and affordable housing as their senior design project. “Villagers currently use a combination of mud and dung and tin or thatched roofs for construction of their homes, which need to be replaced every three to five years,” said Padgett. “Our job was to find an inexpensive alternative that would withstand the heavy rainfall and flooding that causes the mud houses to disintegrate.”

Under the guidance of their civil engineering faculty advisors, Mark Aschheim and Sukhmander Singh, the students worked all summer researching materials and processes, and determined that compressed earth bricks formed by a block press was the best alternative. “In the fall,” said Leaverton, “we tested cement ratios. The current method available in Gambigbo uses 50 percent each of cement and sand, resulting in a prohibitive \$3,000 pricetag per house. We came up with a design that uses soil and just 5 percent cement, keeping the cost way down.” The student-designed blocks also dry faster than conventional bricks, within two days, so building can be done quickly. With the material and process decided, the next step was to design the structure.

“Our design uses an arched door, windows, and roof, which is less expensive because no permanent wood or steel is needed for headers,” said Long.

After months of hard work, it was time to put their design to the test. Their trip was partially funded by a grant from the Webb Family Foundation. Working through the Industrial Research Institute in Accra, the capital of Ghana, they set about finding a village that was willing to try their methods and soon learned that a collaborative attitude and community buy-in are crucial to bringing change. Having never seen such a thing, the villagers were skeptical of the arched window and roof design, so the students enlisted their help and set to work digging a foundation for a three-by-four-meter house prototype, making blocks, and building a gabled wall that proved the strength and integrity of the design. When it was time to leave, the community was convinced. They plan to use the initial structure as a guest house and invited the three students to come back to Gambigbo and stay there.

“We were drawn to this project, not only as engineers, but also because of what we have learned as undergraduates at SCU,” said Leaverton. “It hit us on multiple levels—it presented an interesting engineering challenge that involves social justice and gives us a chance to help others.” Padgett added, “I wanted a senior project that was more than just engineering. Being able to go to Africa and work on a project like this was a really good experience, not just professionally, but personally, too.”

Photo: Betsy Leaverton



Betsy Leaverton and Jessica Long pose with Gambigbo villagers.

## RETINA: A VISION FOR EDUCATION IN OCEAN SCIENCE AND TECHNOLOGY

For the past ten years, Santa Clara University has participated in a world-class technology development program with the National Undersea Research Center in the field of marine science and technology. Christopher Kitts, director of the School of Engineering's Robotics Systems Laboratory who heads SCU's involvement with the program, recently received a one-year subcontract award from the University of Alaska Fairbanks to continue this work as part of a new NASA element of this program known as RETINA: Robotic Exploration Technologies in Astrobiology.

"What is interesting about RETINA," said Kitts, "is that it brings together scientists, students, and faculty from different institutions and from across disciplines to focus on creating novel robotic platforms, integrate advanced

sensing systems, and prototype innovative mission control techniques in order to advance the mission of NASA's Astrobiology Institute in exploring Earth and other worlds." All of this is accomplished under the auspices of a unique educational program in which undergraduate and graduate students work in interdisciplinary design teams to prototype high-risk technologies and systems in low-cost ways, fielding these systems to perform high-quality, peer-reviewed science and technology validation missions. The program has had many successes in fostering such teams and in achieving results with systems that operate on the land, in the sea, in the air, and in space. "Through this collaboration, our engineering students have been motivated to develop highly capable robotic systems that are directly relevant to the needs of the ocean science community," said Kitts.

Through RETINA-sponsored activities, numerous students have been afforded unique opportunities to gain useful

real-world skills. Nearly 100 students (spread over several years), including some in non-engineering majors, have participated in the year-long marine robotics senior design project, and another 200 have participated in the school's unique marine operations class in which students operate an underwater robot in the ocean or Lake Tahoe as part of their final exam. A number of students have completed independent research studies and the scope of their work has resulted in 34 scientific papers or posters. Two student-led project designs are currently being reviewed for patents, and three students have been given special awards by the Marine Technology Society.

With the recent funding, RETINA activities will be expanded to field several highly-capable instruments and robotic systems that will be made available to the astrobiology research and educational communities for conducting field research and outreach. In conducting these efforts, student

Photo: Erin Beck, July 2008



Student-designed autonomous surface craft uses multibeam sonar for bathymetric mapping of Moss Landing, Calif.

involvement will be expanded to include contributions from new university partners. In addition, the program will enhance and increase its K-12 educational and outreach activities.

For more on RETINA: <http://retina.engr.scu.edu>



Photo: Heidi Williams

## GRADUATE OFFICE ANNOUNCES INTERNATIONAL JOINT-DEGREE PROGRAM AND NEW PERSONNEL

The School of Engineering is pleased to announce the addition of two members to the graduate programs staff: Olivia Jenq joins the team as director, bringing to her role ten years' experience in the Silicon Valley technology industry, including co-founding an IT startup, as well as a diverse international business background. Rosie Chow fills the new position of coordinator of student life and operations supporting international graduate engineering students as they adjust to American culture and life at SCU. Fluent in Mandarin Chinese, Chow recently graduated from SCU with a bachelor's degree in marketing.

Chow's position was created in response to a growing desire to facilitate success for graduate engineering students and will be particularly important as the School of Engineering and the Wuhan University of Technology (WUT) in China have launched an international joint-degree

Grad office staff (from left) Stacey Tinker, Olivia Jenq, Rosie Chow, and LeAnn Marchewka

graduate program in electrical engineering, providing the opportunity for Chinese graduate students to complete their first year of study at WUT and the second year at Santa Clara University.

Program participants must meet Santa Clara University's electrical engineering graduate program admission criteria and must have completed their first 22-unit graduate courses at WUT, 18 of which correspond to SCU's technical core in electrical engineering. Participants will complete their remaining 23+ -unit course work at SCU starting in the fall of 2010, and will graduate with a Santa Clara University degree.

Renowned for its engineering studies, WUT has over 37,000 enrolled students, including 3,370 postgraduates, making it the fourth largest university in China.

"We are very excited about the opportunities this collaboration brings," said Alex Zecevic, associate dean for graduate studies, "and about our ability to facilitate our new students' transition to life here in Santa Clara. Olivia and Rosie join outstanding staff members LeAnn Marchewka, assistant director, student services, and Stacey Tinker, assistant director for graduate enrollment management."

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