Spring 2009

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School of Engineering

HORIZONS IN ENGINEERING
School of Engineering
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SANTA CLARA UNIVERSITY

DEAN'S MESSAGE

On the day construction began on our entry in the 2009 Solar Decathlon, Allison Kopf, project leader and sophomore computer engineering student, commented on the challenges the team had faced so far, saying, "We're building confidence every day."

Allison's comment is a testament to the value of project-based learning, a hallmark of an SCU engineering education. The scope of this undertaking—designing and building a fully functional solar-powered home—provides numerous opportunities for students to learn from peers as well as from teachers and industry professionals, and exemplifies the fact that challenges are often best overcome by collaborating with others.

In our partnership with California College of the Arts, students from both schools have gotten a taste of real-world collaboration, experiencing the joys, sorrows, tribulations, and triumphs that arise from such a relationship. Along the way, they have expanded their technical knowledge, improved their interpersonal skills, and have gained a confidence that no classroom experience could provide.

With Silicon Valley a center of energy innovation, it is our job in the School of Engineering to see that our students are ready to step into this arena armed with technical know-how, practical experience, and the confidence that spurs them to action. I want to thank the Solar Decathlon team for their dedication to this project and their determination to actively participate in changing the future of energy use.

Godfrey Mungal
Dean
School of Engineering

Photo: Charles Barry

Godfrey Mungal, Allison Kopf, Mike Splinter, and Fr. Michael Engh visit the Solar Decathlon construction site.

Solar Decathletes Kick Off Construction

As 200 friends of the SCU-CCA Solar Decathlon Team California gathered to celebrate the kick-off of construction, San Jose Mayor Chuck Reed and Applied Materials CEO Mike Splinter shared their enthusiasm for the U.S. Department of Energy competition.

Mayor Reed said the international contest, which brings together 20 universities to design, build, and operate the most energy-efficient, attractive, and comfortable solar-powered house, presents outstanding opportunities for participating students to "get in on the ground floor, doing green things around the world," and effecting change in a dramatic way. He encouraged the students to be an active part of the green vision and to participate in creating the road map for the future of renewable energy. "We need people with the talent and skills to change the world," he said.

Change was on Splinter's mind, as well, as he noted that in today's economy "America needs symbols of hope." The Solar Decathlon, he said, offers hope for the future, for innovation, and for people coming together creating the promise of clean technology. "Infectious optimism drives us forward," he continued. "Energy and the environment are the two great social issues of our time, and the two great engineering issues."

Applied Materials is the presenting sponsor of the 2009 SCU-CCA Solar Decathlon team. Splinter expressed his confidence in the students as they take on this challenge. "The world is ready to change," he said, cautioning them that "this is serious business." During times like these, he said, people are open to change, open to new ideas. As ambassadors for Silicon Valley and all of California, these solar decathletes are in a position to show how technology can be applied in a meaningful way.

The Solar Decathlon will be held in Washington, D.C., Oct. 9-18. Our team is actively soliciting funding. For sponsorship opportunities, contact Leman Ethem, **408-554-2724**. For more information: **www.scu-cca-solar.org** and **www.scu.edu/engineering/solardecathlon.cfm**

SENIOR DESIGN PROJECT BRINGS UNDERGRADS AND ALUMS TOGETHER

Last fall, when senior mechanical engineering students Riley Coon, Bobby Lorenzen, Tyler Petersen, and Kyle Pistor were seeking a project they would enjoy working on together over the course of the year, they knew they wanted to work on something that would be useful and that would challenge them. Their advisor, Chair of Mechanical Engineering Tim Hight, presented a number of possibilities, but one caught their attention right away.

They chose to design a solar cleaner—a device that, when installed on solar arrays, can be operated remotely to keep panels clean, boosting efficiency by as much as 10 percent in dusty regions. The problem of keeping panels free of dust, at a low cost, was brought to Dr. Hight by Valence Energy, a company founded by a group of engineering alumni who had worked together on the 2007 SCU Solar Decathlon team before graduating in 2008.

Valence Energy recently embarked on a project in India, designing the solar systems, monitoring, and power management for a 330-house neighborhood. "The challenges you encounter installing a system in India are different from those in the U.S.," said James Bickford (BSME '08), cofounder and group leader of business development for Valence. "Dust is a big issue, and so is cost."

"Our biggest challenge," said Kyle, "was coming up with a design that was cost effective. It's easy to solve a problem with money, but our solution had to be inexpensive enough that the cost to install, operate, and maintain it is more than made up in the energy savings it produces."

"It took a while to choose a design," said Riley. "We had about 20 different working ideas, and we learned a lot while going through the process of design and implementation." Though they met with Dr. Hight regularly over the fall and winter quarters, they enjoyed the independence this project afforded for trial and error. "We appreciate the freedom Dr. Hight has given to us to make this project our own. Mostly, he would provide a sanity check for us, posing serious questions to get us to think things through," said Tyler.

The result is a cleaning mechanism made from readily available materials that is durable and easy to maintain. "It will be good for 25 years with minor maintenance—the same as the panels themselves," said Bobby.

Tyler Petersen, Bobby Lorenzen, Riley Coon, and Kyle Pistor with their Autonomous Solar Cleaner

As the quarter winds down, the team will test their system with different amounts of dust and will complete a cost analysis. "If it's not saving money, it's not doing its job; we'll know we were successful if we pass the cost analysis," they said.

For Valence Energy, success comes from building a synergistic relationship with the university. "We want to continue to challenge students with ideas for their senior design projects," said Bickford. "We want to promote entrepreneurship and engineers' understanding of business, and want to continue to recruit the best graduates out of SCU engineering for the next 15 years."

More on the Senior Design Conference: **www.scu.edu/engineering/capstone_projects.cfm**

Valence Energy: **www.valenceenergy.com**

Photo: Charles Barry

SECRET INGREDIENT SPICES UP SOLAR DECATHLON TEAM

Kentucky Fried Chicken has its 11 secret herbs and spices. The Big Mac has its secret sauce. But what's the secret ingredient that adds zest, flavor, and spice to the Solar Decathlon team? Visit our website to find out: **www.scu.edu/engineering/horizons/2009spring/secret.cfm**

LESSONS FROM THE SILICON VALLEY TRENCHES

Maynard Webb, Chairman and CEO of LiveOps and former COO of eBay, shared his 10 Guiding Principles for Success with SCU alums during our Engineers Week celebrations. See them on our website: **www.scu.edu/engineering/horizons/2009spring/webb.cfm**

BMW CONTEST DRIVES CREATIVITY

Six multidisciplinary teams of SCU students recently participated in a whirlwind competition that put their innovation and entrepreneurship skills to the test: They were given only 24 hours to conceive and pitch a new product concept for BMW. At stake were bragging rights and a $500 prize.

"The event was a focused, industry-inspired challenge," said Christopher Kitts, director of the School of Engineering's Robotics Systems Laboratory. "It required students to draw upon their engineering knowledge in order to develop a product concept involving the BMW Mini vehicle (and real-time data available from the car), a smartphone (for personal communications), and Internet connectivity (adding a networked capability). In doing so, they had to think creatively, focus on bringing value to a specific type of customer, and consider business issues."

Photo: Brian Gamp

Team Crash Test Dummies: Todd Bruschwein, Nick Greos, Clare Wylie, and Kadee Mardula.

Just 22 hours after the contest rules were presented, teams pitched their ideas to a panel of judges consisting of BMW engineers, entrepreneurs, and venture capitalists. When all was said and done, Crash Test Dummies walked away with the top honors. The team, composed of four sophomores—two mechanical engineering majors, a biology major/bioengineering minor, and a combined sciences major/psychology minor—proposed a software program, EcoDrive, which would encourage green, efficient driving through fun incentives. "We were really impressed with the creativity of all the teams and concepts," said Jeff Zabel (BSME '01), senior engineer at the BMW Group Technology Office USA. "This project helped us quickly realize the potential of iPhone applications developed specifically for in-vehicle use and it was great to work with all the students, faculty, and staff at SCU again."

The contest was made possible through the School of Engineering's partnerships with BMW and the Kern Entrepreneurship Education Network, which awarded a $50,000 grant to expand upon the school's entrepreneurship and innovation education for undergraduate students. "We cannot wait to see where our application goes," said Kadee Mardula of the Crash Test Dummies. "Even if it doesn't take off, it was an amazing experience to work on a fun project outside of class and see the business side of design." Kitts is enthusiastic about the competition, as well. "The BMW Product Pitch Contest was a huge success," he said. "We plan to conduct several more events like this over the next year as part of our KEEN program efforts."

For more on the contest, including photos: **http://innovate.engr.scu.edu/**

"We were really impressed with the creativity of all the teams and concepts. This project helped us quickly realize the potential of iPhone applications developed specifically for in-vehicle use…"

Jeff Zabel (BSME '01), senior engineer at the BMW Group Technology Office USA

SENIORS BUILD SUSTAINABLE SOLAR WATER PUMP FOR LOCAL SCIENCE SCHOOL

Photo: Patti Rintland

Solar energy powers the pumping of harvested storm-drain water to irrigate a student-tended garden at Walden West.

Electrical engineering seniors Maurvi Badshah, Colleen Kilroy, and Brahmani Nandamuri got more than they bargained for when they signed up to build a sustainable, solar-powered water pump for garden irrigation at Walden West, a local outdoor science school for fifth and sixth graders. "Though we are all electrical engineering majors, this was really an interdisciplinary project that also used mechanical and civil engineering concepts," said Maurvi. The trio also worked with students from SCU's education department to refine a lesson plan for Walden West. "That was a very resourceful collaboration and very helpful to us," said Colleen.

After shadowing classes at the science school to learn about the educational environment, the three set to work. "Walden West is all about conserving the environment," said Brahmani, so every aspect of the system needed to be as sustainable as possible. The result is a design that uses six reclaimed thin-film solar panels purchased at a bargain price on Craigslist to power a pump that sends harvested storm-drain rainwater through high-density polyethylene pipes (that are manufactured in an earth-friendly process) to the vegetable gardens tended by the children.

"So much of this experience was new to us: Wiring and installation are not things we covered in class," Maurvi said. Brahmani added, "Though the process seemed very straightforward to us at first, divvying up the tasks, we found that when you come back together to build a cohesive system, it's a big challenge. We learned to deal with that situation."

The engineering community-based project was launched and implemented with the support of a grant from S.D. Bechtel, Jr., Foundation, awarded to Associate Professor of Electrical Engineering Shoba Krishnan to promote science, technology, engineering, and mathematics (STEM) engagement and interest among participating middle-school youth.

With the irrigation project completed and graduation from college on the horizon, the three are looking to the future. "I loved watching the system being built and applied," said Maurvi, who plans to work in engineering for a few years before considering graduate school. Brahmani is focused on getting her MBA after she gathers some field experience. Colleen, who was encouraged by her high school math teacher to pursue engineering, says, "I really sunk my teeth into the education component of this project. It was fun figuring out how to present engineering concepts to fifth and sixth graders. I'm considering pursuing a teaching credential."

Wherever their education takes them, one thing is certain—their work at Walden West will help nurture a whole new crop of engineers.

More on Walden West:
www.sccoe.k12.ca.us/waldenwest/schoolprograms/outdoor.asp

RING KNOCKERS WORK TO OPEN DOORS

SCU Ring Knockers was created to foster innovation, collaboration, and entrepreneurship among engineering students, alumni, and fellow Broncos from other disciplines. At its inaugural meeting, more than 80 graduate students and alumni came together to start building a network. Board member Edmund Cheng (B.S. '01, M.S. '08) said Ring Knockers will provide a number of opportunities. "We wanted to find a way to help part-time grad students connect with other motivated individuals who are interested in starting a company, or working on a project together. In class, you meet maybe a dozen people; with a group such as Ring Knockers, we can help expand that network." Advice on product development, presentations on technology and business trends by industry experts, and preparation for pitching ideas to venture capitalists are other benefits provided by the group.

Ray Kehoe, fellow board member and adjunct professor in computer engineering, sees tremendous potential for promoting entrepreneurship through Ring Knockers: "We have so much talent within our students and alumni. Here, you can present your idea before a diverse team with experience in management, entrepreneurship, and engineering who can help you flesh out your idea or put you together with others who can work with you."

Another focus of the group is career networking. As noted on the Ring Knockers' website, building a community of peers who will help provide support when one is seeking that first job after graduation, or facing a layoff, or looking to advance a stalled career is crucial in times of economic uncertainty: "An SCU engineering degree is a common bond and shared experience for thousands of alumni…Ring Knockers…can leverage the power of the SCU network to apply for, recruit, and hire fellow qualified SCU Ring Knockers for their companies."

"We want to set an example by helping others," said Cheng. "We want to see some start-ups come out of this group, we want to get and keep SCU alums employed, and we want to build value into a Santa Clara engineering degree. Help for all of that is here in this group."

Still puzzled about the name of the group? Cheng explains, "If you have the SCU ring, and you knock, we will help."

Read more about Ring Knockers: **www.scu.edu/engineering/alumni.cfm**

Grad students and alums network at Ring Knockers' first meeting.

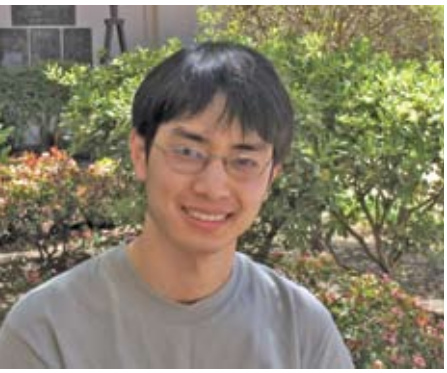

Photo: Heidi Williams

Raymond Wu, BSEE '09

ENGINEERING SENIOR WINS PIANO COMPETITION

Raymond Wu has had a busy spring quarter. While preparing for the Senior Design Conference, the electrical engineering major took time out to compete in the Music Teachers' Association of California 2009 Solo Competition Northern Regional Auditions, taking first place with his performance of the Chopin Andante Spianato and Grande Polonaise Brilliante. Raymond, a music minor, competed with ten other pianists, including majors from Stanford University and the San Francisco Conservatory. Said Hans Boepple, SCU music professor, "Raymond has worked as hard and consistently as most music majors during his four years at Santa Clara, and it has been my privilege to be his piano teacher during this time. He is such a good pianist that, if he chose to, he would be accepted to just about any graduate music program in the country."

But Raymond has other plans for the time being; he is enrolled in the five-year dual-degree program and will complete his master's degree in electrical engineering next year. "I really love both fields," he said, "and I have a hard time choosing one over the other, but I think I will definitely be playing piano as a hobby even while completing my master's degree. What I love about playing the piano is that it relieves my stress. It's very useful to me; it helps me find the strength to continue my engineering work."

It is no wonder Raymond needs a diversion from his engineering work every now and again. He and fellow senior Cole Li have been research assistants in the Center for Nanostructures for the past year, studying contact resistance of carbon nanofibers and making a test structure to determine their properties. "Dr. Yang (CNS director) has allowed us to use the Center to continue our research for our senior design project," he said. The investment has paid off as the pair's research led to their presentation of an oral paper at the Materials Research Society meeting in San Francisco in April. Cary Yang, who also chairs the electrical engineering department, notes, "At this international conference, it is highly unusual for undergrads to present research papers orally. Even doctoral students generally present their work in poster form." Professor Shoba Krishnan, the pair's advisor, agrees: "This achievement is almost unheard of and represents an incredible amount of work."

Following commencement, Raymond will face off against the winner of the Southern California piano competition in July. He looks forward to the challenge, but notes, "It will definitely be intense!"

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