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School of Engineering

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engineering news

School of Engineering

WINTER 10

SANTA CLARA UNIVERSITY

DEAN'S MESSAGE

I recently heard a description of the "T-model" of engineering education. This expression captures succinctly the type of education we provide at SCU—a deep technical core (the vertical stem), paired with a broad set of soft skills that are essential for success (the horizontal arm of the "T").

In today's global marketplace, the T-model will define future successful engineers who must be innovative, ethical, humanistic, and able to communicate clearly in a multicultural environment while effectively managing complex projects staffed with interdisciplinary teams located around the world. Of course, this is what we strive for at SCU—to impart to our students the knowledge, skills, vision, and heart necessary to take on the challenges of the 21st century.

Certainly, some of the greatest challenges facing us today involve the generation and improvement of renewable energy and sustainable engineering practices. As 3rd Place winners in the 2007 and 2009 U.S. Department of Energy's Solar Decathlon international competitions, SCU is a recognized leader in solar and sustainable studies. The passion that our students, faculty, and industry collaborators bring to this field have brought us to the cusp of a new age in engineering at SCU, and we are excited by the promise that lies ahead.

In this edition of *Engineering News*, we report on our students' international travels, faculty input on California's climate strategies, research in green computing, and our expanding program in renewable energy studies here at SCU. Each story presents a tangible outcome that aligns perfectly with the T-model of engineering education.

Godfrey Mungal
Dean
School of Engineering



Laura Skinner '10 carries materials to sustainable building project in Northern Ghana.

STUDENTS SPEND CHRISTMAS IN GHANA

It was a Christmas break like no other for four SCU civil engineering seniors as they spent a month in northern Ghana helping villagers construct a library and an onion storage facility using sustainable building materials and an innovative design. Spencer Ambauen, Erica Fieger, Brienna Rust, and Laura Skinner teamed up last June to begin work on their year-long senior design project, carrying on the effort begun the year before by a previous group of seniors with the support of Village Projects International.

In the summer and fall quarter, they worked on their durable, yet economical, design for the 800-square-foot buildings, which use no timber or metal, studying the benefits of orienting bricks in different ways and investigating how to build by hand with no electricity. They also tested reducing the amount of cement used to make the compressed earth and concrete blocks that are more sustainable and less expensive than the region's traditionally used bricks. "We learned a lot about masonry and design," said Fieger. Along the way, they also learned about finance and grant writing as they applied for and were awarded funding from a number of different sources: a Hackworth Grant from the Markkula Center for Applied Ethics; an SCU Undergraduate Travel Award; and grants from the SCU Center for Science, Technology and Society and The Webb Family Foundation.

Once in Ghana, the four toiled from 8 a.m. to sunset every day, except Christmas and New Year's Day, training masons in Gambibgo and Zebilla to implement their design. "The goal was to get the projects to the point where they could be finished without us," said Rust. "And by the time we left, the masons knew how to do every aspect on their own—the foundation, bearing walls, vault, and windows."

The new style of sustainable construction is proving to be quite a draw in Ghana as people have traveled halfway across the country to see the building that was constructed last year, but some wariness exists. "It's a difficult concept and looks different from what they are used to," said Skinner. "One person said, 'maybe you should put a zinc roof on it to make it look stable.'"

The four agree it will take time for this style of building to become widely accepted, but they are hopeful that another group of students will carry their work forward next year. "Making an impact by applying what we have learned at Santa Clara was important to us in choosing our senior design project," said Rust. Fieger agrees. "Going beyond 'senior design' to see our design realized was an amazing experience."

MAURER INVITED TO CALIFORNIA'S CLIMATE ADAPTATION STRATEGY ROLLOUT

Ed Maurer, associate professor of civil engineering, was an invited participant at Gov. Schwarzenegger's rollout of California's Climate Adaptation Strategy (CAS) final report, a first-of-its-kind comprehensive, multi-sector analysis that will enhance the state's management of climate impacts from sea-level rise, increased temperatures, shifting precipitation, and extreme natural events.

According to the CAS Executive Summary, the report "summarizes the best known science on climate change impacts in the state to assess vulnerability and outlines possible solutions that can be implemented within and across state agencies to promote resiliency." Data submitted by Maurer was used as a foundation for some of the analysis and displays produced in the CAS.

"Climate change is already happening and has been detected in ecosystems, fire regimes, and snowmelt," said

Maurer, whose research focuses on climate change impacts on water resources and how to deal with uncertainty in projecting potential impact. "The projections are pretty dire for many parts of California. The CAS maps out a comprehensive strategy for agencies to analyze what is at risk and how they can manage their resources in the face of unavoidable climate change."

As part of the rollout in December, Google unveiled CalAdapt, a tool for resource managers to use to determine what changes might be in store for their own particular regions. "This is a tremendous tool for planning and decision making," said Maurer. "It brings the information down to scale where planners need to make decisions." Maurer plans to use the tool in his upper-level course, Geographical Information Systems, having students perform spatial data analysis in mapping as it relates to civil design.

Photo: Justin Short, Office of the Governor



Prof. Ed Maurer (8th from right) with Gov. Schwarzenegger and other invited guests.

Maurer, who also served as a member of the Climate Change Technical Advisory Group of the California Department of Water Resources, "felt fortunate to be there at the CAS rollout to see the commitment of the state, the educational infrastructure, and the corporations

and nonprofit organizations that were all there—all recognizing that this is a serious issue and taking concrete steps to try to address it."

Learn more: www.climatechange.ca.gov/adaptation

SCU ALUM PROMOTES HEALTHY LIVING THROUGH TECHNOLOGY IN BOTSWANA

Photo: Charles Barry



Yasemin Kimyacioglu '08.

Following a year spent playing professional basketball in Turkey after graduating with her bachelor's degree in mechanical engineering in 2008, Yasemin Kimyacioglu is living and working in Botswana, promoting healthy living through technology. Partnering with the Botswana Ministry

of Health, Kimyacioglu and three friends from Princeton, University of North Carolina, and Indiana University started the Botswana Association for Positive Living, a nonprofit organization. "We're supporting youth with HIV/AIDS," she said. "There is a big problem with drug regimen adherence here. The medication needs to be taken consistently within a ten-minute window or the body builds resistance. It is especially hard for young people to stay vigilant about taking their medication." So, the team set about finding a way to help, starting a pilot study with 500 patients, with hopes of scaling up.

"Botswana has high cell phone density, so we help clinics communicate with patients, sending reminders about appointments or to take their meds," she said. The group also helps the clinic system track patients.

"This has been a really cool learning experience," said Kimyacioglu, of the study that ends in May. "It hasn't been all smooth sailing; we didn't get funded at first, but we believed in our project and stuck with it and eventually got funding from Project Concern International." The team hopes to do other tech-based projects with orphans and vulnerable children. "We want to be the 'go-to' organization to help. This is a second-world country; the infrastructure is here and there is lots of potential for help through technology," she said.

Selling ideas and working with different types of people comes easily to Kimyacioglu. "I got comfortable with this working on projects at SCU for senior design, Engineers Without Borders, Solar Decathlon, and from playing on the basketball team. I've learned to be patient and persistent,

as well. Here in Botswana, you have to come to terms with a slower pace and different standards, but you just have to believe you'll get what you need to get the job done." In the next year or two, Kimyacioglu plans to apply to graduate school with the aim of studying international development and globalization. "I just like people and in general I see the best in them and care for their well-being," she said. "People deserve a certain standard of living: water, food, health care, education. If I can impact the world to improve that standard, I would be very happy and fulfilled."

More here: <http://thebotswanaproject.blogspot.com>

GRAD SCHOOL INTRODUCES RENEWABLE ENERGY CERTIFICATE

Responding to the tremendous demand for energy professionals nationwide and particularly in Silicon Valley, the School of Engineering is now offering a graduate Certificate in Renewable Energy. The fastest growing sector in California, this field of study brings together principles and practices from engineering, environmental sciences, and economics, and provides diverse career opportunities.

"We are excited about this new Certificate," said Samiha Mourad, professor of electrical engineering. "Our School has a long history of involvement in sustainable energy studies. Nearly fifty years ago, we put solar panels on a Santa Clara city building, in the 60s we began researching electric power, and in the 70s faculty and students broke new ground investigating the use of methanol as a fuel supplement for automobiles. Most recently, we took third place twice in the prestigious U.S. Department of Energy Solar Decathlon, competing against an international field of university heavyweights. This is something we do very well. Our rigorous curriculum combined with an emphasis on social

and ethical responsibility produces engineers who are not only proficient in engineering, but also equipped with an understanding of, and sensitivity to, the impact of their practice on society and the ethical issues related to their profession.

Mourad envisions the Certificate filling a need for area professionals who want to bolster their knowledge and expertise in energy-related areas. "With our Jesuit roots and our history of engagement in the field of renewable energy, we are in a unique position to be of service to our students, our valley, and our world," said Mourad. "This is just the start of great things to come in this arena; each quarter we are adding new curriculum at the undergraduate and graduate levels in response to increasing demand from our students, and we look forward to introducing a Master of Science in Energy soon. Our goal is to become *the* institution in Silicon Valley for sustainable energy studies."

Learn more:
www.scu.edu/engineering/graduate

SCU ESTABLISHES MONTGOMERY MEDAL FOR DISTINGUISHED INNOVATION IN AERONAUTICS

Few people know that John Montgomery (1858–1911), alumnus and professor of physics at Santa Clara, holds the distinction of being the first individual in America to pilot a glider under human control—20 years before the historic flights of the Wright brothers. To recognize this seminal accomplishment, the School of Engineering is establishing the John Joseph Montgomery Gold Medal Award for Distinguished Innovation in Aeronautics.

Read more here: www.scu.edu/engineering/montgomery.cfm



TOWARD GREENER COMPUTING

A new course will be offered in the spring quarter—Green Computing, or maybe Energy Aware Computing. "This field is still so new," jokes Silvia Figueira, associate professor of computer engineering, "I'm not even sure what to call it yet." But that does not stop her from setting her graduate students to work measuring and

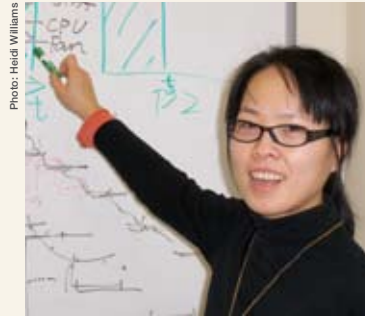


Photo: Heidi Williams

Ginger Tseng researches the energy used in computing.

modeling energy use and efficiency of computer systems. Since last summer, a small group of student researchers have been studying how computers use energy. "There is a lot of talk now regarding how we can use the computer in a more energy efficient way," Figueira said. "We don't know where this research will take us, but

there is a lot to learn and we are exploring with the goal of finding new techniques for better computing."

Assisting with this project is Ph.D. student Ginger Tseng. "Ginger is bold when it comes to hardware," said Figueira. "She just gets right in there and opens things up." Tseng agreed, "I have opened my PCs since I was in high school—taking out CPUs, installing memory. It makes me very excited when I can play with these components."

Right now, Tseng is playing with the motherboard, power supply, and different spinning devices for the disk drives to see how much energy they use. "Once we determine the 'overhead' for a specific system—how much power it takes to run the CPU, the fan, and the disk drives—we can move on to studying signal integrity problems and we can find out how to fine-tune programming for optimal efficiency," she said.

Figueira and Tseng are writing a paper on power usage of software, which they plan to submit to IEEE's first conference on green computing. "In the new class, we will be exploring different places where we can do better," said Figueira.

CLEANTECH PROPONENT ADDRESSES RING KNOCKERS

Marc van den Berg BSEE '83, managing director of Vantage Point Venture Partners, a \$5 billion multidisciplinary venture capital firm with offices in Silicon Valley, London, Montreal, and Beijing, addressed an enthusiastic crowd of SCU students and alumni at our quarterly Ring Knockers meeting.

Read all about it here: www.scu.edu/engineering/enews/2010winter/rk.cfm



Ring Knockers is the SCU engineering alumni network.

ENGINEERING LOSES TWO PIONEERS

Engineering lost two pioneers last year: Richard (Dick) Pefley, a member of our School of Engineering faculty for 35 years and a visionary in the research of alcohol-based fuels, and Frank S. Greene Jr., Ph.D. '70, a leader in Silicon Valley technology. Though no longer with us, their impact will be felt for generations to come.

PROFESSOR RICHARD (DICK) PEFLEY

Dick Pefley joined the faculty of the School of Engineering in 1951 as chair of the mechanical engineering department and immediately became a favorite among students and colleagues, alike. His keen interest in solar energy, artificial lung development, heat transfer, and gas dynamics of the Polaris missile led to numerous scholarly publications, but it was his exploration of alternative fuels in the early 1970s that made him a leading authority in the field, both in the United States and around the world.

Pefley was passionate about finding alternatives for reducing dependence on oil imports, and was a proponent of alcohol-based fuel “not just because it is clean burning, but because it can be produced by every country, even underdeveloped countries, since it can be developed from so many sources” such as sugar cane, natural gas, and coal, he said.

From 1969 to 1980, Pefley received millions of dollars in funding from the U.S. Post Office and the California Energy Commission for alcohol car test programs, converting fleets of vehicles to use alcohol fuels. In 1980 he founded the Methanol Research Center where he led and inspired a loyal following of “alcoholics” who were as committed to alternative fuels as he, even as funding dissipated in the wake of falling oil prices. Pefley’s words, spoken in 1982, ring prophetic today: “We are making a terrible mistake by directing so many dollars into destructive weaponry when they could be going into constructive weaponry—like energy.”

Over the years, Pefley was named ASME Fellow, testified before Congressional subcommittees, and was one of three recipients of the first SCU President’s Special Recognition Award, recognizing superior teaching, publication, and special service to the University and the community. Upon his retirement from SCU, one of his students, David Oliver, BSME '61, wrote: He was a man of “brilliance and exciting energy. [He] blessed a generation of engineers in a time of both exhilarating and desperate technical advances. [He was] a technical man *par excellence*. But the technical did not detract or blind him to the wider issues of moral seriousness.”

Paul S. Russell, BSME '78, who studied under Pefley at SCU and worked with him later at Pefley’s company, Alcohol Energy Systems, remembers his friend this way: “Professor Pefley was an outstanding academic, a visionary, a pioneering researcher, and a philosopher. He could engineer superbly, but in the end his greatest gift to future generations



Richard (Dick) Pefley

was not the courses he taught, the discoveries he made, or the systems he engineered, but his moral compass. Its cardinal points were knowledge, modesty, justice, and hard work. He was an example to all of us.”

FRANK S. GREENE



Frank S. Greene

Frank S. Greene, Ph.D. electrical engineering '70, passed away unexpectedly last December. He was 71.

Considered one of the pioneers of semiconductor technology, Greene also broke new ground for African-American engineers as he helped break the color barrier in Silicon Valley in the 1960s. While working at

Fairchild Semiconductor’s Research and Development Labs, he developed and held the patent for the integrated circuit that made Fairchild a leader in the semiconductor industry.

Greene went on to create two software firms before founding NewVista Capital in 1986, through which he launched numerous start-up companies, with a particular focus on women and minority entrepreneurs.

Last year, Greene was featured in an exhibit at Palo Alto City Hall as one of the 50 most important African-Americans in technology. He told the *Palo Alto Times*, “Success in life is not about ‘me,’ but about what you can do to help others.” He put this philosophy into practice over the course of his life, launching the GO-Positive Foundation and his VRE (Vision, Relationships and Execution) Leadership Model, through which he mentored and served as an

inspiration to high school students and young business professionals. He also served as a Trustee and adjunct lecturer at SCU. For his many contributions to engineering and society, Greene was awarded the School of Engineering’s highest honor, the Distinguished Engineering Alumnus Award, and was inducted into the Silicon Valley Engineering Hall of Fame by the Silicon Valley Engineering Council in 1991.

Dedicated to fostering excellence through leadership training and education, Greene helped countless individuals realize their dreams by lending his time, his knowledge, and his support. SCU alumnus Bob Ulicki, MSEE '72 writes: “Dr. Greene showed a genuine interest in all of us who attended his classes. Independent of his awards and accomplishments, Frank was a human being who cared about others.”



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