DEAN'S MESSAGE

In November, I was invited to give a presentation in Córdoba, Argentina, on "The Profile of the Engineer of a Jesuit University: Competencies and Abilities" before a gathering of deans of engineering of Latin American Jesuit institutions of higher learning. In my presentation I stressed the importance of us as engineers to support the five goals delineated at the most recent Jesuit General Congregation 35 (GC35) held in 2008 in Rome: involve our students in the life of the mind; instill in our students a feeling of responsibility and obligation to help those less fortunate; care for the world's resources for all the world's people; serve our community; and engage with the world.

Here at Santa Clara University, we are "engineering with a mission" and we inspire the head, touch the heart, and guide the hands toward action in accordance with our Jesuit calling. Through a rigorous technical education, undergraduate and graduate core curricula designed to promote intentional, reflective learning and global understanding, commitment to hands-on, project-based learning, collaboration with industry and academic partners, and a focus on sustainability and energy engineering, we are working toward fulfilling GC35's goals.

In Córdoba, we Jesuit engineering educators began building bridges by sharing ideas and pedagogies. In these pages, you will see how our students, faculty, and alumni here at Santa Clara are also building bridges in so many ways that honor our tradition: by introducing technology and education to Africa; helping our neighbor, NASA, monitor satellites; and through the planning of an exciting new conference on science and religion, to name just a few. I hope you enjoy this edition of *Engineering News*, which serves as a bridge between us.

Godfrey Mungal
Dean
School of Engineering

Photo: NASA/Eric James

Satellite operations team member Anthony Young at work in the SCU Mission Operations Center.

STUDENT OPS TEAM MONITORS SATELLITES FOR NASA

Last November, an Air Force rocket launched from Kodiak, Alaska, deploying four satellites that are part of the SCU Robotics Systems Laboratory (RSL) program, announced RSL Director, Christopher Kitts.

The O/OREOS satellite is a NASA Ames Research Center biological sciences spacecraft that SCU students are controlling for one year. NanoSail-D2 is a NASA Marshall Space Flight Center test of solar sail technology, which SCU students monitored for about two weeks. All of the flight computers on board the other two satellites, FASTRAC A and B (designed in collaboration with colleagues and students at UT Austin), were SCU designed. But it was the NanoSail-D satellite that really put the student team's expertise to the test.

This mini-satellite, which was encapsulated inside another NASA satellite, was to be ejected on December 17. "Unfortunately," Kitts reports, "NanoSail did not properly eject from its host at that time, and the mission was feared to be lost. However, it was recently discovered that NanoSail somehow came free and was successfully ejected." According to Kitts, "SCU students, including Laura Bica, Naail Malick, Michael Neumann, and Anthony Young rapidly reconfigured their mission-control network and established successful contact with the spacecraft. The fact that the satellite finally worked its way out of the ejector and that we've now established communications with it is absolutely phenomenal!"

The NASA satellites are being controlled from SCU's Satellite Mission Control Room in the School of Engineering, using two parabolic dishes and a dual Yagi antenna suite. Automated receive-only communication stations installed across the country also relay satellite status data back to SCU mission control via the Internet.

Kitts says, "SCU is the only university in the country providing comprehensive mission control and distributed communications network services to NASA with a student operations team." Recently, the student team—freshmen to doctoral candidates—received special congratulations from NASA leaders, including Center Director Dr. Simon "Pete" Worden (Brig. Gen., USAF, ret.) for their problem-solving skills. Students are trained and certified by enrolling for academic credit in a novel "Satellite Operations Laboratory" course, which includes the control of a real NASA satellite as the lab exercise.

Funding for this work and the RSL's engineering infrastructure comes from NASA, grants from SCU's Technology Steering Committee, and the National Science Foundation.

More about the RSL: http://rsl.engr.scu.edu
O/OREOS dashboard: http://ooreos.engr.scu.edu/dashboard.htm
NanoSail-D site:
nasa.gov/mission_pages/smallsats/nanosaild.html

PERSONAL EXPERIENCE GUIDES SENIOR DESIGN

As our senior engineering students head into the final months before their capstone projects are due to be presented at the Senior Design Conference here on campus May 5, we take a look at two research projects that were inspired by a student's personal experience.

MAKING IT EASIER TO PHONE HOME

When Arturo Posadas, computer science and engineering senior, learned of an opportunity to help the African-American community improve their chances of connecting with family members in their home countries through selection of a reliable phone card, he was intrigued. Based on his own family's experience, he knew how fraught with frustration this situation could be. When, at the age of 10, Arturo moved to the United States from Peru, his parents would often have trouble calling home using a prepaid card.

"The first thing my advisor, Professor Silvia Figueira, told me was that calls often can't get through and many phone card companies are notorious for ripping off customers. Africa has one of the worst connection rates," he said. "Calls drop or never go through. While the customer waits for a dial tone, minutes are ticking off their prepaid allotment. In many cases, there is no customer service department available for lodging a complaint. So the idea for this project is to create a dynamic system of ranking the cards, based on performance, so customers can choose the most reliable phone card provider in their price range."

Arturo is working with Silicon Valley-based PalmCall on the project. PalmCall customers will log in and select the most reliable phone card based on where the call is going, how much they want to spend, and how many minutes they want. "It didn't sound that complicated at first," said Arturo. "I thought I could create an iPhone application, but once we got to work, I discovered we first needed to have a webserver platform for telecommunications before even getting started with the ranking process. It's taking longer than I expected, but I plan to continue working with PalmCall to get it all done, even if it means working beyond Senior Design," he said.

"I was new to all this and didn't know anything about telecommunications when I started, but it's been interesting working as an intern at PalmCall. I like software engineering and solving problems. I like being able to help people by taking away some of their frustration."

A SHAKY START TO LIFE INSPIRES SENIOR DESIGN RESEARCH

Bioengineering senior Simi Olabisi had a very personal reason for choosing her Senior Design project, a solar-powered, low-cost neonatal incubator for use in Nigeria. "I was born a little over two months premature in a Nigerian hospital that did not have incubators," she said, "Luckily, my father was able to transport me to what, at the time, was the only children's hospital in Nigeria, running the last few miles to get me the care I needed in time. When I was 14," she continued, "I visited this hospital and walked the path my father ran. Today, Massey Street Hospital is one of

Simi Olabisi '11 with Team Omoverhi's solar incubator prototype.

the few children's hospitals in Lagos State, and though there is no shortage of donated incubators, a lack of constant electricity and the cost of a backup generator prohibit these incubators from being used. Our group seeks to design an incubator that is affordable, easy to maintain and repair, uses an alternative energy source, and follows industry standards."

She and her teammates, fellow bioengineer Katherine Fazackerley, electrical engineering senior Ben Frederiksen and four mechanical engineering seniors—Collin Burdick, Nick Greos, Kadee Mardula, and Matt Renner— have formed Team Omoverhi (which means "lucky child" in Urhobo, a common Nigerian language) to take on the challenge of improving upon existing designs and give every infant a fighting chance. Nigeria has the third highest infant mortality rate in the world—10 times higher than that of the United States.

The team began their research by observing and testing a top-level American-manufactured model costing more than $30,000 with the goal of reducing the cost to under $2,000 for the solar version. With calculations, research, and a preliminary design developed in the fall quarter, they are now building a prototype and testing the mechanical design, electrical power and control system, thermal power and stability system, and a sensor system to monitor infant health, incorporating the use of local materials, and considering the availability of replacement parts, and sustainability of the finished product.

"Nigeria, with its ample supply of solar energy, is a perfect spot to implement this technology," said Olabisi, "and it is very rewarding to be able to put my education to use in a way that can help a child like me who needs not only a bit of extra luck to get off to a good start in life, but also a well-equipped medical facility."

BUILDING A BRIDGE BETWEEN STUDENT AND PROFESSIONAL ETHICS

Kadee Mardula, senior mechanical engineering student and a Markkula Center for Applied Ethics Hackworth Fellow, is revisiting the School of Engineering Honor Code in an effort to bridge the gap between student and professional ethics. Read more at:
scu.edu/engineering/enews/2011winter/

REALITY CHECK

A month-long stay in a remote village in Nicaragua opened civil engineering senior Ashley Ciglar's eyes to the reality of engineering for the real world. Read her story here:
scu.edu/engineering/enews/2011winter/

THE VALUE OF DEFINING VALUES

Richard P. (Rick) Wallace, president and CEO of KLA-Tencor Corp., the world's fourth largest semiconductor manufacturer, received the School of Engineering's highest honor when he was recently named the 2010 Distinguished Engineering Alumnus Award recipient. At the award ceremony, he shared the story of his career growth and insights gleaned along the way with fellow alumni, students, faculty, and staff.

In the mid-1980s, armed with a bachelor's degree in electrical engineering from the University of Michigan, Wallace came to Silicon Valley and joined a little startup called Cypress Semiconductor, working in the manufacturing cleanroom. "Within a few months, it became apparent to me that I knew very little about semiconductors and needed to expand my education," he said, relating his decision to enter SCU's graduate electrical engineering program. A desire to become conversant in finance, marketing, and business leadership led to his transfer into the engineering management and leadership program, and upon receiving his master's degree in 1989, he was recruited by the department chair to create a syllabus and teach a course in global competitiveness, which he did as adjunct lecturer for five years.

By this time, he was part of the management team at KLA-Tencor. He credits his experience as a student and teaching at SCU with helping him form the basis for one of his early successes at KLA-Tencor: the marketing and launch of a new product into production in fabs outside the United States. "Without the framework from SCU, I wouldn't have had that experience," he said, also noting that teaching was great preparation for his later role as CEO. "Teaching has a lot in common with management and leadership—you need to educate and bring people up to speed to get the team working together."

When Wallace was named CEO in 2006, his goal was to build an effective executive team and a corporate culture to promote success. To do this, he and his team needed to define and foster the corporate values that had contributed to KLA-Tencor's biggest successes over the past 30 years,

and identify and relinquish those actions or beliefs that had led to failure. These are the five corporate values his team identified as being imperative to success:

1. Perseverance. There are no overnight successes; it may take years to bring a project to fruition; be prepared to persevere.

2. Drive to be better. Never be comfortable or satisfied with standing still.

3. High-performing teams. Work globally, across cultures and across disciplines. Having high-performing teams with people who can lead them and people who can serve on them is crucial; management must be prepared to do what it takes to support performance.

4. Be honest, forthright, and behave consistently. Have the courage of conviction to stand up for what you believe, volunteer additional information when it is needed, and cultivate an environment that consistently makes it acceptable for all to do so.

5. Be indispensable to the customer. Strive to be unique and different— keep evolving.

Concluding his remarks, Wallace noted that these are not just corporate values, but also those he passes along to his children and strives to inculcate for his own self-improvement. When asked by an audience member why he should bother to be forthright when it is so often met with a punishment of some kind, Wallace responded in a manner befitting his Jesuit education: "Because it's the right thing to do."

More on KLA-Tencor Corp.:
kla-tencor.com

More on the Distinguished Engineering Alumnus Award:
scu.edu/engineering/about/ engach.cfm

BRIDGES TO INFINITY CONFERENCE ANNOUNCED

The School of Engineering is hosting a conference at Santa Clara University May 6–7, 2011, entitled, "Bridges to Infinity: Humankind, the Scientific Enterprise, and God," announced Aleksandar Zecevic, associate dean for Graduate Studies and professor of electrical engineering. The event will include participants from six Jesuit institutions, and will be opened by Fr. Ronald Anton, secretary for higher education of the Society of Jesus.

"At this conference," said Zecevic, "scholars from the United States, India, and South America will examine the different ways in which science and religion can be related in the curricula of Jesuit universities. The primary focus will be on how these two seemingly disparate areas of human understanding can be connected in the context of 'the true, the good, and the beautiful.'" The role that technology and engineering play in society, particularly when it comes to improving the lives of the poor, will be a central topic of discussion as participants address how Jesuit institutions in different parts of the world apprise their students of technical innovations that are potentially beneficial to broad segments of the population, and share ideas for collaborative projects.

"I am excited about the prospects that this conference affords," said Zecevic, "particularly regarding how the nature of the science-religion dialogue varies across cultures. With such a globally diverse group of participants, we have an unprecedented opportunity for a comparative analysis of different pedagogical models, attitudes to technology, and even aesthetic preferences." One of the goals of the conference is to assess whether establishing a rational and broadly interdisciplinary framework for the dialogue between science and religion is something that could become a common programmatic goal for Jesuit institutions of higher education.

"There is tremendous potential for doing good in the world by calling this group together," said Zecevic, who regularly brings the discussion of the intersection between science and religion to students and colleagues via presentations such as *Teaching Science and Religion: The "Shock and Awe" Approach*, and his unique offering for the undergraduate core curriculum, *Chaos Theory, Metamathematics and the Limits of Knowledge: A Scientific Perspective on Religion*. "I look forward to seeing where the discussion will lead us as a community of Jesuit educators."

Photo: Charles Barry

MICHAEL NEUMANN: EPITOMIZING *"ENGINEERING WITH A MISSION"*

At SCU, we talk a lot about educating leaders who will have the knowledge, integrity, and desire to go out and do some good in the world. A prime example of how well we are achieving our goal is Michael Neumann, who earned his bachelor's and master's degrees in mechanical engineering at SCU and is now in the Ph.D. program researching mechatronics and robotics.

During his undergraduate days, Neumann was unable to study abroad or take part in University immersion trips to Columbia or El Salvador as some of his classmates did, so when he was finishing up his master's work and considering what to do next, he "thought it would be nice to go to another country and learn a new language and culture." He joined the Peace Corps in September 2004 and traveled to Tanzania where he taught math and physics at a secondary school for three years. "It was rewarding work and I became close with other Peace Corps volunteers and teachers living in the area through this shared experience," he said.

When his time in the Peace Corps was finished, Neumann returned to Santa Clara to finish up his master's thesis, and since then has returned to Tanzania twice for two-to-three-month stints, working with Engineers Without Borders (EWB) about 50 miles from where he had previously lived. The first project entailed building a water distribution system, and during his most recent visit in the summer of 2010, he trained locals on solar power and photovoltaic systems. "We are planning to put PV on the dispensary to provide lighting, so we trained a committee to design the system for themselves. Everyone in the community was invited to come and learn," he said. During each of his visits, Neumann returned to schools around the village where he had taught with the Peace Corps—the first time doing some satellite tracking of NASA's SCU-monitored GeneSat satellite using a hand-held Yagi antenna, and later demonstrating the rapid chemical reaction between diet soda and candy mints and making water rockets with

Michael Neumann, center, front row.

the students. A natural-born teacher, Neumann takes every opportunity to help people learn, and he and a couple of friends from the Peace Corps have taken their mission a step farther by starting a nonprofit organization, Tanzania Empowerment Through Education Association, or TETEA which means "to speak out for someone" in Swahili.

"Right now we have a scholarship program helping needy children pay school fees," he said, "and working with another organization, we've started a

community library near where I taught; it opened last October. We would eventually like to build a school."

Pursuing his education and his path through life, Michael Neumann has definitely taken the road "less traveled" and that has, indeed, "made all the difference"—not just in his own life, but in the lives of many.

ENCOURAGING THE NEXT GENERATION OF COMPUTER ENGINEERS

Dan Lewis, professor of computer engineering, Ruth Davis, associate dean of undergraduate programs and professor of computer engineering, and Pedro Hernandez-Ramos, chair of the Department of Education and coordinator of Santa Clara's Science, Technology, Environmental Education, Mathematics (STEEM) Program, have been working in partnership with several high schools and districts to establish a new high school curriculum called "Exploring Computer Science" (ECS). Funded by a three-year, $1 million grant from National Science Foundation (NSF), the project already includes 14 teachers in 11 high schools from San Jose Unified, Santa Clara Unified, and East Side Union High School District.

The ECS course, which was first developed through a collaboration between the University of Oregon and

the Computer Science Equity Alliance for schools in Los Angeles Unified School District, was piloted during the 2008–09 academic year, and is being taught for the first time in the San Jose area this year.

"This course," said Lewis, "has been approved by the University of California for "g" elective credit in order to make it more attractive to college-bound students." In turn, the goal is that it will increase the number of teachers trained in computing and attract students to the study of computing—particularly those from groups under-represented in the field of computing, such as African Americans, Hispanics, and women.

"Statistics show that computer science occupations are projected to account for nearly 60 percent of all job growth in all occupations of all fields of

Photo: Charles Barry

science and engineering between now and 2018, but at the current rate of enrollment in computer science and engineering programs, only 29 percent of these jobs could be filled by U.S. computing graduates. In order to meet the demand, it is imperative that we are aggressive in reaching out to high school students and encouraging them to study computer science and engineering by offering courses such as ECS," said Lewis.

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