Spring 2004

Engineering News, Spring 2004

School of Engineering

(Center for Nanostructures Cont.)

Activities Planned

CNS developed two interdisciplinary themes, which complement each other and take advantage of the strengths and interests of the faculty as well as those of our partners.

Nanobiotechnology – Successful electrical probing of living cells has been a goal of many scientists. Taking advantage of the superb properties of CNT, experiments have been planned to use CNT as an electrical probe to a living cell. This is a collaborative effort among the Nanoelectronics Laboratory, Biology, Chemistry, and Physics Departments, as well as NASA and UCSC.

Nanoelectronics – This is a natural extension of research and education activities conducted in the Microelectronics Laboratory, recently renamed Nanoelectronics Laboratory, over the past twenty years. The main thrust will be interconnect and gate modeling for integrated circuits containing nanoscale feature sizes. Existing collaboration with industry and NASA will be expanded to include modeling of nanowires and carbon nanotubes. The work will be carried out in the existing facilities of the Nanoelectronics and Microwave Laboratories and at partner sites.

The Center is seeking and will continue to seek additional partners and support in order to achieve its mission and goals. For further information, please visit www.scu.edu/engineering/centers/nano/ or you may contact Professor Cary Yang at cyang@scu.edu.

To view the list of selected publications, go to www.scu.edu/engineering/horizons

Faculty

Faculty Research Colloquia are aimed at enhancing the climate for research within the Santa Clara University community of scholars. Once a quarter, respected members of the faculty describe a current research project or an exciting work in progress. In a presentation at the Adobe Lodge on February 18, Aleksander Zecevic and Dragoslav Siljak, electrical engineering, described their groundbreaking work: "Large-Scale Systems: Complexity, Control and Computation."

Alumni

NASA Ames Mars Center Alumni Event *Thursday, May 13*

You are invited to "Escape to Mars." The event kicks-off at 6:30 with a Reception and Lecture in the Lecture Hall. At 7:30, there is a Tour of the Mars Center. The tour will be conducted by Mars Expert Andrew Gonzales, who after graduating from SCU in 1975 with a BS in Civil Engineering (BSCE), worked for the Navy and private sector until 1984, when he joined NASA at Ames to work on window tunnel upgrades and repairs. Always captivated by the space program, Andy took a "temporary" assignment with an advance life support concepts development group. It was during this time he participated in a major study of a reference Mars mission. Eventually, he became interested in Mars airplanes. He now mentors young employees and students, a group he appreciates as his son heads towards college, and gives talks on Mars Airplanes. R.S.V.P. contact the SCU Alumni Office at 408-554-6800.

Ray AbuZayyad, MSEE '90, an early and important leader in IBM's development of data-storage technology and a longtime supporter of the Tech Museum of Innovation, died March 23 after a long illness. He was 66. Born in Palestine in 1937, Mr. AbuZayyad immigrated to the United States after high school and eventually settled in Fremont. With an engineering degree from the University of California-Berkeley, he joined IBM in 1962 and became a leader for the company in the nascent field of hard-disk drives and commercial data-storage technology. He was a member of the SOE Industry Advisory Board. Besides his wife and son, Bassel of San Luis Obispo, Mr. AbuZayyad's survivors include his daughter, Randa, a college student. He has a sister in Berkeley and four other siblings living in the United States and overseas. Donations may be made to the Tech Museum of Innovation, 201 South Market St., San Jose, California 95113.

On February 5, the NASA Ames Research Park Space Technology Center was formally opened with a reception, open house, and press conference. Speakers included Ames Research Center Director Scott Hubbard, **SCU Dean of Engineering Daniel Pitt**, and others. The Space Technology Center is a collaborative facility with representation from the satellite/robot ics programs at Santa Clara University, Stanford University and San Jose State University. Within the Center, the Robotic Systems Laboratory has opened a mission operations facility in order to conduct field operations with on-orbit spacecraft, aircraft, and rovers.

Frank Bellecci '77U, Civil Engineering graduate, President of Bay Counties Civil Engineering and Land Surveyors Association, presenting Dan Pitt with a $10K gift to the Leo Ruth CELSOC Memorial Scholarship Fund. Mr. Ruth was a 1938 SCU civil engineering graduate known throughout the Valley for both his engineering and public service achievements. This new scholarship has been established in Ruth's name to provide financial assistance to current and future SCU civil engineering students.

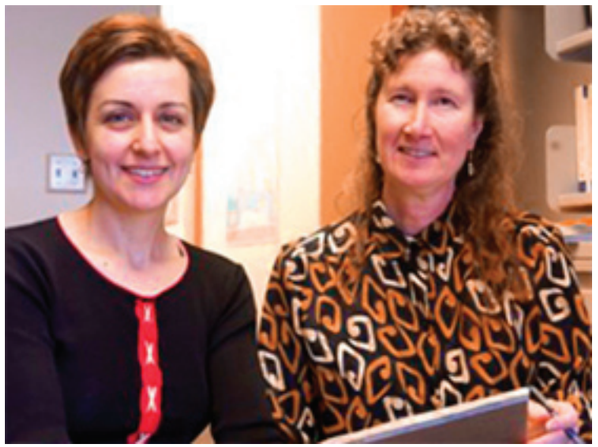
Santa Clara University

School of Engineering

HORIZONS

A quarterly newsletter for alumni, students, parents, faculty, staff, and friends

Spring 2004



Dr. Aslihan Celik, from Operations and Management Information Systems, Leavey School of Business, and Dr. JoAnne Holliday, Computer Engineering, collaborate on distributed systems and databases and in the emerging field of wireless computing.

SVEC Scholarships Awarded to SOE Students

School of Engineering seniors Scott Gunther, Mechanical Engineering, and Carol Reiley, Computer Engineering, were recently awarded the Silicon Valley Engineering Council Scholarships. The SVEC (www.svec.org) honored the scholarship winners at the annual Silicon Valley Engineers Week Banquet held at the Santa Clara Marriott Hotel on February 27. Steve Wozniak and other Valley luminaries were honored and spoke at the event.

Engineer's Week *Joy Wasai*

National Engineer's Week or E-Week, was February 21-28, 2004. The SCU Engineering Council which is currently comprised of 10 student engineering organizations worked hard to plan events and activities to celebrate E-Week. Funded by the School of Engineering, the organizations were able to provide free food and raffle prizes to engineering students. There were also fun activities such as one where students could throw darts at a picture of a professor of their choosing to win free food. Special thanks to Dr. Cary Yang, Dean Daniel Pitt, SoE, and the organizations that helped make this week's event successful.

Publisher's Notes

Cary Yang

Beginning with this issue, we will be highlighting scholarly activities of our faculty as a regular feature of Horizons. One of our faculty featured in this issue, Dr. JoAnne Holliday, and her collaborator, Dr. Celik of the Business School, are fine examples of the University's teaching scholar model. We urge the interested reader to contact the faculty members featured here directly, to find out more about their work and to establish mutually beneficial partnerships.

2004 DEA AWARDS NOMINATIONS

The Awards Committee of the Alumni Board is seeking nominations for the 2004 Distinguished Engineering Awards this October 16. You are invited to nominate one or more persons whom you believe have earned this recognition. For a nomination form, go to www.scu.edu/engineering

Students' event during Engineer's Week

HORIZONS
From the Dean's Desk

Dean Daniel Pitt

As our seniors scramble to complete their senior design projects, I like to look at the accomplishments of our amazing students. Every time one of our students does something great, we are all proud. Consider these examples.

SCU School of Engineering computer engineering major Tomas Bulka (along with teammates CJ Bridges and Pavel Pozdnyakov, both computer science majors from the College of Arts and Sciences) took fourth place in the first Microsoft Windows Challenge competition. The project, entitled "Mobile Digital Fingerprint Identification System," advised by Professor Daniel Lewis, implemented a mobile, digital fingerprint sensor. The system allows an authorized person, such as a childcare attendant, to verify a person's identity. It is a simple system that is deployable anywhere. I got to try it and passed the test!

Shannon Flanagan, a civil engineering junior, moved from Kansas to study at Santa Clara and has been taking part in immersion trips without affecting the high level of performance in her studies. During spring break, she led a group of twenty-one students to build a house with Habitat for Humanity. She also volunteers at an area homeless shelter. Her summer internship last year with the U.S. Army Corps of Engineers gave her real hands-on experience and helped her save money to study abroad in London. She is always ready to help. Through action, she has demonstrated the way the spirit of the poor and marginalized has allowed her to see her career as a calling to compassion.

On February 27, the Silicon Valley Engineering Council at its annual banquet awarded two SCU engineering students scholarships. The award winners are Scott Gunther, senior majoring in mechanical engineering, and Carol Reiley, senior majoring in computer engineering. What will our students do with their scholarships? Scott plans to study for his Ph.D. in mechanical engineering and is trying to decide whether to attend Stanford University or the University of Washington. Carol plans to study for her Ph.D. in computer engineering and is pondering acceptances from Johns Hopkins University and the University of Colorado. Both have helped me in the university's Capital Campaign this year. Is there any doubt they will be outstanding ambassadors for the great engineering education we strive to offer at Santa Clara?

I would like to tell you about the two students whose project has produced such novel results that Santa Clara University is filing for patents, but I'm not permitted to disclose anything until the filing is completed. I promise to tell you more about it later.

SCU Team Places - Microsoft Windows ChallengE

On March 20, SCU School of Engineering computer engineering major Tomas Bulka and teammates CJ Bridges and Pavel Pozdnyakov, came in fourth out of a field of twenty-nine finalist student teams for the design and implementation of a working prototype device for the theme: "Make the World a Safer Place." Microsoft's Windows Embedded Devices Group; Institute of Electrical and Electronics Engineers, Inc. (IEEE); and the Computer Society International Design Competition (CSIDC) sponsored the event. The SCU team will go on to compete in the CSIDC Final Report Selection for the World Finals competition to be held June 27-29 in Washington D.C.

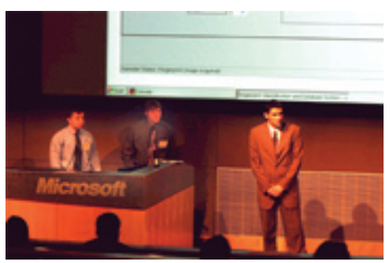
SCU Sends Team

Virtual Development Center Conference

Palo Alto, CA — A team from Santa Clara University will participate and present their results and work on SmartHome, an energy monitoring system to help budget household consumption of energy, at the Anita Borg Institute for Women and Technology's 5th Annual Virtual Development Center (VDC) Conference April 22– 25, 2004 on the campus the of the University of Arizona, at Tucson. The Santa Clara University Team consists of students, Mai Tran and Lauren Yamada, seniors in Electrical Engineering, and Kevin Myers, a junior Computer Science major. The Team is led by Ms. Geetha Rangan and Dr. Garret Okamoto.

The VDC is a collaborative network of nine colleges and universities. It draws together technical and non-technical women, and their supporters, into technology by making the connection between technology skills and the societal needs that they address. VDC participants create technology-based products that engage and build on women's ideas, and vision. In doing so, we amplify the voice and priorities of women to enrich the discussion on technology and drive technology development to the benefit of all people.

"We are excited about the opportunity to share the work we have done over the past year and the especially the interaction with the women of HomeSafe," said Professor Ruth Davis, Program Leader for the VDC Site at Santa Clara University.



Read the complete version of the Spring 2004 Horizons online at www.scu.edu/engineering/horizons

Research

To view the list of selected publications, go to www.scu.edu/engineering/horizons

Dr. JoAnne Holliday

Doctors JoAnne Holliday (Computer Engineering) and Aslihan Celik (Operations and Management Information Systems) have been collaborating since 2000. Shortly after joining Santa Clara they realized they had similar research interests. Both had done work on distributed systems and databases. Additionally, they shared an interest in the emerging field of wireless computing.

With the help of several university research grants they funded graduate students to be research assistants and founded the Wireless Information and Networking Laboratory (WINLab) to provide students with hands-on experience with the latest in high technology.

This interdisciplinary collaboration has proved very beneficial. Within three years of collaboration, these professors have published one journal and four conference papers. Their work focuses on efficient data dissemination over the Internet and wireless LANs and increasing the security and efficiency of wireless communications. Current projects include the effect of mobility pattern on data iservices and increasing the reliability of wireless multicast.

Chris Kitts

Prof. Christopher Kitts and collaborating faculty, staff and students in the Robotic Systems Laboratory have just completed work on a $540,000 National Science Foundation grant focused on developing a distributed command and control network for operating remote robotic vehicles and conducting experimental research in telerobotics.

A centerpiece of this network is a satellite operations system that includes communications stations in California, Texas, Hawaii and Missouri as well as a central mission control center that has been installed in the new Space Technology Center at the NASA Ames Research Park. This system is being used to control currently orbiting and future spacecraft developed by SCU and partners such as Stanford Univeristy, the University of Texas at Austin, Washington University in St. Louis, Kyushu University, and others. Other sponsors and collaborators include NASA, DARPA, NOAA, and the Lockheed-Martin Corporation. The system is also being used to provide experimental verification and validation opportunities for research investigations involving multi-satellite systems, automated reasoning, and internet-based teleoperation. Over the past three years, this program has resulted in more than 10 published or pending journal, conference and magazine articles as well as more than 10 student theses at both the undergraduate and graduate levels. In addition, the program has been leveraged by an additional $500,000 in research projects that make use of the operations network for experimental demonstrations.

Center for Nanostructures

Dr. Cary Yang *& Dr. Shoba* Krishnan

Mushrooming progress in nanoscale science and technology in recent years has begun to create an alarming gap between industry knowledge/skill requirements and workforce preparedness. Existing curricula at virtually all educational institutions do not provide science and engineering students with a sufficiently broad-based coverage of topics to meet such needs. Faculty members in science and engineering generally work in narrow areas within their individual disciplines. The emergence of commercially viable products such as integrated circuits built with nanotubes and biosensors made up of organic molecules demands groundbreaking reevaluation of teaching and scholarship as well as academia/industry interaction.

Center for Nanostructures (CNS) focuses on interdisciplinary research and integrated education in the diverse field of nanoscale science and technology. The CNS incorporates recently established partnerships in nanotechnology with NASA Ames Research Center, Hitachi Global Storage Technology (HGST), and Hitachi High Technologies America (HHTA), as well as ongoing relationships with Stanford Nanofabrication Laboratory and the School of Engineering at the UC Santa Cruz, while building upon existing SCU faculty strengths and initiatives.

Current Research and Education

Extensive effort has been underway involving the modeling of high-speed on-chip interconnects. In this work, a unified resistance-inductance-capacitance model has been developed for operating frequencies up to 100GHz. Results have been published in top-tier journals and conferences. A related project, which is jointly pursued with and partly funded by NASA's Center for Nanotechnology, involves a study of carbon nanotube (CNT) as an interconnect material in sub-100nm integrated circuits. The tasks include CNT synthesis, test structure fabrication, materials characterization, and study of conduction mechanisms, in order to arrive at a physical model for its electrical behavior and that of its contact with metal. Understanding the transport across this CNT/metal interface is the primary objective of this program. Based on this understanding, the projected outcome will be a methodology for measurement, as well as a computational scheme for model parameter extraction and circuit simulation of high-frequency hybrid Si-CNT circuits. Both graduate and undergraduate Santa Clara University students have been involved in these projects, led by Drs. Krishnan and Yang.

The overview course on nanoscale science and technology offered by Santa Clara University came about in 2002. Today, the course is listed as a graduate engineering course but is open to all undergraduate students who have taken a freshman course in chemistry. Preliminary plans are in place to develop five more courses in the nano curriculum. An undergraduate minor in nanoscale science and technology is also targeted.

Last year, a campus-wide seminar series on nanotechnology, supported by an internal grant, presented ten distinguished speakers known internationally for their pioneering work in the field of nanoscale science and technology.

(SEE NEXT PAGE)