



AT THE LYLE SCHOOL OF ENGINEERING, 'PLAY' IS HARD WORK

BY PATRICIA WARD

GEOFFREY ORSAK LOVES IT WHEN STUDENTS COME OVER TO CARUTH HALL TO PLAY. AS DEAN OF THE BOBBY B. LYLE SCHOOL OF ENGINEERING, ORSAK OVERSEES SMU'S NEWEST INTELLECTUAL PLAYGROUND, WHICH HE CALLS A "SANDBOX FOR INNOVATION."

"At the heart and soul of this building is the joy of play, the joy of creation."
The serious intent behind this comment will reshape the engineering profession for the 21st century. "It's a full-on rethinking of what engineering should be," Orsak says. Gone is the stereotype of the back-office tinkerer who communicates strictly in technical jargon. A new breed of engineer has emerged – versatile young men and women who get their

geek on when the job calls for it, but whose vision and talent stretch across disciplines and national borders.

"One thing that has limited the appeal of the discipline is students felt they may be boxed in, but the reality is that they go off and do amazing things across every spectrum of our economy," he adds. "And they lead too: More Fortune 500 CEOs have engineering degrees than any other undergraduate degree."

MAN-MACHINE CONNECTION MOVES FROM SCIENCE FICTION TO REALITY

Technology to provide military and other amputees with realistic robotic limbs – hands, arms and legs that not only move like the real thing but also can “feel” – took a leap forward with the creation of a multimillion-dollar Neurophotonics Research Center led by Lyle School engineers.

Marc Christensen, electrical engineering chair in the Lyle School of Engineering, directs the new center, where two-way fiber-optic communication between prosthetic limbs and peripheral nerves is being developed. Volkan Otugen, mechanical engineering chair, is SMU site director for the center.

Applications for a successful link between living tissue and advanced digital technologies extend to a number of complex medical issues, Christensen says.

Today’s engineers are asked to dream bigger dreams – on a shorter timeline and with a tighter budget – than ever before. The Lyle School’s reality-based curricula, focused institutes and centers, new research initiatives and real-world projects mean next-generation engineers leave SMU with the imagination to ask “what if?” and the knowledge and skills to answer the question with remarkable solutions.

INFINITY AND BEYOND

Bobby B. Lyle ’67, for whom the Engineering School was named in 2008, calls it “the little school that could.”

Established in 1925, the Lyle School is among the oldest engineering schools in the Southwest, with eight undergraduate and 29 graduate programs offered through five core academic departments.

The centerpiece of a building trifecta – the Jerry R. Junkins Building opened in August 2002 and the J. Lindsay

“Providing this kind of port to the nervous system will enable not only realistic prosthetic limbs but also can be applied to treat spinal cord injuries and an array of neurological disorders.”

The Defense Advanced Research Projects Agency (DARPA) is funding the \$5.6 million center with industry partners as part of its Centers in Integrated Photonics Engineering Research (CIPhER) project.

Two SMU undergraduate research assistants, five graduate students and two postdoctoral students are assisting in the research.

“Involving students in broad, multidisciplinary projects like this helps them understand how their knowledge and their work in the lab connect to a bigger picture,” Otugen says.

“We view hands-on implementation as a critical piece of the education of our students,” Christensen says. “It deepens their understanding and provides them with real-world experience that can accelerate their learning and careers.”

The center brings SMU researchers together with colleagues from Vanderbilt University, Case Western Reserve University, the University of Texas at Dallas and the University of North Texas.

The center’s industrial partners include Lockheed Martin (AcuLight), Plexon, Texas Instruments, National Instruments and MRRA.

“Team members have been developing the individual pieces of the solution over the past few years,” Christensen says, “but with this new federal funding we are able to push the technology forward into an integrated system that works at the cellular level.”



Embrey Building was dedicated in September 2006 – Caruth Hall stands as a brick-and-mortar embodiment of can-do spirit. It’s the launching point for what Lyle calls “a transformational journey with the express intent of creating a new kind of engineering school, the best on the planet.”

Orsak started fueling that trajectory soon after joining SMU in 1997 as an associate professor of electrical engineering. In 2002 he was named executive director of what is now the Caruth Institute. In that role he developed several award-winning programs that continue to grow:

- The Infinity Project, a partnership with Texas Instruments that brings engineering curricula into the classrooms in over 40 states and six countries.
- Visioneering, a playful and substantive learning event that gives middle school students the opportunity to be



engineers for a day.

- The Gender Parity Initiative, which aims to attract girls and young women to engineering. Women made up 37 percent of last year's incoming SMU engineering class compared to the national average of approximately 19 percent.

Orsak, who was recently named to a national energy policy study committee by U.S. Secretary of Energy Steven Chu, became dean in 2004.

In 2008 he recruited a longtime mentor, Delores M. Etter, as the first Texas Instruments Distinguished

Chair in Engineering Education and Caruth Institute director.

Etter came to SMU from the electrical engineering faculty of the U.S. Naval Academy. Her distinguished academic career is complemented by service in the U.S. Department of Defense as Assistant Secretary of the Navy for Research, Development and Acquisition and as Deputy Undersecretary of Defense for Science and Technology.

While directing the Navy's acquisitions program at the Pentagon, she realized that academia provides a powerful platform for service to country.

"One of our most serious challenges was finding the right people with technical skills," Etter says.

The Lockheed Martin Skunk Works® Program at the Lyle School, a first-ever partnership with the renowned research center, is a key effort to prepare tomorrow's engineering innovators. Housed in the Caruth Institute, the program borrows from its namesake's playbook with Immersion Design Experiences (IDEs): Working in small teams under tight deadlines, engineering students and faculty find feasible solutions to real client projects.

"Innovation is hard to teach," Etter says. "That's why opportunities for students to work together, come up with a solution and test it are so important."

In the first Skunk Works IDE in January, a team of students developed a prototype system that converts an unmanned aerial vehicle (UAV) now under development by Lockheed Martin and Karem Aircraft into an aerial firefighter. The system has water pumps, a tank and logic that enable it to hover over water, deploy a pump automatically, fill the tank and retract the pump.

During the project, a novel sensor that indicates when the UAV's lowered pump is in the water was created.

"What makes this special is that commercial water sensors cost around \$200. The students used free scraps to make their sensor," explains Nathan Huntoon, director of the school's new Innovation Gymnasium. Huntoon, who received his Ph.D. in electrical engineering from SMU in 2009, develops IDE projects and supervises the student teams.

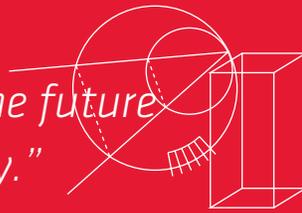
THINK FAST

Engineering isn't just for engineers anymore. The Lyle School's campuswide Innovation Competition, now in its second year, nurtures scholarly cross-pollination by encouraging students in other SMU schools to enter.

Of the three teams selected as finalists in the first contest, "a good half of those students didn't have any relationship with engineering other than they had an idea worth testing," Orsak says.

Like the IDEs, the Innovation Competition

"You can't underestimate the importance of innovation to the future economic health of our country."





Professor Delores Etter, left, helps Jean Ross, right, a CIA case officer, as she demonstrates the art of disguise to three girls attending forensics camp.

CSI-GIRLS: CAMPERS INVESTIGATE CAREER POSSIBILITIES

Wearing a short, black wig and oversized eyeglasses, the cute middle-school girl was transformed into a young woman few would give a second glance.

Mission accomplished.

“You want to become nondescript, you want to blend into the crowd,” explains Jean Ross, a CIA case officer who dramatically demonstrated her specialty in the art of disguise on the audience volunteer.

The session was part of the Caruth Institute for Engineering Education’s CSI-Girls Forensic Evidence and Biometrics Summer Camp. The weeklong pilot program – held on campus in July – offered interactive opportunities for 80 girls entering sixth through eighth grades to study hand geometry, fingerprinting, polygraphs, DNA identification and other topics.

Institute Director Delores Etter, an expert in biometrics, particularly iris recognition, believes this nation’s future depends on the technical agility of the next generation. A key to staying a step ahead is to engage youngsters, especially girls, before they’ve shied away from math and science, she says.

During the camp, female law enforcement officers and forensic experts introduced their occupations to students through discussions and hands-on activities.

Emily Christopher, 11, says the experience was an eye-opener. “It was really interesting to learn about so many different jobs that I didn’t know existed. I want to come back next year!”

Youngsters in the Seattle-Tacoma region, Washington, D.C., and Albuquerque, N.M., will use the camp curriculum via a Web portal – kidsahead.com – developed by the Caruth Institute.

The institute plans to build on the camp’s math- and science-infused subject matter with STEM (science, technology, engineering and math) content, which also will be shared through the portal.

allows students to transform their inspirations into tangibles, Huntoon says. “We can partner students with no technical experience with people who can help them bring their ideas to life,” he says. “What matters is an interesting idea, and we want to hear it with no filter applied.”

Junior Raven Sanders, an electrical and audio engineering major, led the winning project for an audio-mixing system.

“Traditional soundboards are complicated and require considerable training to learn,” Sanders explains. She came up with a spherical design that operates more intuitively, allowing sound designers to control audio tracks by touch.

The team, which included computer science majors Austin Click, senior, and Travis Maloney, junior, and senior mechanical engineering major Jason Stegal, cleared a number of real-world hurdles to reach the top, Sanders says. The cost of developing the sphere was prohibitive, and a software company they’d hoped to partner with didn’t respond to their queries.

So the team did exactly what the competition promotes: They regrouped and devised an innovative workaround by creating a flat-screen device, writing their own program and pulling an all-nighter to complete the project successfully on time.

The project will be featured in an upcoming issue of *Design News* magazine, an engineering publication that focuses on the design of consumer and industry-specific products and systems.

“I will be putting a patent together and a team to build a spherical device as my senior project,” Sanders says.

That “innovate-then-patent” exercise is exactly what Greg Carr ’79 envisioned for the competition, which received generous support from his firm, Carr LLP. Carr, who holds an undergraduate degree in mechanical engineering from SMU, now practices intellectual property law in Dallas.

“On average, the issuance of a patent creates from three to 10 jobs,” he says. “You can’t underestimate the importance of innovation to the future economic health of our country.”

THE HUMAN TOUCH

From day one, Lyle School students are encouraged and empowered to make a difference in the world.

For hands-on opportunities, the Hunter and Stephanie Hunt Institute for Engineering and Humanity was established in December 2009. Hunt Institute projects focus on finding innovative, affordable solutions to such poverty-related issues as safe and affordable housing, clean water and sanitation, and functional roads and transportation systems.

Programs of the recently established Linda and Mitch Hart Center for Engineering Leadership (see page 7) also play a pivotal role in developing tomorrow's well-rounded engineers, according to Dean Orsak. The leadership training builds on current co-op and internship programs, adding personal and team experiences that allow students to hone essential leadership skills – including the abilities to develop and implement strategy, communicate clearly and

function effectively in a group.

The Hart Center will work with faculty across campus. For example, students who need to polish their presentation skills may be steered toward a theatre class in Meadows School of the Arts. A competition offered in collaboration with Cox School of Business will introduce participants to the mechanics of a business plan.

Approximately 750 Lyle School undergraduates are participating in Hart

Center programs this semester.

“Leadership requires students to be fully engaged in the world, to recognize the staggering problems facing us today and feel empowered to contribute solutions,” Orsak says.

“Engineering is a contact sport,” the dean adds. “It’s hard work, but at the same time, the satisfaction of knowing that you are doing something meaningful can be deeply moving.”

For more information: smu.edu/lyle

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Room for big ideas: Students work on a project in the Innovation Gymnasium.

ENGINEERING RELATIONSHIPS: PROFESSORS, MENTORS, FRIENDS

The topics switch from work to family to old times as Bijan Mohraz, a professor in the Lyle School’s Department of Civil and Environmental Engineering, and Cecil Smith, professor emeritus, meet with engineering graduates for lunch.

These are conversations that the self-described “Engineering Lunch Bunch” has carried on without skipping a beat for more than three decades.

“We get together a few times a year at different restaurants near campus,” Mohraz says. “There’s no set agenda; we talk about everything.”

Both Mohraz and Smith call Margaret Pawel-Moore ’77, ’86 “the glue that keeps the group together.” Pawel-Moore, who also earned an M.B.A. from Cox School of Business, is now an asset management specialist. She says that “in the Engineering School, class sizes were small, so you went to most of your classes with the same people. By sharing the

experience, many of us became friends for life.”

Before the meal begins, Sam Basharkhah ’77, chief executive officer of BEI, his own construction and consulting engineering firm, and Kelly Williams ’77, who was an estimator for Austin Commercial on the construction of Caruth Hall, pull out visuals on recent projects to show the group. However, the talk soon shifts from the 9-to-5 arena to life off the clock.

Laughter erupts as Smith shares an anecdote – it’s apparent to everyone in the café that the engineering klatch is having a ball.

Great teachers who also are good friends “make a difference,” says Bill Hanks ’75, chief executive officer of Rosebriar Corp., a real estate investment firm. “Dr. Mohraz was always willing to give students the extra help they needed. Dr. Smith taught everything



The Engineering Lunch Bunch: from left, Professor Bijan Mohraz, Kelly Williams, Professor Emeritus Cecil Smith, Margaret Pawel-Moore, Sam Basharkhah and Bill Hanks

from hydraulics to soil mechanics (dirt) to environmental science (bugs). He also played a pretty good game of tennis, and he taught lessons in that subject if you were willing to try him.”

The opportunity “to truly get to know your professors is a big part of what SMU has to offer and separates it from many other engineering schools,” he adds.

After an hour, the group disbands without good-byes; instead, each says, “I’ll talk to you later.” Their conversation isn’t over yet.

– Patricia Ward