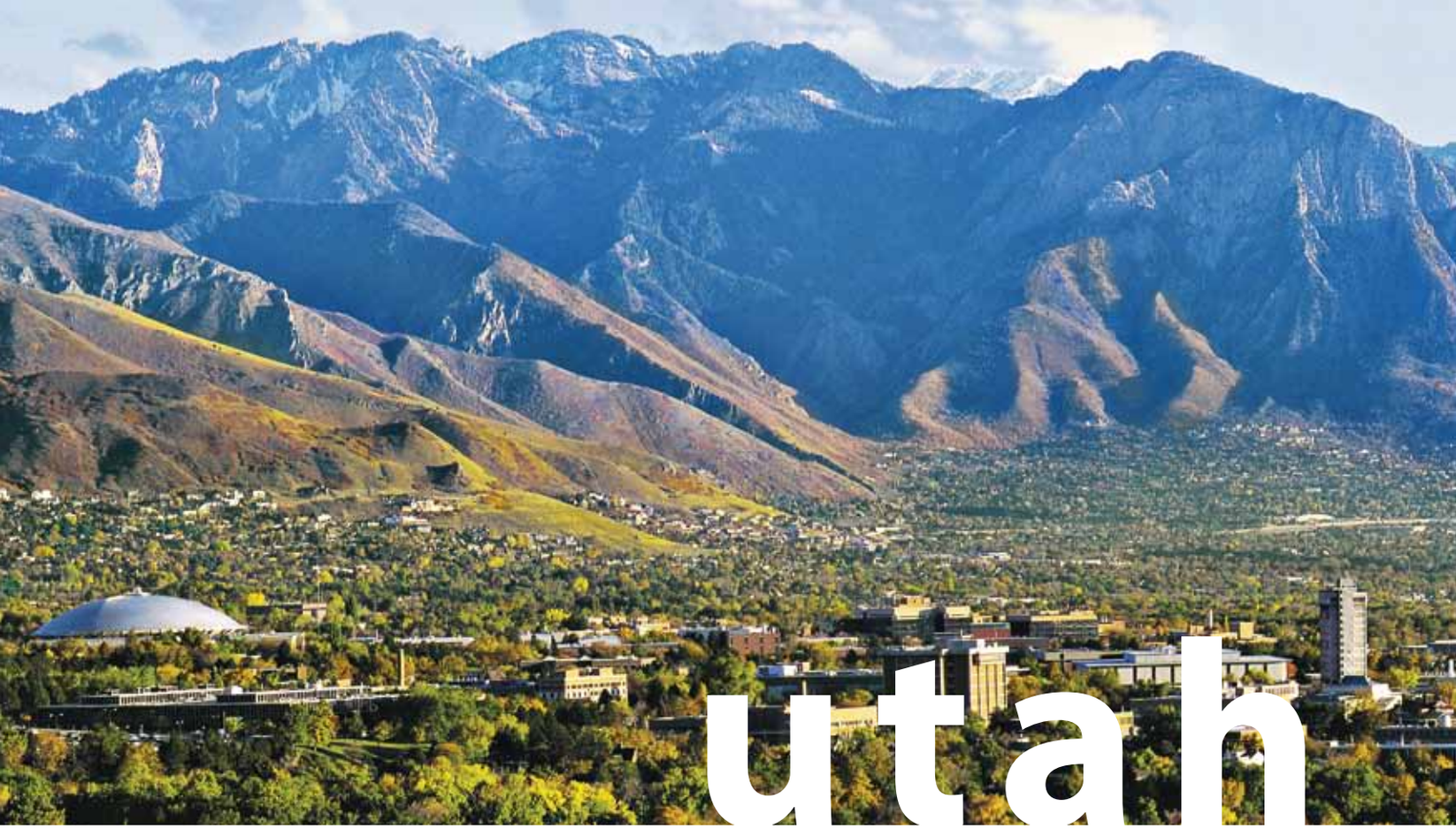


utah ENGINEERING

ENGAGING ENGINEERS FOR THREE & GENERATIONS COUNTING

THE UNIVERSITY OF UTAH • COLLEGE OF ENGINEERING NEWSLETTER

SPRING 2013

GENERATIONS OF TEACHING EXCELLENCE

Larry DeVries, distinguished professor of mechanical engineering at the University of Utah, can't pick his favorite class to teach. "To be honest, I love 'em all," he says.

His colleagues and former students return the sentiment. In more than 50 years at the U, DeVries has earned numerous awards and recognitions for his teaching excellence, including the Calvin S. and Je-Neal N. Hatch Prize in Teaching and the Utah Governor's Medal for Science and Technology.

Born and raised in Marriott-Slaterville, Utah, DeVries earned a bachelor's degree in mechanical engineering in 1959 and a Ph.D. in physics and mechanical engineering in 1962 from the University of Utah. He joined the mechanical engineering faculty at the U that year.

As a specialist in materials and adhesives, DeVries has traveled extensively throughout his career, both as a consultant and while serving on technical advisory boards for the 3M Company and Emerson Electric. He was also chairman of the board of trustees for the Gordon Research Conferences.

At the U, he has taught and advised hundreds of undergraduate and graduate students studying statics, dynamics and strength of materials, among other topics. He receives glowing student evaluations year after year, and students cite his remarkable teaching abilities, willingness to help and sense of humor.

DeVries' teaching has inspired generations of engineering students, including three generations of the Gwilliam family: grandfather Donald, father Scott and grandsons Jim, Tyler and Landon have all taken classes from DeVries while at the University of Utah.

"Larry teaches with such skill and enthusiasm that it is contagious," says Tyler Gwilliam, a U mechanical engineering graduate. "He makes his students a priority and never gets frustrated or impatient with the interruption. He always took the time to help answer questions that we had about his classes or any other topics."

In his role as Associate Dean for Research in the College of Engineering, DeVries mentored countless young faculty at the U. His dedication helped these faculty members compete successfully for grants and establish their careers.

DeVries is an avid fan of U athletics, holding season football and basketball tickets. He often walks or rides his bike to campus—"my pedometer tells me it's exactly one mile from my house until I sit down in my office," he says —while maintaining a double teaching load each semester.

"Larry's teaching skills are the reason he has remained a positive influence in the engineering community for three generations—and counting," says Gwilliam.

Donald B. Gwilliam
University of Utah
B.S., mechanical engineering, 1963

Scott B. Gwilliam
University of Utah
B.S., mechanical engineering, 1986
M.S. mechanical engineering, 1993

Jim Gwilliam
University of Utah
B.S., biomedical engineering, 2007

Tyler Gwilliam
University of Utah
B.S., mechanical engineering, 2011

Landon Gwilliam
University of Utah
B.S., mechanical engineering, 2013

TREATING OLIVE MILL WASTE IN THE WEST BANK

The U.S. Environmental Protection Agency (EPA) awarded two University of Utah engineering teams with grants for sustainability research. One team will optimize cookstove design in rural Nepal, while another team will design treatments for polluted water from olive oil mills in the West Bank.

The U engineers are two of 45 teams in the United States receiving $15,000 each to design their proposed technologies. The competition has two phases: the U students made it through the first phase of the competition in December 2012, and in April, they will travel to the National Sustainable Design Expo in Washington, DC to compete for a grant of $90,000 to help implement their technologies.

A major environmental pollutant throughout the West Bank and Mediterranean region is olive mill waste – the solid and liquid waste generated from olive oil production. These byproducts are disposed routinely into waterways and cesspools in the West Bank, causing surface and groundwater pollution and harming aquatic plant and animal life.

A team of U engineers will address these issues by designing a waste treatment process for an olive mill in the village of Deir Abu Mashal. The U team will test a physical treatment using sand filtration, a biological treatment of liquid waste and composting of solid waste. The team will work with Birzeit University to characterize the waste, identify construction materials and build partnerships with local olive mill owners.

In addition, the team plans to develop a training program to educate mill owners about the need for waste treatment and the benefits of investing in this process, such as reduced water pollution and odors, and the recycling potential of the treated waste for use elsewhere in the olive farm.

“This EPA project provides a great opportunity for the University of Utah team to tailor a low-cost, viable engineering solution to the proper disposal of wastes from olive oil production in the West Bank, where the current practice has resulted in significant environmental degradation,” says Andy Hong, a civil engineering professor at the U and faculty mentor for the olive mill waste project. “This project brings together undergraduate and graduate students working with the Birzeit University team, who by volunteering their time and acquired engineering skills have enriched their education curriculum and international experience.”

The EPA P3 (People, Prosperity and the Planet) grant competition asks college students to design sustainability-related technologies to improve quality of life, promote economic development and protect the planet.

U ENGINEERING GRADUATE RANKINGS KEEP CLIMBING

University of Utah's highly respected College of Engineering moved up three spots in this year's edition of "America's Best Grad Schools 2014," published by U.S. News & World Report, to rank 51 nationally for its comprehensive graduate programs.

Each year, U.S. News & World Report ranks school programs in business, education, engineering, law and medicine. U.S. News says its rankings are based on two types of data: expert opinion about program quality and statistical indicators that measure the quality of a school's faculty, research and students.

In the rankings of specialty disciplines for engineering, the University of Utah was ranked nine times: 27 for biomedical/bioengineering, up three spots; 38 for computer engineering, moving up nine spots; 39 for the separate discipline of computer science; 44 for electrical/electronic/communications, gaining seven spots; 55 for materials engineering; 66 for civil engineering; 57 for mechanical engineering, a rise of 15 spots; and 60 for chemical engineering.

In addition, the Princeton Review has ranked the U's Entertainment Arts and Engineering (EAE) program number one for its undergraduate program and number two for its graduate program (*see sidebar*).

EAE is a joint effort of the U's College of Engineering and College of Fine Arts. Students work in the areas of video games, computer animation, film and special effects and collaborate throughout their academic careers.

"We are pleased the College of Engineering's growth in graduates (up 97 percent since 1999), strong externally-funded research, and leadership in technology commercialization (48 College-based startups since 2006) are being recognized in these rankings," says Richard Brown, dean of the College of Engineering. "Most importantly, our graduates are the workforce fueling the expansion of Utah's high tech economy."

EAE MASTER'S DEGREE APPROVED

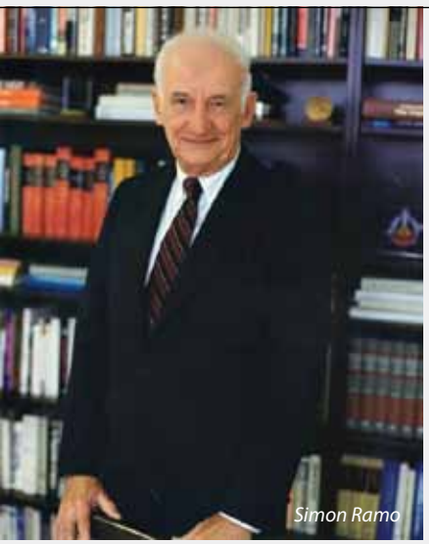
The Utah Board of Regents recently approved a master's degree in entertainment arts and engineering (EAE) at the University of Utah. An interdisciplinary program between the U's Colleges of Engineering and Fine Arts, EAE will provide Utah's first master's degree in video games.

Previously, students graduated with a master's degree in computing or master of fine arts in film and media arts, with an emphasis in game arts, game engineering or game production. This new master's degree in EAE will combine the same level of academic rigor, industry and collaborative experience with the additional graduate education that is increasingly required for advanced careers in the burgeoning industry.

A key feature of the EAE program is its cross-disciplinary structure. Students who go into the graduate program delve deeper into video game production, and all students take classes in video game design and rapid prototyping.

The first students in this new graduate program will begin their studies in Fall 2013.

ENGINEERING LEGEND SIMON RAMO TURNS 100


Simon Ramo

The College of Engineering is pleased to extend birthday greetings to Dr. Simon Ramo, who will celebrate his 100th birthday this May.

Ramo achieved global recognition for his pioneering work using microwave technology for radar and advanced communications. He became one of our nation's top experts in guided missiles, first as the director of the Falcon guided missile program and later as the chief scientist for the intercontinental ballistic missile (ICBM) program.

Born in Salt Lake City in 1913, Ramo began his study of engineering at 16, earning a bachelor's degree in electrical engineering at the University of Utah in 1933. He received his Ph.D. *magna cum laude* in electrical engineering and physics from the California Institute of Technology at age 23.

After his graduate studies, Ramo spent a decade at the General Electric (GE) Research Laboratories, during which he developed GE's electron microscope and acquired 25 patents before his 30th birthday.

In 1946, Ramo returned to California to accept a position at Hughes Aircraft. With his Caltech classmate, Dean Wooldridge, Ramo left Hughes to form the Ramo-Wooldridge Corporation. Their company soon became an integral component of the United States' efforts to compete with Russian weapons development at the height of the Cold War.

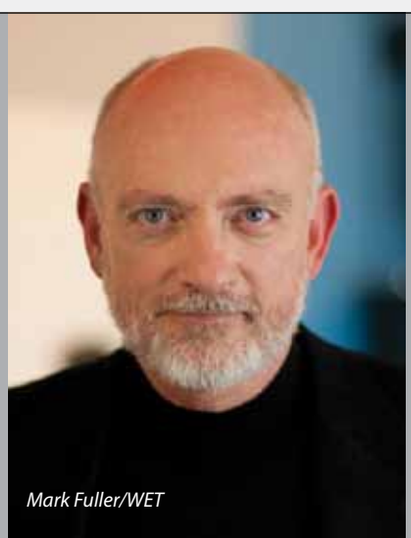
As the lead contractor for the ICBM program, Ramo-Woolridge guided the development of a ballistic missile with a range of 5,000 miles designed for nuclear weapons delivery. The company eventually merged with Thompson Products in 1958 to form Thompson Ramo Wooldridge, Inc., which later became TRW Inc. and was acquired by Northrop Grumman in 2002.

For his contributions to the ICBM program, Ramo received the National Medal of Science from President Carter and the Presidential Medal of Freedom from President Reagan, the highest honor for civilian service. He is also a founding member of the National Academy of Engineering.

A self-described "hybrid scientist, engineer and entrepreneur," Ramo joined the faculty of the University of Southern California in 2008 as Presidential Chair and Professor of Electrical Engineering.

Ramo is an accomplished violinist, and credits Salt Lake City's flourishing performing arts scene for nurturing his talent as a youth. As a high school senior, he invested $325—all his savings—in a violin. With this violin, he won a regional competition and a scholarship to the University of Utah, along with more money than his original investment. An endowed undergraduate scholarship in Ramo's name is awarded to the highest-achieving academic engineering scholar at the University of Utah.

"The College of Engineering is proud to call Simon Ramo an alumnus! His remarkable technological contributions were critical to defending the freedom of the United States and the world," says Richard Brown, dean of the College of Engineering. "As he celebrates this milestone birthday, we wish him many more years of health and happiness."


Mark Fuller/WET

U ALUM JUDGES 'BIG BRAINS'

Mark Fuller, a civil engineering alumnus from the University of Utah and CEO of WET, an architectural water design firm known for the Dubai Fountain, will be a judge on a new competition series on the Discovery Channel.

"The Big Brain Theory: Pure Genius" will feature a seemingly impossible engineering challenge to be solved by the contestants each week. Portions of this series were filmed on location at WET.

The winner of the competition will earn $50,000 and a one-year contract at WET. "The Big Brain Theory: Pure Genius" premieres May 1st on Discovery Channel.

IN BRIEF

Keck Grant for Utah Nanofab

The Utah Nanofab received $200,000 from the W.M. Keck Foundation to provide engineering education materials about length scales to students at the University of Utah, community colleges and four-year colleges nationwide.

By providing instructors with demonstration microelectromechanical systems (MEMS) chips and teaching modules, Utah Nanofab will give students hands-on experience with understanding the physical properties of materials at different length scales.

Utah Nanofab is a part of the U's College of Engineering and is a "core" or shared facility that fabricates and analyzes nanoscale and microscale materials for academic and industrial users in Utah and nationwide.

With guidance from U staff members and colleagues in the region, U engineering students will design and manufacture computer chips that demonstrate how the performance of a given material can change depending on its size and shape.

Local partner institutions – such as Salt Lake Community College and Utah Valley University in Orem – will receive these chips and modules for use in their own classrooms.

Launching Marshmallows, Building Towers at the U

The College of Engineering hosted more than 1,500 elementary school students in March for the College's annual Elementary Engineering Week, designed to spark enthusiasm for engineering at an early age. Students launched marshmallows from catapults and constructed towers from drinking straws – activities that illustrate science and math principles used by engineers. These contests were judged on accuracy and design by U engineering undergraduates. Phillips Petroleum donated $10,000 for schools participating in Elementary Engineering Week to provide books and supplies for science teachers.

Stoll Receives NSF CAREER Award

Rob Stoll, assistant professor of mechanical engineering at the University of Utah, has received a five-year Faculty Early Career Development (CAREER) award from the National Science Foundation. This $492,091 grant is for a project to explore how particles in the atmosphere move through and above plant canopies. These studies will shed light on how ecosystems function and how to manage positive or negative effects of different particles such as fungal spores, pollens, bacteria and pollutants. Stoll says this grant "will help transition from a new topic that started with a University of Utah seed grant into a long-term focus of my research group. I'm really looking forward to the new field and lab experiments we will be doing as part of this project."

ECE Chair Part of Bionic Eye Team

Gianluca Lazzi, professor and chair of the Department of Electrical and Computer Engineering at the U, was part of the multi-institution team to create the first bionic eye approved by the U.S. Food and Drug Administration for human trials. Lazzi's group was responsible for figuring out how to keep the artificial retina from getting too hot while operating. He noted the bionic eye is "essentially a computer working full steam and full time. There is no fan that can cool this device." By optimizing component design and placement, and getting the device to run on just the right amount of power, Lazzi's group was able to keep the artificial eye from getting too hot while operating.

ENGINEERS SHOW FEASIBILITY OF SUPERFAST MATERIALS

University of Utah engineers demonstrated it is feasible to build the first organic materials that conduct electricity on their edges, but act as an insulator inside. These materials, called organic topological insulators, could shuttle information at the speed of light in quantum computers and other high-speed electronic devices.

These findings will help pioneer a new field of research in materials science, in the same way organic materials lowered the cost and eased production of light-emitting diodes and solar cells, says senior author Feng Liu, professor and chair of materials science and engineering.

"This is the first demonstration of the existence of topological insulators based on organic materials," says Liu. "Our findings will broaden the scope and impact of these materials in various applications from spintronics to quantum computing."

Although inorganic topological insulators based on different materials have been studied for the last decade, organic or molecular topological insulators have not. While other researchers still must synthesize the new organic topological insulators, Liu says his team's previous work "shows we can engineer an interface between two different thin films to create topological insulators," in which electrons known as Dirac fermions move along the interface between two films, Liu adds.

Liu and his co-authors performed theoretical calculations to predict the existence of an organic topological insulator using molecules with carbon-carbon bonds and carbon-metal bonds, called an organometallic compound. For this new study, the team investigated how Dirac fermions move along the edges of this compound, which looks like a sheet of chicken wire.

To generate a topological insulator, scientists have to design materials that can transmit fermions. In a topological insulator, fermions behave like a massless or weightless packet of light, conducting electricity as they race along a material's surface or edges. When these fermions venture inside the material, however, this "weightless" conductivity screeches to a halt.

What's more, Dirac fermions have a property called spin, or angular momentum around the particle's axis that behaves like a magnetic pole. This property gives scientists another way to place information into a particle because the spin can be switched "up" or "down." Such a mechanism could be useful for spin-based electronic devices, called spintronics, which can store information both in the charge and the spin of electrons.

"We have demonstrated a system with a special type of electron – a Dirac fermion – in which the spin motion can be manipulated to transmit information," Liu says. "This is advantageous over traditional electronics because it's faster and you don't have to worry about heat dissipation."

Liu conducted this study with Zhengfei Wang and Zheng Liu, both postdoctoral fellows in materials science and engineering at the University of Utah. The study was funded primarily by the U.S. Department of Energy, with additional support from the U.S. Army Research Laboratory and from the National Science Foundation through the University of Utah's Materials Research Science and Engineering Center.

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STUDENT LIFE

BIOENGINEERING UNDERGRADUATE TAKES THE CROWN

U engineering student Thelina Smith is an all-around superstar: while navigating coursework, internships, student clubs and outreach, this bioengineering undergraduate also reigns as this year's Miss Black Utah USA.

The Miss Black USA Scholarship Pageant began in 1986. The competition rewards academic achievement and leadership by providing scholarship opportunities to its winners.

In August, Smith will travel to Washington, DC for the week-long Miss Black USA Scholarship Pageant competition. Her platform for this competition is "Engineering the Leaders of Tomorrow: Because Tomorrow Matters Today."

One of Smith's main goals for this platform is increasing the number of underrepresented minorities in science, technology, engineering and mathematics (STEM) disciplines.

"When I was in seventh grade, I participated in a STEM achievement program that really ignited a passion for engineering in me," says Smith. "I want others to see how cool engineering is, and get them excited about this subject early on."

While studying bioengineering at the U and minoring in leadership studies, Smith works as a research and development intern at BARD Access Systems, where she conducts material evaluations and failure investigation analyses.

Smith has also established the first chapter of the National Society of Black Engineers at the University of Utah and served as section president for the U's Society of Women Engineers. She recently launched a program with monthly engineering activities for junior high and high school girls and is an ambassador for bioengineering at the U.

Regardless of how she fares in August's competition, this inspiring young woman says she is "truly grateful for this opportunity to encourage our next generation of leaders, innovators and educators."

For more about Thelina, visit:
http://www.MissBlackUtahUSA.com.