

# utah

ENGINEERING



## U DOUBLES GRADS

# U ENGINEERING DOUBLES NUMBER OF GRADUATES

**D**emand for engineers continues to climb along the Wasatch Front. Sparked by former Utah governor Michael Leavitt's challenge in 2000 to double the number of engineering and computer science graduates in the state, the U's College of Engineering continues to grow by leaps and bounds.

In 2013, a record 777 students graduated from the College: 483 were awarded bachelor's degrees, 219 received master's degrees and 75 students earned a doctorate. These latest numbers reflect that the College has risen to the challenge during the past decade.

"The College of Engineering's strengths are reflected in our growing number of graduates, strong externally funded research, and leadership in technology commercialization and innovation," says Richard Brown, dean of the College of Engineering. "With a national interest in increasing the number of engineering and computer science graduates, the University of Utah has been held up as an example of success. Since 1999, we have more than doubled the number of graduates."

With generous support from the state of Utah, private donations and university resources, the College is now in the top 40 engineering schools in degrees awarded, as ranked by the 2012 ASEE profiles, which compares U.S. engineering and technology programs.

In parallel with our growth in student numbers, the College has grown from 100 to 156 faculty members. These faculty members are active in teaching, collaborative research and innovation, as evidenced by the 103 invention disclosures and 19 patents

from the College in 2012. The recently launched Center for Engineering Innovation bolsters the College's ability to transform ideas into products.

The College's push for innovation also ensures U engineering students receive an education that aligns with global needs, with new cutting-edge programs in petroleum engineering and data center engineering launched this fall. A high school engineering course is also being piloted in the state to pique interest in engineering fields and continue to supply the high-achieving students that will go on to become engineers.

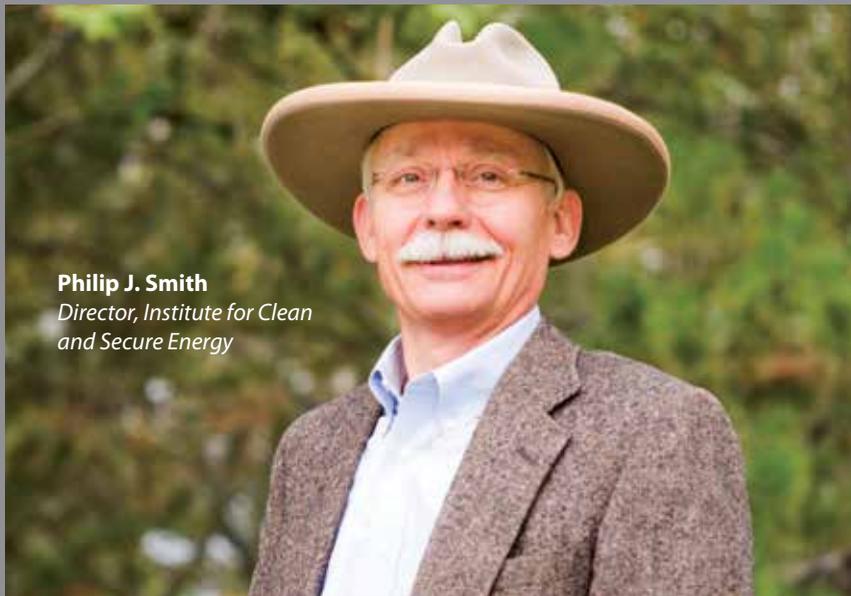
U engineering graduates are making an impact all around the world, but the biggest impact is evident much closer to home. Between 2001 and 2013, employment in Salt Lake City's technology industry grew by 38 percent. According to the Bureau of Labor Statistics, employment in technology-related fields is projected to grow by 29 percent nationwide, adding about 2.1 million new jobs by 2020.

Many U graduates are flourishing in Utah's "Silicon Slopes," a cluster of engineering, information technology and software companies along the Wasatch Front. This cluster includes large companies such as IM Flash, Adobe, ATK and Microsoft, and a plethora of small companies that are bringing innovative ideas to market.

Indeed, experts say engineering is the new liberal arts degree, with potential for impact in business, medicine and law. For students, these are exciting times — at the center of it all, U engineering graduates leave campus prepared to succeed in their careers as researchers, entrepreneurs, policymakers and leaders in their fields.



## U ENGINEERS WIN \$16M PREDICTIVE SCIENCE CENTER



**Philip J. Smith**  
*Director, Institute for Clean  
and Secure Energy*



The College of Engineering was awarded a five-year, \$16 million grant to conduct supercomputer simulations aimed at developing a prototype low-cost, low-emissions coal power plant that could electrify a mid-sized city. The goal of this “predictive science” effort is to help power poor nations while reducing greenhouse emissions in developed ones.

This grant from the Department of Energy’s National Nuclear Security Administration (NNSA) is enabling U researchers Philip J. Smith and Martin Berzins, along with university President David W. Pershing, to establish the Carbon Capture Multidisciplinary Simulation Center.

“This is a very important award for the university, not only because of its size, but because it builds on the strength of our faculty and staff in energy, uncertainty, parallel computing and visualization,” says Pershing, a distinguished professor of chemical engineering. “It will provide critical funding for students to study these topics on some of the world’s largest supercomputers.”

The researchers will use supercomputers to simulate and predict performance for a proposed 350-mega-watt boiler system that burns pulverized coal with pure oxygen rather than air. The design, which never has been built, captures carbon dioxide released during power generation.

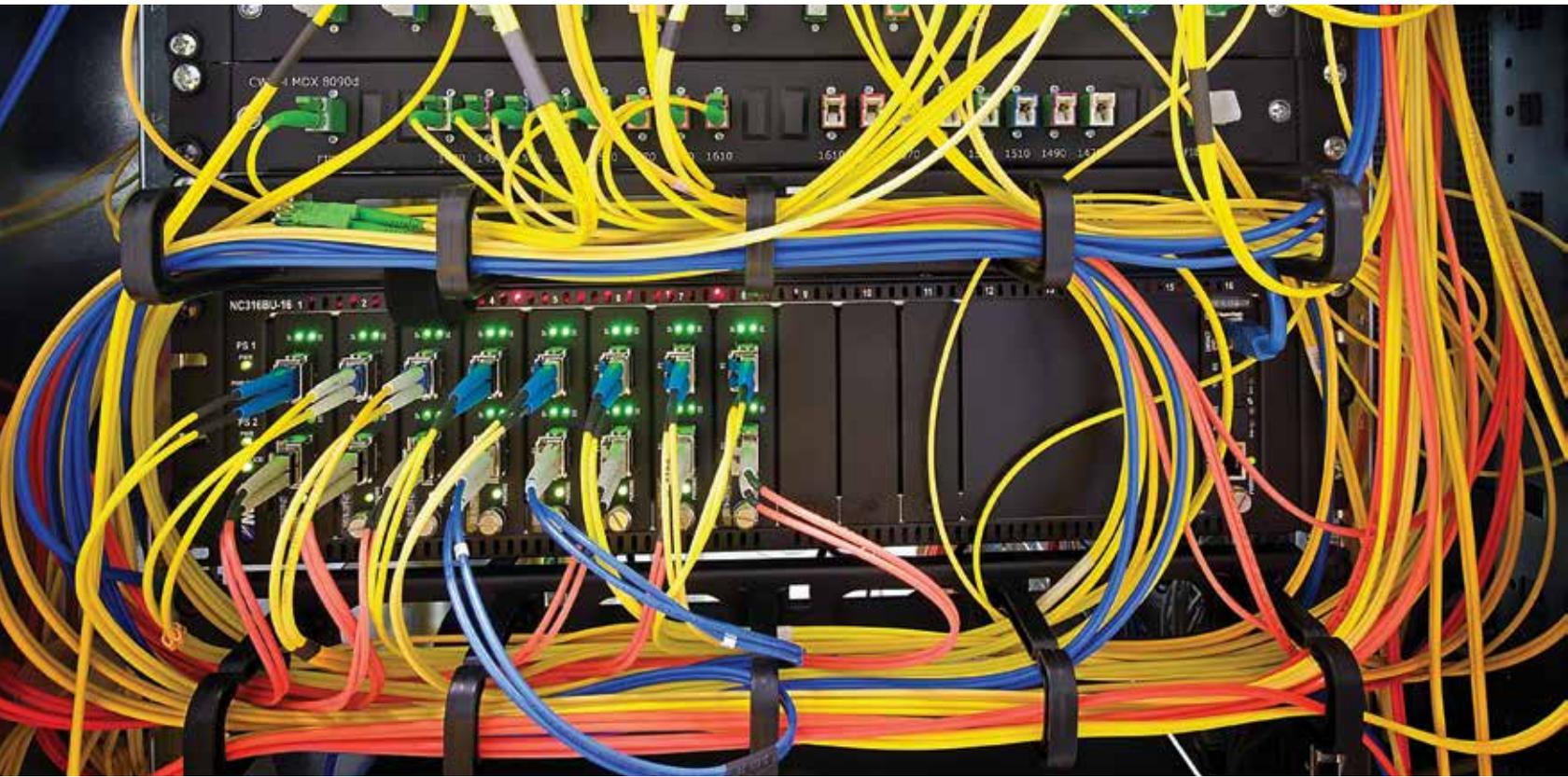
Through computer modeling, researchers will address uncertainties that could arise in building such a power plant. They hope their findings will expedite deployment of clean, economical power to developing nations, where nearly 1.2 billion people lack electricity, and help industrialized nations meet increasingly stringent emissions standards.

Stemming from the ban on nuclear testing, predictive science allows engineers to virtually test and manage nuclear weapons, as well as all-new technologies such as power plants before they are built. This enables officials to check the safety, security and reliability of the U.S. nuclear stockpile and new technologies without physical testing. The majority of the grant will enable students, faculty and staff to develop and run software on Department of Energy supercomputers.

“For perspective, that’s using half a million to 1 million computer processors at once on one problem for several days,” adds Smith, professor of chemical engineering and center director.

This grant builds upon the University of Utah’s experience in predictive science, particularly its previous 13-year effort, also funded by the NNSA, for simulation studies of accidental fires and explosions.

# NEW DATA CENTER ENGINEERING PROGRAM



This fall, the College of Engineering received approval for a new undergraduate certificate program in data center engineering. This program prepares students to design and work in data centers run by government agencies and companies such as eBay, Oracle and Goldman Sachs.

A major challenge for data centers is handling massive amounts of data and storing this information in large-scale facilities. Engineers need to understand how to balance power and temperature regulation with highly concentrated computing infrastructure when operating or managing these facilities.

“This program introduces a new interdisciplinary certificate that will give students at the University of Utah a major competitive advantage in the job market for the growing industry of large-scale data centers,” says Valerio Pascucci, professor of computer science at the U and coordinator of the new

program. “Data centers involve unprecedented concentrations of high-performance computing resources that cannot be managed successfully without combining state-of-the-art computer science practices with modern green technologies to enable truly sustainable operations.”

Drawing on existing coursework in mechanical engineering, electrical engineering and computer science, this new certificate program will provide students with unique skills needed to enter the workforce in data center operations and management.

In addition, students will participate in an internship program in partnership with local companies, providing hands-on experience. This will also lead to employment opportunities for students after graduation. A capstone course on data center design and operation, along with a business course, will also be required in the program.

# GIVING BACK TO THE COLLEGE OF ENGINEERING: JOHN AND JACQUELYN LALONDE

The College of Engineering is pleased to recognize John LaLonde (B.S. computer science, 1989) and his wife Jacquelyn for their ongoing support of the College and students. LaLonde is a College alum and CEO of Abstrax, Inc., a software company focused on automating the ordering and building of customizable or built-to-order products.

“I have always felt a tremendous responsibility to give back to the U because of the incredible value I received in my education,” said LaLonde. “Early in my career I was working with several top universities and realized that there was a culture of giving back that was ingrained in their students far beyond what I experienced. My emphasis now is on helping the College of Engineering to change the culture to where students early on can think about how they can have a role in paving the way for the innovators of tomorrow.”

LaLonde was a member of the first class of software engineers to be incorporated into Motorola Government Electronic Group’s Engineering Training Program. He then joined Motorola’s Artificial Intelligence Lab, where he worked on enhancing a suite of artificial intelligence languages and applied projects internally and with 14 partner research universities.

LaLonde developed the first graphical configurator and step-by-step manufacturing instruction generator for Motorola’s Computer Group. During this time, he collaborated with U computer science faculty member Joseph Zachary to develop the



first electronic classroom with donated state-of-the-art hardware from Motorola. LaLonde serves on the College’s Engineering National Advisory Council.

In 1994, he co-founded Abstrax, Inc. in Tempe, Arizona, where he lives with Jacquelyn and children Misty, Luc and Arianna. In 2011, the LaLonde’s generosity led to a new 1,200-square-foot undergraduate student lounge in the Merrill Engineering Building. They have funded scholarships for women in computer science, and most recently supported the College’s Kennecott renovation project.

“There is no question in my mind that the College of Engineering provides the greatest value and inspires students to not just get a job, but to change the world,” LaLonde adds. “It is one of the true research and educational gems in our country.”

## ARCS<sup>®</sup> Foundation Inc.



The College of Engineering congratulates the 2013–2014 Achievement Rewards for College Scientists (ARCS) Scholars: Matthew Hamilton, Department of Chemical Engineering; Brian Stagg, Department of Ophthalmology; Michelle Hromatka, School of Computing; and Megan Walsh, Department of Civil and Environmental Engineering. Each student received a \$15,000 award, funded by the generous donors and volunteer members of the ARCS Foundation Utah. The ARCS Foundation advances science and technology by providing financial awards to academically outstanding U.S. citizens studying to complete degrees in science, engineering and medical research.

# IN BRIEF

## U Launches Center for Engineering Innovation

The U's Center for Engineering Innovation, which helps researchers transform inventions into ready-to-produce devices, opened its doors this fall. The new center recently held a kickoff featuring a "speed dating" event enabling inventors with new product ideas to meet engineers for 15 minutes and explore bringing concepts to market.

Leveraging Utah Science Technology and Research initiative investments, this unique center makes advanced manufacturing technologies publicly accessible. Housed within the College of Engineering, center staff members collaborate with university faculty to transform ideas into production-ready prototypes. These prototypes then are crafted in university facilities and undergo reliability testing.

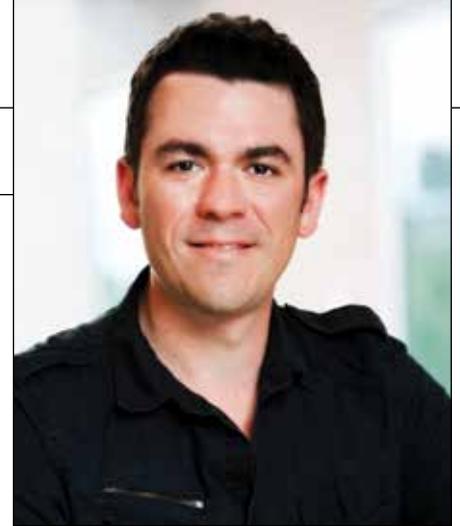
"We're bridging the gap between basic science, engineering innovation and the commercial product," says Florian Solzbacher, center director and an electrical and computer engineering professor at the U. "The U's unique capabilities, coupled with our center, allow us to be more successful in translating technologies into business. There's no other resource like this with a cleanroom, on-site personnel and the knowledge base. We're not just another engineering shop."



## Weiss Receives 2013 van Mow Medal

U bioengineering faculty member Jeff Weiss received the 2013 Van C. Mow Medal from the American Society of Mechanical Engineers (ASME). This highly competitive award is ASME's highest honor for a mid-career bioengineer, and honors an individual who has demonstrated meritorious contributions to the field of bioengineering. This includes research, education, professional development, leadership in the development of the profession, mentorship to young bioengineers, and service to the bioengineering community. Weiss is being honored "for seminal contributions to research in biomechanics related to

fundamental structure-function relationships in musculoskeletal soft tissues, subject-specific modeling of joint mechanics, image-based biomechanics, the mechanics of angiogenesis, and the development and distribution of the FEBio software suite."



## Francoeur Wins NSF CAREER Award

Mathieu Francoeur, assistant professor of mechanical engineering at the U, has received a five-year Faculty Early Career Development (CAREER) award from the National Science Foundation. This \$400,017 grant will allow Francoeur and his group to demonstrate that power generation in a nanoscale-gap thermophotovoltaic device can be enhanced by a factor of 20 to 30, compared to conventional thermophotovoltaic systems, due to radiation heat transfer exceeding the blackbody limit. About 58 percent of the energy consumed annually in the United States is lost to heat. Francoeur says this project is "an important step toward the development of miniature waste heat recovery devices that could be used in personal computers and cell phones."

## Virkar Recognized by American Ceramic Society

This fall, U distinguished professor of materials science and engineering Anil Virkar received the 2013 John Jeppson Award from the American Ceramic Society. Virkar, a member of the National Academy of Engineering, is also a co-founder of several startups including Ceramatec, Materials and Systems Research, and Versa Power Systems. His research interests include ionic and electronic conductors, fuel cells and batteries. The John Jeppson Award honors the ceramics pioneer credited for developing some of the first ceramic grinding wheels. This annual award recognizes distinguished scientific, technical or engineering achievements.

# NEW FACULTY



## **MICHAEL BARBER**

*Department Chair, Civil and Environmental Engineering*

Ph.D., civil engineering, University of Texas, Austin

Research interests: water resources, water quality, impact of bioenergy on water demand



## **ROSS WALKER**

*Electrical and Computer Engineering*

Ph.D., electrical engineering, Stanford University

Research interests: sensors, mixed signal integrated circuits and systems, applied signal processing and machine learning



## **XIAOYUE (CATHY) LIU**

*Civil and Environmental Engineering*

Ph.D., transportation engineering, University of Washington

Research interests: traffic operations, large-scale transportation modeling and simulation, intelligent transportation systems



## **KEUNHAN (KAY) PARK**

*Mechanical Engineering*

Ph.D., mechanical engineering, Georgia Institute of Technology

Research interests: nanoscale heat transfer, scanning probe thermal/optical microscopy, nanomanufacturing



## **MICHAEL HOEPFNER**

*Chemical Engineering*

Ph.D., chemical engineering, University of Michigan

Research interests: scattering structural analysis, deposition and aggregation, heavy petroleum characterization



## **TARA DEANS**

*Bioengineering*

Ph.D., biomedical engineering, Boston University

Research interests: synthetic biology, biomaterials, tissue engineering, cell therapies



## **TAYLOR SPARKS**

*Materials Science and Engineering*

Ph.D., applied physics, Harvard University

Research interests: thermoelectrics, energy materials, data mining, ceramics



## **MICHAEL (SEUNGJU) YU**

*Bioengineering*

Ph.D., polymer science and engineering, University of Massachusetts - Amherst

Research interests: polymers, biomaterials, protein, peptide and tissue engineering, drug delivery

# STUDENT LIFE

## MAKING A CONCRETE IMPACT

Civil engineering major Jem Locquiao (B.S. 2014) broke into undergraduate research by mixing and testing concrete and magnesium oxide blends to lower cement's environmental impact. The project, which she presented at the National Conference on Undergraduate Research, showed Locquiao the right blend is key to everything — in both life and research.

Working with faculty advisor Amanda C. Bordelon in her first major research project, Locquiao sought to lower carbon dioxide emissions in concrete production while increasing concrete's sustainability by incorporating reactive magnesium oxide, or magnesia, filler into conventional cement blends. These blends were then tested for stability and shrinkage, which factor into durability.

"We were attempting to find the right ratio so that the shrinkage properties of cement and the expansive properties of reactive magnesia would balance each other out," Locquiao explains.

Her research pursuits have driven Locquiao into leadership roles for student chapters of the American Society of Civil Engineers, the American Concrete Institute and the Chi Epsilon Civil Engineering Honors Society. It has also propelled her to participate in outreach initiatives, such as Engineering Day and Hi-GEAR (Girl Engineering Abilities Realized) that introduce engineering to young students.



Photo courtesy of Brent Uberty

"I want to keep an interdisciplinary breadth at the core of everything I do," she explains.

Locquiao initially pursued civil engineering to address agricultural challenges, such as food security, facing marginalized groups. Through an International Rescue Committee internship, she has helped refugees integrate into Salt Lake City. However, she is now interested in blending public policy with civil engineering to equalize water access, and hopes to address this topic in graduate school.

"I want to demonstrate how engineering can provide more equitable resource access," Locquiao says. "The civil engineering curriculum at the U is broad — water, structures and the environment — and this has been instilled in me."