

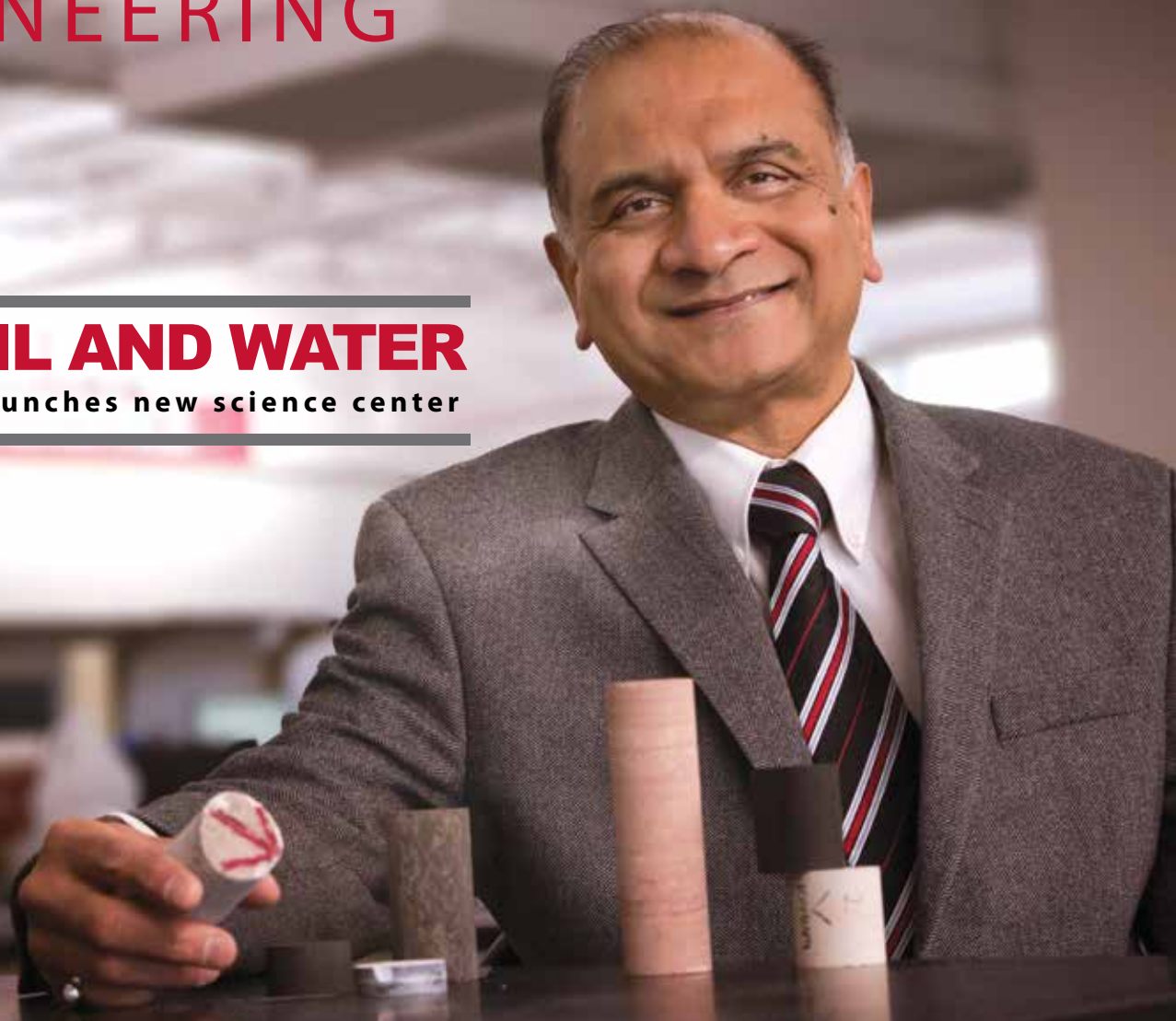


utah

ENGINEERING

LIKE OIL AND WATER

Milind Deo launches new science center



SCIENCE OF OIL AND WATER

Thanks to new technologies in shale oil recovery and hydraulic fracturing, oil production is booming in the United States, from 5.5 million barrels produced per day in 2010 to about 11 million barrels per day this year, according to the U.S. Energy Information Administration.

A key to oil extraction is understanding the science of how fluids like oil and water interact with rock, yet researchers still don't know much about it. That's where the Center for Multi-Scale Fluid-Solid Interactions in Architected and Natural Materials (known for short as, MUSE) will come in. This new center involves researchers from the U's College of Engineering and five other universities and laboratories who will study the interaction between fluids and solids with microscopic pores, or nanopores. The university received a \$10.75 million Energy Frontier Research Center (EFRC) grant from the U.S. Department of Energy — Basic Energy Sciences to establish the center.

"Shale, in which a lot of oil and gas is produced in the U.S., has very complex structures," said U Department of Chemical Engineering Chair Milind Deo, who will be the center's deputy director. "It's difficult to understand what is going on inside them."

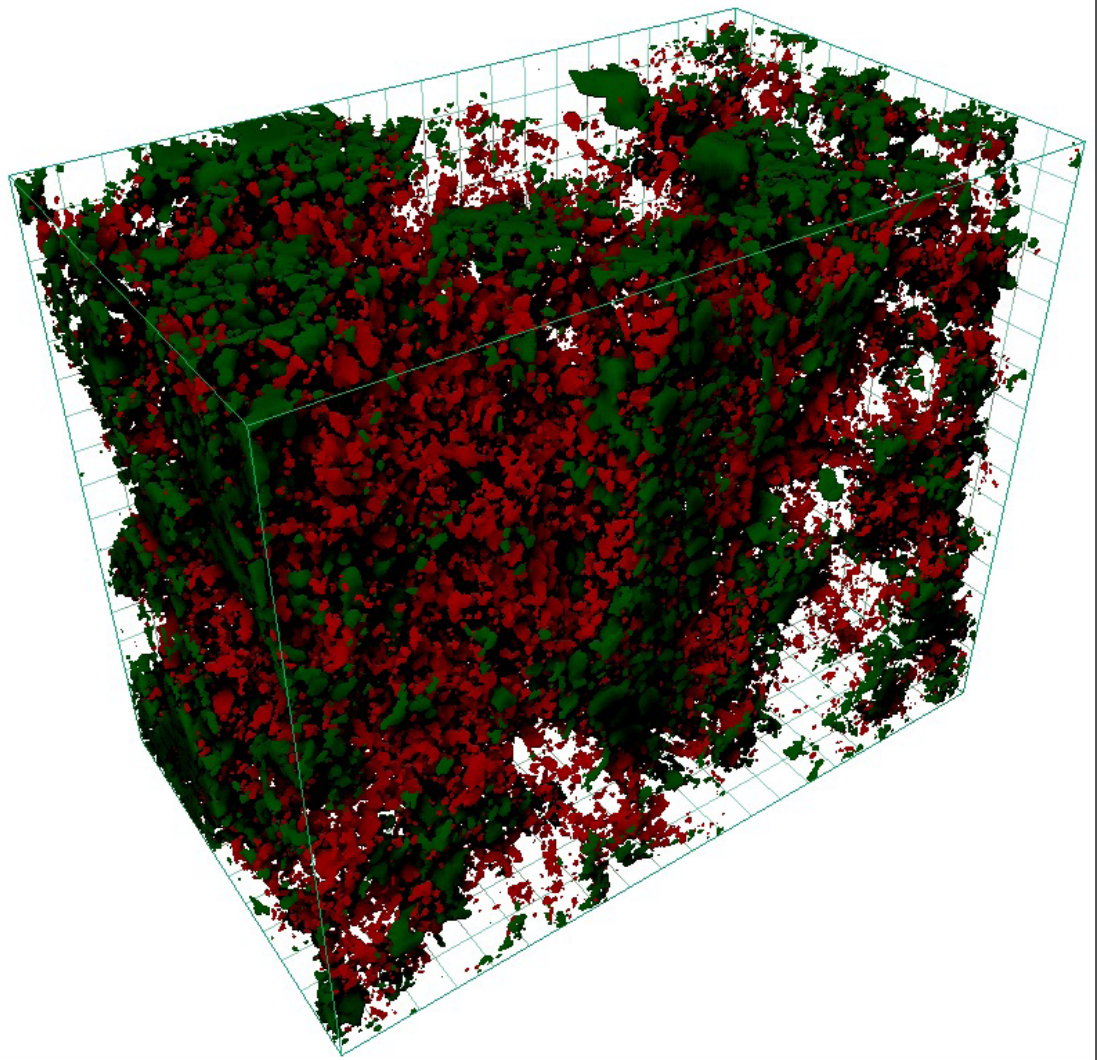
At the center, researchers will be studying "phase transition," the changes between liquid and gaseous states. In a shale oil well, the initial fluid that is extracted is a mixture of oil and natural gas. While removing the oil from the ground, the gas is separated and sometimes compressed and sold. But in many cases, it is also ignited into the atmosphere after separation, known as "gas flaring." If the laws that govern the release of this gas from the oil in shales are better understood, oil companies could develop more efficient procedures.

"It will help them operate the wells better in terms of the flow rates, how the oil is produced, or the pressures at which the oil is produced," Deo said. That could result in less gas flaring which would be much better for the environment, he added.

Researchers will also be studying the scientific laws regarding hydraulic fracturing, the process of injecting water into subterranean rock at high pressure in order to create underground cracks. One of the downsides of this method is that most of the water — as much as 80 percent — disappears into the ground after it's used. Research in how water interacts with the rock can help companies use less water, better manage the water they do use, and learn where most of the water goes after the process.



Natural geomaterials like shales are complex, with different pore systems. Organic and inorganic pore systems are shown in this image.



This research will not only improve oil recovery, Deo said, but also all applications involving the interaction of fluids with nanopores, such as membranes used to separate gas and liquid mixtures. Sensor technology will be an important part of the project. To test their work, the center will synthesize materials that are representative of the geomaterials they will be studying so that important phenomena that occur in pores are reproduced reliably.

The MUSE Center will be a multidisciplinary effort involving researchers from the U's departments of chemical engineering, civil and environmental engineering, mechanical engineering, chemistry, metallurgical engineering, and the U's Energy & Geoscience Institute. It will also include personnel from the Idaho National Laboratory; Pennsylvania State University; University of California, Davis; University of Wisconsin-Madison; and the University of Wyoming. University of Utah College of Mines and Earth Sciences Dean Darryl Butt will be the center director, and it will be mostly staffed by faculty from the College of Engineering, including chemical engineering members Deo, Michael Hoepfner, Jules Magda, John McLennan, Swomitra Mohanty, and James Sutherland. Brian McPherson from the U's Department of Civil and Environmental Engineering and Pania Newell from the Department of Mechanical Engineering also will work in the center.

"Oil shale is a very large resource, and it is going to be around for the next several decades," Deo said about the need for this center. "As oil companies go into the next phase of production with new technologies, the science we are going to develop will definitely help."

The MUSE Center will create synthetic geomaterials like the one shown below to perform its tests on.



CS ALUMNI INDUCTED

University of Utah computer science luminaries such as Ivan Sutherland, Ed Catmull and John Warnock were among eight U alumni who were honored as the first inductees into the ACM SIGGRAPH Academy. The group named 52 inductees in all.

The inaugural group of inductees were announced Aug. 13 during SIGGRAPH's North American conference in Vancouver. ACM SIGGRAPH is an international organization of researchers, artists, developers, filmmakers, scientists, and business professionals in computer graphics and interactive techniques.

The new academy was formed to "shine a light on those individuals — researchers, practitioners, technologists, artists, designers, and educators — whose work is influential and who are having a direct impact on the field as proven through the development of new research or innovations in computer graphics and interactive techniques." Each year, a selection committee will elect five to eight new members to the academy.

Most of the eight University of Utah alumni named to the academy were part of the computer science department's celebrated "Camelot" era of the late 1960s and early 1970s in which a renowned group of students made revolutionary strides in computer graphics in areas of animation, rendering, hardware, education and virtual reality. Many of them produced new technologies that have greatly impacted our world today including productivity software, computer animation for movies and software to recreate lifelike objects.

To the right is a list of the alumni honored, the degrees they received at the U, and a description from SIGGRAPH on why they were included in the academy.

IVAN SUTHERLAND — For Sketchpad and for providing a vision for computer graphics that has sustained the field.

ED CATMULL (B.S., 1969; Ph.D., 1974) — For outstanding creative contributions as an individual researcher, for inspirational leadership, organizational direction and mentorship.

JAMES BLINN (Ph.D., 1978) — For pioneering work in rendering and educational animation, and for exemplary contributions as an author.

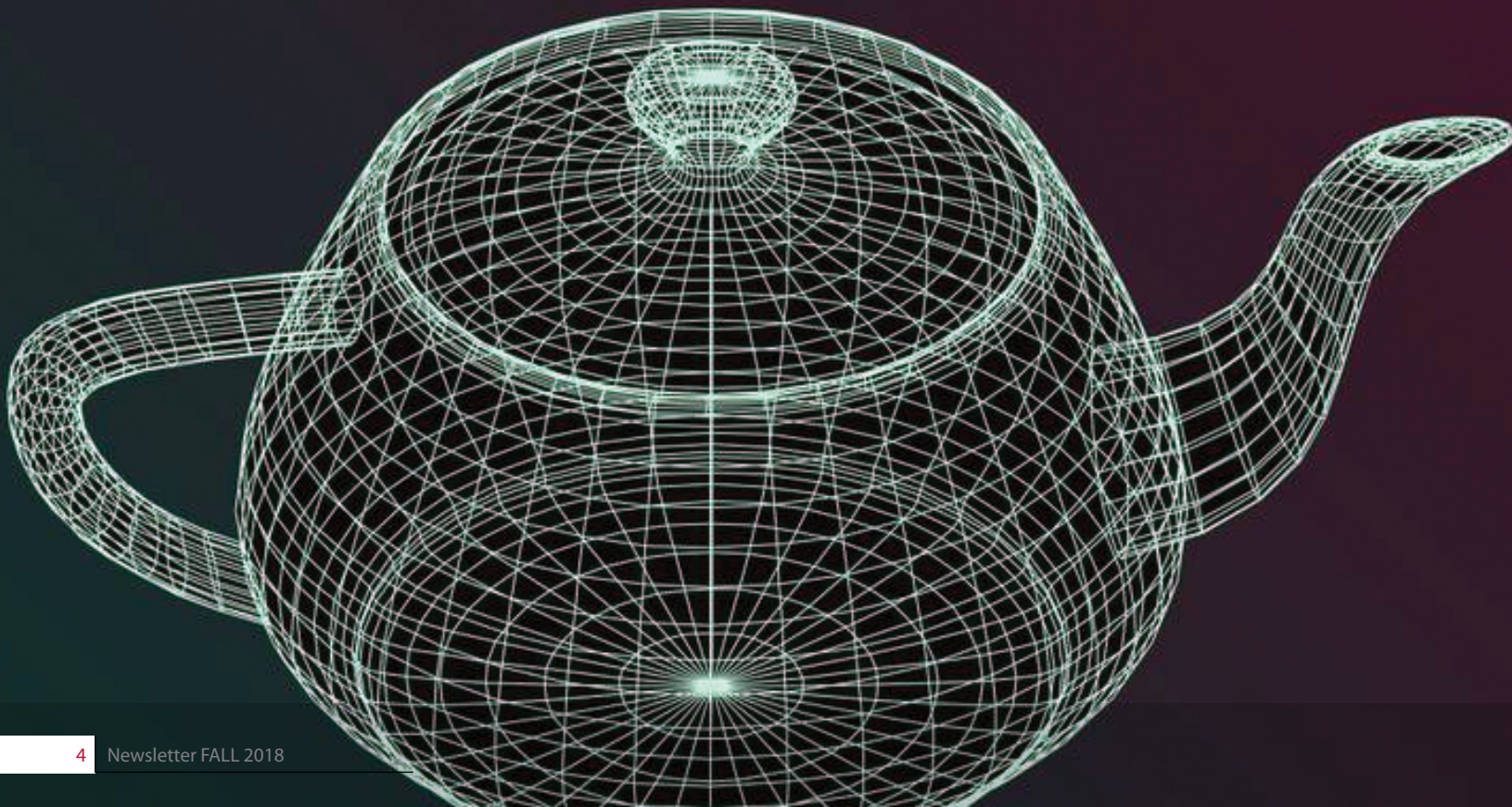
JAMES KAJIYA (B.S./M.S., 1977; Ph.D., 1979) — For numerous pioneering technical contributions to rendering, and computer graphics hardware design.

HENRY FUCHS (Ph.D., 1975) — For contributions to augmented and virtual reality, telepresence and graphics hardware, and for educating the leaders in the field of computer graphics.

JAMES CLARK (Ph.D., 1974) — For the development of the "Geometry Engine."

JOHN WARNOCK (B.S., 1961; M.S., 1964; Ph.D., 1969) — For PostScript, which embodies a major contribution to imaging models, and to integration of graphics and text.

MICHAEL COHEN (Ph.D., 1992) — For the development of practical radiosity methods for realistic image synthesis.



ALUMNA SPOTLIGHT

AURORA TAYLOR-ROJAS

For University of Utah electrical and computer engineering alumna, Aurora Taylor-Rojas, the journey from co-op to Vice President of Engineering at L3 Technologies involved equal parts hard work and having valuable mentors.

Taylor-Rojas was recently named VP of L3's Broadband Communications Sector and oversees more than a thousand engineers in its Salt Lake City office as well as campuses in San Diego and Melbourne, Florida. As the VP, she manages a diverse and creative team of engineers that architect and design communication systems for the Department of Defense.

It's a remarkable ascent considering Taylor-Rojas — a native of Mexico — was one of five children who started their life in the U.S. riding in the family car from Durango, Mexico, to Provo, Utah, so their single mother could work for IBM as a translator.

After bouncing back and forth between Utah and Mexico growing up, Taylor-Rojas decided to attend the University of Utah to become a special education teacher. At one point, though, a combination of personal and financial challenges had her considering the possibility of dropping out of college.

Instead, a change in her major and some advice from mentors put her on a new trajectory. She took a physics course, and the professor encouraged her to consider engineering. "You have a mind for engineering and problem solving," she remembered him saying to her.

It was a life-changing decision. With a new passion in a different track and the guidance of some helpful professors, Taylor-Rojas would earn both bachelor's and master's degrees in electrical engineering at the U.

Taylor-Rojas started at L3 Technologies in 1994, first as a co-op (cooperative education), then hired on as a full-time engineer in the radio-frequency design group. From there, her rise in the company over 24 years was consistent. She took on various roles in the company such as Project Engineer, Manager for the Advanced Communications and Modem design group, Director of Hardware Development and Director of Systems Engineering before being named Vice President of Engineering.

"I feel incredibly privileged, humbled and fortunate to have the career that I have here at L3 Technologies," she said.

But in addition to a handful of important mentors in her education and professional career, Taylor-Rojas said hard work was also a key component to her success.

"There are two things my mother instilled in us: hard work and the absolute importance of going to college. I've always worked incredibly hard," she said.

Her advice to others is simple: "Step up and take the hard assignments, take risks and work hard," she said. "Your work will speak for itself. And always surround yourself with the smartest people you know and people that challenge you and help you grow."



IN BRIEF

GALE NAMED ME CHAIR

University of Utah professor Bruce Gale has become the new chair of the U's Department of Mechanical Engineering, replacing outgoing chair, Tim Ameel.

Gale specializes in collaborative research that combines engineering and medicine and is well known for his work on microfluidic devices for medical applications. He has developed a range of particle and cell separation instruments, advanced diagnostics, drug discovery platforms and medical devices.

He is the director of the State of Utah Center of Excellence for Biomedical Microfluidics, co-founder of the Manufacturing Extension Partnership Center (MEP), has served as director of the College of Engineering Nanofab for the past five years, and has been chair of the University Conflict of Interest Committee for nine years.

Under his leadership, the rapidly-growing Department of Mechanical Engineering will amplify its internationally-recognized research and produce world-class students ready to lead the next generation of innovation, he said.



KASERA APPOINTED NEW ASSOCIATE DEAN

The University of Utah College of Engineering announced the appointment of School of Computing professor Sneha Kasera as the college's new associate dean for academic affairs. He replaces former associate dean Ajay Nahata.

As head of academic affairs, Kasera develops, administers, and promotes student programs and manages outreach and diversity staff.

He received his doctorate in computer science from the University of Massachusetts and was a member of the technical staff for Bell Labs Research, Lucent Technologies in New Jersey. He later joined the University of Utah as an assistant professor in the School of Computing in 2003. He became an associate professor in 2009 and a professor in 2015.

Kasera's research interests include computer networks and systems encompassing mobile and pervasive systems and wireless networks; network security, privacy and reliability; Internet of things; crowdsourcing; dynamic spectrum access; software-defined radios and networks; network resource management; network measurements; and modeling.

In 2017, Kasera launched the Master of Software Development (MSD) program at the U, a unique and rigorous 40-credit-hour curriculum geared for people with no computer science or related degree.

CS RESEARCHER NAMED U PROVOST

Daniel Reed, a computer science researcher who was former vice president of research with the University of Iowa as well as corporate vice president of Microsoft, was named the University of Utah's new senior vice president for academic affairs.

Reed received both a master's and doctorate degree in computer science from Purdue University. His research has focused on the design and construction of high-performance computers and software for areas such as quantum physics, astrophysics and galaxy formation, genetics and genome-wide association studies, civil engineering and earthquake resilience, real-time weather prediction, hurricane storm surge modeling for coastal regions, and wireless spectrum management.

"I cannot remember a time when I did not find science and engineering exciting," he said. "It was a childhood fascination as I built experimental devices and took others apart to see how they worked."

Reed has been involved in countless research collaborations, including with the National Science Foundation, Department of Energy, Los Alamos Computer Science Institute and more. He was head of the computer science department at the University of Illinois and vice-chancellor for Information Technology and director of the Renaissance Computing Institute at the University of North Carolina. He then worked for Microsoft where he built a research-and-development team to design and test prototypes for next-generation cloud data centers. After five years at Microsoft, he returned to academia to oversee campus research, technology transfer, and economic development at the University of Iowa. He joined the U in July and is excited about working with the College of Engineering.



"Among its many attributes, the U has great strengths in engineering, science, and biomedicine," he said. "In computing, it also has a rich history in computer graphics, networking, and computational science."

"I have been impressed by the growth of the College of Engineering and by several of its internationally-recognized research projects," he added. "The number of experiential education opportunities also excites me – there is nothing like putting ideas into practice to understand where theory meets reality."

COLLEGE WELCOMES ASEE



Last June, the University of Utah's College of Engineering was the proud host of the 125th American Society for Engineering Education Annual Conference & Exposition at the Salt Palace Convention Center in Salt Lake City, Utah. More than 4,300 attendees arrived to participate in hundreds of technical sessions, campus tours, socials, exhibit areas and a pavilion of student projects.

The College of Engineering also showed off its booth in the exhibit hall, which included interactive demonstrations with virtual reality games and applications as well as a prosthetic arm that operates with a neural interface. Attendees who visited the booth also had the opportunity to win a free portable weather sensor designed and built by U electrical and computer engineering students.

At the conclusion of the four-day conference, the College of Engineering hosted a successful Engineering Commercialization Workshop with information about how to commercialize research discoveries. Topics during the one-day workshop included building an entrepreneurial ecosystem, the relationship between research and entrepreneurship, an engineering entrepreneurship curriculum, managing conflicts of interest, and the dangers and pitfalls of commercialization. The day also included a tour of the university's Lassonde Studios, a live-in space and hub for student entrepreneurship and innovation.

It was a wildly successful week and an invaluable experience for all engineering educators who attended the conference and workshop. Next year's event will be held June 15 – 19 in Tampa, Fla.

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STUDENT LIFE

BRENDA PAYAN

Brenda Payan was nervous about leaving her rural hometown of Price, Utah, to attend the University of Utah. She didn't know what to expect about living in a big city or going to a major university.

Then she discovered ACCESS, a U program for women in science, engineering and mathematics. The summer experience provides incoming female students with a scholarship and an opportunity to work with mentors on campus to help prepare them for their college years.

"I was really reserved when I came to the university," said Payan, who is now a sophomore in biomedical engineering. "I didn't think I would know how to work with the resources available here as a student. But as an ACCESS student, the program really helped me break out more."

The ACCESS program launched in 1992 under the university's College of Science and began accepting engineering students for the first time in 2017, said engineering associate instructor Stacy Firth.

"The idea of the program is to create a cohort of women students. They come and live on campus one summer and study together under an interdisciplinary course," Firth said. "It's really an important program."

For the summer semester, students engage in projects in engineering, chemistry, biology, physics, and math. Then they are given the opportunity to work with mentors in the fall semester of their first year of college and in a research lab during their spring semester.

Payan liked her experience in the program so much, she became a teacher's assistant for ACCESS the following summer.



"It gives you a sense of community," she said. "All of the people in the ACCESS program are in science or engineering so it's comforting to have people who are going through the same things."

Today, Payan is working in a research lab that is focused on genetic editing, but she isn't sure where her biomedical engineering studies will ultimately take her. "I might go into research because I really like the lab I'm working in right now," she said.

The first in her family to attend college, the 19-year-old student said she's embraced university life thanks to the ACCESS mentors who guided her as well as the encouragement she received from College of Engineering Dean Richard B. Brown, whom she met her first year in school.

"The ACCESS program helped me form the connections I needed, including with the dean," she said. "It really takes students seriously."