

THE UNIVERSITY OF UTAH COLLEGE OF ENGINEERING

RESEARCH REPORT | 2016





From the Dean

William Yeats once wrote, “We are happy when we are growing.” If true, then I am very happy to report that the College of Engineering is growing by leaps and bounds! In 1999, the College graduated 366 students. In 2015, we were thrilled to graduate 876. Thanks to the visionary support of the State of Utah and the University of Utah administration, and with the hard work of our faculty and staff, this year’s graduating class was the largest in the 125-year history of the College with more than 900 students. And we have every intention and expectation of continuing to grow the number of graduates.

A state senator once asked whether we needed to compromise student quality in order to grow the student body. Quite the opposite is true. The average ACT score of our freshman class has gone up two full points during the past 12 years, and the average credentials of the students who accepted direct admission into the College are an ACT score of 30.5 and a high school GPA of 3.9.

Twelve years ago, only 7 percent of the U’s incoming students indicated an interest in the disciplines of the College of Engineering; that number has now more than doubled to 16 percent. The demographics of our student body are also becoming more diverse. The percentage of women among first-year students has gone from 11 to 25 percent of our student body in the past 12 years, and minority students have gone from 10 to 31 percent.

The College of Engineering is moving to a higher level not only in the number and quality of graduates, but also in the quality, quantity and impact of our research. In FY 2003, we had \$29 million of externally-funded research expenditures; last year, there was more than \$80 million in engineering research at the U, and the number of scholarly publications and patents has grown commensurately. The number of doctorates awarded has increased from 36 to 80 per year with that increased research funding. I commend our faculty and graduate students for the tremendous growth in research and scholarship that they have brought about in the College.

As you will see in this year’s report, the College welcomed 22 new tenure-track faculty members, with additional offers still pending. Our faculty members have also been involved in commercializing the inventions from their labs; since 2006, the College of Engineering has spun out 55 companies, 45 of which are still in operation. In all of these ways, we disseminate the fruits of our research for the benefit of society and the world.

Richard B. Brown
DEAN, COLLEGE OF ENGINEERING

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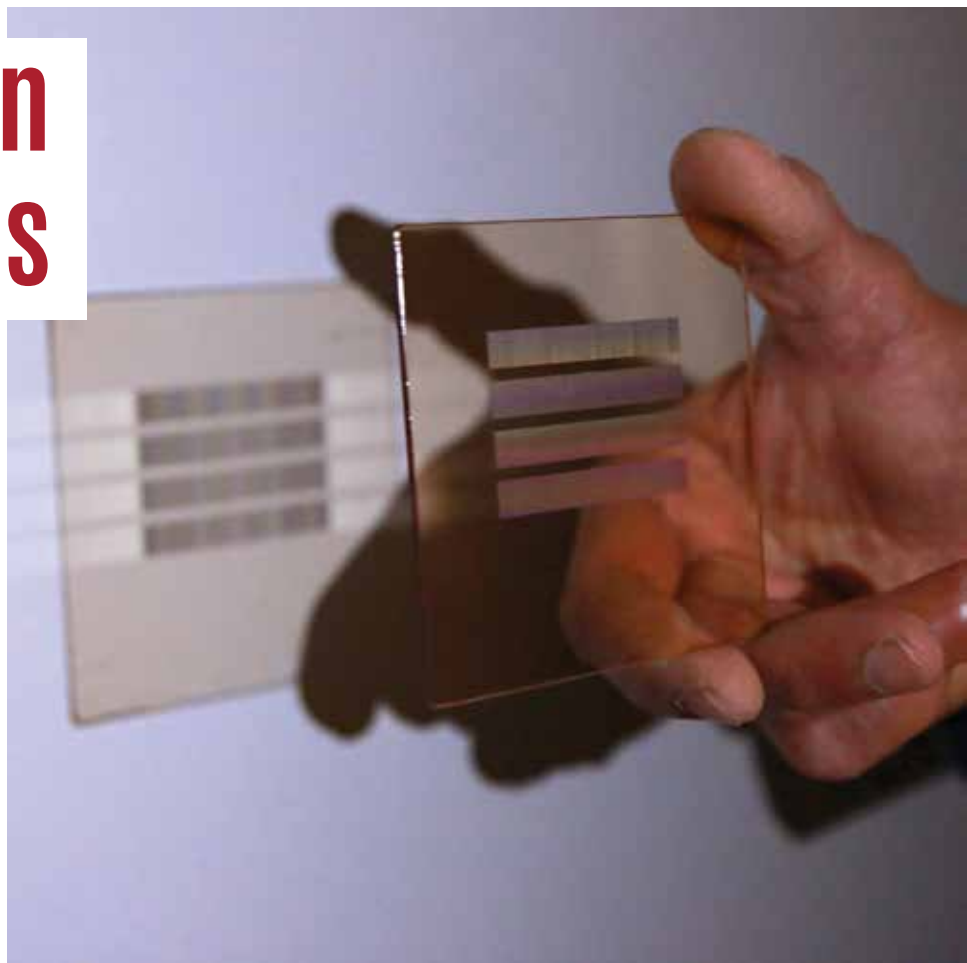
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Flat ultrathin camera lens

Researchers have always thought that flat, ultrathin optical lenses for cameras or other devices were impossible because of the way all the colors of light must bend through them. But University of Utah electrical and computer engineering professor Rajesh Menon and his team have developed a new method of creating optics that are flat and thin yet can still perform the function of bending light to a single point, the basic step in producing an image. The result is a flat lens that can be 10 times thinner than the width of a human hair or millions of times thinner than a camera lens today, creating new design possibilities for smartphones and eyeglasses.



Bias in Algorithms

Can something as impersonal and exacting as a computer algorithm be biased? University of Utah School of Computing associate professor Suresh Venkatasubramanian is part of a research team that believes it's possible. The team has developed software that can determine if a program, such as those used for hiring employees or handing out housing loans, can be biased. And if it is, they have devised an easy fix.



Bright idea for photography

Everyone knows it can be difficult to produce a crisp, vibrant photo taken in low light. But University of Utah electrical and computer engineering professor Rajesh Menon and his team have developed a new camera color filter that lets in three times more light than conventional filters, resulting in much cleaner, more accurate pictures taken in low light. The new filter can be used for any kind of digital camera, but Menon is developing it specifically for smartphone cameras.

Scanning the Brain

Valerio Pascucci, a professor in the University of Utah's School of Computing and director of the university's Center for Extreme Data Management Analysis and Visualization, has developed software that maps out a monkey's brain and more easily creates a 3-D model of it, providing a more complete picture of how the brain is wired. Getting an accurate view of the brain's network of neurons can help medical researchers understand how the brain's connectivity is disrupted in mental and neurological conditions such as schizophrenia, depression, anxiety and autism.

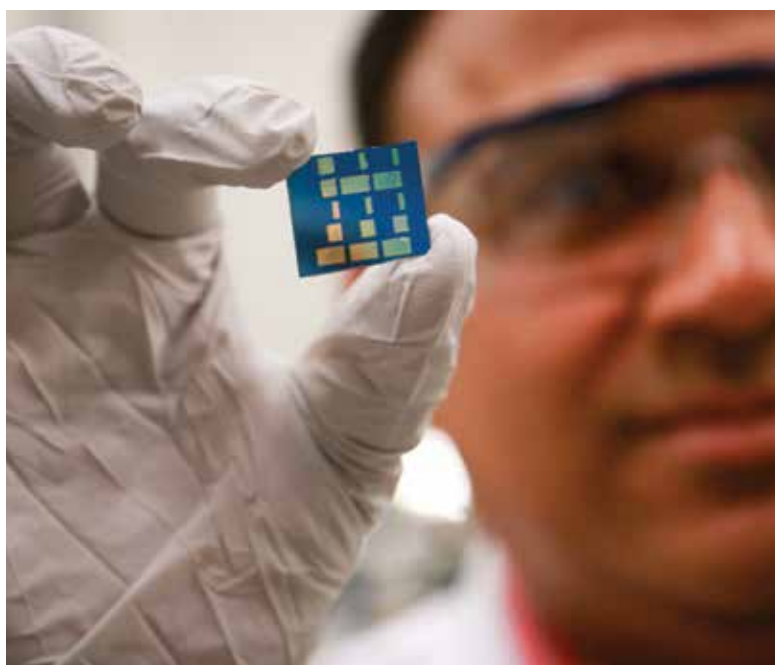


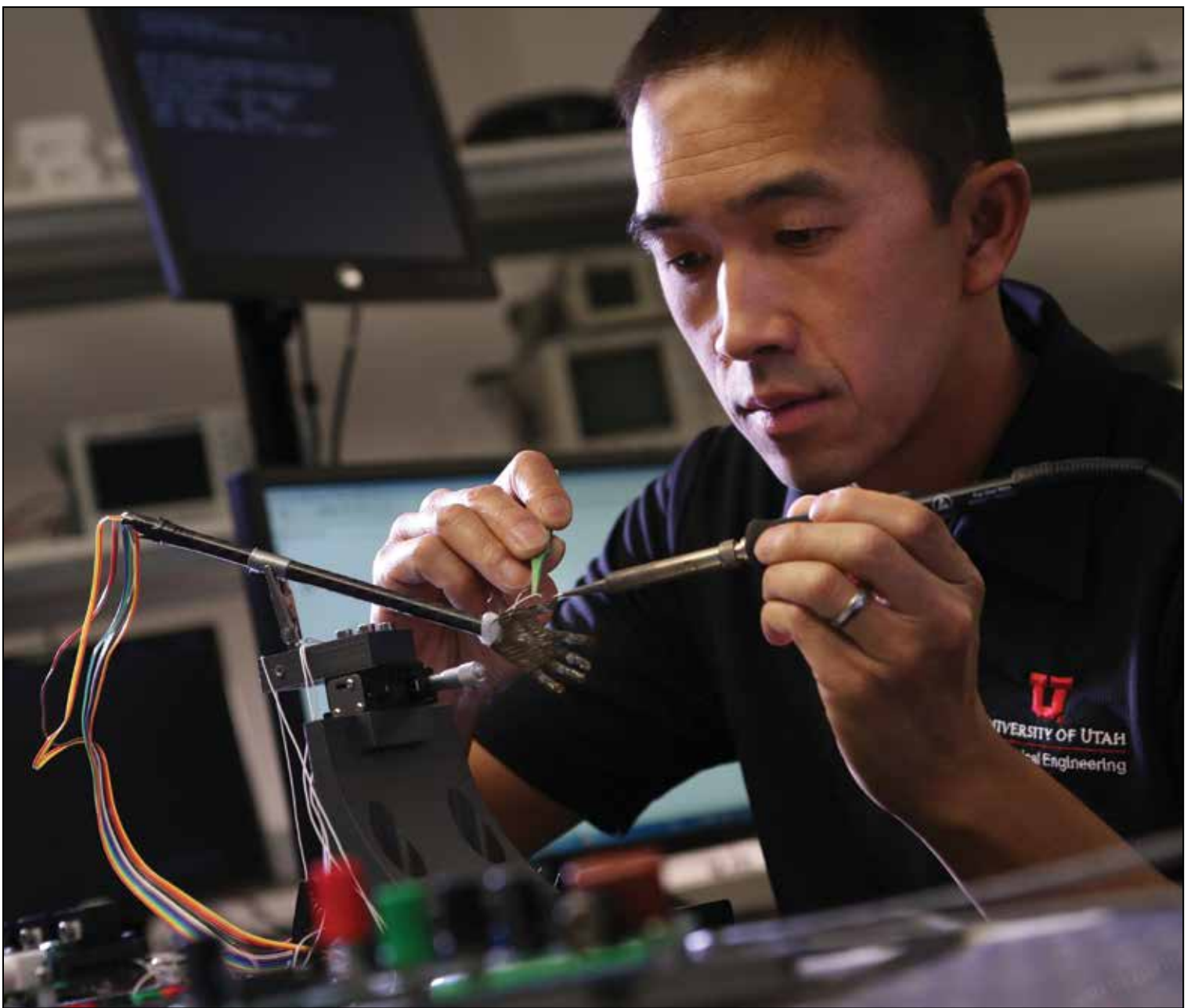
Detecting Dangerous Fuel

Alkane fuel is highly combustible and found in things like gasoline, airplane fuel, even a home-made bomb. But since it's odorless and colorless, it's difficult to detect. University of Utah materials science and engineering professor Ling Zang has developed a new kind of fiber material for a portable scanner that can detect alkane fuel vapor, a valuable advancement that could be an early-warning signal for leaks in an oil pipeline, an airliner, or for locating a terrorist's explosive.

Material Magic

University of Utah materials science and engineering associate professor Ashutosh Tiwari has discovered a new 2D material for semiconductors that allows electrical charges to move through it much faster than conventional 3D material such as silicon. When developed for transistors, this material could lead to computers and smartphones that are more than 100 times faster than regular devices while also consuming a lot less power and producing less heat.





soft ROBOTICS

Mechanical engineering associate professor Kam Leang envisions a better robot made of just one material that moves without the use of motors and gears. And he won't have to build it — he'll just make it with a 3D printer.

It sounds like the stuff of science fiction. But Kam Leang's research into "soft robotics" — in which robots made of soft polymers can move without motors — is quickly turning into science fact.

The University of Utah mechanical engineering associate professor has been developing new ways to create moveable objects from a special polymer called Nafion that deforms and changes shape when you stimulate it with electricity. Think of this material moving much the same way as our muscles contract or move when they receive electrical impulses from the brain.

"We're looking at alternatives to creating the traditional robot but making it more bio-inspired, more synthetic. It mimics what biological systems really are," says Leang.

Since his graduate school days, Leang has been studying the use of ceramic as a smart material, figuring out how he can manipulate it in microscopic movements so it can perform tasks at the nanoscale. Recently, however, he discovered another material — Nafion by the chemical company, DuPont — that can move by just hooking electrodes to it. Typically, Nafion is sold in sheets that look and bend like semi-clear plastic transparencies and are used as membranes for fuel cells. But when immersed in water, Nafion can move like a muscle.

"When you soak it in water it absorbs like a sponge," he explains. "If you put an electrical field across it like a battery, the electrical field causes the ions in the polymer to move, and when they move, they bring the water with them to one side and you cause differential swelling. One side swells and the other doesn't, which causes it to bend."

With just a small sheet of this material, Leang and his team created a fin that propelled a robotic fish.

It didn't require any motors, just a small battery that fed the fin electrical impulses, causing it to bend back and forth. But Leang is taking it further. His team has received a National Science Foundation grant to find new ways to manufacture objects out of Nafion. The researchers built a 3D printer that can create movable objects out of the material.

"Now you're able to build soft robotic structures like a soft robotic hand," he says. So that's what they did. The researchers printed a small hand with no motors, wires or gears yet can move via electrodes.

With this technology, the applications could be limitless, Leang says. Prosthetics that function like real human limbs could be produced for amputees. Soft robots could replace certain stiff metallic machines for more delicate tasks such as working with physical-therapy patients. He also envisions smart materials being used in medicine for devices such as special catheters that need to bend and move as they navigate through the human body. Leang also is working with the U.S. Navy's Office of Naval Research on developing a possible propulsion system for ships and submarines that works like a flipper (and the robotic fish he created). Such a system would not require motors and would use much less energy than fuel-powered propellers. Most importantly, this form of propulsion would be completely silent.

Best of all, Leang believes one day we could just print out the skeleton of a robot and it would immediately begin to work since there are no separate moving parts and no assembly.

"This is our goal: You have a 3D printer. You push the print button. It's done, and a little robot walks out of the printer, fully printed," he imagines. "Why is that important? Because you're literally creating this moving object, and you've done it in a way that makes it easier for the user to create."

it's in the **AIR**



student working with University of Utah chemical engineering assistant professor Kerry E. Kelly received a firsthand lesson in why Kelly is designing and building affordable air-quality sensors for the home.

"He had one of these in his house," she said, pointing to one of the prototype sensors she had built, "and every evening he was seeing [particulate matter] levels go up by a factor of 10. So something was not right. It turned out to be his dryer. It wasn't venting outside, but inside, and there was all this lint and material floating around in the air in his house."

That's why Kelly is designing and testing these sensors, dubbed "AirU." It's important to "take ownership of the air quality around you," she says.

For more than a year, Kelly and U chemical engineering assistant professor (lecturer) Tony Butterfield have been building prototypes for a low-cost sensor that can detect particulate matter and other harmful pollutants in the air. What they have developed — and are still refining — is a small box that can be placed inside or outside a building or home that can read the

temperature, humidity, as well as levels of carbon monoxide, nitrogen dioxide and particulate matter in three varying sizes — PM1, PM2.5 and PM10 (particulate matter, or PM, is a measure of particles in the air). It also has a GPS receiver and will contain a Wi-Fi adapter that will upload data to a central web server.

To produce the AirU box as cheaply as possible, the group — which also includes U electrical and computer engineering student Jonathan Whitaker and some of the university's chemical engineering students — installed a Beagle Bone Black (a small low-cost computer for hobbyists) and off-the-shelf air-quality sensors. Their goal is to ultimately produce a full sensor for \$150 or less. In comparison, professional pollution monitors can cost tens of thousand of dollars each.





But building the sensors is only half of her project. Kelly also wants to deploy as many as 50 of her sensors in public schools in Salt Lake County this fall to create a network that can monitor the pollution levels in Utah's largest metropolitan area in real time.

Each box continually takes measurements of the air and creates an average every minute. Every 20 minutes, the data is uploaded to a central website created by students from the U's School of Computing. The data then can be accessed by researchers and users of the sensor via a web browser or mobile app. Currently, Utah's Division of Air Quality only has about a half dozen professional air-quality sensors throughout the valley, Kelly says, so more sensors spread out over the same area can give

researchers a better idea of where pollution hotspots are.

Meanwhile, people who place a sensor in their home can get a better understanding of the air they breathe even when they are not outside. Ideally, Kelly and her team would like to make these sensors commercially available.

"Air — especially particulate matter — is the big driver for health effects," Kelly says. "Understanding your personal exposure is important for you, for kids and their development, for older people and for people with compromised immune systems. This sensor is just one in an array of tools we can use to help drive down our pollution levels."

A photograph of two men in blue shirts smiling outdoors. The man on the left is in the foreground, looking towards the camera with a slight smile. The man on the right is partially visible, also smiling. The background is a blurred green landscape. A large, dark brown circular graphic is overlaid on the top left, containing the text 'CATCH SOME rays'.

CATCH SOME rays



ike Scarpulla is shining new light on solar panel technology.

The University of Utah materials science and engineering associate professor has been researching how to improve the efficiency of solar cells by utilizing the compound semiconductor cadmium telluride (CdTe), a promising material that can improve solar panel technology.

“The solar industry these days is completely different than it was five years ago, even three years ago,” says Scarpulla, who also is an associate professor in electrical and computer engineering. “It’s moving so fast right now. We’re making so many advances now in the technology, and prices have been cut in half.”

More than 90 percent of today’s solar panels use thick wafers of silicon as the semiconductor material that converts sunlight to energy. However, using CdTe allows the solar cells to be much thinner and more easily manufactured while achieving the same energy conversion efficiency. Cadmium telluride cells also perform better under hotter conditions than silicon.

“You can use a lot less material to do the same job,” Scarpulla explains. “When the cells are thinner, you can have lower material quality and still get the electrical power out. This, in turn, allows easier manufacturing.”

Scarpulla also is researching a new way to improve the performance of CdTe while also lowering its cost.

First, he and his research group are developing ways to use lasers to change the composition or improve the quality of the cadmium telluride that is deposited directly on sheets of glass to produce thin-film solar panels.

Traditional solar panels are made from semiconductor wafers that are produced by melting and

then slowly cooling silicon. Then tens of individual solar cells are assembled to make a solar panel, which takes energy and time. One of the advantages of using CdTe is that a thin film of the material can be coated on the whole panel at once from a vapor.

Meanwhile, Scarpulla’s most recent work involves a new theory — which he recently published along with senior scientist Kirstin Alberi of the National Renewable Energy Laboratory in Golden, Colorado — in which they discovered that adding light during the manufacturing of semiconductors can reduce defects, potentially leading to more efficient solar cells and brighter LEDs. Their theory applies to all semiconductors but is especially exciting for compound semiconductors such as gallium arsenide (GaAs) and CdTe.

Compound semiconductors are composed of two or more chemical elements, which makes them more susceptible to defects when the material is processed at high temperatures. The two discovered that the extra electrons excited by adding light while at high temperature can stamp out some defects. This could lead to LED light bulbs that consume less power and thin-film solar panels that are more efficient at creating electricity.

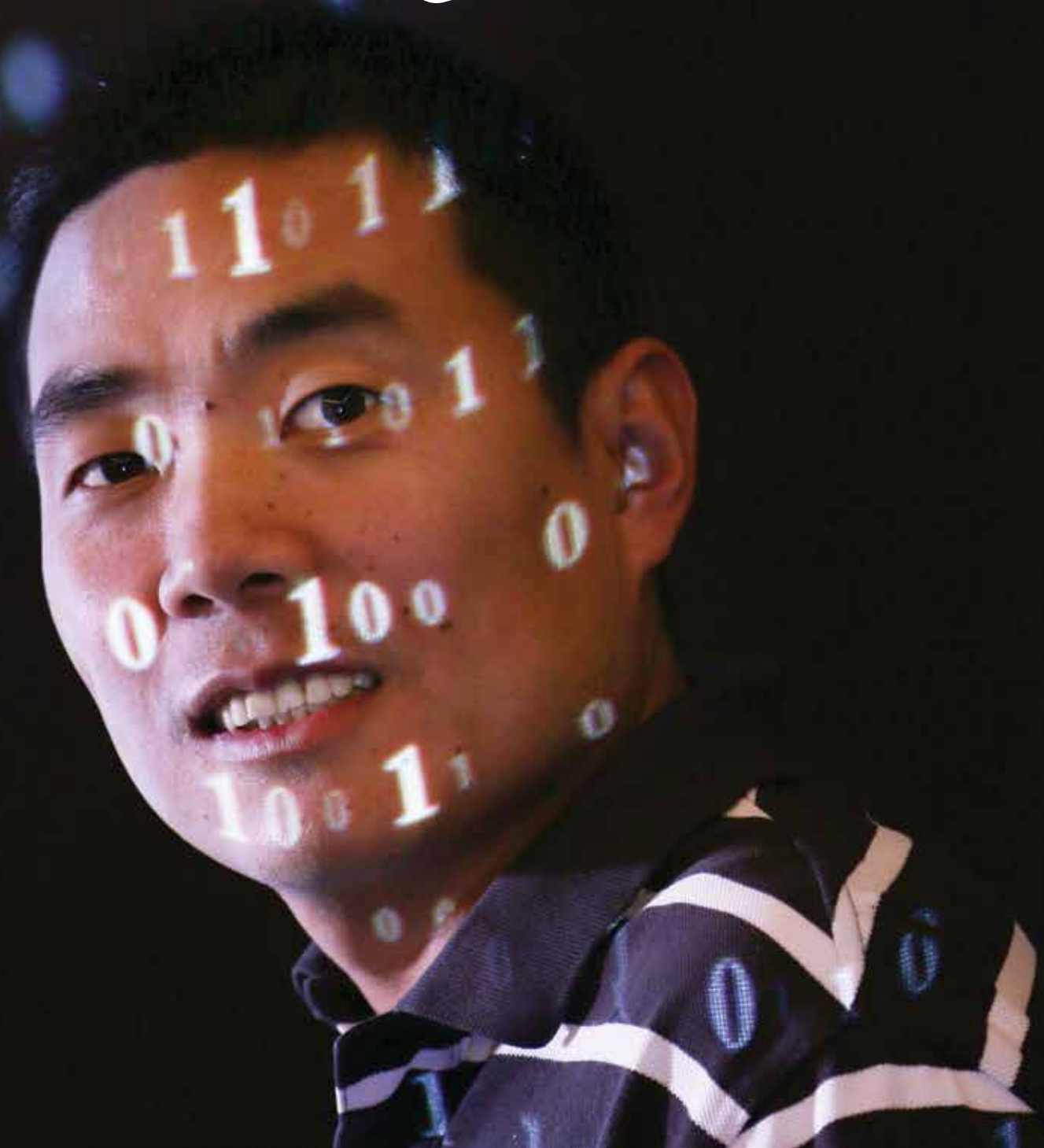
Scarpulla’s graduate research at the University of California, Berkeley, wasn’t focused on solar energy, but something he describes as much more “esoteric” — magnetism at low temperatures. Near the end of his graduate work, he decided to switch to research in solar cells because, “I felt like it was the best way I could make an impact.”

“I had done this really esoteric physics stuff and was thinking about what I really wanted to do with my career. Compound semiconductor solar cells are fascinating, and I realized it was a way that I could use what I knew and was good at to actually make a difference in the world,” he says. “It’s something that people really should care about.”

Digging

through the

data



Just about anyone using a computer has encountered this aggravation: You run a complicated query or analysis in a big database and incessantly wait for it to cough up your results. Eventually you run out of patience and kill the command. What do you get? Nothing.

That's because for all database engines, it's an all-or-nothing proposition — you have to either wait for it to run to the very end or you get no results. But University of Utah School of Computing associate professor Feifei Li has developed a new database engine that can spit out results as early as you want depending on the level of accuracy you want. That could save countless hours for users who want answers now and not when the computer is done performing its computations.

"The amount of data coming in has outpaced the efficiency that the existing database engines can deliver for us," Li says, explaining why he developed this new database system. "We face this dilemma of time — should we wait for the query to finish or simply terminate it? A lot of database folks have been frustrated by this."

Li's system, called "XDB" for Approximate Database Engine, is designed for flexibility. Users can run a complex analysis from a vast database of information and decide whether they want results sooner with less accuracy or to wait longer for a more exact outcome. Li does this with a series of new algorithms cooked into system software that allows the database engine to give results whenever the user stops the query. Users can decide ahead of time how long they want to run the computation or how accurate they want the results to be based on a percentage of what Li

calls the "confidence," a measurement of the probability the results are correct. A query that could take hours to complete could instead be run in seconds, albeit with a less accurate but still acceptable result.

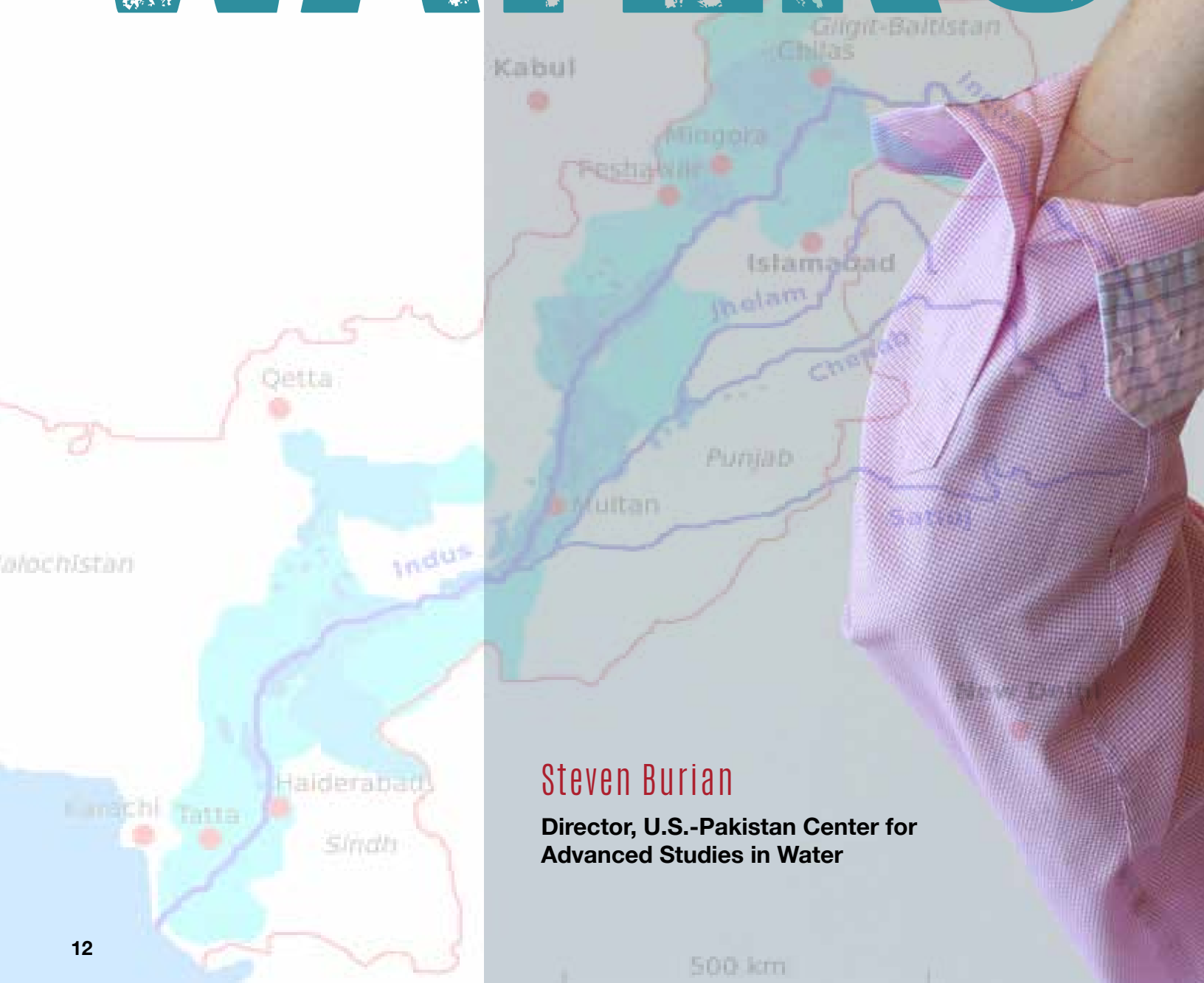
This kind of flexibility could be invaluable for business, government, or industries like the medical field, in which people need results now but don't necessarily require information with pinpoint accuracy. Or they can run the query longer and know that after a set time the results will be accurate to a certain percentage.

"If you're a mayor and trying to make some ad hoc decisions, it doesn't make sense to wait for hours or days to compute it," Li says. "If you get the results in seconds — even if it's a rough estimation for a presentation — you don't need an exact answer."

To demonstrate the effectiveness of the database engine, Li and his team have been collecting Twitter data for 2½ years, gathering billions of tweets made globally. With that collection of raw data, Li is able to analyze what subjects people are tweeting about and at what times of the day and in which regions of the world. He is able to produce results from complex queries in seconds or hours, depending on how long he is willing to wait.

Li's research won the Best Paper award at a recent Association for Computing Machinery conference, and he has received a \$500,000 National Science Foundation grant for this work. He expects to commercialize his database system and hopes companies such as Oracle or Microsoft can implement it in their existing database software.

TESTING THE WATERS



Steven Burian

Director, U.S.-Pakistan Center for
Advanced Studies in Water



University of Utah civil and environmental engineering associate professor Steven Burian arrived in Pakistan and saw first-hand how grim the water issues were there.

In the city of Jacobabad in southern Pakistan, “people were pumping what they hoped was good quality ground water with hand pumps, then delivering it by donkey carts, and you could just see the points of potential contamination all along the delivery system,” he remembers.

At the Mehran University of Engineering and Technology (MUET) in Jamshoro, he and his group of researchers toured the water treatment facility for that area and learned it was not operating. “It had water going through it but the water treatment processes weren’t working,” he says.

So it goes for Pakistan and for many other countries like it where clean water has become a precious resource and bacteria-laden water is a way of life due to political, social and technological hurdles. That is why Burian, along with other University of Utah researchers in engineering, law, geology, health sciences and social and behavioral sciences, have partnered with MUET to create a new water research center to tackle the problems that plague Pakistan’s water systems.

The U.S.-Pakistan Center for Advanced Studies in Water is an education and research center housed in the U’s College of Engineering that began in 2014 to both analyze the water-quality crisis in that country and foster a new generation of researchers who can work to improve conditions there. With this unique partnership, there are faculty and student exchanges and newly-developed curricula with the common goal of stamping out water-borne disease and inefficient use of water in that country.

“It’s gone great for the first year and a half,” says University of Utah Department of Civil and Environmental Engineering Chairman Michael Barber, who also is a researcher for the center. “We’ve taken tremendous steps, and it’s given us a different perspective on the world when you go over and see what the average person is working through.”

The center, which is led by Burian, is working on three important research initiatives: look at the gaps in the country’s ability to achieve water sustainability and determine what is needed; analyze what infrastructure improvements are needed to deliver clean water to cities; and figure out how to best manage the Indus River — the country’s main water source — so it can produce usable water to all parts of the country.

Meanwhile, the center also is attempting to promote more gender equality in Pakistan’s research hubs, teach faculty there how to commercialize emerging technologies from their research, and develop ways to make the center sustainable through future research proposals and fund-raising. Currently, the center is being funded in part by a five-year grant from the United States Agency for International Development (USAID), the government agency that provides aid to impoverished foreign countries. USAID selected the University of Utah to form the water center with the Mehran University as part of a larger partnership with other U.S. and Pakistani universities to also research energy and agriculture issues in that Middle Eastern country.

Faculty from both MUET and the U are working closely together in both countries, and 15 to 20 graduate students from MUET will attend a semester at the University of Utah later this year and

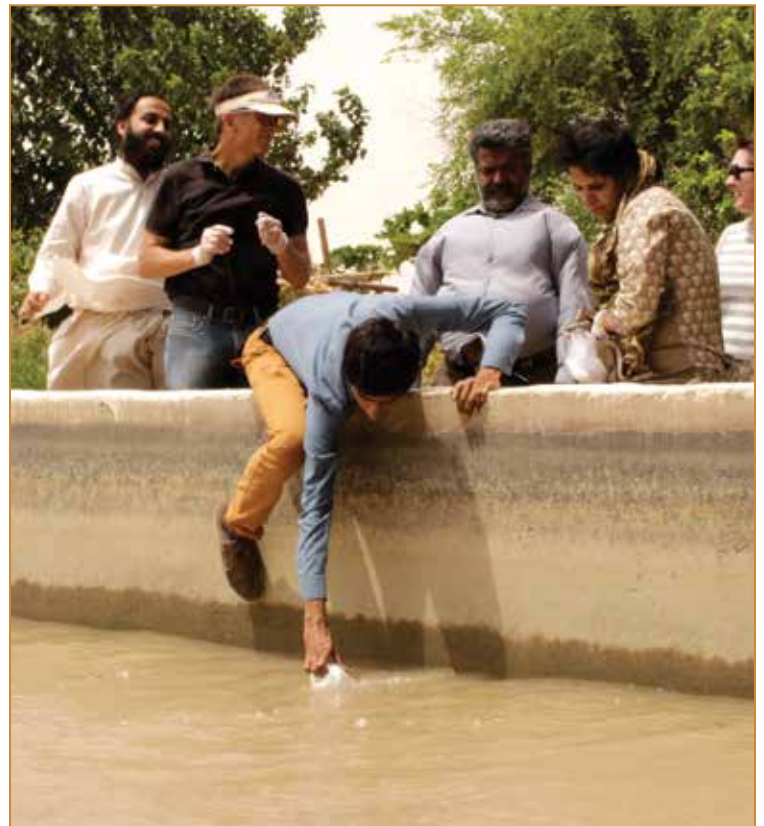




every semester thereafter. The center also has established master's and doctoral programs with four different tracks: integrated water resources management; hydraulics, irrigation, drainage; environmental engineering; and water, sanitation and health.

Burian hopes it won't be too long before the center has a tangible impact on helping eradicate many of Pakistan's water-quality problems.

"We can help," he says, "by fueling that with information, with facts, with an understanding how the issues come together and with the data to help policy makers and the public make the right decisions."



ALUMNI

SPOTLIGHT

Peter Meldrum



The starting point in Peter D. Meldrum's entire career in genetics can be traced back to a single book he read while an army officer stationed in Pittsburgh in the early 1970s.

That influential tome was *The Double Helix: A Personal Account of the Discovery of the Structure of DNA* by noted American biologist and geneticist James D. Watson. The book would be the genesis of Meldrum's decades-long journey in genetics, resulting in the startup of his multimillion-dollar medical diagnostics company and the development of the first molecular diagnostic test for breast cancer.

"It was fascinating. It was kind of the story of life," Meldrum says about the book's inspiration. "It struck a chord with me."

After graduating from the University of Utah in chemical engineering in 1970 and a two-year stint in the U.S. Army as a radiological officer, Meldrum returned to Utah to earn a master's in business administration and later start a venture capital firm. Then in 1990, he visited U genetics researcher and medical professor Mark Skolnick.

"I just walked up to his office, knocked on his door, introduced myself, and we started talking genetics," Meldrum says of his first meeting with the Utah geneticist. "We had a fascinating discussion, and at the end I said, 'How would you like to start a company with me?'"

The result was Salt Lake City-based Myriad Genetics, which Meldrum and Skolnick started in 1991. Its first challenge was entering the race to unlock BRCA1, the gene responsible for breast cancer. Thanks to what Meldrum says was Skolnick's brilliance and a little luck, the team was the first to identify the gene, unlocking a new path for women's health as well as an innovative vision for Myriad.

Instead of diagnosing disease, Meldrum envisioned Myriad predicting whether or not a patient is more likely to get a disease in the future. "This was predictive medicine," he says. "And if we

could identify the genetic cause for breast cancer and identify women that carry a gene that predisposes them to breast cancer then physicians could intervene."

If a person inherits the BRCA1 gene or one of the other genes that may lead to cancer, there is an 87 percent probability the patient will get cancer in their lifetime, Meldrum says. So Myriad produces 13 products — mostly in the form of blood tests — that inform patients whether they carry a particular gene that increases the risk of cancer. One of the products, myRisk, screens for 25 genes and can identify an elevated risk for eight forms of cancer ranging from breast and pancreatic cancer to melanoma. It was one of Myriad's tests that actress Angelina Jolie used to confirm she has the BRCA1 gene, resulting in her decision to undergo a double mastectomy and raising awareness of hereditary cancer.

In 2015, Meldrum retired from Myriad after 24 years as its president and chief executive officer. Today, he devotes his free time to heading the Meldrum Foundation, a philanthropic endeavor run by him and his wife Catherine Meldrum that donates funds for education and humanitarian efforts. During his career, Meldrum received an honorary doctorate in engineering from the University of Utah, and *Scientific American* named him one of the Top 50 Scientific Visionaries in the world. He also was a founding member of the Engineering National Advisory Council for the University of Utah's College of Engineering.

Today, Myriad Genetics has about 2,400 employees in offices and labs in Salt Lake City, San Francisco, Austin, Zurich and Munich. Not a bad trajectory for a company that just started with Meldrum and Skolnick a mere 25 years ago.

"I told Mark when we started Myriad that the odds of us being successful were one in ten in the technology field, so this was probably going to go nowhere. But I told him it's a fascinating science and it's going to be fun," Meldrum remembers. "We had no idea Myriad would evolve into what it is today. It's been an enjoyable, fun ride."

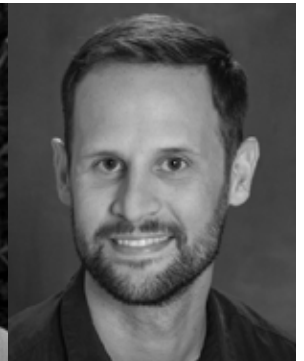
NEW FACULTY

As a member of the PAC-12 Conference, the University of Utah's College of Engineering prides itself in having a diverse faculty with the knowledge and skills to solve some of society's most critical engineering challenges. Each year, the College looks for the brightest minds to spur innovation, entrepreneurialism and research breakthroughs. This year's group of new faculty members represents some of the best academics and scientists in the country.



**JESSICA
KRAMER**

Bioengineering



**LUCAS
TIMMINS**

Bioengineering



**MICHAEL
NIGRA**

*Chemical
Engineering*



**KODY
POWELL**

*Chemical
Engineering*



**TONY
SAAD**

*Chemical
Engineering*



**THOMAS
ZANGLE**

*Chemical
Engineering*



**HUANAN
ZHANG**

*Chemical
Engineering*



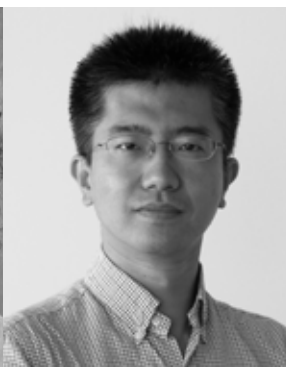
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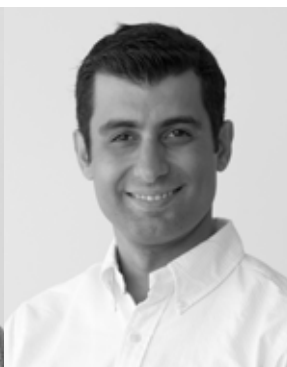
**JENNIFER
WEIDHAAS**

*Civil and
Environmental
Engineering*



**MINGYUE
JI**

*Electrical and
Computer
Engineering*



**MOSTAFA
SAHRAEI-
ARDAKANI**

*Electrical and
Computer
Engineering*



**HAEYOUNG
YOON**

*Electrical and
Computer
Engineering*



**HENRY
FU**

*Mechanical
Engineering*



**OWEN
KINGSTEDT**

*Mechanical
Engineering*



**TOMMASO
LENZI**

*Mechanical
Engineering*



**STEVEN
NALEWAY**

*Mechanical
Engineering*



**PANIA
NEWELL**

*Mechanical
Engineering*



**MAHDI
NAZM
BOJNORDI**

*School of
Computing*



**SRIKUMAR
RAMALINGHAM**

*School of
Computing*



**BEI
WANG**

*School of
Computing*



**JASON
WIESE**

*School of
Computing*

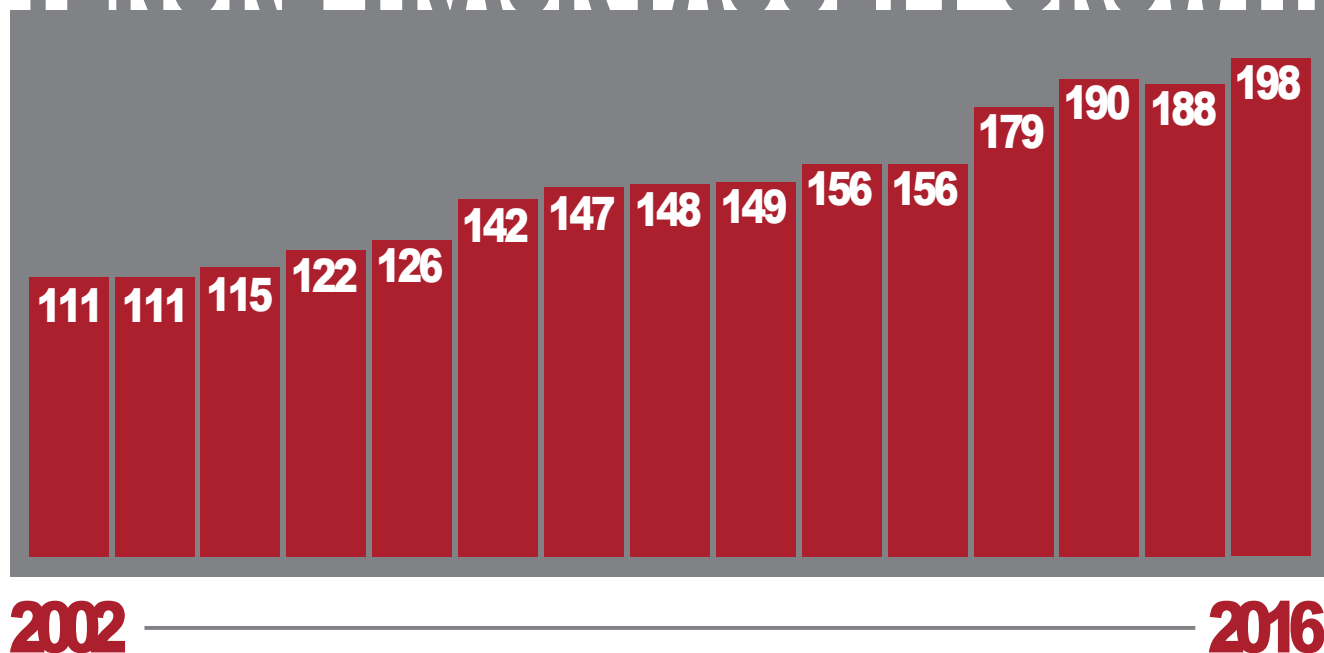


**MICHAEL
YOUNG**

*School of
Computing/
Entertainment Arts &
Engineering*

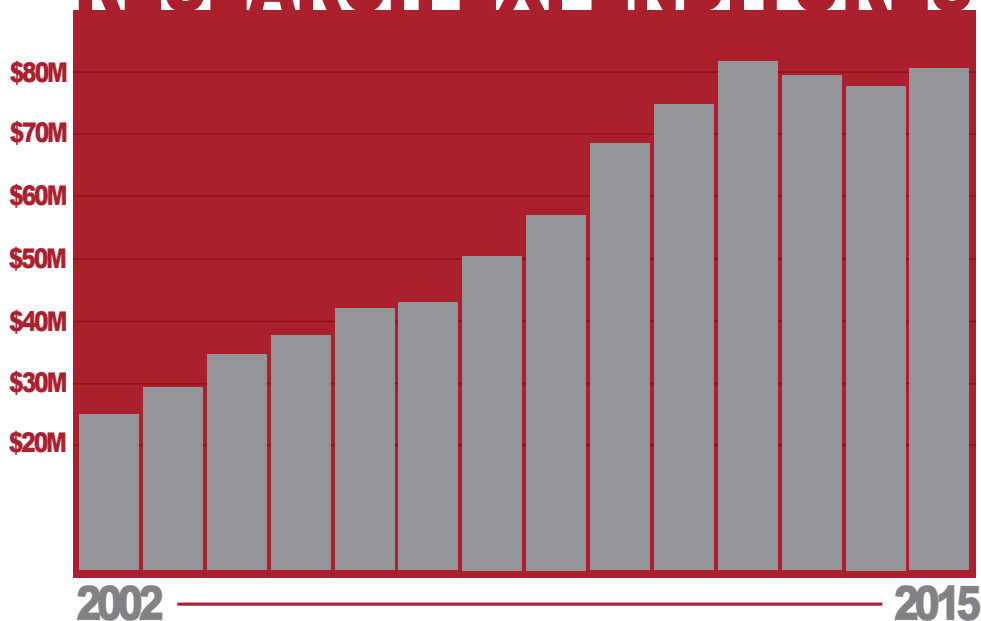
BY THE NUMBERS

TENURE TRACK FACULTY GROWTH



The University of Utah's College of Engineering continues to grow as it hires more tenure-track faculty members to meet the continued rise in students. This year, the College has 198 tenure-track faculty members, a 57 percent growth in the last decade. In 2016, the College awarded 902 undergraduate and graduate degrees, a 52 percent increase since 2006.

RESEARCH EXPENDITURES



The University of Utah's College of Engineering is one of the West's leading research institutions with \$80.4 million in research funding for 2015, nearly double the amount 10 years ago.

BUDGET 2014-2015

● RESEARCH EXPENDITURES ● STATE BUDGET ● OTHER FUNDS ● DONATIONS ● USTAR



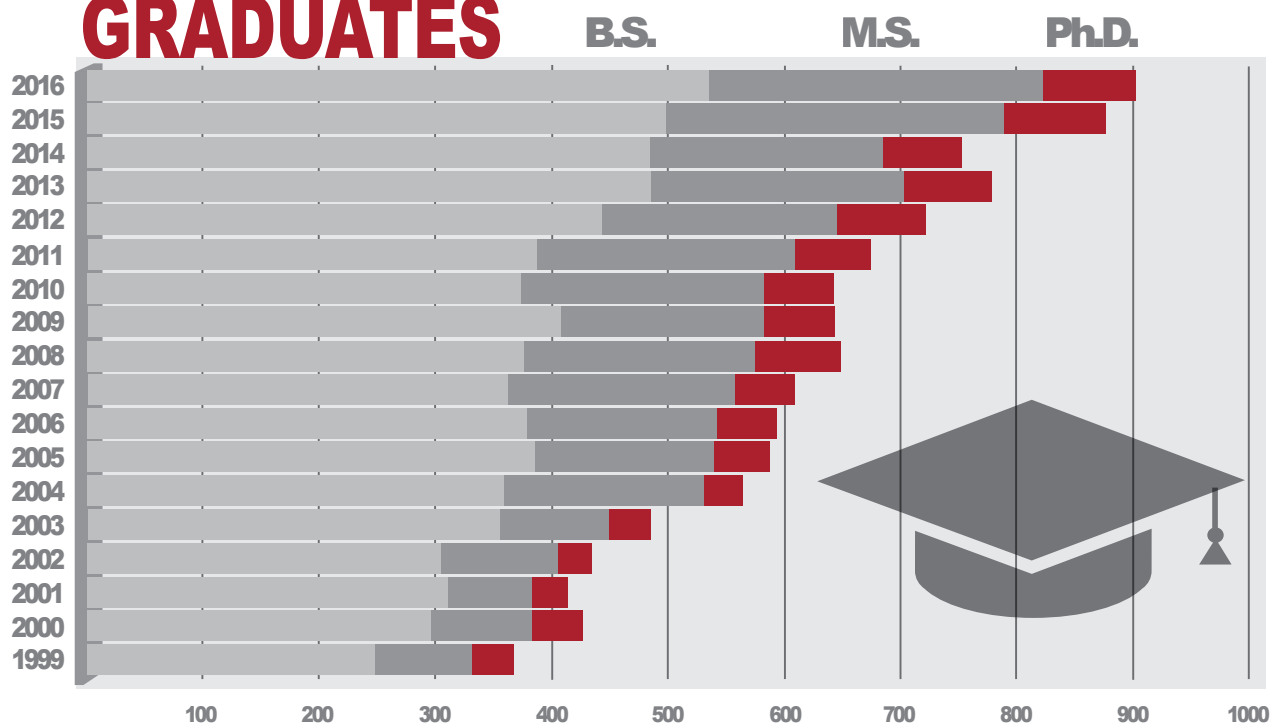
The University of Utah's College of Engineering continues to rise in the national rankings, and it is quickly becoming one of the country's top engineering institutions. In 2015, the College was ranked 56th in *U.S. News & World Report's* "America's Best Colleges" ranking of undergraduate engineering programs, up from 70th in 2008. Meanwhile, the graduate program was ranked 51st in the country, moving up five places from the previous year. The U's College of Engineering has been either No. 1 or No. 2 all but one year since 2006 in the number of spinoff companies generated from the college, with a total of 55 new startups.

RANKINGS

The University of Utah's College of Engineering excels in a wide variety of metrics, according to the 2015 U.S. rankings from Profiles of Engineering & Engineering Technology.

- Computer science degrees awarded — #31 (out of 175 schools)
- Engineering doctoral degrees awarded — #34 (out of 203)
- Graduate enrollment — #49 (out of 237 schools)
- Undergraduate enrollment — #41 (out of 356 schools)
- Tenured/tenure-track faculty members — #27 (out of 350 schools)
- Research expenditures — #38 (out of 203 schools)

GRADUATES



MULTIDISCIPLINARY RESEARCH CENTERS AND INSTITUTES

Scientific Computing and
Imaging Institute
Institute for Clean and Secure Energy
Energy & Geoscience Institute
University of Utah Robotics Center
U.S.-Pakistan Center for Advanced
Studies in Water
Nano Institute
Utah Nanofab
Cardiovascular Research and
Training Institute
Huntsman Cancer Institute
NSF Materials Research,
Science and Engineering Center
Center for Engineering Innovation
Utah Center for Nanomedicine
Utah Center for NanoBioSensors
Utah Center for Nanomaterials
Utah Center for System Integration
Utah Center for Interfacial Sciences
Utah Center for Advanced
Imaging Research
Utah Center of Trace Explosives
Detection

Center for Neuroimage Analysis
NIH/NIGMS Center for Integrative
Biomedical Computing
Center for Controlled
Chemical Delivery
Rocky Mountain Center for Occupational
& Environmental Health
NVIDIA CUDA Center of Excellence
Center for Scalable Data Management,
Analysis and Visualization
Biomedical Image and Data
Analysis Center
Center of Excellence for
Biomedical Microfluidics
Center for Neural Interfaces
Global Change & Sustainability Center
Carbon Capture Multidisciplinary
Simulation Center
Intel Parallel Computing Center
Center for Extreme Data Management
Analysis and Visualization

Michael W. Soulier - Chair

Retired - Director Human Resources
E.I. Du Pont De Nemours & Co.

David C. Aldous

Chief Executive Officer
Rive Technology, Inc.

Dr. Don R. Brown

President
Partnet

Dr. Densen Cao

President and CEO
CAO Group, Inc.

Craig S. Carrel

President
Team 1 Plastics

Dr. Edwin Catmull

President
Walt Disney Animation Studios and
Pixar Animation Studios

Ronald H. Dunn

President
Dunn Associates, Inc.

Chris Durham

EVP Acquisition & Product
Integration
Merit Medical Systems, Inc.

Mark Fuller

Chairman and CEO
WET

Scott D. Gochnour

Vice President
Global Generics R&D
SSL at Actavis

Jeanette L. Haren

Chief Product Officer
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Los Alamos National Laboratory

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President and CEO
Job Industrial Services, Inc.

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Chief Technology Officer
Abstrax Inc.

David S. Layton

President and CEO
The Layton Companies

Paul Mayfield

Partner Group Program Manager
Enterprise & Mobile Client
Microsoft Corporation

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Dr. Gregory P. Starley

Manager, Exploration Evaluation
Corporate Reservoir Engineering
Apache Corporation

Dr. Gerald B. Stringfellow

Distinguished Professor
U of U Dept. of Electrical &
Computer Engineering and
Materials Science & Engineering

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Retired - President
ContentWatch, Inc.

Dr. Randal R. Sylvester

Chief Technologist
L-3 Communications –
Communication Systems West

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Vice Chairman & Managing Partner
Deloitte

J. Howard Van Boerum, P.E.

President Emeritus
Van Boerum & Frank, Associates,
Inc.

Dr. John A. Williams

Founder & General Manager
EPS, LLC

Gerould (Jerry) K. Young

Director Materials &
Manufacturing Technology
Boeing Company

EX OFFICIO

Dr. Richard B. Brown

Dean
College of Engineering

Marilyn K. Davies

Director Development
College of Engineering

John C. Sutherland

Chair - Industry Advisory Board
Assistant CIO
Brigham Young University

LIFE

IN UTAH

Utahns need only do one thing to remind them of why they work and live in the Beehive State — they just look out their window. Thanks to stunning views of our celebrated Wasatch Mountains, an enviable quality of life, a robust economy and one of the fastest-growing technology sectors in the country, Utah is the place where innovators want to work and play. Utah and Salt Lake City have been praised all year in a variety of categories.

UTAH

- #1 Top Destination in the World to Visit — *Fodor's Travel*
- #1 America's Top States for Business — *CNBC*
- #1 Best States for Business — *Forbes*
- #1 Best States for Business — *24/7 Wall Street*
- #1 Economic Outlook Ranking — *American Legislative Exchange Council*
- #1 Most Economic Growth Potential — *Business Facilities Magazine*
- #2 Personal Income Growth — *Pew Charitable Trusts*
- #3 States with Total Job Growth — *U.S. Bureau of Labor Statistics*
- #4 Strongest States in the Union — *Politico Magazine*
- #5 Most Bicycle-Friendly States — *The League of American Bicyclists*

SALT LAKE CITY

- #1 Best Cities to Start a Career — *WalletHub*
- #2 America's Next Boom Towns — *Forbes*
- #2 Best Summer Travel Destinations — *WalletHub*
- #5 America's Fastest-Growing Cities — *Forbes*
- #6 Best U.S. Cities for Affordable Getaways — *Travel + Leisure*



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