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LEARNING**
Accelerating the
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iconic new staircase

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PATIENTS' LIVES**
Delivering medications
to the body — better

TEXAS ENGINEER

THE MAGAZINE OF THE COCKRELL SCHOOL OF ENGINEERING
AT THE UNIVERSITY OF TEXAS AT AUSTIN

FALL
2017

WELCOME TO
THE FUTURE

Introducing UT's massive new hub
for engineering innovation

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RETHINKING RELAXATION

THE NIDO STRUCTURES TEAM

DANIEL GOODWIN (RIGHT)
COMPANY CO-FOUNDER &
MECHANICAL ENGINEERING SENIOR

OLIVIA NGUYEN (CENTER)
COMPANY CO-FOUNDER & 2016
AEROSPACE ENGINEERING B.S. GRADUATE

ZANE LEWIN (LEFT)
HEAD OF MANUFACTURING &
ELECTRICAL ENGINEERING SENIOR

ALEX BOOTH (NOT PICTURED)
HEAD OF OPERATIONS &
MECHANICAL ENGINEERING SENIOR



IN THEIR QUEST TO BUILD A BETTER SLING that doesn't rely on trees, a group of entrepreneurial, hammock-loving Texas Engineering students ended up inventing a crowd-pleasing new product and launching a unique startup.

Nido Structures is run by a cross-disciplinary team of Cockrell School students and recent graduates who came up with an idea for free-standing structures to hang hammocks—an important distinction because tree-hanging hammocks can damage the bark and ultimately cause a tree to die.

“Thus, the Weaver was born,” said Alex Booth, one of Nido’s leaders, referring to what would become the company’s first product. Using the Longhorn Maker Studios and continuing to draw on their hands-on training in the Cockrell School, the Nido team began developing these structures out of locally sourced reclaimed steel oil pipes. The pipes are arranged in a geometric way that can accommodate up to eight hammocks in various configurations, and, today, Nido sells and leases their products to individuals and groups in Austin and throughout Texas and the U.S.

“It is both humbling and immensely fulfilling to have something that you worked so hard on be valued by a complete stranger—the response has been tremendous and has solidified each of our paths toward entrepreneurship,” Booth said. 📧

→ LEARN MORE AT [NIDOSTRUCTURES.COM](https://nidostructures.com)



DID YOU KNOW?

Nido is the Spanish word for “nest.”



LEADERSHIP

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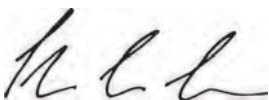
BRINGING TEXAS ENGINEERING TOGETHER

If you have visited the UT Austin campus recently, you have undoubtedly seen a significant addition to our skyline: the 430,000-square-foot Engineering Education and Research Center (EERC). After almost a decade of preparation — and with the help of our supporters and university leadership — we celebrated the EERC's official opening earlier this fall. With brand new labs, classrooms, and project spaces; a cutting-edge maker studio; a conference center; and a hub for student services, the EERC is more than just a new building. It is a symbol of a stronger Texas Engineering community.

As the centerpiece of the Cockrell School of Engineering, the EERC will attract top talent and encourage industry partnerships, but most importantly, it is designed to bring faculty and students from all departments together to confront the challenges of the future and to foster a more collaborative and interconnected Cockrell School.

I am excited to share more about the EERC and our extraordinary community in this issue of *Texas Engineer* magazine. I hope our stories inspire you to never stop creating, making, and seeking solutions that move our world forward. Thank you, as always, for your continued support of our students and faculty.

Hook 'Em Horns!



Sharon L. Wood, *Dean*

Cockrell Family Chair in Engineering #14

Jack and Beverly Randall Dean's Chair for Excellence in Engineering

TEXAS ENGINEER

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2017

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IMPROVING LIVES
THROUGH BETTER
TREATMENT



THE MASSPEC PEN

ENGINEERS &
SCIENTISTS
COLLABORATE ON
NEW DEVICE THAT
CAN IDENTIFY CANCER
IN SECONDS

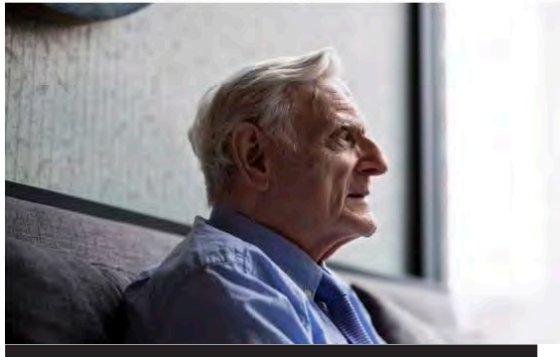
THIS YEAR SO FAR

SO MUCH HAS HAPPENED in the Cockrell School since last fall—new buildings, new leaders, new degrees, new research centers, the list goes on. Get the scoop with a sampling of our most exciting moments.

To Be a Genius, Think Like a 94-Year-Old



Pagan Kennedy APRIL 7, 2017



BATTERY LEGEND JOHN GOODENOUGH FEATURED IN *THE NEW YORK TIMES*

"He and his team at The University of Texas at Austin filed a patent application on a new kind of battery that, if it works as promised, would be so cheap, lightweight and safe that it would revolutionize electric cars."

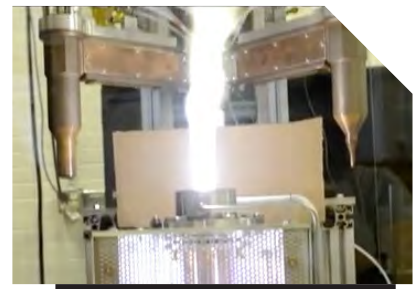
PROFESSOR JOSH APTE
LEADS AIR QUALITY
STUDY IN OAKLAND



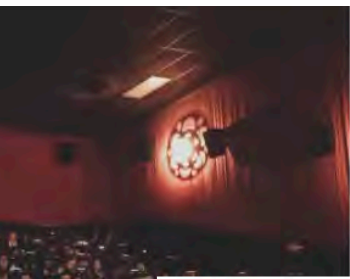
UT AUSTIN
ENGINEERING
HOSTS 'GIRL DAY,'
BIGGEST EVENT OF
ITS KIND IN THE U.S.



PROFESSOR ROBERT GILBERT
BECOMES CHAIR OF THE DEPARTMENT
OF CIVIL, ARCHITECTURAL AND
ENVIRONMENTAL ENGINEERING



AEROSPACE ENGINEERS
USE NEW PLASMA
TORCH TO HELP NASA
TEST SPACECRAFT
HEAT SHIELDS



cockrellschool
Alamo Drafthouse Slaughter Lane

cockrellschool Tonight we have an Alamo Drafthouse theater packed with Texas Engineering students watching Hidden Figures! Love gathering our community to celebrate an incredible group of role models in STEM. 🚀



Texas Engineering
@CockrellSchool

Construction fences are down and the new residents of our Engineering Education and Research Center are moving in! **#EERC** 🙌 **NEW**



\$3,900,000

CENTER FOR INFRASTRUCTURE MODELING & MANAGEMENT
NATIONAL SCIENCE FOUNDATION

\$15,600,000

CENTER FOR DYNAMICS & CONTROL OF MATERIALS
NATIONAL SCIENCE FOUNDATION

\$20,000,000

CENTER FOR INNOVATIVE & STRATEGIC ALKANE RESOURCES (CO-LEAD)

ENVIRONMENTAL PROTECTION AGENCY

3 NEW CENTERS TO ADVANCE RESEARCH

2

NEW UNDERGRADUATE DEGREES LAUNCHED:

COMPUTATIONAL ENGINEERING AND ENVIRONMENTAL ENGINEERING



ALUMNUS REX TILLERSON (B.S. CE 1975) CONFIRMED AS 69TH U.S. SECRETARY OF STATE

PROFESSOR DEJI AKINWANDE WINS INAUGURAL MOORE INVENTOR FELLOWSHIP
FOR CREATION OF SILICENE, WHICH COULD INCREASE ENERGY EFFICIENCY IN COMPUTER CHIPS TENFOLD



#9 TEXAS ENGINEERING RISES TO BEST GRADUATE PROGRAM
IN THE NATION — U.S. NEWS & WORLD REPORT

TEXAS ENGINEERING STUDENTS WIN INNOVATION AWARD IN SPACEX'S HYPERLOOP POD COMPETITION

COCKRELL SCHOOL EXPANDS PARTNERSHIPS

STATOIL RENEWS

\$2,500,000

OF SUPPORT FOR GRADUATE STUDENT RESEARCH

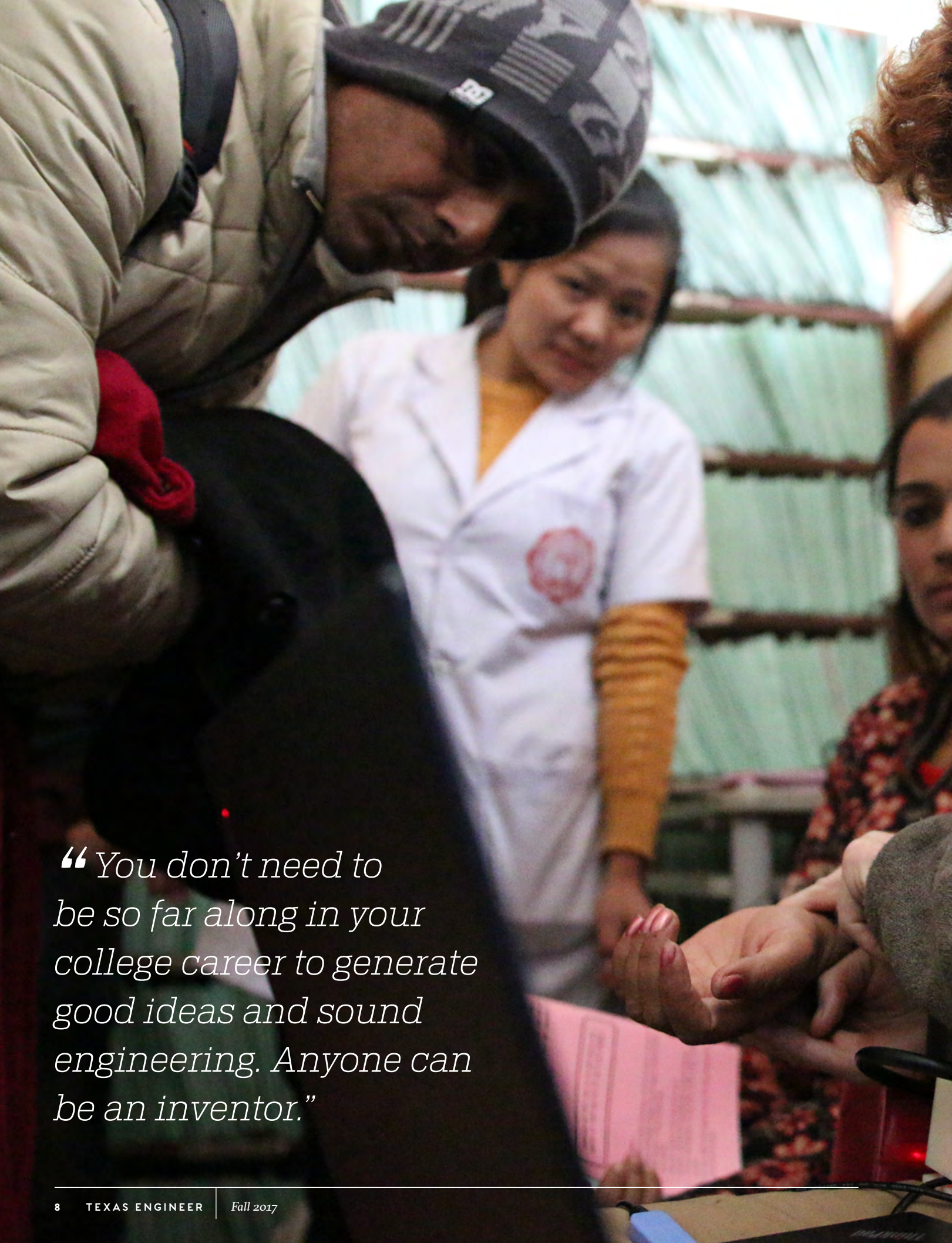


COLLABORATIVE RESEARCH AGREEMENT WITH LOCKHEED MARTIN

"Engineering researchers at UT Austin are world-class innovators. When searching for potential partners, we identified the Cockrell School because of its extraordinary breadth of talent, the real-world relevance of the research it conducts, the synergy with Lockheed Martin's technology strategy and customer needs and the collaborative environment it has built for company partnerships."

—KEOKI JACKSON,
CHIEF TECHNOLOGY OFFICER,
LOCKHEED MARTIN





“You don’t need to be so far along in your college career to generate good ideas and sound engineering. Anyone can be an inventor.”



DOING A WORLD OF GOOD

FOR ONE EYE-OPENING month during college, biomedical engineering student Reece Stevens joined the staff of a remote hospital in Rwanda, where he saw nurses struggling to care for hundreds of patients with only a handful of patient monitors. From that point forward, Stevens became determined to build a new device that could be manufactured less expensively and in higher quantities—one that he felt could change, and potentially save, thousands of lives around the world.

Considering that he had never before left the U.S., much less traveled anywhere alone, a two-month journey to another continent was a daunting proposition for both Stevens and his parents. But, after applying and gaining acceptance to the Engineering World Health Summer Institute, a student program aimed at building and repairing medical devices in low-income countries, Stevens had no time to dwell on his own stress and uncertainty. After arriving in Rwanda in June 2014, he quickly learned the basics of the Rwandan language of Kinyarwanda before joining his colleagues for a full month of

PHOTOS: COURTESY OF MADELEINE DUNAWAY

intensive device-repair training—just the type of hands-on experience he was seeking.

“I had just finished my freshman year and didn’t know anything about in-depth hardware design or fixing complex machines,” Stevens said. “But once you start cracking them open, you learn pretty quickly what to look for and how to recognize what is broken.”

Equipped with this new training, Stevens spent the second month repairing devices for a local hospital, where he experienced first-hand the challenges facing medical providers in developing countries. When he took inventory of the hospital’s equipment, he was disheartened by how quickly he completed the task, so scarce were the hospital’s resources.

“There were 400 beds in the hospital and only five patient monitors,” he said. “I will never forget seeing three patients in critical condition with only one monitor. The

environment with no climate control and frequent power outages.

But functionality alone was not enough to address Stevens’ greatest concern. During his 60 days in Rwanda, Stevens noticed a high turnover rate among the nurses and discovered that they frequently move from one hospital to another, bringing their training with them. He realized he needed to develop a monitor that would require minimal training to operate. Borrowing a phrase from Steve Jobs, he wanted to make a device that “just works.”

That sentiment became the guiding mandate of FreePulse, the social venture project that Stevens launched upon his return for the development of this new monitor. Initial designs outlined a simple touchscreen device with no buttons that ran on batteries and only measured EKG. Most importantly, it just worked.

“We didn’t have many tools. I had a knife and some epoxy, and I was gluing stuff together on bumpy jeep rides to keep it intact.”

nurses were hooking one patient up to the monitor and measuring their vitals, then immediately disconnecting that patient, connecting to the next patient and repeating the process. You can’t perform surgeries without hooking patients up to monitors. I’d see people actually standing in lines that wrapped around the hospital, waiting hours for surgery because of the lack of monitors. It was unbelievable.”

Unable to shake these realities, and certain that lower-cost, readily available monitors could solve the problems he encountered, Stevens began working with his Engineering World Health student group at UT Austin to design a new device that could function in an unsealed

The prototype was well received at engineering design competitions in 2015, taking first place in the international Engineering World Health Design Competition and second place in the prestigious National Institutes of Health Design by Biomedical Undergraduate Teams Challenge. The immediate success surprised Stevens and his teammates. “Most of us were only sopho-

mores,” he recalls, “so it was encouraging to realize that you don’t need to be so far along in your college career to generate good ideas and sound engineering. Anyone can be an inventor.”

Despite the accolades, Stevens was unsatisfied with the device’s limited functionality and began developing a second prototype from scratch that could measure pulse oximetry, which detects changes in blood oxygen levels. He also incorporated an arm cuff for measuring blood pressure.

As it turns out, one of the few things that Rwandan hospitals have in abundance are sphygmomanometers, old-fashioned blood pressure measurement devices that are inaccurate and difficult to use. But by modifying his device to work with standard cuffs pulled from these sphygmomanometers, Stevens created a device that will allow nurses to more easily utilize the equipment they have on hand.

Ultimately, Stevens hopes to make every function compatible with the equipment he inventoried in Rwanda. “We had several clear goals for this device that we thought would make it successful: make it work with what’s on hand, don’t make it difficult for the end user, make it battery-powered and easy to read, and make sure it costs less than \$250.”

To survey the needs of those who will eventually use the device, Stevens returned to Rwanda in the summer of 2015 and met with device distributors to determine a manageable price point and desired specs. He then went to Nepal in the winter to visit remote hospitals and speak with staffs about their requirements.

Nurses were thrilled with the smaller form factor and extended battery life, and they were grateful to have a device that began measuring vitals as soon as it was turned on. Though there were a handful of re-





quests for additional features, like loading bars that indicate FreePulse is “thinking,” staffers were almost universally happy with a product that could potentially solve a pressing problem in their community.

After improving the device based on this feedback, Stevens returned to Nepal the following winter, this time prepared to use FreePulse in a clinical setting. “It was important to show doctors the actual device,” he said. “You can talk about it all you want, but when someone holds it in their hands, it’s a lot easier to see what does or doesn’t work.”

“We didn’t have many tools. I had a knife and some epoxy, and I was gluing stuff together on bumpy jeep rides to keep it intact,” he said. “It was a dramatic experience that taught me how to take something that works in a lab and shape it so it works in an

actual hospital. That’s where the doctors are judging your product—in the field.”

Stevens was excited to see his monitor in action but also found the experience to be somewhat stressful. No longer a visiting student providing maintenance as needed, Stevens now assumed full responsibility for the success or failure of his own device, which he continues to work on today.

He plans to have a clinic-ready prototype in 2018, and he hopes to return to hospitals in Nepal and leave fully functional monitors behind.

Stevens credits the Cockrell School of Engineering for providing both the opportunity to make these trips and the training and understanding he needed to react to the problems he encountered.


“I’m so grateful for my professors, all of whom were very supportive and encour-

aged us to continue past what they taught us,” he said. “Through projects and lab work, they provided a way to go far beyond the curriculum.”

After graduating in May 2017 with a bachelor’s degree in biomedical engineering, Stevens has reflected on his time in Texas Engineering and said he feels incredibly lucky to have been given so many opportunities.

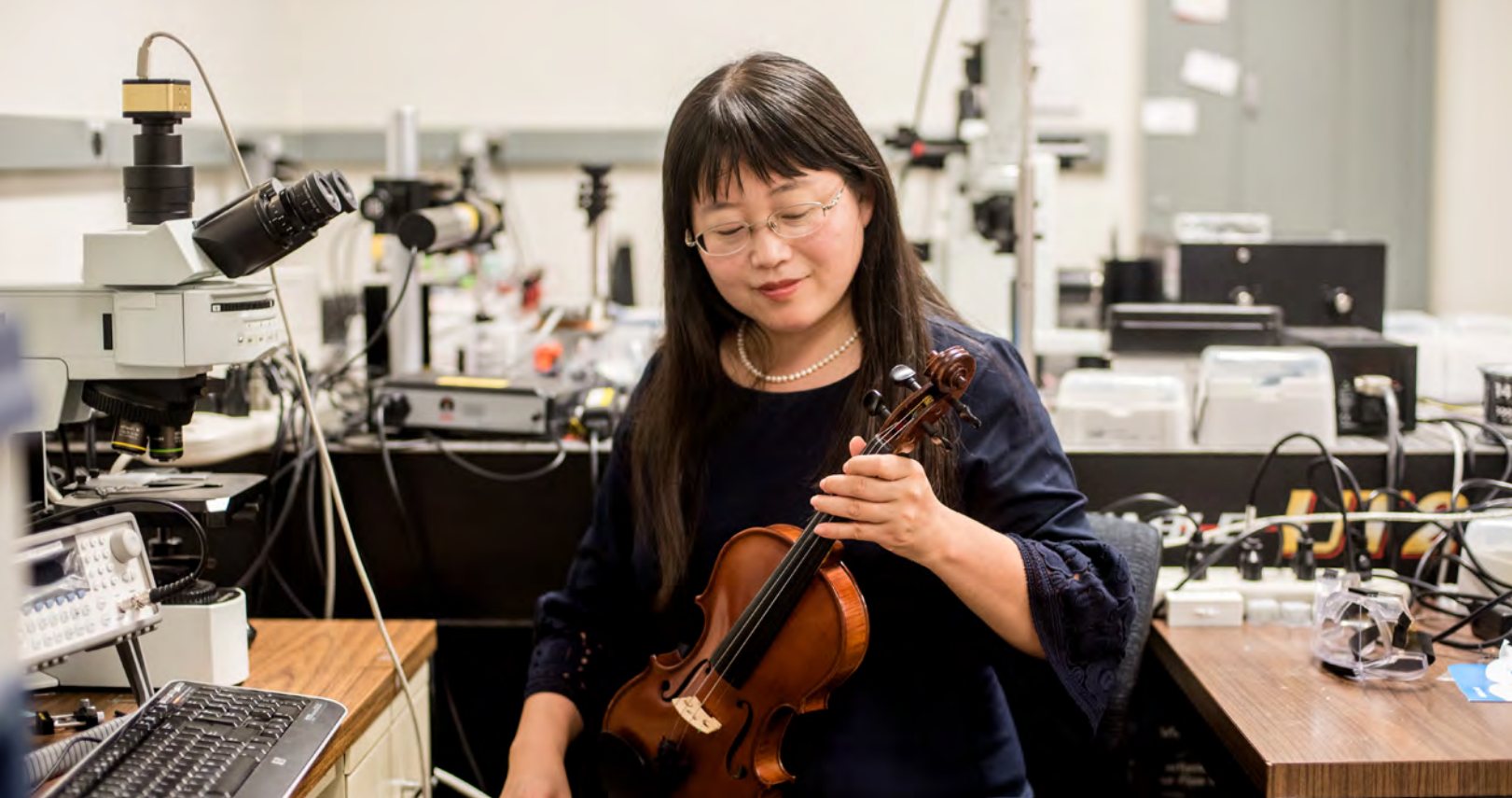
“When I was growing up, my dad would always remind me, ‘To people who have been given much, much will be expected,’” Stevens said. “Because I have been helped by so many, I feel like it’s my turn to help as many as I can.” **TE**

To follow Stevens’ work on FreePulse and learn more about his experiences abroad, visit freepulsemed.com

A black and white photograph of a woman with long dark hair and glasses, wearing a dark top and a pearl necklace. She is playing a violin. A small sensor is attached to her right shoulder with a wire. The background is dark and out of focus.

“As an engineer, I want to solve critical problems that human beings are facing, and particularly, I am interested in helping children and making their lives better.”

MUSICAL SENSING



DONGLEI (EMMA) FAN TAKES AN ACTIVE ROLE in her daughter's violin lessons — providing endless encouragement, listening to the pitch of each note and checking her playing postures. While other proud parents may simply see an aspiring violinist, Fan, a mechanical and materials science engineer, sees an opportunity to invent a new learning tool for the next generation.

Understanding the importance of proper posture in the development of young violinists, Fan decided to reconfigure her previously developed ultrasensitive and durable 3D graphite strain sensors and apply them as a string-like wearable technology that can reduce the difficulties in musical instrument learning.


“As an engineer, I want to solve critical problems that human beings are facing, and particularly, I am interested in helping children and making their lives better. The world-renowned violin educator Shinichi Suzuki once said, ‘Perhaps it is music that will save the world,’ since it nurtures the hearts of kids and facilitates an understanding between people of different cultures,” Fan said. “If students struggle with poor posture when learning musical instruments, it can severely limit their potential to advance to higher levels and can easily cause them to lose interest.”

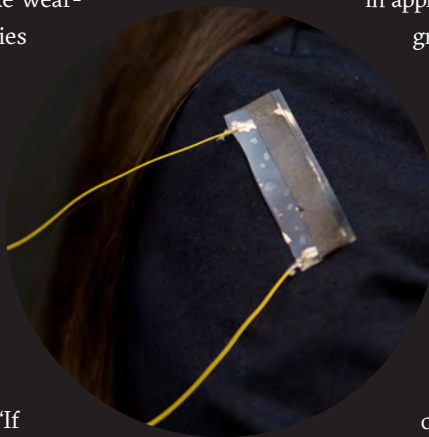
Her research team recently executed the first demonstration

of flexible strain sensors for musical education and their results were published as the cover story on *Advanced Materials Technologies*. The team's technology can detect not only the fine details of the postures of violin learners but also the body's vital signs (pulse rate and respiration), all in real time, offering a multifaceted data set to supplement instructors' teaching.

Previously, significant global research efforts focused on an atomically thin material known as graphene for strain sensing. With an understanding of the properties of materials and practical needs in applications, Fan's group decided to focus instead on graphite, a thicker material. Their decision paid off when they found that graphite produces much greater sensitivity and reproducibility in strain detection. More testing and product design is still needed, but Fan ultimately hopes to commercialize the sensors for music students and aspiring athletes, in sports like golf and baseball, where posture plays a major role in player development.

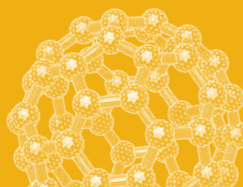
Fan is thrilled that her new sensors could one day help more children like her daughter reap the lifelong rewards of music.

“That's exactly why I wanted to test my sensors on violin students — music education in childhood can instill kindness, hard work and a deeper understanding and enjoyment of life,” she said. 



ACCELERATING DISCOVERY

*Machine Learning and the
Quest for Better Design*



“Machine learning gives us a way to use computers for what they’re really good at—analyzing data in an unbiased and systematic way to help solve problems.”

—TOM TRUSKETT,
PROFESSOR AND CHAIR OF CHEMICAL ENGINEERING

DESIGNING AN INNOVATIVE NEW PRODUCT may seem like a dream job to some engineers, but the reality is that it is an expensive and time-consuming challenge for most companies. To start, the company needs to hire a team of employees to conduct numerous experiments on many different materials before deciding which ones to use. The cost of the materials and time it takes to analyze those experiments can quickly add up, and months—even years—can pass before the product is commercially viable.

But what if there was a better way? How much money could companies save, and how many more products could hit the market sooner?

Tom Truskett, professor and chair of the McKetta Department of Chemical Engineering, believes there is—and it starts with machine learning. An emerging and growing field of study in which powerful computers are given access to data and then use that data to learn for themselves, machine learning can make actual decisions and provide real-time recommendations and predictions.

“If you have an idea for a new product and want to start designing it, you could hire 50 people to do experiments. Or, you could hire significantly fewer to think creatively about the goals and design challenges and then work with a computer algorithm that helps predict the most effective experiments to perform,” Truskett said. “If

there’s a way to get to the ultimate answer with fewer resources, in a shorter amount of time and with a greater appreciation for the important human contribution, whether it’s anything from a new golf club to a new flu vaccine, we should leverage it. Machine learning gives us a way to use computers for what they’re really good at—analyzing data in an unbiased and systematic way to help solve problems.”

Three years ago, Truskett enlisted post-doctoral researchers Ryan Jadrach and Beth Lindquist to see if they could use these ideas to speed up discovery and transform the way research was conducted in the lab. This summer, their efforts paid off when they completed development of a new set of software tools that allows them to use machine learning to design new chemicals and materials. The tools provide an automated way to use data obtained from previous

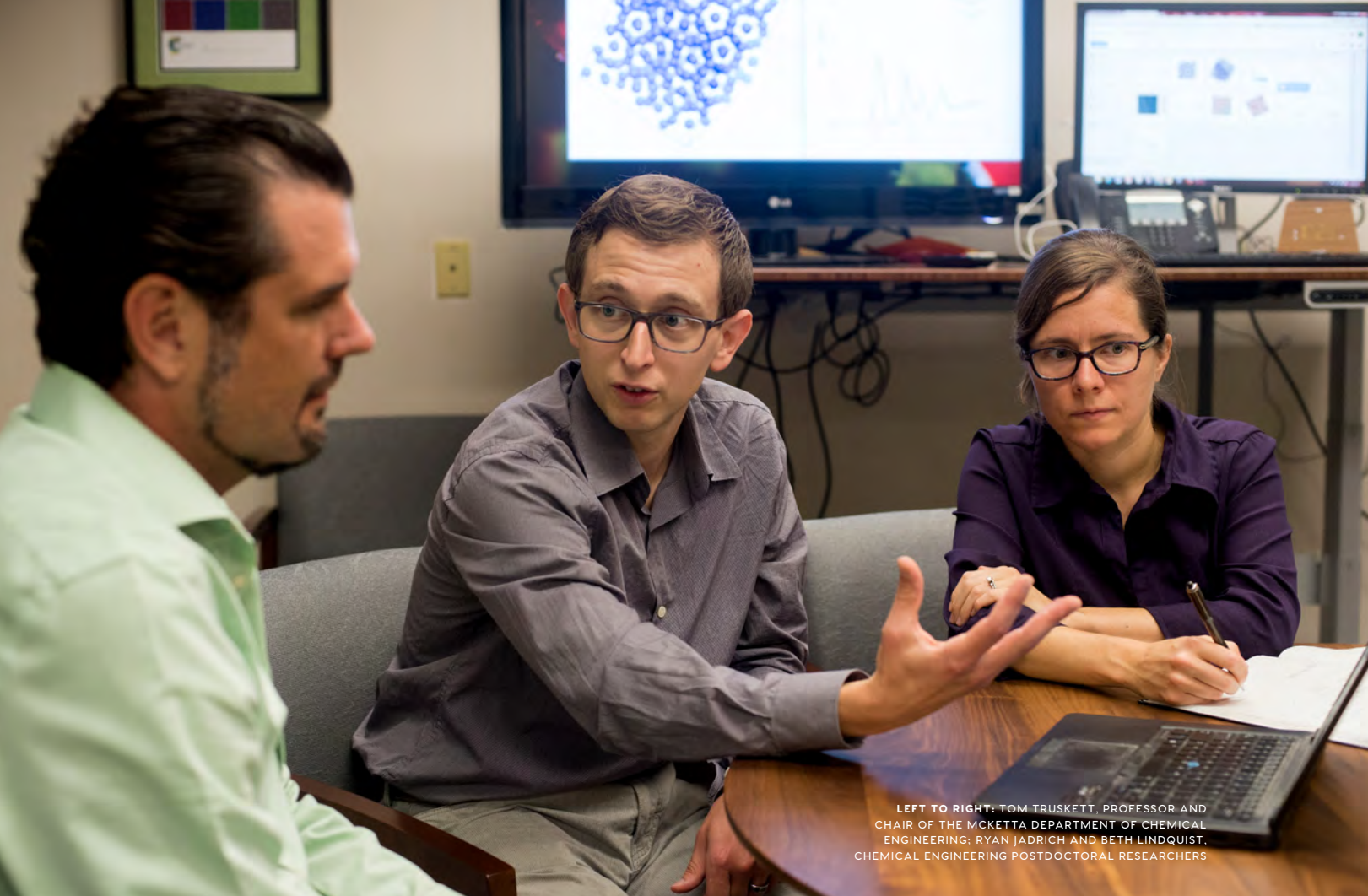
measurements or computer simulations to suggest the most promising directions for future research.

Whether we realize it or not, machine learning has become an inextricable part of our daily lives, enabling retailers to recommend online purchases and navigation apps to deliver the shortest route between two locations. However, given how research has traditionally been conducted, incorporating machine learning into fields like chemical engineering and materials science and engineering could be considered a paradigm shift, but it shouldn’t be perceived negatively, Truskett said.

“It would remove people from some tasks, but they would be the tasks that are less rewarding and that humans are frankly not as good at performing,” Truskett said. “In my mind, what machine learning is about is recognizing where computers can be effectively used to free up time and resources that are needed for creativity on the human side. We’re really at the beginning. No one knows what the future will bring, but it’s hard to imagine a world for certain companies where such methods won’t play a critical role in their research and development.”

The team’s machine learning tools are based on inverse design, an approach in which the end product is considered first.

“The idea is to start with the properties that you want the material to possess and



LEFT TO RIGHT: TOM TRUSKETT, PROFESSOR AND CHAIR OF THE MCKETTA DEPARTMENT OF CHEMICAL ENGINEERING; RYAN JADRICH AND BETH LINDQUIST, CHEMICAL ENGINEERING POSTDOCTORAL RESEARCHERS

then work backward to figure out how to make that possible,” Jadrich said.

They are using the technique to design structures — the arrangements of components that make up a material and give it its special properties, such as conductivity, optical properties or solubility, as well as performance, strength and resilience.

“Structures that we’ve targeted so far include materials with pores of specified size, shape and connectivity, as well of a variety of crystalline lattices,” Linquist said. “Once we have a set of targeted structures, we can use the machine learning technique to suggest what types of material systems are most likely to realize them. If all goes well, we can give researchers a map of how to best execute the design in their labs.”

Truskett said that Jadrich and Lindquist — who happen to be married — are

the driving force behind the team’s new machine learning tools.

“Ryan and Beth are two of the best researchers I have had a chance to partner with over the past 20 years,” Truskett said. “Ryan’s deep interest and theoretical understanding of machine learning and statistical mechanics, coupled with his expertise in materials theory, allowed him to formulate the key design strategies and the theoretical framework. Beth, who has a talent for distilling the important physics of a problem and then planning an effective computational strategy for incorporating them, worked together with Ryan to build this strategy into a user-friendly simulation approach capable of addressing a wide variety of material design problems.”

After spending the last few years developing the algorithms, tailoring existing

software and testing the strategy, Truskett, Jadrich and Lindquist said they are eager to apply the machine learning tools to real-world problems. They are currently working with chemical engineering professor Delia Milliron to accelerate the otherwise time-consuming synthetic discovery of nanomaterials for smart windows that separate light from heat and with professor Keith Johnston to find new formulations of therapeutic proteins appropriate for safe, at-home treatment of disease via injection (similar to insulin for diabetics). The team is also in discussions with companies about how such machine learning approaches can be applied.

The team’s machine learning tools aren’t necessarily the magic bullet for research, Truskett said, but they do bring us one step closer to automation of the research and development process. **TE**



NEW VIEW

A NEW, ADVANCED, LIGHT-BASED MICROSCOPE INVENTED AT UT AUSTIN OFFERS A GLIMPSE DEEP INSIDE LIVING CELLS

PACKED INSIDE EVERY CELL is an exciting scene — there's the nucleus, DNA, RNA, rocketing vesicles, walking vesicles, proteins, mitochondria and other biological structures bustling with activity. But because of their diminutive size and constant motion, it remains difficult even for the most advanced microscopes to deliver an image of these structures.

Enter Cockrell School professor Thomas Milner and College of Natural Sciences professor Martin Poenie who have developed a microscope to help scientists and engineers navigate this tiny, moving cellular landscape.

After years of development, they will soon be introducing a new light-based microscope that they believe offers an improved platform for viewing cells, viruses and other biological structures. A microscope with the ability to reveal more about how cells and viruses work can open up new avenues for scientific discoveries, disease diagnostics and drug discovery.

With an eye on commercializing the tool, which they call the SpectraPol microscope, Milner and Poenie have teamed up on a startup called Intelligent Light Sciences.

This year, the startup received a \$48,200 Innovation Grant from the Cockrell School's Innovation Center. In the near future, the first SpectraPol microscope will be accessible through one of UT Austin's microscope service centers where scientists and engineers from the university and around the world can use the tool.

The microscope is being fine-tuned, but the researchers have already been able to see viruses emerging from living cells — which has not been possible before. And they are attempting to image the cytoskeletal structures inside T-lymphocyte cells to gain a better understanding of how the immune system kills cancer cells. Other researchers have been able to image T-cells responding to tumor cells but have not yet been able to see inside a T-cell to glean more information about what is happening.

The UT Austin microscope can produce images that show structures as small as 25 nanometers (about 3,000 times smaller than the diameter of a human hair) for sustained periods of time, and what's perhaps most groundbreaking is that the microscope can do this without the need for fluorescent dyes or other contrast agents.

A major shortcoming of other advanced microscopes is that they rely on fluorescent dyes for contrast, and these fluorescent molecules typically offer only seconds of continuous imaging at a high resolution. The UT Austin microscope, however, offers continuous imaging of a cell for hours without the need for contrast agents. In ad-


dition, the polarized light generates sharper images than those that use fluorescent dyes.

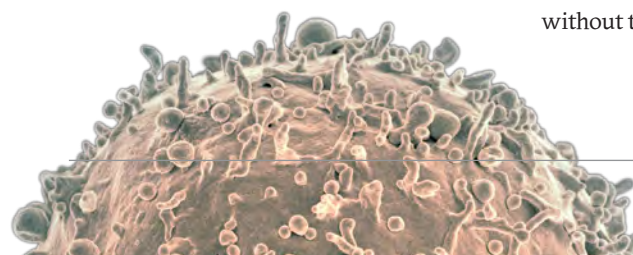
"With our new microscope, you can really see structures that you can't normally see with current microscopes," Poenie said. "For example, you can see individual microtubules that are 20 to 25 nanometers in diameter, and you are seeing these objects without stains or contrast agents going onto the specimen."

Their new light-based microscope relies on spectroscopy, the use of different colors or wavelengths of light to extract information about an object and create an image. Specifically, the microscope takes advantage of polarized light, a type of light wave, to generate contrast with a biological sample.

Milner and Poenie are still working to collect data on their microscope's capabilities, but they believe their microscope could be better than existing technologies at producing images of specific biological structures, such as viruses. To date, scientists have struggled to successfully use fluorescent dyes to tag a virus that can be consistently utilized in the diagnosis of an infection.

Ultimately, Milner and Poenie hope to develop algorithms to display their images in real time, which would allow scientists and engineers to leverage even greater information about an object than is now possible.

"It's just amazing what you can see," Milner said. "You can see vesicles light up, presumably because of the collagen inside them. You see all sorts of things in and around the nucleus where things have never been observed." 





A UNIFYING FORCE

From the moment you walk into the atrium of the 430,000-square-foot Engineering Education and Research Center (EERC) at The University of Texas at Austin — with its dazzling staircases, connecting bridges and bright, window-filled views — you can tell that Texas Engineering has entered into a new era.



HUNDREDS FROM THE TEXAS ENGINEERING COMMUNITY—ALUMNI, FRIENDS, FACULTY, STAFF AND STUDENTS—CAME TOGETHER TO CELEBRATE THE GRAND OPENING OF THE ENGINEERING EDUCATION AND RESEARCH CENTER ON SEPTEMBER 28, 2017.

“Now, our entire community can share ideas and solve complex problems in an open and modern gathering place that inspires teaching moments of its own through a remarkable combination of function and aesthetics.”

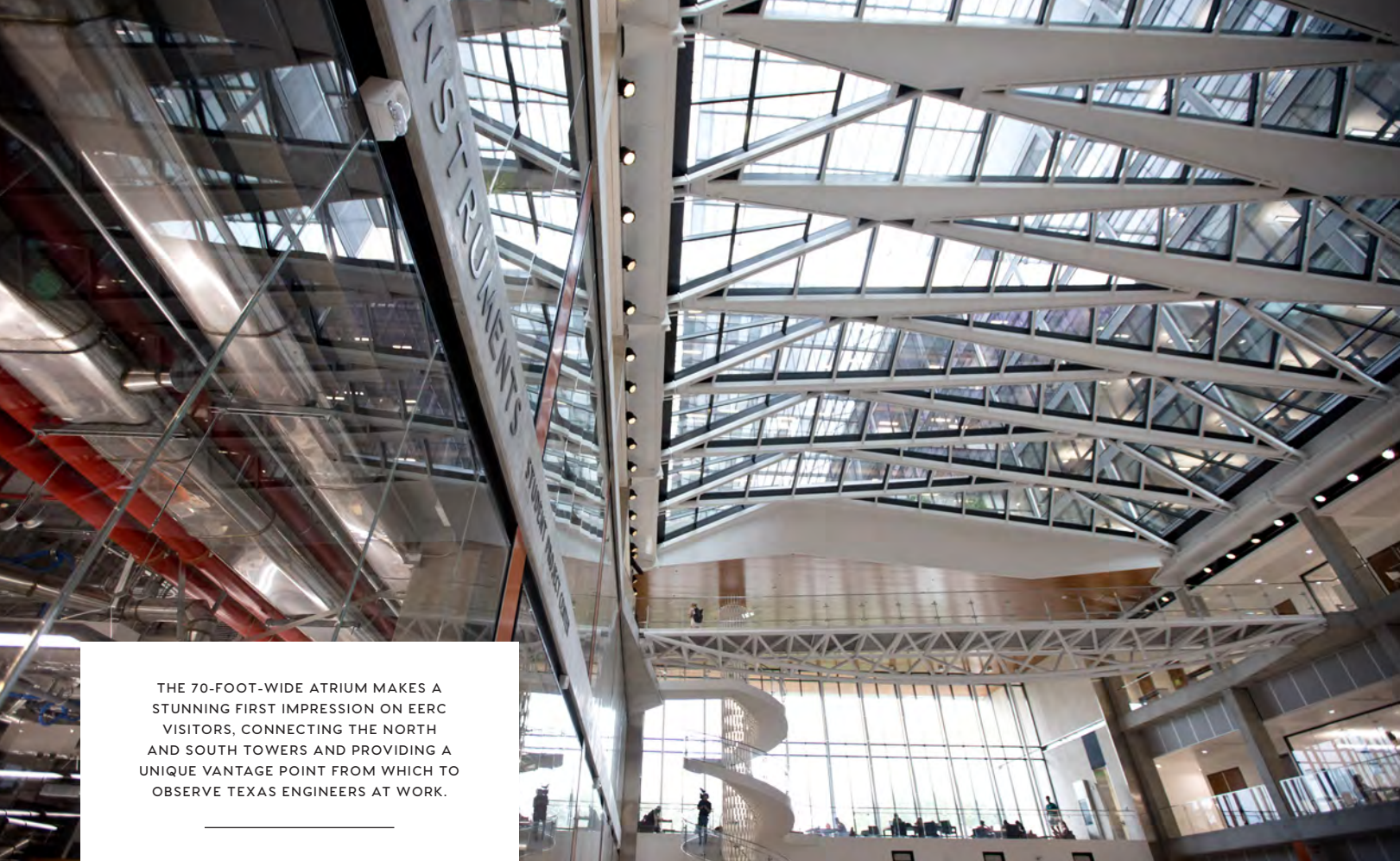
—SHARON L. WOOD
DEAN OF THE COCKRELL
SCHOOL OF ENGINEERING

THE EERC IS THE UNIVERSITY'S NEW HUB for engineering education, research and innovation and serves as a center for multidisciplinary collaboration within the Cockrell School of Engineering. It is also the new home for the Department of Electrical and Computer Engineering, the school's largest academic department.

When the EERC officially opened this September, it became the physical manifestation of the Cockrell School's commitment to collaboration. The school began work on an architectural design in 2008, and, six years later, the 50-year-old Engineering-Science Building was demolished, allowing construction to begin on the EERC and paving the way for a new, cross-departmental approach to engineering education.

The two-tower, nine-story EERC signals a movement away from the discipline-specific nature of engineering facilities in the past. With large open spaces, numerous team meeting rooms and a makerspace dedicated to student projects, it is the first UT Austin engineering building designed to unify the school and bring all Texas Engineers together under one roof.

“We wanted to establish the EERC as the home for the Cockrell School,” says Dean Sharon L. Wood. “Now, our entire community can share ideas and solve complex problems in an open and modern gathering place that inspires teaching moments of its own through a remarkable combination of function and aesthetics.”



THE 70-FOOT-WIDE ATRIUM MAKES A STUNNING FIRST IMPRESSION ON EERC VISITORS, CONNECTING THE NORTH AND SOUTH TOWERS AND PROVIDING A UNIQUE VANTAGE POINT FROM WHICH TO OBSERVE TEXAS ENGINEERS AT WORK.

INSPIRATION THROUGH DESIGN

The building itself is a masterclass in engineering. Ennead Architects set out to create a facility that showcased not only the marriage of architecture and engineering but also the purpose behind the building's design — to bring Texas Engineering research and invention out from behind closed doors and put them on display for the world to see.

The canopy panels that stretch high across the building's two towers were individually designed to provide the proper amount of shading, making the openness even more striking. Plaster around the glass panels contains acoustic properties that dampen the sound in the biggest spaces, maintaining a comfortable noise level for conversation and collaboration. Throughout the EERC, the floor-to-ceiling views spark creativity, ingenuity and curiosity.

"We designed the EERC to meet the challenges of an increasingly collaborative field through architecture that reinforces community through visibility and shared space," says Todd Schliemann, Ennead design partner and head architect on the project. "Recognizing that innovation requires multiple perspectives, the EERC was conceived as an inspiring learning space to encourage greater collaboration between the next generation of problem solvers in this field."

LOOKING THROUGH THE ATRIUM'S INTRICATELY ANGLED SKYLIGHT, VISITORS WILL NOTICE THE CANOPY HIGH ABOVE. ITS CAREFULLY DESIGNED PANELS PROVIDE DIFFERENT LEVELS OF SHADING FOR DIFFERENT PARTS OF THE BUILDING.





THE ENTIRE UNIVERSITY COMMUNITY WILL FIND A SHARED GATHERING SPACE IN THE JAMES J. AND MIRIAM B. MULVA CONFERENCE CENTER AND AUDITORIUM, WHICH IS NOW THE COCKRELL SCHOOL'S LARGEST EVENT SPACE AND FIRST AUDITORIUM.

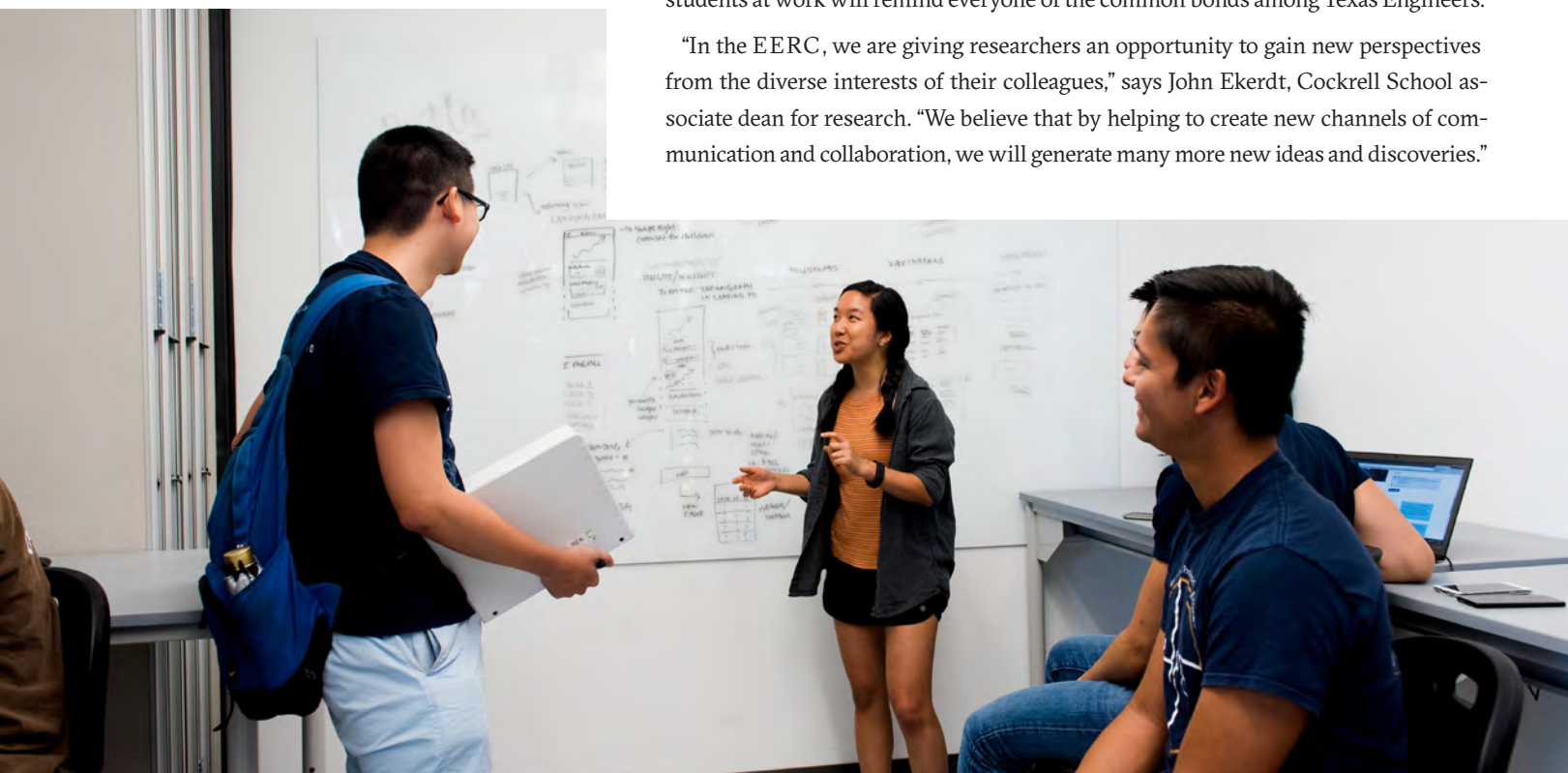
HUB FOR COLLABORATION

As the Cockrell School's first facility built for all engineers, the EERC serves as a bridge between disciplines, assembling thought leaders into shared spaces and central locations where they can solve problems in teams. The Texas Engineering community has been brought together like never before.

In the north tower, 50,000 square feet is dedicated to large-scale research labs where flexible workspaces accommodate engineers from all areas of expertise. In the south tower, electrical and computer engineering faculty and students will work together in seven "research neighborhoods" that are focused on developing cutting-edge technologies. Gazing through the tower windows and seeing faculty members and students at work will remind everyone of the common bonds among Texas Engineers.

"In the EERC, we are giving researchers an opportunity to gain new perspectives from the diverse interests of their colleagues," says John Ekerdt, Cockrell School associate dean for research. "We believe that by helping to create new channels of communication and collaboration, we will generate many more new ideas and discoveries."

PROJECT ROOMS AND LABS LIKE THE ELECTRICAL AND COMPUTER ENGINEERING CAPSTONE LABS BRING STUDENTS TOGETHER TO SHARE IDEAS AND LEARN FROM EACH OTHER.

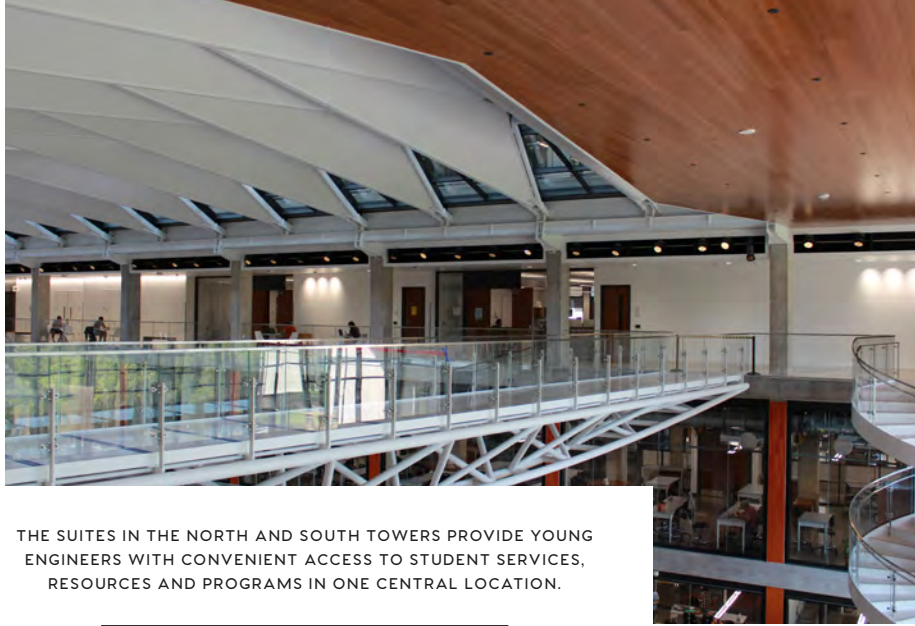


BUILT FOR STUDENTS

Engineers of the future — Cockrell School students of today — need 21st-century facilities to maximize their 21st-century education. With the entire student experience under one roof for the first time, the EERC gives students the opportunity to engage in more hands-on projects, work more closely with their peers and have a new place on the Forty Acres to call home.

In the student organization center, contemporary design is coupled with functionality to create a multipurpose area of meeting rooms, glass writing surfaces and unique spaces for brainstorming. An airy skybridge conveniently connects students to essential resources and offices such as advising, career assistance and student life, and multiple gathering places and quiet getaways indoors and out offer relaxing environments in which students can study or take a break between classes.

“A facility like this has never existed before at UT Austin,” says Mike Peng, chemical engineering student and president of the Cockrell School’s Student Engineering Council. “It’s a place where engineering students from all departments can meet, organize an event and work together to turn ideas into realities.”



THE SUITES IN THE NORTH AND SOUTH TOWERS PROVIDE YOUNG ENGINEERS WITH CONVENIENT ACCESS TO STUDENT SERVICES, RESOURCES AND PROGRAMS IN ONE CENTRAL LOCATION.



THE REX AND RENDA TILLERSON TERRACES PROVIDE SERENE PARK-LIKE SPACES ON BOTH THE EAST AND WEST SIDES OF THE EERC THAT OFFER AN ESCAPE FROM THE ACTIVITY INSIDE.

OVERLOOKING WALLER CREEK, THE MUNDKUR E-LOFT IS PART OF THE ATRIUM YET SUBTLY SEPARATED FROM ITS CENTRAL ACTIVITY, PROVIDING A QUIET ENVIRONMENT FOR STUDY OR CONVERSATION.





THE NATIONAL INSTRUMENTS STUDENT PROJECT CENTER OFFERS STUDENTS AN INNOVATIVE SPACE TO COLLABORATE AND DEVELOP EVERYTHING FROM SOLAR CARS AND SATELLITES TO ROBOTS AND BIOMEDICAL SENSORS.

IN SPACES LIKE THE ANWAR FAMILY LEARNING CENTER AND THE INNOVATION CENTER, FACULTY AND STUDENTS UTILIZE MEETING ROOMS AND COMFORTABLE SEATING AREAS TO BRAINSTORM NEW IDEAS AND WORK TOGETHER ON PROJECTS AND COURSEWORK.



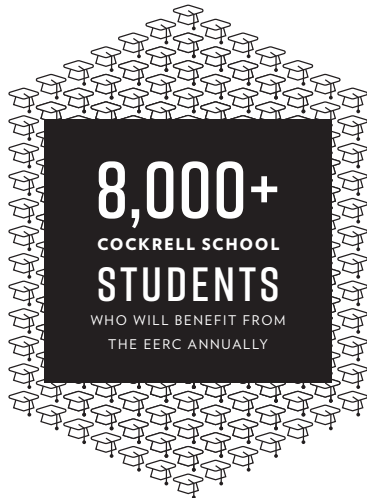
JOURNEY THROUGH INNOVATION

The EERC is the first physical space in the Cockrell School dedicated to entrepreneurship training and commercialization programming. Inside, students and faculty can transform their ideas and inventions into entrepreneurial endeavors.

Research labs in the north and south towers, along with the 23,000-square-foot student project center, will jumpstart discovery and engage Texas Engineers in the full prototype-to-product lifecycle. And, as the new home of the Cockrell School's Innovation Center — headed by Ethernet inventor and Professor of Innovation Bob Metcalfe — the EERC now serves as an incubator and entrepreneurship training ground for the school.

"We want the makerspace to serve as an innovation commons where students can engage in a community of engineering practice and explore beyond the boundaries of their disciplines," says Scott Evans, director of the student project center. "In our labs, students take ownership of their education and truly begin to see themselves as engineers."

EERC BY THE NUMBERS

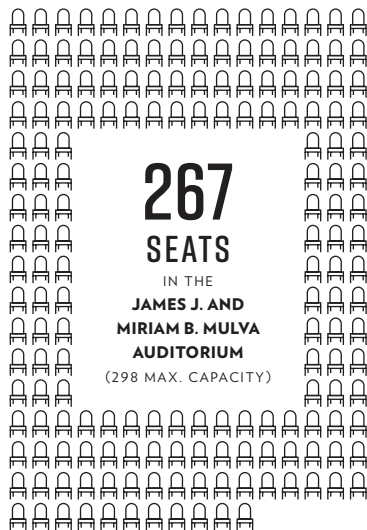


9 STORIES
HIGH

\$70,000,000

RAISED FROM
MORE THAN **280**
TEXAS ENGINEERING SUPPORTERS
(MOST EVER RAISED IN SUPPORT OF A UT AUSTIN BUILDING)

432,671
SQUARE FEET
OF SPACE IN THE EERC



23,000
SQUARE FEET
OF OPEN DESIGN SPACE
IN THE NATIONAL INSTRUMENTS
STUDENT PROJECT CENTER






THE NEXT CHAPTER

IN THE COMING YEARS, THE EERC will be joined by Texas Engineering's second multidisciplinary building, one that will allow UT Austin to strengthen its reputation as "the energy university."

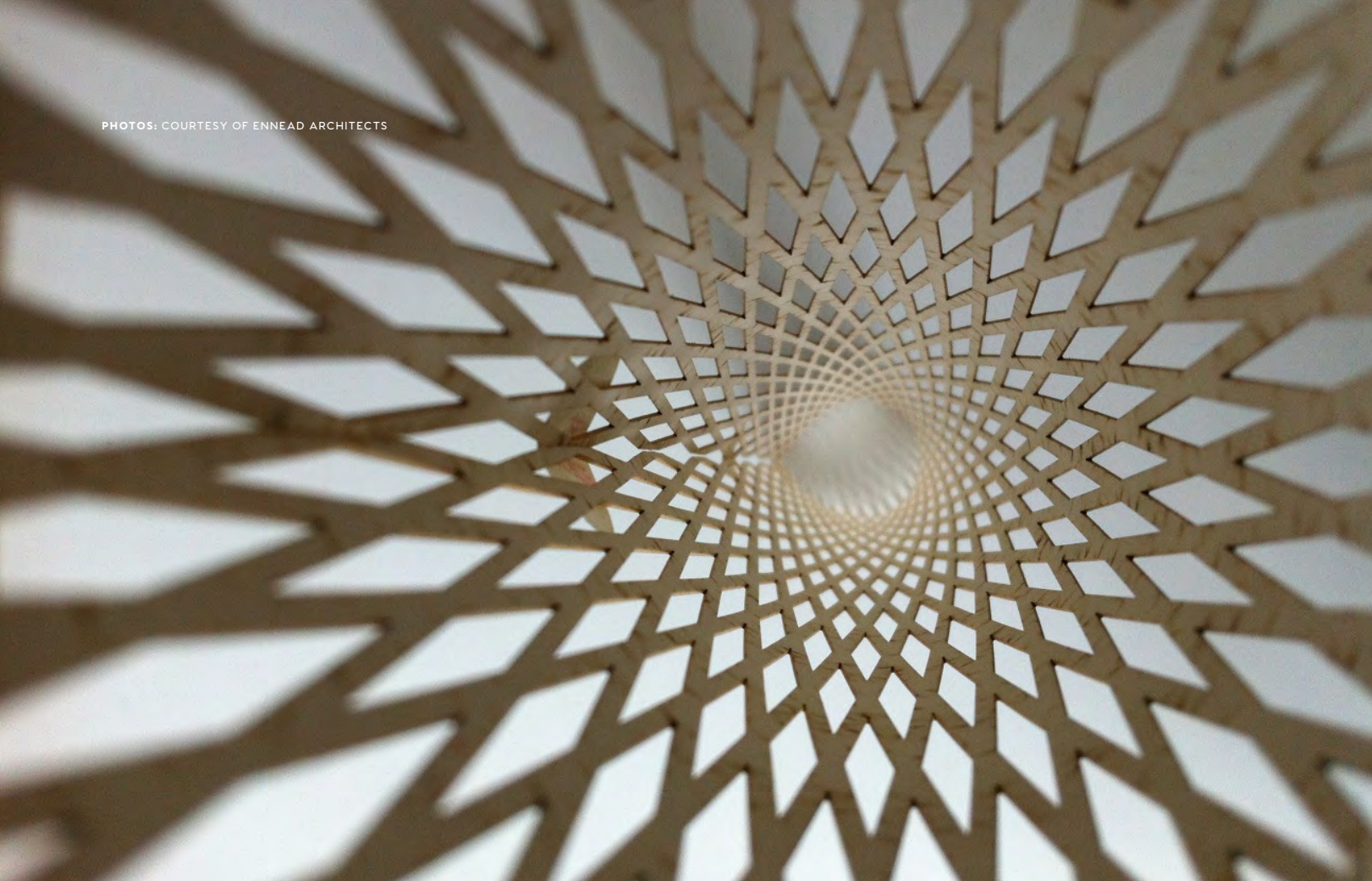
With a history rooted in hydrocarbon energy leadership, the Cockrell School has also been a recognized leader in renewable energy, nuclear energy and batteries. As energy sectors continue to evolve rapidly, and as the state of Texas continues to lead the nation in energy production, the school will leverage its strengths and provide new facilities to explore new frontiers in energy innovation.

"By bringing the university's energy community together to create successful partnerships and inspire world-changing ideas, the Cockrell School will continue to play a vital role in solving the global energy challenges of the future," said Cockrell School Dean Sharon L. Wood.

This vision will take physical form in the new Energy Engineering Building (EEB), which was approved for \$100 million of initial funding by the UT System Board of Regents in November 2016. In addition to encouraging collaboration, the EEB will provide more flexible, energy-specific teaching spaces, laboratories and study rooms. 

SPIRALING UPWARD

Inside the bright, bustling atrium of the EERC, there is one feature that stands out from the rest. It reflects a unique blend of form and purpose—of simplicity and complexity—and serves as a functional art installation that symbolizes the building's charisma and character. The story of the S.P. Yates Staircase, which begins in New York, continues in Europe and ends in Texas, is a tale of novel design, shrewd problem solving and international collaboration.



THE CONCEPT

ENVISIONED TO BE THE ANCHOR THAT TIES three floors together within the atrium and connects the Schlumberger Center for Student Organizations with the lounges of the Mundkur E-Loft, the staircase was designed by NYC-based Ennead Architects to inspire engineering teaching moments in the building. They began by exploring different shapes and patterns for the steel frame around which the stairs would wrap. By creating models out of paper, the team was able to produce an assortment of styles that could be analyzed and scaled to assess feasibility at actual size.



THE FABRICATION

CREATING A MINIATURE MODEL OUT OF PAPER IS ONE THING. ROLLING UP AND perforating a 45-foot-long steel plate is another. After tweaking and finalizing the design to meet code, project partners Jacobs Engineering Group, Hensel Phelps, Datum Engineers and Big D Metalworks collaborated to find the optimal solution to construct the central column. They found it halfway around the world.

Because of the column's size (over 10,000 lbs.) and the complexity of its diamond-shaped pattern — which was designed to appear more compact and weight-bearing at the bottom and sparser at the top — there were few fabricators that could construct it with a high degree of precision. After months of research and meetings with potential shops, Big D contracted with Netherlands-based Plaatwalserij Purmerend to produce the cylindrical column and HGG Profiling Specialists, also based in the Netherlands, to cut the material. The column was then placed in a crate and shipped across the Atlantic to the Port of Houston.

PHOTO: COURTESY OF BIG D, TAKEN AT THE HGG FACILITY IN ZUIDRAK, THE NETHERLANDS

A large crane is lifting a tall, cylindrical, perforated metal column. The column has a complex, lattice-like pattern of diamond-shaped openings. It is suspended by cables and is being lowered into place. The background is a bright blue sky with scattered white clouds. The crane's arm extends from the top left towards the center of the frame.

THE INSTALLATION

ON AMERICAN SOIL FOR THE FIRST TIME, the column was loaded onto a truck in Houston and transported to Big D's facility in Dallas, where it was hand-ground for smoothness and prepared for final completion. It was then transported to the EERC construction site at the corner of San Jacinto Boulevard and Dean Keeton Street.

Lifted high into the air and meticulously placed through a hole intentionally left unfinished in the atrium roof, the column was bolted to the floor, primed and painted and prepped for installation of the handrail, curved-glass outer guardrail and treads and risers. After six years of planning, dozens of design evolutions, hundreds of meetings and conversations and thousands of miles traveled, the EERC's iconic spiral staircase was finally home.

PHOTO: COURTESY OF BIG D



PEYTON AND LINDA YATES



THE VISIONARY

LIKE MOST EXTRAORDINARY STRUCTURES, the EERC spiral staircase needed an extraordinary investor to help make it a reality. Enter Peyton Yates, Texas Engineering alumnus and energy industry leader for over four decades, who believes that great buildings need great artwork to inspire future generations.

Yates, who lives in Artesia, New Mexico, earned both his bachelor's and master's degrees in petroleum engineering from UT Austin. He began his career with Chevron before joining his family's business in 1970 and ultimately rising to be president of Yates Drilling Company and president of Yates Petroleum Corp.


As a philanthropist and civic leader, Yates has been equally influential. He has served as president of the New Mexico Academy of Science, the Independent Petroleum Association of New Mexico and the Boy Scouts of America Conquistador Council, and he has served on the boards of the Federal Reserve Bank of Dallas El Paso Branch, the College of the Southwest and the Petroleum Association of Wyoming. He is an active leader in the Artesia community and a passionate supporter of the Cockrell School, serving for many years on the Engineering Advisory Board and providing numerous gifts to the school and its students.

Yates is the son of S.P. Yates, a successful UT Austin chemical engineering graduate, but few people know he's also the son of an accomplished painter, potter and proponent of public education. His mother, Estelle, served as president of the Artesia

Library Board in the 1950s. As a lover of books and reading, she was instrumental in building the city's first public library in 1957 and was the key benefactor for its newest one completed in 2013. The new library's most stunning feature, a 46-foot-wide 1952 Peter Hurd mural that was masterfully restored and transported from its original location inside the Houston Main Building (formerly the Prudential Building), was installed as a result of Estelle and Peyton's vision and dedication to civic advancement.

"Both Estelle and S.P. were friends with Peter and his wife Henriette (Wyeth), and Estelle desired to save Peter's artwork for all to see and enjoy," Peyton says. "To her, the mural was a painting mainly of the Southeastern New Mexico ranch country, and Southeastern New Mexico is where the mural belonged. Its availability coincided with Artesia's desire and need for a new public library."

In 2013, Peyton saw the renderings of the EERC spiral staircase, and the inspiring combination of art and engineering immediately piqued his interest. He met with Cockrell School officials about the project, obtained details from the architects and he and his mother decided to make a generous donation to ensure its construction.

"Our purpose in making the donation was to honor my father," Peyton says. "He was proud of his ties to the university, and he would have marveled at the engineering design and construction of the staircase. Estelle would have loved its beauty." 

HOW DO GREAT COMPANIES SUSTAIN SUCCESS?

They Keep Their People Razor-Sharp.

BY ERIC ROE

EXECUTIVE DIRECTOR OF TEXAS ENGINEERING EXECUTIVE EDUCATION


TECHNOLOGY CONTINUES TO TRANSFORM SOCIETY at an ever-increasing rate. In fact, the pace is so rapid that companies often find it difficult to stay current and equip their people to be the best. How does a leading corporation ensure it has the capacity to grow and maintain its leadership position? I see the answer as a three-legged approach, where success depends on all three supports.

The first two are familiar to anyone who knows higher education: a skilled entry-level workforce (recent engineering graduates) and innovative research (technological advancement). The Cockrell School, along with other top-ranked U.S. engineering schools, do a great job of preparing people to immediately make contributions to their employers. Regarding research, the technology-driven business community — whether involved in STEM or not — benefits from the thought leadership and tech breakthroughs discovered by our faculty and students.

The third support, which is critically important and too often overlooked, is upskilling the corporation's current workforce to ensure that its people are its biggest assets. It is imperative for STEM and business professionals to continually grow, develop and re-train. Engineering professional education programs, like those offered in the Cockrell School and at other select schools across the country, are the vehicles for this effort. The programs offer a unique education that links the expertise of the university's thought leaders with tailored curriculum and training designed for people who work full time.

As a result of growing demand for this type of advanced education, we are seeing a rush of innovation in the professional

development programs of several top engineering schools. In the Cockrell School, we are now offering micro-credentials, fully online degrees, better certificate programs and creative models for adult learning. Our master's degrees, weekend executive master's degrees, certificates in engineering leadership and customized, cutting-edge training programs in fields like nanotechnology, health care and energy are transforming workforces and enabling long-serving employees to remain secure and competitive in their companies — no matter how much younger their coworkers are becoming.

I understand that both employees and their companies constantly require new skills, and they need to gain them quickly and cost-effectively. Programs like ours will continue to evolve and improve to meet the needs of changing industries. The bottom line is this: great engineering schools thrive on partnerships with great companies, and great companies — along with their employees — thrive when leveraging the educational assets of great engineering schools. 

→ LEARN MORE ABOUT TEXAS ENGINEERING
EXECUTIVE EDUCATION PROGRAMS
AT EXECUTIVE.ENGR.UTEXAS.EDU

'CREATIVITY IS EVERYWHERE'

IT HAS BEEN A YEAR SINCE SHELLY SAKIYAMA-ELBERT — a leading expert in biomaterials and regenerative medicine and the former vice dean for research at the Washington University School of Engineering — took the reins as department chair of biomedical engineering at UT Austin. We sat down with her to learn more about her impressions of campus, her vision for the future and the deep commitment our faculty and students have to advancing health care.

What have been your early impressions of the university and the city of Austin?

What has really struck me about UT Austin is its enormous breadth and depth. There is incredible variety in terms of expertise and strengths, especially within the Cockrell School, which makes it invigorating to be here. And what can you say about Austin that hasn't been said already — it's so lively, so vibrant. Creativity is everywhere — both in this school and throughout the city.

Why did you choose to come to the Cockrell School, and what made the Department of Biomedical Engineering (Texas BME) so appealing as the next step in your career?

I found the story of Texas BME very interesting — it's a department that grew out of a world-class engineering school but also in the absence of a local medical school. There hasn't been a new medical school at a research-intensive university for decades, so one of the things that drew me here was the ability to engage in the start-up process of the Dell Medical School.

How can Dell Medical School's presence enhance the work that is currently being done in Texas BME?

Biomedical engineers need front-line, real-world experience so they can really understand the problems that clinicians and patients face. We need to design technologies and approaches that meet these clinical needs and affect lives. With our Dell Med faculty collaborators, now we have that perspective, and we can learn what their biggest challenges are and where a new device or therapy could help. For engineers, it's helpful to have that feedback early-on so we can design tools that solve real-world problems.

Why is the continued investment in and advancement of biomedical engineering so important to society today?

We are living in a time of rapid advancements in biology and medicine, and there are emerging opportunities for entrepreneurship and commercialization in these industries. Technology innovation in big data and wearables are just two examples of this. New technologies can make people's lives better and allow them to live longer. Biomedical engineers can drive this integration of technology and biomedical advancements.



What are the key priority areas for Texas BME as you look to advance the department's impact and reputation around the world?

When you combine the quality of our people and our academic program, our department is already one of the best in the country. There are four key areas, which also are current strengths of ours, where I believe our faculty and students can really change the world. First, we are implementing new imaging methods and technologies to improve diagnosis, using non-invasive techniques to screen for Alzheimer's or Parkinson's diseases early in the process. This could change the way that health care is practiced for those types of neurodegenerative diseases. Second, we are making big strides in developing formulations for oral delivery of protein drugs. Most people don't like injections, so having a method to deliver those drugs orally is a game-changer for patients, especially children. Third, we are advancing screening platforms for drug discovery to make things cheaper and faster. And fourth, we are using computational models to develop treatment programs specific to each patient.

How are you preparing Texas BME students for life after UT Austin?

We try to help our students understand that throughout their careers they will be working on open-ended problems. The students' coursework spans across several different departments and disciplines in the Cockrell School, and a lot of their design projects have multidisciplinary aspects to them. As a result, we've received feedback from industry that our graduates are well-prepared to collaborate with groups from different fields and serve as leaders on their teams.

If you could reinvent the biomedical engineering classroom — with no boundaries — what would you do?

In an ideal world, I would like to see our first- and second-year students venture outside academic buildings and into hospitals and clinics. I would like them to shadow clinicians. They would be able to see how existing technologies are implemented in the real world and understand from the beginning of their education what clinicians really need. Then they could work on creative design projects that last over several years based on those experiences.

What advice do you have for current and future engineering students?


View your time in college as an opportunity to explore many different areas. If you get outside of your academic comfort zone, you just might discover a passion you never knew existed. Then find a mentor who can help you navigate the road ahead.

Tell us about a time when you were most daring or courageous and what you learned from the experience.

One experience that was formative for me in college had nothing to do with academics.

I decided I was going to try to rowing, which I had never done before. I had never even participated in a team sport before! I stuck with it and worked really hard, and I learned that to have success as part of a team, you can't just rely solely on your individual skill — you must be a good team player and those who work well together will go further than those who are focused only on themselves.

You have spent many years attending and working at top U.S. engineering schools. What sets Texas BME apart?

Our community. I think it's our biggest strength. The environment in our department is outstanding. People are highly creative, collegial and supportive, and they care about the education and experiences of our students. I am very proud to be a member of this community. 



DELIVERING A BETTER LIFE

THE CONNECTION BETWEEN RESEARCH AND REAL LIFE is never so direct—or crucial—as it is in the field of health care, where advancements, and the deployment of those advancements, can determine the wellbeing of so many. And there is perhaps no better example of this reality than in the study and engineering of drug delivery methods.

The field of drug delivery encompasses a wide variety of approaches, technologies and systems for transporting a pharmaceutical compound through the body to treat and manage health issues. Broadly speaking, the field includes everything from pills to pumps and protein engineering to antibody delivery.

While the last five decades have seen remarkable progress, there is still more to be done to make the delivery of medications more efficient, effective, painless and affordable. One life-changing breakthrough at a time, a cadre of visionary Texas Engineers have become global leaders in this pursuit. They are driven by both personal and professional motivation, and it is their belief that, through advancements in drug delivery, we can transform patients' daily lives and even extend the window of treat-

ment long enough to change a prognosis. These are their stories.

A MOMENT THAT CHANGED EVERYTHING

In everyone's life, there are a few moments that serve as reminders of how things can drastically change in an instant. For Nicholas Peppas—a renowned inventor and expert in oral drug delivery—one of those moments came when he was diagnosed with multiple sclerosis (MS) in 1992. Over 2 million people around the world have MS, with symptoms that include blurred vision, loss of balance, poor coordination, slurred speech, paralysis, extreme fatigue, blindness and more.



NICHOLAS PEPPAS

The diagnosis changed his life and shaped the course of his research.



His physician quickly prescribed a common drug for MS, called interferon-beta, which is aimed at keeping symptoms at bay. The drug came in the form of a weekly intramuscular injection, a type of injection where the needle must push into muscles to release the medicine.

“We need to improve the quality of life of our patients, and injections are not always the best solution.”

“As a patient, I remember feeling that the day after the injection was just terrible,” said Peppas, a professor in the Department of Biomedical Engineering and McKetta Department of Chemical Engineering with appointments in the university’s Dell Medical School and College of Pharmacy. “My wife had to administer the injections. I had pains in my bones, pains in the injection area. That’s when I decided to take my oral-drug delivery platform and develop it for MS.”

Though Peppas was told years later that he had shockingly been misdiagnosed (12 years later he learned he had an autoimmune disease with the same symptoms that could be managed much more easily and without shots), he and his team never wavered in their efforts to develop a better treatment delivery platform for MS. They developed a new, less invasive method, a capsule, which has not yet made it to market but has informed many other oral delivery platforms in labs around the world.

Often described by his colleagues with words such as pioneer, pacesetter and iconic, Peppas continues to make incredible leaps in the oral drug delivery and controlled-release drug delivery arena. Last year, he and his former graduate student, Serena Horava, announced a breakthrough for hemophilia B that enables a treatment to be administered via a biodegradable capsule.

“My most pressing concern was the treatment of younger patients who suffer from hemophilia and who have to apply injections every two days,” Peppas said. “The original idea of the project was conceived when Dr. Lisa Brannon-Peppas, who at the time was a biomedical

engineering faculty member, discussed with me the side effects of the disease and the psychological impact it has on mothers.”

Peppas’ lab, along with his new Institute for Biomaterials, Drug Delivery and Regenerative Medicine at UT Austin, is also working on new types of carriers (biopolymers, biomaterials) to better target specific areas of the body. His lab is also focused on siRNAs (small interfering RNA) that were recently discovered to regulate the expression of genes. This work is centered on finding ways to deploy siRNAs in the treatment of autoimmune diseases such as MS, Crohn’s disease and various bowel syndromes.

“I think in the next 10 to 15 years, we are going to see less expensive systems and new systems for the treatment of diseases such as cancer, autoimmune diseases and cardiovascular diseases,” Peppas said. “We need to improve the quality of life of our patients, and injections are not always the best solution.”



JEANNE STACHOWIAK

RETHINKING CHEMOTHERAPY

When her sister was diagnosed with Hodgkin’s Lymphoma—a cancer that starts in the white blood cells—Jeanne Stachowiak was already working in drug delivery as a biomedical engineer. Still, seeing that chemo process firsthand gave Stachowiak a new perspective.

“Going to chemo treatment with my sister brought a level of realism that I don’t think I would have otherwise experienced,” said Stachowiak, an assistant professor in the Department of Biomedical Engineering. “As researchers, we work with Doxorubicin, the most successful chemotherapeutic drug ever. But when we work with it in the lab, we have tiny quantities and make up small volumes of concentrated solutions. I remember watching a nurse bring a big red bag of it into the room and pump it right into my sister’s veins during treatment. I had no idea just how significant the dosing is and how weak people can get from it.”

Even for a patient with a positive prognosis and a cancer with a high survival rate, chemotherapy is debilitating.

Hoping to solve that problem, Stachowiak and her graduate student Avinash Gadok drilled down to the cellular level to find a faster route to deliver chemo-

“Going to chemo treatment with my sister brought a level of realism that I don’t think I would have otherwise experienced.”

therapy directly to individual cells. They set their sights on a part of the cell called a gap junction, which is the body’s natural mechanism for sharing molecules between neighboring cells.

“There must be a way to utilize gap junctions for better drug delivery,” Stachowiak said. “The big challenge is in making the materials efficiently and showing that the drugs are delivered through the gap junctions and not some other component.”

To use this pathway, the researchers developed “connectosomes,” a new type of nanoparticle, derived from donor cells, that are equipped with gap junctions. Their new method, which in cell-level studies led to a significant decrease in the dose required to kill a cancer cell, enabled them to deliver the chemo more directly than ever before.

The researchers are now working on a second study advancing “connectosomes” by making them much smaller and adding antibody fragments in order to target them to breast cancer cells. Stachowiak said the “connectosomes” have demonstrated an ability to distinguish between cells on the basis of receptors that they express on their surfaces, which often serve as key markers of health and disease.

“We think we can reduce the chemo doses even further by targeting the particle and hopefully get to a dose that’s not going to be toxic for the bystander cells in the tissue,” she said.

GIVING CONTROL BACK TO PATIENTS

For those searching for what’s next in drug delivery, look no further than Jennifer Maynard’s lab. Inside, almost two dozen students are focused on protein engineering and antibody delivery. For the past five years, Maynard has worked with chemical engineering professors Keith Johnston and Tom Truskett on ways to deliver proteins, which are the basis of many immunizations and treatments for those with cancer and autoimmune diseases.

The challenge is that proteins at high concentrations can become unstable and fold onto each other, becoming viscous, like honey. As a result, the process of delivering proteins, largely through infusions, is extremely taxing on patients. That is why research efforts in this area typically focus on stabilizing concentrations of proteins so that a small volume of proteins can be delivered more easily.

Patients typically receive an infusion every week or two weeks at a medical center, where the protein is diluted in a large volume to help with its stability. During treatment, health care professionals are monitoring patients for a possible allergic reaction.

“Because of this inconvenience, there’s a lot of focus on developing methods to deliver antibodies that patients can deliver themselves, like an insulin shot,” said Maynard, an associate professor in the McKetta Department of Chemical Engineering.

Maynard and her colleagues have engineered a formulation of proteins that is stable enough to be delivered through an injection. The technology is currently being tested in mice.

In a completely different project, Maynard has turned her attention to the bacteria that led to the Black Death, one of the most devastating pandemics in the world’s history, resulting in 75 million to 200 million deaths.



JENNIFER MAYNARD

Maynard and her team hope to utilize the pathogen responsible — the *Yersinia pestis* bacterium — and specifically a hearty protein found in the bacteria for drug delivery.

They believe that the bacteria could be used best to treat diseases such as cholera, which is caused by the ingestion of bacteria in contaminated water or food and other causes of gut distress.

“I like the idea of taking something that killed people and using it to actually help and treat people, through a vaccine.”

“Bacteria are the original drug delivery specialists,” Maynard said. “The black plague was so effective at wiping out humanity. I like the idea of taking something that killed people and using it to actually help and treat people, through a vaccine.”

IT'S ALL ABOUT PEOPLE

Adam Heller finds that the best way to approach a problem is to think about those affected by it.

"Before I even think about a solution, I ask the question 'To whom does it make a difference and why?'" said Heller, a research professor in the McKetta Department of Chemical Engineering and the recipient of the 2007 National Medal of Technology and Innovation. "That is always my first question, not whether it is in the scope of my expertise."

That approach has helped turn Heller into one of the most prolific inventors on the UT Austin campus. He has been a co-inventor or inventor of 271 patents granted by the U.S. Patent and Trademark Office and is co-inventor or inventor of 393 total U.S. patent applications. Of these, more than 200 were or are in use.

Heller has helped pave the way for the commercialization and entrepreneurial culture that now permeates the Cockrell School. He is perhaps best known for creating the first painless glucose-monitoring system and the sensing element of the world's first bloodless, continuous glucose-monitoring system.

The ideas for the systems came from his son. "He came to me with the idea and said, 'Can we measure glucose in a way that doesn't hurt people?' So we set out to make the measurement of glucose simple, quick and painless," Heller said.

Their technology, which could measure glucose with eight times less blood than what is drawn by a mosquito, changed the lives of millions of diabetics worldwide.

In 1996, the father-son team co-founded TheraSense to bring the painless glucose-monitoring device and the continuous glucose-monitoring device to market. That company was eventually sold to Abbott Diabetes Care Inc., which now produces

billions of units of the devices, known as the FreeStyle systems, every year.

In the last few years, Abbott began producing the FreeStyle Libre system, which is the first continuous glucose monitoring system that is completely bloodless. The core of the sensor technology of FreeStyle Libre, which Heller created, provides for the electrical connection of oxidation and reduction in reaction-accelerating enzymes to electronic circuits, for which he coined the term "electrical wiring of enzymes," now commonly used around the world.

Now in his mid-80s, Heller hasn't stopped innovating. With his son, Ephraim, along with his colleagues, he has engineered a micropump that continuously delivers into the mouth a drug used to treat Parkinson's. The unobtrusive device fits into the cheek and is held by a tooth-anchored orthodontic retainer following the contours of the palate. It is the basis for a new venture, synAgile Corporation, developing the continuous oral drug-infusion systems. SynAgile presently focuses on DopaFuse™, its continuous oral Levodopa-Carbidopa delivery system for patients with advanced Parkinson's disease.

Heller will tell you that much of his professional drive comes from his experiences with his family in the Holocaust and the suffering of his misdiagnosed daughter who died at the age of 24. As a young boy, he was incarcerated in the Kolozsvár Ghetto in Hungary, then in the Bergen-Belsen concentration camp in Germany. He and his immediate family survived on Kasztner's train. This experience, along with the suffering of his daughter, profoundly impacted the work that he, his wife and his two sons have pursued.

"My family is truly committed to helping people," Heller said. "We have a drive to give back. I owe it as long as I can work." 



ADAM HELLER

"Before I even think about a solution, I ask the question 'To whom does it make a difference and why?'"





TAKE YOUR MARK

5 QUESTIONS WITH ENGINEERING STUDENT
AND OLYMPIC HOPEFUL JOHN SHEBAT

PHOTO: COURTESY OF TEXAS ATHLETICS

SINCE HIS ARRIVAL FROM VIRGINIA two years ago, John Shebat has dedicated himself to two seemingly different areas—engineering and swimming. Today, as a mechanical engineering junior in the Cockrell School, a backstroker on the 13-time (and reigning) national champion Texas Men's Swimming and Diving team and a contender for the 2020 Olympic Games in Tokyo, John must balance these passions and manage his time to perfection. We sat down with him to hear about his commitment to engineering and swimming and why UT Austin is the ideal place to achieve academic and athletic success.

1. Why did you choose The University of Texas at Austin?

I started thinking about colleges before recruiters noticed my swimming, and I was really looking for schools with great engineering programs. Once recruiters began to contact me, it became clear that I had the opportunity to choose a university where I could fulfill my desire to major in engineering—at a world-class engineering school—and where I could get to the next level in my swimming.

I'd visited UT Austin, so I was excited when [Texas Men's Swimming Coach] Eddie Reese asked me to swim for the Longhorns. I was not a top recruit, but Eddie has a reputation of recruiting swimmers who have a steady record of improvement. That really stuck with me and my parents—we really appreciated his trust and faith in me as a swimmer. So it was an obvious choice to come to Texas. Growing up in Northern Virginia, I never understood why Texas was such a proud state and why people were so proud to be Texan. But now that I'm here, I get it. I find myself loving things I never thought I would, like hiking the greenbelt and eating Rudy's barbecue.

TEXAS MEN'S SWIMMING

3
CONSECUTIVE
NCAA CHAMPIONSHIPS
2015 • 2016 • 2017

5
OLYMPIC
GOLD MEDALS
AT THE 2016 GAMES
IN RIO DE JANEIRO

67
OLYMPIC
MEDALS
IN TOTAL

JOHN SHEBAT

Nº 1
RANKED
BACKSTROKER
ON THE TEAM

2ND
PLACE
100M + 200M
BACKSTROKE
2017 NCAA CHAMPIONSHIPS

6TH
PLACE
100M
BACKSTROKE
2016 OLYMPIC TRIALS

2. How did you know you wanted to be an engineer?

As a little kid, I used to always watch “MythBusters” and “How It’s Made.” So my mom encouraged me to pursue engineering throughout school. I really like the hands-on and building aspect of the field, so mechanical engineering felt like the right fit. With that as my foundation, I knew I could pursue a great career path. Ideally, I would like to work for a manufacturer that collaborates with the U.S. Armed Forces to make their weapons safer and easier to use. My grandfather was in the military, and I found his stories inspiring. I’d love to be able to play a part in protecting and helping the people who give their lives every day.

3. How do you balance both your engineering course load and your swim practice schedule?

Prioritizing and time management. I look at how most college students divide their time in three categories: school, social and sleep. For me, it’s school, swimming and sleep—but sometimes, there is only time to pick two, so it’s usually school and swimming. Eddie often reminds us that you can get an education without swimming, but you can’t swim at UT Austin without getting an education. All of us on the team have made the commitment to do both, and we hold ourselves to the high standard of doing both well.

Building good relationships with your teammates and classmates is also incredibly important to succeed as a student-athlete because those friendships will make your time and studies so much easier and enjoyable. And with two other engineering students on the team (Brett Ringgold in aerospace engineering and Safa Anya in electrical and computer engineering), it’s nice to have that extra camaraderie and support.


4. Is there a correlation between engineering and swimming?

Yes! Just like engineering, swimming requires you to problem solve quickly, consider all angles and focus on the mechanics and the movements. I use all of these skills in the classroom and in the pool.

For example, in swimming, I focus on having my knees at exactly 90 degrees coming off the wall to guarantee a really strong start. Underwater work is also very important in my training. Breaking out from your underwater streamline to your stroke too early will result in a lapse in speed from the wall push off. You want to save energy by relying on the impact of your push, but you also don’t want to spend too much time underwater because you’ll lose speed.

5. What are you looking forward to in your remaining two years in Texas Engineering and Texas Swimming?

I’m really excited to use the Longhorn Maker Studios more, especially in the new EERC. I’ve used it for class and with a friend for fun so we could get more familiar with SOLIDWORKS and the 3D printers. I’d like to start experimenting and preparing for my upcoming design courses. And, it would be amazing to win another NCAA Championship with the team. I’d also like to keep building and absorbing as much as I can with the team that will hopefully help me make the 2020 U.S. Olympic team. A gold medal at the Olympic Games is definitely a dream of mine, and I am lucky that my collegiate swimming career will end in a summer games. Ultimately, I want to leave the program swimming better than when I joined, and I know I’m on the right track.

This interview is part of an ongoing “5 Questions” series, where we ask Texas Engineers about their lives and research. 

→ TO READ MORE, VISIT [MEDIUM.COM/COCKRELLSCHOOL](https://medium.com/cockrellschool)



UT AND MEXICO

A Partnership that 'Just Makes Sense'

WITH A HISTORY THAT STRETCHES BACK CENTURIES, Texas and Mexico have an enduring connection. Not only do we share a 1,200-mile-long border, similar economic approaches and many cultural traditions, but we share a desire to leverage each of our strengths for a mutually beneficial return.

PHOTO: NASA WORLDVIEW

Building upon this deep-rooted relationship, it should come as no surprise that The University of Texas at Austin — the state's flagship university — has made a recent push to enhance its ties with Mexico in two critical areas: research and education.

"We have had excellent UT undergraduate and graduate students from Mexico who are already playing key roles in their country in administration, research and industry. We have also had many professors from UT and Mexico collaborating on research for both short- and long-term visits," said Carlos Torres-Verdin, professor in the Department of Petroleum and Geosystems Engineering in the Cockrell School of Engineering and one of the university's most passionate ambassadors in these efforts. "Several social, cultural and economic situations have prompted these new conversations, but we have been friends for a long time."

Four years ago, Mexico announced that it would privatize its oil and gas industry, ending a 75-year monopoly held by the government-run oil company Pemex. As a result, states throughout Mexico began to evaluate their infrastructure and preparedness for a significant increase in investment and development across all energy sectors.

The shift in the country's energy policy re-opened the doors for renewed research and academic partnerships between Texas and Mexico — so, naturally, it was our expertise as "the energy university" that jumpstarted our overall research

relationship. UT community members, such as Jorge Piñon, director of the Latin America and Caribbean Energy Program in the UT Jackson School of Geosciences, and alumnus Sergio Alcocer (Ph.D. CE 1991), former undersecretary for North America in the Ministry of Foreign Affairs of Mexico, began having conversations with Mexican organizations and universities about future collaborations, ultimately helping to catalyze the launch of our newest initiatives.

"There was this perfect storm that began our whole process — from the energy reform to an agreement with the National Autonomous University of Mexico (UNAM) to two of our senior members being inducted into the Mexican Academy of Engineering," Piñon said. "Everything came together at once and enabled us to develop a university-level, interdisciplinary strategy to focus on our relationship with Mexico."

In 2016, the university took its first-ever delegation of more than 40 Longhorns to Mexico to continue discussions and make plans to develop research collaborations and exchange programs, grow alumni engagement opportunities and design customized offerings for students and professionals.

"Such relationships allow us to better address questions that face the entire border region, from building a strong economy with opportunities on both sides to finding new and efficient ways to develop energy sources," wrote UT President Gregory L. Fenves in an op-ed in *The Dallas Morning News* before the visit.



DID YOU KNOW?

UT President Gregory L. Fenves and Texas Engineering Dean Sharon L. Wood were inducted as Corresponding Members into the Academy of Engineering of Mexico in 2015. Also, this year UT has more Mexican Fulbright Scholars — one of the most competitive and prestigious programs — than any other U.S. university.

“If we stay on course, this will be an extremely rewarding partnership — no question about it.”

Multiple initiatives and agreements are in place to begin and energize the research relationships between UT Austin and Mexico. Initial collaborations, which include workshops, seminars, exchanges and more, will tackle additive manufacturing; water systems and sustainability; robotics and intelligent systems; infrastructure and smart transportation; and, of course, energy. In addition, the university will work on faculty, staff and student exchanges; study abroad opportunities; graduate student recruitment; professional training; ESL programs; and shared cross-disciplinary grants.

“To ensure the success of these programs, UT faculty and researchers need to continue making connections with their Mexican peers and identifying those areas of collaboration,” Piñon said. “If we stay on course, this will be an extremely rewarding partnership — no question about it.”

Faculty members, students and researchers across campus continue to develop new ideas to create new partnerships and bring new types of funding, programming and brainpower to

this joint initiative. And, as conversations about research have advanced, it has become clear that there are many other equally beneficial areas in which Texas and Mexico could team up.

“I truly believe UT and Mexico are and will continue to be excellent partners in education and research,” Torres-Verdin said. “Being Mexican and being part of UT, I have a personal connection to these initiatives. I can see a win-win for both of my homes.”

John Ekerdt, associate dean for research in the Cockrell School, said the two partners identified the areas for research exchange based in part on areas that will advance the Cockrell School’s strategic research plan, which was launched in 2015 to help shape the school’s investments.

“Partnering with Mexico provides exciting opportunities for our engineering community,” Ekerdt said. “We work on the same problems but the solutions are unique to our situations and geographic locations. That’s how we learn from each other. Simply put, this partnership just makes sense.” **TE**

UNSUNG HEROES

WE ALREADY KNOW that Texas Engineering faculty and students are changing the world, but behind the scenes, staff and administrators are the ones keeping things running smoothly. From alumni outreach to student life programming, staff members dedicate themselves to improving and advancing the Cockrell School. Read about two of our many “unsung heroes,” and find out what inspires them to build a better Texas Engineering experience for the next generation.



MARY DE SOPO

TITLE: ASSOCIATE ACADEMIC ADVISOR

YEARS AT UT AUSTIN: 3

When Mary De Sopo took a position as academic advisor for the Ramshorn Scholars Program, a new student success program in the Cockrell School of Engineering established to help first- and second-year engineering undergraduates transition to the demands of college life, she also became a de-facto community builder.

Armed with degrees in sociology and higher education administration, De Sopo focuses on helping students navigate their initial years and find the right support resources available to them, such as reserved seats in select first-year courses and access to leadership opportunities, first-year interest groups and mentors. Along the way, De Sopo encourages them to work together and help one another.

“I want our students to have a support network that really benefits them, so it’s gratifying to see them working with and inspiring each other,” De Sopo said. “When I see that happen, and when those student-to-student connections start to get stronger throughout the academic year, I feel like I’m doing my job.”

Her advice to students is simple but impactful: “Take advantage of every opportunity to maximize your experience at UT Austin. If there is a resource offered to you and there’s a chance you could benefit, seize it.”

“*It is so exciting when I see our students become active, supportive and engaged campus citizens. When they come into our offices and tell us, ‘I just applied to be an engineering ambassador or a summer camp leader,’ that’s the best moment.*”

—MARY DE SOPO


STEVE FERRARO

TITLE: MANAGER, LONGHORN MAKER STUDIOS

YEARS AT UT AUSTIN: 17

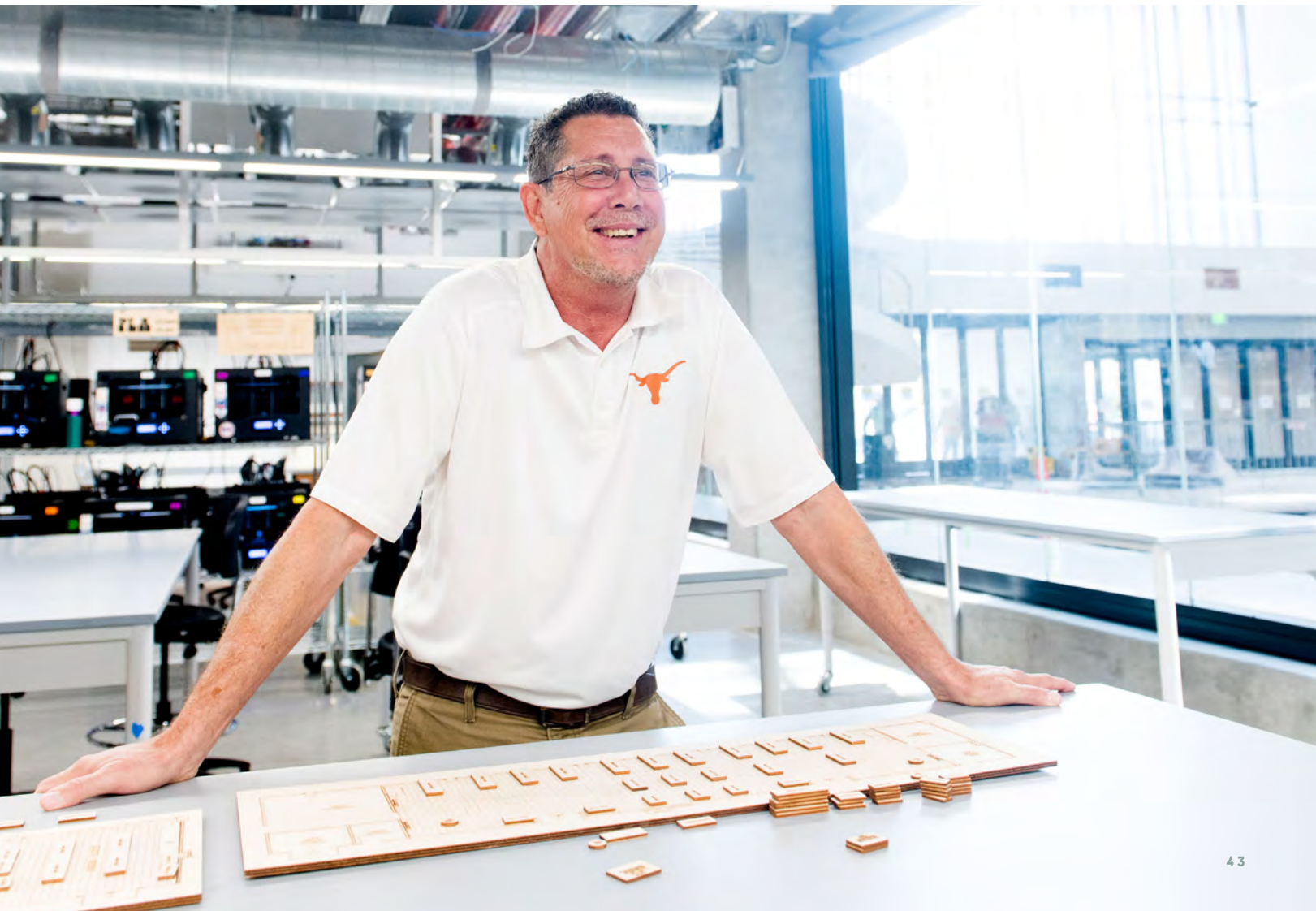
It doesn't take long to see that veteran technician Steve Ferraro, with his expertise, enthusiasm and easy-going disposition, is the perfect fit to manage the Cockrell School's popular makerspace. He spends all day every day training, helping and encouraging students to create, build and collaborate—so much so that he often forgets to eat lunch.

"My favorite part is seeing that light bulb turn on in the students," Ferraro said. "Whether helping them work on a piece of equipment or figure out how to make something actually work properly, being with the students and seeing their creativity advance and come to light is extremely rewarding."

Ferraro is the go-to for students using the Longhorn Maker Studios, which has a new 30,000-square-foot home inside the now open Engineering Education and Research Center. He is often seen brainstorming with students on their class projects, team designs and early-stage prototypes, while also teaching them how to use the high-tech equipment and materials available to them in the space. 

“It's the most fulfilling job I've had so far in my career—getting to know these amazing students, working so closely with them and watching them bring their ideas to life.”

—STEVE FERRARO



BE YOURSELF, AND KNOW YOUR BLIND SPOTS

EXXONMOBIL IS THE WORLD'S LARGEST publicly traded energy company. XTO Energy Inc., a wholly owned subsidiary acquired in 2010, is responsible for its unconventional business—using and advancing technologies that extract oil and gas from shale rock formations. With 4,700 employees, XTO owns interests in approximately 55,000 active oil and gas wells and holds 11 million acres in the United States, Canada and Argentina. One Texas Engineer leads it all.

*“Surround yourself
with people who
think differently
than you do.”*

PHOTO: COURTESY OF XTO ENERGY INC.



AS PRESIDENT OF XTO, SARA ORTWEIN charts the course for the company's success, overseeing everything from drilling and production operations to team development to budgeting and cost management.

After graduating with her bachelor's degree in civil engineering from the Cockrell School of Engineering in 1980, Ortwein felt drawn to the fast pace and intensity of the energy industry and joined ExxonMobil as a drilling engineer. Over her 37 years with the company, she has served in prestigious executive roles, developing a keen sense for team building and leadership in a volatile industry.

We sat down with Ortwein to gain insights into how she leads and develops successful teams that improve the efficiency, effectiveness and profitability of one of the world's top companies.

What is your leadership philosophy, and how has it evolved over time?

I received my first supervisor assignment after only five years with ExxonMobil. I was leading a group of people who had far more experience than I did, and I spent most of my first year in that role struggling to find how I could add value. But then I came to the realization that it wasn't my job to know more than the people around me — it was my job to enable them to apply their strengths to whatever challenges and opportunities we faced. Now, as president, I know I'm not here to have all the answers. I'm here to find and develop the right people and allow them to use their capabilities to move us forward.

What skills and attributes do effective leaders possess?

Integrity, honesty and candor are at the top of the list. If people can't trust you, they won't know whether they should follow

you. Good leaders also need what I call innate optimism. You have to be able to see opportunities where others see challenges and then rally your team around seizing those opportunities.

How do you build a strong team?

As a leader, you have to be able to see potential in people and understand their unique skills. You must also have a good understanding of your own strengths — and your blind spots. Surround yourself with people who fill those gaps and think differently than you do. You need people who are willing to put their ideas on the table and debate with you so you can test your own views. This is especially important after you have been in leadership roles for a long time and have a strong vision for where you think the business should go.

What is the biggest challenge of being president?

At the end of the day, you have to know when it's time to synthesize all the input and feedback from your team and make the tough decisions that can, at times, impact the whole organization. It's a fine balance — creating an open, collaborative team environment and then pulling everything together and setting a direction as the leader. The buck stops with you.

How do you build a work environment that attracts and supports diverse employees?

It's important to create an environment that allows people to bring their full selves and natural personalities to work. I've learned over time that I'm most effective if I can be myself rather than trying to fit into a certain mold. I'm female, and I approach things differently because of that and because of how I was raised. I like humor in the workplace. I'm an open and relatively casual person. If

I try to be more reserved or shape myself into someone I'm not, it just doesn't work. Additionally, you need policies in place that help employees manage through difficult times. All of us, whether male or female, go through periods in life when you need some flexibility, whether it be having children, recovering from illness or taking care of aging parents.

Why is it important for companies in the energy industry and other STEM fields to recruit and retain women?

For many years, I had a hard time answering questions around women in the workforce and my experiences. My approach was always to work as hard as I could and become the expert at whatever I was doing because I didn't want anyone to question whether I had earned my success. But in the early 2000s, I worked for a male executive who helped me understand the business perspective behind recruiting and retaining women at ExxonMobil. It's a business imperative that we attract and cultivate the best minds. The challenges of tomorrow will be solved with technology, and we need the brightest individuals, regardless of gender, race or ethnicity, with aptitudes and interests in STEM, to confront those challenges. As a society, it is important that we do a better job of encouraging women and underrepresented minorities to pursue interests in science and math from grade school through university to ensure we are accessing the entire talent pool. **TE**

Ortwein and her husband Randy have two children, Adam (B.A. Architecture 2009) and Megan (B.S. Public Relations 2017). As a family, they enjoy golf, tennis and travel. Ortwein is an active member of the UT Austin community, serving as chair of the Cockrell School's Engineering Advisory Board and a member of the University of Texas System Chancellor's Circle.

LIVING THE DREAM

GROWING UP IN AN IGBO COMMUNITY in Houston, Nnadubem Gabriel (Gabe) Muoneke dreamed that he would one day live and work in Nigeria, where his roots were strongest and where he felt he could make the biggest difference. After an extraordinary student experience at UT Austin, which included four years of rigorous engineering courses and perhaps even more rigorous practices as a member of the Texas Men's Basketball team, he never lost sight of that dream.



GABE MUONEKE WITH PETROLEUM AND GEOSYSTEMS ENGINEERING PROFESSOR CARLOS TORRES-VERDIN AT THE FALL 2016 COCKRELL SCHOOL COMMENCEMENT CEREMONY, WHERE MUONEKE WAS HONORED AS AN OUTSTANDING YOUNG ENGINEERING GRADUATE.

Muoneke always knew he wanted to build things. At age 10, he was already repairing the plumbing and drywall in his family home, and, by the time he turned 14, he was installing car stereos and fixing his friends' radios almost as easily as he dominated the local basketball courts.

After choosing to attend The University of Texas at Austin on an athletic scholarship, Muoneke decided to focus his academics in an area he thought would best prepare him to make an impact and have success in Nigeria.

"I realized that I had all these accumulated skills with no real direction, but I knew one thing very clearly—I eventually wanted to end up in Nigeria," Muoneke says. "So, I thought, which field could I pursue and which skills could I nurture that would be applicable to living in and adding value to Nigerian society?"

The answer was energy, and specifically, petroleum engineering. Given Texas Engineering's world-renowned distinction in this area, Muoneke knew it was the perfect degree program for him.

Many student athletes would think twice before adding a challenging engineering course load to their plates, but Muoneke was dedicated to pursuing his two passions and believed that one could potentially help him realize his dream of pursuing the other.

REALIZING THE DREAM

As a four-year starter who still ranks among UT Austin's top 15 all-time scorers and rebounders, Muoneke had a college basketball career that most sports fans and student athletes would envy. But he recognized that athletic ability does not last forever, and he began planning his second career before his first had even begun.

"From day one, I knew I was using basketball to set up a career in engineering," Muoneke said. "I once saw an article from my freshman year, in which I was asked what I wanted to do in 20 years. Not knowing much about the terminology of oil and gas at the time, I said I wanted to start an oil 'excavation' company in Nigeria. So, I guess you could say I knew what I wanted to do very early."

But his energy-industry career would have to wait. After college, Muoneke toured the world for nine years as a professional basketball player, playing in various countries, introducing himself to interesting people and cultivating relationships with key influencers who might one day help him develop a company in

Nigeria. Today, some of his biggest financiers are based in Spain, where he won his first professional basketball championship.

When the time came to hang up his sneakers for good, Muoneke's outreach efforts began paying huge dividends.

He retired from basketball in 2009 to join Afren, a U.K.-based oil exploration and production company, where he learned the ins and outs of the industry and advanced quickly. He marveled at the company's efficiency and appreciated the fact that employees in every phase of the operation performed their tasks effectively and understood each other's work.

"The experience at Afren was invaluable," Muoneke said. "In addition to teaching me how to raise money and debt financing, Afren taught me patience and gave me a lot more responsibility and trust than I even realized at the time."

Equipped with the knowledge and training he received at Afren, Muoneke founded MTX, an energy company based, unsurprisingly, in Nigeria.

Though it had been his lifelong dream, having achieved it so quickly took even Muoneke by surprise.

"While attempting to broker a partnership between a friend's company and a would-be investor in Nigeria, the investor asked if I wanted to just start my own company and partner with them myself," he said. "By that time, I knew a lot about the operations, landscape, regulations and overall climate of Nigerian energy, and having that knowledge led me to move quickly on building the company."

Muoneke hit the ground running. He traveled frequently to meet potential partners, financiers and investors — in fact, he can recall a whirlwind 24-hour-period during which he flew to Singapore for a presentation and then got right back on a plane the same night to return to work the following day.

When people ask him how he managed it, the only word he can summon is "supernaturally." But, if he accomplishes the goals he has set for MTX, then these considerable efforts will certainly have been worthwhile.

INVESTING IN AFRICA

Muoneke founded MTX as a mission-driven company focused on bringing sustainable and economically viable energy projects to Africa. "We know we have to make money," Muoneke says, "but I've learned that, if money is your driving factor, you won't make it."

Muoneke sees an African market with deficits in many areas — deficits that he believes can only be addressed by African stakeholders who are willing to invest time, effort and resources.



Only then, Muoneke feels, will Africa bring its energy projects to fruition. For this reason, MTX is made up of the very stakeholders whom Muoneke has in mind.

"We cannot just talk about 'Africa rising' or the proverbial 'potential of Africa,'" Muoneke says. "We must embody it, and we do. We love working for Africa, and we love the people of Africa. We aren't going anywhere. We do not invest elsewhere. Because we are true stakeholders, we act accordingly and invest in Africa. Our ultimate goal is to address all energy deficits on the continent, starting with Nigeria, in a sustainable manner."

For Muoneke, his company's focus on sustainable energy is the highest priority. When he drives through the streets of Nigeria and sees buildings filled with stacks of decommissioned diesel-fueled generators that are perpetually being replaced with new ones, he is reminded that change in the region is long overdue.

But, he knows that there must first be a shared desire to invest in new solutions. "It's a shame that the only thing standing in the way of sustainable energy in Africa is investment," he said. "We believe there is an energy solution in every region of Africa. The issue is just to find that solution. If that requires investing in research, so be it. We are willing to do it."

Above all, Muoneke wants to set an example for his colleagues in the region and help change the global image that sometimes presents Africa as a charity case in need of assistance.

"My hope is that MTX can help to quell the sensationalism that contributes to this image, not by directly addressing it but simply through the results of our work," he said. "I want MTX to do the job of an honest son of the soil, and the results will follow." **E**

Muoneke and his wife, Lenea, have two daughters, Bianna and Ari, and two sons, Dubem and Nnazi. Muoneke speaks seven languages and is a Brazilian Jiu Jitsu brown belt. He is currently completing a master's degree in oil and gas project management from the University of Liverpool.

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The University of Texas at Austin
Cockrell School of Engineering



ALUMNI NOTES

Texas Engineering alumni lead industries, launch companies and help develop solutions that improve lives around the world. We're proud to share just a few of their accomplishments from the past year.

1970s

Ali H. Dogru (Ph.D. PE 1974) was elected to the National Academy of Engineering for his development of high-performance computing in hydrocarbon reservoir simulation. Dogru is a chief technologist and fellow in computational modeling technology for Saudi Aramco and a visiting scientist at the Massachusetts Institute of Technology.

Noboru Kikuchi (M.S. ME 1975; Ph.D. ME 1977) was elected to the National Academy of Engineering for his contributions to theory and methods of computer-aided engineering and leadership in their applications in the automotive industry worldwide. Kikuchi is president and chief operating officer of Toyota Central Research and Development Labs in Nagoya, Japan, and emeritus professor of mechanical engineering at the University of Michigan, Ann Arbor.

Rex W. Tillerson (B.S. CE 1975) was confirmed as the 69th U.S. Secretary of State. In this cabinet position, Tillerson serves as the top foreign policy advisor to President Donald Trump and the leader of the U.S. Department of State and the U.S. Foreign Service. Tillerson was previously chief executive officer and chairman of Exxon-Mobil Corp.

Charles Mallini (B.S. ASE 1977; M.S. ASE 1987; M.S. ME 1987) led a NASA research team in a study of the sun during the 2017 total solar eclipse, sending two research jets into the stratosphere to capture high-resolution photos that allow scientists to

observe the sun's atmosphere. Mallini is branch chief of NASA's WB-57F Program.

Randall W. Poston (B.S. CE 1978; M.S. CE 1980; Ph.D. CE 1984) was elected to the National Academy of Engineering for his development of diagnostic and repair technologies for concrete structures and leadership in concrete building code development. Poston is senior principal at Pivot Engineers.

1980s

Duy-Loan Le (B.S. ECE 1982) was inducted into the Asian Hall of Fame, which was founded in 2004 to honor achievement, inspire the next generation and build the national community of Asian Pacific Americans. Le retired in 2015 as the first and only woman elected senior fellow at Texas Instruments Inc., closing out her distinguished 33-year career at the semiconductor company.

Deb A. Niemeier (B.S. CE 1982) was elected to the National Academy of Engineering for developing groundbreaking tools to characterize the impact of transportation emissions on air quality and environmental justice. Niemeier is a professor at the University of California, Davis.

John A. Brooks (B.S. PE 1984) was appointed president and chief executive officer of Penn Virginia Corporation, an independent oil and gas company. Brooks has more than 33 years of energy industry experience and 24 years of management

experience, and he has been with Penn Virginia for over 15 years.

Kevin Hansel (B.S. ECE 1986) was appointed chief information officer of SailPoint Technologies Inc., a leader in identity governance. Hansel will oversee the company's IT organization and drive IT strategy and innovation while scaling the company's information system capabilities in support of SailPoint's continued expansion.

Stephanie Watts Butler (M.S. ChE 1989; Ph.D. ChE 1991) received the Society of Women Engineers Achievement Award for her outstanding technical contributions throughout her over 20 years in the engineering profession. Butler is a technology innovation architect at Texas Instruments and currently holds 16 U.S. patents.

Steve E. Watkins (Ph.D. ECE 1989) became the president-elect of IEEE-Eta Kappa Nu, the honor society of the Institute of Electrical and Electronics Engineers. In 2018, he will lead the honor organization as president and will chair the board of governors. Watkins is a professor at Missouri University of Science and Technology.

1990s

Sergio Manuel Alcocer (Ph.D. CE 1991) was elected to the National Academy of Engineering for his improvements to the seismic safety of buildings in developing countries through design standards and government policies. Alcocer is a research professor at the National Autonomous University of Mexico and the former undersecretary for North America in the Ministry of Foreign Affairs of Mexico.

Andrew Dunn (Ph.D. BME 1997) received the 2017 Edith and Peter O'Donnell Award in Engineering from The Academy of Medicine, Engineering & Science of Texas. He was also elected a fellow of the Biomedical Engineering Society. Dunn is a professor of biomedical engineering in the Cockrell

School of Engineering and director of the Center for Emerging Imaging Technologies at The University of Texas at Austin.

Juergen Hahn (M.S. ChE 1998; Ph.D. ChE 2002) developed an algorithm that accurately predicts whether a child is on the Autism spectrum disorder. The algorithm, developed by Hahn and his fellow researchers at the Rensselaer Polytechnic Institute, is the first physiological test for autism and opens the door to earlier diagnoses and potential future development of therapeutics.

2000s

Jasson Casey (B.S. ECE 2001) became senior vice president of engineering and chief technology officer at SecurityScorecard, a leader in security ratings. An 18-year veteran in the telecommunications, computer networking and security industries, Casey most recently ran the engineering department for IronNet Cybersecurity.

Cristal Glangchai (B.S. ME 2001; B.A. Plan II Honors 2001; M.S. BME 2005; Ph.D. BME 2008) became director of the newly opened Blackstone Launchpad at The University of Texas at Austin. This interdisciplinary, cross-campus effort will introduce entrepreneurship as a viable career path for UT Austin students.

Muhammad M. Hussain (M.S. ECE 2004; Ph.D. ECE 2005) has been elected a fellow of the American Physical Society in recognition of his work in physics. Hussain currently serves as an associate professor at King Abdullah University of Science and Technology in Thuwal, Saudi Arabia, and is principal investigator of its Integrated Nanotechnology Lab.

Tania Betancourt (M.S. BME 2005; Ph.D. BME 2007) was promoted to associate professor of chemistry and biochemistry at Texas State University.

2010s

Laura Fisher (B.S. ME 2010) received the Manufacturing Institute's Emerging Leader STEP Ahead Award, which recognizes exceptional female leaders in manufacturing for their advocacy, mentorship, engagement and leadership in the industry. Fisher is a reliability engineer at BASF in Freeport, Texas, where she leverages her technical expertise and leadership skills to enhance efficiency and safety.

Sowmiya Chocka Narayanan (M.S. ECE 2010) co-founded the fashion shopping app Lily and serves as its chief technical officer. Narayanan spent two years building the app and engaged in 10,000 hours of interviews with women to develop the app's "Perception and Empathy Engine," which allows Lily to understand the shopper's emotions and body perceptions before selecting the perfect clothes. Lily won a 2017 SXSW Accelerator Award.


Ankur Singh (Ph.D. BME 2010), an assistant professor in the Sibly School of Mechanical and Aerospace Engineering and the Meinig School of Biomedical Engineering at Cornell University, received the 2017 Young Investigator Award from the Society for Biomaterials. Singh also received a U.S. Department of Defense Peer Reviewed Cancer Research Program Career Development Award.

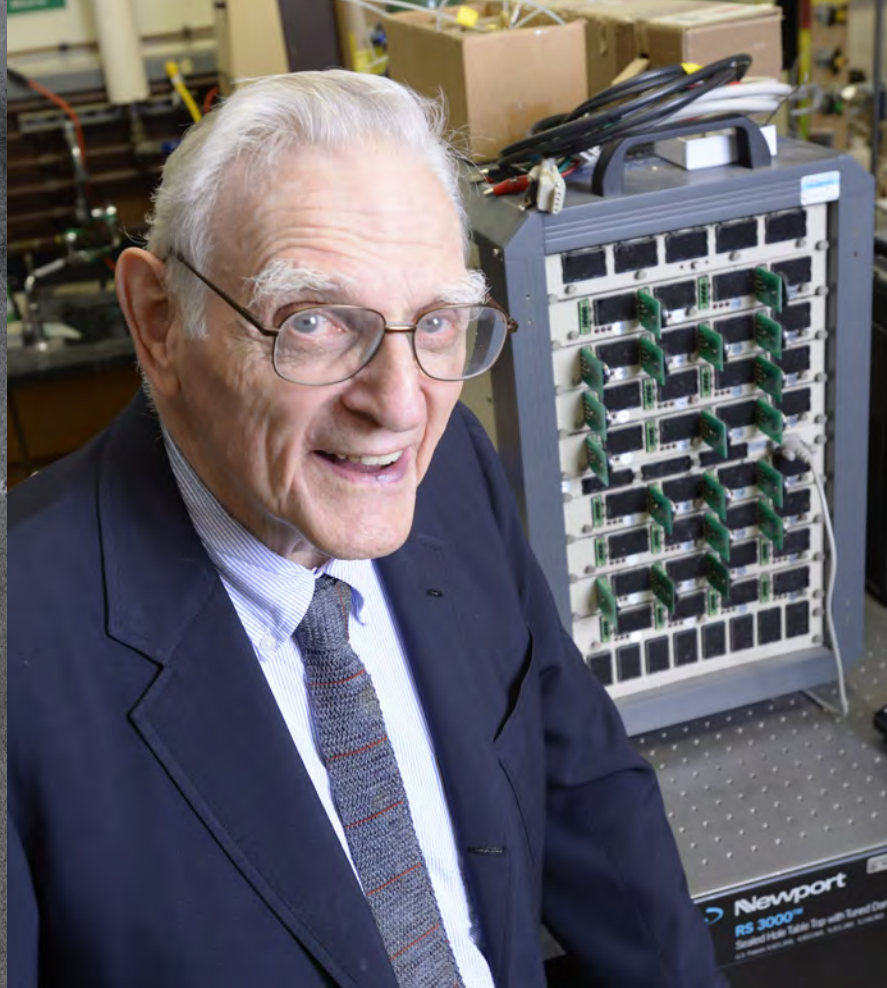
Noble Hatten (B.S. ASE 2011; M.S. ASE 2012; Ph.D. ASE 2016) was named director of the Texas Spacecraft Laboratory in the Cockrell School of Engineering at The University of Texas at Austin, a lab where undergraduate and graduate students across disciplines design and build small, cost-effective satellites to help advance the space industry. Hatten will be focused on recruiting new students to work on a variety of hands-on satellite missions.

Payam Banazadeh (B.S. ASE 2012) was named one of Forbes' 30 Under 30 in the Enterprise Technology category for his work at Capella Space, the first company to combine Synthetic Aperture Radar (SAR) with small, inexpensive satellites called CubeSats in an effort to launch the United States' first commercial SAR satellite into space. Capella Space was also named on Inc's Top 25 Disruptive Companies.

William Liechty (Ph.D. ChE 2013) received the American Institute of Chemical Engineers 35 Under 35 Award, which recognizes outstanding young institute members who have made significant contributions to the organization and the chemical engineering profession. Liechty is an associate research scientist in the food, pharmaceutical and medical business at Dow Chemical Co.


Menzer Pehlivan (Ph.D. CE 2013), was named one of the American Society of Civil Engineers' (ASCE) 2016 New Faces of Engineering and appeared in the ASCE-produced film "Dream Big: Engineering Our World." The first IMAX film to answer the call of the STEM initiative, "Dream Big" aims to inspire kids of all backgrounds to become the innovators who will improve lives around the world in the 21st century and beyond.

Rebekah Scheuerle (B.S. ChE 2013) received the American Institute of Chemical Engineers 35 Under 35 Award, which recognizes outstanding young institute members who have made significant contributions to the organization and the chemical engineering profession. Scheuerle, who is pursuing her Ph.D. at the University of Cambridge, is a board member and researcher at JustMilk, a nonprofit dedicated to improving maternal and infant health through top quality, user-informed medical devices. 



TEXAS ENGINEERING: THEN & NOW

THE LONGHORN LEGEND

JOHN B. GOODENOUGH, HOLDER OF THE VIRGINIA H. COCKRELL Centennial Chair in Engineering and inventor of the lithium-ion battery, taught at the Massachusetts Institute of Technology from 1952 to 1976 (left). In 1986, he joined the Texas Engineering faculty where he remains today (at 95 years young) as a passionate professor and world-renowned innovator. Goodenough, who received the Japan Prize in 2001 and the National Medal of Science in 2011, made international headlines once again in 2017 for developing the first all-solid-state battery cells that could lead to safer, faster-charging and longer-lasting batteries. 



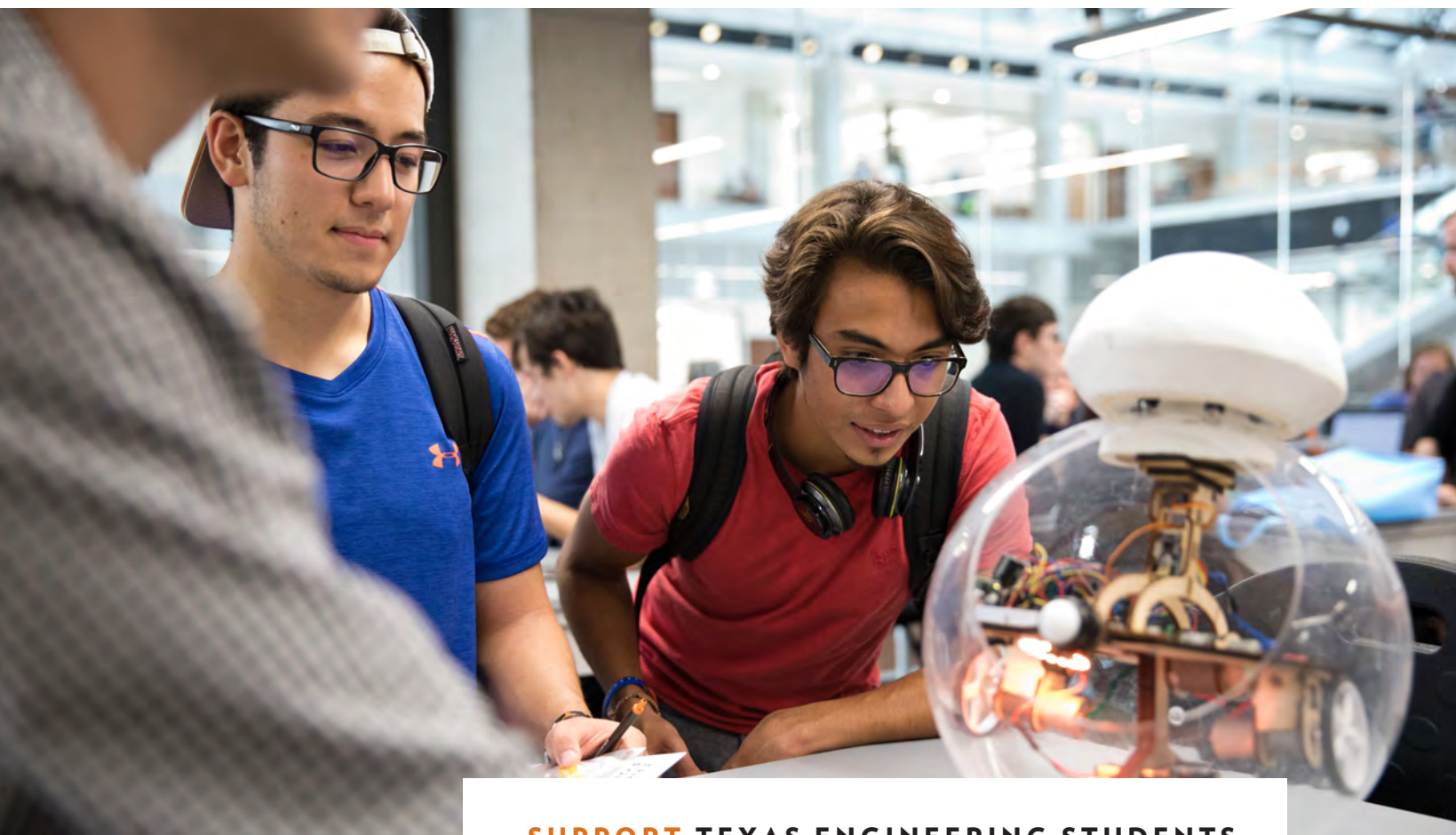
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