

THE JONSSON SCHOOL

# RESEARCH





David Merz (right), a member of the award-winning UT Dallas battlebot team, visits with future engineers during Explore Engineering Day. Several thousand families and students attended the event, which was part of UT Dallas' Engineers Week festivities.

## FALL 2017

JONSSON  
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Welcome to the inaugural edition of the annual Jonsson School research magazine. We are proud to bring you news regarding our research and achievements. We hope you enjoy.

**Questions? Comments?**

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Jacob Lancaster, a UT Dallas computer science student, plays the virtual reality game "Space Pirate Trainer."



## Hackathon Draws National Competition

**WHEN STUDENTS ARE STUCK ON HOMEWORK,** they can now text a tutor for help. At least that was the winning idea at HackUTD, a 24-hour competition where teams of students build apps, hardware and more to solve real-world problems.

"Julian," the winning project at the hackathon, is a tutoring platform that rapidly connects students to qualified tutors using text messaging. Users simply ask a question over text, tutors see it in their dashboard, claim the question and answer it.

"Julian' has wide applications in the education market," said Thomas Hobohm, a University of North Texas student who worked on the project. "We can access individual students with our

texting platform, and license our infrastructure to universities or high schools for use by their instructors and teaching assistants. 'Julian' is the tutor that's always just a text away."

More than 500 students from across the country flocked to the UT Dallas campus to hunker down in the Edith O'Donnell Arts and Technology Building and build their best ideas. Some visitors like Dalton Hahn and his three teammates from Kansas State University stood out from the crowd: the team wore tall, white chef's hats as they stewed over their laptops.

"We wore the chef hats because we are cooking up batches of spaghetti code," Hanh said jokingly. Spaghetti code is a slang term that describes a tangled web of programming code

that can be difficult to follow.

The Kansas State group created an app called “DJ Collab” that allowed people to collaborate on Spotify playlists in real time.

“If you’re at a party or dance, you can crowd-source the playlist and add music to the queue,” Hanh added.

The second-place project at the hackathon went to a hometown team as a group of Erik Jonsson School of Engineering and Computer Science students created “SwordzVR,” a multi-player experience where two players can sword fight each other in the same virtual space.

“One of the biggest challenges we faced was how to provide a realistic sword for the user while still attaching the controller to keep track of the sword,” said Marwan Kodeih, a junior computer science student. “We solved this by creating a custom sword stick and controller holder. We made a custom mold and then used the 3-D printer. There were a few iterations until we found the perfect fit.”

HackUTD helped students learn how to work in diverse teams, to collaborate and, ultimately, pitch their projects to a panel of judges who based their decisions on uniqueness, complexity and impact factor.

Dr. Gopal Gupta, who holds the Erik Jonsson Chair and is head of the Department of Computer Science in the Jonsson School, delivered the keynote address.

“In its third year, HackUTD saw its most energized and inspired group of participants. Students tackled real world problems – like preventing cyber-bullying or providing developing nations access to healthcare – and proposed intuitive solutions using the newest technologies,” Gupta said. “This event gives students a platform to tease out ideas, to challenge themselves and others and further prepares them for futures that require creative thinking to solve complex issues.”

Between coding their apps, attendees also networked with industry representatives and attended tech talks from event sponsors like State Farm and Wal-Mart.

The third annual HackUTD was organized by the UT Dallas Student Chapter of the Association for Computing Machinery with the guidance of Dr. John Cole, a UT Dallas computer science professor.

Additional sponsors for the event included Wolters Kluwer, Raytheon Co. and New York Life. Partners for the event included Major League Hacking, Quantopian, Namecheap, Poly-Printer, VRS, Microsoft Corp. and UTDesign, the Jonsson School’s corporate-sponsored capstone program. ✨



“SwordzVR,” where players can sword fight each other in a virtual space, took second at the competition.



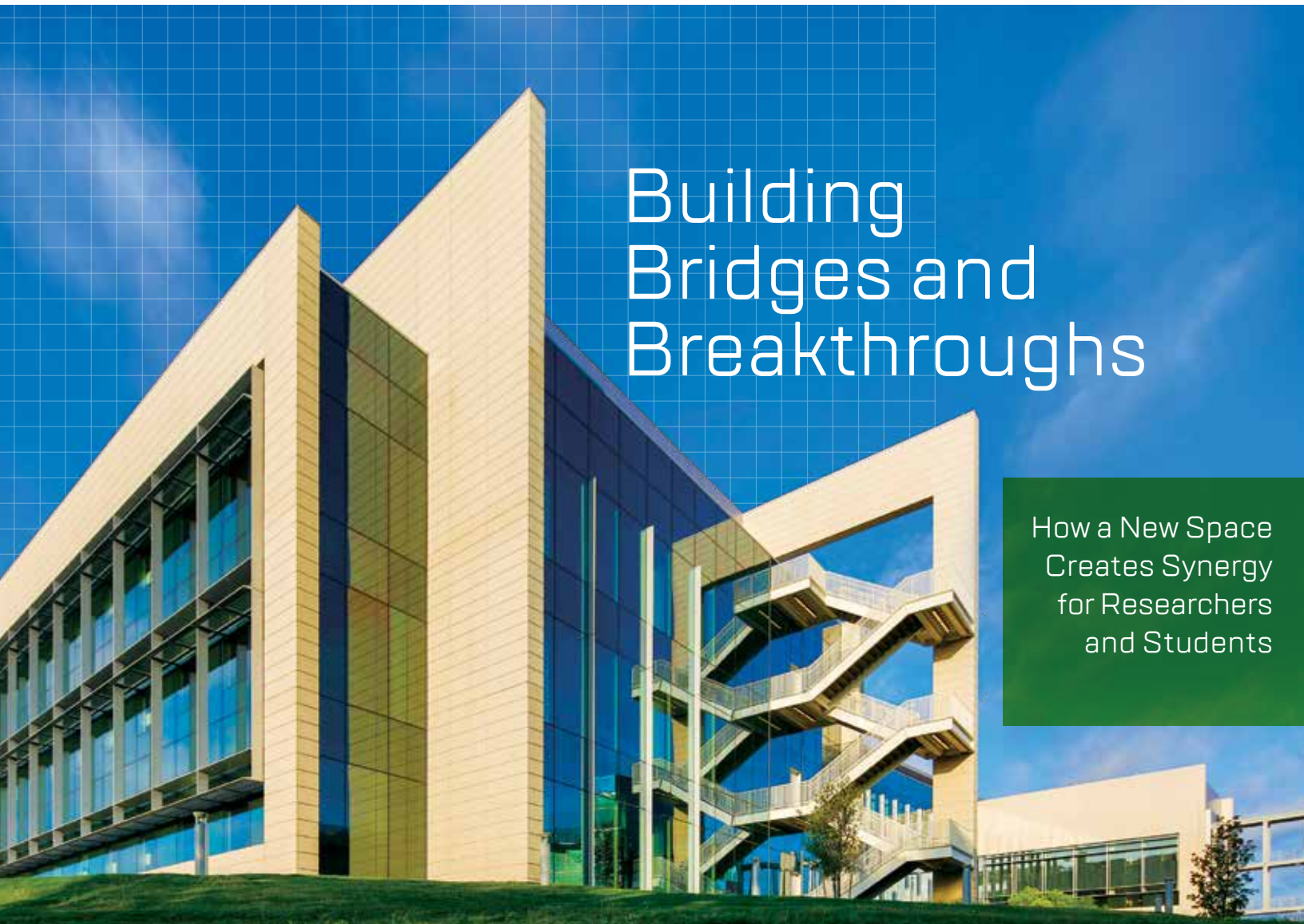
Three UT Dallas students work on their project – an algorithm that roots out and reports abusive language on social media platforms.

## What is a Hackathon?

Hackathons are intensive tech entrepreneurial sessions wherein teams race to design programs or apps while competing for thousands of dollars in prizes. The goal of HackUTD is to bring together young coders and challenge them to design and develop an original product. A total of \$15,270 in prizes were given to the winners. Over the past three years, the Department of Computer Science has hosted more than 2,000 students from across the nation at UT Dallas hackathons.

# Building Bridges and Breakthroughs

How a New Space Creates Synergy for Researchers and Students



Grand Stairwell (left):  
The entrance to BSB;  
this space is used to hold  
community events.



Top Floor (right):  
Highest floor  
of the foyer.





**THE NEW BIOENGINEERING AND SCIENCES Building (BSB)** was built to inspire: five levels fully loaded with advanced equipment to conduct high impact research; a view of the Dallas skyline; a grand stairwell entrance; natural lighting that even fills the basement; and a scenic skywalk that connects to the Natural Science and Engineering Research Laboratory, a facility full of groundbreaking, interdisciplinary research in its own right.

Inside the walls of the four-story, 220,000-square-foot structure known as BSB, a culture of collaboration creates an active, vibrant community that motivates talented researchers and students to excel.

“You can drive up on a Sunday morning and you’ll find 30 plus cars in the parking lot,” said Dr. Joseph Pancrazio, an associate provost at UT Dallas and professor of bioengineering in the Jonsson School.

Dedicated last year, the building houses the Department of Bioengineering, Department of Biological Sciences, Department of Chemistry and

Biochemistry, as well as the Neuroscience program and Texas Biomedical Device Center. Created six years ago, the fast-growing Department of Bioengineering now has about 600 undergraduate students and more than 100 graduate students. Research is an expectation even at the undergraduate level, with students being able to earn up to six academic credits for time in the lab. Twenty new research and 10 teaching faculty members have been hired, and millions of dollars have been invested in research and lab equipment, such as the \$113 million BSB, to ensure that students get a high quality and useful education. The Jonsson School research program is focused on the areas of bioimaging; biomaterials; biomechanics; biosensors and bioelectronics; neural engineering; and systems biology.

The program prepares students for medical or graduate school, entrepreneurship or industry positions needing engineers capable of making medical devices. Many of the faculty members have joint appointments with UT Southwestern Medical Center and professionals from the

Dr. Heather Hayenga (second from the right) is one of the 30 bioengineering faculty members hired in the last few years whose lab is housed in BSB.



Preparation: Department head Dr. Robert Rennaker (left) said bioengineering professors train students to engineer solutions to specific problems.



hundreds of high-tech, startup and biomedical companies nearby also give program input, said Dr. Robert Rennaker, head of the Department of Bioengineering and holder of the Texas Instruments Distinguished Chair in Bioengineering.

“Some engineers have a tendency to build a hammer and go find a nail,” said Rennaker, who is also director of the Texas Biomedical Device Center at UT Dallas. “We have the clinicians working with us so that we are engineering solutions to specific problems. This trains the students to think deeply about issues – not only the technical problems, but also the practical implications: ‘How do I build a device that will operate in a surgical suite? How do I build a device that the patients can take home? These are questions that you just don’t think about if you don’t have the right partners.’”

While partnerships with outside organizations ensure relevance of the research being conducted inside the building, BSB was designed to facilitate research collaborations between different disciplines, and within the six bioengineering

clusters that the Jonsson School is building.

“The difficult problems we are solving require experts in different areas working together to make significant breakthroughs,” said Dr. Alexandra Joshi-Imre, a research professor involved with multiple labs in the building.

For example, researchers with complementary interests are positioned nearby or on the same floor; all offices in the building are the same size and located near their lab for easy access for students; kitchen areas are only in common spaces at the ends of the buildings; most labs have at least one glass wall so passersby can see what research is being conducted, with some labs not having any walls between them; and once a person passes the main entrances on each floor, the labs have no locks.

“Locks are about keeping people out, and UT Dallas is very good at welcoming people in by eliminating perceived barriers and boundaries between research groups,” Pancrazio said.

Joshi-Imre, who completed a postdoctoral position in materials science and engineering at

Instruction: (below left) Dr. Mario Romero-Ortega teaches Ashlesha Deshmukh in his faculty office; offices are located very near labs for student access to professors.

Student Space: (below center) Even the walls of the labs can be used to inspire or teach.







Shared Lab: Dr. Taylor Ware (right), speaks with Julia Burroughs, an undergraduate biomedical engineering student, in a lab area used by four professors, with no walls separating their spaces.



UT Dallas, said that the Jonsson School attracts the types of students who are driven by intellectual curiosity to broach other labs: it is not uncommon for a graduate student in one lab to dream about an experiment, and then come in the next day and work with students in another lab to run the experiment, she said.

“We think about space in BSB as though all the labs are our playground,” she said. “It is understood that the professors have to endorse the idea.”

Pancrazio agrees that students, after they are adequately and properly trained, are then treated as respected and trusted colleagues.

“The students run this whole place,” he said. “That is what makes it vibrant; faculty members steer a little bit, but it is a student/trainee environment.”

“We have young, vibrant faculty who are all research active. They know that in order for them to do big science, they need to be collaborative. They also recognize that having students moving in and around labs is a way to nucleate new ideas and create new collaborations.”

The larger community extends from the lab members housed inside BSB to the adjoining clean room and facilities inside NSERL, the aforementioned building that houses other UT Dallas engineers, materials scientists, physicists, chemists and microbiologists. That \$85 million facility rivals museums in aesthetics and leading universities and industry labs in research equipment capabilities, and has also helped recruit and retain faculty members from some of the best universities and research institutes in the world.

“BSB and the research culture has everything needed to get done what students and researchers need to get done, and do things that they did not even plan on doing when they arrived that morning,” Pancrazio said.

Even if that morning falls on a Sunday. ✨

*The following pages present snapshots of a few research collaborations occurring between biomedical engineers inside the Bioengineering and Sciences Building.*

Skywalk (above): Students in BSB labs have access to the resources in NSERL, another research powerhouse.

## Bioengineering and Sciences Building (BSB)

220,000 Square Feet

\$113 Million

More than 690 cubicles and 72 labs

Five stories, including basement access to a vivarium

Skywalk and basement connection to the Natural Science and Engineering Research Laboratory, or NSERL, an

\$85 million, facility that rivals leading universities and industry labs in research equipment capabilities

129 chemical fume hoods

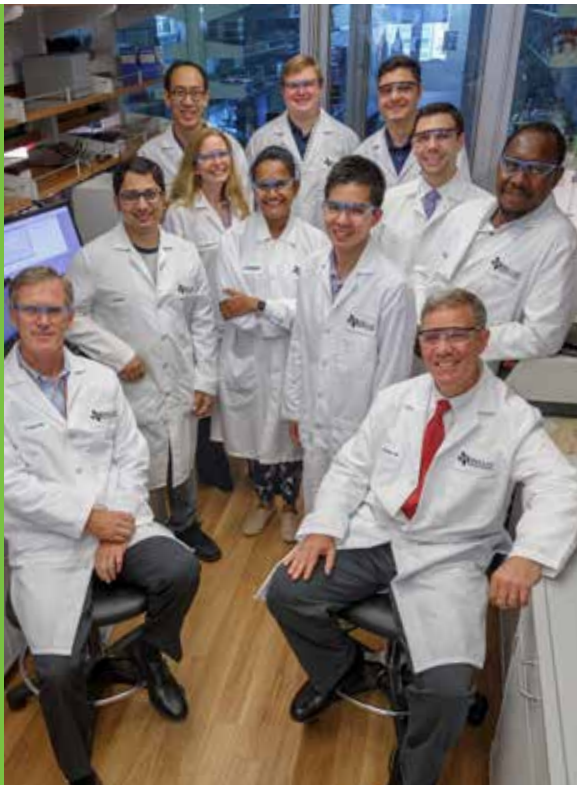
523 active chilled beam system; this feature allows for minimal energy consumption, noise and construction space, and maximum comfort and air safety

Certified LEED Gold by the U.S. Green Building Council

Sustainable wood products throughout

Lighting conservation system that adjusts to the amount of daylight using motion sensors

Rainwater collected from the roof is used to irrigate the grounds of both BSB and the adjacent NSERL



## Shared Resources Drive Discoveries in Neural Interface Tech

**Principal Investigator:** Dr. Stuart Cogan, front left, professor of bioengineering from the biomaterials research cluster

**Co-Investigator:** Dr. Joseph Pancrazio, front right, associate provost at UT Dallas; professor of bioengineering from the neural engineering research cluster

**Outside Collaborators:** researchers at Blackrock Microsystems and the University of Utah

Leaders of the DARPA-Blackrock collaboration above include: (front row, left to right) Dr. Stuart Cogan and Dr. Joseph Pancrazio; (second row, left to right) Bitan Chakraborty, Dr. Alexandra Joshi-Imre, Dr. Aswini Kanneganti and Christopher Nguyen; (back row, left to right) Dr. Jimin Maeng, Justin Abbott, Rashed Rihani, Dr. Bryan Black and Felix Deku.

**DR. BRYAN BLACK, A RESEARCH ASSOCIATE** completing a postdoctoral fellowship in the lab of Dr. Joseph Pancrazio, was one of the first people to move into BSB.

“The new building is an extraordinary collaborative space in terms of both architecture and resources,” he said. “Moving into it made me feel like the possibilities were limitless.”

To Black, possibilities mean working on significant projects such as the research his lab is doing with colleagues in Dr. Stuart Cogan’s lab: improving the stability and reliability of penetrating microelectrode arrays (MEAs) produced by Blackrock Microsystems. In pilot studies, this flagship neural interface technology has allowed paralyzed people to control electronic devices such as TVs, computers or wheelchairs with their thoughts. The MEAs are also used in a variety of other treatments for the central nervous system, but only last in the body a relatively short time, requiring multiple implantation surgeries. This group has received funding from the Defense Advanced Research Projects Agency, or DARPA, to design MEAs to last longer in the body.

Their solution is to use amorphous silicon carbide and sputtered iridium oxide in the devices.

“Silicon carbide in neural interfaces is not widely used, but if it becomes the main material of the device, then we could make thinner MEAs,” said Dr. Alexandra Joshi-Imre, a member of Dr. Cogan’s lab. “We expect the amount

of current and signals needed to activate the nerve would be much less, minimizing the foreign body response that can lead to device rejection.”

Their proposed solution is possible because of several resources: expertise, equipment and proximity.

Cogan is a highly published scientist who has spent much of his career working in industry; and Pancrazio is a leading researcher in national initiatives. Both are fellows of the American Institute for Medical and Biological Engineering, a distinction reserved for the top 2 percent of the field. Cogan joined UT Dallas in 2014, and Pancrazio joined a year later.

The research requires the use of equipment such as an advanced confocal microscope for high-speed live cell imaging, tissue slice histology; and immunostaining. Their microscope was built between and is shared by several labs.

“If I want to do tissue histology and section a piece that is 8 millimeters wide, you go to most other labs and you can’t do it because you don’t have a microscope that is capable,” Black said.

Often, conversations about the research they are conducting happen in unofficial moments, such as seeing each other in corridors.

“We live in an age of email and text messages,” Black said. “There is nothing like going down the hall, having a face-to-face conversation and together understanding the results we’re seeing.” \*



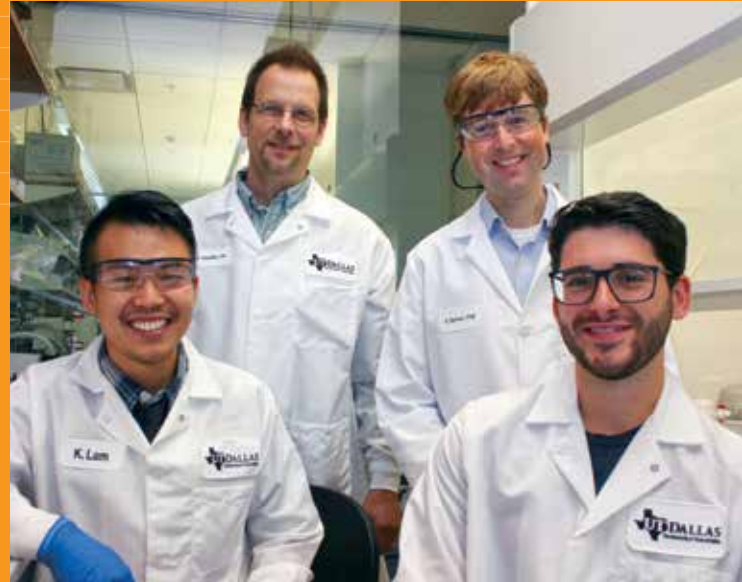
Dr. Stuart Cogan (center) explains electrochemical measuring techniques to senior Breanna Huynh (left) and doctoral student Bitan Chakraborty (right).

## Researchers Set Sights on Healing Injury to Human Eye

**Principal Investigator:** Dr. David Schmidtke, back left, professor of bioengineering from the biosensors and bioelectronics research cluster

**Co-Investigator:** Dr. Victor Varner, back right, assistant professor of bioengineering from the biomechanics research cluster

**Outside Collaborators:** physicians and researchers in the Department of Ophthalmology at UT Southwestern Medical Center



MASTER'S STUDENT DANIEL MARURI FIRST saw BSB while on a University tour.

"I wanted to be in that environment and could imagine myself working there," he said.

After attending a meet and greet for students and professors, he was introduced to Dr. Victor Varner and joined his lab. Varner joined UT Dallas this past year after completing a postdoctoral fellowship at Princeton University. His lab studies the mechanical cues involved in complex tissue development with implications for tissue engineering and regenerative medicine.

"I like how the classes relate to what I'm performing in the lab," Maruri said. "There is a lot of flexibility in the coursework and plenty of options here to find your niche."

One of their collaborations is with the lab of Dr. David Schmidtke, whose members develop novel tools for basic cell biology studies, medical research and clinical applications such as cancer, diabetes and cardiovascular disease.

Their collaboration has implications for minimizing scarring and other damage to the human eye that sometimes occurs with laser eye surgery — specifically the response of keratocytes (the cells in the eye responsible for repair) of the stroma.

"The novelty of this idea is using a polyacrylamide gel," Maruri said. "The gel can change stiffness in a way similar to how a cornea

changes density as it is injured."

"We're testing how the cells of the stroma react to different proteins to determine which is most active and effective in the healing process."

Schmidtke's students handle the microfluidic portion of the experiment, with Maruri handling characterization of keratocyte response to different protein environments.

"I go to Schmidtke's lab pretty much every day," Maruri said. "I'm either borrowing equipment or collaborating with a couple of his students."

Maruri also meets with members of Schmidtke's lab, Varner's lab and collaborators at UT Southwestern Medical Center twice a week, and gives weekly presentations about experiment results.

"They know the corneal keratocytes better than we do," he said. "They are able to give us advice about what we expect to see, what we are not seeing and how we can improve our experiment."

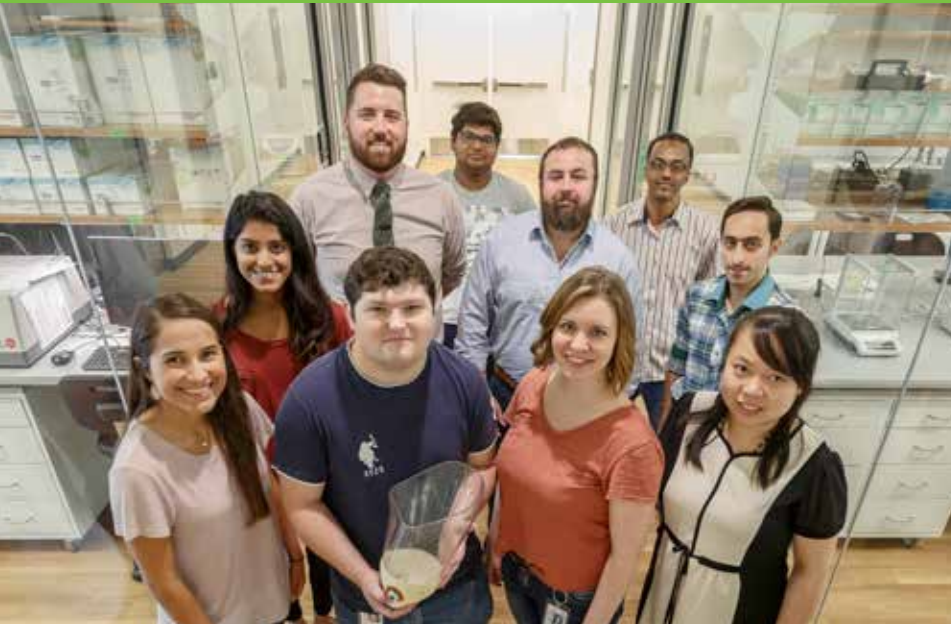
Maruri said all the feedback is a motivator to continue learning.

"I am able to talk to them articulately and am learning a bunch from the hands-on experimentation," he said. "But I think exposure to the professional environment is paramount. Working with people who are smarter than me teaches me a lot, but I know there is still a lot more to learn." \*

The collaborative work of (above, left to right) doctoral student Kevin Lam, Dr. David Schmidtke, Dr. Victor Varner and master's student Daniel Maruri has implications for minimizing scarring and other damage to the human eye that sometimes occurs with laser eye surgery.



Doctoral student Jennifer Boothby (left) works with incoming freshman Joshua Hack.



## Programming Muscles for Robotic Prosthetics

**Co-Investigator:** Dr. Nicholas Fey, assistant professor of mechanical engineering and of bioengineering in the biomechanics research cluster; Fey is also an assistant professor of physical medicine and rehabilitation at UT Southwestern Medical Center

**Co-Investigator:** Dr. Kenneth Hoyt, associate professor of bioengineering in the bioimaging research cluster; associate professor of radiology at UT Southwestern

Collaborators above from left to right include: (front row) Justine Borchard, Joshua Childress, Emily Levy and Dr. Fangyuan Xiong; (middle row) Jamie Kunnappally, Dr. Nicholas Fey, Dr. Kenneth Hoyt and Hassan Jahanandish; (back row) Swapnil Dolui and Dr. Mawia Khairalseed.

**HASSAN JAHANANDISH WAS A PHD STUDENT** at another university in the United States when he started reading published research papers from engineering faculty members at UT Dallas. He was inspired.

“It made sense to me to step down from my doctoral program to be exposed to a team of researchers here,” said Jahanandish, now a master’s student in the Jonsson School biomedical engineering program.

Dr. Nicholas Fey and Dr. Kenneth Hoyt had just launched the idea of a collaborative project applying ultrasound to understand muscles involved in controlling and assessing lower-limb prostheses – a field of translational science extensively investigated by Fey. Jahanandish’s prior training in robotics and machine learning were ideal for this project.

“We are trying to use neuromuscular signals as complementary information to control the robotic leg more efficiently,” Jahanandish said. “Muscles have good information to be used in control of a powered prosthesis, but current sensor technology is not good at capturing information from muscles.

“Ultrasound is capable of looking at superficial muscles as well as deep muscles, and with

current ultrasound technology that information can be accessed with only a touch and swipe of a screen.”

Fey joined the Jonsson School in 2016 after completing a postdoctoral fellowship in the Center for Bionic Medicine at the Shirley Ryan Ability Lab (formerly the Rehabilitation Institute of Chicago) and Northwestern University’s Feinberg School of Medicine, specializing in prosthetics and rehabilitation engineering.

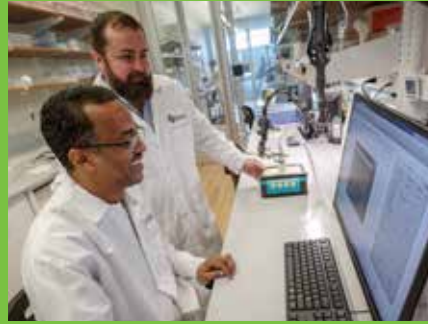
Hoyt is an expert in medical imaging, signal and image processing, and cancer research. Hoyt is an elected member of the Technical Standards Committee of the American Institute for Ultrasound in Medicine (AIUM), through which he helps develop, in part, standardized approaches to performing clinical measurements using ultrasound imaging systems. Hoyt joined the Jonsson School in 2015.

If their hypothesis about ultrasound capturing information from deep within muscles continues to be supported, that information could be programmed to help the wearer of a robotic lower-limb prosthesis gain a higher degree of volitional control over their device, as well as a means to assess assistance of any prosthetic leg.

As the project advances, students like Justine



Dr. Fey (left) simulates wearing a prosthetic device as Swilma Labastida Mateos (center) and Jamie Kunnappally collect information.



Researchers in the lab of Dr. Kenneth Hoyt (right), such as Dr. Mawia Khairalseed (left), focus on developing new ultrasound techniques.



Dr. Nathan Pickle (left) and Ross Neuman (right) design and test passive orthotic devices.

Borchard, an undergraduate researcher, will become more involved.

Projects such as this are motivated partly by personal reasons for Borchard.

She spent her high school years wearing a back brace that required going to physicians every six months to be fitted.

“I am interested in researching and improving medical devices to help people like me,” she said.

The junior chose UT Dallas because of the biomedical engineering program size and research opportunities.

“People say UT Dallas is nerdy,” Borchard said. “It’s kind of funny but also kind of true, and I really like that.”

Some of her “nerdy” experiences include participating in national academic conferences and collaborating with radiologists at UT Southwestern Medical Center. She said she feels fortunate to be part of the program.

“The new building feels clean and has a lot of neat tools and resources for us,” she said. “I also get to be around physicians and researchers. You get to see the intellectual side of things and how people think; it’s enlightening.” \*



Dr. Stuart Cogan (standing foreground), Dr. Joseph Pancrazio (standing center) and Dr. Mario Romero-Ortega (standing background) listen to a student presentation at a Neural Engineering Research and Vision Exchange, or NERVE, meeting.



Dr. Bryan Black presents at NERVE. The meeting is an opportunity for students in the labs of the three professors to present research and ask questions. Fostering collaboration is a goal of NERVE. Professors also interact with students whom they may later advise as a member of the student's graduate committee.



# DR. MARK W. SPONG

steps down this fall as fourth dean of the Jonsson School. A world leader in robotics research and education, he returns to regular faculty duties as a professor of systems engineering and electrical and computer engineering. During his tenure as dean from 2008 until 2017, Spong led the Jonsson School through transformative growth, and in example of research and teaching excellence. These photos present only a snapshot of his impact.



Spong's mentor, Dr. T.J. Tarn of Washington University in St. Louis, joined Spong at the 2009 investiture ceremony. Spong held two endowed chairs while dean: the Lars Magnus Ericsson Chair in Electrical Engineering and the Excellence in Education Chair. Under his leadership, the Jonsson School tripled the number of faculty members who held endowed chairs and professorships.



Nine degree plans and four departments were developed during Spong's time as dean. Some of his department heads from left to right are: Dr. Mario A. Rotea (seated left) of mechanical engineering; Dr. Mehrdad Nourani, associate head of electrical and computer engineering (ECE); Spong; Dr. Gopal Gupta of computer science; Dr. Stephen Yurkovich of systems engineering; Dr. Lawrence Overzet of ECE; and Dr. Yves Chabal (seated right) of materials science and engineering.



Spong served as dean under two University presidents: Dr. David E. Daniel (left), a civil engineer who is now Deputy Chancellor of the University of Texas System; and Dr. Richard C. Benson, a mechanical engineer who joined the University in 2016 after serving as dean of Virginia Tech's College of Engineering. The three gathered in 2016 at the dedication of the Bioengineering and Sciences Building, one of two new buildings for research and education constructed while Spong was dean.



Spong established and directed the Laboratory for Autonomous Robotics and Systems (LARS), which has attracted highly motivated students such as Hazen Eckert (left) and Dr. Hasan Poonawala (center). Here they demonstrate some of their work to Hugh Herr (right), who heads the biomechatronics research group at the MIT Media Lab. Eckert earned three bachelor's degrees from UT Dallas, and Poonawala earned his PhD under Spong and is now a postdoctoral researcher at the University of Texas at Austin.



Spong is a founder of UDesign®, the Jonsson School's team-oriented capstone experience that has earned accolades from educational and industry groups. In 2014, Spong and Dr. Hobson Wildenthal, then the University's executive vice president and provost, cut the ribbon at the UDesign® studio. At more than 30,000 square feet, the studio is one of the largest of such spaces in the country.



Spong helped unload equipment donated by Texas Instruments Inc. Strengthening external ties was a priority for Spong. In recognition of his service toward the "advancement of technology for economic prosperity, quality of life, and security to our nation, our state and our city," the mayor of the City of Richardson, Texas, named Spong a "hometown technology hero" and declared Aug. 18, 2017, as Dean Spong Day.



Spong and his wife, Lila, enjoy a workshop dinner. While leading the Jonsson School, Spong continued to earn recognitions from his peers, such as the 2011 Pioneer in Robotics and Automation Award from IEEE (Institute of Electrical and Electronics Engineers) Robotics and Automation Society, and the Nyquist Lecturer Prize, awarded by the ASME (American Society of Mechanical Engineers) Dynamic Systems and Control Division.

In 2013, 60 of the most renowned researchers in the robotics and control fields came to UT Dallas for the two-day International Workshop on Recent Developments in Robotics and Control. The event was held in recognition of Spong's contributions and leadership in the fields on the occasion of his 60th birthday.





30

The Jonsson School Thanks Distinguished Speakers  
Who Helped Celebrate Our 30<sup>th</sup> Anniversary



**Ron Adrian**  
Regents' Professor  
Arizona State University



**Ravi Bellamkonda**  
Vinik Dean of Engineering  
Duke University



**Danielle Griffith**  
Distinguished Member of  
the Technical Staff  
Texas Instruments Inc.



**Phil Krein**  
Grainger Endowed Emeritus Chair In Electric  
Machinery and Electromechanics  
University of Illinois at  
Urbana-Champaign



**Kai Li**  
Paul M. and Marcia R.  
Wythes Professor  
Princeton University



**Peter Linder**  
Networked Society Evangelist  
Ericsson



**Robin Murphy\***  
Raytheon Professor of Computer  
Science and Engineering  
Texas A&M University



**Inga Musselman**  
Interim Provost  
UT Dallas



**Bill Nye†**  
A Mechanical Engineer Known  
as the Science Guy



**Richard K. Templeton**  
Chairman, President and  
Chief Executive Officer  
Texas Instruments Inc.



**Amy Wheelus**  
Assistant Vice President Advanced  
Technology Realization  
AT&T Inc.



**Betsy Wilson**  
Vice President  
Business Operations  
Ericsson



**Sharon L. Wood**  
Dean, Cockrell School of Engineering  
Cockrell Family Chair in Engineering #14  
University of Texas at Austin

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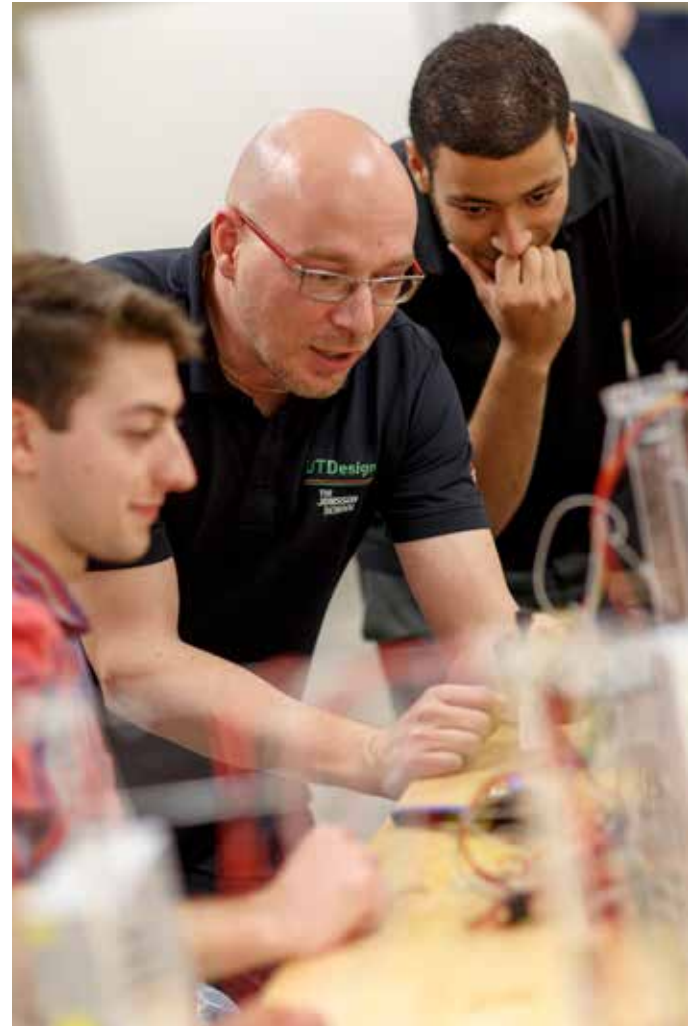
\* Co-sponsored by the UT Dallas Galerstein Women's Center

† Co-sponsored by the UT Dallas Student Union and Activities Advisory Board, the Eugene McDermott Library, the School of Natural Sciences and Mathematics and the Naveen Jindal School of Management

## PROGRAMS OF NOTE



Through **UTDesign**, the Jonsson School's corporate-sponsored capstone program, students have taken top honors in back-to-back national design competitions.



The UTDesign® studio provides space to design, build and prototype capstone projects, as well as allow student makers a place for creative making. One maker group used the space to build a 150-pound fidget spinner that is now in the running for recognition as the world's largest. The studio has room for 56 project stations, a computer lab and machine shop, Makerspace project area, seven conference rooms including a Cisco Telepresence room, five secured project lab rooms, a seminar room and the Texas Instruments Innovation Lab.

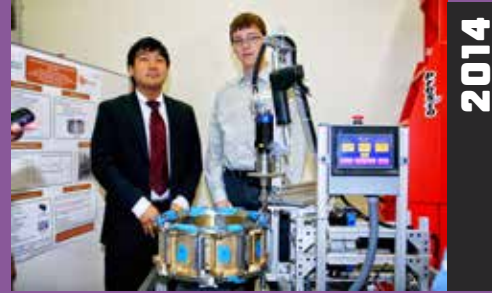


UTDesign®

## Biennial National Capstone Conference



A UTDesign team won first place for their device that aids in the treatment of incontinence. Realizing the prototype's potential impact on healthcare, CerSci Therapeutics has spun out a separate business and invited the UTDesign team leader to help co-found the company.



This first-place capstone project was sponsored by Frito-Lay. Students built a prototype tool that automated the adjustment process of blade gaps on Frito-Lay's potato slicers. Frito-Lay extended three internships to team members to fully develop the tool.

UTDesign®

## ASME Manufacturing Science and Engineering Design Conference Student Design Competition



This group designed and constructed a robot to replace a manual component-placement process used in the assembly of radar devices produced by Raytheon Co. Their system cuts average cycle time for the replacement process in half and is expected to save an estimated \$100,000 per year in labor and component costs once fully implemented.

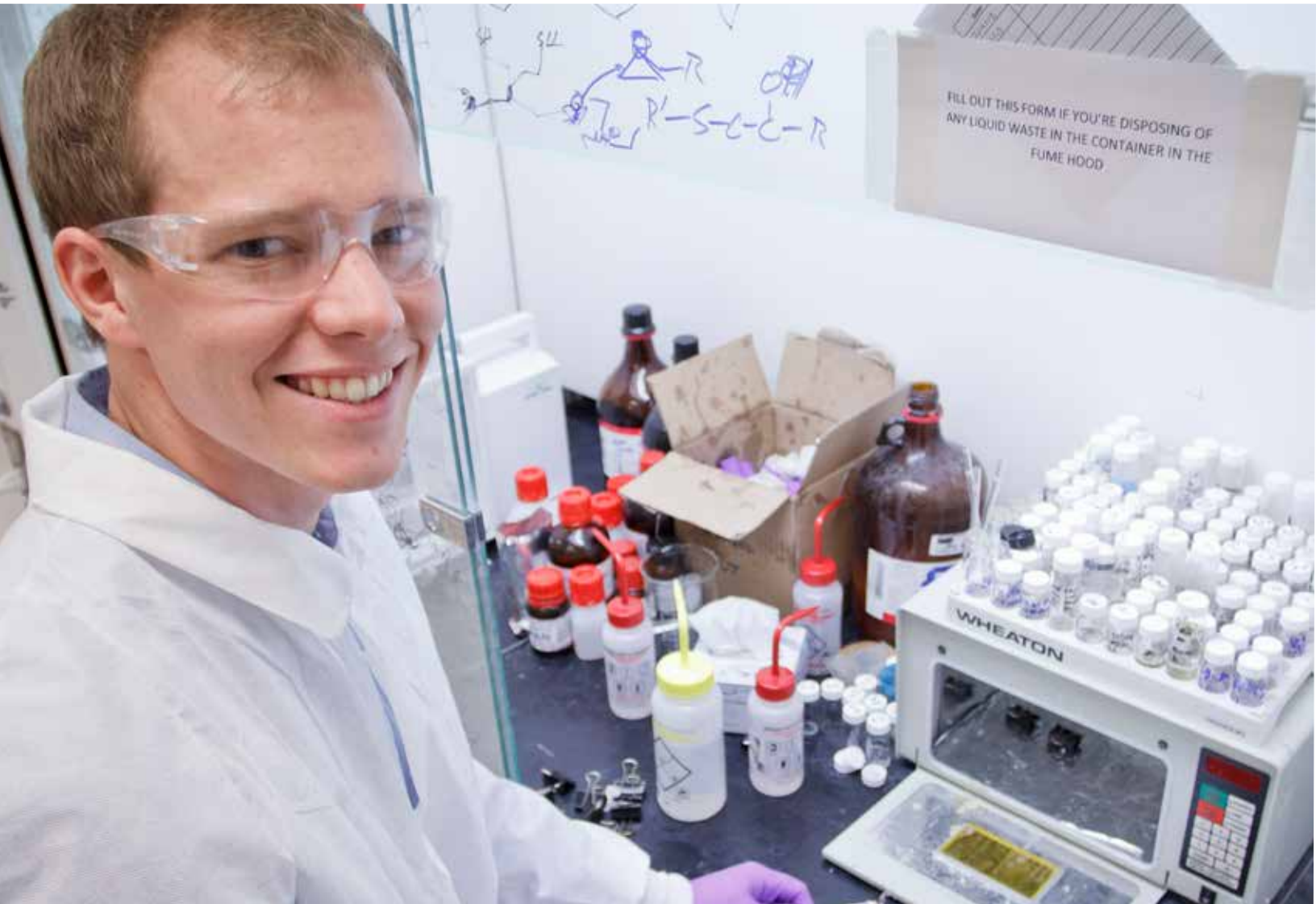


The winning design focused on the development of a machine that measures how well a coating, such as an anti-reflective coating, adheres to an optical lens. Their prototype, created for Essilor of America, performs an adhesion test that can provide more consistent results and relieve operator fatigue.



This project, sponsored by Raytheon Co., focused on the development of an automated machine that places lids on small electronic packages. The new machine was expected to save \$50,000 in labor costs per year, reduce test time of each package, and increase the number of packages.

## ALUMNI PROFILE



# JONATHAN REEDER

BS'12, PhD'16

**As an undergraduate at UT Dallas, Jonathan Reeder could be found in one of two places: the research lab or the baseball field.**

**TWICE SELECTED AS THE AMERICAN SOUTHWEST Conference East Division Pitcher of the Week, Reeder, a tall lefty with a decent fastball, won three games and contributed as a middle reliever for the Comets. Refusing to rest on his accolades earned on the pitching mound, Reeder would go on to make a name for himself as a world-class engineer and aspiring entrepreneur.**

After graduating in 2012 as one of five students in the first class of mechanical engineering undergrads,

Reeder hung up his baseball mitt for a lab coat and decided to pursue a PhD in materials science and engineering at UT Dallas.

The inspiration to continue in academia came from working with Dr. Walter Voit BS'05, MS'06, Jonsson School associate professor of materials science and engineering and mechanical engineering.

“Before taking Voit’s undergraduate class, I was not even interested in research,” Reeder said.

Specifically, Reeder wanted to make new discoveries in the fields of flexible and stretchable electronics, organic transistors and shape memory polymers to use these materials for biomedical applications in new ways. On his journey toward discovery, it helped that he gained a global perspective: The summer before beginning his doctorate, Reeder was selected to participate in the National Science Foundation (NSF) East Asia and Pacific Summer Institute, and was awarded a National Science Foundation Graduate Research Fellowship.

The fellowship, which took him to the University of Tokyo in Japan, resulted in a publication in the scientific journal *Nature*. As a co-author, he assisted in the fabrication of electronic circuits that are lighter than a feather and can be crumpled like paper and still retain their electrical properties.

His time in Japan would prove to be useful beyond the summer abroad – Reeder built connections with the Someya Organic Transistor Lab, one of the world’s leaders in flexible and stretchable electronics. This partnership led to other scientific developments and subsequent publications. In 2014, Reeder, Voit and the research group from Tokyo published a paper in the journal *Advanced Materials*. Reeder, as lead author, detailed how the researchers had created electronic devices that became soft when implanted in the body and could grip objects like tissues, nerves and blood vessels.

Reeder eventually made two more trips to conduct research in Tokyo and co-authored an additional three papers with his Japanese counterparts in *Nature Communications*, *Nature Nanotechnology* and *Proceedings of the National Academy of Sciences*.

“Gaining an international perspective was truly an education in itself,” Reeder said. “I realized that despite the cultural differences,

the universal language of science allowed me to make an immediate impact and contribution in the lab.”

Apart from his NSF fellowship, Reeder was also a recipient of the UT Dallas Eugene McDermott Graduate Fellowship, a program aimed to provide resources and opportunities for professional development and career acceleration for some of the most promising doctoral students. Through the fellowship, he managed his own research fund.

“Support from the McDermott Fellowship led to many opportunities I would not have had otherwise,” he added. “The Fellowship enables grad students to pursue their own ideas without being tethered to any particular project or principal investigator – students can create their own research projects.”

In between globetrotting and leading research on campus, Reeder helped spin out a startup from his work: he led an engineering team toward lab-to-production scale up

Reeder, a lefty, throws against LeTourneau University on Friday, April 10, 2009.





Reeder celebrates finishing his PhD with Dr. Walter Voit.

of flexible sensor applications. His company, Pascalar, focused on commercializing proprietary pressure and temperature sensors developed at the Advanced Polymer Research Lab.

“Although this particular venture has since ended, the startup served as an educational experience – I learned what creating a startup entails and about the process for transferring technology out of an academic lab,” Reeder said.

When four years of studies came to an end in 2016 and Reeder finished his dissertation on thermally responsive soft bioelectronics, he walked the stage to receive his doctoral hood.

Today, this former student-athlete turned engineer is now working to improve the lives of other athletes. Reeder is a Postdoctoral Researcher at Northwestern University where he develops soft, flexible sweat collection systems for athletic performance monitoring. He recently visited the Chicago Cubs, a Major League baseball team, to test out some of his devices during spring training.

“I didn’t think baseball at UT Dallas would later lead to working with professional athletes, and certainly not as an engineer to measure the sweat of these athletes to inform them about their performance and health,” Reeder said.

“My journey really has come full circle.” \*

## UT DALLAS ALUMNI FALL 2017 EVENTS

### OCTOBER

- 10/18 Computer Science Speed Mentoring
- 10/26 Celebration of Support
- 10/27 Founders Day

### NOVEMBER

- 11/7-11/11 UT Dallas Homecoming
- 11/11 Diversity Speed Networking
- 11/15 Diversity Speed Mentoring

### DECEMBER

- TBD Fall New Alumni Celebration
- 12/1, 12/6, 12/8 UTDesign Expo
- 12/7 – 12/9 BEST Robotics

For more information on events or to attend, please email

[jonssonalumni@utdallas.edu](mailto:jonssonalumni@utdallas.edu).



The Davidson-Gundy Alumni Center Opening, Sept. 7, 2017.

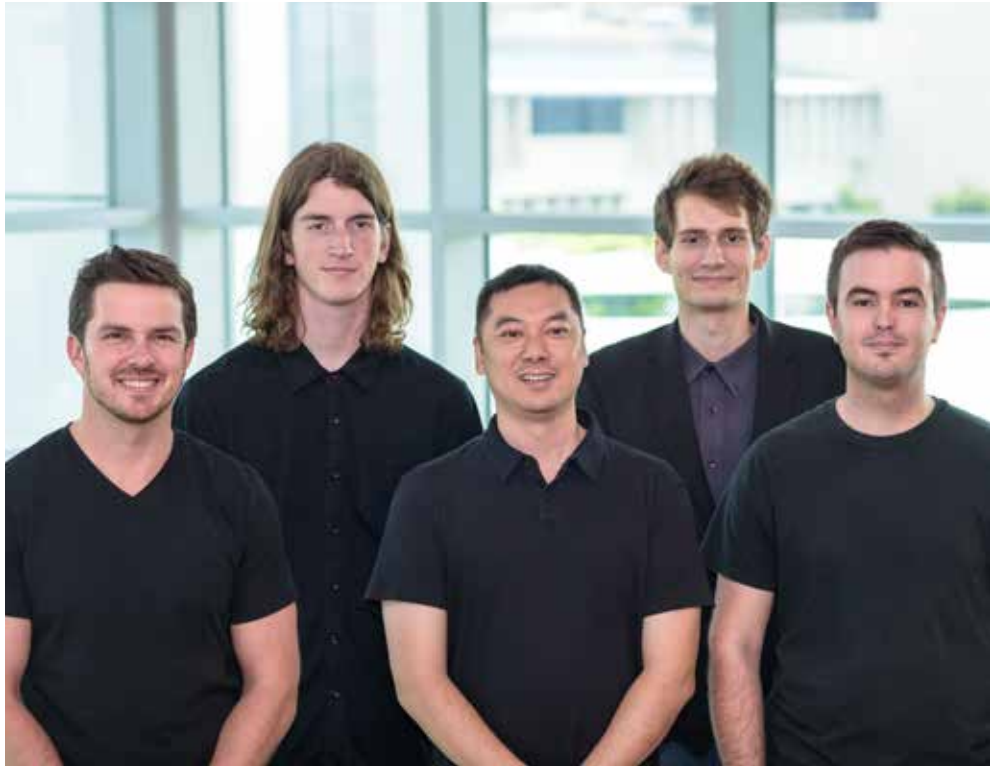
## THE JONSSON SCHOOL SCOOP

### STUDENTS AND ALUMNI

#### Industry Partnership Leads to Global AI Competition

Jonsson School students and faculty members have teamed up with CauseBot, an artificial intelligence software company that creates next-generation funding solutions for nonprofits, to compete in the IBM Watson AI XPRIZE competition. The three-year, \$5 million global competition challenges teams to develop and demonstrate how humans can collaborate with powerful AI technologies to tackle the world's grand challenges. CauseBot is the only competitor from Texas. CauseBot's competition partners also include the Richards Group, Gardere, the City of Frisco Economic Development Corporation and the United Way of Metropolitan Dallas.

The CauseBot team includes (from left) Todd Alsup, chief marketing officer at CauseBot; UT Dallas biomedical engineering senior Michael Carlson; Ken Koo, founder and CEO of CauseBot; and UT Dallas alumni Adrian Armaselu BS'16 and Jimmy Hester BS'16.



### STUDENTS AND ALUMNI

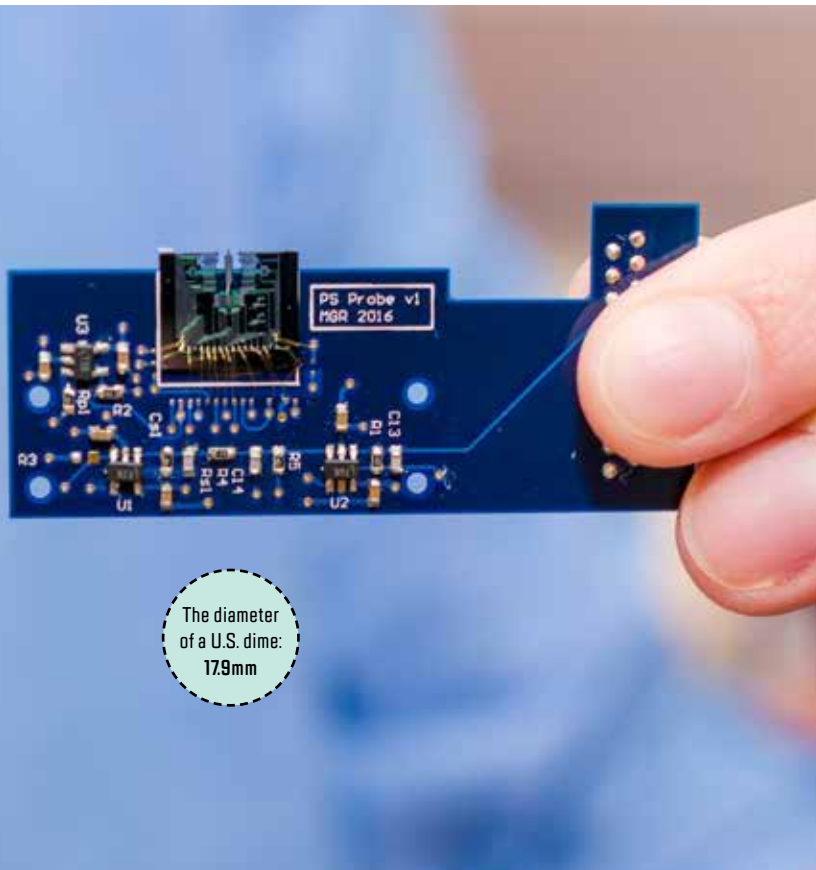
#### Research Paper Stands Test of Time

A paper written in 2006 by three PhD students and a Jonsson School Department Head received a 10-year Test of Time Award from the Association for Logic Programming (ALP) at the 32nd International Conference on Logic Programming (ICLP) last fall. **Dr. Luke Simon BS'01, PhD'06; Dr. Ajay Bansal PhD'07; and Dr. Ajay Mallya MS'02, PhD'06;** were co-authors on a paper with **Dr. Gopal Gupta**, head of the Department of Computer Science and holder of the Erik Jonsson Chair. Their paper, "Coinductive Logic Programming," demonstrated a practical way of addressing circular, infinite-patterned objects in a computational setting. The work became the foundation for many efforts to address unsolved problems within logic and computer science. Simon is now a software engineer at Twitter; Bansal is now an assistant professor at Arizona State University; and Mallya joined Amazon.com after graduation and more recently went to work for KeyMe.

### STUDENTS AND ALUMNI

#### Alumnus Wins Million Dollar Prize

Arun Gupta, who earned his PhD in the Department of Electrical and Computer Engineering in 2012, was recently named the grand prize winner of the 76West Clean Energy Competition – a title that would earn his company, Skyven Technologies, a \$1M prize. 76West is a renewable energy development competition overseen by the New York State Energy Research and Development Authority. The competition focuses on growing entrepreneurs and attracting resources from the U.S. and around the world to build clean energy businesses and jobs in New York State's Southern Tier region. Skyven allows consumers to draw energy from the most reliable source available without cost: the sun. Gupta's New York City startup has designed a heating system that concentrates the sun's energy into a closed, controllable piping network that is routed through existing plumbing. Extra heat is stored in hot water tanks while internet-based monitoring tracks the system's activity. The technology helps lower heating bills for propane, fuel and other non-renewable sources while reducing carbon emissions.



The MEMS-based AFM is about 1 square centimeter in size (top center). Here it is attached to a small circuit board that contains circuitry, sensors and other miniaturized components that control the movement and other aspects of the device.

#### BREAKTHROUGHS

### Researchers Create MEMS-Based Atomic Force Microscope

Mechanical engineers in The Jonsson School have created an atomic force microscope (AFM) on a chip, dramatically shrinking the size of the high-tech device commonly used to characterize material properties. **Dr. Reza Moheimani**, holder of the James Von Ehr Distinguished Chair in Science and Technology, and his colleagues created their prototype on-chip AFM using a microelectromechanical systems (MEMS) approach. The MEMS-based AFM is about 1 square centimeter in size, or a little smaller than a dime. It is attached to a small printed circuit board, about half the size of a credit card, which contains circuitry, sensors and other miniaturized components that control the movement and other aspects of the device. Their device would produce images through the oscillation process, and not require lasers and other large components needed for conventional AFMs. The MEMS approach to AFM design would potentially reduce the complexity and cost of the instrument. This work was published in the *IEEE Journal of Microelectromechanical Systems* with research scientist **Dr. Anthony Fowler** and research associate **Dr. Mohammad Maroufi** as co-authors. The work was funded by UT Dallas startup funds, the Von Ehr Distinguished Chair, and the Defense Advanced Research Projects Agency.

#### BREAKTHROUGHS

### Study Named Most Influential by IEEE



Dr. Marcus

A paper published in 2007 by **Dr. Andrian Marcus**, associate professor of computer science, has been selected as the most influential paper from that year's conference and was recognized at the 25th IEEE International Conference on Program Comprehension in Buenos Aires. The paper, "Combining Formal Concept Analysis with Information Retrieval for Concept Location in Source Code," was written by Marcus with a student while both were at Wayne State University in Detroit. Cited in 222 subsequent papers, the work addresses the problem of concept location in source code. They presented an approach that combines formal concept analysis and latent semantic indexing to organize different concepts and their relationships present in the subset of the search results.

#### BREAKTHROUGHS

### Trapping Harmful Gases with Microporous Structures

Jonsson School researchers helped develop a novel method of trapping potentially harmful gases within microporous organo-metallic structures. These metal organic frameworks, or MOFs, are made of different building blocks composed of metal ion clusters and organic molecules as the linker. Together they form a honeycomb-like structure that can trap small gases within each comb, or pore. In a study in *Nature Communications*, lead author **Dr. Kui Tan**, a research scientist in the Department of Materials Science and Engineering, introduced vapors of a molecule called ethylenediamine, or EDA, that created a monolayer, effectively sealing the MOF "honeycomb" and trapping gases such as carbon monoxide, carbon dioxide, sulfur dioxide and nitric oxide within. The nano-scale structures also have the potential to trap various emissions from things as immense as coal factories and as small as cars and trucks. The monolayer is less than 1 nanometer in thickness, or less than half the size of a single strand of DNA. **Dr. Yves Chabal**, department head of materials science and engineering and holder of the Texas Instruments Distinguished University Chair in Nanoelectronics, is senior author of the paper. Other collaborators were from Rutgers University, Wake Forest University and the Massachusetts Institute of Technology. Funding for the study came from the Department of Energy.





## STUDENTS AND ALUMNI

## Renewable Energy Research Earns Recognition



**Jeanie Aird**, a mechanical engineering junior, received an honorable mention in the Barry M. Goldwater Scholarship and Excellence in Education Program. Aird has studied wind energy, researching aerodynamics of off-shore floating wind turbines. She hopes to earn a PhD in mechanical engineering and work in renewable energy. She also started the University club called Women Mentoring Women in Engineering, which matches female students with their counterparts in industry. This is the seventh straight year that a Jonsson School student has been recognized by the prestigious program.

## BREAKTHROUGHS

## Prof Authors Paper on Carbon Computing

**Dr. Joseph Friedman**, assistant professor of electrical and computer engineering, was lead author of a *Nature Communications* paper describing a novel computing system made solely from carbon. In his circuit design, the spintronic switch functions as a logic gate: electrons move through carbon nanotubes creating a magnetic field that affects the flow of current in a nearby graphene nanoribbon, providing cascaded logic gates that are not physically connected. The all-carbon spin logic proposal might one day replace silicon transistors that power today's electronic devices. The novel computing system could be made smaller than silicon transistors and with increased performance. Friedman conducted much of the work while a doctoral student at Northwestern University. Other researchers from Northwestern, as well as researchers from the University of Illinois at Urbana-Champaign and the University of Central Florida, also contributed to this design.



## STUDENTS AND ALUMNI

## Community Geeks Out Over New App

A social networking and marketplace app designed by software engineering junior **Zac Cooner** is gaining traction with the geek culture community. The Cosmunity app is aimed at the demographic of frequent convention attendees with hobbies including anime, comics, gaming and cosplay. It allows users to share pictures, find friends with similar interests, sell memorabilia and learn about new events. Cooner is co-founder and COO of Cosmunity, which has been featured in outlets such as *TechCrunch* and *Forbes*.

## BREAKTHROUGHS

## Two Papers Considered Classic by Google Scholar



Papers by two Jonsson School professors made it onto Google Scholar's list of classic work published 10 years earlier. "Gossip-Based Ad Hoc Routing," co-written by **Dr. Zygmunt Haas**, made the list of the ten most-cited papers in computer networks and wireless communication.



**Dr. Mark W. Spong's** paper with a postdoctoral student, "Passive bilateral teleoperation with constant time delay," made the list of the ten most-cited papers in robotics. Haas, holder of the Distinguished Chair in Computer Science, directs the Wireless Networks Lab. And Spong, holder of the Excellence in Education Chair, directs the Laboratory for Autonomous Robotics and Systems (LARS).



Bioengineering research assistant Badrinath Jagannath (left) and Dr. Shalini Prasad wear the device that allows people with diabetes to monitor their health by measuring compounds in their perspiration.

**BREAKTHROUGHS**

**Wearable Tech Becomes Diagnostic Tool**

Jonsson School bioengineers created a wearable diagnostic tool that measures three diabetes-related compounds in microscopic amounts of perspiration for up to one week. The biosensor, published in *Nature Scientific Reports*, detects cortisol, glucose and interleukin-6 in perspired sweat for up to a week without loss of signal integrity. The work has implications for insulin resistance and Type 2 diabetes. The tool was developed in the lab of **Dr. Shalini Prasad**, professor of bioengineering and the Cecil H. and Ida Green Professor in Systems Biology Science. Other researchers on the study are **Dr. Rujuta Munje**, a recent bioengineering PhD graduate, **Dr. Sriram Muthukumar**, adjunct associate professor of materials science and engineering; and **Badrinath Jagannath**, research assistant professor in bioengineering.

**BREAKTHROUGHS**

**Citations Prove Global Impact of Researcher**

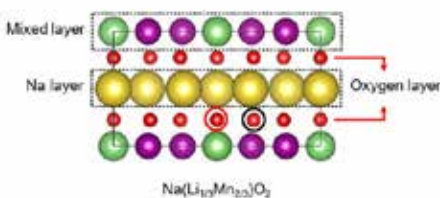


**Dr. Aria Nosratinia**, professor of electrical and computer engineering and the Erik Jonsson Distinguished Professor, was named a 2016 Highly Cited Researcher from Clarivate Analytics, formerly the Intellectual Property & Science business of Thomson Reuters. He was named among researchers recognized for having a significant global impact within their respective fields of study. Nosratinia was one of about 125 named to the list in computer science. The Highly Cited Researchers data contributes to the Academic Ranking of World Universities, one of the longest established annual surveys of top universities globally. It also contributes to *The World's Most Influential Scientific Minds*. Nosratinia directs UT Dallas' Multimedia Communications Laboratory, which investigates the theory and practice of information and coding and their application to address challenges in communications and signal processing. His most highly cited work was produced during his time at UT Dallas, including contributions in cooperative communication, in which wireless nodes work together to establish a communication link. The idea of cooperation was later incorporated into wireless communication standards.

**BREAKTHROUGHS**

**New Material Could Fuel Next-Gen Devices, Electric Cars**

In a study published in the journal *Advanced Materials*, **Dr. Kyeongjae Cho**, professor of materials science and engineering, describes a new material that could replace lithium-ion in batteries used to power cellphones and electric cars. The novel manganese and sodium-ion-based material was developed at UT Dallas in collaboration with Seoul National University. As manufacturers and consumers push for more electric vehicles, lithium production may have a hard time keeping up with increasing demand, said Cho, senior author of the study. The new material is a potentially lower-cost, more ecofriendly option to fuel next-generation devices and electric cars. Researchers from Seoul National University were co-authors of the work. The research was funded by the National Research Foundation of Korea and the Ministry of Trade, Industry and Energy of Korea.



Design of the new material includes lithium atoms (green) with sodium (yellow), manganese (purple) and oxygen (red).

## A CLOSER LOOK

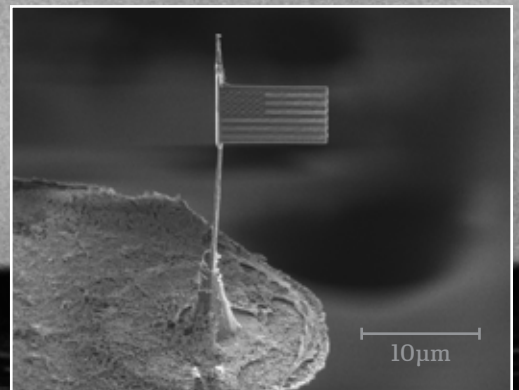
FLAG ON THE  
BRINK

IN DR. MOON KIM'S NANO AND BEYOND LAB, scientists are looking through their microscopes with an artistic eye. Combining imagination with research, Kim, professor of materials science and engineering and holder of the Louis Beecherl Jr. Distinguished Chair, has inspired a different kind of creation.

Nano Art is a discipline that discovers and accentuates the artistic beauty of microscopic-sized works of art. An instrument such as an electron microscope or scanning probe microscope is used to capture the magnified images of these nanostructures.

That tiny shape in the middle of the picture is a nano-sized flag, which is so small that simply breathing would blow it away.

"This piece is the result of very skillful manipulation — great precision was required to compose all the microscopic elements," said Kim who also holds an appointment in the arts and technology program.



The singular flag stands precariously on the edge, barely remaining aloft. The flag is made from silicon, the stars and stripes are platinum, and the flagpole is a carbon nanotube. The flag itself is about 8 micrometers wide and 5 micrometers high.



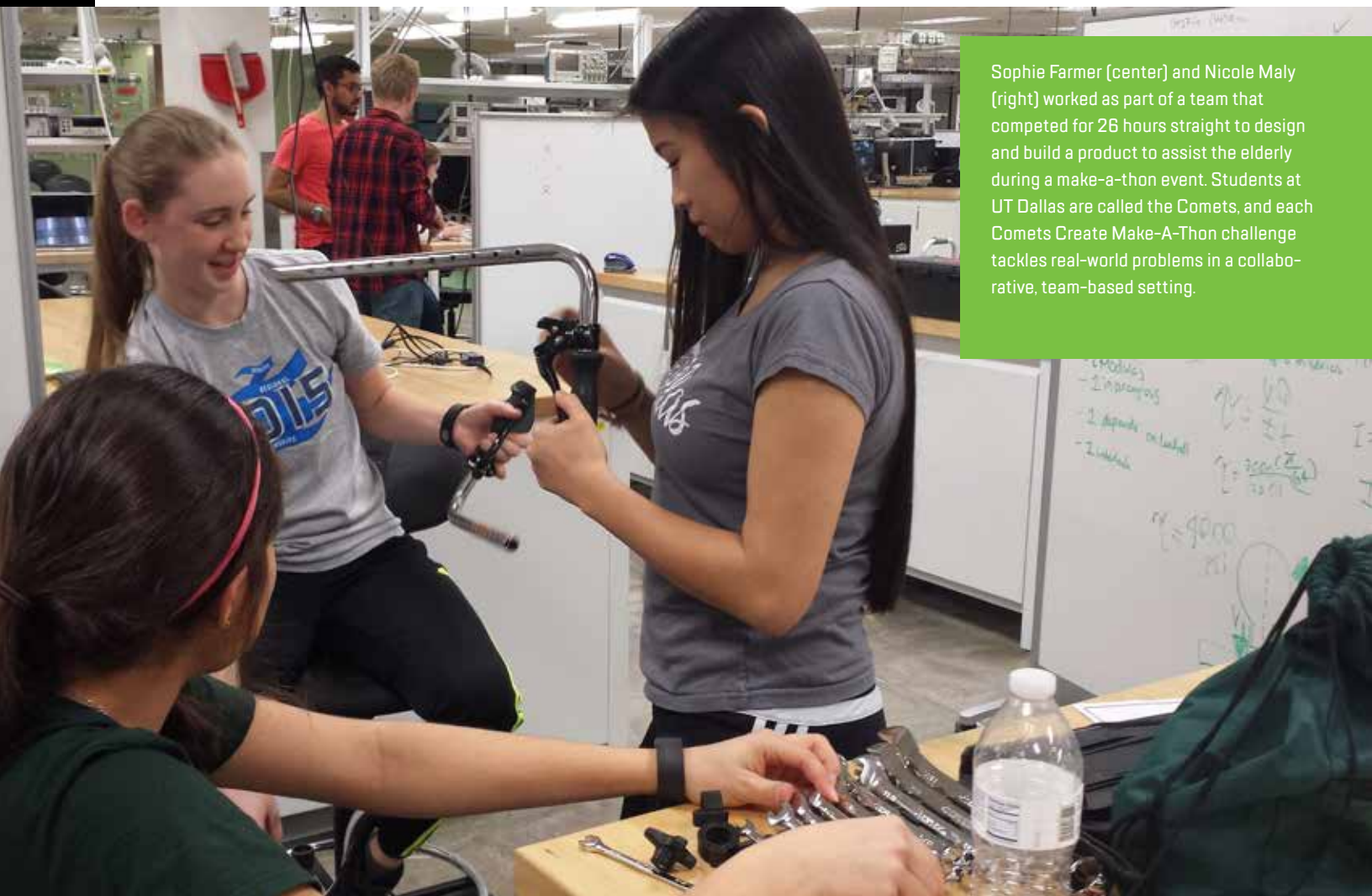
## ERIK JONSSON SCHOOL

OF ENGINEERING AND COMPUTER SCIENCE

The University of Texas at Dallas

800 West Campbell Road EC32

Richardson, Texas 75080-3021



Sophie Farmer (center) and Nicole Maly (right) worked as part of a team that competed for 26 hours straight to design and build a product to assist the elderly during a make-a-thon event. Students at UT Dallas are called the Comets, and each Comets Create Make-A-Thon challenge tackles real-world problems in a collaborative, team-based setting.