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The University of Texas at Austin
Walker Department of Mechanical Engineering
Cockrell School of Engineering

TEXAS MECHANICAL ENGINEER

Texas Mechanical Engineer is published annually for alumni and friends of the J. Mike Walker Department of Mechanical Engineering in the Cockrell School of Engineering at The University of Texas at Austin.

—

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DEAR FRIENDS

What a difference a year makes! When I drafted this welcome note one year ago, 2022 had just started and was greeted – unfortunately – with the arrival of the Omicron variant. This delayed our return to in-person instruction, required that we move interviews for prospective faculty online, and generally slowed the re-engagement of our community. It's now 12 months later, and happily, things could not be more different. The fall '22 semester was truly a "remarkably-normal" term, with all the enthusiasm and activity one expects from our students, faculty, and staff. It's great to be back.

With the return to normal, I've had the opportunity to begin traveling again, both for research and to connect with other mechanical engineering departments across the country. During these visits I share exciting goings-on within the Walker Department and across campus. I'd like to share a few of these highlights with you:

» Last year, UT Austin ranked first among all U.S. universities in research support from the National Science Foundation, the first time UT has topped this list. Our success reflects the culture of collaboration that makes UT unique among peers in its hosting of four major NSF centers: the Texas Advanced Computing Center (TACC), an Engineering Research Center (NASCENT), a Materials Research Science and Engineering Center (CDCM), and an AI Institute (IFML). Importantly, ME faculty continue to play key (leadership) roles in three of these centers.

» Our students continue to amaze. This year, six current or incoming ME Ph.D. students were selected for NSF Graduate Research Fellowships; another six were selected for Honorable Mentions. This haul sets a new record for NSF fellowship awardees within the department.

» The department's Nobel laureate, professor John Goodenough, celebrated his 100th birthday this July with a full-day symposium and dinner banquet. The symposium was held on campus, was attended by nearly 200 participants from around the world, and included presentations by co-laureates Stan Whittingham and Akira Yoshino.

» Finally, regarding facilities, this fall saw the completion of the Gary L. Thomas Energy Engineering Building (GLT). GLT contains state-of-the-art classrooms and research space for faculty from across the Cockrell School of Engineering, including nine from ME, who are engaged in energy-related R&D. I'm also happy to report that we have initiated a detailed "formation study" of the department's home building, ETC. The study will propose ideas for reimagining all interior spaces in ETC, program a proposed new addition off the east side of the building, and provide cost estimates for renovation and expansion. This will provide the data we need to quantify the scale of investment required to keep the department at the forefront of mechanical engineering.

And that's not all! In the pages that follow, you will hear about happenings within the department, including: two graduate students creating their own 3D printing startup, our newest faculty member, and some cutting-edge research from our faculty.

As always, thank you for your support of the Walker Department of Mechanical Engineering,

DON SIEGEL
CHAIR, WALKER DEPARTMENT OF MECHANICAL ENGINEERING

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GOODENOUGH TURNS 100

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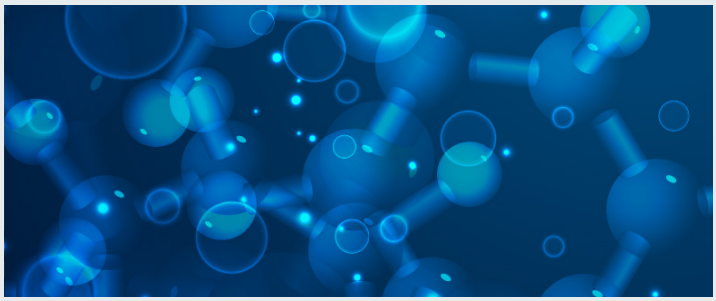
3D PRINTING GOES NANOSCALE



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GRAND OPENING

In August 2022, the engineering footprint on UT Austin's campus expanded with the opening of the Gary L. Thomas Energy Engineering Building (GLT). This new space facilitates interdisciplinary research among energy engineering faculty with multiple departments represented.

THESE NINE ME FACULTY NOW CALL GLT HOME:

- Vaibhav Bahadur
- Donglei 'Emma' Fan
- Arumugam Manthiram
- David Mitlin
- Don Siegel
- Li Shi
- Venkat Subramanian
- Yaguo Wang
- Guihua Yu

HOVERING OVER RUSH HOUR

Mechanical Engineering distinguished alumni **Matt Chasen**, CEO of Lyft Aircraft, gives 60 Minutes' Anderson Cooper a ride in Hexa, an electric vertical takeoff and landing vehicle (eVTOL). Chasen envisions a future where the single-set, battery-powered machine is used by commuters to skip rush hour traffic.

YouTube WATCH THE FULL VIDEO

2022 WINNERS

8 GROUPS | **16** HOURS

1ST PLACE WINNERS RECEIVED A GRANT FOR **$500**

THE UNDERGRADUATE ADVISORY BOARD FOR MECHANICAL ENGINEERING HOSTED ITS ANNUAL TWO-DAY CREATE-A-THON EVENT IN THE SPRING.

Eight student groups from across all majors came together in the Texas Inventionworks studio to design and build a device born of their own imagination. Teams submitted design proposals and then had only 16 hours to build their design from scratch.

Winners were selected in first, second, and third place as well as Most Entrepreneurial and Most Aesthetic. Judges included experts in the field of design and mechanical engineering: Richard Crawford, professor in the Walker Department of Mechanical Engineering; Manu Gorrepati, chief of staff for Genesis; and Brooks Protzmann, design program director at IBM.

The first place winners, who received a grant of $500, were The Tree Lighters. Mechanical engineering students Jaclyn Chiou and Kate Whitmire joined electrical engineering student Daisy Prince to create a unique tree lamp with moving butterflies. The group wanted to represent their love of art and engineering while also creating something functional.

"For our project, our goal was to intertwine art and engineering in a build that displays the beauty of nature. To do this, we designed and built a two-foot by two-foot tree with moving butterflies that also functions as a lamp. We used servo motors inside of the tree to create the movement of the butterflies that are mounted throughout the treetop. Artificial leaves fill the branches and strands of fairy lights wrap around the tree to construct a decorative lamp with a creative twist," said Chiou. ■

John Goodenough has been a part of rarified air for decades now.
And this summer he joined another exclusive club.

The lithium-ion battery pioneer and Nobel Prize winner turned 100. To celebrate, battery leaders from around the globe, many of whom have been influenced by Goodenough's breakthroughs, gathered virtually and in person at a symposium at The University of Texas at Austin to share stories and discuss the next generation of battery research.

Goodenough identified and developed the critical materials that provided the high-energy density needed to power portable electronics, initiating the wireless revolution. Today, batteries incorporating Goodenough's cathode materials are used worldwide for mobile phones, power tools, laptops, tablets and other wireless devices, as well as electric and hybrid vehicles.

"He is a symbol of ingenuity, strength and excellence in the Cockrell School," Sharon Wood, executive vice president and provost at UT Austin and former dean of the Cockrell School of Engineering, said at the event. "His mere presence inspires students and encourages our faculty to succeed. He has unequivocally and quite literally changed the world with his inventions. And he has the biggest laugh on campus, so you always know when you are in John's presence."

In 1979, Goodenough showed that by using lithium cobalt oxide as the cathode of a lithium-ion rechargeable battery, it would be possible to achieve a high density of stored energy with an anode other than metallic lithium. This discovery led to the development of carbon-rich materials that allow for the use of stable and manageable negative electrodes in lithium-ion batteries.

Goodenough began his career at the Massachusetts Institute of Technology's Lincoln Laboratory in 1952, where he laid the groundwork for the development of random-access memory (RAM) for the digital computer. After leaving MIT, he became professor and head of the Inorganic Chemistry Laboratory at the University of Oxford. During this time, Goodenough made the lithium-ion discovery.

After retiring from Oxford in 1986, Goodenough joined UT Austin, where he serves as the Virginia H. Cockrell Centennial Chair of Engineering in the Cockrell School. He holds faculty positions in the Walker Department of Mechanical Engineering and the Chandra Family Department of Electrical and Computer Engineering.

Dating back to his time at MIT, Goodenough developed a reputation for working closely with others, Arumugam Manthiram, professor of mechanical engineering at UT and a 30-plus-year colleague of Goodenough, said during his remarks at the event. The distinguished group of attendees was a perfect example.

Leading battery experts who were influenced by Goodenough and worked directly with him talked about the history of batteries and how his discoveries continue to influence the field today. Audience members, many of whom are now professors themselves after learning from Goodenough, engaged in spirited debates with presenters about their work on batteries.

This communal aspect of his work speaks to Goodenough's personality, said Manthiram, who delivered the Nobel Lecture in Chemistry in 2019 on behalf of Goodenough. He can talk to anyone, about practically anything.

And it showed in his research and willingness to work with others. A physicist by training, Goodenough often worked with chemists and experts from other disciplines, Manthiram said.

> "HE RECOGNIZED THE IMPORTANCE OF INTERDISCIPLINARITY, BEFORE MANY OTHERS GAVE IT MUCH THOUGHT," MANTHIRAM SAID.

Speakers touted Goodenough's longevity, with his research portfolio and academic tree stretching more than 70 years. Goodenough joined UT Austin at age 67, a time when most people have started to wind down.

This ongoing ambition inspired Tien Duong, senior technical advisor at the U.S. Department of Energy, who manages DOE's Advanced Battery Materials Research Program and the Battery500 Consortium at the Vehicle Technologies Office. He was also inspired by Goodenough's advice he received at an event more than a decade ago: to focus on simple but important things like children and family.

"Not only should John be admired for his technical accomplishments, but he's also a man to be admired for his humanity," Duong said.

Midway through the symposium, representatives from the Electrochemical Society presented Goodenough with a new award named for him. In May 2023, Manthiram will become the first ever recipient of this prestigious award.

They also gave him a hard copy of the first-ever combined issue of the Journal of Solid State Science and Technology and Journal of The Electrochemical Society, an edition released in May that was solely dedicated to Goodenough. It includes more than 80 invited papers celebrating and honoring the life, legacy and contributions of Goodenough.

Goodenough, seated front and center in the packed Mulva Auditorium in the Cockrell School's Engineering Education and Research Center, accepted the award, gave a wave and sent the battery luminaries, his former students, and other attendees off to lunch with some sage advice: "All you have to do is work one step at a time."

Simple enough. ■

GOODENOUGH TURNS 100

OUT OF THIN AIR:

LOW-COST GEL FILM CAN PLUCK DRINKING WATER FROM DESERT AIR

More than a third of the world's population lives in drylands, areas that experience significant water shortages. Scientists and engineers at The University of Texas at Austin have developed a solution that could help people in these areas access clean drinking water.

The team developed a low-cost gel film made of abundant materials that can pull water from the air in even the driest climates. The materials that facilitate this reaction cost a mere $2 per kilogram, and a single kilogram can produce more than 6 liters of water per day in areas with less than 15% relative humidity and 13 liters in areas with up to 30% relative humidity.

"This new work is about practical solutions that people can use to get water in the hottest, driest places on Earth," said Guihua Yu, professor in the Walker Department of Mechanical Engineering. "This could allow millions of people without consistent access to drinking water to have simple water generating devices at home that they can easily operate."

The researchers used renewable cellulose and a common kitchen ingredient, konjac gum, as a main hydrophilic (attracted to water) skeleton. The open-pore structure of gum speeds the moisture-capturing process. Another design component, thermo-responsive cellulose with hydrophobic (resistant to water) interaction when heated, helps release the collected water immediately so that overall energy input to produce water is minimized.

Other attempts at pulling water from desert air are typically energy-intensive and do not harvest significant quantities of water. And although 6 liters does not sound like much, the researchers say that creating thicker films or absorbent beds or arrays with optimization could drastically increase the amount of water they yield.

The reaction itself is a simple one, the researchers said, which reduces the challenges of scaling it up and achieving mass usage.

"This is not something you need an advanced degree to use," said Youhong "Nancy" Guo, the lead author on the paper and a former doctoral student in Yu's lab, now a postdoctoral researcher at the Massachusetts Institute of Technology. "It's straightforward enough that anyone can make it at home if they have the materials."

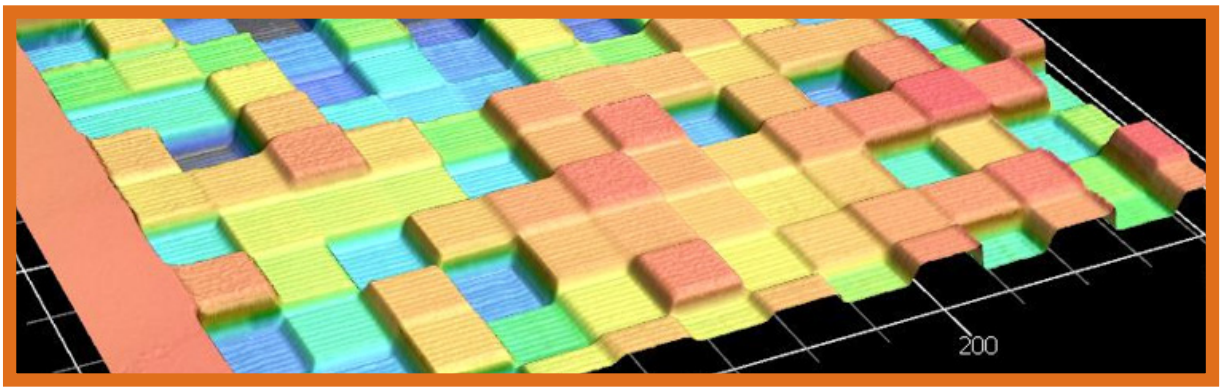
The film is flexible and can be molded into a variety of shapes and sizes, depending on the need of the user. Making the film requires only the gel precursor, which includes all the relevant ingredients poured into a mold.

"The gel takes 2 minutes to set simply. Then, it just needs to be freeze-dried, and it can be peeled off the mold and used immediately after that," said Weixin Guan, a doctoral student on Yu's team and a lead researcher on the project.

The research was funded by the U.S. Department of Defense's Defense Advanced Research Projects Agency (DARPA); producing drinking water for soldiers in arid climates is a focus of the project. However, the researchers also envision this as something that people could someday buy at a hardware store and use in their homes because of the simplicity. ■

SCALING DOWN

New Nanoscale 3D Printing Technique for High-Throughput Nanomanufacturing



In 3D printing, there is a tradeoff between the precision needed to create the object (resolution) and the speed and scale at which the object can be made (throughput). This is especially true at the nanoscale, where it is practically infeasible to make any kind of complex structure with multiple types of materials or patterns at a high rate.

A new $3 million grant from the National Science Foundation through the Future Manufacturing program will give researchers at The University of Texas at Austin an opportunity to solve this problem at the nanoscale. And they say the technique they are developing will make it easier to produce more complex, tiny structures.

"As printing size gets smaller, printing rate goes down, and what we want to do is break that tradeoff," said Michael Cullinan, an associate professor in the Walker Department of Mechanical Engineering and leader of the project.

THE RESEARCH:

The standard process at smaller scales works by using light to cure a polymer material and change its properties. An image known as a mask is applied to the material to block the light from exposing and curing certain parts of that material, like a microscopic stencil. What is left under the mask is the 3D printed object.

At the nanoscale, the process of diffraction — where light can't fit through tiny holes and therefore veers off course — leads to inaccurate outcomes. The researchers are using this diffraction to their advantage to create patterns on their objects.

The researchers will use a different kind of lens that they call a metamask, placed much closer to the material than usual. Their process creates holograms — 3D images of light — with a thin structure. Exposing the photocurable material using holograms creates a solid 3D structure. Based on the color of the light, the material will react differently and take on different properties.

"You get an idea of what structure you want to build, and then work backwards to design the mask that forms the image needed to make that structure," Cullinan said.

This technique allows the researchers to build more precise images with improved resolution. That leads to the ability to create multi-material structures with increased speed because it can be done all at once instead of having to create multiple structures with different materials and then put them together in a serial fabrication process.

WHY IT MATTERS:

The researchers have targeted water filtration membranes, which remove chemicals from water, as their primary application. These are critical to the health of society, cleaning billions of gallons of water for energy production, agriculture, and drinking, but they are complex and not particularly efficient. This 3D printing technique offers the potential to manufacture carefully designed membranes that are stiff in some places and flexible in others to be permeable for water but to keep out unwanted elements. ■

A PUTT ABOVE

ME grad students take a swing at a startup to 3D print golf putters

With most great ideas, you start with something you know. And the Snarr brothers, Scott and Patrick, know the most about two things: additive manufacturing and golf.

Enter Snarr3D Inc., the company the brothers founded that uses additive manufacturing, the technical term for 3D printing, to create high-performance putter shafts with an increased aesthetic appeal. By 3D printing the putter shaft, they can fully control the weight distribution to promote better speed control and strike location. This method also allows for custom textures and patterns to be added to the shaft. It's what they call the Snarr3D Advantage.

"We believe that our clubs not only look better, but also provide higher performance to help people play better golf," explains Patrick.

Texas Engineers have been at the forefront of additive manufacturing for decades. Scott, who recently earned his Ph.D. in mechanical engineering and Patrick, a current Ph.D. candidate, were both drawn to UT Austin because of this legacy. Snarr3D's shafts are currently manufactured in Germany and utilize the additive manufacturing process known as powder bed fusion for their fabrication.

Patrick and Scott also credit UT Austin for giving them the tools they needed to create their startup.

> "WE ARE TRULY A UT STARTUP. WE REALLY BOUGHT INTO THE ECOSYSTEM AND USED THE RESOURCES THAT UT HAS AVAILABLE, AND I DON'T THINK WE WOULD HAVE MADE IT TO WHERE WE ARE, OR WOULD HAVE EVEN TRIED, WITHOUT UT'S SUPPORT," SAID SCOTT.

The brothers partnered with the Texas Innovation Center, the hub at UT Austin for bringing engineering and science discoveries and technologies to the market. The center provides commercialization support, coworking space, networking connections, and many other resources to budding entrepreneurs.

Both Patrick and Scott get out on the greens as much as possible to collect data to improve the putter's design. They also bring in different testers to obtain more data and network with potential clients.

Among their testers is ME Academy of Distinguished Alumni president, Glenn Gilkey. "They're two nice guys trying to follow their dream," said Gilkey. "Being engineering students, I knew they would have a design, thought process, and analytics to back up their designs to optimize the putter to improve putting performance."

The future of Snarr3D includes testing more prototypes, raising capital, and securing supply chains as they prepare to bring a product to market in 2024. The company won the top prize at the Texas Venture Labs Investment Competition in spring 2022, which was instrumental for Scott and Patrick in growing their business. The goal now is to bring in additional investors and create strategic partnerships with current manufacturers.

As Snarr3D grows the brothers will continue to build on what they know – and hopefully add a few new things to that list. ■


LAMKIN
LAMKIN
LAMKIN
PURE
SNARR3D


ENGINEERIN
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While the curriculum for a student in the Walker Department of Mechanical Engineering can be intensive and far-reaching, some of the greatest impacts happen outside of the classroom. Every day, our students take on challenges beyond their courses in an effort to gain valuable experiences and make a difference in their community – and communities around the world. In the next few pages, we'll take a closer look at some ways mechanical engineering students explore new paths to reach their goals and apply the world-class skills they learn at The University of Texas at Austin. From building products to help underserved communities abroad, to creating the next generation of electric vehicles, and turning hobbies into unlikely engineering strategies, **What Starts Here Changes the World.**

Left: PUC India Team building the foundation of a children's library
Right: PUC Mexico Team with their completed Polyhouse Solar Dryer

Humanitarian Engineering Certificate Program

Students who earn their Humanitarian Engineering certificate garner more than just 18 credit hours of knowledge. They commit themselves to building better, safer, stronger communities by developing innovative solutions that improve lives. Administered through the Walker Department of Mechanical Engineering and directed by professor Janet Ellzey, the program takes students through one of two academic sequences: Projects with Underserved Communities (PUC) or Humanitarian Product Development (HPD).

> "I WAS INSPIRED BY OUR STUDENTS TO GET INTO THIS AREA OF HUMANITARIAN ENGINEERING. THE NEW GENERATION WANTS TO POSITIVELY IMPACT THE WORLD. THEY HAVE THE AWARENESS OF THE NEEDS IN THEIR OWN COMMUNITY AND AROUND THE WORLD," SAID PROFESSOR ELLZEY.

With over 40 completed projects, PUC brings together students of various disciplines to participate in a year-long course to research and design infrastructure projects in response to community needs. Teams collaborate with local NGO partners, raise money, and then travel to the community to implement their project. To date, PUC teams have travelled to 10 countries and served over 18,000 people. Their projects have included efforts to create access to clean water sources, increase sanitation, build health clinics, and expand community learning.

Maya Payman, an environmental engineering student, was the project manager for her PUC team. The group traveled to Thailand in the summer of 2022 and helped build a First Aid Clinic at a school in a rural community. Getting to engage with that community and build mutual respect was the biggest highlight for Payman.

"We got to know so many of the elementary school students that we were providing the clinic for, it was kind of heartbreaking to have to leave them but we had so much fun every day," said Payman.

A newer addition to the certificate program, HPD is a two-course sequence that brings together engineering, design, and other disciplines to create products that address the needs of people such as refugees and those with limited resources. Project ideas are suggested through the program partner, the International Federation of Red Cross and Red Crescent Societies (IFRC), which serves as a guide throughout the semester. Since many of the products will be used in outdoor settings, the students use an outdoor lab space at UT Austin's Brackenridge Field Laboratory for realistic testing and development. Four product teams have created products ranging from a small-scale wind energy generator to a device for fabricating customizable sanitary pads.

Ana Peralta, a senior mechanical engineering student, is part of what they've dubbed 'Team

Above: HPD 'Team Pad' showing off their prototype

.

Left: PUC Thailand Team outside their completed First Aid Clinic
Right: UT Austin EcoCAR EV Team with their Cadillac LYRIQ

Pad'. This summer Peralta will travel to Greece as part of a Maymester course with Ellzey where she hopes to introduce people in the refugee community to her prototype. The whole experience has been eye-opening she says.

"Before, I thought engineering was just lab work or office work, but this class is so hands on. You get to actually see the steps as they progress and then see how your product affects a community," explained Peralta.

The work is difficult, but Ellzey sees her students continue to rise to the challenge. "For most of our students, this is the biggest project they've ever taken on in their lives, and they have responsibility for it. Seeing them embrace that and be successful is just incredible."

EcoCAR EV Challenge

Engineering students at UT Austin never shy away from a challenge, especially one that could directly impact the world. So, when the university was selected to compete in the multi-school EcoCAR EV Challenge, they were ready to jump in head first. Sponsored by the U.S. Department of Energy in collaboration with General Motors and MathWorks, this four-year competition includes access to state-of-the-art equipment and a hands-on educational experience.

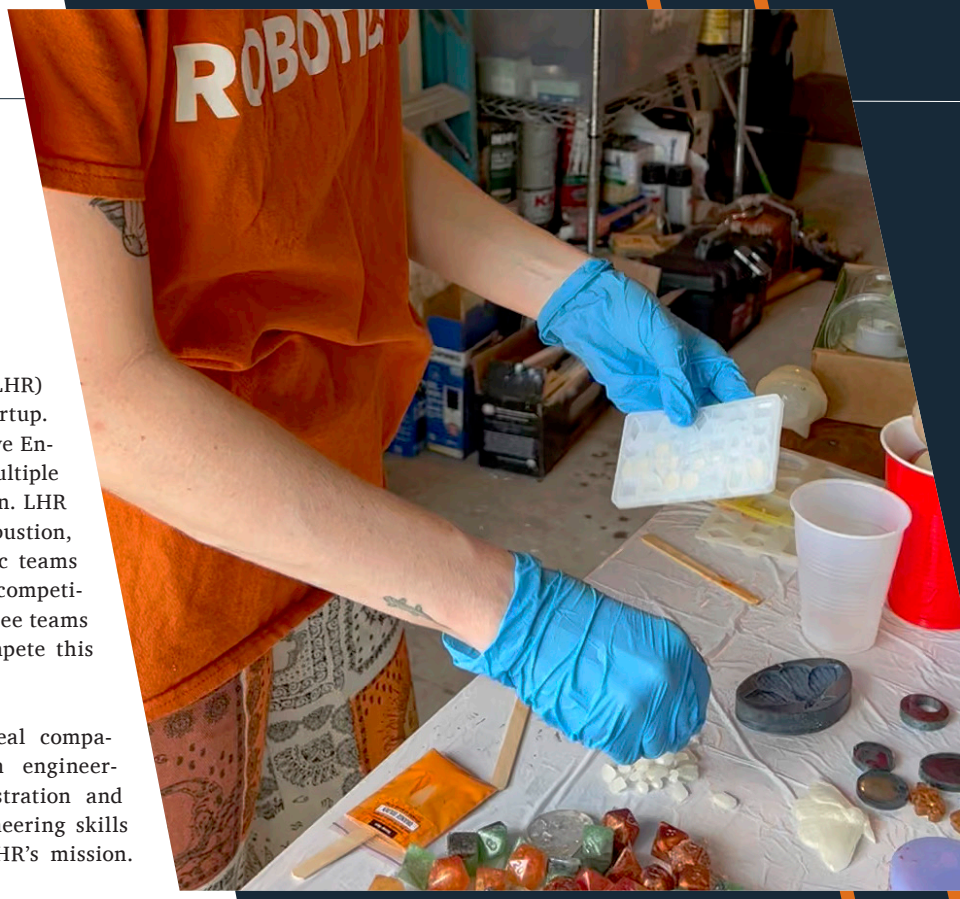
Each team received a Cadillac LYRIQ and four years to implement energy efficiency and customer-pleasing features, while meeting the decarbonization need of the automotive industry. As the challenge continues, the team will grow to about 150 students, mainly undergraduates. Faculty from mechanical engineering, electrical and computer engineering, and computer science serve as team advisors.

One of the main goals of the project is to prepare students for their future careers in engineering industries. Students are able to experience all parts of the four-year design process from concept to the final product. In addition, a large focus is put on diversity and inclusion efforts as well as effective communication practices.

Iman Salafian, a Ph.D. student in the Walker Department of Mechanical Engineering, is on the team as the project manager. "We want to prove that our students are capable of creating something that meets national standards and will be used by the public. It's a fast track for students to get prepared to enter the workplace and work in a technical environment with industry level equipment that isn't always available at the university level." said Salafian.

All participating university teams meet several times a year for engineering and leadership workshops. This spring the workshop will be hosted by The University of Texas at Austin. Let the challenge continue.

Below: Petlowany in her crafting studio.



Longhorn Racing

For the students involved in Longhorn Racing (LHR) it's like clocking in at a real-life, 250-person startup. As a student chapter of The Society of Automotive Engineers (SAE), LHR brings together students of multiple disciplines to run a fully student-led organization. LHR is composed of three vehicle design teams: combustion, electric, and solar. The combustion and electric teams compete each year in the national Formula SAE competition, which started at UT Austin in 1981. The three teams are on a one-year build cycle and will all compete this summer.

The group tries to model themselves as a real company. Different departments work together on engineering, graphic design, public relations, administration and more. Training new students in practical engineering skills and to function as a team is a big part of LHR's mission.

"WE DON'T WANT TO JUST BUILD THE CARS, WE WANT TO BUILD ENGINEERS. IF WE CAN FIND SOMEONE PASSIONATE ABOUT ENGINEERING AND BRING THEM ON WHEN THEY'RE FIRST STARTING OUT, THEY CAN LEAVE HERE WITH FOUR YEARS OF JOB EXPERIENCE," EXPLAINS ANDREA KALANI, A JUNIOR MECHANICAL ENGINEERING STUDENT AND LHR PRESIDENT.

Above: Longhorn Racing's three design teams: electric, combustion, and solar.

MY CRAFTING MAKES ME A BETTER ENGINEER

—but it took me a while to realize

BY CHRISTINA PETLOWANY, ME PH.D. STUDENT

Originally published in Science, Vol. 376, Issue 6598

My classmates were certain we needed to use steel. We were designing a wheelchair for a college engineering course and they felt only steel would be strong enough for the handheld levers that would allow the user to propel the chair with a rowing motion. I wasn't so sure. Based on my experience making sculptures with soda cans and creating jewelry with wire, I believed steel would be too heavy and aluminum would be a better option. But the student who most strongly advocated for steel worked at a bike shop; surely I didn't know better, having used metal only for crafts. A few days later, when the hefty, overbuilt steel arm kept flopping down, I felt validated. I had been right—and I wished I had shown more steely resolve in defending my position.

I was a crafty kid. Not crafty like a fox, but crafty to the point that my parents would come home braced for whatever "artistic" explosion I had unleashed that day—origami, painting, clay sculpting, sewing stuffed animals and clothes, and more. But when I enrolled in engineering in college, I put these pursuits aside. Not only was I stretched for time, but I didn't think they were relevant to my academic work—and I hesitated to highlight my "feminine" crafting interests in the male-dominated engineering environment where I already felt like an outsider. I told myself that engineering adequately fed my creative side and I didn't need the hobby.

The wheelchair project was a hint that my crafting might be important and relevant, but for the next few years I continued to avoid bringing it up in professional spaces. When I was interviewing for engineering jobs after finishing my master's degree and was asked whether I tinkered in my spare time, for example, I was sure the panelists wouldn't care about my elaborate homemade holiday cards, even though they featured lever action and moving parts. Instead, I muttered about wanting to do more 3D printing. The company extended an offer, so I felt my assumption was confirmed.

My attitude didn't change when I went on to pursue a Ph.D.—until early in the pandemic, when I felt restless and turned to crafting as an outlet. I was making a set of Dungeons & Dragons dice, shimmery blue and purple swirled with gold flakes, as a gift for a friend. While pipetting the liquid resin into the silicone mold, I made an off-hand joke to my partner that I was "injection molding"—a standard engineering manufacturing process. I suddenly realized that although resin art is not injection molding in the technical sense, it shares the spirit and probably some skills. Maybe my crafting was something I should embrace rather than hide.

Soon I was seeing more examples of connections between engineering and craft that I had previously overlooked. When working on the wheelchair project, I put my sewing skills to use creating cushioned grips for the handles. The engineering "design kitchen" where my undergrad classmates and I tested our ideas was stocked with inexpensive tools including felt, pipe cleaners, and popsicle

sticks—materials that would not be out of place in a craft bin, I now realized. I saw how crafting taught me to persevere when my product didn't match my initial vision and to consider the failed creation a learning and prototyping experience, just as an engineer must.

Since then, I've built crafting back into my free time. I've also stopped hiding it from my colleagues. I mentioned my dicemaking escapades at a robotics conference and broached in a team meeting how we could gain inspiration from an interactive art experience I had recently visited. The responses were consistently positive and constructive—not dismissive or insulting, as I used to fear.

I've grown from a girl who created a makeshift vulpine friend by attaching legs to a stuffed sock and coloring it with red Sharpie to an engineer with valuable skills from my first passion. **Perhaps I am crafty like a fox. I am also crafty like an engineer.** ■

A CLOSER LOOK AT MECHANICAL ENGINEERING

2022 saw the rise of our department's national rankings and an increase in research expenditures. In addition the department restructured it's leadership to include four new faculty Associate Chairs.

STUDENTS

UNDERGRADUATE

ENROLLMENT	**1,272**
Women	313
Black	42
Hispanic	332

DEGREES AWARDED 2021-2022

Bachelor's	251

GRADUATE

ENROLLMENT	**383**
Materials Science & Engineering	92
Operations Research & Industrial Eng.	92

DEGREES AWARDED 2021-22

Master's	63
Doctoral	33

ALUMNI

14,681
alumni around the world

HOME TO

3-D PRINTING
Selective laser sintering (SLS), invented by Joe Beaman

&

JOHN B. GOODENOUGH
Winner of the 2019 Nobel Prize in Chemistry

OUR GRADUATES ARE LEADERS IN:

- **research**
- **government**
- **industry**
- **academia**
- **military**
- **and more**

FACULTY

TENURE/TENURE-TRACK FACULTY **65**

HONORS AND AWARDS

1 **Nobel Laureate**
4 Members, *National Academy of Engineering*
30 Winners, *National Science Foundation CAREER Award*

RESEARCH ON THE RISE

$32.9M
in research expenditures

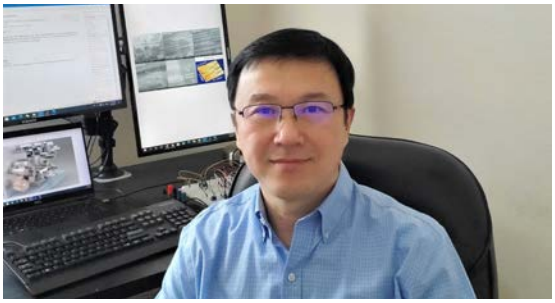
RESEARCH AREAS

- **Acoustics**
- **Advanced Manufacturing & Design**
- **Advanced Materials Science & Engineering**
- **Analytics & Probabilistic Modeling**
- **Biomechanical & Biomedicine**
- **Clean Energy Technology**
- **Complex Systems**
- **Computational Engineering**
- **Engineering Education**
- **Nano & Micro-scale Engineering**
- **Nuclear & Radiation Engineering**
- **Robotics & Intelligent Mechanical Systems**
- **Thermal Fluids Systems & Transport Phenomena**

NEW DEPARTMENT ASSOCIATE CHAIRS

Desi Kovar
Associate Department Chair

Raul Longoria
Associate Chair for Undergraduate Education



Wei Li
Associate Chair for Graduate Education

Yaguo Wang
Associate Chair for Diversity, Equity, and Inclusion

RANKINGS IN THE U.S.

NO. 1
UT Austin, National Science Foundation funding

NO. 6
Cockrell School, Graduate Program

NO. 9
Cockrell School, Undergraduate Program

NO. 10 MECHANICAL ENGINEERING
GRADUATE PROGRAM

MECHANICAL ENGINEERING 10
UNDERGRADUATE PROGRAM

STAFF

Our staff continue to be recognized by the college and the university for their exemplary service. We appreciate their hard work and dedication to the department.

Terrie Chandler, Director
2022 Cockrell School of Engineering Staff Excellence Award

Jennifer Horsak, Senior Financial Analyst
2022 President's Outstanding Staff Award
2022 Cockrell School of Engineering Staff Excellence Award

Kelly Frazer, Graduate Program Administrator
2022 Texas Exes James W. Vick Award for Academic Advising

Katherine Spiering, Communications Coordinator
2022 ME Staff Excellence Award

Shante Tyus, Academic Advising Coordinator
2022 ME Staff Excellence Award

WHEN IT MA

Tanya Hutter originally found engineering by chance; none of her family members were scientists or engineers. After finishing her undergraduate degree in chemical engineering and starting out in industry, her interest started to falter. Then she found herself talking with a friend who had just started working with optical nanotechnology. That sparked her interest again and she decided to pursue a master's degree focused on optical sensors.

After nearly 15 years, she's been able to figure out exactly what she does like – **making things better.**

During her Ph.D. program at the University of Cambridge, Hutter learned the value of finding new collaborations. She also knew that she wanted to create more of an immediate impact. She started attending entrepreneurship and technology commercialization events. The right idea just had to strike.

Soon it did, with SensorHut. At this UK-based company, Hutter developed an optical chemical sensing technology for detecting volatile organic compounds (toxins) in the air. Since moving to the U.S., Hutter has taken a step back to focus on her academic career.

After a few years leading SensorHut and working part-time as a postdoc, Hutter was approached by a clinician who needed a sensor to allow patients to monitor their blood potassium levels. This led her to create her second company, Kalium Health, where she still serves part time as chief technology officer.

With years of entrepreneurship experience under her belt, Hutter was ready to get back into research. So she turned her sights to academic pursuits at UT Austin.

KES SENS(OR)

> "I ENJOY RESEARCHING IDEAS AND FINDING SOLUTIONS RATHER THAN THE PRODUCT DEVELOPMENT PART. THAT WAY I CAN HAVE MORE TECHNICAL CREATIVITY AND ALSO WORK DIRECTLY WITH COMPANIES, CLINICIANS, AND END USERS," EXPLAINS HUTTER.

Hutter has now been an assistant professor in the Walker Department of Mechanical Engineering since 2019. In addition to teaching multiple classes, she runs a research group in the areas of nanomaterials, biochemical sensing, surface interactions, and molecular spectroscopy.

The group was recently awarded a grant from the National Institutes of Health and the National Institute on Alcohol Abuse and Alcoholism. In collaboration with the College of Pharmacy at UT Austin, Hutter will be developing an optical fiber probe that can measure brain function as a result of alcohol intake in real time. By monitoring alcohol and concentrations directly and continuously, this simple tool will be a major step forward for alcohol researchers who are already studying the effects of alcohol on behavior.

Recent awards and recognitions gave Hutter what she calls a stamp of approval in her short time in academia, including being selected as a Fellow in the Royal Society of Chemistry.

For now, Hutter wants to focus on growing her lab and exploring new avenues of research. Currently in the pipeline are various sensor devices including a skin sensor that can sniff out diseases such as Parkinson's similar to the way dogs can smell illness. This kind of early detection could make things better for people all over the world. In other words, exactly what Hutter wants to do.■

INSIDE THE HUTTER LAB

Nanostructured silicon samples with structural coloration due to light reflections

LEARN MORE ABOUT TANYA HUTTER'S WORK IN OPTICAL NANOTECHNOLOGY

MEET OUR NSF WINNERS

Five graduate students in the Walker Department of Mechanical Engineering have accepted the 2022 National Science Foundation's Graduate Research Fellowship. The fellowship includes three years of tuition support and an annual stipend.*

Caitlin Benway-Trejo

Research Area: Electromechanical Energy Storage

What does receiving this fellowship mean to you? Receiving the NSF fellowship as a first-generation Indigenous student is an incredible honor. I am beyond grateful and humbled to be recognized for this award. This funding will support me in my efforts to contribute to the energy storage field and in my continued outreach with minority communities. I give many thanks to my PI, mentors, lab mates, family, and friends who have supported me along this journey.

Chris Martin

Research Area: Dynamic Systems and Control

What does receiving this fellowship mean to you? Receiving this fellowship is a huge honor that I am deeply grateful for. In addition to providing for me materially while I pursue my Ph.D., this fellowship will open doors for me throughout my research career. These opportunities will help me mentor the next generation of STEM students and develop innovative technologies that will benefit society. I would like to thank my graduate advisor Dr. Dongmei Chen and everyone who has guided me during my time as a student researcher. I could not have won this award without their support.

Stephanie Molitor

Research Area: Human Gait Biomechanics

What does receiving this fellowship mean to you? Receiving the NSF fellowship allows me to help improve fall prevention strategies by researching what mechanisms people employ to maintain their balance during locomotion.

Seth Reed

Research Area: Electrochemical Energy Storage

What does receiving this fellowship mean to you? Receiving this fellowship represents growth for me. I have developed as a researcher and scientific writer through the support of my professors and colleagues. This growth is represented in the fellowship applications I have submitted over the previous years; with each year, my research experience has continued to clarify my goals and strengthen the passion behind my work. I am excited for this fellowship to support my path through education and research in the energy storage field.

Sofia Valdez

Research Area: Manufacturing and Design

What does receiving this fellowship mean to you? Receiving this fellowship means so much to me. Of course, the financial support from the fellowship allows me to devote more of my time to my research. More importantly, the fellowship has increased my confidence as a Ph.D. student by validating that the work I'm doing is important and valuable. I'm so excited for the next steps of my research and to continue working with Dr. Seepersad and my labmates in our efforts to push the boundaries of engineering design and additive manufacturing. ■

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* **OF NOTE:** Graduate student Joseph Kirchhoff was also selected for this fellowship but declined in order to accept the NASA Space Technology Graduate Research Opportunities grant.

WELCOME NEW FACULTY

ALEXANDER MARRAS
Assistant Professor

RESEARCH AREA: BIOMECHANICAL AND BIOMEDICINE ENGINEERING

Alexander Marras joined the department in August 2022 as an assistant professor and affiliated faculty member with the Texas Materials Institute. Marras comes to UT from the University of Chicago where his postdoctoral studies focused on charged polymer assembly with biomolecules and structural characterization of nanomaterials using light scattering, electron microscopy, and small-angle X-ray scattering. He also worked on a project with industry partner SiO2 Materials Science assembling COVID-19 vaccines and studying their structure and stability under various conditions.

HOW WOULD YOU DESCRIBE YOUR RESEARCH?

My research program uses biomaterials to create self-assembled nanodevices and materials for sensing, actuation, and delivery applications. We use DNA as a structural material, RNA as a therapeutic, and polymers to package, control, and broaden the range of materials we can make. Through extensive materials characterization, we are able to improve our design strategies to program self-assembly for specific physical and chemical properties.

WHAT HAVE YOU ENJOYED MOST ABOUT JOINING UT?

My favorite part so far is meeting so many people from different backgrounds, both personally and professionally. UT has so many strengths in the STEM fields and a diverse population that brings unique perspective, skills, and ideas. I'm excited to explore collaborations across campus and continue to meet impressive students and colleagues. ■

FACULTY AWARDS

Our faculty are doing great things and getting recognition for it:

Farshid Alambeigi
» *NIH Director's New Innovator Award*

Janet Ellzey
» *President's Award for Global Learning*

Donglei "Emma" Fan
» *NSF Mid-Career Advancement Award*

Michael Haberman
» *DARPA Young Faculty Award*

Mark Hamilton
» *Gold Medal Award, Acoustical Society of America*

Tanya Hutter
» *Fellow of the Royal Society of Chemistry*

Yuanyue Liu
» *Outstanding Junior Faculty Award in Computational Chemistry, American Chemical Society*

Arumugam Manthiram
» *John B. Goodenough Award, The Electrochemical Society*

Mitch Pryor
» *Fulbright Scholars Award*

Guihua Yu
» *2022 Class of MRS Fellows, Materials Research Society*

» *Finalist in the 2022 Blavatnik National Awards for Young Scientists*

GETTING THE SCOOP

WITH ALUM DANIEL NICHOLSON

When you get an offer to put a product on the shelves of a national grocery store chain, you don't pass that up. The founders of **NadaMoo!** certainly didn't.

Left: Daniel Nicholson at NadaMoo! headquarters in Austin, TX

At the time, Daniel Nicholson was still finishing up his undergraduate degree in mechanical engineering from The University of Texas at Austin but would soon join the company and eventually become President and CEO.

Made with sustainably sourced coconut milk, NadaMoo! started out as a homemade recipe that has grown into a premiere non-dairy dessert brand. Now with 15 flavors, including seasonal favorites, and a new frozen snack bite, NadaMoo! ships to grocery stores across the country, including Whole Foods Market and Walmart.

For Nicholson, who originally joined the team in 2008 on the accounting side, it's all about creating healthy indulgences for the consumer while focusing on efficiency and sustainability, which includes staying local. NadaMoo! products have been manufactured and packaged in a plant in Tyler, Texas since the brand's early days in 2008.

Nicholson grew up in a family of what he calls 'serial entrepreneurs' in Laredo, Texas. Unsure of what to study in school, his high school physics teacher suggested engineering because of his aptitude in math and science. The choice to attend UT Austin though was a no-brainer. There's a deep history of Longhorns in the Nicholson family.

It was important for Nicholson to bring his small-town experience to the 40 Acres and interact with other Hispanic students. In his early years he participated in groups like the Society of Hispanic Professional Engineers and the Equal Opportunity in Engineering program.

"It's nice to find yourself in smaller groups and smaller pieces of community at such a massive school. Those experiences help you find your way, and help translate into very valuable experiences within your professional career where you're just finding a place of belonging," said Nicholson.

So how does mechanical engineering translate into ice cream? Nicholson says he gets that question all the time.

"My engineering degree provided me with a very valuable set of problem-solving skills. As an entrepreneur and head of a company, these problems are being put in front of you big and small, and being able to think about things in a systematic way set me up for success."

The complex problems Nicholson faces include current market turbulence that is heavily affecting the frozen dessert category and the broader industry. But the team at NadaMoo! believes that continuing to focus on bringing value, continuity, and efficiency will take them through the ebbs and flows and eventually into a wider range of products.

As consumer trends shift, one constant is the need for sustainability and transparency from brands. Nicholson believes that the power to choose what you consume has the biggest impact on people's sustainable decision making on a day-to-day basis.

From their sustainable packaging to the organic, non-dairy raw materials they source, including 100% pure agave syrup sweetener, NadaMoo! can truly be a mindful indulgence.

> "OUR COMPANY WAS FOUNDED UPON THE MISSION TO MAKE THE WORLD HAPPIER AND HEALTHIER ONE SCOOP AT A TIME." ■

ACADEMY *of* DISTINGUISHED ALUMNI

CLASS OF
2022

Established in 2004, the Academy of Distinguished Alumni represents the highest honor that the Walker Department of Mechanical Engineering bestows on its alumni. Including this year's honorees, 164 alumni have been selected for this award, recognizing them as highly respected professionals, dedicated engineers, and supporters of higher education.

The Academy honors alumni in four categories: Outstanding Young Mechanical Engineer, Distinguished Mechanical Engineer, Mechanical Engineering Hall of Fame, and Honorary Mechanical Engineer.

Outstanding Young Mechanical Engineer

Emily Boyd
B.S. ME 2006, M.S. ME 2008, PhD. 2014
Teaching Professor & Director of Undergraduate Studies
Washington University

Columbia Mishra
B.S. ME 2006, M.S. ME 2008, PhD. 2016
Senior Staff Spacecraft Systems Architecture Engineer
Maxar Technologies Inc.

Distinguished Mechanical Engineer

Jean Claude 'JC' Jammal
B.S. ME 1988
VP of Online, Customer, and Marketing Technology
The Home Depot Company

Atul Kohli
B.S. ME 1989, M.E. ME 1992, PhD. 1996
Senior Technical Fellow
Pratt & Whitney

James Mikulak
B.S. ME 1988, M.S. ME 2007, PhD. 2011
Technical Director
Evonik Corp

Nannette Wright
B.S. Environmental Health 1988, M.S. Health Physics 1990, PhD. 2000
Senior Director Program Management
L3Harris Technologies

Mechanical Engineering Hall of Fame

Atlee Cunningham, Jr.
B.S. ME 1961, M.S. ME 1963, PhD. 1966
Senior Technical Fellow
Lockheed Martin Aeronautics

Ronald Matthews
B.S. ME 1971, M.S. ME 1972, PhD. 1977
Professor Emeritus
Walker Department of Mechanical Engineering

William Oberkampf
B.S. AE 1966, M.S. ME 1968, PhD. 1970
Consultant
W.L. Oberkampf Consulting

Honorary Mechanical Engineer

David Bogard
B.S. ME 1974, M.S. ME 1976, PhD. 1982
Professor
Walker Department of Mechanical Engineering

Learn more about the inductees
https://bit.ly/3FJ5CZc

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ICYMI: TAILGATES AND TRADITIONS

We were happy to see Texas Engineers back on the Forty Acres at our annual tailgate last fall. Past, present, and future mechanical engineers came together with our sponsor, Phillips 66, to cheer on the Texas Longhorns. Hook 'Em!

STAY CONNECTED @UTMECHENGR