MechSE

SUMMER 2024 MAGAZINE

ENGINEERING DESIGN FOR PEOPLE, WITH A PURPOSE

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MECHSE MAGAZINE • DEPARTMENT OF MECHANICAL SCIENCE AND ENGINEERING • SUMMER 2024

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FROM THE DEPARTMENT HEAD

Anthony M. Jacobi
MechSE Department Head
Richard W. Kritzer Distinguished Professor

Dear alumni, students and friends of MechSE,

Greetings from Urbana-Champaign! With immense pride, I write to share with you news from the Department of Mechanical Science and Engineering.

As you will see on the next page, my friend and colleague, Professor Taher Saif, was named this year to the highest of engineering honors—the National Academy of Engineering. While we have many alumni and several former members of our faculty who have earned this prestigious distinction, Taher is the only current MechSE faculty to hold the honor. Most notable, though, is his gracious capacity to share the recognition with his students. I encourage you to watch the touching interview with Taher after he received the news from NAE.

I recall writing on the topic of departmental growth in the previous issue of MechSE Magazine, and I'm excited to tell you, again, that MechSE is enjoying yet another year of unprecedented growth. Our incoming fall 2024 undergraduate class and our incoming MS/PhD student cohort are both the largest in MechSE history. What's most important are the extremely impressive young scholars this growth brings to our program. We are also seeing the benefits of the last few years of faculty recruiting efforts with seven new faculty (tenure track and specialized) joining this coming academic year. This dynamic growth breaks many years of hiring records for MechSE. You can read more about our tremendous development on page 13.

This issue of the magazine also includes a feature on the inspirational work being led by some of our ME 470 (Senior Capstone Design) teams focused on human-centered design in engineering—this time in the space of healthcare and medicine. Our students continue to amaze me with their empathetic and out-of-the-box problem-solving. It's exactly the mindset and skills we hope our students take with them when they graduate. Read about their work on pages 4-9 and be sure to watch the inspiring short film.

As always, I invite you to visit us anytime at the Sidney Lu Mechanical Engineering Building and to try out our new interactive art sculpture while you're here! (See page 3 for details.)

Be sure to check out the multitude of extra magazine content on the MechSE website. Just scan the QR code, found on the opposite page and throughout this issue, using your phone's camera.

MECHSE CARES CREATED TO SUPPORT INCLUSIVE ATMOSPHERE FOR ALL

Learn more about the MechSE CARES initiative, its purpose and committee members: go.illinois.edu/MechSECARES

A new resource in MechSE aims to support the department's efforts to ensure an inclusive, welcoming environment for everyone—students, faculty, staff and visitors to campus.

MechSE CARES, an initiative led by the Diversity, Equity and Inclusion Committee, hopes to address and resolve any reported incidents related to belonging, discrimination and hate within the MechSE community. Additionally, a new mechanism has been developed for confidentially disclosing such experiences or concerns.

The MechSE CARES committee has assembled an effort to actively listen to concerns and gain insights into incidents related to inclusion and belonging; provide an internal resolution process; and, alongside campus-wide offices, offer support for responses to explicit acts of racism, discrimination and hate.

"MechSE and the MechSE CARES committee believes that diversity and unbounded inclusion of our faculty, staff and students are fundamental to our mission of developing engineers who will work together to address major societal challenges," said Professor Geir Dullerud, Chair of the MechSE CARES and DEI committee.

Saif Elected to NAE

Election to the National Academy of Engineering, which is the most prestigious U.S. honor an engineer can receive, recognizes those who have made "outstanding contributions to engineering research, practice or education," according to the NAE.

M. Taher Saif, the Edward William and Jane Marr Gutgsell Professor in MechSE, has been elected to the NAE "for characterizing mechanical properties of materials at small scales, with applications in materials science and biology."

Saif is one of two faculty from The Grainger College of Engineering elected to NAE's 2024 class, which includes Kiruba Haran, a professor of electrical and computer engineering and the Grainger Endowed Director's Chair in Electric Machinery and Electromechanics.

"I am delighted that my friend and colleague has been recognized for his deep scholarship in this prestigious, well-deserved way. While I am extremely happy for him, personally, I am also pleased by the added visibility his election to the NAE brings to the MechSE Department and The Grainger College of Engineering," said Tony Jacobi, MechSE Department Head and Richard W. Kritzer Distinguished Professor.

Saif studies the effects of forces at small scales, focusing on nanoscale materials and living cells. His work on deformation in nanomaterials could lead to self-healing metal components, and his work on the effects of cellular forces has opened new research avenues in neuron function, cancer progression and biological robotics. Among other achievements, Saif was the first to demonstrate that plastic deformation in nanocrystalline metal films can be reversible—raising the possibility of manufacturing metal components that can heal themselves after being deformed. In other work, he and a collaborator demonstrated that neurons are under mechanical tension, and he is now studying the role of tension in neurons on memory and learning. ◆

Watch the video >>
go.mechse.illinois.edu/NAE

> I immediately felt and knew that [this honor] is not because of me but because of my students over the long, long years. My job is to guide them, to inspire them, but it's their work and their results.

Saif with his wife and son

Grasp

Just outside the Sidney Lu Mechanical Engineering Building, at its east entrance—one of the busiest on the entire campus—stands a new piece of public art. Called "Grasp," the sculpture is kinetic, with three metal fins that move back and forth with the power of a simple hand-crank on the base. The fins are tipped with pieces of multicolored fused glass. On the back of the gearbox, a glass panel allows the user to see the gears at work.

The piece was part of the state of Illinois' "Art-in-Architecture" program that allocates one-half of one percent of the construction cost of state building and renovation projects to purchase public art. The MechSE community demonstrated interest in the Lu MEB art including a kinetic aspect. Oregon-based artist Pete Beeman's proposed design was selected in summer 2021 and "Grasp" was installed in fall 2023.

Next time you're on campus, give it a turn!

See it in action!

go.mechse.illinois.edu/kinetic

Engineering Design for People, With a Purpose

BY TAYLOR PARKS

MechSE at Illinois has a rich history of producing a diverse body of research that includes medical device development, bio-mechano-materials innovations, bio-inspired design to benefit both people and the advancement of technology, and more. Our faculty and students are routinely immersed in human-centered design projects—developing solutions to meet the needs of a particular user group. Indeed, mechanical engineering can play a powerful role in supporting and improving human health.

In addition to working with the medical industry, MechSE now finds itself in a world of new opportunities through collaborations with the Carle Illinois College of Medicine (CI MED), the world's first engineering-based college of medicine. For MechSE, this intersection of engineering and medicine presents novel opportunities to prioritize human-centered design to engineer solutions to human-health problems. In addition to seeing this infused in faculty research, MechSE students are also discovering its importance during their final major projects completed as undergraduates. Several recent Senior Capstone Design teams have employed elements of human-centered design to develop novel mechanical design solutions to problems in the health and medical fields.

Democratizing Scalp Cooling Technology

During the fall 2023 semester, Aroun Awasthi, Seamus Mellican, Nikita Pawar, George Penn and Nick Winkler focused on addressing a prevalent oncology need: mitigating the hair loss experienced by many cancer patients during chemotherapy.

The delivery of chemotherapy agents to hair follicles commonly results in hair loss—which can in fact be mitigated or even prevented through the use of scalp cooling methods. The process limits the delivery of chemotherapy agents to the follicles through vasoconstriction, a method that has existed for decades and was FDA-approved in 2017, with efficacy rates as high as 84 percent. However, only around 10 percent of eligible patients use scalp cooling devices due to their expense, bulk and nebulous design.

"As a medical student, I knew the issue of chemotherapy-induced hair loss existed, but I didn't understand the extent of it until I started doing my clinical rotations at the hospital," said CI MED third-year student Mahima Goel, who sponsors the ongoing project, called CAPSLocks™ .

The problem hit home for MechSE's Grayce Wicall Gauthier Professor Elizabeth Hsiao-Wecksler. "I became involved in the project after being diagnosed with breast cancer and starting chemotherapy." She consulted with her Carle Cancer Center oncologist, also involved with CI MED, regarding scalp cooling treatments that relatives had mentioned. Unfortunately, the center did not have these systems available.

Current scalp cooling caps, which may be worn by the patient before, during and after a chemotherapy session (where one session can last anywhere from 4 to 8 hours), fall into one of two categories: manual cooling, in which the standalone cap contains intricately arranged ice packs and is replaced repeatedly as the packs thaw; and automatic cooling, in which the patient wears a silicone cap connected to a computer-controlled refrigeration machine that pumps coolant continuously.

Watch the coordinating film featuring the CAPSLocks™ project

go.mechse.illinois.edu/magazine-summer24

"The two leading fluid-cooling systems are large and heavy and remain in the clinic, requiring the patient to stay for an additional one to two hours after completion of the chemotherapy while the chemicals are still at their peak," Hsiao-Wecksler said of the automatic cooling process. "Cold cap ice pack systems allow the patient to go home sooner but require a large cooler to store multiple caps that must be replaced every 30 to 60 minutes."

Both methods can be costly and many insurance companies don't cover cooling services or rental. Thus, the CAPSLocks™ project seeks to develop a scalp cooling approach that could lead to reduced expense and improved portability. The fall 2023 team developed a preliminary prototype of an ultra-compact, affordable chiller system that circulated a saltwater mix. The system could

Allison Kautz holds her team's CAPSLocks™ device.

> I was not able to save my hair but made the best of my hair loss for Halloween!
>
> *Elizabeth Hsiao-Wecksler*

Read the related story: go.mechse.illinois.edu/higherpurpose

also convert between AC and DC power to allow for continuous treatment both indoors and in transit.

"CAPSLocks™ could be a game changer by addressing problems with current systems and helping a lot of cancer patients who are receiving chemotherapy to retain their hair," Hsiao-Wecksler said.

Having tested the device on a human volunteer to measure scalp temperature and calculate efficiency, the team's final CAD deliverable presented an optimized model that was less than half the size, weight and price of their closest market competitor's product.

"We are all excited to see where this goes," Goel said of the project's progress.

The spring 2024 team, comprised of mechanical engineering majors Jarred Baligod, Diane Gonzalez, Andrew Hansen, Alex Herlo, Allison Kautz and Juan Reynoso, followed up on the previous team's work by reducing both size and cost by another 15 percent. The team implemented a propylene glycol-water mix to improve cooling efficiency and is incorporating additional features to address ergonomics, safety and comfort.

"Part of the feedback we were given for ergonomics was largely based on making it easier to use," said Reynoso, who explained that the original prototype required multiple steps to initiate the fluid flow and timing sequence. "For example, we changed the electronic system to streamline the startup process."

"The original plan was that the cooling system was going to be carried on the person, such as in a backpack," Kautz added. "However, a lot of patients who undergo chemotherapy already have things they need to bring along—blankets or sweatshirts to stay warm, things to do during the hours-long process. We've decided to go with an enclosure that can be wheeled and potentially store some of these items to make things easier for the patient."

The team plans to deliver a functional prototype that resembles the final marketable product as closely as possible. The project, and its contribution to the medical community, is not something they take lightly.

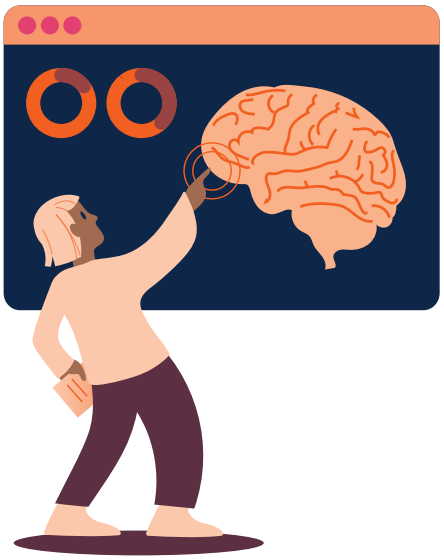
"In my personal life, I've seen many loved ones affected by cancer," Gonzalez added. "This project hit close to home and I wanted to see if I could make an impact."

Creating Custom Mobility

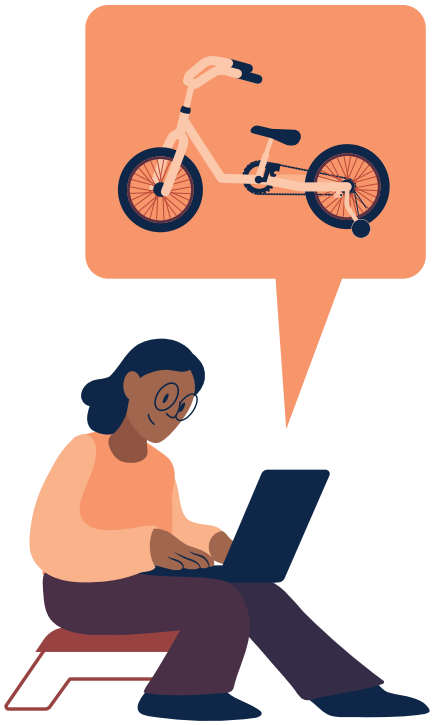
Henry Beuving, Ryan Klein, Austin Kody, Eric Lambke and Ohiomokhai Musa designed and developed a customized bicycle for Logan, an eight-year-old boy in the Chicago suburbs diagnosed with achondroplasia.

Achondroplasia is a genetic disorder credited as the most common cause of dwarfism. The condition has impacted Logan's physical build, causing his legs to be comparatively short for his body. As a result, commercially available bicycles do not suit his needs.

By the time they wrapped, the spring 2024 CAPSLocks™ team had brought the scalp cooling prototype as close to market-ready as possible.



Logan and his parents (left and right) with the Bicycle Fit team. In addition to the customized frame and gear hub, Logan's bike has aesthetic features to suit his preferences.



"The bicycle fit was a problem for Logan because, for example, the handlebars would be the right height, but then the pedals would be too long. Or the pedals would be just right, but then the whole bike would be too tiny," Beuving explained. "We needed to design a new frame from scratch."

The team's other main design consideration was torque generation, as Logan's family explained that he struggles with pedaling from a standstill. The team calculated gear ratios and sourced a hub that would offset Logan's efforts to build momentum.

Beuving's focus during the project was to design a correctly proportioned frame on paper and model it in CAD. The team then met with Logan's family to receive feedback.

"They gave us a lot of creative freedom to get it working," Beuving said of collaborating with Logan's family to design the bike. "They also gave us feedback that helped to improve our design."

Once the team had arrived at a viable model, they built a full-scale prototype with PVC. For their final deliverable, the team sought help from Silver Machine Shop in Champaign to fabricate a custom steel frame. They farmed wheels, brakes and other universal bicycle components off an existing bike of compatible size.

"I've had internships before where I've had to design parts for people," Beuving said. "This was probably the first time where a client told me directly what they needed. [The project] was a really good exercise in getting feedback from everyone involved."

Beuving and fellow team members Klein and Kody were able to deliver the finished bike to Logan in Chicago late last year, and the occasion was featured on Chicago's WGN news.

Improving a Surgical Device for Patient Comfort

Other senior design projects focused on specialized medical devices. Saad Alblwi, Evan Drew, Kevin Lui and Tim Sheehan on the **Spinal Vision** team worked to develop a tool to improve lumbar punctures, a process in which a needle is inserted into the spine between the L4 and L5 vertebrae to extract fluid for testing.

"One of the reasons I picked this project was for the human-centered design aspect," Alblwi said. "You look at your users' needs and develop a solution based on those. If you do a good job, you could make a real impact on someone."

During a lumbar puncture procedure, the doctor typically determines the puncture site by feeling for anatomical landmarks by hand. However, for patients whose landmarks may not be prominent, such as those experiencing obesity or scoliosis, it can be much harder to detect where to insert the needle.

Unsuccessful lumbar punctures, called traumatic taps, account for nearly 10 percent of approximately 363,000 procedures performed annually in the U.S. To improve the experience for both patient and doctor, the team focused on developing a proof-

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>
> *- Saad Alblwi, Spinal Vision team*

of-concept prototype for a handheld device that holds both the needle and an ultrasound probe. The device would also employ a rotary potentiometer and gear system to assist the doctor in precisely angling the needle.

"The end goal for the device would be that when a doctor angles the needle toward the puncture site, the ultrasound would help him see exactly where to insert it," Alblwi said.

The team collaborated with students from CI MED as well as a senior design team from the Department of Bioengineering whose primary focus was to develop an anatomical model for future testing.

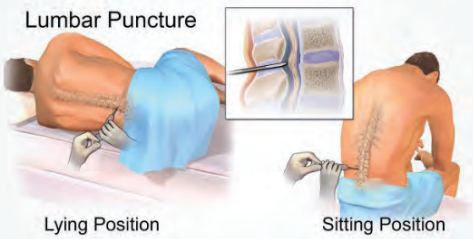
"We had three or four prototypes, and each had a problem that we couldn't avoid," Alblwi said of the iteration process. "We had to keep changing the design until we arrived at our current deliverable, which was a challenge."

The device will continue to be developed by future Senior Capstone Design teams.

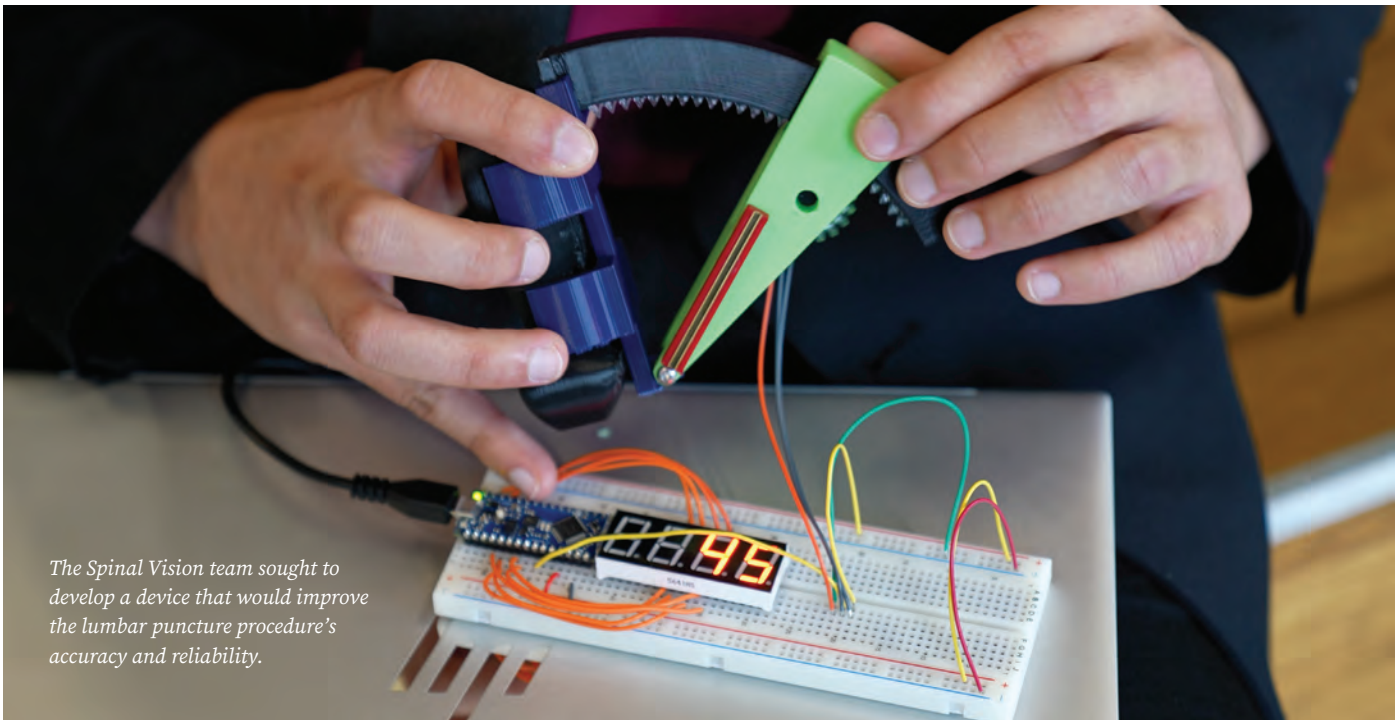
Refining Surgical Efficacy

Yigit Atas, Dan Andreyev, Darren Biskup and Jonas Sodini on the **MOPASS** team also focused on evolving a medical procedure that impacts both doctors and patients. The team worked to develop a conceptual prototype for improving hydrocephalus surgeries.

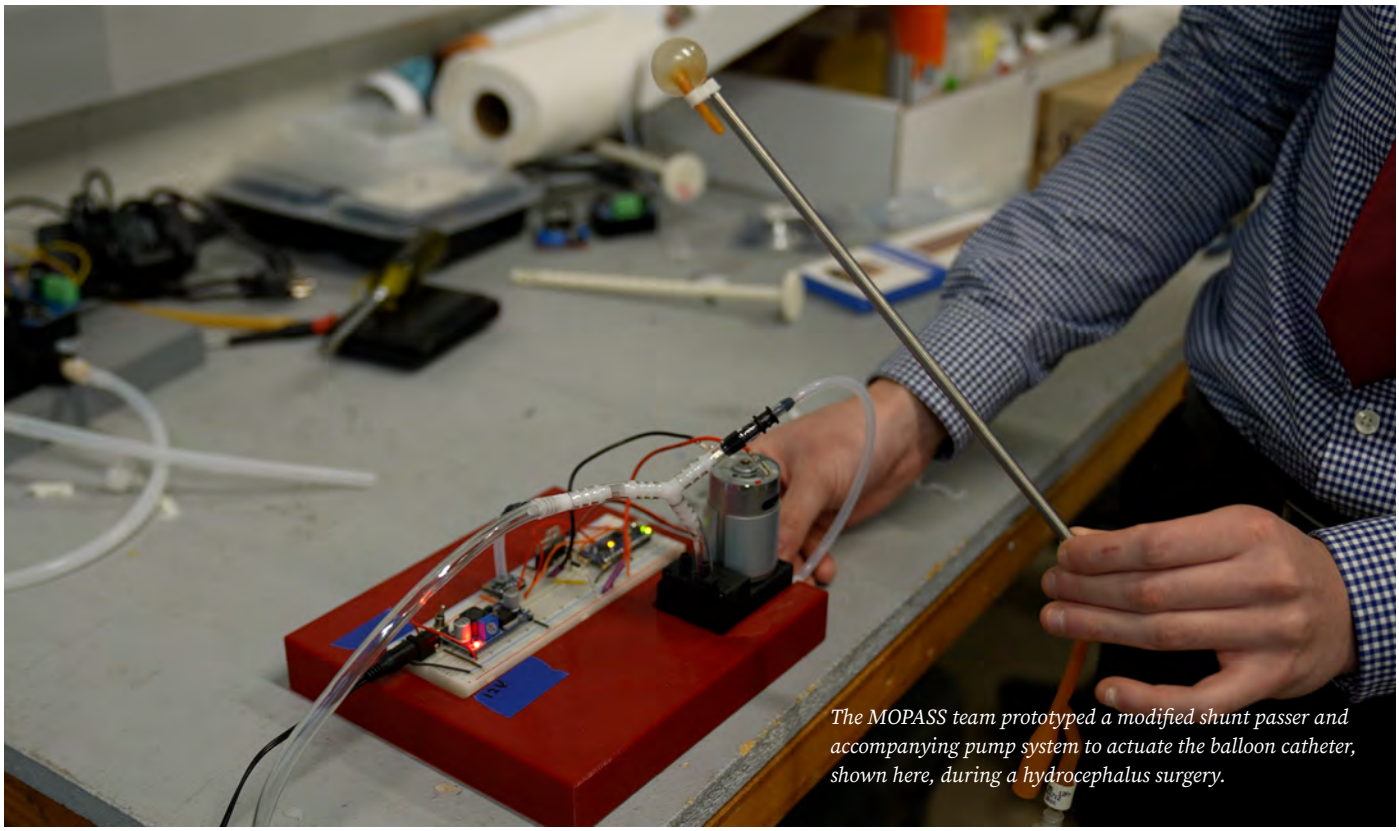
Hydrocephalus is a condition in which cerebrospinal fluid accumulates inside the brain, causing it to expand and put pressure on the skull. The disease is common in infants and older adults, with



During a lumbar puncture, a needle is inserted between the L4 and L5 vertebrae to extract fluid for testing.



The Spinal Vision team sought to develop a device that would improve the lumbar puncture procedure's accuracy and reliability.



The MOPASS team prototyped a modified shunt passer and accompanying pump system to actuate the balloon catheter, shown here, during a hydrocephalus surgery.

estimates ranging from 88 per 100,000 children to 400 per 100,000 adults over age 80. Cerebrospinal fluid ordinarily flows through the brain's ventricles to coat brain matter and the spinal column. However, issues such as poor absorption, flow blockage or overproduction of fluid can lead to a build-up within the ventricles. The pressure is often relieved by surgically inserting a shunt that allows fluid to drain from the skull to a different area of the body, such as the abdomen, where it can be safely reabsorbed.

The shunt is typically a long plastic tube that the surgeon must force between the skin and adipose tissue using a rigid metal shunt passer. Doing so is physically demanding for the surgeon and can cause damage to both layers of tissue, resulting in a longer, more complicated recovery for the patient.

"I watched a VP (ventriculoperitoneal) shunt surgery at Carle Hospital and witnessed the surgeons tunnelling beneath the skin," said Biskup. "It helped me understand how intensive the process is."

To mitigate these issues, the team investigated affixing a surgical balloon, or inflatable latex catheter, to the tip of a modified shunt passer so that inflating the balloon would separate skin from subcutaneous tissue and ease the passage of the device through the body in a non-invasive way. For this system, the team also designed a pump controller to operate inflation.

"We went through an ideation phase where we drew ideas for the modified passer," Biskup described. "It needed to retain a form similar to what surgeons are already familiar with."

The team was able to test their 3D-printed prototype on a hog cadaver provided by the Department of Animal Sciences. They also experimented with using air versus water to inflate the catheter. Using air would allow for an open deflation system that would exhaust air through a valve. In contrast, a water system would require purging trapped air bubbles, an extra step for the surgeon team. However, water's incompressibility would likely achieve greater lift with less pumping effort as compared to compressible air. The team explored both pneumatic and hydraulic systems and ended the semester with a conceptual prototype that can continue to be developed in future Senior Capstone Design projects. ◆

Undergraduate News

Scholarship Story: Michael Haughey

Speaking to MechSE undergrad Michael Haughey, you can't help but smile. He lights up a room with his enthusiasm for being an engineering student.

Like many students around the world, COVID-19 upended Haughey's high school experience. As a teenager going through a global pandemic, his view of relationships was turned upside down. He went from everyday access to his friends and family to finding new ways to communicate and interact with his community.

As Haughey addressed his own feelings brought on by the pandemic, he thought about older people in his community who were likely also dealing with similar feelings of isolation. An idea was born to link these two worlds. Haughey set up a program in his hometown to connect senior citizens and high schoolers via Zoom. He saw the problem around him and found a way to fix it. His engineering mindset kicked in. "I knew how lonely it was for people in my high school," Haughey said. "I couldn't imagine being a resident in a nursing home and not able to have visitors."

Read the rest of Michael's story: go.mechse.illinois.edu/Haughey

Knights of St. Patrick

Ximena Castillo

Hrushikesha Athreya

Recent mechanical engineering grads Hrushikesha Athreya and Ximena Castillo were named 2024 Knights of St. Patrick, an honor awarded to students who demonstrate leadership characteristics, excellence of character and exceptional contributions to The Grainger College of Engineering.

Athreya earned a dual degree in mechanical engineering and engineering physics with a minor in astronomy. He served as president of the student chapter of ASME; consulting engineer and former president of Illinois Robotics in Space; and Business Director for MechSE MakerWorks. Next fall, Athreya plans to continue his education in graduate school. "I will be starting my PhD in physics with a focus on astronomical instrumentation, which is essentially doing engineering for astrophysical purposes such as detectors, telescopes and balloons," Athreya said. "My career goal is to become a physics faculty member."

Castillo earned her degree in mechanical engineering. Throughout her college career, she was heavily involved in the Society of Hispanic Professional Engineers (SHPE), for which she served as internal vice president. She was also an active member of the Morrill Engineering Program (MEP), having served as an MEP mentor and on the Core Welcome Committee Team. She recently moved to Southern California to work for Boeing, where she was accepted into their Engineering Foundational Career Program, a rotational program lasting two years, with four different six-month rotations. "I am very excited for this next chapter of my life, and receiving the Knights award before graduation was truly an honor," Castillo said.

Mayo Clinic Research Fellowships

Each year, the Mayo Clinic invites roughly 180 undergraduates from across the nation to participate in their Summer Undergraduate Research Fellowship (SURF) program. Sponsored by the Mayo Clinic Graduate School of Biomedical Sciences, the 10-week program gives undergraduates a chance to work at the forefront of biomedical research at one of the world's leading medical centers. This year, nine Illinois students are participating in the SURF program—including two MechSE undergraduates.

Delaney Marringa is a James Scholar with a minor in biomolecular engineering. She works in the lab of Chemical and Biomolecular Engineering Professor Brendan Harley, where they are examining how stem cells interact within their bone marrow microenvironment. Marringa is also involved in Women in MechSE and serves as a Women in Engineering Advisory Board Liaison.

Rene Mohammadi also works in Harley's lab on a project using 3D bioprinting methods to develop hydrogel-based models of endometriosis lesion etiology and progression. She is president of the Illinois chapter of the Engineers in Action Bridge Program and serves as an Engineering Learning Assistant (ELA) for Grainger's First Year Experience.


Rene Mohammadi


Delaney Marringa

Eco Illini "G6" debuts at Indianapolis Motor Speedway

In 2023, the Eco Illini Supermileage team raced their brand new car, "G6," in the Shell Eco Marathon competition at the Indianapolis Motor Speedway. It was the team's first new car since COVID, which they designed, built and raced in just one academic year.

Check out more team photos from the event!

mechse.illinois.edu/news/G6

Two Formula SAE teams are now one

In fall 2023, the university's two Formula SAE competition teams—Illini Motorsports (IM) and Illini Formula Electric (IFE)—combined their knowledge and experience to form the newly merged Illini Electric Motorsports (IEM). Both teams have a history of incredible achievements—most recently, the crowning of IM as the #1 team in the world.

"This merger will ensure the long-term success of Illinois in Formula SAE competitions and the success of FSAE members at Illinois, especially as the auto industry and the world embrace a new wave of electrification," said IEM President Hadley So. ◆

Goldwater Scholarship

MechSE undergraduate Amelia Korveziroska was one of five students from the University of Illinois to be awarded a Barry M. Goldwater scholarship. The Goldwater scholarship program encourages the continued development of highly qualified scientists, mathematicians and engineers by awarding scholarships to sophomores and juniors from the U.S. who intend to pursue doctorates. Nationally, 438 students were chosen from 1,353 nominees to receive the $7,500 award.

Korveziroska is a rising senior in mechanical engineering and plans to pursue a doctorate in mechanical engineering with a research focus in applied physics relating to space equipment. She participated in two NSF-sponsored Research Experiences for Undergraduates (REUs): one in solar physics at the Harvard-Smithsonian Center for Astrophysics and a second at the Illinois Materials Research Science and Engineering Center. She recently studied abroad at Nagoya University in Japan, which has a partnership with the Japan Aerospace Exploration Agency.

How two sisters found their second home in Grainger Engineering

They share a love of learning, pride in their family and a deep appreciation for their home, both in the Chicago suburbs and at The Grainger College of Engineering. For sisters Ximena Castillo, who graduated in May with a bachelor's degree in mechanical engineering, and Kamila Castillo (BS 2026, Environmental Engineering), the choice to become Grainger Engineers has meant exploring college life together for the past two years. From finding a community with the Illinois Chapter of the Society of Hispanic Professional Engineers (SHPE) and the Morrill Engineering Program to enjoying activities like slacklining and weekly dinners, the sisters are ready for the next chapter in their lives.

"I am grateful for these two years, being able to experience this time of our lives together," Ximena said. "I have really enjoyed my experience at U of I, and it's even better now that I've gotten to share the experience with my Kamila!"

As Ximena prepares for life after university, she will still cheer Kamila through the last two years of college. "I hope she continues how she has been and isn't scared of asking for help when it's needed," Ximena said. "I also don't want her to compare her journey with anyone else's, and this is true for anyone pursuing engineering because everyone has their own path to follow."

Undergraduate programs now rank #5 in the nation

As more evidence of MechSE's commitment to excellence in education, the department's undergraduate degree programs moved up two spots to #5 in the 2024 *U.S. News and World Report* rankings.

"The mechanical engineering and engineering mechanics programs at Illinois continue to be among the very best in the nation," said Professor Sanjiv Sinha, Associate Head for Undergraduate Programs in MechSE. "We are fortunate to have a passionate and creative faculty, a hard-working and dedicated staff, and a motivated and involved student body. Our job going forward is to make sure we continue to nurture this excellence in MechSE while we focus on our mission of providing high-quality engineering education at scale." ◆

MechSE's Unprecedented Growth

This fall, all of MechSE's degree programs will welcome their largest student cohorts in department history. Our faculty roster has also seen a bigger-than-ever expansion—providing the department with an enhanced presence in the growing fields of cancer research, mechanics of materials, soft robotics, manufacturing, and more.

BS degrees in Engineering Mechanics (EM) and Mechanical Engineering (ME)

The halls of Sidney Lu MEB in August will see an estimated 318 first-year students—our largest class ever—including nearly 23% women, 47% Illinois residents and 27% international students. These first-year students are projected to receive $102k in MechSE departmental scholarships for the 2024-25 academic year—out of an anticipated total of $354k given to undergraduate students.

"While our student body has always been exceptional, in recent years, we have seen notable rises in the caliber of our incoming undergraduates. This has been evident from not only the courses they enroll in, but also their early involvement in significant opportunities like undergraduate research, internships, study abroad and other enriching experiences," said Stephanie Ott-Monsivais, Director of Undergraduate Programs. "These developments highlight the superior academic preparation of our recent students and their proactive efforts to enhance their educational experience right from the start."

MS and PhD degrees in Mechanical Engineering (ME) and Theoretical & Applied Mechanics (TAM)

Nearly 900 students applied for Fall 2024 for the MS and PhD programs in ME and TAM. About 32% of those applicants were offered admission, with 115 accepting—resulting in the highest number of enrolled graduate students in the past 10 years. This 40% acceptance rate far surpasses the 28% acceptance in 2022 and even 36% in 2023.

What's most impressive, however, is the scholarly rigor this incoming class will bring to MechSE. This year, many of our graduate students will be funded by $781k in fellowships provided by the Graduate College and The Grainger College of Engineering.

Master of Engineering in Mechanical Engineering (M.Eng.ME)

Since its launch in Fall 2015, with an intense focus on recruitment, program development, student engagement and individualized student advising, enrollment in M.Eng.ME has exploded. For Fall 2024, MechSE expects to serve 120 students, one-third of which are enrolled in the online program. The M.Eng.ME continues to boast high retention and graduation rates as well as an impressive cumulative GPA.

During its early formative years, under the direction of former Faculty Director Jiajun He and Program Coordinator Susan Roughton, the M.Eng.ME grew rapidly, with highly talented students enrolling and a greater number of high-quality course offerings for online students.

"Now, with our recent hiring of an Online Programs Coordinator, Jessica Moyer, we're transitioning into a period of even more rapid growth, and MechSE is looking forward to further increasing online course offerings to meet the needs of our students, both academically and professionally," said Professor Quinn Brewster, M.Eng.ME Faculty Director.

This year, the online mechanical engineering master's degree – part of the M.Eng.ME program – was ranked #4 in the country by *U.S. News and World Report*.

Faculty

MechSE's robust faculty recruiting efforts during the last several years are paying off as seven new faculty (both tenure track and specialized) join the department this coming academic year—surpassing many years of hiring records for MechSE. We also welcomed an additional four tenure track and specialized faculty during the 2023-24 academic year, enhancing our expertise in materials design, drug transport and tissue microenvironments, sustainable manufacturing and structural engineering.

"MechSE's faculty are truly some of the best in the world, and prospective faculty know that," said Department Head Tony Jacobi. "It's so important that we continue to build a critical mass of researchers here in MechSE who are addressing the world's most pressing engineering problems." ◆

Graduate News

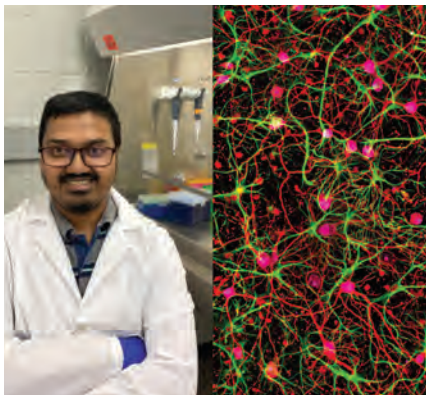
Brewster assumes leadership of M.Eng.ME Program

In Fall 2023, Professor Quinn Brewster began serving as Director of MechSE's professionally oriented Master of Engineering in Mechanical Engineering (M.Eng.ME) Program. He took over the reins from Teaching Assistant Professor Jiajun He, who had led the degree program since its inception.

Curriculum is delivered to both on-campus and online students, and the online program is currently ranked #4 in the nation by *U.S. News & World Report.*

"I believe that, in addition to understanding the day-to-day needs of the program, Quinn possesses a compelling vision of excellence and educational impact through our M.Eng.ME," said Department Head Tony Jacobi. "His prior service as Associate Head for Graduate Programs from 2005 to 2008 also equips him with a unique perspective and understanding of how the M.Eng.ME is related to and differentiated from our other graduate programs."

Time Under Tension



What do researchers look at all day? Perhaps a lush, green-and-purple rainforest of muscle fibers. Maybe a microscopic swallowtail scale. Sometimes, a computer-generated sea slug. These perspectives and more were represented by the winners of the Beckman Institute's fifth annual research image contest. This year, MechSE doctoral student Md Saddam Hossain was one of the winners in the graduate student category. Hossain studies under Professor Taher Saif, who is also faculty in Beckman's Neurotechnology for Memory and Cognition Working Group.

The human brain's 86 billion neurons strain under constant tension, enabling its neuronal network to generate enough mechanical force to lift a two-pound weight. Hossain's image, which he calls "Time Under Tension," depicts a network of several hundred rat hippocampal neurons (red) surrounded by astrocytes (green). The force of the network pictured is on the order of 100 nanonewtons, which is roughly 5 million times weaker than the force needed to type on a computer.

Mechanical Engineering graduate program ranks #6

U.S. News and World Report's 2024 college rankings have placed the University of Illinois at the #6 spot for its graduate program in mechanical engineering. MechSE's MS/PhD program consistently ranks in the top ten in the country.

Additionally, The Grainger College of Engineering moved up two spots to #9, and now boasts six graduate degree programs ranked in the Top 5.

Kim recruited to attend Hyundai Vision Conference

Mechanical engineering graduate student Minkyung Kim was selected to attend the 2023 Hyundai Vision Conference.

Organized by Hyundai Motor Group, the conference serves as an industrial platform for networking in the fields of robotics, future air mobility, autonomous driving, eco-friendly cars (electric and hydrogen fuel cell vehicles), device intelligence (embedded artificial intelligence and quantum computing) and smart factories.

Kim, who earned her bachelor's degree from the Korea Advanced Institute of Science and Technology (KAIST), is a doctoral candidate in Professor Naira Hovakimyan's Advanced Controls Research Laboratory. Her research is in the areas of adaptive control and machine learning. She has been working on DiffTune—auto-tuning through auto-differentiation—which unrolls the dynamical system and controller as a computational graph and updates the controller parameters through gradient-based optimization.

From CU to Turkey: Gelisli leads humanitarian efforts for earthquake victims

Mechanical engineering doctoral student Asena Gelisli continues to lead efforts to support Turkish citizens following the earthquakes that devastated southeastern Turkey in February last year. Upon hearing about the 7.8 and 7.5 magnitude earthquakes that struck near the Syrian border, Gelisli called an emergency Turkish Student Association meeting to rally support for relief efforts. The group first focused on raising awareness by reaching out to local media and hanging informative posters around campus. Group members also hosted a fundraiser on the main Quad, selling Turkish food, coffee, and tea, and collected donations to send to local NGOs that were active in the effort.

This school year, the group's focus shifted from humanitarian relief to providing support for homeless Turkish families and orphaned children as they transition into new situations post-earthquake.

"Earthquake survivors' lives are affected not just in one moment, but over the long term," said Gelisli, who serves as president of the student organization. "We plan to host events aimed at supporting impacted children and their education."

New research offers insight into crosstalk between cancer cells and their environment

Most solid cancerous tumors become stiff as the cancer progresses. Although researchers recognize that the environment around the cancer cells influences their behavior, it is unclear how it does so. In a new paper, MechSE postdoctoral researcher Bashar Emon and graduate student colleagues collected gene expression data in response to mechanical stiffness in tumors. Their work can help guide our understanding of the crosstalk between cancer cells and their surroundings.

Historically, researchers have focused on how cancer cell genes change their expression over time. "But we haven't made as much progress as we would have liked against cancer," said Emon, who works in Professor Taher Saif's lab. "Even with all the advances, the patient survival rate has not improved proportionately, when you consider how much research and funding has gone into studying cancer."

MRS Graduate Student Award recognizes Nahid's excellence and distinction

Doctoral student Shahriar Muhammad Nahid was recently awarded a Materials Research Society (MRS) Graduate Student Award (GSA) as a Silver award recipient. He was honored in April during the MRS 2024 Spring Meeting and Exhibit in Seattle, where he also presented his research. The GSA awards honor and encourage graduate students whose academic achievements and current materials research display a high level of excellence and distinction. Nahid's research has explored how the distinctive characteristics of 2D materials, such as lower dimensionality and enhanced flexibility, interact with the optoelectronic properties of ferroelectrics. ◆

GROUNDBREAKING RESEARCH

NOVEL FLYING MICROCHIPS FOR ENVIRONMENTAL MONITORING

New work on novel flying microchips that includes the use of environmentally degradable materials and colorimetric chemical reagents, combined with the aerodynamics of 3D fliers, represents a major breakthrough in the development of distributed monitoring technology.

The work was a synergistic collaboration of an international team led by Professor John Rogers at Northwestern University, MechSE professor **Leonardo Chamorro** as a corresponding author, and former MechSE doctoral student Jin-Tae (Jimmy) Kim (now a postdoc in Rogers' lab) as co-first author. This same team made significant design improvements to the flying microchips in 2021.

The researchers have now incorporated bioresorbable materials and colorimetric assays for various environmental parameters, including pH, heavy metal concentrations, ultraviolet exposure, humidity and temperature. The "microfliers" are modeled after wind-dispersed Tristellateia seeds or "helicopter seeds" and have wireless, electronic components for sensing.

"These fliers can be used for remote sensing of multiple environmental parameters and can also be deployed in regions difficult to access, such as complex terrain or bodies of water, allowing for more comprehensive monitoring of environmental conditions," Chamorro said.

A biodegradable, colorimetric 3D flier—about the size of a grain of sand—resting on the leaf of a plant. This radially symmetric design derives inspiration from the helicopter-type seeds of the Tristellateia australasiae plant as the basis for stabilized aerial dispersal by rotational motions during free fall in air.

FRESH INSIGHT INTO BATTERY-BASED DESALINATION TECHNOLOGY

A chemical analog to Prussian blue, the intense blue pigment used in Katsushika Hokusai's famous woodblock print "The Great Wave off Kanagawa," is being utilized in an updated saltwater desalination technique. MechSE researchers are using it in a new electrode equipped with flow channels to make the desalination process more effective and efficient.

To achieve more effective saltwater desalination, the team focused on fluid movement rather than new materials. By adding microchannels to the inside of battery-like electrodes made of Prussian blue – which also has special chemical properties – researchers increased the extent of seawater desalination five times over their non-channeled counterparts to reach salinity levels below the freshwater threshold. The Prussian blue analog material works by taking hold of positively charged ions like sodium within the pigment's crystal structure.

The study, led by MechSE professor **Kyle Smith** and graduate student Vu Do, used a chemical analog to Prussian blue. Their findings are poised for applications in desalination, energy conversion and storage, CO_2 conversion and capture, environmental remediation, and resource and nutrient recovery.

"In previous work, we predicted desalination could be performed using this method, but nobody had validated seawater-level desalination in the lab," Smith said.

Below: A chemical analog to Prussian blue, the intense blue pigment used in Hokusai's woodblock print "The Great Wave off Kanagawa," is being utilized in a new electrode equipped with flow channels to make the desalination process more effective and efficient. After Katsushika Hokusai, public domain, via Wikimedia Commons.

> *The reality is that fossil fuels aren't going away for at least 100 years. A lot of CO_2 is going to be emitted before we get to a place where we can lean on renewables. If our F-DLC coating were adopted globally, it would noticeably curtail carbon emissions and water usage for the existing power infrastructure.*
>
> *- Nenad Miljkovic*

Copper steam condenser pipes coated with F-DLC (top) and without a coating (bottom). The F-DLC coating allows the condensed water to form into droplets rather than a thin film covering the pipe. The coating can be used on any common metal, including copper, bronze, aluminum and titanium.

NEW STEAM CONDENSER COATING COULD BOOST GLOBAL POWER EFFICIENCY

If coal and natural gas power generation were 2% more efficient, every year there could be 460 million fewer tons of carbon dioxide released and 2 trillion fewer gallons of water used. A recent innovation to the steam cycle used in fossil fuel power generation could achieve this.

MechSE professor **Nenad Miljkovic** developed a coating for steam condensers used in fossil fuel steam-cycle generation that is made with fluorinated diamond-like carbon, or F-DLC. In addition to boosting overall process efficiency by 2%, they demonstrated the coating's suitability for industrial use by performing the longest durability test ever reported.

Fossil fuel power generation depends on a process called the steam cycle, in which fuel is burned to boil water, the resulting steam spins a turbine and the turbine drives an electric generator. The steam then reaches a condenser which both reclaims water from the steam and maintains a pressure difference across the turbine so the steam flows. Improving the condensers' heat transfer properties would allow a pressure difference to be maintained while burning less fuel. With the new coating applied, the steam condenses into water and forms droplets on the F-DLC surface, putting the steam into direct contact with the condenser and allowing heat to be directly transferred. This improves the heat transfer properties by a factor of 20, which translates to a 2% overall process boost.

The team also collaborated with the university's Abbott Power Plant to study the coating's performance for six months of steady condensation exposure under industrial conditions.

Examples of Onymacris bicolor beetles under different treatments: Nanoscale-thin gold paint to change wettability (left), nail polish to remove texture (middle), and nail polish with gold on top to change both texture and wettability (right).

BEETLE MORPHOLOGY INFLUENCES FOG DROPLET COLLECTION

In coastal arid regions where water sources are scarce, windborne fog droplets play a crucial role in sustaining life, and several beetle species have evolved their own unique strategy for water collection – utilizing their bodies to intercept the droplets. However, the mechanics behind this process have long puzzled researchers due to the beetles' bulky morphology. In a recent study, scientists delved into how adaptations in the beetles' back enable them to gather enough water.

Two species make use of a behavior called fog basketing to collect water droplets from the morning fog. They ascend dunes and balance on their front appendages, leaning their bodies into the wind. Microscopic droplets from the fog accumulate on the beetle's back, and then trickle towards its mouth.

"In terms of fluid dynamics, water collection efficiency is way higher with thin structures like a mesh," explained Hunter King, an assistant professor of physics at Rutgers University, one of the study's authors. "But if you're a beetle, you've got a ball shaped body, and you don't have the freedom to change your geometry that wildly. We wanted to determine the strategy they use for a situation that's not ideal to begin with."

The computational phase of the experiment was led by MechSE professor **Mattia Gazzola** and involved the creation of models to assess the impact of various surface geometries on water collection. Utilizing data from these simulations, they then produced 3D-printed models replicating different curvatures and surface properties derived from the models.

Given that the beetles' backs are inherently hydrophobic, the researchers coated them with a nanoscale-thin layer of gold to render them hydrophilic. To eliminate surface irregularities, an intriguing method was employed: applying nail polish to smooth out the beetles' backs. Some beetles received only gold or nail polish, while others were coated in both.

They found that surface bumps and a textured surface resulted in the most water accumulation. "We show in our designs that if you add bumps on the back, resulting in these very sharp deflections in the back's curvature, the water particles hit the bump, but then the flow continues to move along the back," explained Gazzola. "And then it continues to flow over another bump and another, and the spaces between bumps then serve as traps to collect the water."

Surprisingly, the researchers discovered that the wettability of the beetles did not substantially influence water collection; instead, only geometric features played a significant role. However, they did observe that wettability influenced the directional movement of water down the beetle's back, supporting previous research underscoring the importance of wettability in guiding water towards the beetle's mouth.

The team said these findings likely won't be applicable for collecting water on the scale that humans need, but the results could inform material designs for when the opposite pattern is desired—*avoiding* water accumulation.

> *Our dream for the future is to have a small mission in which the robot executes multiple jumps until they reach a target.*
>
> *- Sameh Tawfick*

ATHLETIC, INSECT-SCALE LONG JUMPING ROBOTS REACH WHERE OTHERS CAN'T

A team of engineers from the University of Illinois, led by MechSE's **Sameh Tawfick**, has published the first known study documenting the long-jumping motion of 3D-printed insect-scale robots.

"To my knowledge, this is the first time anyone has demonstrated long jumping in insect-scale robots," Tawfick said. "This is significant because it gives the robot planned mobility, where it can now jump from A to B, traversing terrain rougher than its own size."

Jump performance in insect-scale robots was previously hindered by small-scale manufacturing processes and limited availability of materials and miniature actuators. Tawfick's team used coiled artificial muscle actuators and projection additive manufacturing to produce a monolithic elastomeric robot design inspired by a locust's jumping mechanism.

The insect-scale prototype has a lightweight elastomer body and an artificial muscle made from coiled, heat-treated nylon fishing line. Tawfick's lab previously developed machines to produce these miniature coils. The researchers designed and tested 108 robot iterations produced through additive manufacturing, with the smallest having a mass of 0.216 grams and the ability to jump 60 times its body size in horizontal distance.

The development of a long-jumping, insect-scale robot is significant for agricultural and maintenance applications that benefit from non-destructive evaluation. For example, future robots could be equipped with sensors to gather data from contacting a crop or exploring inside a machine.

"These robots can reach locations that drones currently cannot," Tawfick said of long jumping robots' predicted ability to gather crop data. "They are inexpensive to mass manufacture, which gives them a lot of utility for sensing as a fleet."

Read more and see the research in action! go.mechse.illinois.edu/longjump

MORE THAN 35 YEARS IN, THE ACRC IS IMPACTFUL AS EVER

In the late 1980s, damage to the ozone layer began to rapidly increase. This was due in part to an accelerated introduction of chlorofluorocarbon (CFC)—and other compounds that contain chlorine—into the ozone layer. Under proper conditions, chlorine can destroy large amounts of the ozone, so international agreements began limiting certain refrigerants. At the time, a DuPont executive and Illinois alumnus knew that the university was working on research for automobile and refrigeration companies, and he returned to the university to propose a collaboration to address this issue.

MechSE Professor **Clark Bullard** (now Professor Emeritus) helped facilitate several grants and also suggested expanding to include other companies across the industry. With this introduction, the Air Conditioning and Refrigeration Center (ACRC) at the University of Illinois was born.

"From the beginning we designed ACRC to operate on a model similar to the modern research hospital, where research priorities are set by the client. Engineers, like doctors, are problem solvers and could be trained in a similar way, consistent with the tradition of land grant universities of the 1860s where students learned-by-doing and carried knowledge of the agricultural and mechanical arts back to the farms and factories of Illinois," Bullard said.

Founder Professor **Nenad Miljkovic** is the current Director of the ACRC.

"The future of ACRC is exciting. Current and future trends of electrification and decarbonization are creating engineering challenges for several industrial sectors relevant to the ACRC. From electrified vehicles to thermal management of data centers to low global warming refrigerants, we look forward to continuing to make contributions and educate the students needed to solve these important challenges," said Miljkovic. ◆

MORE BREAKTHROUGHS

Nick Glumac shared his expertise on explosives with the *NY Times* for two of their stories last year on the collapse of the Kakhovka dam, which sits on the front line of the Russia-Ukraine war. Earlier this year, he also weighed in on how salvage experts were planning to use controlled explosives to remove pieces of the Francis Scott Key Bridge in Baltimore from the bow of the container ship that caused the bridge's collapse weeks earlier.

The Illinois Materials Research Science and Engineering Center (I-MRSEC) has been renewed for another six years, and will fund two new interdisciplinary groups co-led by MechSE faculty—**Elif Ertekin** ("Photo-Ionics: Controlling Ion Transport and Defects with Light") and **Arend van der Zande** ("Directing Energy and Information Using 2D Strain-Scapes").

Randy Ewoldt was appointed to the newest class of the U.S. Defense Science Study Group (DSSG), a competitive program that introduces outstanding science and engineering professors to the country's security challenges, fostering their talents towards working on these issues. Group members interact with top officials from the DoD, various intelligence agencies, defense laboratories, the White House and Congress.

In their ongoing collaboration investigating the impact of bubble bursting on the aerosolization of contaminants, **Jie Feng** and **Randy Ewoldt** have found that when a bubble rises through a liquid and bursts at the surface, it can produce ejected droplets that play a key role for mass transfer in both natural and industrial processes. In sea spray, for example, the evaporation of these droplets affects the atmosphere's radiative balance and serves as cloud condensation nuclei.

Jie Feng was awarded nearly $500k from the National Science Foundation to further his efforts to improve targeted drug delivery and controlled release of therapeutics. In part, he and his research team hope to capitalize on recent developments of microswimmers to assist in their work on the next generation of programmable vesicle-based drug delivery systems.

Nikhil Admal won a prestigious NSF CAREER Award to characterize the response of heterointerfaces to temperature, shear, and normal forces in terms of interface dislocations. Doing so could lead to a new understanding of how structural properties emerge from van der Waals interactions, which in turn will pave the way for a systematic design and large-scale synthesis of heterostructures.

Naira Hovakimyan is leading a new study to develop safe learning-enabled systems (SLES), which represent AI-driven systems that can adapt to extreme events, environmental hazards and irregular behaviors. A viable SLES framework is key to ensuring end-to-end safety in developing technologies such as self-driven cars and aircraft.

Faculty News

Lili Cai was granted the 2024 Office of Naval Research Young Investigators Program (ONR YIP) award for her smart wearable technology research. She was one of just 24 recipients nationwide to be awarded this competitive funding.

Randy Ewoldt was invited to teach an international short course as part of the XIXth International Congress on Rheology (ICR2023) in Athens, Greece, considered by many to be the "Olympics" of rheology, with 900 participants from 37 countries. Additionally, earlier this year, he closed out the Annual European Rheology Conference (AERC) in Leeds, UK, as the final plenary speaker.

Mattia Gazzola unveiled a cost-effective, open-source in vitro system for interfacing with neurons, offering a more accessible avenue for researchers interested in neural interactions. The study was part of a larger project called Mind in Vitro, which explores how neurons interact with each other. Gazzola was also named a Charles Conrad Kritzer Faculty Scholar.

Hovakimyan (center) at the Campus Middle School for Girls

Naira Hovakimyan was elected a Fellow of ASME. She was also the 2024 recipient of The Grainger College of Engineering's Award for Excellence in Translational Research, which honors researchers for special achievements and activities related to research which leads directly to products or outcomes with notable societal impact. Additionally, in a long-term outreach project that began last year, she and her graduate researchers taught students at the Campus Middle School for Girls how to design and build their own drones.

Sinha *Hsiao-Wecksler*

Elizabeth Hsiao-Wecksler received the 2024 MechSE Two-Year Alumni Effective Teaching Award, voted on by the class of 2022 to recognize faculty whose teaching they now perceive as having had the greatest impact on their careers.

Iwona Jasiuk was named a Richard W. Kritzer Faculty Scholar.

Blake Johnson was featured on a podcast from the university's Center for Innovation in Teaching & Learning (CITL) about his process in preparing the labs for several key undergraduate courses for remote learning at the start of the COVID-19 pandemic.

Mariana Kersh presented a keynote lecture at the International Society of Biomechanics in Sports Conference and served on a panel with other women scientists to discuss the challenges faced by women in the biomechanics and science fields.

William King was elected to serve a three-year term on ASME's Board of Governors. He was also the 2023 recipient of the ASME William T. Ennor Manufacturing Technology Award, the society's highest honor for manufacturing-related engineering. Additionally, he and **Nenad Miljkovic** will co-lead a new research project on the "Fundamentals of Machine Learning for Phase Change Heat Transfer," funded by a 2024 Multi-University Research Initiative (MURI) grant sponsored by the U.S. Department of Defense.

New research from **Seid Koric** and collaborators at NCSA applied a recently introduced deep learning operator network, or DeepONet, in nonlinear and irreversible plastic behavior exhibited by many engineering materials under large deformation. By feeding neural networks different values of training data, the researchers helped them learn by example and trained them to recognize patterns in data, find connections, predict outcomes and predict solutions in a wide range of fields.

Katie Matlack is the 2023 recipient of ASME's C.D. Mote Jr., Early Career Award, presented to an early-career recipient who demonstrates research excellence in the field of vibration and acoustics. Matlack was also named a Richard W. Kritzer Faculty Scholar.

Prashant Mehta was elevated to IEEE Fellow, one of the most selective honors in engineering. No more than 0.1% of the IEEE voting membership become Fellows each year.

A University of Illinois team led by **Nenad Miljkovic** and collaborators at the University of Arkansas were recognized by R&D 100 Awards for their innovations. This year's recognition highlighted their design of a 250 kW all-silicon carbide motordrive for hybrid electric aircraft.

Martin Ostoja-Starzewski presented the Rothschild Distinguished Visiting Fellow Lecture at the Isaac Newton Institute for

Mathematical Sciences at the University of Cambridge. He was also elected this year as a Foreign Member of Academia Europaea, the Pan-European Academy of Sciences, Humanities and Letters.


Sehitoglu

Huseyin Sehitoglu was named the 2023 recipient of the Paul C. Paris Gold Medal from the International Congress on Fracture (ICF) for his major contributions to the complexity of fatigue failure of a broad range of materials. He was also invited to serve on the Board of Governors for Acta Materialia, the most influential journal in the field of materials science and mechanics.

Sanjiv Sinha received the 2024 MechSE Five-Year Alumni Effective Teaching Award, voted on by the class of 2019 to recognize faculty whose teaching they now perceive as having had the greatest impact on their careers.

Kyle Smith was honored with an inaugural Dean's Award for Early Innovation from The Grainger College of Engineering, which recognizes individuals who are working at the early stages of the innovation life cycle to turn their research into products that benefit society.

Sameh Tawfick was named a Ralph A. Andersen Faculty Scholar.

Arend van der Zande was named an Associate Editor of ACS Nano Letters, a prestigious journal that reports original results on fundamental, applied and emerging research in all areas of nanoscience and nanotechnology.

Amy Wagoner Johnson presented the plenary lecture at the Summer Biomechanics, Bioengineering, and Biotransport Conference. Her talk focused on her research in engineering materials for coral restoration as well as the mechanics of the cervical microenvironment with applications to preterm birth. She was also featured on two episodes of the "Redefining Energy Tech" podcast to discuss her work on coral reef restoration.


Wagoner Johnson

In Memoriam

Judith S. Liebman, a Professor Emerita whose work was in the field of operations research, died July 8, 2023, in Urbana. She was 87.

Raised mostly in Kansas City, she returned to her beloved Colorado mountains every summer, and attended college at the University of Colorado, Boulder, where she majored in Physics. Interviewing for a student committee assignment in her freshman year, she met her future husband Jon. As she delighted in telling people throughout their lives together, "Jon was the only man I ever met whose eyes lit up when I said my major was Physics."

When Jon accepted a faculty position at Johns Hopkins University in Baltimore, Judith began her doctoral studies in Operations Research. On completion of her degree in 1971, she joined the Johns Hopkins faculty in the Departments of Public Health Administration and Operations Research. Just one year later the Department of Civil and Environmental Engineering (CEE) at the University of Illinois offered faculty appointments to both the Liebmans, with Judith accepting a joint appointment in the Department of Mechanical and Industrial Engineering (now MechSE).

When Jon was named department head of CEE, Judith moved entirely to MechSE. Her promotion to associate professor in 1977 made her the first woman to earn tenure in MechSE—and only the second woman to earn tenure in the College of Engineering.

In 1984 she was promoted to full professor. Her research areas were in the applications of operations research in engineering optimization, health systems, and military and civil infrastructure investment. She also had a deep interest in studying how to improve engineering education.

She served as Vice Chancellor for Research and Dean of the Graduate College from 1987 to 1992. She retired in 1996, though continued to teach part-time for several years.

In 2018, she was recognized in Illinois's "150 for 150: Celebrating the Accomplishments of Women." As part of the sesquicentennial celebration, 150 women were honored for making significant contributions to Illinois throughout its history. At the time, looking back on her ambitious career, Judith's advice for students was to "find that branch of engineering that interests you most and seek out appropriate courses. Look for opportunities to acquire more depth in both the theory and applications—and believe in yourself."

Overshadowing all these accomplishments, Judith is remembered for her ever-sunny smile, her always-cheerful demeanor, her iron will and her unflappable approach to every difficulty.

Welcome New Faculty

Four new faculty have joined the MechSE department, enhancing our expertise in materials design, drug transport and tissue microenvironments, sustainable manufacturing and the field of structural engineering.

Hagh brings design and training of disordered materials to MechSE

"I heard from colleagues that the Illinois environment is very collaborative and interdisciplinary," said Assistant Professor Varda Hagh of their decision to join the University of Illinois. "The fact that the barriers for people to talk across disciplines are so low really got me excited and I could see myself collaborating with researchers from different departments."

Hagh completed their PhD at Arizona State University and did their postdoctoral studies at the University of Chicago's James Franck Institute. Their research interests include the study of memory formation in materials, training of disordered materials for novel functionality, and design of bio-inspired metamaterials and reconfigurable and shape-shifting materials.

"What I do is explore the enormous space of possibilities for disordered materials and manipulate their local properties in a systematic and algorithmic way to guide them to a state of being that's unusual and extraordinary," Hagh said.

For instance, a piece of foam used for chair cushions has a positive Poisson's ratio, meaning that when compressed longitudinally, it will expand transversely to preserve its volume. "However, by paying attention to the foam's structure and viewing it as a mechanical network at the microscopic level, we encounter an opportunity for innovation," Hagh said. By systematically adjusting and altering

Assistant Professor Varda Hagh

the network's local properties, such as stiffness and the natural rest-lengths of the connections between constituent parts, the foam network can be "trained" to exhibit a negative Poisson's ratio. "This alteration in the foam's behavior is extraordinary," Hagh said.

Although most of Hagh's work has been theoretical and computational, they look forward to performing experiments in new areas in their research lab. "At the moment, I am very excited about exploring the relationship between physical configuration and structure of caterpillar colonies and the emergent group signals that they display in response to external stimuli. We are going to play tones of varying frequencies and observe groups of caterpillars change their dance moves as we rearrange them carefully into new group configurations in the colony."

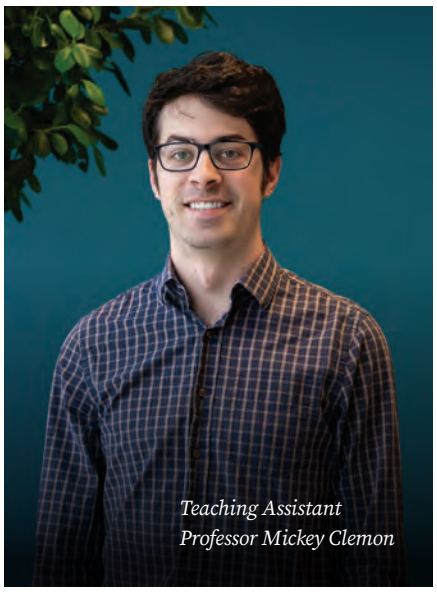
Clemon introduces sustainable manufacturing exploration to MechSE

Teaching Assistant Professor Mickey Clemon returned to the U.S. last fall from the University of Technology in Sydney, Australia, where, among other academic pursuits, he was working to automate wool harvesting on farms.

Clemon completed his undergraduate studies at the University of Kansas and his MS and PhD from the University of California, Berkeley, all in mechanical engineering. The focus of his academic research has been two-fold: first, additive manufacturing (AM) and learning how to control, monitor and perform material state estimation during 3D printing. Second, he has worked with waste management and life cycle impact, performing triple bottom line analysis of the production process.

More recently, Clemon worked on developing a new system for AM that involved multiple robots collaborating to print objects together. When these robots have highly overlapping workspaces, they need an efficient framework for collaborating. This isn't as common when printing larger items, as one can move the robots far from each other. "The future is adding multiple materials and assembly tasks with humans, so that would merge into the realm of collaborative robot ("cobotic") manufacturing, where humans and robots are interacting together."

Regarding his work at UTS in Australia, Clemon noted that the wool industry is now trying to move toward automating the harvesting and processing of wool. ''The need for this project stemmed from the fact that shearing sheep is very physically taxing," he said. This leads to high shearing costs and a low number of workers available for such jobs. He and his team continue to explore this area.



Teaching Assistant Professor Mickey Clemon

"One thing that's very clear to me is that the sustainability improvement metrics that we need to achieve are not a technological solution," Clemon added. "We have lots of technology. What we don't have is adoption, translation, understanding, education, or policy, which makes it very hard to adopt the technology that we already have. I think there's a very important and big area where I can help within the education outreach piece."

Han pioneers drug and nanoparticle delivery in pancreatic cancer and the brain

Professor Bumsoo Han joined the MechSE faculty in January after 14 years on the faculty at Purdue University. He holds affiliate appointments in the Materials Research Laboratory, the Carl R. Woese Institute for Genomic Biology, and is a Phil & Ann Sharp Scholar in Cancer Research for the Cancer Center at Illinois.

"I took a non-traditional mechanical engineering path," Han said. His PhD research focused on gas turbines and heat transfer, with postdoctoral research specifically on bioheat transfer. "Although my research started with those topics, I am now working on the transport of fluids, matters and energy in the body," he said. "It regards how to control heat, fluids and particles transfer to diseased and injured tissues and organs."

Han credits his background in heat transfer with informing his current work on applications of engineering in the human body. "[My background has] helped me understand how those processes worked in humans," he said. "My goal now is to improve human health through mechanical engineering." His group has been working on developing the tissue and disease models for drug discovery. His research at Illinois revolves around drug and nanoparticle transport in tissue microenvironments for pancreatic cancer and brain research, related to Alzheimer's and dementia.

"The great thing about Illinois is that the university is designed to be more collaborative from an interdisciplinary perspective," he said. "People collaborate between different departments and colleges. It's

Professor Bumsoo Han

much easier and more natural to work at the research centers and institutes across multiple departments and colleges."

Han is currently preparing to expand his research in the Cancer Center by setting up his lab and making sure logistics with his postdoctoral students are resolved. "My lab creates an environment to collaborate with different fields, and it can provide a unique field to work with biology, chemistry, medicine and even clinicians," he said.

Golecki lends industry expertise to introductory TAM courses

Teaching Assistant Professor Tom Golecki, PE, SE, joined MechSE after completing his PhD at Illinois in civil engineering with a structural concentration.

Golecki earned dual bachelor's degrees in civil engineering and architectural engineering and a master's degree in civil engineering (structural) from Drexel University. He then joined the engineering firm Simpson Gumpertz & Heger, working at the headquarters in Waltham, Massachusetts. After six years with the firm, Golecki moved to Intelligent Infrastructure Systems (IIS) (later acquired by Pennoni) to do structural health monitoring.

However, a new opportunity presented itself when Golecki's wife, Teaching Assistant Professor Holly Golecki, was offered a faculty position in the Department of Bioengineering at Illinois after completing her PhD in engineering sciences at Harvard University.

"I'd been curious about getting a PhD for a long time and [moving to Illinois] was a good opportunity," Golecki said. "The timing was right to make the change." He focused his dissertation research on topology optimization for dynamic bridge structures. Traditionally, topology optimization approaches analyze structures under a single static load—in other words, with zero acceleration.

Having taught TAM 212 (Introductory Dynamics) this spring, Golecki said he enjoys being able to connect lecture topics to relevant problems and trends from industry. "I can speak from firsthand experience to show students common pitfalls in engineering problem-solving, like keeping track of units or properly documenting your work," he said. "I can give them examples of physical things out in the world that someone had to do some course-related calculations for." ◆

Teaching Assistant Professor Tom Golecki

Alumni News

Peter Chien (BSME 2022) authored "The Ultimate Guide to the Mechanical Engineering Interview" to guide young graduates through the interview process. The book, which provides sample and practice interview questions as well as review topics, has roughly 90+ technical and behavioral interview questions and solutions inspired by real interviews with companies.

Douglas A. Litteken (BSME 2011, MSME 2016) received this year's Young Alumni Award from the University of Illinois Alumni Association (UIAA). The award recognizes alumni who are under the age of 35, and who have emerged as early leaders in their respective professional or civic endeavors. An expert in the emerging field of structural softgoods, Litteken is a structural engineer at NASA's Johnson Space Center.

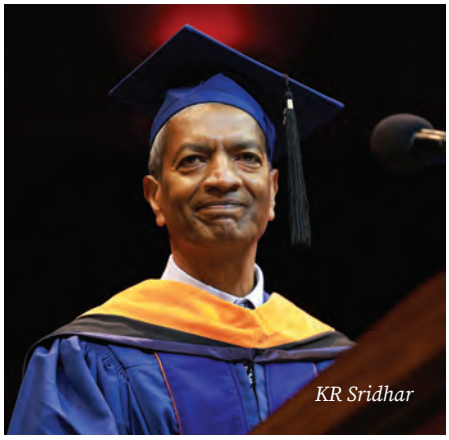
Anna Oldani

Dan Mirabelli

A suite of software developed by **Craig McClung** (MSTAM 1984, PhDME 1988) was inducted into the Space Technology Hall of Fame. McClung was Professor Huseyin Sehitoglu's first graduate student. The honor was bestowed on the technology itself – the NASGRO software – and the core leadership team at Southwest Research Institute (SwRI) and NASA's Johnson Space Center. McClung is the Program Director in the Materials Engineering Department in the Mechanical Engineering Division at SwRI, where he has worked since 1988.

For the past three years, **Dan Mirabelli** (BSME 2016) has handled a wide variety of criminal cases as an Assistant District Attorney in the Manhattan district attorney's office. Mirabelli said the work ethic he refined while studying engineering prepared him well for the long hours and heavy workload that come with his current position.

Craig McClung, center. Photo by the Space Foundation.



KR Sridhar

Anna Oldani (BS AgE 2012, MSME 2014, PhDME 2019) was promoted to a new position as Chief Scientific and Technical Advisor for Environment and Energy at the Federal Aviation Administration (FAA). At FAA, she has directed many sustainable aviation research projects in both academia and industry. In her new role, Oldani will work across the organization to achieve environmental goals for aviation.

Jigar Shah (BSME 1996) was named one of Time's 100 Most Influential People of 2024. Shah is Director of the U.S. Department of Energy's Loan Programs Office, overseeing more than $200B in government loans to bring energy innovation to market.

This year's commencement speaker at The Grainger College of Engineering graduation ceremony was **KR Sridhar** (MSNE 1984, PhDME 1990). Sridhar is founder, chairman, and CEO of Bloom Energy, based in Sunnyvale, CA.

This August, **Karen Thole** (BSME 1982, MSME 1984) will become the Robert J. Vlasic Dean of the College of Engineering at the University of Michigan. She is currently a University Distinguished Professor in the Department of Mechanical Engineering at Pennsylvania State University.

In Memoriam

Alexander Rankin V (BSME 1957) passed away on February 20, 2024, at his home in Bedminster Township, Pennsylvania. He was 91. Along with Joanne, his late wife of 66 years, Rankin was a longtime friend and supporter of the MechSE department, with the endowment of two professorships beginning more than two decades ago.

In 2000, the Rankins honored the well-known and beloved machine design professor by endowing the James W. Bayne Professorship. In 2003, they established the Alexander Rankin Professorship in Mechanical and Industrial Engineering in honor of the men after whom he was named: his father, grandfather, great-grandfather and great-great-grandfather.

Rankin graduated from Illinois with the goal of owning his own business within 10 years. He began his professional career with Firestone Tires and, notably, was on the team that invented radial tires. True to his vision, in 1967 he opened Vulcan Spring and Manufacturing Co. Initially a small operation run out of his basement—with one spring coiling machine, one customer, and one order—Vulcan moved into a small factory space six months later. Rankin owned and operated the company in Telford, Pennsylvania, for more than 50 years until his retirement. His childhood passion for engineering materialized in a children's product when a Vulcan spring was used to drive the speech mechanism of the "Talking G.I. Joe" action figure, the company's first commercial application. Today, Vulcan is an international supplier of springs for a wide range of products from appliances and surgical tools to locomotives and satellites.

Gerald E. "Jerry" McGinnis (BSME 1958), bioengineering pioneer, inventor and entrepreneur, passed away after a long and courageous battle with Parkinson's Disease on January 25, 2024, just a few months shy of his 90th birthday.

In 1971 McGinnis founded his first company, Lanz Medical Products, in his home. His first two devices were a ceramic anesthesia mask and a tracheotomy tube developed using his family's kitchen stove as a kiln. His overarching goal was always the comfort of the patient.

He founded Respironics in 1976 and developed the CPAP (continuous positive airway pressure) and BiPap (bi-level positive airway pressure) machines, oxygen concentrators for patients requiring supplemental oxygen, infant apnea monitors for infants at risk of sudden infant death syndrome, asthma treatment solutions, and hospital ventilators. As an entrepreneur, McGinnis had learned first-hand the need to find the right problem to solve, and the emerging awareness of sleep apnea disorder provided him with his ultimate arena.

Respironics became an industry leader in sleep apnea therapy and earned the honor of being named the 5th Best Private Company by Forbes Magazine just before it went public on the Nasdaq Exchange in 1987.

McGinnis was beloved for his humility and work ethic, and his philanthropy extended to the institutions that helped him along his journey, including the University of Illinois.

Create your own permanent imprint on our community patio at Lu MEB!

Purchase your paver today!

go.mechse.illinois.edu/pavers

A prominent feature of the Sidney Lu Mechanical Engineering Building is the paved patio, a beautiful gathering spot at the center of the building facing Green Street. Individuals, companies, and organizations can become a permanent part of the building, the MechSE Department, and the University of Illinois by sponsoring one of these paver bricks with a personalized engraved message.

Your inscription could honor a friend or family member, memorialize a cherished professor, or show the world you're a supporter of MechSE. An engraved paver can also be a unique, meaningful and lasting gift. Most importantly, your contribution is an investment that will help empower the department to continue to be among the best in the world.

Planting the seeds

of creativity and innovation

Robert, left, and Richard Mauge show off the CNC machine they built in their garage.

Richard and Robert Mauge (BSME 2020) credit their parents for encouraging exploration and innovation at an early age. The twins were enrolled in Shotokan Karate (they both earned black belts); studied music (Richard plays flute, Robert is a clarinetist); and by purchasing magazines such as Popular Mechanics, Popular Science, and Scientific American, the twins' parents discovered their children had an interest in science and technology.

The brothers started working on computers at the tender age of three, quickly becoming comfortable navigating software and the internet. During high school they began exploring and learning available software, including Blender, an open-source software that introduced them to computer-generated imaging (CGI).

These early CGI applications planted the idea that, in 2023, bloomed into MATRICS, Inc., their machining and design business located in Champaign.

When Richard first arrived at Illinois, he says he considered getting involved in anything and everything. Then he found the Illini EV Concept (formerly known as Illini Eco Concept) car competition team. “First of all, the car looked cool. It was unique at the time. And second, when I understood the competition and the freedom

of design, I realized, wow, I can literally make a supercar," said Richard.

There was, however, one complication: the team didn't have a computer numerical control (CNC) machine large enough to make the molds in one piece. CNCs are computer-controlled, highly precise and efficient manufacturing machines.

"I had to make the molds in six different pieces, and then basically glue them together. And nothing turned out to be proper," said Richard. "There were too many big body gaps, the tolerance was incorrect, it was an extremely tough process, and it took way too long."

That summer, Richard, Robert and their father built a CNC router in their garage at home, then brought it in pieces to campus to be assembled and used to make the molds for that year's car. The process of building that first CNC proved invaluable to the twins' futures.

From education to employment to entrepreneurship

While in college, Richard and Robert landed internships with Psyonic, a startup founded by an Illinois alum and winner of the Cozad New Venture Challenge. Originally based in Champaign, the company was looking for people who had carbon fiber experience, which the Mauges had from the EV Concept car team. The internships led to full-time employment directly after their 2020 graduation.

While they both started as mechanical engineers, Robert later moved to lab manager and regulatory roles. "I didn't get as much manufacturing experience, but I did get a lot of experience regarding how to lead projects in a commercial space and a more research-based space as well," said Robert. "Going through that whole process was transformative. We as engineers are very focused on making things, moving fast, breaking stuff, etc., but when it comes to regulation, even just documenting past progress, you don't think about that. Developing those skills early on really helped."

In 2022, Psyonic's decision to relocate to San Diego coincided with the brothers being ready to move in a different direction. They stayed in Champaign, close to their family and where they own a home, and started their own company, MATRICS. The young business partners had a few advantages. They have worked well together since they were children and know they can rely on each other. They also know each other's strengths and enjoy bouncing ideas off each other.

"I have a broad set of interests," said Robert. "My mechanical knowledge isn't as deep as it could be. But I still know a bunch of different things, and I like working on different things. Whereas Richie is very much focused on a singular project. And that's oftentimes manufacturing related."

After hand-building a new, high standard CNC machine in their home garage, the Mauge twins focused on their niche market. MATRICS serves startups and small businesses, fulfilling the types of jobs not practical for large manufacturers.

"We take on those small, low-volume prototype runs, or low-volume production runs, and we're also able to help with design knowledge. We have this very interesting background where we started as mechanical engineers and then went into manufacturing. And oftentimes, those two were very much divorced," said Robert.

While they continue to build a consistent manufacturing and consulting client base, long-term, the twins are developing an idea that could be a game-changer for their field. They plan to develop production CNCs small enough to fit into tight quarters, such as an urban office building, while maximizing the machines' build area. While they acknowledge the need for additional customer and market research, they believe the customer base will be people who aren't necessarily manufacturers.

"Ideally, we'll get to a point where we could go in and start hiring some new individuals here at the company," said Richard.

The goal, however, is not to be wealthy. "We want to make a difference, a big difference, hopefully," said Robert. "We never really thought of starting a business right out of college. We're in it because we see this as getting to the life that we want for us and others. For us that is the ability and freedom to pick and choose what projects we do." ◆

TORCHING A PATH

FROM ENGINEERING TO FIREFIGHTING

MechSE alumnus Dr. Gavin Horn (BSME 1998, MSME 2000, PhDME 2004) pioneered his own unique path to earning his doctorate in mechanical engineering. After earning three degrees from Illinois, he went on to complete a master's degree in fire protection engineering at the University of Maryland. With over 100 peer-reviewed articles and 15 years of service as a firefighter, he is now working as a Research Director for the Fire Safety Research Institute (FSRI). Horn credits his education with impacting the trajectory of his career. The FSRI is part of the Underwriters Laboratories' (UL) Research Institutes.

"Having a background in engineering built the foundation for how I approach a problem. In both research and emergency situations, this foundation helps me think clearly on my feet so I can bring the most positive outcome as the situation calls."

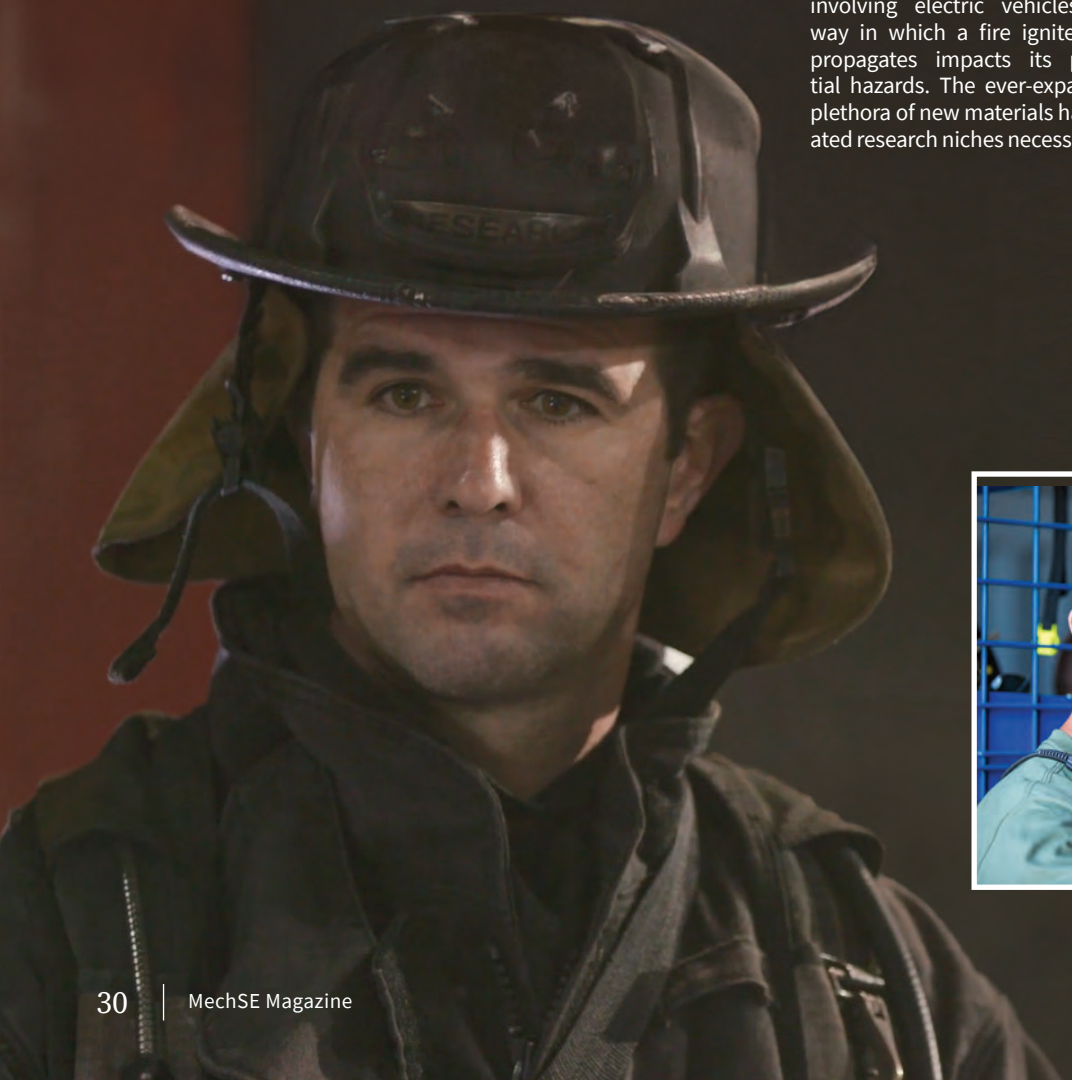
During his time at the university, Horn was inspired by former MechSE Professor Tom Mackin to learn about failure analysis in the context of materials and mechanics after the September 11, 2001, attack. A dedicated firefighter safety program created while he was a PhD student became the foundation for his interest in fire safety. "I am currently interested in the human health implications of smoke, lithium-ion battery fires, and wildland urban interface fires," he said. "The goal of this research is to help protect the public."

He also investigates how evolving material properties impact fire risk. From synthetic materials to larger urban fires and fires involving electric vehicles, the way in which a fire ignites and propagates impacts its potential hazards. The ever-expanding plethora of new materials has created research niches necessary for understanding how to prevent fires. "We're playing a lot of catch-up," Horn said. "In our research we're learning how to stay ahead of the game to reduce risks of fires involving new technology."

Horn said he uses his research skills to test and apply things he finds in the moment and make on-the-spot decisions. "My mechanical engineering education provided the background to understand fire dynamics, thermal dynamics and heat transfer. It helps me to teach other firefighters to apply these to real life," he said of utilizing his skillset on the job. "These skills are also useful to help with fire investigations to find the cause of each fire."

Horn remarked that while his career is constantly evolving, he aims to continue on the path of fire safety and research.

"If you asked my 15-year-old self, this is exactly what I would have wanted to do—my career path has been non-traditional but very rewarding," he said. "Engineering can help create safer and more fulfilling lives, and I am motivated by the goal of having my research bettering the course of someone's life."◆



Grit and perseverance

in a self-driven career path

Every student takes a different path following their education at Illinois. Alumnus Lori Gold Patterson (BSME 1990), Chief Executive Officer for PixoVIN, paved her way from co-op to startup. From beginning her academic career studies in psychology at the University of Arizona to ending as a MechSE graduate, Patterson reminisced on her path to achieving her current career.

"My original educational path was frustrating because it was emotion-based, not logical," Patterson explained. "I once followed students into math class to learn more about STEM, and I found math to be cerebral and straight to the point. After talking with my advisor, I decided to follow an engineering course of study."

Patterson enrolled at Parkland Community College, where she prepared for and then transferred to Illinois, and soon found an opportunity to work in her desired industry by attending a co-op program. "I worked for John Deere every other semester," she said. "I loved manufacturing, and I thought I would have a career in it."

After stints as a computer programmer at Accenture and Caterpillar and a special project manager for Solo Cup, she realized that she had an eye for business systems for reengineering human systems. "I relied a lot upon the problem-solving of engineering to recreate these systems," she said. "There is always an answer even if it seems impossible."

Patterson soon left the corporate world to work closer to her family in Urbana. In 1998, she co-founded Pixo, an IT and technology consulting agency, serving as CEO until 2020, when she sold the company to her directors. In 2017, she launched PixoVIN, developing the leading vehicle barcode scanning technology called Capture. The tech captures VIN numbers from automobiles using standard mobile devices.

In addition, she teaches for the Natural Science Foundation, an organization that teaches scientists how to discover their customers' pain points so they can create need-based, commercial-ready solutions. She also works for the non-profit STEAM Genius, which brings STEM and STEAM education to under-resourced students through popular culture with things like radio control cars, drones, deejaying and more. "I have continued to focus on the theme of human-centered design in my career," Patterson reflected.

Patterson's advice for students is to identify their passion. "When I was studying at the University of Illinois, I had no advanced math or science background," she said. "I was one of only a few women in each class, but our small cohort of women battled with determination to get to the places we are today because we refused to fail. Find what you are unwilling to fail at!" ◆

> *"I have continued to focus on the theme of human-centered design in my career."*
>
> *- Lori Gold Patterson*

2024 Alumni Awards

MECHSE DISTINGUISHED ALUMNI AWARD

Since 1968, this award has recognized alumni who have established careers and have served in a professional and technical capacity to honor the department and the university. To date, nearly 200 MechSE alumni have received the award.

William Profilet (BSME 1984), *Retired Legacy Fellow in Business Development at BAE Systems Electronic Systems*

Michael Kessler (MSTAM 1998, PhDTAM 2002), *Louis M. Sardella Department Head and Professor of the Department of Materials Science and Engineering at Johns Hopkins University*

Venanzio Cichella (PhDME 2018) *Assistant Professor of Mechanical Engineering at the University of Iowa*

Arif Nelson (BSME 2013, MSME 2015, PhDME 2018) *Assistant Professor in a food, chemical and biotechnology cluster at the Singapore Institute of Technology*

MECHSE OUTSTANDING YOUNG ALUMNI AWARD

Initiated in 2015, this honor recognizes alumni who have graduated from MechSE less than 10 years ago and who have embodied the department and university's values in their professional careers.

GRAINGER ALUMNI AWARD FOR DISTINGUISHED SERVICE

MechSE alumni Daniel N. Donahoe and Bruce Koe were among the seven recipients of this award from The Grainger College of Engineering in 2024.

Daniel N. Donahoe (MSME 1979)
With career interests spanning spacecraft thermal control work at Lockheed to artillery fuzing at Motorola to worldwide tracking stations at Ford Aerospace, Donahoe is currently the owner and CEO of 1000 Kilometers, a general engineering practice with specific focus defined by a radius of 1000 kilometers from Salt Lake City, Utah.

Bruce Koe (BSME 1966)
During his corporate career, Koe worked in the publishing industry as VP of global operations at Reader's Digest, executive VP of operations at Golden Books Family Entertainment, director of business development at Hallmark Cards, and corporate VP at Banta Corporation. He then launched The Kirkwood Group, providing strategic marketing, management and operations consulting to the publishing, media and printing industries.

Alumni Board pledges $100K to support DEI efforts

In 2022, MechSE launched a new funding initiative as part of its larger efforts to move the department toward an increasingly diverse and inclusive community that is open, just, and welcoming for everyone.

Now, the MechSE Alumni Board has generously pledged a gift of $100,000 towards this effort. At the time of publication, their combined personal and company gifts total more than $72,000.

The funds raised by the Alumni Board will support four major DEI initiatives:

1. Scholarships for undergraduates to increase MechSE's competitiveness in the Big 10 with respect to excellent scholastic candidates who are first generation-in-family to attend college, enhance the MechSE learning community from a holistic perspective, or have financial hardship.
2. Mentoring Program for first-generation students and students from otherwise underprivileged backgrounds – who, as the data show, are most at risk for dropping out of the program due to academic challenges in their first two years.
3. New invited seminar series, bringing in academic experts on DEI to present the latest and most innovative practices and research.
4. Travel grants to help undergraduates and graduate students attend national-level DEI meetings to promote MechSE and their own advancement.

"The incredible generosity of our Alumni Board will allow MechSE to continue doing what it does best, which is developing successful future leaders in engineering. I am so proud to be part of the MechSE Alumni Board and to support our alma mater in this effort," said Patrick McAuliffe, president of the Alumni Board and Vice President of Engineering at Werner Co. "As a MechSE grad myself, I know how impactful it is to have a degree from Illinois and this initiative will help bring that education and opportunity to more students who share our passion for engineering and innovation. It will also help strengthen our MechSE community and foster a culture of diversity, equity and inclusion." ◆

You can make your own gift toward MechSE's Diversity, Equity and Inclusion Initiatives Fund by reaching out to Kendra Wolf, Associate Director for Advancement, at kjwolf@illinois.edu. Or use the QR code to give through our online donation form.

go.mechse.illinois.edu/DEI

ILLINOIS

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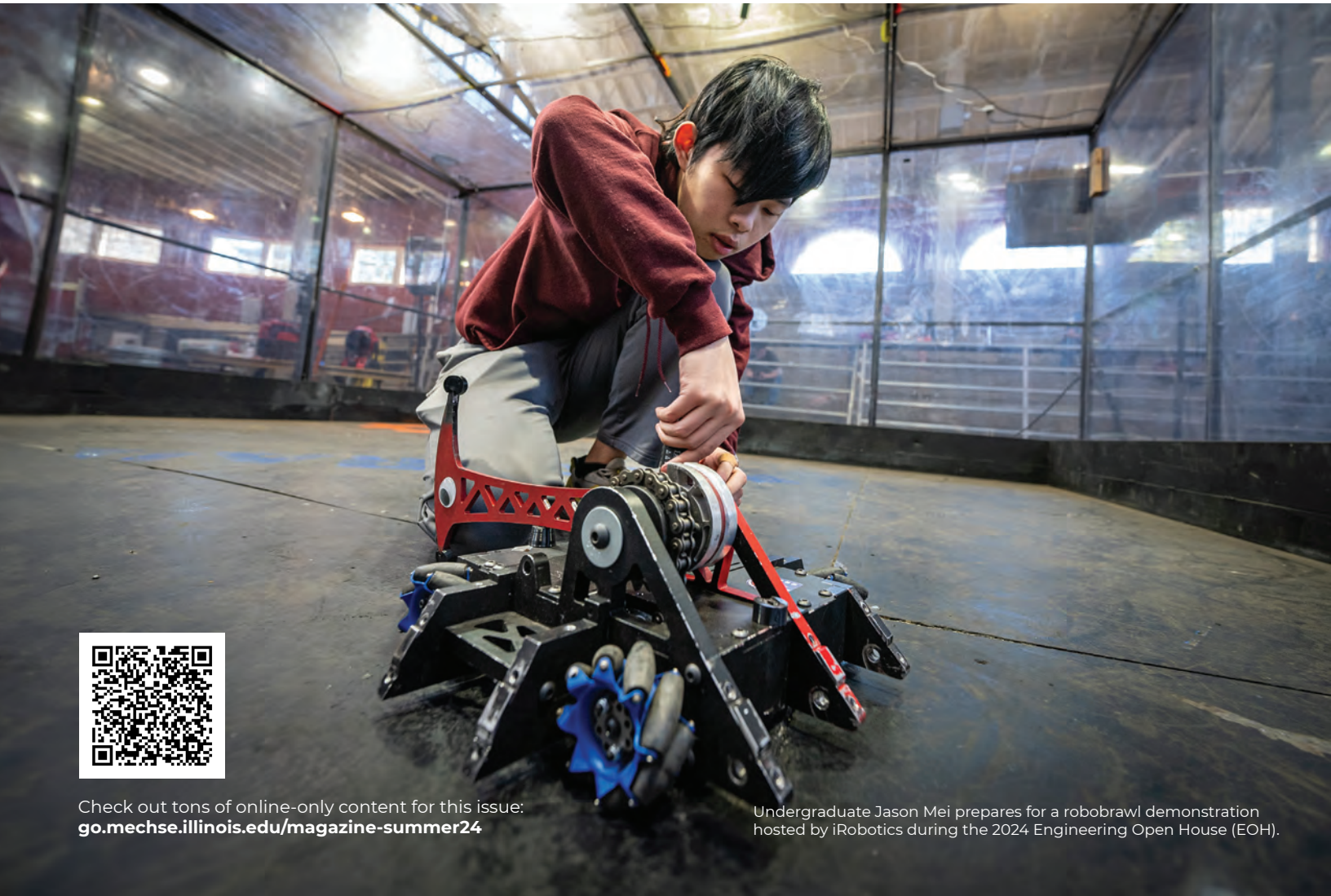

Check out tons of online-only content for this issue:
go.mechse.illinois.edu/magazine-summer24

Undergraduate Jason Mei prepares for a robobrawl demonstration hosted by iRobotics during the 2024 Engineering Open House (EOH).