College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

FALL 2025 NEWSLETTER

DEPARTMENT OF

BIOMEDICAL ENGINEERING

As part of Professor Krishanu Saha's lab, PhD student Anna Tommasi is working on a project in collaboration with industry partner Cellares to manufacture CRISPR-edited CAR-T cell therapies. Photo: Joel Hallberg.

Greetings from Madison!

As we begin a new academic year, I would like to highlight some of our recent successes as a department. Several of our junior faculty were awarded highly competitive early career awards from the National Institutes of Health and the National Science Foundation, grants that will well position them to establish their careers. Enrollment in our PhD and master's programs has continued to grow. We have increased our hands-on lab courses for senior undergraduate and graduate students, including a lab-based course on CRISPR gene-editing technology and a lab course on how to build a microscope from scratch. Collectively, these courses provide real-world experiences and better prepare our students for a range of careers.

This year has also been exciting in terms of faculty hiring. In 2024, UW-Madison launched the Research, Innovation, and Scholarly Excellence (RISE) program, which included initiatives in Artificial Intelligence/Machine Learning (AI/ML) and Transforming Healthspan through Research, InnoVation, and Education (THRIVE).

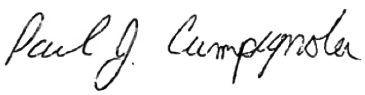
We have hired two new AI/ML junior faculty members, Yang Lu and Dhananjay Bhaskar, who will develop new course offerings in this area. We are early among our peers in embedding an AI/ML topical area within BME. Under THRIVE, we recruited Associate Professor Mehmet Orman from the University of Houston in the microbiome field, who will join us in January 2026 and complement existing strengths across campus. We've also hired two new assistant professors, Monica Ohnsorg and Jonathan Soucy (who will both start in 2026), and Professor David Dean (from Ohio State University) in tissue engineering, broadening an existing strength of the department.

We hope to continue our hiring momentum in the AI/ML and THRIVE areas, as well as in other areas, including advanced biomanufacturing.

We continue to expand upon our efforts for opportunities for professional development of early-stage engineers interested in pursuing careers in academia. Notably, several of our BME faculty participated in the fourth annual WiscProf workshop in May 2025. We are also planning on hosting the next Rising Scholars BME professional development conference in the near future.

I hope you and your loved ones are well, and I thank you for your support of our department.

On, Wisconsin!



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FOCUS ON NEW FACULTY

Dhananjay Bhaskar plays with the 'shape' of data

Dhananjay Bhaskar can't hide his enthusiasm on the other end of the video call as he carries his laptop down the hallways of Yale University's new Wu Tsai Institute building.

He stops in front of a striking piece of art he helped create: a lenticular print that shifts and shimmers as he moves. What makes it remarkable is not just the changing images, but how they were made. They come from brain scans of people imagining Yale's campus, decoded with the help of artificial intelligence and transformed into moving images. Part artwork, part scientific experiment, the piece offers a glimpse into how thoughts themselves might one day be made visible.

While not tied to a scientific publication, the work is more than an artistic exercise: Bhaskar and his collaborators see it as a glimpse of future applications in neuroscience and medicine, from studying mental imagery in infants to aiding communication in patients with neurological conditions.

"That sort of project really gets me going," Bhaskar says with a smile.

Bhaskar brings his passion for bridging science and the arts to UW-Madison in fall 2025, joining the faculty as an assistant professor of biomedical engineering. Hired as part of the university's RISE-AI Initiative, he uses a combination of topological data analysis, machine learning and mathematical modeling to better understand the "shape" of data and reveal insights that could inform drug discovery and design, cancer biology, neuroscience and more.

"I'm a very visual person," says Bhaskar, whose wife is a manga artist. "I like to see the shapes in data and paint a picture of what they mean."

The son of two chemistry professors in Kanpur, India, Bhaskar discovered the field of mathematical biology as an undergraduate student at the University of British Columbia. When he moved to Brown University to pursue his PhD, he looked deeper into cancer biology, using microscope data to build mathematical models and simulations of cancer progression. For his dissertation project, he applied insights from the work of M.C. Escher, a Dutch graphic artist known for infusing mathematical concepts into his art, to understanding how cells transition from healthy states to cancerous.

"I'm a very visual person. I like to see the shapes in data and paint a picture of what they mean."

"Artists often pay attention to negative space, the blank areas that give a picture balance and meaning," says Bhaskar. "In biology you can ask the same question: Where are cells not located? The key insight in my PhD work was realizing that the empty spaces in tissue matter just as much as the cells themselves. By studying those gaps, through the lens of geometry and topology, I could see how normal tissue patterns broke down as cancer emerged."

As a postdoctoral researcher at the Yale School of Medicine, he incorporated machine learning, including deep learning, into his arsenal. One recent project involved teaching algorithms to recognize the structure of brain activity in individuals with schizophrenia, part of a broader research program on representation learning for neural data. By teaching machine learning algorithms to fundamentally understand the shape of such data, he says, they don't require as much raw data—an important consideration for conditions like schizophrenia where patient data isn't as plentiful.

"With just 20 patients, every data point counts," he says. "That's where understanding the shape of the data becomes powerful."

In line with his research, Bhaskar is interested in creating new courses in machine learning for bioengineers and cell and systems modeling at UW-Madison. And before officially starting, he'd already begun collaborating with BME colleague Aviad Hai around calcium signaling patterns in the brain.

"I want to continue to develop new methods," says Bhaskar. "And I think with my background, I can speak to biologists, to cancer biologists, I can speak to neuroscientists. We share the same language, I have the same vocabulary, so I find it easy to communicate with them. But I have a technical background that allows me to build methods using things like geometry and topology, which are things that I think I'm uniquely positioned to build on."

FOCUS ON NEW FACULTY

Duc-Huy Nguyen builds organs on a chip to learn about the liver

"We can make basic science research a little closer to the bedside than what we typically have in the current biomedical research environment."

As he got deeper and deeper into biomedical research over the past decade and a half, Duc-Huy Nguyen came to two conclusions:

1. Given the genetic similarities between mice and humans, it's understandable why the former are so frequently used in biological studies.
2. Too many therapeutic possibilities tested in mice fail to translate to humans.

Nguyen wants to help change that disconnect by developing human organs-on-chip models that will allow biomedical researchers to better mimic human biology and disease.

"My hope is by better understanding human diseases and human biology, through these human organs-on-chip models, we can actually better come up with more translational interventions and therapies for patients," says Nguyen. "We can make basic science research a little closer to the bedside than what we typically have in the current biomedical research environment."

Nguyen joined UW-Madison faculty in fall 2025 as an assistant professor of biomedical engineering after spending the past nine years as a postdoctoral researcher in two labs at Weill Cornell Medicine in New York City.

In developing so-called "organs-on-a-chip," he's specifically interested in studying vascular and liver biology, especially related to endothelial cells, which line blood vessels throughout the body. Nguyen hopes to better model the liver microenvironment to uncover the biological mechanics behind diseases and to test treatments.

In particular, Nguyen is interested in metabolic dysfunction-associated steatotic liver disease (formerly referred to as nonalcoholic fatty liver disease), in which fat accumulates in the liver. More than 1/3 of the population in the United States has the condition, according to a 2024 study published in the journal *Diabetes Spectrum*.

"We don't know the reason why that happens, but we do know that over time, if you don't treat patients, they can progress further to go to cirrhosis or can develop cancers," says Nguyen. "With that number exploding over time, that becomes a really major burden for the healthcare industry."

Nguyen came to the United States at 20 from Ho Chi Minh City, Vietnam, and studied chemical engineering at the California Institute of Technology, where he encountered a faculty member studying how cells respond to mechanical forces to better understand how they migrate.

"That's how I started learning about using engineering techniques to apply to biological problems," he says.

While pursuing his PhD in chemical and biomolecular engineering from the University of Pennsylvania, he began working with microfluidic devices, which allow researchers to culture cells and study their interactions on a single chip.

When he joined Weill Cornell Medicine, he split his time between labs looking at vascular biology—he was a co-author on a 2020 *Nature* paper detailing a method for producing functioning blood vessels—and liver biology.

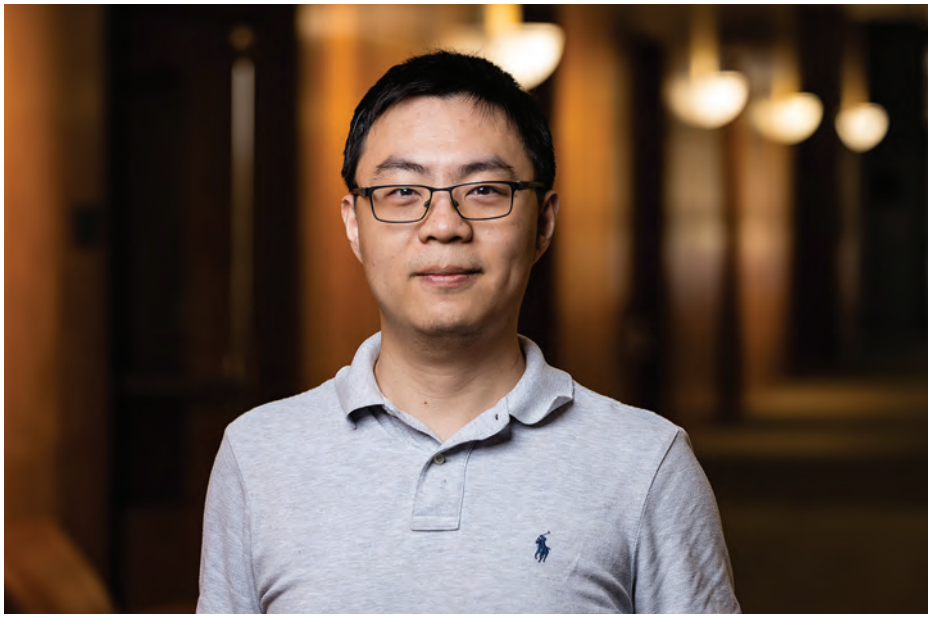
"Because of the training in different areas that I've had—microfluidic devices, vascular biology and liver biology—I want to encompass everything into my lab and start to build vascularized human liver-on-a-chip models, to be able to understand the liver biology but also try to model liver diseases," he says.

Nguyen sees UW-Madison as the ideal place to do so. He's excited to tap into the expertise of new colleagues like Paul Campagnola and Kevin Eliceiri on the extracellular matrix of his models, as well as David Beebe, a pioneer in microfluidic devices. He'll teach BME 520: *Stem Cell Bioengineering*, a topic that speaks to another selling point for the university.

"UW-Madison is always the forefront for stem cell research," he says, "so I'm really excited to leverage that expertise to push my research further into that direction using stem cells to be able to model human liver diseases."

FOCUS ON NEW FACULTY

Yang Lu brings AI to biology



To determine which genes are responsible for—or act as biomarkers of—a given disease, researchers must work their way through thousands upon thousands of genes, using previous scientific studies as their guide. After identifying a candidate gene, they knock it out in an experimental model, gather data and then revise their initial hypothesis.

"This is very inefficient," notes Yang Lu, a computational biologist who imagines a better way forward. "Right now, we are in the right time, in the sense that we have been collecting so much data in the past decades, the resolution of data has become finer and finer, and we have more and more powerful artificial intelligence tools. Can we use AI to accelerate this tedious process? Can we just try to find needles from a haystack in an automatic fashion, purely by looking at data? This is what I pursue."

That pursuit has brought Lu to UW-Madison, where he'll continue his work using artificial intelligence, machine learning and other statistical methods to inform biological research. In fall 2025, he joined BME as an assistant professor after spending the past two and a half years at the University of Waterloo in Canada, where his work focused more on data science methodologies.

That's what Lu originally set out to do as an undergraduate student at Shanghai Jiao Tong University in his native China. He wanted to work for Microsoft as a software engineer and interned at the company. But he discovered computational biology as a master's student at Shanghai Jiao Tong University, which prompted him to turn down a job offer from Microsoft and pursue a PhD in the United States. He joined the computational biology and bioinformatics program at the University of Southern California in 2013.

"I was exposed to different kinds of training, so I learned the language, talked to different people, like statisticians, biologists and computer scientists," he says.

A four-and-a-half-year postdoctoral stint in the Department of Genome Sciences at the University of Washington deepened his interest in biological research questions.

Lu has built AI tools to analyze things like the relationship between genotypes (what is encoded) and phenotypes (what is observable), as well as methods to interrogate AI models and assign measures of statistical confidence for each hypothesis they generate. He sees his work as helping biological researchers prioritize their experiments and laying the groundwork for an AI-aided—and greatly accelerated—research workflow in the future.

Now, he's thrilled to come to UW-Madison as part of the campuswide RISE-AI initiative and connect with researchers in BME, the School of Medicine and Public Health and across campus.

"These powerful tools cannot be useful without applying to real disease," he says. "This is the perfect fit, because I can sit with a bunch of people who care about biomedical problems—who really want to solve problems by building something, and then my expertise can greatly help. I know there are a lot of opportunities—not only research opportunities within UW-Madison, but outside the university, for example, companies like GE Healthcare, Epic Systems, and even if we go further away, in Chicago there are many big pharmaceutical companies. They can offer a lot of opportunities to translate my research into real-world impact."

"This is the perfect fit, because I can sit with a bunch of people who care about biomedical problems—who really want to solve problems by building something, and then my expertise can greatly help."

FOCUS ON NEW FACULTY

David Dean creates new tools for skeletal reconstruction

"I see great potential for collaboration with folks at Wisconsin, as well as really good resources in terms of core facilities and programs in the hospital and the medical school."

David Dean has stories.

Of walking into a lab at the Cleveland Natural History Museum as an undergraduate student and seeing the bones of the famous "Lucy" Australopithecus fossil skeleton laid out on a table. Of later, as a new faculty member at Case Western Reserve University, driving loads of human skulls from the Smithsonian in Washington, D.C., to Cleveland to be CT scanned. Of having nightmares where the skull implants he'd designed and begun to 3D print based on those scans wouldn't fit during surgeries on patients.

A long career can lead to long stories. "My wife likes to say, 'Who put a quarter in him?'" he jokes.

Three decades of groundbreaking work offers plenty of material. In addition to creating the first patient-specific computer-aided design (CAD) system and CAD-derived skull implants, Dean patented the first resorbable polymer system for 3D printing tissue-engineered bone scaffolds. A decade later, he helped invent a resorbable magnesium alloy that he and colleagues are validating for use in skeletal fixation plates and other medical devices.

He's got plenty of other projects in the works, too. And they've all come to UW-Madison, which he joined as a professor of biomedical engineering in fall 2025.

Dean arrives in Madison after spending the past 12 years at Ohio State University and nearly 20 before that at Case Western Reserve. He joins his wife, UW-Madison Vice Chancellor for Research Dorota Grejner-Brzezinska, who's also a professor of electrical and computer engineering.

"I see great potential for collaboration with folks at Wisconsin, as well as really good resources in terms of core facilities and programs in the hospital and the medical school," says Dean.

In addition to his wealth of experience, Dean brings with him a major role in the National Science Foundation-supported HAMMER (Hybrid Autonomous Manufacturing, Moving from Evolution to Revolution) Engineering Research Center. Dean has led one of the five-year, $26 million national center's testbeds, focused on point-of-care manufacturing of medical devices. UW-Madison joined the HAMMER-ERC in summer 2025.

Dean and his HAMMER collaborators have created a robot called the Robotic Skeletal Fixation Shaper (informally dubbed the "Bendy Bot"). Their team uses data from 3D CT scans to create a virtual surgical plan that provides a final skeletal fixation plate shape and instructions to the robot to reshape an off-the-shelf metal skeletal fixation plate ahead of a surgery. Currently, surgeons must manually bend most metal fixation plates until they fit the intended location—a taxing and time-consuming activity.

"If you have a smashed face, with lots of pieces of bones that were traumatically separated, that needs to be fixed pretty quickly," says Dean. "If we could use a CT scan to plan all of this ahead of time, and then just bend all the plates on a machine in a few seconds rather than hours, I think we have a game-changer."

Dean is applying some of the same technology to "percutaneous, osseointegrated" implants for above-the-knee prosthetics that would allow amputees more control over their movement and dramatically improved stability compared to current state-of-the art socketed implants. Percutaneous, osseointegrated implants are attached directly to the patient's remaining thigh bone and then pass through the patient's skin to directly connect with a prosthetic limb.

Dean's lab is also exploring 3D printing of tissue-engineered scaffolds using many novel techniques, including an emerging polymer fiber-weaving technique known as melt electrowriting. For example, his team has presented melt electrowriting textile scaffolds that show promise for corneal regeneration.

It's all the culmination of a curiosity that first sparked in a vertebrate anatomy course during the second semester of his junior year as an undergraduate student at Case Western Reserve.

"I loved the course. I was curious, but I wasn't expecting to love it," he says. "The instructor inspired me with rich examples of how anatomical form follows function across species. I decided I needed to learn more."

DEPARTMENT NEWS

Assistant Professor Joshua Brockman received a five-year, $1.86 million Maximizing Investigators' Research Award from the National Institute of General Medical Sciences to support his work in mechanobiology. Brockman will explore forces at the level of cellular receptors, which could yield findings relevant to cancer and cell-based therapies such as cancer immunotherapy.

Harvey D. Spangler Professor William Murphy is leading a project to develop messenger RNA therapies that can be stored at room temperature. The research is funded through the University of Wisconsin-Madison's Research Forward initiative, with support from the Wisconsin Alumni Research Foundation.

PhD student Adam Vareberg received a 2025-26 Grainger Wisconsin Distinguished Graduate Fellowship. Vareberg is part of Vilas Early Career Assistant Professor Aviad Hai's lab, where he develops computational and experimental approaches for neuromodulation and neurotherapeutics.

Assistant Professor Filiz Yesilkoy earned a Vilas Faculty Early Career Investigator Award, one of the honors available to UW-Madison faculty and staff that provide flexible research funding for three years.

ALUMNI

Healthy leadership

Kristin Myers (BS '02) grew up as one of four kids of a single mother who worked overnight shifts in the psychiatric ward of the Veteran Affairs hospital in Milwaukee.

"From an early age, I saw the importance of healthcare," she says. "If you don't have your health, it's hard to be able to enjoy and appreciate anything else."

Myers has spent her career trying to fix the healthcare system across different sectors of the industry and different sized companies, from CVS Health and the Blue Cross and Blue Shield System all the way down to a startup with a single employee. She is BME's 2025 Distinguished Achievement Award winner as part of the college's annual Engineers' Day celebration.

"The U.S. spends more on healthcare than any other country in the world and we have some of the worst outcomes," she says.

Most recently, Myers served as chief operating officer of the Blue Cross Blue Shield Association, leading operations, technology and innovation programs like generative AI and advanced analytics. Previously, she founded and served as CEO of Hopscotch Primary Care, a clinic-based primary care provider to Medicare and Medicaid patients in rural communities.

Myers, whose husband is an anesthesiologist, started her career in medical device sales at Medtronic and worked in the venture capital space before moving into executive roles at Aetna, CVS Health and Unified Women's Healthcare.

"The opportunity to take my skill set and my passion for healthcare, and be able to address so many different issues, so many different challenges, in so many different places and settings, over time, I feel truly grateful for that opportunity," she says.

The right time

Medical devices enable modern medicine but carry a risk: They can cause harmful or even fatal infections. Sarah Sandock (BS '12, MS '13), the founder and CEO of the medical device company Dock Technologies, saw these consequences impact her family. This exposure inspired her to understand the conditions that lead to these infections.

The seeds for this pursuit were sown long before Sandock arrived at UW-Madison. Her father is a urologist with experience in preventing catheter-associated infections, and her great-grandfather invented one of the first adjustable hospital beds to prevent pressure ulcers.

The BME Design program offered a supportive environment to nurture this exploration, helping facilitate early conversations with dozens of nurses and physicians. The discussions pointed to a contributing factor: Tracking medical devices is challenging in the overwhelming hustle of the modern hospital.

Clinicians interact with hundreds of devices per day, and technology could dramatically simplify their workflows. That realization catalyzed Sandock to transform her work from an academic project to a commercial pursuit. The mission: give clinicians tools to better prioritize medical device care.

Sandock, who is BME's 2025 Early Career Award winner as part of the college's annual Engineers' Day celebration, founded Dock Technologies in 2013. The company's partially biodegradable INSIGHT Timer displays how long a medical device has been in place; longer times correlate with higher infection risk. Unfortunately, cleaning or removing the devices—actions which reduce risk—are often delayed. Dock's timers provide easy-to-see information and are designed to prevent such delays. The device is currently being studied in a controlled, randomized clinical trial.

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BME students step forward to help teen with muscular dystrophy

Juniors Sadie Rowe, Kate Hiller, Maddie Michels, Lucy Hockerman and Presley Hansen spent the spring 2025 semester developing and refining a prototype of an inconspicuous, lightweight ankle-and-foot brace for Maggie Eggleston, a 16-year-old girl with facioscapulohumeral muscular dystrophy.

Using computer-aided design software and 3D printing equipment, the team made a two-part device consisting of an adjustable compression sock that supports Maggie's foot while also allowing her to bend it upward (dorsiflexion), along with a carbon-fiber plastic ankle brace to guard against rolled ankles.

"The main objective was to find something that was functional but also very sleek-looking and can kind of pass as almost an athletic brace so she wouldn't get much attention from peers," says Hockerman.

The students used a cast sent to them by the Egglestons, who live in Ann Arbor, Michigan, to create 3D models for their designs. They also took advantage of force-plate testing equipment in the BME teaching lab on the first floor of the Engineering Centers Building.

"We wanted it to be patient-specific," says Michels.

Maggie's mother, Debbie, heard about the BME design program through her friend, Peter Adamczyk, an associate professor of mechanical engineering at UW-Madison and an affiliate of the biomedical engineering department. Each semester, the design program solicits projects from clients ranging from major medical device companies to individuals or families like the Egglestons.

From left, Kate Hiller, Presley Hansen, Maddie Michels, Sadie Rowe and Lucy Hockerman. Photo: Tom Ziemer.

The five students who worked with the Egglestons say the personalized nature of the project made it more rewarding.

"It's a very real experience," says Hansen.