College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

FALL 2026 NEWSLETTER

DEPARTMENT OF

CHEMICAL AND BIOLOGICAL ENGINEERING





CBE award season is here!

After a humid summer with campus cooling issues and above-average temperature predictions for the fall, the department has been turning up the heat in more ways than one! From advances in sustainable energy and catalysis to biotechnology and computational research, our faculty and students are tackling some of the hottest challenges facing our society. At the same time, our department is growing, our community is earning recognition and we are bringing in new people and ideas.

This year, our faculty have been melting the competition with an impressive collection of honors and awards. Victor Zavala was named a senior member of the National Academy of Inventors, recognizing his work translating computational methods and optimization into technologies with real-world impact. Marcel Schreier has had an especially strong year, earning both a 2026 Sloan Research Fellowship and a 2026-27 Vilas Associates award for his work in electrochemistry and electrocatalysis. Additionally, Whitney Loo was among this year's Vilas honorees, receiving a Faculty Early-Career Investigator Award for her work developing sustainable polymers and advanced polymer-based materials. Styliana Avraamidou also received an NSF CAREER Award to develop new tools for helping Wisconsin's dairy industry handle unexpected disruptions in the perishable supply chain, while Joel Paulson received the 2026 CAST Outstanding Young Researcher Award for his work at the intersection of artificial intelligence, optimization and process systems engineering.

Our students are also generating plenty of energy of their own! This year, Grace Zhang received a Hilldale Undergraduate/Faculty Research Fellowship for the second year in a row, joining Karrin Sackett as a Hilldale recipient and Maxwell Bartlett as a Sophomore Research Fellow. Their projects range from renewable hydrogen storage to pollution-abatement catalysts and converting cheese-making waste into useful products. Our students are also making their mark beyond campus. This summer, the revived Chem-E-Car team placed seventh of 17 teams at the AIChE North Central Student Regional Conference and earned second place in the poster competition, while Morris Yen took home second-place awards for both his poster and technical presentation.

Not to mention, we welcomed 22 new graduate students this fall. Among our new cohort, we are proud to have two NSF Graduate Research Fellows and six Graduate Engineering Scholars. These fellowships recognize the quality of our students and provide additional support and opportunities to pursue ambitious research.

We also owe a huge thanks to our alumni and friends for their continued support. All three of our recent faculty members, Jeff Greeley, Joel Paulson and Rahul Sujanani, now hold named professorships. Additionally, we have confirmed two additional faculty hires, Gina Partipilo and Xiaoping Bao, who will bring new expertise and energy. Stay tuned to get the chance to meet them in an upcoming town hall.

Reflecting on our hard work, we saw our rankings rise in both our undergraduate and graduate programs in the latest U.S. News & World Report. These rankings are one measure of our progress, but growth like this does not happen by accident. It comes from the hard work of our faculty, staff and students, strong cross-campus collaborations, and from alumni and friends who believe in what this department can accomplish. This fall, I look around and see a department that is going to let nothing stand in its way. I'm excited to see what awaits us in 2027!

On, Wisconsin!

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Create leaders with graduate student support!

During our PhD program, graduate students bring their expertise into the classroom, helping undergraduates connect to the material and educating them on the fundamentals of chemical engineering. At the end of the spring semester, we recognized four graduate students who have made a difference to our legacy as a top-tier educational program. Selected directly by our undergraduates, this year's teaching assistant Ragatz Awardees are Kyra Keenan, Lily Callen, Erin Gwaltney and Evan Grothen.

This award highlights our commitment to our graduate students, not only supporting their research endeavors, but developing their teaching and mentorship skills.

Your support helps make that professional development possible. Funded in honor of Roland A. Ragatz, this TA award is only one example of the impact of direct support. Many more of our graduate students receive grants and fellowships, as well as scholarships primarily supported by our alumni and friends. Your generosity provides resources that strengthen the graduate experience. By investing in our students, you help them become better researchers, teachers and mentors—shaping the next generation of engineers.

Join us in making a difference!

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On the cover: Graduate students Erin Gwaltney and La'Darious J. Quinn work on a project in the lab of Duane H. and Dorothy M. Bluemke Professor and Vilas Distinguished Achievement Professor David Lynn. Photo: Susann Ely.



Graduate Student Abigail Cordiner navigates dyslexia in science

For Abigail Cordiner, research is about more than advancing stem cell therapies—it's also about helping make science more accessible for people with learning disabilities.

A fourth-year PhD student, Cordiner studies ways of understanding and controlling the genetic processes of turning stem cells into heart muscle cells, with the goal of making their production more reliable and scalable. These cells are important tools for studying heart disease and may one day contribute to regenerative therapies to treat conditions such as heart failure.

Her work has earned her an NSF Graduate Research Fellowship and a place in UW-Madison's Biotechnology Training Program (BTP).

Diagnosed with dyslexia, dysgraphia, and Irlen syndrome, a visual processing disorder, as a child, Cordiner has spent years developing strategies and discovering tools to help her navigate the demands of graduate research. Now, she openly shares those experiences with other students and advocates for greater awareness and accessibility in science and engineering.

For instance, trial and error with various setups and routines led to a process for absorbing the hundreds of scientific papers she needs to read. Using text-to-speech software, she can listen to papers while reviewing figures and uses digital tools to annotate and organize materials. She even listens to papers while riding a stationary bike.

But there is no single solution. Because learning disabilities affect everyone differently, Cordiner encourages other students to experiment with different tools and approaches—and to share what they discover.

"If you find something that works for you, share it," Cordiner says. "It might help someone else."

Cordiner also hopes to change how scientists talk about disability. Conversations about inclusion often focus on success stories without acknowledging the accommodations, technology and support systems that made it possible.

She also encourages students to focus on developing strong communication skills, especially storytelling in writing and presentations. So rather than striving for perfect spelling, she suggests concentrating on clarity, structure and the ability to explain ideas effectively.

"Make the content so good that it doesn't matter if someone else checks the spelling," she says.

Beyond these tools, Cordiner recognizes students' struggle to decide whether to disclose their disability. "There isn't an easy answer. Some people still believe that having any learning disability means you can't be a good engineer or researcher," she says. "So, you have to balance the potential risks and benefits for yourself."

But she believes that more open discussions about disability in science can help reduce stigma and improve understanding within the research community. She hopes that sharing her experience can help others make that decision and pave the way for those who come after her.

"Dyslexia alone doesn't stop someone from becoming a scientist or engineer," she says. "What makes it difficult is a system that isn't built for us."

Abigail Cordiner has found strategies to manage her learning disabilities, leading to success as a PhD student. Submitted photo.

Styliana Avraamidou is building a tool to help the Wisconsin dairy industry run smooth as butter

The modern food distribution system is a wonder of logistics and engineering, with ingredients moving seamlessly from farms and fields to processors, manufacturers, distribution hubs, and, eventually, grocery store shelves. That system is even more impressive when it comes to perishable items like dairy products (or even certain pharmaceuticals, or blood) that need to stay refrigerated for their entire journey, degrade over time and have a defined lifespan.

But what happens if a major railway or interstate hub is knocked out of commission? What if one key ingredient is in short supply? What if a factory goes offline unexpectedly? Any of these scenarios can wreak havoc on the perishable goods supply chain, resulting in spoiled food, wasted medication and money down the drain.

Answering those questions is how Duane H. and Dorothy M. Bluemke Assistant Professor Styliana Avraamidou will use her National Science Foundation-funded CAREER award. She's applying her expertise in process systems engineering to develop tools that allow farmers, food processors and distributors to better understand and work around unexpected disruptions in the perishable supply chain.

Avraamidou and her students will develop an integrated computational framework for modeling, optimizing and analyzing resilience in perishable food chains. First, they will develop a graph-based model to explore the cascading effects these disruptions can have throughout the supply chain and perform game-theoretic analysis to explore the impacts of collaboration and competition among stakeholders.

"We'll explore disruptions like increasing energy and fuel prices, limited worker power, transportation disruptions, natural disasters and changes in laws and regulations," she says. "We will then develop a unified modeling framework to see how different disruption events propagate, how processing units or industry actors are affected and how the decisions of industry actors affect each other."

The team will then develop optimization tools that can help industries make long-term preparations for unexpected disruptions and allow for real-time operational changes to mitigate these problems. They are also developing a board game based on dairy supply chains that may also provide non-intuitive insights into the industry.

Avraamidou will use the Wisconsin dairy industry as her primary case study and plans to collaborate with the UW-Madison Division of Extension Dairy Program to help ground the framework in real-world scenarios. "We hope to capture what's currently happening in Wisconsin and then see if we can redesign the supply chains of perishable products to make them more resilient to different types of disruptions," she says.

At the end of the project, Avraamidou says she plans to roll out a dairy resilience hub that will help industry stakeholders collaborate and plan so that the milk stays fresh and the ice cream remains frozen, no matter what happens.



Photo: Joel Hallberg



Photo: Joel Hallberg

Photonic nanocrystals have been the guiding light of Rose Cersonsky's research career

When Conway Assistant Professor Rose Cersonsky was a graduate student at the University of Michigan, she had a "Eureka!" moment that would define the next decade of her research.

She was studying the design of 3D photonic nanocrystals, tiny structures that selectively let some wavelengths of visible light through while blocking or limiting others in a phenomenon known as a photonic band gap. The structures are what give chameleons their otherworldly color-shifting abilities. They are also important in the petrochemical industry, optical communications and computing, biological sensing and many other fields.

If researchers can better understand and then design various types of 3D nanocrystals on demand, it could advance all these applications and improve a wide array of other technologies.

During her PhD, Cersonsky discovered that colloidal diamond, a promising photonic nanostructure material, didn't behave as expected. "I found a system that broke that diamond structure, but kept its optical properties, and that was really weird," she says. "That discovery made it clear how much we still didn't understand about which 3D photonic crystals are worth targeting."

That revelation set Cersonsky on a fascinating, albeit frustrating, quest to understand the origins of these photonic properties and to develop rational design principles beyond what is known about the diamond structure.

Now, after almost nine years of work, Cersonsky and graduate students Sasawat Nayak and Seungmin Lee have collected what she's learned so far in a paper in the journal *ACS Omega*.

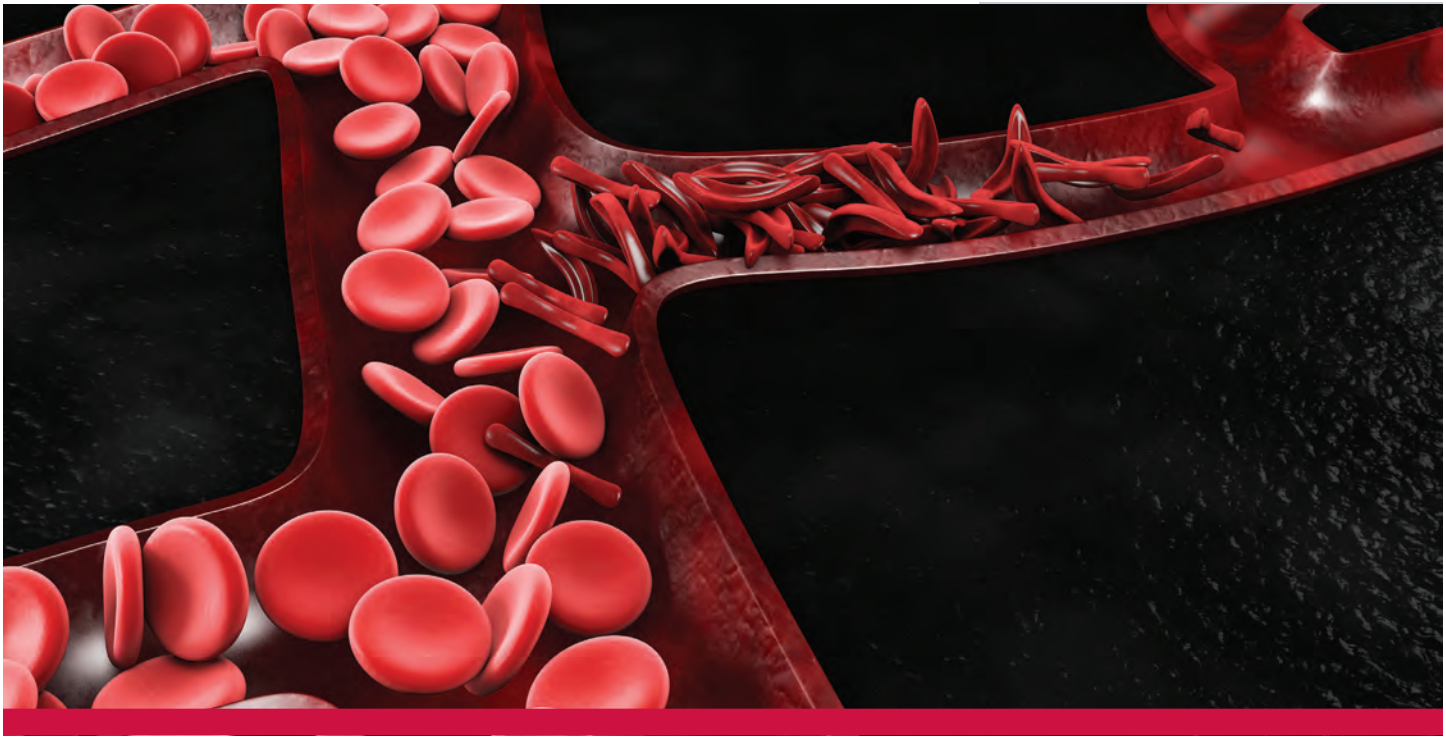
Cersonsky cataloged and assessed as many optical nanocrystal structures as she could find. The survey, she hoped, would provide enough data to help her tease out some universal design paradigms. That, however, proved more difficult than anticipated. As the work advanced, Cersonsky realized she would need more powerful tools to analyze the structures. That led her to a postdoctoral position in machine learning.

The detour was worth it; Those machine learning tools are now at the core of Cersonsky's research. Unfortunately, those tools still couldn't uncover structural properties of the crystals.

Instead of abandoning the project, Cersonsky decided to turn it on its head. She began looking at the end results to see what frequencies the nanostructures can transmit and what that reveals about them.

The results of the study begin to sketch some of the design principles behind the crystals, including what features produce the largest band gaps, and how the composition, symmetry and geometry of the structures influence the size of their band gaps.

While this work gives shape to her research thus far, Cersonsky says she is not close to being done. "It's a story where I'm not fully satisfied with the answer yet. And I'm thinking about it a lot differently than many others," she says. "I've got suspicions about what may work."



Powerful simulations illuminate blood flow in sickle cell disease

Blood is often pictured as a smooth, continuous stream, but in reality it behaves more like rush-hour traffic in a dense city with crowded lanes, sudden merges and countless tiny intersections where direction and speed change instantly. For most people, those arterial roadways manage this traffic gracefully.

For people living with sickle cell disease (SCD), however, the circulation is under constant strain. Much of the harm happens quietly in the body's smallest blood vessels, where red blood cells must bend, slide and divide into branching pathways to keep tissues alive. When this choreography breaks down, damage accumulates over years, injuring vessels, stressing organs and shortening lives.

Recent research by Michael Graham, Steenbock Professor of Engineering, Harvey D. Spangler Professor and Vilas Distinguished Achievement Professor, and Wilbur Lam, a physician-scientist at Emory University and the Georgia Institute of Technology, zooms in on what happens when blood encounters microscopic vessel bifurcations, the tiniest forks in the road where one capillary splits into two branches. The team used detailed simulations enabled by the Expanse system at the San Diego Supercomputer Center at the University of California, San Diego and supported by NSF ACCESS.

"Blood isn't just a liquid, it's a suspension of living, flexible particles," says Graham. "Once you recognize that, you realize that where cells are located within the flow can matter just as much as how fast the blood is moving."

Using high-performance computing, Graham has shown that in SCD, a subset of abnormal red blood cells consistently takes the wrong turn at these junctions. These smaller, stiffer blood cells are pushed toward the wall, where they travel in a thin layer rather than mixing evenly with the main flow.

The simulations showed that when a vessel splits, these stiff, sickle-shaped cells near the wall are more likely to peel off into the slower-flowing branch rather than following the faster stream. Over time, that pattern causes certain pathways to become disproportionately loaded with abnormal cells. These cells cluster along the outer walls, spiking frictional force and leading to inflammation and wear-and-tear.

The findings suggest new directions for therapy. Instead of focusing solely on preventing outright blockages, future treatments might aim to change how red blood cells distribute themselves within flowing blood.

"Our research does not offer an immediate cure, but it provides a clearer map of how microscopic events translate into long-term harm," Graham says. "These simulations let us see patterns that would otherwise remain hidden. For people living with sickle cell disease, that kind of insight offers something invaluable: not just better explanations, but the possibility that smarter, gentler treatments may one day change the course of the disease, one tiny vessel at a time."

Simulations show that the way red blood cells distribute themselves in blood contributes to damage in sickle cell disease. Photo: iStock.com/tussik13.



Project selected for effort to automate and speed up design of new industrial catalysts

The U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) has selected a project led by CBE faculty for its Catalytic Application Testing for Accelerated Learning Chemistries via High-throughput Experimentation and Modeling Efficiently (CATALCHEM-E) program. The goal of the $34 million CATALCHEM-E program is to pair artificial intelligence with self-driving laboratories to dramatically accelerate industrial catalyst development for fuels and chemicals production. It aims to compress catalyst development timelines from roughly a decade to about one year.

The team includes Richard L. Antoine Professor George Huber; Ernest Micek Distinguished Chair, James A. Dumesic Professor, and Vilas Distinguished Achievement Professor Manos Mavrikakis; Baldovin-DaPra Professor Victor Zavala; Duane H. and Dorothy M. Bluemke Assistant Professor Siddarth Krishna; Faculty Associate Eric Codner; honorary research fellow and VP of catalysis at Pyran, Inc. Daniel McClelland; as well as two of CBE's new faculty members, Paul A. Elfers Professor Jeff Greeley and Gerald and Louise Battist Associate Professor Joel Paulson. BASF, one of the world's largest chemical companies, is serving as industrial partner on the project, represented by Amit Gokhole, a 2005 CBE PhD graduate.

The $2.84 million award will fund a project with the goal of developing catalysts to convert ethanol into alcohol for fuels and specialty chemicals by combining AI models with automated lab tools and industrial scale catalyst testing. The team will also explore integrating the technology into standard laboratory information management systems to make the design workflow widely accessible to a range of commercial entities.

Using automation and AI tools can increase the design of new industrial catalysts, increasing the sustainability and efficiency of many chemical processes. Photo: iStock.com/Aliaksandr Yarmashchuk.



CBE graduate students cited for excellence in mentorship

The College of Engineering recently recognized 25 faculty, postdocs and graduate student mentors with its second annual Graduate Student Mentoring Awards. The awards recognize those who make outstanding contributions to mentoring students or peers and cultivate a sense of belonging in and outside of the lab. The College of Engineering's Graduate Student Advisory Council, which is composed of graduate students from across the engineering campus, sponsored the awards.

CBE graduate students recognized include Sarah Noga, who won for Excellence in Inclusive Community Building. "Despite the many demands on her time, Sarah is a patient, engaged and enthusiastic mentor," notes Hunt-Hougen Assistant Professor Quentin Dudley. "She has supervised more than 10 undergraduate poster presentations, and consistently provides supportive and insightful guidance to her mentees. Though I check in frequently with both undergraduate and graduate researchers in my group on scientific ideas and directions, I frequently tell them to 'ask Sarah about that question when you are next in the lab' for hands-on advice and further details."

Three other graduate students received honorable mentions for their efforts at aiding undergraduates and creating a welcoming environment in their labs, including Sam Johnstone, Christian Jorgensen and Yun Sen.

Sarah Noga, who works with Hunt-Hougen Assistant Professor Quentin Dudley, conducts research in the Bluemke Family Bioengineering Laboratory. Photo: Joel Hallberg.

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PhD student Changsu Kim is a puzzle master, in and out of the lab

Changsu Kim is a third-year PhD student working in the lab of Sobota Professor Reid Van Lehn. He specializes in molecular dynamic simulations and artificial intelligence to design models for selecting solvent mixtures to isolate lignin, a hard to process part of plant cell walls that can be broken down by microbes into valuable products.

How would you explain your research? Separating those unique building blocks from a big complex of organic material is difficult. It's similar to crude oil distillation. Many different varieties of chemicals are mixed together. In order to use them for microbial upgrading, you have to take them out from the whole mixture. I developed a software model using artificial intelligence to predict the properties of the solvent, which extract the specific chemical for this microbe consumption.

The difficulty is in the collective behavior of the solvents. When mixed together, their properties are totally different from individual solvents. And AI can help to interpret this mixture behavior.

When did you decide to pursue research? I feel like I didn't really have a choice. I just like solving puzzles. Any other simple task always bored me, even school subjects. When I think the problem is simple, my brain just kind of stops.

What sorts of puzzles do you like? Rubik's cubes. Back in high school, I did it within 17 seconds. I was young back then, so my hand was much faster.



Do you feel like there are any obstacles you've had to overcome to get where you are? I'm a first-generation college student, and I was a first-generation high school student, and I'm the first generation going to grad school too. Growing up, I didn't really see anyone doing science. Not just my extended family, but my whole village. So, I'm always carrying self-doubt that I might not belong here. What I want is just to solve mysteries, to find the next puzzle.

Changsu Kim solves a Rubik's cube at his desk in Reid Van Lehn's chemical engineering lab. Photo: Chris Hubbuch/Wisconsin Energy Institute.