No. 67 | 2025

BADGER CHEMIST

MEET OUR NEW ASSISTANT PROFESSOR:
FRANK GAO

THE SECRET LIVES OF BADGER CHEMISTS:
LIFE BEYOND THE LAB

ALWAYS A BADGER CHEMIST:
BRUCE MCCORD PH.D. ‘86

University of Wisconsin–Madison Department of Chemistry | Est. 1953

Departments

Feature

Department of Chemistry
UNIVERSITY OF WISCONSIN–MADISON

Professor Sam Gellman Department Chair
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Pat Egan Reviewer
Char Horsfall Reviewer
Katie McCullough Reviewer
Prior Turnmeyer Reviewer
Rosemary Wonnell Reviewer

*On the cover: "Magic Cave," a watercolor and alcohol inks painting by Professor Cavagnero, who says this piece was inspired "by the discovery of the unknown in new, unimaginable and unexpected places." **Credit: Silvia Cavagnero***

On this page: Chem 329 undergraduate students analyze polyphenols from a personal sample via spectrophotometry using vanillin.
Credit: Department of Chemistry

From the Chair's Office

There have been many events to celebrate in our department this year, but current difficulties and uncertainties dominate my attention. The past year has brought many challenges to our department.

Universities in the U.S. are experiencing unprecedented pressure from the federal government, and ours is no different. The UW–Madison leadership has imposed budget cuts in response to this pressure. For departments in the College of Letters & Science, which include chemistry, the current budget cut is 7%. With careful management, we think we can accommodate the diminished budget without layoffs, but achieving this goal comes at a cost in terms of our mission. For example, we will be forced to curtail substantially the number of graduate acceptances this winter, to hold down the size of the class that starts in fall 2026. We have a profound need for new faculty, but our ability to search for new colleagues is limited. We are struggling to fund a robust schedule of seminars by external scholars, a feature of our program that has long been extremely important to our students and faculty. To stay cutting-edge, we desperately need to replace aging shared instrumentation.

Despite these challenges, which are common across academia in the U.S., we remain committed to our mission of education and scholarship. This fall, we have seen the largest undergraduate enrollment ever in chemistry courses. Our faculty members, collectively, continue to engage with a large body of energetic and committed graduate students and post-doctoral scholars. Serving student needs is our primary motivation, and we are doing our best to meet these needs despite current and looming constraints.

On the positive side, we completed a year-long self-study and provided a comprehensive review to the College of Letters & Science in May. Generating this document helped us understand our strengths and highlighted opportunities for innovation and improvement. The College is convening an external committee to assess the department, based in part on the comprehensive report we provided. Many faculty members received honors this past year that reflected their scholarly accomplishments; you can read about these honors on pages 16-17. New space for Chemical Education scholarship was completed last winter, and a new floor of research space should be completed next spring in the North Tower.

Several faculty members have departed over the past year. **Bob Hamers** retired in August. He was preceded by **Dave Schwartz** (split appointment with Genetics) in January. Read more about their developments on pages 20-21. **Ive Hermans** recently moved to the Johns Hopkins University. **Andy Buller** will depart before the end of this year, to relocate to the Manchester Institute of Biotechnology (UK).

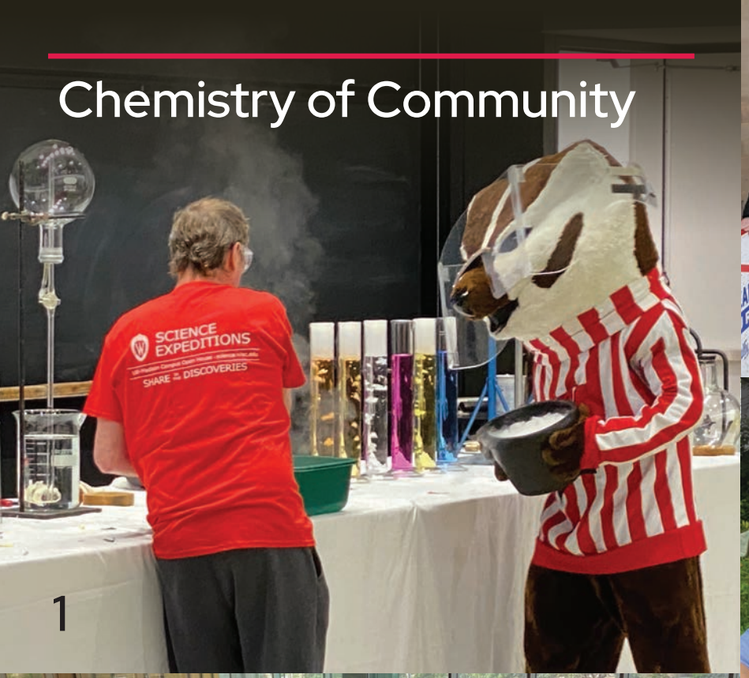
Over the past year, chemistry searched for a new faculty member under the auspices of the RISE-EARTH initiative at UW–Madison. We were delighted to hire **Dr. Frank Gao**, a specialist in the characterization of ultra-thin materials; he'll join our ranks in the fall of 2026. Read more about Dr. Gao on pages 18-19. We have just initiated a search as part of the RISE-THRIVE initiative.

You have been an important part of our work to produce knowledge that improves the human condition, and scientists equipped to grapple with a wide array of unmet needs. These goals become more important as large segments of our society seem to turn away from science and the benefits it can provide. Right now, our department needs help from you more than ever. Please consider a gift to the department this year. Contributions will help us maintain excellence as we continue to pursue our mission of scholarship and education.

Best,

Professor Sam Gellman
Irving Shain Chair of Chemistry | Vilas Research Professor

Chemistry of Community



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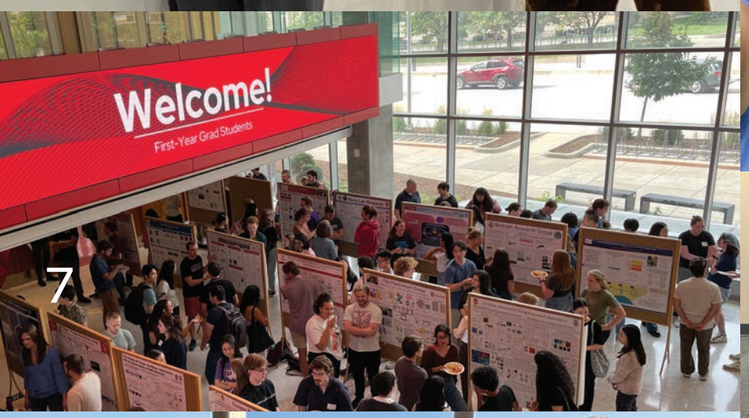

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__1__ Lecture Demonstrator Jim Maynard presented a chemistry demonstration with Bucky Badger to a standing-room-only crowd during the chemistry open house as part of Science Expeditions in April 2025. Courtesy: Peter Jaeger __2__ Members of the Graduate Student Faculty Liaison Committee (GSFLC) enjoy ice skating at the Sub-Zero Ice Arena at Bakke in February 2025. Courtesy: GSFLC. __3__ In July 2025, Women in Chemistry and "Barbie the adventure cat" hiked 1.5 miles in the rain at Indian Lake County Park. Courtesy: Emily Elisabeth Palmer __4__ Keep Wisconsin Warm donated more than 40 handmade hats and scarves to Porchlight, an organization providing solutions to homelessness. Courtesy: Emily Elisabeth Palmer __5__ Volunteers from the department assembled 2000 STEM Kits in August as part of an outreach effort in collaboration with PPG's Colorful Communities program. __6__ Affiliate Professor Marcel Schreier with two of his students at the spring 2025 ACS meeting in San Diego, California. __7__ A poster session was one of many welcome events for sixty-seven new first-year graduate students who joined the department in the fall of 2025.

By the Numbers

53,436
chemistry credit hours
taught in 2024–25

More than
150
students
were recognized with over
$420,000
in **scholarships and grants** in 2025.

Chemistry groups collaborate with more than
50
schools, colleges, departments, institutes,
and other **organizations** across campus.

120
undergraduates
are participating in research this year.

More than
14,000
square feet
of additional research space on the fourth floor of the North Tower, set to be finished in March 2026

More than
1,000
community members
interacted with the department through our outreach efforts in the last year.

The **1st** of our
Bridge Fellows
graduated this year.

31
alumni
featured on our new alumni main street

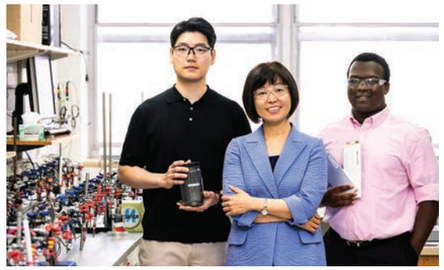
Recycling lithium from old electric vehicle batteries could be done cheaply with new electrochemical process

by Will Cushman

With ever more electric vehicles on the road, regulators and automakers are considering what can be done with the millions of batteries that power EVs after they're spent. Even when their useful life is over, EV batteries contain valuable lithium that could be recycled and used in new batteries, but coming up with a cost-effective way to do so is critical.

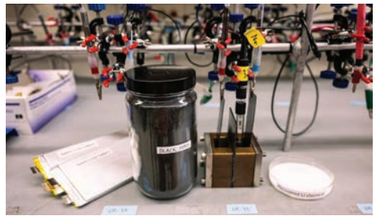
Now, a group of University of Wisconsin–Madison chemists is hopeful they've found a solution, and they're already filing patents and courting global carmakers.

The work has been led by **Kyoung-Shin Choi**, a UW–Madison chemistry professor who specializes in developing electrochemical processes for various ends. Choi and her colleagues have come up with a proof of concept for using electrochemistry to extract lithium from spent lithium-iron-phosphate (LFP) batteries, which have been widely adopted by major EV manufacturers like Tesla and China's BYD.



Pictured from left to right, staff scientist Dohwan Nam, chemistry professor Kyoung-Shin Choi, and graduate student Brian Foster have developed an electrochemical method to recycle lithium in spent lithium iron phosphate batteries from electric vehicles and other applications as pure lithium chemicals to make new batteries. Photo: Jeff Miller / UW–Madison

Lithium-based EV batteries come in a few flavors, and while LFP batteries have lower energy densities than batteries that are based on elements like nickel, manganese, and cobalt, they're significantly cheaper to produce and safer to operate. On the flip side, iron and phosphate aren't worth much compared to nickel or cobalt, making LFP batteries less attractive from a recycling perspective.



Chemistry Professor Kyoung-Shin Choi's research lab has developed an electrochemical method to recycle lithium that's catching the attention of electric vehicle makers. Photo: Jeff Miller / UW–Madison

"At this point, there's no economically compelling method to recover lithium from spent LFP batteries even though the market is shifting to them," says Choi.

"Access to natural lithium resources is also limited," Choi says. "We need an innovative method that makes lithium recovery from spent LFP batteries commercially viable to support a circular and competitive battery economy."

The problem has become all the more pressing for global carmakers since the European Union has new regulations aimed at reducing the environmental impact of batteries.

Current methods for recovering lithium from spent batteries depend on energy-intensive heat or an extensive series of steps that consume a lot of chemicals and generate significant waste, Choi says.

Instead, Choi developed a two-step electrochemical process that doesn't require special conditions and minimizes chemical inputs and waste. The first step sees lithium ions leached out from spent LFP batteries and selectively extracted by a lithium-ion storage electrode. In the second step, the extracted lithium ions are released in a separate solution to recover them as high-purity lithium chemicals.

Choi and her colleagues have demonstrated the process's viability using both a commercial LFP battery and black mass, which is an industrially mass-produced substance from spent LFP batteries. They recently detailed the process in the journal ACS Energy Letters and have filed a patent for it through the Wisconsin Alumni Research Foundation.

The work has begun to catch the attention of battery makers and automakers who are seeking new ways to bolster the resilience of the battery market. Choi's team is now developing a prototype of the technology to answer outstanding questions about how to commercialize the process, and she's forming a startup company.

"The technology works, but it is important to scale it up in the most cost-effective manner," Choi says, adding that it will be crucial for successful commercialization to streamline the technology with other steps in the overall recycling process, such as the production and use of black mass.

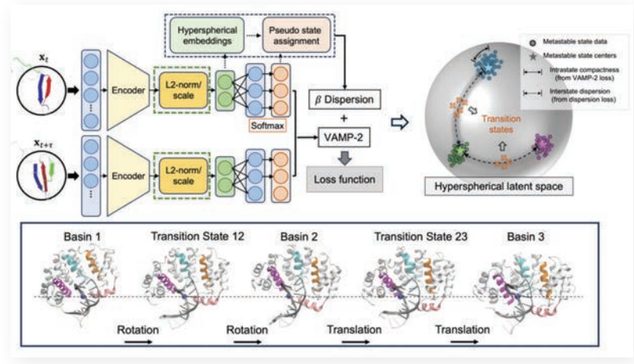
This work was supported by Samsung E&A and the National Science Foundation Graduate Research Fellowship Program (2137424).

New deep learning method identifies transition states in protein conformational changes

In a recent study published in Nature Communications, researchers at the University of Wisconsin–Madison introduced a deep learning method capable of automatically identifying transition states in protein conformational changes, a key process that underpins many biological functions. This new tool promises to accelerate the study of biomolecular dynamics and could have wide-reaching applications in drug design, biomolecular engineering, and materials science.

This study is a collaborative effort between Professor **Xuhui Huang's** group (Department of Chemistry) and Professor **Sharon Li's** group (Department of Computer Sciences) at the University of Wisconsin–Madison.

Transition state identification has long been considered the "holy grail" in chemistry. Unlike chemical reactions, biomolecular conformational changes, such as protein folding or binding to other molecules, involve multiple metastable intermediate states, giving rise to numerous transition states situated at the free energy barriers within a complex landscape. Despite decades of research, existing methods have only been able to locate transition states between pairs of metastable states. The simultaneous and automatic identification of all transition states in biomolecular processes has remained a major challenge.



Schematic representation of TS-DAR for transition state identification. Courtesy: Nature Communications

The new technique, named TS-DAR (Transition State identification via Dispersion and vAriational principle Regularized neural networks), overcomes these challenges by leveraging a deep learning framework inspired by out-of-distribution (OOD) detection – a concept from artificial intelligence (AI) used to identify data that deviates from typical patterns. The key breakthrough of TS-DAR is its ability to treat transition states as OOD data – rare structures located at the free energy barriers between metastable conformations. The method works by embedding molecular dynamics (MD) data into a hyperspherical latent space, where it can efficiently detect and isolate these sparsely populated transition states. This approach provides a comprehensive, end-to-end pipeline for studying protein dynamics and identifying all transition states involved in biomolecular processes.

"Identifying transition states is one of the most challenging and important tasks in studying protein dynamics," said Professor Xuhui Huang. "TS-DAR is the first method capable of automatically capturing all transition states at once from MD data, enabling a much deeper understanding of the underlying molecular processes."

Professor Xuhui Huang

Professor Sharon Li

The research team tested TS-DAR on a range of systems, including the translocation of a DNA motor protein (AlkD) along DNA. In each case, TS-DAR outperformed traditional methods in both accuracy and efficiency. Notably, in the AlkD system, the method revealed new insights into the role of protein-DNA hydrogen bonds, which play a critical role in determining the rate-limiting step of AlkD's translocation – an important process in DNA repair.

With its ability to detect transition states in complex biomolecular systems, TS-DAR represents a significant advancement in the study of molecular dynamics. The framework's potential to accurately model highly dynamic processes could also pave the way for the development of generative AI models, offering new avenues for predicting and manipulating biomolecular dynamics.

More information: Bojun Li et al, Exploring transition states of protein conformational changes via out-of-distribution detection in the hyperspherical latent space, Nature Communications, 16(349), (2025).

Lab Notes

Cavagnero Group

Graduate student **Anubhab Halder** was selected to deliver an oral presentation at the Biophysical Society Meeting in Los Angeles (CA) in February 2025. In his talk, Anubhab described the development of LED-enhanced nuclear magnetic resonance spectroscopy on a benchtop NMR spectrometer, to elucidate biomolecular structure and dynamics in solution at low cost and ultra-high sensitivity.

Undergraduate student **Hermione Liu** was awarded the Wisconsin ACS Local Section Undergraduate Award for Excellence in Chemistry. Undergraduate students **Akshata Moorthy** and **Sofia Merrick** were awarded the Research Sophomore Award and the Hilldale Fellowship, respectively, to pursue investigations on protein folding at birth. **Sam Carey** was awarded the Robert Franklin Taylor Scholarship and the Mary Shine Peterson Undergraduate Research Award to pursue investigations to explore biomolecular structures with LEDs and magnets. Undergraduate student **Emma Thomas** was awarded the Richard Fischer Fellowship from the UW-Madison Department of Chemistry to carry out research on the kinetic trapping of proteins at birth.

Professor **Silvia Cavagnero** was awarded the 2025 Emily M. Gray Award of the Biophysical Society for her student mentoring, innovations in course development, and for broadening participation in her research on protein folding and dynamics in living cells. Silvia (with Alessandro Senes, Biochemistry) also received funding from the National Institutes of Health for a new T32 Training Grant in Molecular Biophysics (MBTP). This training program will fund 10-12 graduate students every year for 5 years to pursue cutting-edge quantitative bio-related research across many UW-Madison departments, including chemistry.

Gellman Group

Research in the Gellman group continues to explore the functions of proteins and protein-inspired molecules. Their approach emphasizes chemical synthesis and unorthodox design strategies to generate novel tools and surprising discoveries. Sam has been department chair for over a year, and, somehow, the group has not collapsed, which raises the possibility that his role might not be essential in terms of experimental progress. Testing of this hypothesis is underway.

There has been lots of turnover in the past year. Four graduate students recently completed their Ph.D. **Rylie Morris** has taken a post-doctoral position at the University of Michigan, **John Mannone** is a post-doctoral scholar in Munich, **Ruiwen (Irian) Xu** has a post-doctoral position at Eli Lilly, and **Philip Lampkin** is teaching introductory organic chemistry (Chemistry 343) this fall; he will begin a post-doctoral fellowship at the University of Utah in January. **Dr. Ariel Kuhn** completed an NIH post-doctoral fellowship in the group and took a position at Empirico, a biotech company in Madison. In the fall of 2024, two graduate students joined the group, **Rui Wang** and **Charlie Roberts**. Also joining last fall was a new post-doctoral scholar, **Dr. Ash Sarkar**. Post-doctoral scholar **Dr. Joe Swain** joined us in May 2025.

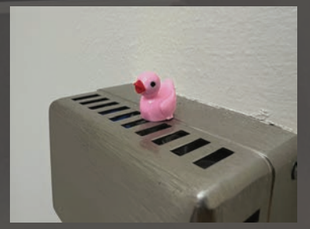
Above: The Gellman Group enjoying the Memorial Union Terrace in June of 2025. Courtesy: Professor Sam Gellman

Weix Group

Research in Professor **Dan Weix's** group is focused on the development of new, catalytic methods for forming C-C and C-X bonds, with a particular emphasis on understanding the mechanism and the use of first-row transition metals. The major focus of the group continues to be the selective cross-coupling of two electrophiles and the use of earth-abundant, first-row metals. Big advances in the past year were new ways to couple abundant, but unreactive, aryl triflates and aryl chlorides with alkyl halides and alcohols, the discovery that cobalt is better than nickel for more hindered cross-electrophile coupling reactions, and a new, non-radical approach to use alkyl carboxylic acids as alkyl sources in cross-coupling. A theme this past year was collaboration: our papers include collaborations with Buller, Stahl, Guzei, Ackerman-Biegasiewicz (Emory), Paton (CSU), Rafiee (UMKC), Novartis, and GSK. Finally, the group had a mysterious invasion of small plastic ducks, which appeared overnight in nearly every location (even inside glove boxes)! The origins of this experiment in whimsy remain unknown.

Dan was on sabbatical for the 2024-2025 school year, which provided extra time for grant writing (new grants from NSF, Novartis, Lilly) and scholarship – 2024 ended up being our most productive year as a lab ever! This school year, Dan is teaching the Advanced Organic Chemistry course for undergraduates (Chemistry 547) and will continue to teach Structure Determination (Chemistry 605). It is great fun to return to teaching undergraduates after years of teaching only graduate courses.

As always, each academic year brings new arrivals and departures. Herman Recendiz passed his TBE and earned his master's degree. **Benjamin Ahern** and **Tianrui Wu** passed their research proposals and advanced to candidacy. **Lauren Ehehalt** (Ph.D. '25) completed her Ph.D. work and moved to Kingsport, TN to take a research position at Eastman. **Isabella Priest** (M.S. '24) moved to Dallas to take a lab director position at the University of North Texas–Dallas. Three new undergraduate students joined the group, **Anna Rolfs**, **Lars Erikson**, and **Zehao Yuan**, bringing our total to six, a new high for the group at UW-Madison! Finally, **Abigail Ramirez** joined the group as a new Ph.D. student. Abi is from the San Francisco Bay Area and has previously done research at San Jose State (Radlauer) and Arizona State University (Rascón).



Below, clockwise from top (Courtesy: Professor Dan Weix): The Weix Group in March, 2025. | Dr. Lauren Ehehalt Graduation | Welcome to the Weix Group Abi! | Ducks!?

Lab Notes

Ediger Lab

Professor **Mark Ediger** (emeritus) is collaborating with other groups to continue work on supercooled liquids and glasses. In the spring, he spent 3 months at Roskilde University in Denmark, and he will return to Roskilde in September to receive an Honorary Doctorate. Mark presented the Burstein Lecture at the University of Pennsylvania in January and the Chan Hong Ha Lectureship at Sungkyunkwan University in South Korea in March. This summer, the Journal of Physical Chemistry published a Festschrift special issue to celebrate his contributions to supercooled liquids and glasses.

Below: Dr. Frank Noé, Courtesy: Frank Noé

Theoretical Chemistry Institute News

Dr. Frank Noé, Partner Research Manager at Microsoft Research AI for Science in Berlin, was awarded the 2025–2026 Joseph O. Hirschfelder Prize in Theoretical Chemistry. Dr. Noé visited the Department of Chemistry, presented talks on October 20 and 21, 2025, and was honored at an award banquet the night of October 21. Dr. Noé is a pioneer in integrating artificial intelligence with theoretical chemistry. He has developed deep learning approaches that address fundamental challenges in statistical mechanics: Boltzmann Generators, which introduced AI generative models into statistical mechanics to transform molecular sampling; VAMPnets, which provide a deep learning framework for constructing kinetic models of biomolecular dynamics; and the recent BioEmu-1 model, which enables the prediction of protein structural ensembles with unprecedented efficiency. In addition, his group has advanced quantum chemistry through the development of deep learning-based quantum Monte Carlo methods that deliver accurate solutions to the electronic Schrödinger equation. Together, these landmark contributions have established artificial intelligence as a transformative frontier in theoretical chemistry. "Noé has made transformative contributions at the interface of machine learning and theoretical chemistry," says Professor and TCI Director **Xuhui Huang**. "From Boltzmann Generators to BioEmu, his innovations in molecular sampling and protein dynamics have addressed some of the most difficult problems in statistical mechanics. His work has not only deepened our understanding of molecular systems but also opened new directions for the future of theoretical chemistry."

The annual Joseph O. Hirschfelder Prize in Theoretical Chemistry was established by the Theoretical Chemistry Institute in 1991 from funds donated by Professor **Joseph O. Hirschfelder** and his wife, **Dr. Elizabeth S. Hirschfelder**. Professor Hirschfelder was the founder of the Theoretical Chemistry Institute at the University of Wisconsin–Madison and had a distinguished career of teaching, research, and public service at UW–Madison for over forty years.

In 2022, TCI launched the Hirschfelder Visitor Program to honor outstanding mid-career theoretical chemists. Through this initiative, four prominent mid-career theoreticians have visited Madison in 2024-2025. TCI has successfully recruited three new faculty members over the past few years: Assistant Professor **Micheline Soley**, affiliate Associate Professor **Yuan Ping** (MSE), and affiliate Associate Professor **Reid Van Lehn** (CBE). These new hires have greatly strengthened the research portfolio of TCI, helping to create a more comprehensive theoretical chemistry program and attract talented graduate students. The theoretical chemistry program has risen back into the Top 10 in the latest U.S. News rankings.

Wickens Group

Reimagining Z-Alkene Synthesis via Z-selective Elimination

A recent manuscript in *Science* from researchers in the Wickens Group challenges our conventional understanding of an elementary reaction taught in organic chemistry classrooms. This interdisciplinary project brought together organic chemists, computational chemists, and chemical engineers to provide a complete picture of an unusual elimination reaction that defies textbook expectations. Faculty member **Zachary Wickens** and his team of researchers – **Peter Verardi**, **Liza Ryutov**, and **Karina Targos** – discovered that this elimination reaction produces alkenes with Z-selectivity.

This surprising finding overturns textbook expectations. Conventional elimination reactions typically produce the E-form of the alkene because this geometry minimizes energetically unfavorable steric interactions (repulsion between atoms that are too close together). However, Wickens' team found that when working with 1,2-*bis*-sulfonium salts (molecules containing two positively charged sulfur atoms), the elimination reaction surprisingly produces the Z-form instead, creating a Z-alkenyl sulfonium salt.

To understand why this unusual selectivity occurs, Wickens' team collaborated with computational chemists **Poulami Mukherjee**, **Remy Lalisse**, and **Osvaldo Gutierrez** (UCLA). Their calculations revealed that attractive non-covalent interactions between the adjacent sulfonium groups uniquely stabilize the Z-forming pathway, making it energetically favored over the conventional E-route. More broadly, these data establish that non-covalent interactions can override steric control in elimination reactions.

The team then leveraged this discovery to develop a new synthetic method: a Z-selective C–H functionalization protocol. This method directly transforms highly abundant terminal alkenes into Z-alkenyl sulfonium salts, which can be used in cross-coupling reactions to access an impressive array of Z-alkene products. Z-alkenes are valuable building blocks because they are found in many natural products, but are challenging to access selectively. **Tetsuya Inagaki**, a visiting scholar in the Wickens group during the fall of 2023, leveraged his expertise in transition metal catalysis to help develop these cross-coupling reactions. **Ilia Guzei**, Director of Crystallography at UW-Madison, provided crystallographic evidence to support the proposed structure and geometry of the Z-alkenyl sulfonium salt products.

Finally, to demonstrate the practical utility of their method, Wickens collaborated with **Megan Kelly** and **Marcel Schreier** from the UW-Madison Department of Chemical Engineering to scale up the reaction to produce decagram quantities of Z-alkenyl sulfonium salts.

Beyond providing a convenient way to synthesize Z-alkenes, this study establishes a new design principle for controlling selectivity in fundamental organic reactions. By demonstrating how non-covalent interactions can override traditional steric effects, this work may inspire textbook revisions in how elimination reactions are taught and understood.

Contributed by Zachary Wickens and Peter Verardi

Link to paper

The Secret Lives of Badger Chemists

Life Beyond the Lab

This page: An image of the Eastern Veil Nebula, a remnant of a supernova explosion, with red and teal atomic hydrogen and doubly-ionized oxygen created using a 5" refractor telescope using narrowband filters. Professor Hamers created this image in his backyard in Madison of the nebula located approximately 2,400 light-years from Earth.

Right: Professor Cavagnero has become involved with the Association of Wisconsin Artists and has enjoyed sharing her art with others.

Department of Chemistry faculty have interests beyond science that include running, aviation, woodworking, cooking, travel, and many others. Some use time away from the lab to let their minds wander and explore questions related to chemistry, while others take time away from science to lose themselves in a completely different world. The common thread? They approach their hobbies like they approach their science…with enthusiasm and passion. For a Badger Chemist, would we expect anything less?

It's the middle of a summer night, and Professor **Bob Hamers** is in his backyard watching the sky and waiting patiently in a lawn chair. Mosquitoes have long since disappeared, leaving the night calm and cool with Bob and his astrophotography equipment: a telescope working on a equatorial mount that tracks the stars as the earth moves on its axis, a full-frame camera that captures 75-megabyte images, filters to narrow not only the light pollution but specific wavelengths to look selectively at hydrogen, oxygen, or sulfur, and a second guide camera to piggyback the main scope sending a signal to keep it in position for long exposures. He's alone in the dark, photographing light from a celestial object that has taken tens of thousands of years to reach his backyard. Yet, his mind is there, in his backyard, focused on capturing that one image that sometimes can take multiple days to achieve. "It's often meditative," Bob explains, "being outside at night when I'm the only one around."

As a painter, Professor **Silvia Cavagnero** knows the idea of losing herself in what she enjoys. "There are a lot of technical aspects of art, but most of it is just not worrying about the logic," Silvia reflects. As a child, she was interested in both art and music and tried her hand at both before setting them aside to focus on science. Comparing the two, Silvia recalls that she had always enjoyed the carefree expression of art, and it's what drew her back to it later in life. "I did a lot of music. I performed and took exams in the conservatory, and decided it was not coming

Above: Professor Schomaker enjoys sharing the bounty of her garden with students and others in the department. Courtesy: Jen Schomaker.
Below: Professor Schomaker likes to use her flower gardens to "paint with plants" and create an atmosphere using their color palette. Courtesy: Jen Schomaker

naturally to me," she reflected. "With visual arts, I just feel like I can let my mind go." Here, Silvia sees parallels between her science and her art. "I am usually a very broad person, and I need to have a list to stay focused.... But when I am on the verge of a discovery in science, writing a paper, or doing art, I am so focused," she explains. "I think it's really a blessing."

In the quiet of a flower patch, avid gardener Professor **Jen Schomaker** finds that allowing her mind to wander while she prunes and pulls weeds gives her time to think about questions from students and problems she needs to work through in the lab. "When I'm gardening, I'm thinking about new ideas or a question a student asked me that day," Jen says, "It's just something that can clear my mind, allows me to rejuvenate and be creative." She also enjoys giving back to the community. Chemistry personnel and graduate students enjoy boxes of corn, peppers, basil, peaches, tomatoes, and other fresh produce given to the department from Jen's gardening efforts.

Those efforts are guided by shared knowledge that she uses in both her science and her gardening. "I think you have to be very patient with your research, and you have to be patient with your plants." A scientist has to understand the whole idea of reaction design or optimization, understanding what goes into the product. For gardening, this means thinking about the soil, the temperature, what types of plants, and what solid additives Jen chooses. "You don't just stick the seed in the ground. You have to think about it the same way when you're trying to design your reactions," Jen says. "Think about things like solvents and catalysts, did you purify your materials, how much reaction time, and are you checking things periodically?" Design optimization aside, Jen admits that gardening can sometimes involve more factors out of her control, such as weather and pests.

For Professor **John Berry**, the lines between science and chemistry are blurred. His passion for music began in fifth grade when his mother offered him the balance of a set of violin lessons, one of his brothers decided were not for him. He took to music immediately, learning viola, piano, and composing all within a few short years. As a declared chemistry major undergraduate student at Virginia Tech, John also applied to earn a composition major and was accepted into the program. John had seriously considered making music his career instead of chemistry. And as the two educational paths ran parallel, he also saw how his approaches to both music and chemistry were similar. In his training as a synthetic chemist, he believes his job is

> *"I use specific arrangements of atoms as a motif in my synthetic projects to build a diverse set of new compounds just the same way you could use a collection of notes as a motif to build out a theme and variations."*
> *— Professor John Berry*

to create something new that the world has never seen before. Likewise, as a composer, John feels his job is to make something new that no one's ever heard before. "It's the same creative process," he says. "I use specific arrangements of atoms as a motif in my synthetic projects to build a diverse set of new compounds just the same way you could use a collection of notes as a motif to build out a theme and variations." And like chemistry, music follows a set of rules; in fact, sometimes, the same rules apply. Take group theory, for example. John explained that while this mathematical concept can be applied to chemistry and allows us to classify the symmetry of molecules so that different molecules have different symmetry properties, it can also be applied to musical compositions. A composer can use group theory to apply symmetry operations to collections of notes. They can be arranged in certain symmetric rhythms, or they can be organized in a musical composition method called serialism. For example, you could have a melody that is played backwards instead of forward, or inverted, where the notes go down instead of up.

Rules for Silvia's art are less important. She says painting allows her to treasure the world, and she says, "re-elaborate it with my mind in ways that nobody tells me what is right or wrong." As a mixed media artist, her chemistry acumen has helped her understand how inks, watercolors, graphite, and oils will come together, especially when they are not meant to blend. "I think it gives me more courage to try something new." While the rules of chemistry help, they also give her a special freedom in her art that reminds her of what drew her to it from the beginning.

It's interesting to note that for all these faculty, these passions began as seeds at an early age. A love of music for John began in fifth grade. For Jen, her thumb began to turn green when she began to dig around in the dirt of her grandfather's potato plot as a nine-year-old, and she nurtured her talent growing and selling cucumbers for spending money as a teenager. Silvia discovered her enjoyment of painting at the age of 10. Over many years

Professor Berry began playing violin at the age of 10 and composing music informally in the fifth grade.

and several obstacles, she was able to pick up a paintbrush again and has joined a group of Wisconsin artists to earn attention as an artist, earning some local awards and gallery showings. Bob's grandfather, after retiring as a machinist, built a 10" diameter telescope that ran the length of his garage. And while Bob was only seven when his grandfather died, Bob's uncle fostered his interest in astronomy by taking him to Yerkes Observatory in Williams Bay, Wisconsin. Just a few years ago, when his uncle passed, Bob found the books that his grandfather used to build the garage telescope, along with some other items. He reflects that it all seems to be coming full circle for him. "I found this little magnifier that my grandfather made back in 1960, and I'm going to use it as part of my scope. It's totally old school." Bob says with enthusiasm, "I like old school." ■

Recognition: Awards & Achievements

Faculty

Helen Blackwell
2024 Vilas Distinguished Achievement

A.J. Boydston
2025–26 Vilas Associates Competition Awardee

Andrew Buller
2025 Romnes Award

Josh Coon
2025 Donald F. Hunt Distinguished Contribution in Proteomics Award from the Human Proteome Organization

Song Jin / Graduate Student Katelyn Michael
2024 WARF Innovation Award

Ive Hermans
2025 AAAS Fellow

Sam Pazicni
2025 Exceptional Service Support Program

2025 Appointed associate editor for Chemistry Teacher International, IUPAC's new journal for chemistry education. Sam will be the associate editor for North America.

Shannon Stahl
2025 Robert K. Grasselli Award from the European Federation of Catalysis Societies

Arun Yethiraj
2025 Fulbright US Scholar to India

Dan Weix
2025 Kellett Mid-Career Award

Zachary Wickens
2024 Kavli Frontiers of Science Fellows

2025 Chancellor's Distinguished Teaching Award

2025 Camille Dreyfus Teacher-Scholar

Tehshik Yoon
2026 David A. Evans Award for the Advancement and Education of Organic Synthesis ACS

Martin Zanni
2025 Elected a member of the National Academy of Sciences *(see story page 17)*

2025 WARF Professorship

Staff

Lauren Aria
2025 American Scientific Glassblowers Society Memorial Award

Amanda Buchberger
2025 Taylor Teaching Award

2025 L&S Academic Staff Early Career Award

Michelle Fitzgerald
2025 University Staff Excellence Award

Heike Hofstetter
2025 College of Letters & Science Distinguished Status

Char Horsfall
2025 Chemistry Department Staff Award

Peter Jaeger
2025 Selected to serve a three-year term on the Executive Board of Water at UW–Madison

Jericha Mill
2025 American Society for Mass Spectrometry Postdoc Career Development Award

Becca Moy
2025 University Staff Recognition Award

Michael Shortreed
2025 Al Yergey American Society for Mass Spectrometry Scientist Award

Marc Willadson
2025 University Staff Recognition Award

Chad Wilkinson
2025 L&S Academic Staff Mid-Career Award

Student

Jalianet Roman Matias (Jin), Georgia Sands (Boros)
2025 Graduate Student NSF Research Fellowship awardee

Ali Altamimi (Van Lehn), Anna Clayborn (Goldsmith), Dylan Forbes (Coon), Leonardo Lizardi Rodriguez (Gopalan), Madison McGuire (Blackwell), Ruby Neisser (Widicus Weaver), Liza Ryutov (Wickens), Evan Smith (Goldsmith)
2025 Graduate Student NSF Research Fellowship honorable mention

Riley Lehman (Gellman), Daria Rudykh (Boydston), Rodrigo Villanueva (Yoon)
2025 Undergraduate NSF Research Fellowship honorable mention

Lauren Fields (Li), Holden Rogers (Ge)
2025 American Society for Mass Spectrometry Graduate Student Award

Michael Kelley
2025 American Society for Mass Spectrometry Undergraduate Student Award

Cade MacAllister (Yoon)
2025 ACS Future Pharma Innovators

Elijah Marris (Weix)
2025 ACS Graduate Student Leadership Award in Mentoring

Adrian Matthews
2025 WCC Merck Research Award

Lauren My-Linh Tran
2025 ACS Women Chemists Committee (WCC) Travel Award sponsored by Eli Lilly & Company

Bojun Liu (Huang)
2025 Chemical Computing Group Excellence Award for Graduate Students from the ACS COMP Division

2025 APL Computational Physics Best Poster Award at the 55th Midwest Theoretical Chemistry Conference

Brenna Bierman (Rhodes), Harrison Esterly (Zanni), Willa Mihalyi-Koch (Jin), Irene Stoutland (Blackwell), Brittany Trinh (Boydston), Philip Zhou (Stahl)
2024 PPG Travel Award Recipients

Alissa Choi
2025 Goldwater Scholarship

continued on p. 30

Department celebrates Professor Zanni's election to the National Academy of Sciences

Emeritus Professor Fleming Crim stands with Professor Martin Zanni at the celebration reception on September 19, 2025.

The National Academy of Sciences (NAS) announced on April 29, 2025, that Professor **Martin Zanni** had been elected as a member. Professor Zanni is one of 120 members elected this year in recognition of distinguished and continuing achievements in original research. Thirty international members were also elected.

Martin T. Zanni is the Meloche-Bascom Professor of Chemistry in the Department of Chemistry. He received his Ph.D. from the University of California-Berkeley, working with Dan Neumark, and was an NIH Postdoctoral Fellow at the University of Pennsylvania with Robin Hochstrasser. Notably, he is the only person to have received the ACS Nobel Laureate Signature Award as both a student and a mentor and the first person to receive the Craver, Coblentz, and Lippincott Awards.

Professor Zanni is one of the early pioneers of 2D IR spectroscopy and has made many technological innovations that have broadened the capabilities and scope of multidimensional spectroscopies and microscopies. His research group is well known for developing a new class of ultrafast multidimensional spectroscopies. They can correlate the vibrational motions or the electronic states of different molecules or different parts of the same molecule. That information can be used to study molecular structures, like protein structures, or energy transfer, such as between two quantum dots. His research group has developed technologies for these techniques that have become the default methods by which they are implemented. In fact, in 2012, along with a postdoctoral researcher, **Chris Middleton**, Professor Zanni started a company called PhaseTech to commercialize this technology based on patents with WARF that they had written. With the application of 2D infrared spectroscopy, the Zanni group studies a protein involved in type 2 diabetes, cataract formation, and the motions of potassium ion channels. They utilize 2D visible spectroscopy to study a new type of solar cell made from semiconducting carbon nanotubes and microcrystals of organic molecules that can split energy from sunlight in half, thereby increasing the amount of electricity a solar cell can generate.

On September 19, 2025, introduced by NAS member Emeritus Professor Fleming Crim, Professor Zanni presented a special seminar entitled, "Contributions to the Development and Application of Ultrafast 2D Spectroscopy," to celebrate his election into the NAS, which provided brief synopses of two of many scientific directions during his 23 years at UW–Madison. Professor Crim is also a member of the NAS. Professor Zanni remarked that while he has earned many awards and recognitions in his career, this honor is the pinnacle. "It comes on top of 23 years of hard work by my graduate students and postdocs, working together to create and implement our ideas," he remarked. He credited his work to the talents of his group and the support of the department. "There are few places in the world where we could have attracted so many talented people to pull off these scientific feats," he said. "Our department houses roughly 40 research groups, each of which is like a small business. On top of that, there are probably five different groups of people working like collaborative co-ops, teaching thousands of students each year, and this is all only possible because of our dedicated staff." Professor Zanni remarked, "I cannot imagine my job without these teams and support staff."

> *"There are few places in the world where we could have attracted so many talented people to pull off these scientific feats."*
>
> *— Prof. Martin Zanni*

This page: Professor Gao on the slopes with his group at Alta Alta Snow Resort outside Salt Lake City, Utah in April of this year. Courtesy: Frank Gao

Right: Assistant Professor Frank Y. Gao

Assistant Professor Frank Y. Gao

***Assistant Professor Frank Gao** will join UW–Madison as a Department of Chemistry Assistant Professor in Fall 2026.*

Professor **Frank Gao** will join the University of Wisconsin–Madison's Department of Chemistry as an assistant professor in August 2026. He is currently a Texas Quantum Institute postdoctoral fellow at the University of Texas at Austin. Before moving to Texas, he earned his Bachelor of Science degree in chemical physics from the University of Toronto in 2015 and his Ph.D. in physical chemistry from the Massachusetts Institute of Technology in 2021, supported by an NSERC post-graduate fellowship.

Originally from Canada, Frank was excited about the opportunity to move to the Midwest and work for UW. "Going in, I knew that UW-Madison was a world-class institute for the chemical sciences," he explained. "When I arrived, I was blown away by the unique combination of intellectual vigor and supportive environment that I found." Frank said, "Joining such a preeminent institution as UW-Madison is akin to the stars aligning for me, and I could not be more excited going forward!"

As he transitions to Madison and prepares to launch his lab, Frank will draw on his prior experience helping to build a research group from the ground up. "It gave me a firsthand view of the challenges involved in starting out," he explains, "but also the enormous rewards of realizing one's own research vision and driving the success of one's mentees."

ASSISTANT PROFESSOR FRANK Y. GAO

Ph.D. in Chemistry from
Massachusetts Institute of Technology (MIT)

B.S. in Chemical Physics from
University of Toronto

Frank's research journey began in college, where he encountered the concepts of femtochemistry and coherent control – the realization that light could be used not only to observe atomic-scale dynamics in real-time, but also to shape them. This idea, that light could serve as both a probe and a tool for directing chemical and physicochemical change, became a guiding theme in his scientific path. He began his Ph.D. by investigating ultrafast photochemical reactions in highly constrained local environments. From there, his interests gradually expanded into materials and solid-state systems, and he became increasingly intrigued by the prospect of using light to induce dramatic transformations, unlocking novel phases of matter hidden in time.

This curiosity led him to develop the experimental skillset required to operate in the ultrafast and nonlinear optical regimes—tools he carried into his postdoctoral work. There, he began applying these techniques to the new class of quantum materials and found himself drawn to physical concepts such as symmetry, magnetism, chirality, and emergent order. These systems opened new frontiers, where Frank found opportunities not only to observe but also to actively control collective phenomena.

Today, Frank's research harnesses tailored light pulses – spanning the visible to terahertz spectral range – to drive material systems into new dynamic regimes, revealing behaviors inaccessible under normal conditions. Positioned at the intersection of physical chemistry, condensed matter physics, and materials science, the Gao group pioneers novel multidimensional and single-shot spectroscopy techniques aimed at uncovering and manipulating fundamental interactions among electrons, vibrations, and spins within complex materials. Current efforts include directing energy transport in light-harvesting systems, interrogating photocatalysts for solar fuel production, and probing collective mode dynamics in quantum materials, with the broader goal of advancing next-generation clean energy and information technologies. As part of the UW RISE-EARTH initiative, the Gao group is dedicated to laying the scientific foundations for a sustainable technological future and taking full advantage of the collaborative community at UW-Madison.

Frank's approach to teaching is a culmination of his experience in public schools. "I firmly believe in public education and its mission," he explained, "I see it as a vital public good—one that enriches society by cultivating the next generation of scientists, engineers, and critical thinkers." In his teaching, he's motivated by the opportunity to support students' intellectual and academic development, not only by demonstrating the elegance of chemical and physicochemical principles but also by linking these ideas to cutting-edge developments in industry and research. His ultimate goal is to help students build a holistic understanding of the material world and equip them to apply it meaningfully in real-world settings.

In class, students can expect scientific rigor from an enthusiastic teacher. "My goal is not only to convey the course material clearly but also to enrich the learning experience with engaging stories that spark curiosity and broaden students' perspectives." He says he will actively encourage students to attend office hours so that he can try to explain things differently, knowing from experience that different explanations may resonate more intuitively with different learners.

In his lab, Frank's goal is to help students become well-rounded scientists. He aims to produce exceptional experimentalists with strong skills in ultrafast optics, nonlinear spectroscopy, electronics, and data analysis, he says, "but also individuals who are passionate about their research and possess the creativity and insight to open new paths at the frontiers of human knowledge."

> *"Joining such a preeminent institution as UW-Madison is akin to the stars aligning for me, and I could not be more excited going forward!"*
>
> *– Assistant Professor Frank Gao*

Outside of science, Frank is a voracious reader of non-fiction, dabbling in philosophy, economics, and linguistics, though history is his true weakness. He happily explores eras across the globe, from the classical world to modern times. "If I had to choose, the late Ming dynasty China and the Roman Republic are my favorites," he says. "Because why settle for one crumbling polity when you can have two?

When not buried in books, Frank likes to keep moving: biking, running, really anything that convinces him he's not chained to a desk. Being Canadian, he also has snow hardwired into his DNA, and skiing has become something of an obsession. During his postdoc, he even convinced his entire group to hit the Rockies, a trip that miraculously ended in great memories and no broken bones. These days, he's eyeing the local Midwest slopes, though he admits: "Maybe cross-country is a more realistic pursuit."

New Faces, New Changes

Since January 2025:

New Faculty

Frank Y. Gao, Assistant Professor
(Featured on pp. 18–19)

New Staff

Tammy Comber, Financial Specialist
Neil Foegen, Chemistry Learning Center Instructor
Nate Onopa, Financial Specialist
Emily Otto, Financial Specialist
Sabrina Miner, Research Administrator
Emily Schjoth, Accountant

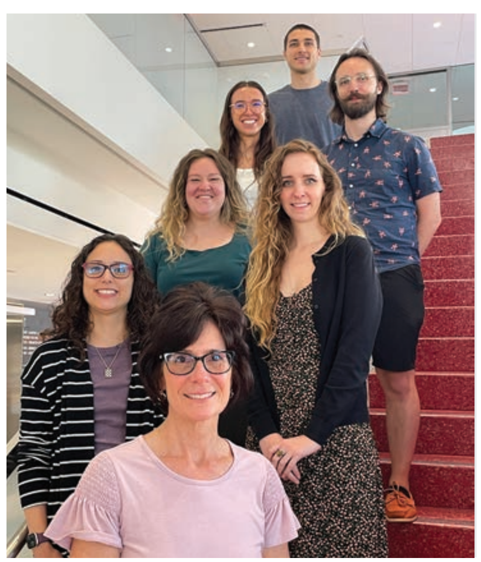
Change

Emily Bennin, Financial Specialist *to* Research Administrator

Retirements

Faculty

Robert Hamers, Professor
David Schwartz, Professor



Back–front, L–R: Nate Onopa, Emily Otto, Neil Foegen, Emily Bennin, Sabrina Miner, Emily Schjoth, Tammy Comber

Professor David C. Schwartz

Retired January 2025

Professor Schwartz joined the department in the analytical and biochemistry paths in 1999. He received his B.A. from Hampshire College, Amherst, MA, and his Ph.D. from Columbia University, New York, NY. Previous faculty appointments were at New York University, New York, NY, and the Carnegie Institution for Science, Baltimore, MD.

Professor Schwartz is well-known internationally for his accomplishments in genomics research. Among his most significant accomplishments are the invention of pulsed field electrophoresis (as an undergraduate/graduate student); his pioneering use of digital light microscopy for studying dynamics of single DNA molecules at Carnegie Institution of Washington, Dept. of Embryology, Baltimore; his invention of the first single molecule system for genome analysis – Optical Mapping – at New York University and his development of single molecule genome analysis systems and applications at UW-Madison.

Professor Schwartz held a joint appointment with Genetics, and he was affiliated with Biophysics and Microbiology. He also founded and served as director of the NHGRI-funded Genomic Sciences Training Program, an interdisciplinary predoctoral and postdoctoral training program. His multidisciplinary research group worked at the intersection of genetics, chemistry, nanotechnology, and computer science with an aim to discover fundamental molecular phenomena and use those discoveries to build integrated systems for genome analysis. Their highly innovative and technical work involved both biological and engineering disciplines. His inventions are covered by approximately 30 patents and have served as the scientific basis for multiple start-up companies. Among Dr. Schwartz's awards are the Lucille P. Markey Scholar Award; the Biochemical Analysis Prize of the German Society of Clinical Chemistry, awarded jointly with Dr. Charles Cantor; the Presidential Young Investigator Award from the National Science Foundation; the Beckman Young Investigator from the Arnold and Mabel Beckman Foundation; and the American Society for Biochemistry and Molecular Biology-Amgen Prize. In addition, he served as a permanent member of the National Center of Human Genome Research Study Section (1995–1999), earned a Kellett Mid-Career Award and a Vilas Associate Award (UW-Madison), and, in 2022, he was named the Douglas D. Sorensen Professor.

Professor David Schwartz. Courtesy: David Schwartz

Professor Robert Hamers

Retired August 2025

Professor Hamers received his Bachelors of Science degree from UW–Madison and earned his Ph.D. from Cornell University. After five years at IBM's main research center in Yorktown Heights, NY, he joined the Department of Chemistry and has been a member of the faculty for nearly 35 years.

At UW, he served as principal advisor to 70 Ph.D. students and 21 postdocs, and mentored more than 75 undergraduate students and 14 high school students. Together, they co-authored nearly 400 scientific publications and secured 18 U.S. patents. He has been recognized by awards, including the Vilas Fellow, Wisconsin Distinguished Professor, and Steenbock Professor of Physical Science. In 2024, he was recognized with the Hilldale Award in the Physical Sciences in recognition of his combined research, teaching, and service to the university.

Professor Hamers laughs along with colleagues at a retirement celebration held on July 26, 2025. Courtesy: Robert Hamers

His group's research centers on the unique physical and chemical properties of solid surfaces and their interface with vacuum and liquid environments. His early research focused on the area of scanning tunneling microscopy, where his group conducted some of the first atomic-resolution studies of structure and chemical reactions at surfaces of semiconductors. This work led to a continuing interest in the surface chemistry of diamond and other carbon materials, where their research yielded new insights into how to manipulate diamond's properties to enhance biocompatibility, stability, electrochemical activity, and photochemical properties. In 2012, he founded the NSF Center for Sustainable Nanotechnology (CSN) and served as Center Director through its 13-year lifetime, linking UW-Madison with twelve other universities and government labs in a collaborative effort to understand the environmental interactions of engineered nanomaterials. Among other discoveries, their work showed that nanoparticles can serve as a highly effective way to deliver copper and other micronutrients to plants, improving plant health by stimulating the plants' intrinsic defense mechanisms. In 2007, his interest in nanomaterials led him to entrepreneurship, and alongside Professor **Robert West**, he co-founded a start-up company, Silatronix, with the goal of making safer lithium-ion batteries. Their UW research yielded critical mechanistic information that contributed to the company's growth to 15 employees and an acquisition in 2021.

Professor Hamers was one of 30 scientists and engineers nationwide named a Presidential Faculty Fellow by NSF in 1993. Courtesy: Dept. of Chemistry

His research accomplishments have been recognized with external awards, including an NSF Presidential Faculty Fellow, the AVS Medard Welch Medal, the ACS National Award in Colloid & Surface Chemistry, the ACS Arthur Adamson Award, the International Surfaces and Nanostructures Prize, and recognition with Fellow status in the AAAS, the American Chemical Society, and the AVS.

He has taught undergraduate courses aimed at the fundamentals of analytical chemistry, Chemistry 327 and 329, and created our department's Materials Chemistry Ph.D. path to provide opportunities for students with interests spanning synthesis and characterization of condensed phases. He has also developed the graduate-level materials chemistry class, Chemistry 652. To provide increased opportunities for undergraduates to conduct research, he co-founded the Chemistry/CBE joint REU Program in Renewable Energy and served as co-PI. The REU and the CSN's SURE summer program have created opportunities for more than 100 non-UW undergraduates to conduct summer research at UW. In 2019, Professor Hamers co-founded the ACS/UW Bridge to the Chemistry Doctorate Program — the first in the country — and served as its co-lead.

The Newest Badger Chemists

Congratulations to our recent graduates.

Baccalaureate *Bachelor of Science, Chemistry Major*

December 2024

Mason Bohn
Qianyu He
Ian Herman
Yung-Hsu Lee
Yura Merikan
Owen Odegard
Lexi Sun

May 2025

Nicole Aigner
Maryam AlJawad
Kaleb Anderson
Courtney Batchelor
John Blount
Jordan Boysen
Grace Browning
Levi Callahan
Yumi Chen
Ian Clark
Song Nhi Dang
Josh Davis
Jonathan DeWald
Zhilin Du
Jerome Evans (H)
Elias Gomez
Grace Gooley
Maxim Hamilton (H)
Thomas Han
Erika Huang
Thomas Hughes (H)
Emily Johnson
Brandon Kendall
Fiona Kinney
Max Knight
Haoyu Kong
Natalie Kozlowski
Joshua Kruger
Carter Kucala
Ali Kuehn
Brenna Lekschas
Charles Lenz H
Mary Kate Loichinger
Audrey Lyp (H)
Jasmine Maier
Maxwell McLean H
Josh Meason
Olivia Moroney
Ayden Morros
Seungwoo Noh
Ashley Palecek
Yekun Pan
Juan Perez
Ana Pietsch
William Platten

Chemistry major graduates at the May 2025 graduation celebration. Photo: Ilia Guzei

Kylie Plouff (H)
Chase Radziej
Maeve Raphael-Reily
Tony Rappold
Gabe Riska
Michael Rolfs
Lillian Rosenblatt
Daria Rudykh H
Taylor Sachs
Kaitlyn Shi
GM Shields
Jacob Shor
Elizabeth Stang
Allyson Stepper
Nathan Sullivan
Neha Thalpur
Lillian Thompson (H)
Vishwa Vijay Prabhakar
Rachel Vogel
Fengwei Wang
Moran Wang
Guy Weibel
Ahmia Williams-Walsh
Gavin Wirth
Brandon Yang
Jason Zhang
Kelley Zhang
Ziang Zhao
Jayda Zhu (H)

August 2025

Paige Bakkestuen
Ani Brzozowski
Brian Choi
Dane Christiansen
Drilon Etemi
Solomon Fair
Patrick Granowski
Molly Hoyman
Edison Jiang
Sydney Juntunen
Christine Kortendick
Justin Kurth
Daniel Lee H
Anders Magnuson
Marissa Mannhardt
Ahmad Danial Bin Muhammad Idress H
Collin Queen H
AJ Schmeiser
Luke Walsh
Tanner Witt

(H) Graduating with Comprehensive Honors
(H) Graduating with Honors in the Liberal Arts
H Graduating with Honors in the Major

Credit: Ilia Guzei.

Graduate

Master of Science

December 2024

Leslie Acevedo (Martell)

May 2025

Jãán Andrews (Jin)
Katherine Conrad (Pazicni)
Morgan Dierolf
Michael Jones (Todd)
Emma Potter (Wang)
Herman Recendiz (Weix)
Simruthi Subramanian
Sierra Thein (Schomaker)

August 2025

Gabriela Muñoz Sánchez (Berry)

Ph.D.

December 2024

Nishit Banka (Romero)
High Throughput Screening and ML-Aided Engineering of Transcription Factor-Based Biosensors

William Breining (Lynn)
Design and Synthesis of Novel Azlactone-Functionalized Materials

Thomas Derrah (Bertram)
Heterogeneous Reactivity of Dinitrogen Pentoxide with Sodium Chloride and Nitrate-Containing Solutions

Cassandra Doody (Blackwell)
Small Molecule Modulation of LuxR-type Quorum Sensing Receptors

Emma Eisenbraun (Blackwell)
Development and Characterization of Peptide Quorum Sensing Modulators in Gram-Positive Bacteria

Eric Kohn (Martell)
Development of Single-Round Selection Protocols for the Discovery of Aptamers With Enhanced Affinity and Conformational Responsiveness

Princess Merenini (Choi)
Electrode Materials and Electrochemical Systems Design for Ion Storage in Aqueous Electrolytes

Katelyn Michael (Jin)
Development and Implementation of Redox Reservoirs for Modular Electrochemical Synthesis and Tandem Advanced Oxidation Processes

Willa Mihalyi-Koch (Jin)
Tuning the Structure, Symmetry, and Chirality of Low-Dimensional Metal Halide Perovskites and Nanostructures for Optoelectronic and Spin-Orbitronic Applications

Kathleen Nickson (Garand)
Developing Automated Spectral Assignment Programs for Cryogenic Ion Vibrational Spectroscopy

Tyler Ogorek (Golden)
Synthesis and Optimization of Heterocycles That Target New and Old World Alphaviruses and Hit Development Efforts Aimed at Inhibiting Coronavirus

Yunrui Qiu (Huang)
Modeling Dynamics of Multi-Body Systems via Machine Learning and Non-Markovian Approaches

Isabella Whitworth (Smith)
Advancing Technologies to Study RNA and Its Protein Interactome

Ph.D. recipients at the May 2025 graduation celebration. Photo: Ilia Guzei.

May 2025

Sara Alektiar (Wickens)
Leveraging C(sp2)–H Bonds to Access Radical Intermediates

Emily Chapman (Ge)
Top-Down Proteomics Strategies for the Characterization of Endogenous Cardiac Proteins and Protein Complexes

Tahoe Fiala (Yoon)
Illuminating Asymmetry: Development and Prediction of Excited-State Organic Reactions

Keaton Mertz (Coon)
Mass Spectrometer Instrumentation Developments for Proteomics Applications

Leah Nkulu (Stahl)
Merging Organic Synthesis, High-Throughput Experimentation and Data Science to Improve the Uptake of C(sp3)–H Functionalization Reactions in Medicinal Chemistry

Surajudeen Omolabake (Stahl)
Aerobic Oxidation Coupled With Liquid–Liquid Chromatography Enables the Recovery of Valuable Chemicals From Lignin

Riley Petersen (Butcher)
Poly(UG) RNA Structure and Dynamics

Matthew Ryan (Zanni)
Characterization of Potassium Ion Channel Proteins with 2D IR Spectroscopy

Austin Salome (Coon)
Development of Mass Spectrometry-Based Techniques to Characterize Protein Complexes

Lia Serrano (Coon)
Rapid Mass Spectrometry-Based Analyses of Complex Mixtures for Translational Applications

Jennifer Whetter (Boros)
Ligands for Low-Temperature, Stable Chelation of Rare Earth Radiometals and Radiofluorination

Kenneth Wilson (Garand)
Photoelectron Spectroscopy and Autodetachment Dynamics of Cryogenically Cooled Anions

August 2025

Guadalupe(Lupe) Aguirre-Figueroa (Blackwell)
The Development of Chemical Tools to Study Cell-Cell Communication and Virulence in Pseudomonas aeruginosa and Burkholderia multivorans

Hyeonjeong (Olivia) Bae (Boydston)
Functional Polymers Across the Lifecycle: Mechanophore Reactivity, Additive-Based 3D Printing, and Enzymatic Degradation

Ryan Belson (Choi)
Electrochemical Ion Removal and Recovery for Lithium and Phosphate

Samantha Bruffy (Buller)
Leveraging Threonine Transaldolases for the Synthesis of Novel β-Hydroxy Non-Canonical Amino Acids and Derivatives

Minhua Cao (Boros)
Metallophores as Tools for Antibiotic Drug Development and the Study of Bacterial Metal Homeostasis

Jedidiah Chung (Martell)
Development of Protein-Based Materials for Scaffolded Catalysis

Ray Czerwinski (Goldsmith)
Advances in Single-Molecule Measurement Techniques: Approaches, Applications, and Challenges

Lauren Ehehalt (Weix)
Decarbonylative Cross-Electrophile Coupling Methods to Form C–C Bonds

Sifei Fang (Martell)
Directed Evolution of Enzymes for Improved Proximity Labeling

Ryan Hall (Brunold)
Spectroscopic and Computational Insights Into the Chemistry and Biochemistry of Coenzyme B12

Chris Hanneman (Stahl)
Development of C–H Oxygenation Strategies for Late-Stage Functionalization With Application to Metabolite Synthesis

Inhyuk Jang (Yethiraj)
Machine Learning Meets Statistical Mechanics: Exploring Phase Behavior Through Local Affinity

Jed Kim (Schomaker)
Expanding Nitrene Transfer Chemistry: Selective C–H Aminations With Cost-Effective Metals

Min Ji Kim (Wickens)
Alkene Functionalization via Alkene-Thianthrene Adducts

Philip Lampkin (Gellman)
Flexible and Foldamer Catalysts

Kwanpyung (Kwan) Lee (Schmidt)
Computational Modeling of Electrochemical Biomass Upgrading

John Mannone (Gellman)
An Assortment of Peptide Related Topics: Encapsulation of Transmembrane Helices, Heterochiral Quaternary Contacts, and Thioamide Containing Antigens

Rylie Morris (Gellman)
Exploring the Activity of Peptide Agonists of Class B GPCRs With Sidechain Appendages

Anand Ode (Hamers)
Electron Emission From Metal-Diamond Nanocomposites

Ellie Plachinski (Yoon)
Controlling Photochemical Reactions: The Effect of Brønsted Acids on [2+2] Cycloadditions

Emily Reasoner (Jin)
Nanomaterials-Enabled Strategies for the Enrichment of Low-Abundance Proteins

Olga Riusech (Li)
Label-Free and Derivatization-Assisted Techniques for the Analysis of Small Molecules via Mass Spectrometry

Margaret Tetzloff (Boydston)
Expanding the Applications of Metal-Free Ring-Opening Metathesis Polymerization Through Functional Chain-Transfer Agents, Initiators, and Monomers

Jairo Villalona (Buller)
Overwriting Natural Evolution by Inverting the Chemoselectivity of an Engineered Tryptophan Synthase β-Subunit

Wenxin Wu (Li)
From Sample to Signal: Development of Integrated Neuropeptidomics to Study Crustacean Signaling

Ruiwen Xu (Gellman)
Interrogation of Intermolecular Interactions in Liquid–Liquid Phase Separation

Mingyi Xue (Huang)
Feature-Based Deep Learning Approaches to Facilitate Drug Discovery

Jordan York (Blackwell)
New Approaches to Modulating Staphylococcal Virulence and Antibiotic Susceptibility

Haoran Zhang (Li)
Nanomaterial-Enabled Analytical Frameworks With Multifaceted Mass Spectrometry

From the World Trade Center to microbial bacteria DNA, Bruce McCord ‘86 puts analytical chemistry into real-world practice.

Bruce McCord, Ph.D. ‘86 has fond memories of his time at the University of Wisconsin. He remembers the morning sailing excursions with students through Hoofers, the cinnamon buns from Ovens of Brittany, and playing hockey with brooms and bicycle helmets instead of traditional equipment. However, he seems most grateful for his advisor, **James Taylor**, the students he met through his research, and the opportunities his chemistry degree afforded him in his career. “My degree at UW ultimately led to a dream position as a researcher at the FBI laboratory,” Bruce shared. “Chemistry is such a flexible degree.”

After graduating with a Ph.D. in analytical chemistry in 1986, Bruce married **Margie Phipps**, also a UW graduate, ‘86, M.S. in materials science, and began working as an industrial analytical chemist, first at CIBA-Geigy and then at Syntex Pharmaceuticals in the Bahamas. However, he said he missed the research he conducted during his graduate studies, and when he saw a government researcher position open up at the Federal Bureau of Investigation (FBI) Laboratory in the Forensic Science Research and Training Center, he applied. Although he knew little about forensic science, he said the agency was interested in his analytical chemistry background and his experience in analyzing fluorescent compounds and chromatographic science, and he landed the position.

Above: Bruce McCord ’86 has published over 150 research papers, holds 12 patents, and has received a number of accolades, most notably the Paul Kirk Award from the American Academy of Forensic Sciences, being named a thought leader by Pittcon (2018), and he is an ambassador for emerging technologies by Qiagen (2022). Photo courtesy: FIU.

Bruce began his role at the FBI in 1989. There, he developed methods for the detection of postblast explosives using ion chromatography, capillary electrophoresis, and supercritical fluid chromatography. Bruce assisted the FBI following the World Trade Center bombing by helping to set up a lab in New York City, and this work was later expanded into methods for detecting dangerous drugs, inks, dyes, and DNA. Also at the FBI, he became interested in work involving PCR and its capability to improve the sensitivity of DNA typing. While he was working in industry, Bruce was exposed to automation and felt that DNA work could also be automated. “In my explosives work, I developed a methodology using capillary electrophoresis to detect ions from post-blast explosives such as nitrate in black powder and perchlorate in improvised explosives,” Bruce explained. “I thought that this same method would be ideal for automating DNA detection.” After several years of work, his idea ultimately led to the development of an automated system for DNA detection that is used in laboratories all over the world.

Another area of research at the FBI was solving the problem of drug-facilitated sexual assault. Often, by the time the victim reports the crime, the levels of drugs in their system become very low and difficult to detect. “We developed ways to use fluorescent derivatization, microfluidics, and electrochemical detection for screening trace levels of these drugs,” Bruce explained. “This became even more important with the onset of the opioid crisis and the development of novel psychoactive substances, including analogs of dangerous drugs such as cannabinoids, phenethyl amines, and opioids.”

> ***“My degree at UW ultimately led to a dream position as a researcher at the FBI laboratory.”***
>
> ***— Bruce McCord ‘86***

After his time at the FBI, Bruce took an associate professor position in chemistry at Ohio University. In 2004, he moved to Florida International University in Miami, Florida, where he is now a professor of analytical/forensic chemistry. He is currently working on the development of rapid and portable methods for the detection of the components of counterfeit drugs containing fentanyl analogs. They are developing nanocolloids and nanostructured surfaces for use with portable UV and visible lasers to develop rapid AI-based discrimination of mixtures. A second project involves the application of deep shotgun sequencing to detect and identify DNA from microbial bacteria transfer following sexual assault. Here, the McCord Group is trying to develop a DNA-based method to detect sexual contact between males and females when insufficient human DNA is transferred. They are working on methods to assist law enforcement in the detection of this “sexual assault microbiome” to identify criminal suspects.

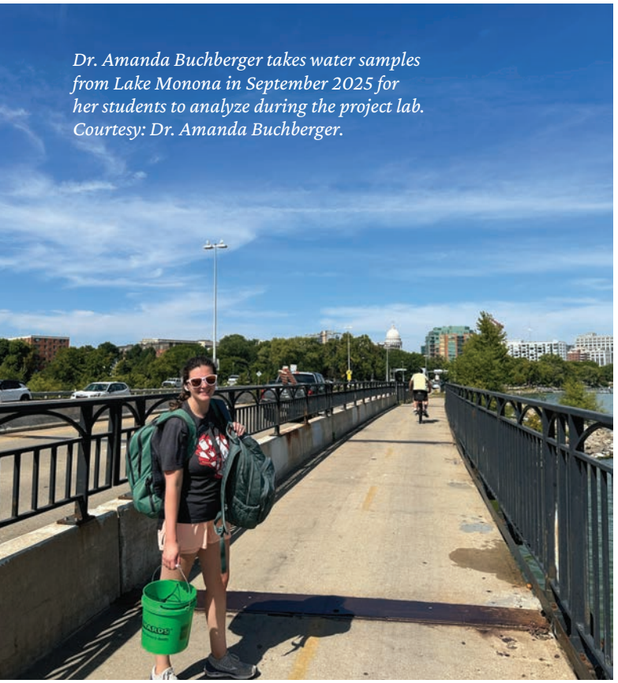
“I have always been intrigued by the fact that we use novel technology to solve problems with immediate societal impact,” said Bruce. “Seeing our research ultimately transition into practice is a tremendous validation of all the hard work.”

Above: Bruce lives in Miami with his wife, Margie Phipps ’86. Together they have three daughters, two of whom have Ph.D.s in chemistry and one who is still in graduate school studying computer science. In his spare time, Bruce enjoys water sports and plays jazz saxophone and clarinet in several bands. Photo courtesy: Bruce McCord.

Outreach and Community Centered Chemistry

By Peter Jaeger, Chemistry Outreach Manager

As one of our core tenets, outreach at the Department of Chemistry is built to advance three priorities. First, we make the department visible through engagement with other departments on campus and with the community. Second, we seek to make the department accessible by supporting the community in thinking about issues they are facing. Third, we provide high-quality, meaningful contexts for learning for everyone.



Dr. Amanda Buchberger takes water samples from Lake Monona in September 2025 for her students to analyze during the project lab. Courtesy: Dr. Amanda Buchberger.

Some opportunities meet all of these three requirements. However, it's rare when they fulfill all of these priorities and give us a chance to bring a commitment to our community into the classroom. This year, a unique collaboration between campus departments and the City of Madison will do just that.

One of the main roads in and out of downtown Madison, John Nolen Drive, is scheduled for major reconstruction this fall. As part of this project, the city hopes to increase the climate resilience of this area via cultivating a more dense tree canopy. Outreach Program Manager, **Peter Jaeger**, met **Anna Bierbrauer**, an Assistant Professor in the Department of Planning and Landscape Architecture, who was working with the City of Madison on having students in her course design public spaces adjacent to John Nolan Drive and Lake Monona. Their discussion focused on how the relevant instrumentation and expertise of the Department of Chemistry might support tree canopy health via the analysis and testing of stormwater runoff.

Peter and Assistant Professor **Ryan Stowe** began attending planning meetings for the project with Anna, City and county officials, and the design firm providing the plans for the project. "We really want to be visible and help groups in our community work on the messy, real-world challenges that they face every day, and we want our students to be involved in that," explained Peter. It became clear to Ryan and Peter that the project provided an opportunity to build a course for students to use their chemistry knowledge and skills to contribute to real-life decisions.

To consider what would be needed for this vision to become reality, Ryan and Peter approached Analytical Lab Director **Amanda Buchberger** for ideas about how to develop a testing protocol and where stormwater runoff analysis might fit into her Fundamentals of Analytical Science course. "When I hear something relevant to our analytical chemistry students, I always want to find ways to add it to our courses," Amanda shared. "Why wouldn't we want to expose our students to authentic experiences?" The first "project lab" will happen in the Fall of 2025, and Amanda is grateful to have campus and departmental partners who are excited to help students imagine how chemistry is important outside the classroom.

"As we expand what our students can do, I feel fortunate that our Ted and Mary Kellner Instrument Laboratory can expose our students not only to real-world chemistry problems but also modern-day analysis tools," explained Amanda. By embracing outreach and community engagement as a core tenet, the department has become more visible to departments across campus and, through its collaborative involvement in planning, has been able to put the community of Madison at the center of the classroom."

Professor Jen Schomaker hosts endowed professorship donors Dr. Edward and Mrs. Nancy Fody

This spring, **Dr. Edward and Mrs. Nancy Fody** visited the Department of Chemistry ahead of the College of Letters & Science 2025 Investiture Ceremony on Friday, April 25, 2025. At the ceremony, faculty members from the four divisions of the College, including **Professor Schomaker**, were presented with a medallion by L&S Dean **Eric M. Wilcots**. The Fodys were formally recognized, and Professor Schomaker was conferred with the Edward and Nancy Fody Professorship in Chemistry. "Attaining an endowed position is a tremendous honor," Dean Wilcots said in his introduction. "It reflects not only the hard work and passion that these faculty members have put in over the years, but it also reflects that their scholarship has had an impact on their disciplines, on their communities, and on society at large."

Dr. Fody, who earned his master's degree in chemistry at UW–Madison ('71), conducted early research on the role of chemical compounds in cancer therapy—a focus he continued throughout his career as a physician. Mrs. (Keipe) Fody, a UW–Madison alumna ('72) with a bachelor's degree in chemistry, has been a steadfast partner in his professional journey in pathology. During their visit to the department, the couple toured facilities, met with Professor Schomaker, and learned more about her group's research on novel mechanisms of action for tuberculosis treatment.

Dr. Fody's distinguished career includes playing a major role in establishing new laboratories at three different hospitals, as well as serving as Chief of Pathology for Western Michigan Pathology Associates and teaching at both the University of Arkansas Medical School and the University of Texas Medical School. Dr. Fody is the co-editor of the best-selling text, *Clinical Chemistry – Principles, Techniques and Correlations*, now in its ninth edition.

Professor Schomaker expressed her gratitude for the Fodys' generosity in endowing the Edward and Nancy Fody Professorship in Chemistry. "Among the many things I appreciate about this financial support is its flexibility," remarked Jen. "It allows us to explore new research ideas, attend key conferences, and support our students in professional development activities that help them achieve their career goals."

Photos, left–right: Mrs. Nancy and Dr. Edward Fody with Prof. Schomaker at the 2025 Investiture Ceremony. Photo by Empire Photography. Fifteen of the 17 faculty members who received 2025 named chairs and professorships on stage with Eric Wilcots, the Dean of the College of Letters & Science, and UW-Madison Chancellor Jennifer Mnookin (at right). Photo by Empire Photography.

In Memoriam

1950s

Donald Lee Battenberg, *90, d. January 2, 2025.* He earned his bachelor's degree in chemistry and education at UW–Madison in 1956 and enlisted in the United States Army and served in Germany for two years after college.

Jeremy Richard Fox, *91, d. December 23, 2023.* He earned his bachelor's degree in chemistry in 1954. He was an avid cellist and scientist.

Barbara Meyers Koerber, *92, d. October 9, 2024.* She graduated from Radcliffe College in 1954, one of three women earning a degree in chemistry, and completed a master's in chemistry at UW–Madison in 1956.

Rodney Jerome Sime, *93, d. October 24, 2024.* He earned his bachelor's degree in chemistry from UW–Madison in 1955. He served in the Air Force during the Korean War, and after UW earned his Ph.D. and was a professor at Sacramento State University for 33 years.

1960s

Ralph G. Czerepinski, *84, d. July 12, 2025.* Ralph earned a bachelor's degree from UW–Madison in chemistry in 1962, where he met his love, Donna Monteith. When they began dating, Donna firmly told Ralph they were not allowed to kiss in the Chemistry building, a rule which Ralph promptly disregarded. He moved on to receive his Ph.D. in rocket fuel oxidizer chemistry and work as a research scientist for the Dow Chemical Company until his retirement in 2001.

Marilyn Ankeney Parker, *82, d. May 6, 2023.* Marilyn earned her bachelor's degree from UW–Madison in 1962. She went on to earn her Ph.D. in chemistry from the University of Washington and was a professor of chemistry for 36 years at Monmouth University.

Nancy Louise Russell, *86, d. November 28, 2024.* Nancy graduated from the UW–Madison with a bachelor's degree in chemistry in 1960.

Manfred Weigele, *93, d. July 11, 2025.* Manfred came to the United States as a Rhodes Scholar and earned a Ph.D. in organic chemistry at UW-Madison in 1965. He co-invented fluorescamine, a reagent for the detection and quantification of primary amines that gained widespread use. In 1991, he cofounded Ariad Pharmaceuticals.

1970s

Wayne Layton Wittenberg, *69, d. January 9, 2025.* Wayne's passion for science led him to the UW–Madison, where he earned a B.S. in Chemistry in 1977 as part of the honors program and Phi Beta Kappa society. He earned a Ph.D. in Biochemistry, an M.D., and completed a neurosurgery residency program for a career that took him across the country as a neurosurgeon.

Department community

Janice Christine (Brumm) Haynie, *87, d. January 7, 2025.* Janice was the analytical path administrative assistant for the department from 1991 to 1997. Janice loved her career at UW–Madison where she was very involved in the students' academics and would assist with typing thesis details for them.

***Student Awards**, continued from p. 16*

Jonathan Rebelsky (Widicus Weaver)
2025 *Wisconsin Wanderer* Award from Badger Talks for giving outreach talks in the greatest number of Wisconsin counties

Ray V. Czerwinski (Goldsmith)
2025 WISL Award for Communicating Ph.D. Research to the Public

NOBCChE, University of Wisconsin–Madison Chapter
2025 NOBCChE Chapter Awards – Best Social Engagement

Abayomi Awoyomi, **Brenna Bierman**, **Rich Botzoc**, **Patrick Cross**, **Cristina Gonzales**, **Ryan Hall**, **Sneha Maheshwari**, **Shay McLean**, **Julianna Mouat**, **Alex Nelson**, **Hazel Styers**, **Brittany Trinh**, **Katie Weber**, **Yuzhe Zhang**
2025 Department of Chemistry Outstanding Chemistry Teaching Assistant Award

Legacy Giving

Legacy gifts honor and celebrate alumni and friends who have committed to support the work of the UW–Madison Department of Chemistry through a planned gift. These future gifts contribute to the growth and success of the department. We are honored to acknowledge and celebrate the following individuals who have all made a commitment to the Department of Chemistry.

> *"I've included the UW Chemistry Department in my estate planning to thank the department for its influence on my career and for the careers of future Badger chemists."*
>
> *– Dr. Jimmie R. Baran '85*

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Marlene "Marnie" Schrage Shaul '63
Thomas Squire '36*
Tammy '94 Turek-Etienne and Christopher '94 Etienne
Doyle Udy '50
John* '48 and Dorothy* Vozza
Donald Wheeler '50*
Neil Woolsey '62*
Y Stephen Yamamoto '65*

* deceased

There are several benefits to planned giving. Legacy gifts allow donors to leave a lasting legacy and ensure their life's work continues to make a difference for generations to come. Unlike annual gifts, estate gifts can support endowments or long-term initiatives, providing stable funding that helps the department plan for the future and weather economic uncertainties. Legacy gifts can also offer financial flexibility that won't affect day-to-day finances and provide substantial tax benefits to the donor's estate. Legacy gifts celebrate a life and provide a meaningful way to honor a memory of someone special.

If you'd like more information on establishing a legacy gift, please contact **Kayla Riese**, Director of Development at Wisconsin Foundation and Alumni Association, at (608)732-1142 or kayla.riese@supportuw.org.

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Morning sunlight shines upon a close-up view of the letters on the "Sifting and Winnowing" plaque, mounted in the arched-portico of Bascom Hall at the University of Wisconsin–Madison. ***(Photo by Jeff Miller / UW–Madison)***

CONNECTION IS THE CATALYST.

Join us for these special events:

April 11, 2026 | **Science Expeditions Chemistry** Open House

April 14–15, 2026 | **Day of the Badger**

May 9, 2026 | **Graduation**