

CHEMISTRY

Annual Highlights 2023-24

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A wave of new faculty
join Chemistry at Illinois



MESSAGE

Message from the Department Head

Greetings,

As I start my 15th year on the faculty in chemistry at Illinois, I am reminded of how, over the last 150+ years, we became a premier institution for research and education in the chemical sciences. Our reputation of excellence has been built by people who are enthusiastic about scientific scholarship and discovery and are committed to excellence in achieving their goals.

A legacy of excellence in Illinois chemistry stretches back to the founding of the University, but more importantly, continues today, as you will see in this report of annual highlights. These highlights are only a sample of the robust body of scientific discovery and numerous academic and professional achievements of our faculty, students, and alumni in the previous year.



From research that is making a difference in the fight against cancer and other diseases, to the development of new technologies that can help solve societal problems in energy, health, the environment and more, these are the scientific advancements and academic achievements of a diverse group of people who share a passion for exploration in the chemical sciences.

Our chemical sciences community is rooted in shared experiences and achievements on the Illinois campus, and it continues to grow. In August, we welcomed 139 new chemistry majors, the largest group of first-year students in at least five years, and a strong cohort of 62 graduate students. In May, we celebrated 177 new graduates (119 Bachelor's, 10 Master's, and 48 Ph.D.s) who joined our network of more than 10,000 alumni.

Our graduates are in demand. More than 100 companies recruited our students in the past academic year, and more than 90 percent of our bachelor's graduates landed their first choice for furthering their education or launching their careers.

And we continue to recruit at the faculty level with three wonderful new assistant professors joining our faculty this academic year. We have another faculty search open this year, and we hope to grow our faculty even more.

Reflecting on the past year, I am proud of all we have achieved and excited for the future, which would not be possible without support from all of you. Thank you for the impactful ways you make a difference in our academic and research efforts in the Department of Chemistry.

Catherine J. Murphy (BS, '86)

Head, Department of Chemistry
Larry R. Faulkner Endowed Chair in Chemistry

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About the Cover

Eight new professors have joined the Department of Chemistry faculty since January 2023. Pictured, left to right in front of Noyes Laboratory on the Illinois campus Main Quad, are Majed Fatafah, Mayuko Isomura, Anastasia Manesis, Christy Landes, Joomyung (Vicky) Jun, Ben Snyder, and Stephan Link. Not pictured is Xiaotang Lu, who officially joins the faculty in January 2025. Photo credit: Holly Birch Photography.



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RENOVATION

Chemistry revitalizes advanced organic and inorganic courses with modern instructional lab



A portion of the 6,000 square foot area under construction in Noyes Laboratory.

The state-of-the-art facility will provide students with high-tech experiential learning opportunities that prepare them for successful careers in chemistry.

A major project launched in 2024 features the renovation of a 6,000 square foot area on the second floor of Noyes Laboratory where the Department of Chemistry is revitalizing its advanced organic and inorganic lab courses with upgraded facilities and equipment to better prepare its students for successful careers in chemistry.

One half of the area under construction will be an advanced organic synthesis lab for chemistry majors specializing in organic chemistry and an inorganic synthesis lab for chemistry majors and graduate students specializing in inorganic chemistry. The other half will house the Department of Chemical and Biomolecular Engineering's Unit Operations Lab.

New experiments will be added to chemistry courses in this space that reflect the importance of modern topics such as asymmetric catalysis and organometallic-mediated cross-coupling reactions. The department plans to increase the number of such experiments and introduce new analytical methods and spectroscopic tools used to monitor reactions and characterize both organic and inorganic compounds.

Josh Vura-Weis, associate professor of chemistry and associate head of major projects, has been overseeing the renovation project and helped design the lab space.

"We really want to modernize both the layout of the lab and the experiments the students can do and use this as an opportunity to modernize the teaching that we are doing," he said.

Most of chemistry's half of the project features a large open-concept instructional lab with several large windows on the south-facing exterior wall of Noyes that allow in a lot of natural light where students will be doing their hands-on training. In this open design, students can see each other and communicate easily, but it is also conducive to safety, because the teaching assistants can see every student all at once as they do their lab work.

The infrastructure has been designed to enable flexibility in preparing for a wide variety of experiments. Thirteen hoods will be spaced along interior walls and three double glove boxes will be installed.

And a separate instrumentation room with a variety of modern instruments will allow students to do most of the modern characterization of the products they make in the wet lab.

Vura-Weis said a big part of modern chemistry, especially inorganic synthesis, is now done in glove boxes.

"We see this as a way for the students to learn modern glove box techniques, and then they can still do some air-free work in the hoods because that is still part of modern chemical synthesis," he said.

And more modern chemistry topics can be weaved into the curriculum, like metal-organic frameworks and asymmetric organocatalyzed reactions.

"We have faculty who are designing new metal-organic frameworks to do things like gas separations, so we are trying to connect the research that people do in the lab with the research that current faculty members are doing, and it also makes it much more relevant for our students," Vura-Weis said.

NEW FACULTY

Wave of new faculty bring talents to Illinois chemistry

Ongoing efforts to recruit more faculty have garnered a diverse and talented group of chemists whose expertise, experiences and new ideas are already making a positive impact in the Department of Chemistry.

Since 2022, the department has added eight tenure-track faculty members. Ben Snyder joined the faculty in January 2023, followed by Christy F. Landes and Stephan Link, who came from Rice University in the 2023-24 academic year. Majed Fataftah and Anastasia Manesis joined the faculty as assistant professors in August 2023, and the most recent faculty search this past spring garnered three new assistant professors, Joomyung (Vicky) Jun, Mayuko Isomura and Xiaotang Lu.

“We are always thrilled to welcome top-notch new faculty members, and we are excited that this diverse and accomplished group of chemists chose Illinois chemistry to pursue their individual research interests and build their careers,” said Catherine J. Murphy, Larry R. Faulkner Endowed Chair in Chemistry, and Head, Department of Chemistry. “Our ongoing efforts to grow and diversify our faculty is an investment in the future of Illinois chemistry as a world-class leader in scholarship and innovation in the chemical sciences.”

Joomyung (Vicky) Jun officially joined the department in August 2024, and Mayuko Isomura and Xiaotang Lu will start in January 2025.



Working in a temporary space in Roger Adams Laboratory awaiting lab renovations, **Joomyung (Vicky) Jun** has been busy teaching, recruiting researchers into her group, and applying for grants.

“I am excited to work with young, motivated students full of potential,” Jun said.

Originally from South Korea, Jun received her B.Sc. degree in chemical biology at UC Berkeley and participated in undergraduate research with Prof. Ken Raymond.

“I have been very fortunate to have amazingly supportive mentors throughout my scientific career. I especially want to acknowledge Prof. Ken Raymond, who gave me my very first research opportunity and told me, ‘The late bloomers are often the best flowers,’ a statement that has stayed with me,” said Jun, who went to work for two years at the Molecular Foundry at Lawrence Berkeley National Laboratory before starting the Ph.D. program at the University of Pennsylvania, where she focused on development of novel and underexplored fluorogenic small molecules to study the misfolding of α -synuclein protein, a key protein implicated in Parkinson’s disease.

To expand her expertise in chemical biology into translational research, Jun pursued postdoctoral research at MIT, where she received two postdoctoral fellowships from the Koch Institute for Integrative Cancer Research and the Life Sciences Research Foundation sponsored by the Shurl and Kay Curci Foundation.

Jun advanced the utility of diazo compounds in protein-based drug delivery by devising a rapid synthesis method to discover a new reversible late-stage protein modification strategy. That led to several collaborations, including work with world-class biomedical engineering labs at MIT building therapeutic platforms for in vivo protein delivery.

At Illinois, Jun is interested in developing modular chemical tools to address biomedical problems in drug delivery at the molecular level.

“My research vision is to provide molecular-level insights into drug delivery and revolutionize the field of medicine by introducing proteins as next-generation therapies for currently undruggable diseases,” she said. “My research program will encompass synthetic organic chemistry, biochemistry, and chemical biology to train students to branch out to nanotechnology, biomedical engineering, pharmacology, and optical imaging.”



Originally from Tokyo, **Mayuko Isomura** studied chemistry at the University of Tokyo, where she graduated at the top of her class and discovered that she enjoyed reaction development as an undergraduate researcher. After completing a master’s degree in reaction development at the University of Tokyo, Isomura received a fellowship from the Funai Foundation and left Japan for

Switzerland. She completed a Ph.D. in the research group of Illinois chemistry alum Prof. Erick M. Carreira at ETH Zurich, studying the development of enantioselective reaction using transition-metal catalyst (iridium catalysts).

With a Swiss National Science Foundation Early Postdoc fellowship and a Japan Society for the Promotion of Science fellowship, Isomura pursued postdoctoral work at Harvard University in the research group of Prof. Eric Jacobsen, a former Illinois chemistry faculty member, and studied organocatalysts (hydrogen-bonding donor catalysts) through the development of asymmetric reactions, DFT calculations, and collaborative research with industry, involving new screening techniques.

At Illinois, Isomura will focus her research on reaction development, catalysis, asymmetric reactions, and mechanistic study in physical organic chemistry.

“I want to collaborate with industry through the efficient synthesis of frameworks that are considered important in areas like drug development,” Isomura said.



After spending several years in a neurobiology lab, **Xiaotang Lu** said she is eager to return to the field of chemistry as an assistant professor at Illinois.

At Harvard, Lu worked with Prof. Jeff Lichtman, who pioneered connectomics, a nascent field in neuroscience that aims to produce and analyze comprehensive wiring diagrams of the brain. Lu focused

on developing tools and refining techniques to overcome challenges in connectomic studies.

“The technical challenges in this new field and the aspiration to understand how the interconnected nanostructures in our brain translate to diverse functions, and how diseases disrupt those connections, motivated me to pursue a career in academia,” said Lu, who graduated with a B.S. in materials chemistry from Nanjing University of Science and Technology in China and an M.S. in chemistry from Tsinghua University in China. She moved to the United States to pursue a Ph.D. in Materials Engineering at the University of Texas at Austin, where her graduate training focused on nanomaterials for energy applications.

At Illinois, Lu’s research will focus on developing biochemical tools and methods to enable multimodal, multiscale, and multiplex brain circuit imaging, with the goal of applying newly developed technologies to understand neuropsychiatric diseases.

“These diseases not only lack cures, but they are also not associated with any specific pathology, which may be embedded in the disrupted nanoscale connections between neurons,” Lu explains. “Our work will provide new insights into the diagnosis and prognosis of these conditions, which is the first step toward developing therapeutics for currently incurable diseases.”



Since joining the faculty nearly two years ago following postdoctoral work at UC Berkeley, **Ben Snyder** has received funding through the Research Corporation for Science Advancement for a “Scialog: Negative Emissions Science” project to investigate self-amplifying adsorbents for negative carbon emissions. And he was awarded an American Chemical Society Petroleum

Research Fund grant enabling his research group to investigate exciting questions surrounding the formation of reactive metal-oxo intermediates in heterogeneous catalysis.

“If successful, our approach will provide new insights into how inert hydrocarbon substrates can be transformed into valuable products using cheap and abundant oxygen,” said Snyder, who received his Ph.D. from Stanford University in 2018, where he was an NSF Graduate Fellow and Stanford Graduate Fellow and then moved to UC Berkeley as an Arnold O. Beckman Postdoctoral Fellow.



An inorganic chemist, **Anastasia Manesis** has spent her first year on the faculty building a bioinorganic lab equipped for research exploring metals, microbes, and metabolism. Specifically, her projects will focus on structural and mechanistic studies of metalloenzymes, identifying novel metal cofactors within large, unexplored protein superfamilies through rigorous genome mining and bioinformatics methods to identify new metalloenzyme cofactors involved in microbial metabolisms.

With four graduate students from chemistry and biochemistry, Manesis said her group is working toward publishing their first set of papers, and she has secured a National Institutes of Health New Investigator grant totaling \$1.25 million over five years.

Manesis completed a Ph.D. in biochemistry at Ohio State University, studying nickel metalloenzymes relevant for energy-related catalysis. As a Simons Postdoctoral Fellow of the Life Sciences Research Foundation at Northwestern University, Manesis conducted research on copper transport in methanotrophs.



An inorganic chemist, **Majed Fataftah** has spent his first year as a faculty member launching his physical inorganic chemistry research group at Illinois. A chemistry and biochemistry major at the University of Washington, Fataftah received his Ph.D. from Northwestern University and was a National Institutes of Health NRSA postdoctoral fellow at Yale University.

At Illinois, Fataftah is building a lab that focuses on using synthetic chemistry to tackle problems at the intersection of chemistry, physics, and materials science. He wants to exploit the synthetic tunability of molecules to control photophysical properties for advancements in quantum information science, and the magnetic properties of molecules to design novel magnetic materials, and reactivity of molecules to model heterogeneous and bioinorganic active sites for advancements in catalysis.



Christy F. Landes and **Stephan Link** launched their respective academic research careers in 2006, and after more than a decade pursuing their scientific goals at Rice University, the physical chemists joined the Illinois faculty to grow their research careers in the collaborative and interdisciplinary research environment at the University of Illinois. Link is doing pioneering work in nanophotonics. And Landes leads an NSF Center comprised of an interdisciplinary multi-university team of researchers and focuses on improving experimental and theoretical methods to better understand structure-function relationships at heterogeneous interfaces with an overall goal to design better materials. Recently, the U.S. Department of Energy awarded Landes and Link \$1 million in new funding for research to study Energy Transfer at Nanoscale Interfaces.

They recently published research detailing how nano-sized bits of light-absorbing gold transfer electrons to titania, which provided valuable new insight into the mechanism of plasmon-mediated charge transfer that could lead to more efficient photovoltaic and photocatalytic devices.

HIGHLIGHTS

Highlights 2023-24

Prashant Jain invested as G.L. Clark Professor of Physical Chemistry

In December 2023, **Prashant Jain** was invested as the G.L. Clark Professor of Physical Chemistry with university leaders, colleagues, students, family, and friends in attendance.

As Venetria K. Patton, dean of the College of Liberal Arts & Sciences, said during the ceremony, this recognition is not given lightly or frequently and named positions require exceptional contributions to research, teaching, and service.

"Today we add Prashant Jain to that list of impressive colleagues," Patton said. "Prof. Jain has distinguished himself as an innovative



award-winning researcher and educator. He has been recognized by his students and colleagues alike for his impact as a teacher and has led by example while serving in administrative roles and committees within the Department of Chemistry."

This past year, Jain also received two campus awards for excellence in undergraduate teaching. The Office of the Provost and Vice Chancellor for Academic Affairs selected Jain as recipient of the Excellence in Undergraduate Teaching award, and he received the College of LAS Dean's Award for Excellence in Undergraduate Teaching. He is the first faculty member in chemistry to receive each of these awards.

Jain teaches lecture and laboratory courses in physical chemistry, which are commonly regarded with anxiety by undergraduates, but Jain has consistently received excellent teaching evaluations as he strives to make the subject matter engaging through his innovative teaching techniques and dedication. Jain said teaching undergraduate students has been "a true joy."

"On class days, I am filled with energy. Going to class is often the focal point of my day. What I love most is seeing in my students' eyes a spark of wonder and excitement about a new chemical principle or phenomenon covered in class," Jain said.



From left: Prof. Jonathan Sweedler, College of LAS Dean Venetria Patton, Prashant Jain wearing the G.L. Clark medal, and Prof. Catherine J. Murphy.

Kenneth S. Suslick elected to National Academy of Sciences



Kenneth S. Suslick, Marvin T. Schmidt Professor of Chemistry Emeritus, was elected to the NAS for distinguished and continuing achievements in original research. He works at the forefront of chemical sensing, having developed an artificial optoelectronic "nose" capable of detecting harmful substances in the air, such as poisonous gases, toxins, and explosives.

Paul J. Hergenrother named 2023 National Cancer Institute Outstanding Investigator



Paul J. Hergenrother, the Kenneth L. Rinehart Jr. Endowed Chair in Natural Products Chemistry and Cancer Center at Illinois Deputy Director is the first Illinois researcher to receive this award. Hergenrother focuses on the identification of new anticancer compounds with unusual modes of action, and in collaboration with other Illinois researchers, has discovered

multiple new anticancer compounds.

Christy F. Landes elected Fellow of the American Association for the Advancement of Science



Christy F. Landes, Jerry A. Walker Endowed Chair in Chemistry, was elected a 2023 AAAS Fellow for "development of next-generation tools and models to image and understand dynamics governing separations at soft interfaces at the single analyte limit." Landes studies the structure-function relationships in biological processes to inspire innovations in materials design. Landes also received the 2024 Kazuhiko Kinoshita Award in Single-Molecule Biophysics from the Biophysical Society for "developments of single-molecule measurement techniques and their application to chemical and biological systems such as polymers and ion channels."

Douglas A. Mitchell elected to the American Academy of Microbiology



Douglas A. Mitchell, John and Margaret Witt Professor of Chemistry, was elected a 2024 fellow of the American Academy of Microbiology, the honorific leadership group within the American Society for Microbiology, in recognition of scientific achievement and original contributions that have advanced microbiology. The Mitchell lab is a chemical biology group that focuses on the study of natural products.

Jeff Chan, graduate student Melissa Lucero receive 2024 ACS National Award



Prof. **Jeff Chan** and **Melissa Lucero** (PhD, '22) received the Nobel Laureate Signature Award for Graduate Education in Chemistry, recognizing outstanding graduate students and their preceptors in the field of chemistry. Lucero worked on developing a non-toxic, small-molecule probe that provides real-time visualization of disease progression without the need for surgical intervention and developing a finely tuned molecular agent that can target lung and other cancer cells for imaging and treatment. Lucero is now a postdoctoral fellow at the Center for Cancer Research in Maryland.

Andrew A. Gewirth receives ACS Analytical Chemistry Division Award in Electrochemistry



Research in the lab of **Andrew A. Gewirth**, Peter C. and Gretchen Miller Markunas Professor in Analytical Chemistry, focuses on the structure and reactivity of surfaces and interfaces, using local probe microscopies in conjunction with electrochemical, computational and spectroscopic methods. Electrochemical use of the Atomic Force Microscope was developed in the Gewirth laboratory.

Lisa Olshansky receives 2024 Paul Saltman Young Investigator Award



The award is given each year to a young investigator who has made outstanding contributions to the field of bioinorganic chemistry. Prof. **Lisa Olshansky's** work focuses on examining the interplay between protein conformational changes and metallofactor activation with application in the development of new systems for solar energy conversion, biosensing, and catalysis.

Mikael Backlund selected a National Academy of Sciences Kavli Fellow



Selected a Kavli Fellow by the National Academy of Sciences (NAS), Prof. **Mikael Backlund** participated in the 2024 U.S. and international Kavli Frontiers of Science symposia. The Backlund group is a physical chemistry lab doing both theoretical and experimental research. The central focus is to apply the machinery of quantum sensing and metrology to the measurement of molecules, biomolecules and materials.

Company created by Illinois co-founders receives DOE Small Business of the Year Award



Tiptek, LLC, was co-founded by chemistry alum Scott Lockledge (PhD, '90) and Illinois professors Joseph Lyding, Robert C. MacClinchie professor in the Department of Electrical and Computer Engineering, and **Gregory S. Girolami**, William H. and Janet G. Lycan Professor of Chemistry. Tiptek received the Small Business Innovation Research and Small Business Technology

Transfer award for development of a product line that includes hard, conductive, and ultra-sharp probes that are used by the microelectronics industry in three areas — semiconductor fault detection, scanning tunneling microscopy, and atomically precise manufacturing.

May 2024 Convocation Speaker: H.N. Cheng (PhD, '74)



The Department of Chemistry celebrated 177 graduates in the annual May Convocation ceremony (119 Bachelor's, 10 Master's, and 48 Ph.D.s). The keynote address was delivered by **H.N. Cheng** (PhD, '74) who retired in May 2022 from the Southern Regional Research Center of the U.S. Department of Agriculture in New Orleans. He still serves as a collaborator at SRRC, where he continues his research activities in several projects.

“It is wonderful to return to Illinois and meet the wonderful new graduates today.... remember that you have been educated at one of the best chemistry schools in the world.” **H.N. Cheng**

Alumni events

August 13, 2023

Alumni & Friends Reception, San Francisco

October 27, 2023

Alumni lecture featuring Greg George (BS, '82), Persedo Spirits

November 10, 2023

Alumni Career Panel: Chemistry and Beyond

- **Brett McGuire** (BS, '09) Class of 1943 Career Development Assistant Professor of Chemistry, Massachusetts Institute of Technology
- **LaShaunda King-McNeil** (BS, '95) Senior Director, R&D, Olay Product Development & Packaging Innovation, Procter & Gamble
- **Alan Wu** (PhD, '80) Professor of Laboratory Medicine, Chief, Clinical Chemistry Laboratory, San Francisco General Hospital

February 13, 2024

Alumni Career Chat featuring **Patrick Hanley** (PhD, '12), R&D Director, Dow

February 23, 2024

Alumni Career Chat featuring **Justin Gallivan** (BS, '94) Senior Program Director W. M. Keck Foundation

March 17, 2024

Alumni & Friends Reception, New Orleans

March 28, 2024

Alumni Lecture featuring **Richard Lazarus** (BS, '76), Professor of Law, Harvard Law School

April 5, 2024

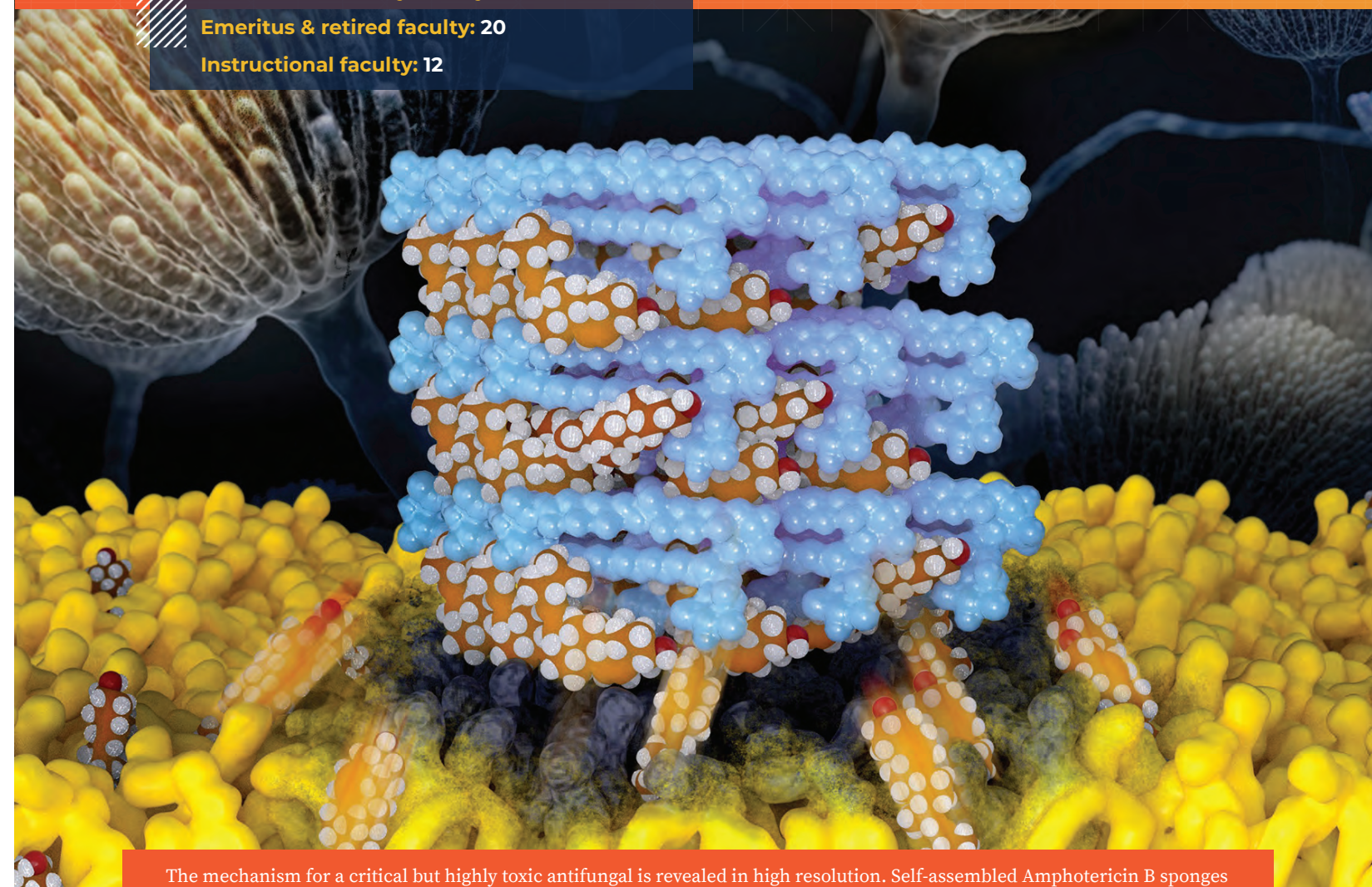
Alumni Career Chat featuring **Daniel Heller** (PhD, '10), Head of Cancer Nanomedicine Laboratory, Sloan Kettering Institute

FACULTY & RESEARCH

Full-time Chemistry faculty: 33

Emeritus & retired faculty: 20

Instructional faculty: 12



The mechanism for a critical but highly toxic antifungal is revealed in high resolution. Self-assembled Amphotericin B sponges (depicted in light blue) rapidly extract sterols (depicted in orange and white) from cells. Image by Jose Vazquez

New antifungal molecule kills fungi without toxicity in human cells, mice

A new antifungal molecule, devised by tweaking the structure of prominent antifungal drug Amphotericin B, has the potential to harness the drug's power against fungal infections while doing away with its toxicity, according to a study led by **Martin D. Burke**, May and Ving Lee Professor for Chemical Innovation. A naturally occurring small molecule produced by bacteria, AmB excels at killing fungi, but is reserved as a last line of defense because it is also toxic to humans, especially kidneys. Researchers uncovered the mechanism of the drug, how it kills human kidney cells and its atomic-level structure. Using the structural information along with functional and computational studies, they understood how AmB functions as a potent fungicidal drug, which provided the insights to modify AmB to reduce the toxicity.

New antibiotic kills pathogenic bacteria, spares healthy gut microbes

Chemistry researchers developed a new antibiotic that reduced or eliminated drug-resistant bacterial infections in mouse models of acute pneumonia and sepsis while sparing healthy microbes in the mouse gut. The drug, called lolamicin, also warded off secondary infections with *Clostridioides difficile*, a common and dangerous hospital-associated bacterial infection, and was effective against more than 130 multidrug-resistant bacterial strains in cell culture. Chemistry Prof. **Paul Hergenrother** led the study with former doctoral student **Kristen Muñoz** (PhD, '23) and their findings were published in the journal Nature.

“People are starting to realize that the antibiotics we've all been taking — that are fighting infection and, in some instances, saving our lives — also are having these deleterious effects on us,” said Hergenrother. “They're killing our good bacteria as they treat the infection. We wanted to start thinking about the next generation of antibiotics that could be developed to kill the pathogenic bacteria and not the beneficial ones.”



Chemistry faculty selected CZ Biohub Chicago investigators

Illinois chemistry's **Catherine Murphy**, **Mei Shen**, and **Jonathan Sweedler** are part of the Chan Zuckerberg Biohub Chicago inaugural cohort of 48 scientists and engineers to receive funding for high-risk, high-reward research on topics related to instrumented tissues, inflammation, and the functions of the immune system. Also in the group are **Qian Chen**, a chemistry joint appointee and materials and science engineering professor, and chemistry affiliate and bioengineering professor **Rohit Bhargava**. The CZ Biohub Network focuses on understanding underlying mechanisms of disease and developing new technologies that will lead to actionable diagnostics and effective therapies.

Researchers develop therapeutic to reduce cancer treatment side effects

Chemistry Prof. **Jefferson Chan** and graduate student **Suritra Bandyopadhyay** published research demonstrating the development of an activatable cancer therapeutic to help eliminate the side effects of traditional chemotherapies. Their approach uses chemistry to develop molecules that can be activated by external light irradiation and cancer biomarkers to cause toxicity only at the cancer site, sparing healthy cells. The research focuses on improving drugs for Photodynamic Therapy (PDT), a clinically approved therapeutic technique that can be used as a standalone therapy, as an adjuvant alongside other therapeutics, or during surgical tumor removals to 'clean up' any remaining cancer cells to help prevent relapse.

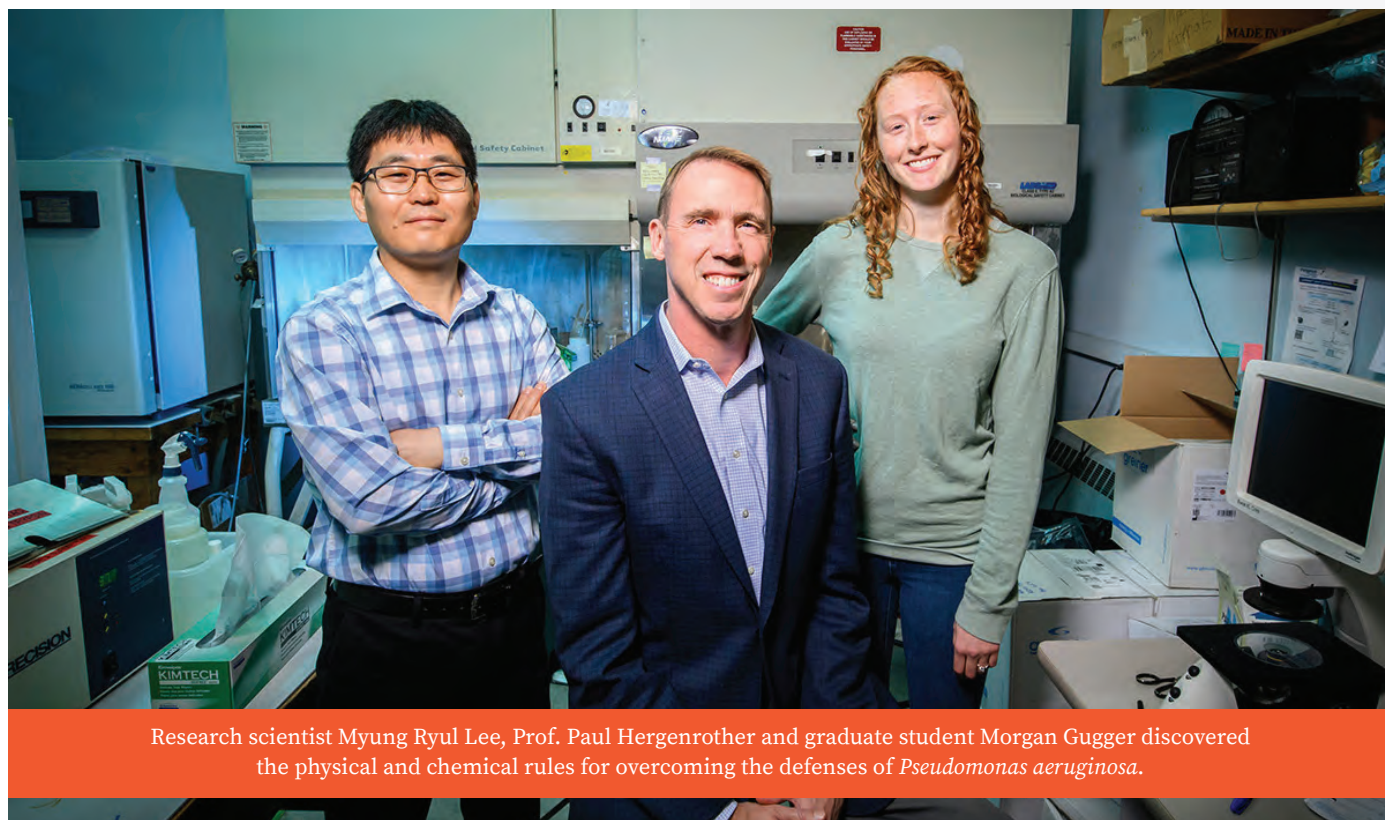
Machine learning tool simplifies widely used Buchwald-Hartwig reaction

The carbon-nitrogen bond forming reaction known as the Buchwald-Hartwig reaction has become one of the most widely used tools in organic synthesis, especially in the pharmaceutical industry, but it requires lengthy, time-consuming experimentation to determine effective reaction conditions. **Scott Denmark**, Reynold C. Fuson Professor of Chemistry, and former graduate student **Ian Rinehart** (PhD, '23) developed a machine learning tool that predicts in a matter of minutes the best conditions for a high-yielding reaction with no lengthy experimentation.

Researchers discover rules for breaking into Pseudomonas

Researchers reported they found a way to get antibacterial drugs through the nearly impenetrable outer membrane of *Pseudomonas aeruginosa*, a bacterium that – once it infects a person – is notoriously difficult to treat. By bombarding *P. aeruginosa* with hundreds of compounds and using machine learning to determine the physical and chemical traits of those molecules that accumulated inside it, the team discovered how to penetrate the bacterium's defenses and used this information to convert an antibacterial drug that previously had no activity against *P. aeruginosa* into one that did.

Prof. **Paul Hergenrother** led the work with former graduate student **Emily Geddes** (PhD, '22), research scientist **Myung Ryul Lee**, chemistry graduate student **Morgan Gugger** and other Hergenrother lab researchers and collaborators at Roche.



Research scientist Myung Ryul Lee, Prof. Paul Hergenrother and graduate student Morgan Gugger discovered the physical and chemical rules for overcoming the defenses of *Pseudomonas aeruginosa*.

Researchers get \$4.5 million for Energy Earthshots project

By packaging electrochemical reactions in smaller-than-standard serving sizes, interdisciplinary researchers aim to produce clean hydrogen, sequester carbon dioxide, and store renewable energies like wind and solar inexpensively and sustainably. The DROPLETS project received \$4.5 million from the U.S. Department of Energy's Energy Earthshots Initiative, a program created to quash net carbon emissions by 2050. Leading the Beckman Institute project is chemistry Prof. **Joaquín Rodríguez-López**, whose team consists of 12 researchers, including chemistry joint appointee and materials science and engineering professor **Qian Chen**, chemistry professors **Christy F. Landes**, **Jeffrey Moore**, **Lisa Olshansky**, and chemistry affiliate **Charles Schroeder**.

Researchers develop autonomous electrochemistry robot

An interdisciplinary team at Beckman Institute – co-led by Prof. **Joaquín Rodríguez-López** and **Charles Schroeder**, chemistry affiliate professor – developed an automated laboratory robot to run complex electrochemical experiments and analyze data. The benchtop robot, named Electrolab, greatly reduces effort and time by automating basic and repetitive laboratory tasks. It can be used to explore energy storage materials and chemical reactions that promote the use of alternative and renewable power sources like solar or wind energy.

Unprecedented compound takes step toward breast cancer clinical trials

Estrogen receptor-positive breast cancer is the most common form of breast cancer, and in advanced and metastatic form, is lethal with no drug able to eradicate these advanced tumors. But that could change. In November 2023, an anticancer compound developed in a Cancer Center at Illinois collaboration between the labs of chemistry Prof. **Paul Hergenrother** and biochemistry Prof. **David Shapiro** was licensed for pre-clinical development. The biotech company Oncoteq announced the licensing of the novel compound TEQ103 from Systems Oncology, which advanced the novel technology for clinical viability.

Catalyst mimics liver enzyme; may broaden scope of drug discovery

A team led by **M. Christina White**, William H. and Janet G. Lyan Professor of Chemistry, collaborated with scientists at Merck & Co. to develop a rapid and efficient method of making large quantities of metabolites directly from a drug or drug precursors via carbon-hydrogen oxidation catalysis. The critical component of the method is the White-Gormisky-Zhao catalyst [Mn(CF₃-PDP)] that can mimic the natural function of the CYP450 liver enzyme in oxidizing drugs and breaking them down to metabolites.

Copper molecule exhibits fastest ever electron transfer rates

Prof. **Lisa Olshansky** and former graduate student **Paul J. Griffin** (PhD, '23) have created copper molecules that can transfer electrons faster than any other copper molecule ever reported, by at least an order of magnitude, according to Olshansky, whose lab is testing the application of their copper complexes in solar energy conversion.

2023-24 Research Inventions, Patents, Startups

# Invention Disclosures	28
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# US Patent Applications	35
# US Patents Issued	15
# Startups <i>(Iridescent Sensors; Prof. Ken Suslick)</i>	1

Research technology being developed for first responders

Police officers and firefighters are usually the first responders to chemical spills, but there is no mobile and inexpensive technology enabling them to rapidly detect toxic gases. Iridescent Sensors Inc. (ISI) is developing a new class of chemical sensors based on the optoelectronic nose technology, developed by **Kenneth Suslick**, Marvin T. Schmidt Professor of Chemistry Emeritus. In February 2024, the National Science Foundation Convergence Accelerator program awarded ISI and a team of researchers the funds to develop a handheld analyzer using colorimetric sensor arrays as a field device to identify and protect against chemical spills by first responders. The long-term goal is a commercial device that can be fielded by first responders.

2023-24 Research Proposals Funded by Source

	#	\$
U.S. Dept. of Agriculture	1	\$50,000
National Institutes of Health	6	\$13,724,337
National Science Foundation	8	\$4,979,340
Private Funding	10	\$2,671,160
U.S. Department of Energy	3	\$1,825,912
U.S. Department of Defense	1	\$100,000
Total	29	\$23,350,749

Team will use \$3 million NIH grant to develop tools, agents to detect Alzheimer's Disease

Liviu M. Mirica, William H. and Janet G. Lycan Professor of Chemistry, received a \$3 million grant from the U.S. National Institute on Aging of the National Institutes of Health to lead an interdisciplinary team at Beckman Institute in the development and testing of multi-modal imaging agents for the detection of Alzheimer's disease and related dementias.

Researchers use electricity to recycle a widely used plastic

Researchers demonstrated how to use electricity to recycle polyoxymethylene (POM), a high-performance acetal resin, or thermoplastic, that is used in a variety of industries, including automobiles and electronics, but is challenging to recycle. Postdoctoral researcher **Yuting Zhou** worked with chemistry professors **Jeffrey Moore** and **Joaquín Rodríguez-López** on this electro-mediated process that deconstructs the polymer by breaking it down into monomers.

NSF grant awarded for recovering critical elements from U.S. mines

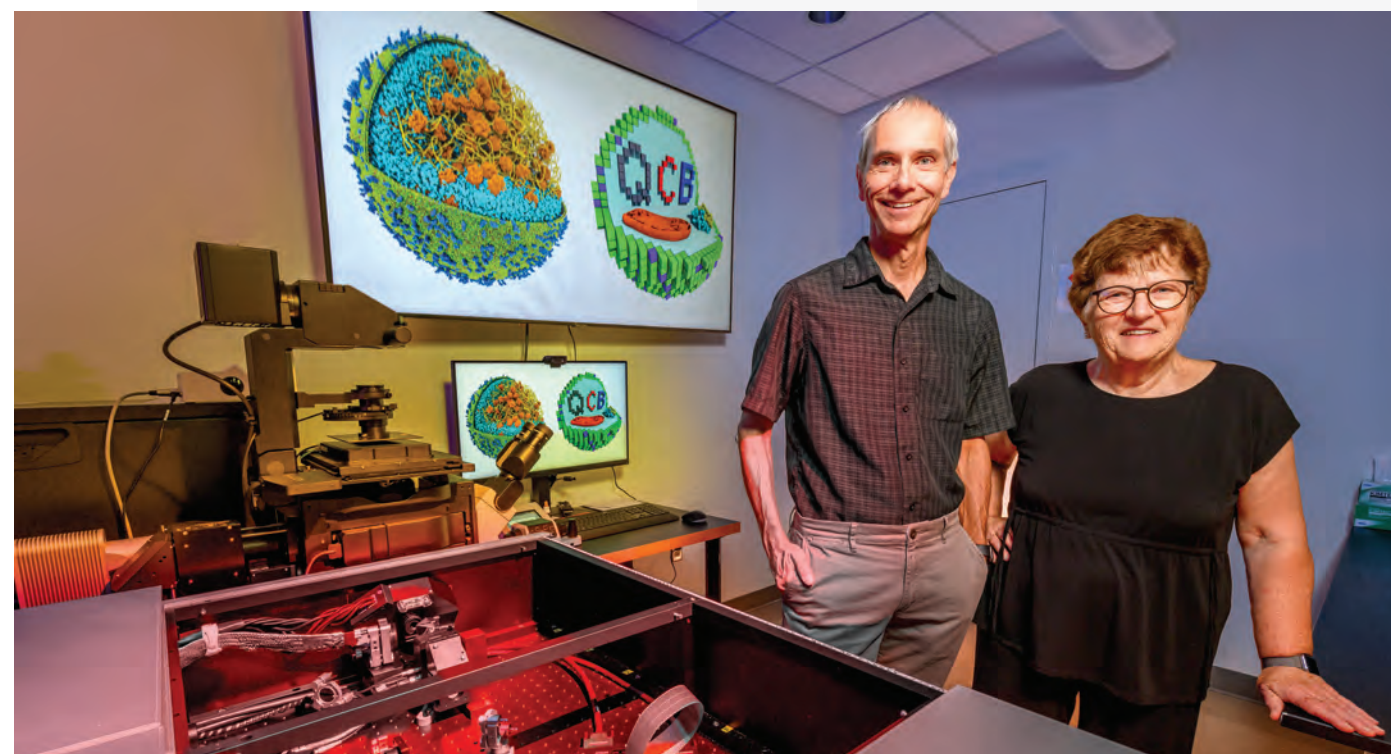
Prof. **Prashant Jain** is part of an Illinois research team awarded a \$2 million National Science Foundation grant to develop new functional materials to separate and recover rare-earth elements and platinum group metals from waste streams of U.S. mines. These critical elements – which are required materials for widely used products like smartphones and LED lights – are currently largely mined and processed by other countries.

Nick Jackson pursues neuromorphic computing research project

With a U.S. Department of Energy Early Career Award, Prof. **Nick Jackson** is studying neuromorphic computing, an alternative computing paradigm inspired by the structure and function of the human brain that shows potential for more energy efficient computing. Organic mixed ionic-electronic conductors have emerged as a high potential materials class to achieve neuromorphic computing, so Jackson is developing a new paradigm of scalable quantum mechanical calculations that will allow for the modeling of this new class of OMIEC materials.

Chemistry professors lead NSF Science and Technology Center for Quantitative Cell Biology

Supported by a \$30 million U.S. National Science Foundation grant, **Zan Luthy-Schulten**, Murchison-Mallory Endowed Chair in Chemistry, and **Martin Gruebele**, James R. Eiszner Endowed Chair in Chemistry, Professor Emeritus of Chemistry, have launched the NSF Science and Technology Center for Quantitative Cell Biology located at the Beckman Institute. Researchers will create whole-cell models to transform understanding of how cells function with cutting-edge imaging and simulation tools. The center will advance the study of healthy and diseased cells; accelerate research into gene expression, metabolism, and division; and share science through a partnership with the computer game Minecraft.



Prof. Zan Luthy-Schulten, right, and Prof. Martin Gruebele have launched the NSF Science and Technology Center for Quantitative Cell Biology.

STUDENTS

Chemistry welcomes largest number of undergraduates in five years



TOTAL
736 • 264 graduate students
• 472 undergraduate students

The university welcomed a record-breaking class for the Fall 2024 semester. With a freshman enrollment of 9,008, the new class brings record total student enrollment at 59,238, including on-campus and online students. This total includes 37,140 undergraduates and a record number of 20,765 graduate students.

The Department of Chemistry welcomed its largest class of undergraduates in at least five years with 139 students – 121 freshmen and 18 transfers – and a strong number of graduate students with 62.

The freshman class has a strong academic profile. The average ACT was 32.1 (31.5 in 2023) and the average SAT was 1440 (1418 in 2023). ACT and SAT scores continued to be optional this year, with approximately 51% of enrolling new students submitting scores.

This year's new freshmen include 6,429 students from Illinois, comprising 71% of the class. They represent 85 out of 102 counties throughout the state. The freshman class also includes 1,346 students from 43 other U.S. states and territories and 1,233 enrolled international students from 48 countries. The top home countries for incoming freshman international students continue to be China, India, and South Korea.

In chemistry, 66% of incoming undergraduates are from Illinois, 7% come from out of state and 27% are international students.

University-wide, more than 1 in 5 incoming students is a first-generation college student, making up 22% of the freshman class, and the freshman class also includes 22% of students from underrepresented groups. In chemistry, 23% of incoming undergraduates are first-generation college students, and 13% are from underrepresented groups.

Incoming Students Department of Chemistry 2024-25

This data is from 9th day enrollment numbers for the 2024-2025 academic year.

Total incoming undergraduate students: 139

Freshmen		Transfers	
Illinois	77	Illinois	15
Nonresident	10	Nonresident	0
International	34	International	3
Total	121	Total	18

URM Freshmen	17	URM Transfer	1
First Generation	26	First Generation	6

UNDERGRADUATE

Undergraduate students

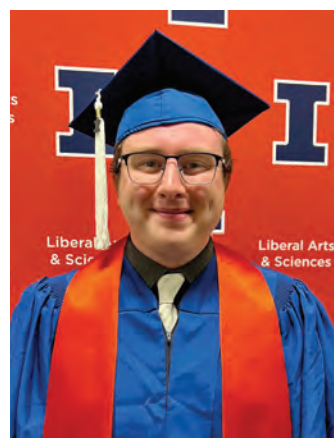
Scholarships

12% received a departmental/donor-funded scholarship

\$212,000 awarded in departmental/donor-funded scholarships

Undergraduates gain interdisciplinary research experience

In a survey of undergraduate chemistry majors, more than 75 students reported participating in undergraduate research in 2023-24. And 78% percent of those reported participating in research for two semesters or more.



The highest number reported doing research in chemistry labs, but students also conducted research in chemical and biomolecular engineering, materials science and engineering, veterinary medicine, integrative biology, kinesiology, bioengineering, biochemistry, agricultural, genetics, geology, environmental science, applied health sciences, psychology, education, speech and hearing science, and community health.

Zach Burke was a dual degree major in chemistry and astrophysics and an undergraduate researcher in the lab of Prof. Mikael Backlund. Burke did research on super resolution via image inversion interferometry with the overall mission to improve information in the fields of biochemistry and astronomy. Burke was recognized for his work in the lab, winning the John C. Bailar Award for Excellence in Undergraduate Research and the Royal Society of Chemistry Certificate of Undergraduate Excellence.

He is now pursuing a Ph.D. in chemistry at MIT. Burke said he is most proud of the opportunities he took advantage of at Illinois, including undergraduate research, which was a key to his undergraduate success.

“It is the best way to gain experience and determine what you want to do with your chemistry degree.”

Zach Burke

GRADUATE

Graduate students

Graduate student support

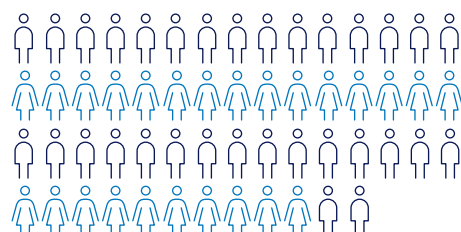
Fellowships	40
Research Assistants	145
Teaching Assistants	79
Total	264

Incoming Students Department of Chemistry 2024-25

This data is from 9th day enrollment numbers for the 2024-2025 academic year.

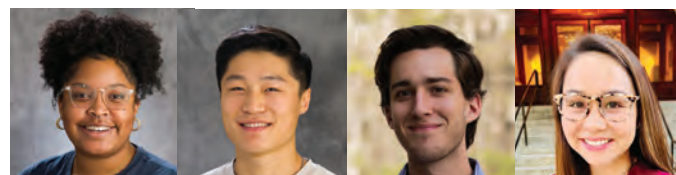
Total incoming graduate students: 62

Applicants	471	Domestic	40
Accepted	62	International	22



Male	37
Female	25

Graduate fellows tackle interdisciplinary research projects



From left to right: Kristin Martin; Jason Wu; Michael Pence; Chelsea Swartchick

In the Department of Chemistry, all graduate students are supported with a teaching assistantship, research assistantship or fellowships from external or internal resources. In the past year, there were 14 who were National Science Foundation Graduate Research Fellows and two who were selected Beckman Institute Graduate Fellows.

NSF Fellows

Illinois chemistry's newest NSF fellows, Kristin Martin and Jason Wu were awarded the prestigious fellowships in March 2024. Martin works on the development and surface modification of carbon-based electrodes for inorganic and biological applications, including a platform for large scale carbon dioxide capture to mitigate the oversaturation of greenhouse gases in the atmosphere and development of a biosensor with the ability to detect proteins that are overexpressed when patients have certain types of cancer. Wu works on automating synthesis of sequence-defined oligomers, which integrates various disciplines including organic synthesis, computational chemistry, and materials science for developing novel organic photovoltaic materials for harvesting renewable energy.

Beckman Fellows

As a Beckman Institute Graduate Fellow, Michael Pence worked on streamlining the process for optimization of electrochemical transformations through an automated platform, called the Electrolab, which will screen conditions for oxidization of common biomass byproducts, such as glycerol and polyols, a process that leads to value-added chemicals. And Beckman fellow Chelsea Swartchick focused on developing a novel therapeutic intervention for diabetes patients by synthesizing a liver-targeting nanoparticle containing a photothermal therapeutic agent, which is designed to induce a heat-shock response in liver cells, thereby upregulating production of protective heat-shock proteins and improving sensitivity to insulin.

Joe Forzano receives inaugural ACS Pride Merck Graduate Research Award

Graduate student Joe Forzano was one of seven to receive ACS Pride Merck Graduate Research Awards, presented for the first time in Spring 2024. A Ph.D. student advised by Prof. Jeff Chan, Forzano received the award and a stipend and presented research at the ACS Pride Merck Graduate Research Award symposium. Awardees are also paired with industry employees as part of a one-year mentorship program.



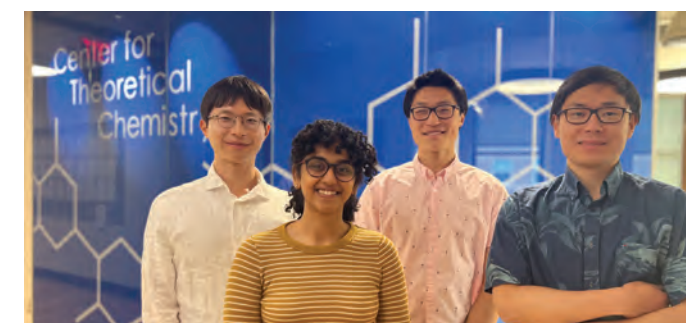
Sohang Kundu (PhD, '23) wins national dissertation award from American Physical Society



Sohang Kundu (PhD, '23) did his Ph.D. under the advisement of Prof. Nancy Makri developing theoretical methods based on the real-time path integral formulation of quantum dynamics to advance the understanding of quantum processes in large molecules and the condensed phase. The American Physical Society selected Kundu for the 2024 Justin Jankunas Doctoral Dissertation Award in chemical physics for “illuminating work

using real-time path integral methods to reveal the interplay of electronic and vibrational dynamics in excitation energy transfer.”

Chemistry team wins computational science hackathon



From left, Seonghwan Kim, Shruti Iyer, Jason Wu and Zheng Yu, won the Ashby Prize in Computational Science Hackathon at the National Center for Supercomputing Applications.

A team from the Department of Chemistry took first place among 12 teams in a cross-campus computational science competition at the National Center for Supercomputing Applications.

Three graduate students, Jason Wu, Shruti Iyer, and Seonghwan Kim, and postdoctoral researcher Zheng Yu won the Ashby Prize in Computational Science Hackathon in April 2024. They are members of Prof. Nick Jackson's research group. Wu and Kim are co-advised by Prof. Charles Schroeder in Materials Science and Engineering.

“Remarkably, they managed to win first place despite not having any computer scientists on their team,” Jackson said.

The 48-hour competition challenged teams to build a front-end workflow management system using Large Language Models (LLMs) and related tools to setup and execute computational workflows. Students were provided with access to the Delta supercomputer. The chemistry team created a system called “Mol-Hunter: an artificial intelligence agent for automated molecular discovery and synthesis.” Their workflow included machine learning predictions, molecular dynamics simulations, quantum mechanical calculations, literature search, a database application programming interface, and a retrosynthetic reaction network search.

ALUMNI

Alumni Impact

10,173 alumni in 54 countries
(9,592 – 94% live in the U.S.)

Daniel Heller (PhD, '10) working on new treatments for brain cancer

In 2023, Illinois chemistry alum **Daniel Heller** (PhD, '10) and colleagues reported a new nanotherapeutic approach targeting blood vessels to deliver medicines to brain cancers. This work could open doors to new treatments for brain cancer.

As the head of the Cancer Nanomedicine Laboratory at Memorial Sloan Kettering Cancer Center, Heller has rapidly become one of the preeminent young scientists in cancer science, and in recognition of this important work, he was honored in Spring 2024 with the **LAS Outstanding Young Alumni Award**. He also works with startup companies to bring his group's innovations to the clinic and is helping to build a Cancer Engineering PhD program to explore how engineers and cancer researchers can be integrated in new ways.

"I get to do so many exciting things," said Heller, who returned to campus for the College of LAS alumni award ceremony and to deliver a research lecture for students, faculty, and staff. He shared his unique career path that began with a degree in history and what he enjoys most about his job now.

"Getting to work with so many great people from different backgrounds and fields of expertise and working to make a difference in peoples' lives," he said.



Daniel Heller, left, accepts the LAS Outstanding Young Alumni Award from Dean Venetria K. Patton



Alumni Tom Remec and Susan Morisato receive LAS Dean's Quadrangle Award

Tom Remec (BS, '74, chemistry; MS '83, metallurgical engineering) and **Susan Morisato** (BS, '75, mathematics and education; MS, '77, mathematics) received the **LAS Dean's Quadrangle Award** in Spring 2024. They have found many avenues to give back since graduating, including serving on advisory boards and leadership councils for various departments and providing funding for the Thomas Remec and Susan Morisato Fund for Data Science in the Chemical Sciences and the Susan C. Morisato Mathematics Scholarship. Susan Morisato retired as the president of the Medicare Supplement Business for United Healthcare and AARP, and Tom retired as the president of Beta Instruments and Display Process Consulting.

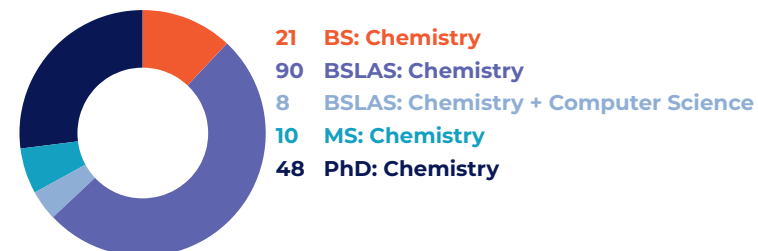
Two alumni elected to National Academy of Engineering



Alums **Hye Kyung Timken** (PhD, '87), a principal scientist and Chevron Fellow at the Chevron Technical Center, and **Taeghwan Hyeon** (PhD, '96), a distinguished professor in the School of Chemical and Biological Engineering at Seoul National University in Seoul, South Korea, were elected to the NAE in February 2024. Timken was elected for development of environmentally friendly processes for producing hydrocarbon fuels. Timken has worked for more than 20 years on the groundbreaking technology. Hyeon was elected for scalable synthesis of precisely controlled nanoparticles and design of inorganic nano-biomaterials. Hyeon is known for pioneering work in the chemical synthesis of uniformly sized nanocrystals and applications of functional nanomaterials.



New alumni by degree: 177 graduates in 2023-24



Mary-Dell Chilton awarded National Medal of Technology and Innovation

In a ceremony at the White House on October 24, 2023, chemistry alum **Mary-Dell Chilton** (MS, '60; PhD, '67) was awarded the **National Medal of Technology and Innovation** by President Joe Biden. Chilton led the team of Syngenta researchers that produced the first transgenic plant and pioneered plant biotechnology, discovering novel methods to improve plants' ability to control pests and withstand extreme conditions. Chilton retired in 2018.



Dr. Mary-Dell Chilton with President Biden at the White House. Photo courtesy of Ryan K. Morris and the NSTMF.



Rebecca Ulrich, far left, is pictured with the novel antibiotic research team, including back row from left, Paul Hergenrother; Chris Fields, Po-Chao Wen, Matt Sinclair; and, front row, from left, Hyang Yeon Lee; Jessica Holmes, and Emad Tajkhorshid.

Rebecca Ulrich (PhD, '24) continues infectious disease research at Broad Institute

The American Chemical Society awarded PhD graduate **Rebecca Ulrich** the 15th Irving S. Sigal Postdoctoral Fellowship for 2024–2026. Ulrich is conducting her fellowship studies with Deborah Hung at the Broad Institute of Harvard and MIT. She will focus her postdoctoral work on chemical-genetic approaches for tuberculosis drug discovery and working with the PROSPECT technology developed in the Hung lab for rapidly identifying and validating new targets in *Mycobacterium tuberculosis*.

Ulrich was advised by Paul Hergenrother, Kenneth L. Rinehart Jr. Endowed Chair in Natural Products Chemistry, and Professor of Chemistry. Hergenrother said Ulrich has become a true expert at antibiotic drug discovery and efflux of antibiotics from bacteria.

"She has made multiple contributions to several important discoveries and publications, including our recent finding of a novel antibiotic that spares the gut microbiome," he said.

Ulrich said the resources and opportunities for collaboration at the U. of I. are unmatched.

"And that is what has enabled me to tackle big and exciting scientific questions, collaborate widely, and explore different areas of chemical biology and hone my interests," she said.

Parmeet Kaur (BS, '24) starts career in research & development

In May 2024, Parmeet Kaur graduated with a Bachelor of Science degree in chemistry and in August joined SC Johnson's Research and Development Early Career Development Program, a three-year program with three one-year rotations in various departments across R&D. Kaur was an undergraduate researcher in Prof. Jeffrey Moore's lab working on the investigation of material properties of a new frontal ring-opening metathesis polymerization (FROMP) monomer called norbornene acetate. Kaur said a highlight of her undergraduate experience was serving as President of the ACS student chapter and the Women in Chemical Sciences group. Kaur was a James Scholar, received the Office of Minority Student Affairs Scholastic Award and the J.J. Lagowski Scholarship in Chemistry, Stanley R. Levy Leadership Scholarship, Homer J. and Edith M. Birch Scholarship, and the Oliver J. Bell Merit Scholarship in Chemical Sciences.

Bachelor's degree graduate success (2022-23)

Secured First Destination	94%
Employed	46%
Continuing Education	48%
Average Full-time Employed Salary	\$71,248

This graduate success data is self-reported and represents a 68% response rate (88 of 129) from those who received an undergraduate degree in 2022-2023 from the Department of Chemistry. Visit illinoisuccess.illinois.edu for more information.

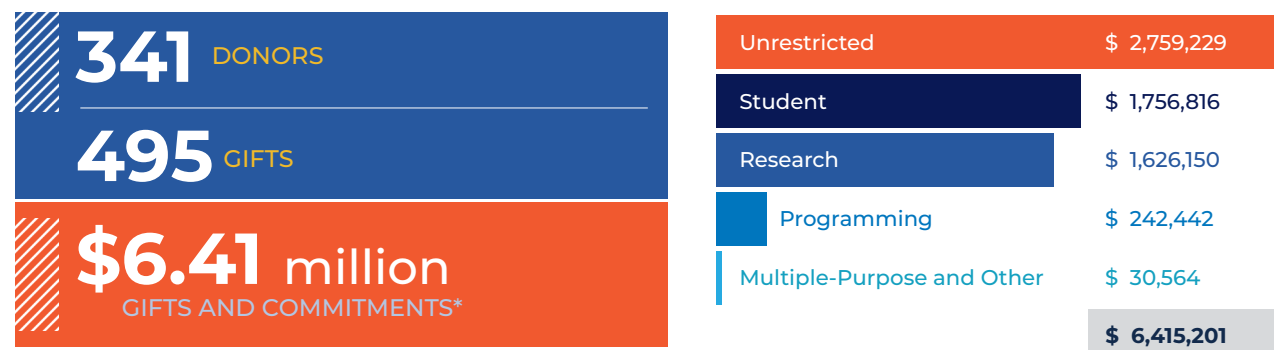
GIVING

Giving 2023/24

Thank you

Your gifts directly support our students and faculty, empowering transformative learning experiences and innovative research. Thank you for your generosity in partnering with us to make a difference in people's lives and in our world. We are deeply grateful.

Giving totals for the 2023-24 Fiscal Year



*Does not include payments on major gift commitments made prior to 2023-24.



In the back row, Dr. Milligan is the third adult from the left wearing a gray shirt with a camera strap around his neck.

Dr. David Milligan establishes graduate fellowship in Chemistry at Illinois

In a 1994 alumni profile story, Dr. David Milligan (MS, '65; PhD, '67) expressed his belief that hard work and the rational application of science would continue to pay off in years to come.

"In the future, industry will be scrambling to hire high quality talent. There is a tremendous need for more scientifically literate students evolving through the system," said Milligan, who was Abbott Laboratory's Corporate Vice President for Pharmaceutical Products Research and Development when he was quoted in the School of Chemical Sciences Alumni News.

Now, exactly 30 years later, Milligan has established a graduate fellowship for students in chemistry at the University of Illinois Urbana-Champaign, to help meet that same need for well-educated scientists by supporting students as they earn their PhDs in chemistry.

Milligan said it was also important to him to establish the Dr. David V. Milligan Graduate Fellowship in Chemistry to help the U. of I. attract the highest-quality new graduate students in chemistry. The fellowship will be awarded for the first time in Fall 2024.

After graduating summa cum laude in 1963 from Princeton University with an AB degree in Chemistry, Milligan said it was a NASA scholarship that convinced him to choose the chemistry graduate program at Illinois rather than Wisconsin. At Illinois, he discovered an excellent research environment in the chemistry graduate program, where he said he was stimulated and challenged, worked hard, and received excellent support from his advisor, Prof. Stan Smith.

"Obtaining my PhD from a high-quality Chemistry department allowed me many opportunities," said Milligan, who also took several business courses at Illinois. "This took a while to get approved, but it did provide me with an advantage of having an MBA-like background, which became very valuable later and why I was comfortable putting sales and marketing on my CV."

Using his scientific knowledge and business acumen, Milligan built a very successful career in science-based business, first at 3M and eventually Abbott Laboratories, where he retired as Senior Vice President and Chief Scientific Officer after a long career that included many years in pharmaceutical research and development.

Milligan said his responsibilities ranged over the entire R&D spectrum in support of a growing pharmaceutical business, from

the discovery of new chemical entities and the basic chemistry and biology that enable the generation of clinical candidates, through the clinical development program, filing product license applications, and support of marketing efforts.

In graduate school, Milligan knew he was interested in the business, management, and marketing side of science-based business. After graduating, he said he was given the unusual treatment of interviewing with the head of R&D at 3M, who offered him a choice of areas within the company, and he chose the Photographic Products Division R&D run by George Rathmann.

"This totally changed my career path and my long-term career success. George became a mentor, and I followed him from 3M to a division of Litton Industries and on to Abbott," said Milligan, whose career also included serving as director or chairman of many public and private company boards.

Now retired and working as a consultant, Milligan said looking back on his life and a career that took him all over the country and the world, what makes him most proud is his family. He and his wife, Sue, have enjoyed watching their children grow up and pursue successful careers and have children of their own.

"My wife and I both grew up in Evanston, Illinois, and first dated when she was a freshman, and I was a junior at Evanston High School. She and I worked together to get through tough times in the early days and now have a very successful family including our grandchildren," he said.

To read the full story visit:

go.chemistry.illinois.edu/MilliganFellowship

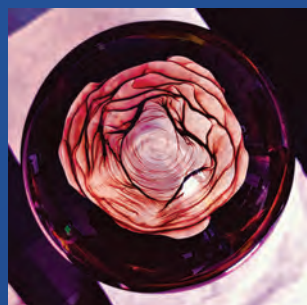


To learn more about how gifts to the Department of Chemistry are making a difference, please visit: go.chemistry.illinois.edu/GivingImpact.

Chemistry winner, finalists in School of Chemical Sciences Image Challenge

Four images created by students, faculty and postdoctoral researchers in the Department of Chemistry were chosen as finalists in the School of Chemical Sciences 2023 Image Challenge, and one of those images was the overall winner of the main category.

The annual image challenge highlights computer-assisted or traditional scientific images that feature an object, process, or technique within a scientific research project in the Department of Chemistry or in the Department of Chemical and Biomolecular Engineering at Illinois. Alumni from both departments volunteer as judges for the annual challenge. If you are interested in being a judge, let us know at chemistry@illinois.edu!

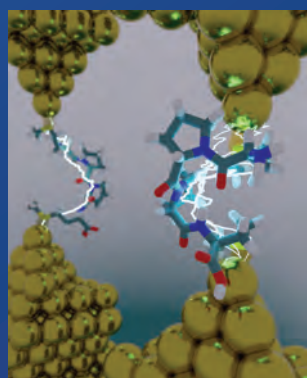


Overall Winner

Rose in the flask

Xiaolin Liu (Jeffrey Moore lab)
Department of Chemistry

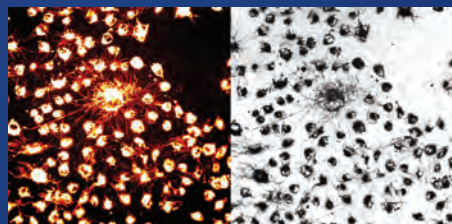
Some roses grow from flowerbeds, and others appear in chemistry labs. This rose-like hue and pattern formed at the bottom of a flask as dichloromethane solvent evaporated from an aromatic compound sample. The polycyclic aromatic hydrocarbons show useful electronic properties and impart color.



Do Peptides Dream of Electric Sheep?

Moeen Meigooni (Emad Tajkhorshid group)
Center for Biophysics and Quantitative Biology, Department of Biochemistry, Department of Chemistry, and Beckman Institute

This image shows an atomistic model of a molecular break junction. An oligopeptide is caught between two gold electrodes, forming a single-molecule circuit. Using a combined experimental/computational approach, we show that secondary structure plays an important role in determining electron transport in peptides. Image rendered using VMD and Blender.



Driving a muscle

Suritra Bandyopadhyay (Jeff Chan group)
Department of Chemistry

Resembling spiders or fireworks, these are images of exquisite crystals of formazan. Astonishingly, these patterns are crafted not by 3D printing but by living cells. The reducing nature of mitochondrial enzymes yields insoluble Formazan crystals from 3-(4,5-dimethylthiazol[1]2-yl)-2,5-diphenyltetrazolium bromide, which is used to assess the cellular toxicity of chemicals.



Golden Necklace

Xiaolin Liu (Jeffrey Moore lab)
Department of Chemistry

This "golden necklace" pattern was formed because of trapped air and water pockets during frontal ring-opening metathesis polymerization, an energy-efficient technique for fabricating high-quality thermosets and composites used in engineering applications.



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