

ILLINOIS TECH

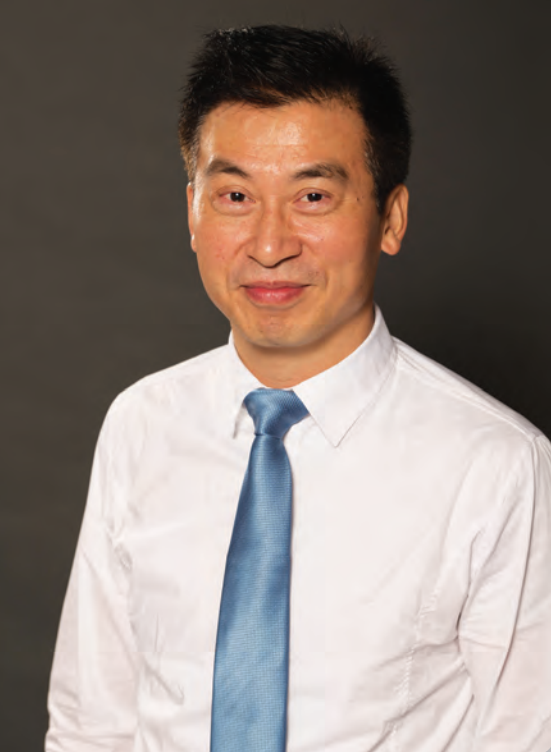
# CHEMISTRY ELEMENTS

A publication of the Department of Chemistry at Illinois Tech



Photo by Bonnie Robinson

2022 Issue



# Letter from the Chair

Welcome to the 10th issue of *Chemistry Elements*.

It is good to be back on campus after we all have endured the COVID-19 pandemic! I'm so happy to meet students and chat with colleagues personally! We have been able to organize and hold more in-person events and activities as well, including our regular department meetings.

We hosted our 2022 Kilpatrick Lecture on September 23, along with the launch of our new master's program in sensor science and technology. We were honored to have two experts in sensor science as the speakers for this event: Professor Yi Lu from the University of Texas at Austin and Professor John Rogers from Northwestern University. Many thanks to committee chair Professor Richard Guan and committee members Assistant Professor Sameh Elsaidi and Professor Rong Wang for their dedicated work to bring this flagship event back after a long hiatus. Many of our friends, alumni, students, faculty, and staff enjoyed the event, either in person or virtually, and a well-attended poster session and research discussion followed. Thanks to so many individuals and offices for helping to make this wonderful lecture series happen, including the offices of Marketing and Communications, Technology Services, Advancement, catering services, and our dean's office.

Our department welcomed more undergraduate and graduate students this fall semester, including a record-high cohort of new undergraduate students—the largest in four decades. I greatly appreciate

our departmental Undergraduate and Graduate Studies committees for their proactive recruitment endeavors, all of the members of our department for their diligent outreach efforts, and so many friends and colleagues for their support and teamwork, especially those at the offices of Undergraduate Admission, Graduate Admission, Marketing and Communications, and our dean's office. Boosted by these successful strategies and motivated to learn new approaches, we are now renewing and broadening our outreach and recruiting efforts to further increase and diversify our student population.

In terms of student activities to enhance the learning experience of our students and build bonds and teams among our students and faculty/staff, we held meet-and-greet events for our new undergraduate and graduate students during the first week of the fall 2022 semester. We then held a departmental picnic at Burnham Park on September 10. Professor Hyun-soon Chong traveled with her graduate students in the summer to Springfield, Illinois, to attend the Illinois State Fair, where they did chemistry demonstrations with colleagues from the Illinois Section of the American Chemical Society to promote science and our programs. Our chemistry club is running several events as well, including a Mole Day contest and Halloween pumpkin carving. They also had a table at the Illinois Tech Career Fair in September, and held a s'mores study night in November. We are always encouraging our students to attend and present their work at conferences and network with others in the field. Taking advantage of our location, many of our students attended the annual American Chemical Society meeting that was held in late August at McCormick Place Convention Center in Chicago—another great opportunity for all of us, too. Thanks to the Fanta family for supporting our students' travel to conferences. Finally, we have distributed our recently designed department hats to our students and faculty.

We are pleased to have Cinthya Osuna, who joined us as our laboratory manager in January 2022. Osuna's main responsibilities include managing the overall operation of our general chemistry labs, maintaining our teaching and research equipment, and serving as our department safety coordinator. She brings a decade-long track record of industrial experience, and is pursuing her M.S. degree.

After an external review of our department programs in December 2021, we have been holding specific department meetings over the past several months to develop our departmental strategic plan for the next five years.

Our faculty members have continued working hard on scholarly activities. More than 30 proposals have been submitted by seven of us to various funding agencies in 2022 so far. For example, Professor Guan received two new grants from the National Institutes of Health and the National Science Foundation to continue his research endeavors on nanopore-based science. Adam Hock continues his work on interfaces with Argonne National Lab and on atomic layer etching with the Semiconductor Research Corporation. Professor Braja Mandal received a Cross-Disciplinary Seed Funding Grant from the Wanger Institute for Sustainable Energy Research at Illinois Tech to support his research on lithium-ion batteries. Assistant Professor Elsaidi received an internal Educational and Research Initiative Fund award to develop novel dual-functional porous materials for integrated CO<sub>2</sub> capture and conversion.

As C. S. Lewis puts it: "You can't go back and change the beginning, but you can start where you are and change the ending." We here at the Department of Chemistry are always creating new chapters and are aiming for a bright 2023 and beyond!

Keep us in mind if you are in the Chicago area. We always welcome a visit from our alums and friends at any time.

Thank you all for your continuous support of the Department of Chemistry at Illinois Tech. I wish you a happy and productive 2023!

**Yuanbing Mao**  
Professor and Chair  
Department of Chemistry

December 2022



## New Professor Brings Separation Science and Sustainability Research to the Department of Chemistry

For new Illinois Institute of Technology Assistant Professor of Chemistry Sameh Elsaidi, a passion for science runs in the family. Elsaidi, who grew up in Alexandria, Egypt, is the son of a father who teaches elementary school science. As an elementary school student, Elsaidi had his father as a teacher.

"I was always asking him a lot of questions," Elsaidi says. "His talks about how experiments worked and how atoms interact were invaluable. My father always encouraged me, and I was greatly inspired by science."

As of January 2022, Elsaidi is the latest hire in the Department of Chemistry, where his work focuses on materials chemistry and, more specifically, separation science and sustainability.

"In my group, we are working on materials design, specifically on how to think at the molecular level and how to arrange atoms and molecules in the way that you want," Elsaidi says. "I chose materials chemistry as a research area because it is a multidisciplinary field of study, and I believe that we can develop materials for a wide range of applications. I believe that we are capable of designing materials for almost any application. I believe that we can control the material at all levels, from atomic to molecular to solid-state."

Elsaidi earned a bachelor of science in chemistry from Alexandria University in 2005 and spent the next five years teaching chemistry at the university while also taking courses as a graduate student in chemistry. He relocated to Florida for a doctoral program in inorganic chemistry at the University of South Florida in 2011,

**COVER:** A group photo of the attendees of the 2022 Kilpatrick Lecture outside of The McCormick Tribune Campus Center Auditorium on Illinois Tech's Mies Campus.



earning his Ph.D. in 2014. He then worked as a visiting assistant professor at Pacific Northwest National Laboratory in Washington before joining the National Energy Technology Laboratory in Pittsburgh as a research scientist. Elsaidi also served as a visiting research scientist at University of California, Berkeley in 2019, and in 2020 co-founded SE-MAT Smartly Engineered Materials LLC, a manufacturer of task-specific materials for which he continues to serve as chief executive officer.

Like his father, Elsaidi finds teaching very fulfilling, and he is excited to work with students and postdoctoral researchers on projects in his lab, the Center of Separation Science and Sustainability. The group focuses on materials design.

"[Materials design] is a much broader area and gives an opportunity for my students to master not only chemistry but also chemical engineering," Elsaidi says. "It's a bridge between chemistry and chemical engineering—how to transition materials from the laboratory to the industrial scale. We are interested in developing materials for energy storage applications from a sustainability standpoint. We are attempting to recover valuable elements from waste, such as uranium from seawater or nuclear waste. This entails the extraction of various elements, such as precious metals, lithium, and rare earth elements to maintain a sustainable system."

One of the main research interests in Elsaidi's lab is separation science, he says.

"We focus on bridging environmental preservation and energy-related applications in this area of research," Elsaidi says. "For example, we are currently working on the capture and conversion of carbon dioxide, which has the potential to solve the problem of climate change while also producing clean fuels. This also falls under the umbrella of sustainability, and this is the ambition I have for my lab."

Additional projects in Elsaidi's lab are aimed at separating radioactive gases for nuclear waste management and separating hydrocarbons. He has been working with two graduate student researchers, two master's students, one undergraduate student, and one postdoctoral researcher, and new graduate students joined the group in the fall.

"One of my main goals is to ensure my students' success in the lab and throughout their careers," Elsaidi says. "I tell my students all the time that we are a small family within the chemistry department and within the larger family at Illinois Tech. We are constantly striving for group success and collaborating with colleagues in our department and other departments. Our communication with one another is how we generate novel ideas, or how we ensure that our work is complementary, in order to obtain the full story and the true outcome of our collaboration."

Elsaidi expresses enthusiasm for continued collaboration across departments within the university as well as for taking advantage of the school's close proximity to other major universities and research facilities. He is actively applying for grant funding with the goal of continuously expanding the separation science and sustainability capabilities of his lab.

—Linsey Maughan

*Elsaidi was awarded a 2022-23 Educational and Research Initiative Fund (ERIF) grant from IIT for his work entitled "Dual-Function Porous Materials for Integrated CO<sub>2</sub> Capture and Conversion." He also held an outreach event entitled "Climate Change in the Chicago Metropolitan Area: Education, Awareness, and Actions" on Saturday, November 19, that included a talk, poster session, and hands-on training involving CO<sub>2</sub> adsorbent materials. Elsaidi initiated the EAA outreach endeavor and plans to hold events each semester. Elsaidi is also the Lewis College representative for the Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship advisory council.*

# 2022 Kilpatrick Lecture



The Department of Chemistry was pleased to have Professor Yi Lu from the University of Texas at Austin and Professor John Rogers from Northwestern University as our Kilpatrick Lecture speakers on September 23, 2022. The two speakers gave talks on sensor science titled "Advancing Metallomics, Metabolomics, and Pathogen Detections Using Functional DNA Nanotechnology" and "Soft Electronic and Microfluidic Sensor Systems for the Human Body," respectively. Thirty student posters were displayed at a reception following the lectures. These themed presentations help to promote our newly launched M.S. program in sensor science and technology.



Photos by Bonnie Robinson





**Yi Lu**

University of Texas  
at Austin

Professor **Yi Lu** is the Robert J.V. Johnson-Welch Regents Chair in Chemistry at the University of Texas at Austin. Lu received his B.S. degree from Peking University in 1986, and Ph.D. degree from the University of California at Los Angeles in 1992. After two years of postdoctoral research in the Professor Harry B. Gray group at the Caltech, Lu started his own independent career in the Department of Chemistry at the University of Illinois at Urbana Champaign in 1994. He was promoted to associate professor with tenure in 2000, to full professor in 2004, and named the endowed Jay and Ann Schenck Professor in 2010. In August 2021 Lu moved to University of Texas at Austin, becoming the Robert J.V. Johnson-Welch Regents Chair in Chemistry.

Lu's research interests lie at the interface between chemistry and biology. Specific areas of current interests include the design and engineering of functional metalloproteins as environmentally benign catalysts in renewable energy generation and pharmaceuticals; the fundamental understanding of DNAzymes and their applications in environmental monitoring, medical diagnostics, and targeted drug delivery; employing principles from biology for directed assembly of nanomaterials with controlled morphologies and its applications in imaging and medicine; and to engineer biocatalysts to address challenges in synthetic organic chemistry and applications of novel biocatalysts in synthetic biology for biomass conversion, and valuable products generation. Lu has received numerous research and teaching awards, including the Howard Hughes Medical Institute Professors Award (2002), being named a fellow of the American Association for the Advancement of Science (2007), being named a fellow of the Royal Society of Chemistry (2015), Royal Society of Chemistry Applied Inorganic Chemistry Award (2015), Joseph Chatt Award (2020), and being named a fellow of the National Academy of Inventors (2021).



**John A. Rogers**

Northwestern University

Professor **John A. Rogers** obtained B.A. and B.S. degrees in chemistry and in physics from the University of Texas at Austin, in 1989. He received SM (Magisterii Scientiae) degrees in physics and in chemistry in 1992 and a Ph.D. degree in physical chemistry in 1995 from Massachusetts Institute of Technology. From 1995 to 1997, Rogers was a junior fellow in the Harvard University Society of Fellows. He joined Bell Laboratories as a member of technical staff in the Condensed Matter Physics Research Department in 1997, and served as director of this department from the end of 2000 to 2002. He then spent 13 years on the faculty at the University of Illinois at Urbana-Champaign, most recently as the Swanlund Chair Professor and director of the Seitz Materials Research Laboratory. In fall 2016, he joined Northwestern University as the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering, and Medicine—with affiliate appointments in chemistry, mechanical engineering, and electrical and computer engineering—where he is also director of the Querrey-Simpson Institute for Bioelectronics. He has published more than 850 papers, and his research has been recognized by many awards, including a MacArthur Fellowship (2009), the Lemelson-MIT Prize (2011), the Smithsonian Award (2013), the Benjamin Franklin Medal (2019), and a Guggenheim Fellowship (2021). He is a member of the National Academy of Engineering, the National Academy of Sciences, the National Academy of Medicine, the National Academy of Inventors, and the American Academy of Arts and Sciences.

## 2022 Kilpatrick Lecture Series Poster Winners



Persi Panariti (Hock Group), first place



James Tufts (Minh Group), second place



Saundarya Prithweeraj (T. Mathew Group at UIC), second place



Pearl Arora (Guan Group), third place



Thi Hong Ha Nguyen (Minh Group), third place



Hexi Zhang (Mao Group), third place

## Welcome to Cinthya Osuna!



Cinthya Osuna joined the Department of Chemistry in January 2022 as our laboratory manager, where she oversees the overall operation of our chemistry labs. She also maintains our teaching and research instruments, and is our department's safety officer.

## Professor David Minh Introduces a New Course in Computational Biochemistry and Drug Design

Robert E. Frey Jr. Endowed Chair in Chemistry David Minh has introduced a new course—CHEM 456: Computational Biochemistry and Drug Design. In this course, students learn to use computer modeling to study biochemistry and design drugs and apply modeling methods in team projects with real scientific significance. The course satisfies an Interprofessional Projects (IPRO) Program requirement.



*Minh, who is also an associate professor of chemistry, was invested as the Robert E. Frey Jr. Endowed Chair in Chemistry during a ceremony on Friday, September 16. Congratulations to David Minh!*



David Minh [center] with Interim Provost Kenneth T. Christensen and Dean Jennifer deWinter

## Chemistry Weekly Colloquium Offers Diverse and Stimulating Research Presentations

Following are some of the colloquia that our department held during the 2021–22 academic year (speaker's names with talk titles):

### Fall 2021

**Research Assistant Professor Soohaeng Yoo Willow, Illinois Tech's Department of Chemistry**  
"Direct Endpoint Binding Free Energy Calculation"

**Assistant Professor Sameh Elsaïdi, Illinois Tech's Department of Chemistry**  
"Custom-Designed Metal-Organic Frameworks and Their Composites: A Broader View of the Molecular World"

**Professor Jeff Terry, Illinois Tech's Department of Physics and Department of Material, Mechanical, and Aerospace Engineering**  
"The Role of Artificial Intelligence in Minimizing Analysis Errors, Illustrated with EXAFS and Core-Level Photoemission"

**Visiting Research Assistant Professor Ursula Perez-Salas, University of Illinois Chicago**  
"Mapping the Passive Regulatory Role of Lipids in Maintaining Complex Lipid Organizations in Cell Membranes"

**Professor M. Ishaque Khan, Illinois Tech's Department of Chemistry**  
Panel Discussion on the 2021 Nobel Prize in Chemistry

**Adjunct Research Professor Bob Eisenberg, Illinois Tech's Department of Applied Mathematics**  
"The Voltage Sensor of the Nerve Signal: A Protein Device in the Hierarchy of Life"

**Postdoc Fellow Amine Garci, Northwestern University**  
"Polycyclic Aromatic Hydrocarbons-based Homo[2] Catenanes: Design, Synthesis, Photophysical Properties and Applications"

**Professor Benoit Roux, University of Chicago**  
"Using Computer Simulations to Advance our Understanding of Biological Systems at the Atomic Level"

**Professor Eva Hemmer, University of Ottawa**  
"Rare Earth-Based Nanomaterials: from Microwave-Assisted Synthesis to Opto-Magnetic Applications and Back"

**Professor George Schatz, Northwestern University**  
"Understanding Self-Assembly of Functional Nanostructures"

**Director of Engineering Joseph Block, Metro Mold and Design Company**  
"Analytical Characterization of Fuel Filtration Contaminants"

**Professor Yasuaki Einaga, Keio University**  
"Electrochemical Application on Boron-Doped Diamond Electrodes"

**Professor Gabriel Rocklin, Northwestern University's Feinberg School of Medicine**  
"Massively Parallel Experiments to Investigate Protein Stability and Dynamics"

**Professor Wei-Tsung Lee, Loyola University of Chicago**  
"Design, Synthesis, and Characterization of Transition Metal Complexes Bearing Redox Non-Innocent Pincer Ligands"

### Spring 2022

**Professor Shuo Chen, University of Houston**  
"Electrochemical Seawater Splitting"

**Professor Lin Chen, Northwestern University and Argonne National Laboratory**  
"Following and Controlling Excited State Structural Dynamic Trajectories Using Photons with Different Energies"

**Professor Ju Li, Massachusetts Institute of Technology**  
"Challenges and Opportunities in Battery Storage"

**Research Scientist Joe Lustig, Valent BioSciences Corporation**  
"Better Understanding of Fermentations Via Fatty Acid Analysis"

**Chief Science and Technology Officer Seth Darling, Advanced Energy Technologies Directorate at Argonne National Laboratory**  
"Designing Material Interfaces to Deliver Clean Water"

**Professor Jeffrey Lopez, Northwestern University**  
"Understanding and Design of Materials for High Energy Density Batteries"

**Professor Hong-Cai Zhou, Texas A&M University**  
"Pore Engineering and Its Potential Applications"

**Professor Li-Qun "Andrew" Gu, University of Missouri**  
"Pinpointing Regulatory RNA Folding Mechanism and Profiling RNA Biomarkers in a Nanopore"

**Principal Research Scientist of Analytical Research and Development Gregory Webster Sr., Abbvie**  
"Using Design of Experiments for Efficient ADC Methods Development"

**Professor Dimitri Talapin, University of Chicago**  
"Solution Synthesis of Semiconductor Nanostructures: Perfection, Complexity, and Tradeoffs"

**Professor Yamuna Krishnan, University of Chicago**  
"Next-Generation Drug Targeting Achieves Organelle-Level Precision"

**Associate Professor Wei Chen, Illinois Tech's Department of Mechanical, Materials, and Aerospace Engineering**  
"First-Principles Data-Driven Design of High-Entropy Alloys"

**Professor Yuanbing Mao, Illinois Tech's Department of Chemistry**  
"Exploration of Luminescent Materials for Sensing Applications"



ACHM Students Visit Axion Lab in Chicago in summer 2022.



Art Suzanowicz [right], a Ph.D. student in the Mandal lab who won the first-place poster award with his team members at Illinois Tech's Welcome Week Student Research Poster Day on August 19, 2022, with Fred Hickernell, Vice Provost for Research

## 2021–2022 Student Awards

(announced in May 2022)

### Undergraduate Student Awards

Junior Award: Alexis Williamson

Senior Award: Aaron Gregory

Undergraduate Service Award: Macy Young

First Year at Illinois Tech CHEM Award (new category): David Cooper

Undergraduate Kilpatrick Scholars:

- Rachel Bechtel
- Andres Martinez
- Aleksander Myaris

### Graduate Student Awards

Best Teaching Assistant Awards:

- Artur Suzanowicz (Mandal Group)
- Hexi Zhang (Mao Group)

Graduate Service Award:

- Thulitha Abeywickrama (Mao Group)
- Chathurika Rathnayake (Wang Group)
- Shuyuan Zhang (Chong Group)

Best M.S. Student Award (new category): Ayesha Siddiqua

Best ACHM Student Award (new category): Cary Watterson

Paul E. Fanta Travel Fellowships (for presenting at a national conference):

- Thulitha Abeywickrama
- Muhammad Waseem Akram
- Abdulelah Alolayan
- Forough Jahanbazi
- Sahar Shadman
- Sivanujan Suthaharan
- Haixing Wang
- Hexi Zhang
- Shuyuan Zhang

Chemistry Graduate Fellowships:

- Eva Bucke (Hock Group)
- Joshua Samuel (Elsaidi Group)

## 2022 Summer Scholars

### Elsaidi Lab

Natalie Chlebus, Whitney Young High School  
Zhouqi Shao, Whitney Young High School

### Guan Lab

Clelia Poujade, Walter Payton College Prep High School

### Mandal Lab

Ayse Senlik, Northside College Prep High School  
Maya Suzanowicz, Rolling Meadows High School  
Ben Tobias, Maine Township High School South  
Bianca Turner, Oak Park and River Forest High School  
Vanessa Zhang, Libertyville High School

### Mao Lab

Angela Guo, Adlai E. Stevenson High School  
Elizabeth Herrejon, Highland High School  
Brianna Thomas, Lane Tech High School  
Shirley Zhuang, Oswego East High School

### Minh Lab

Sarah Jano, Jacobs High School

### Wang Lab

Nicholas Blanchard, Wilbur Wright Community College  
Yazhel Lopez, Elgin High School

## 2021–22 Degree Conferrals

(December 2021, Spring 2022, and Summer 2022)

### Bachelor of Science in Chemistry

Nicholas Du  
William Blodgett  
Enya Mulroy  
Shayna Casupang  
Aaron Gregory  
Diana Csercse  
Kunj Patel

### Master of Science in Chemistry

Jayla Morgan  
Enya Mulroy  
Ayesha Siddiqua  
Diana Csercse  
Zuyu Jin

### Master of Chemistry

Malini Singh

### Master of Science in Analytical Chemistry

Thomas Bevins  
Stephen Hotchkiss  
Janine Matthews

Anthony Partacz  
Raneen Taha  
Gregory Vanderstel  
Joseph Block  
Kimberly Bowman  
Aimee Frakes  
Adam Struss  
Cary Watterson

### Master of Chemistry in Materials Chemistry

Angela Burnham

### Doctor of Philosophy in Chemistry

Bo Liu (Adviser: Adam Hock): "Synthesis and Application of Organometallic Precursors for Tungsten and Molybdenum Sulfide"

Elwin Clutter (Adviser: Rong Wang): "Stimulation-Responsive Materials for the Treatment of Disordered Tissue"

Damola Shuaib (Adviser: M. Ishaque Khan): "Tetrametalates and New Route to Ligand Transformation in Metal Complex"

Dustin Woods (Adviser: Jeff Wereszczynski, Professor of Physics and Biology): "An Exploration into the Effects of Chromatin Structural Proteins on the Dynamics and Energetic Landscape for Nucleosome Architectures"

Young Ju Yun (Adviser: Jean-Luc Ayitou): "Synthesis and Photophysical Characterization of Novel Organic Triplet Donor-Acceptor Dyads for Light-Harvesting/Modulation Application"



Sally Ho, from the United States Drug Enforcement Administration, visited the Department of Chemistry to give a colloquium on October 11, 2022, and to have an informal lunch and discussion with chemistry students.



ACHM Director Diep Nguyen with Sally Ho.

## Congratulations to our 2022–23 Kilpatrick Fellow!



Forough Jahanbazi, Ph.D. candidate in the Multifunctional Applications of Oxides (MAO) Lab

## Professor Yuanbing Mao Participates in Local Science Coaching Program

Yuanbing Mao, professor of chemistry and Department of Chemistry chair, teamed up with a chemistry teacher Jason Davidson at De La Salle Institute in the Bronzeville neighborhood on Chicago's South Side as part of the American Association of Chemistry Teachers Science Coaches Program. This program pairs K–12 teachers with chemistry professionals, either from a company that employs chemists or through the local section of the American Chemical Society. This is a wonderful educational outreach initiative that the AACT recommends to teachers. The organization advertises that the coaching program "helps bring chemistry to life for your students."

Mao, in addition to participating in high school chemistry classroom teaching, also hosted lab tours on Illinois Tech's Mies Campus for two groups of more than 20 high school students each visit.

Department of Chemistry  
Robert A. Pritzker Science Center, Room 136  
3101 South Dearborn Street  
Chicago, IL 60616



Our Ph.D. program students were hooded on Friday, May 13, and received their long-awaited diplomas at Commencement on Saturday, May 14.