2022-23 Annual Report

Chemistry AT ILLINOIS

Unless otherwise indicated, all data in this report is for 2022-23.

MESSAGE FROM THE *Department Head*

As a new academic year unfolds on the University of Illinois Urbana-Champaign campus, we take this moment to look back on the previous year and share with you some of the 2022-23 highlights in the Department of Chemistry. With nearly 100 faculty members and more than 700 graduate and undergraduate students engaged in world class scientific research, academic scholarship, and community outreach, it is nearly impossible to adequately summarize all the important work and achievements in the Department of Chemistry in the past year.

What is possible is conveying our appreciation for our network of brilliant alumni, who now number more than 10,000, and our thanks for the generous giving that supports our students, faculty, research, and programming in myriad important ways.

As Acting Head of the Department of Chemistry, I am proud to be part of this world-class scientific community at Illinois and hope you enjoy learning more about what we have accomplished this past year.

Jonathan V. Sweedler
Acting Head, Department of Chemistry
James R. Eiszner Family Endowed Chair in Chemistry

Image: Nathan Forney

2022-23 HIGHLIGHTS

2022

AUGUST

ACS Alumni and Friends reception held in Chicago

SEPTEMBER

Scott Denmark, Nancy Makri win ACS National Awards

OCTOBER

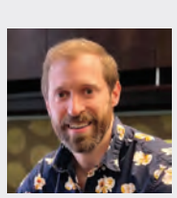
Martin Burke elected to National Academy of Medicine

NOVEMBER

Angad Mehta and Wilfred van der Donk win $9.5 million grant to study emerging pathogens

2023

JANUARY



Benjamin Snyder joins faculty as assistant professor

Inaugural Chemical Biology Research Conference

FEBRUARY

Dr. Lance E. Rodewald (BS, ‘76, chemistry; MS, ‘84, computer science) wins LAS Alumni Humanitarian Award

MARCH

UIUC to co-lead new Chan Zuckerberg Biohub in Chicago

Josh Vura-Weis receives 2023 ACS Physical Chemistry Division award

APRIL

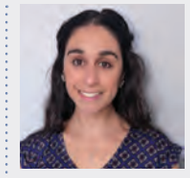
Prof. Christy Landes and Prof. Stephan Link accept offers to join faculty

MAY

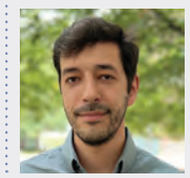
Martin Burke invested May and Ving Lee Professor for Chemical Innovation

Nancy Makri elected to National Academy of Sciences

JUNE



Anastasia Manesis and Majed Fataftah accept offers to join faculty as assistant professors



Ralph Nuzzo honored in Kavli Prize ceremony in Norway

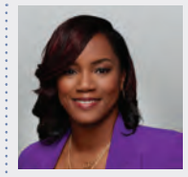
Prashant Jain elected Fellow of the American Physical Society

Alumni Lecture: Stephen Kocheril (BS, ’16)

Liviu Mirica elected AAAS Fellow

ACS Alumni & Friends reception held in Indianapolis

Alumni Lecture: Dr. Lance E. Rodewald



Dr. Alveda Williams (PhD, ‘02) speaks at May Convocation

Alumni

10,017 ALUMNI FROM **53** COUNTRIES
(9,459 – 94.4% ARE IN U.S.)

Image: Carlos Juarez-Yescas

2023 Chemistry at Illinois graduates land first destinations

A specialized chemistry major in the Class of 2023, Morgan Kennebeck graduated in May and is continuing her education at the University of California, Berkeley, where she is pursuing a PhD in chemistry. Taking advantage of the many opportunities at Illinois, Kennebeck was involved in research all four years as an undergraduate, starting second semester of her freshman year working with DNAzymes in Prof. Scott Silverman's lab, where she was an author on multiple published papers and received the department's Reynold C. Fuson Award for excellence in undergraduate research.

"A highlight of my career at UIUC has been being a part of the student chapter of the American Chemical Society. Being able to have a close group of people also interested in chemistry has helped me to advance my career and make a lot of friends," Kennebeck said.

BACHELOR'S GRADUATES

CLASS OVERVIEW	
Secured First Destination	97.5%
PRIMARY STATUS	
Employed	43.9%
Continuing Education	52.4%
Volunteer/Service	1.2%
Seeking	2.5%
FULL TIME EMPLOYED SALARY	
Average Salary	$ 78,868

M.S. & PHD GRADUATES

FULL TIME EMPLOYED SALARY	
Average Annual Salary	$ 110,437
Highest Annual Salary	$ 130,000
Lowest Annual Salary	$ 77,000

Bachelor's graduate data and continuing education data were self-reported by chemistry graduates in 2021-22. And MS and PhD salaries were self reported to the School of Chemical Sciences Career office by chemistry graduates in 2022-23.

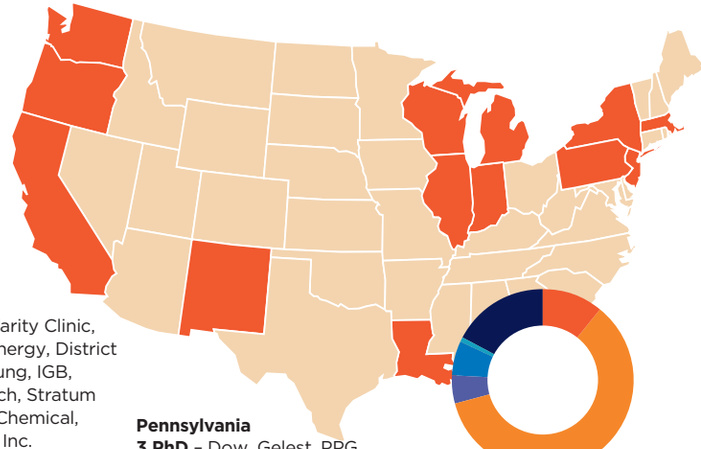
BACHELOR'S GRADUATES: CONTINUING EDUCATION

Degree Sought	%
MD	11.8
MD/PhD	2.9
PharmD	14.7
PhD	20.6
Master's degree	14.7
MA	2.9
MEng	5.9
MS	23.5
Other	2.9

WHERE DID RECENT GRADUATES GO TO WORK?

129 Undergraduate Degrees

40 Graduate Degrees



Washington (state)
1 PhD – Engineering Systems

Oregon
1 PhD – Intel Corp.

California
4 PhD – Amgen, Morrison Foerster, N1 Life, Sandia National Labs

New Mexico
1 PhD - Los Alamos National Laboratory

Wisconsin
1 BS (CS + Chemistry) - Epic Systems
1 PhD – Thermo Fisher Scientific

Illinois
11 BS – Carle, Clarity Clinic, Constellation Energy, District 219, Ernst & Young, IGB, Hick's Oil, Isotech, Stratum Reservoir, Sun Chemical, WET Solutions, Inc.
1 BS (CS + Chemistry) – Capital One
2 PhD – AbbVie

Michigan
1 PhD – Dow

Indiana
1 PhD – Eli Lilly and Co.

Louisiana
1 BS – SASOL

Pennsylvania
3 PhD – Dow, Gelest, PPG

New York
1 BS (CS + Chemistry) – Publicis Sapient

New Jersey
1 PhD – Bristol Myers Squibb
1 Master's – Crystal Pharmatech

Massachusetts
1 PhD – Merck

18 BS: Chemistry
103 BSLAS: Chemistry
8 BSLAS: Computer Science + Chemistry
1 MS: Teaching of Chemistry
10 MS: Chemistry
29 PhD: Chemistry

Alumni Impact

With more than 10,000 alumni in more than 50 countries, our graduates are making an impact across the globe, not only in the chemical sciences, but in a wide variety of careers and professions.

In April 2023, Dr. Lance E. Rodewald (BS, '76, chemistry; MS, '84, computer science) received the College of LAS Alumni Humanitarian Award for his dedication to improving children's access to life-saving vaccines. A senior advisor to the national immunization program of the Chinese Center for Disease Control and Prevention, he previously led immunization programs for the World Health Organization and the U.S. Centers for Disease Control.

"Illinois has meant so much to so many people and opened so many doors and meant so much to me personally. It's just an amazing place, so I feel grateful to get an award from Illinois for this work. But it's work that I just love to do. In a certain sense we are all humanitarians," Rodewald said.

Dr. Walter Orenstein, former Director of the U.S. National Immunization Program at CDC, said Dr. Rodewald was instrumental in successful efforts to effectively vaccinate children and provide free vaccines to children with no health insurance.

"Quite simply, the world is a better place because of Dr. Rodewald's work," Dr. Orenstein said.

Top 5 states for Alumni

3,588	Illinois
835	California
341	Texas
330	Pennsylvania
252	Massachusetts, Ohio (tie)

Top 5 countries outside U.S. for Alumni

141	China
124	Republic of Korea
52	Canada
31	India
29	Taiwan, Republic of China

Faculty + Research

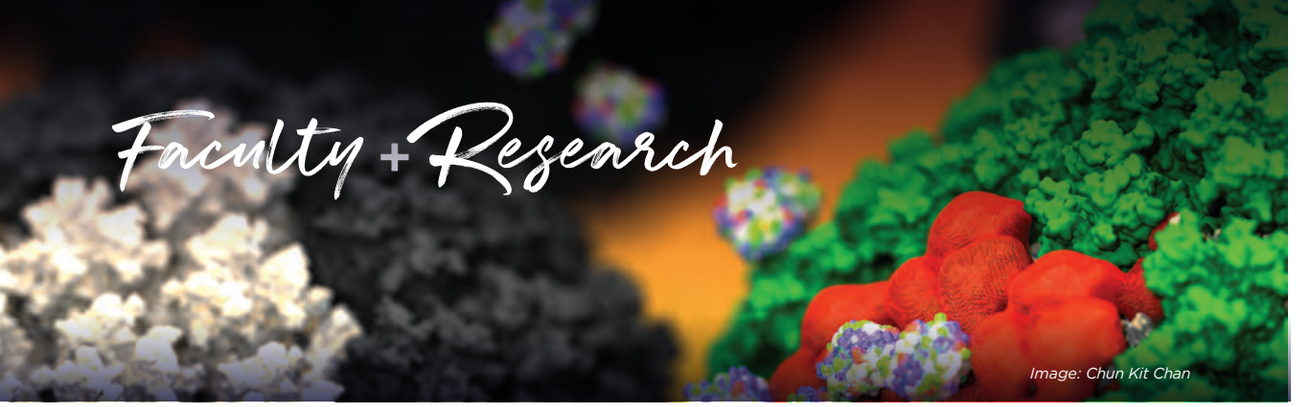
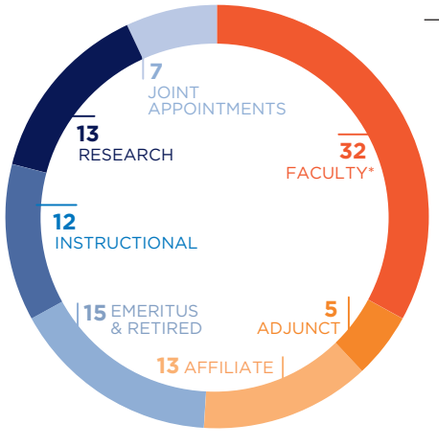


Image: Chun Kit Chan

97
FACULTY



*Includes full-time and part-time

2022-23 RESEARCH ACHIEVEMENTS

21	7	3	34	16
DISCLOSURES	LICENSES & OPTIONS	STARTUPS	US PATENT applications	US PATENTS issued

FUNDED RESEARCH PROPOSALS

29 = $23.35 million

FUNDING AGENCY		NUMBER OF PROJECTS
DEPT. OF AGRICULTURE	$ 50,000	1
DEPT. OF DEFENSE	$ 100,000	1
DEPT. OF ENERGY	$ 1,825,912	3
NATIONAL INSTITUTES OF HEALTH	$ 13,724,337	6
NATIONAL SCIENCE FOUNDATION	$ 4,979,340	8
PRIVATE FUNDING	$ 2,671,160	10

Research Funding Highlights

UIUC to co-lead new Chan Zuckerberg Biohub in Chicago – In March 2023, the University of Illinois Urbana-Champaign was chosen to lead the Chan Zuckerberg Biohub Chicago – a new biomedical hub – along with the University of Chicago and Northwestern University. Chemistry at Illinois researchers played a key role in landing the Chicago biomedical hub that will focus on measuring human biology, including developing new ways to make chemical and physical measurements on tissues to learn about healthy versus diseased states.

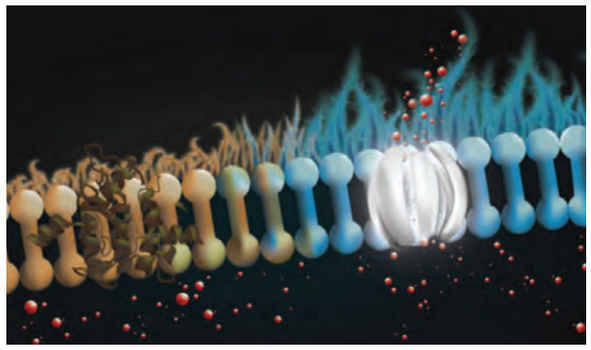
Emerging pathogens – Professors Wilfred van der Donk and Angad Mehta are part of a team awarded $9.5 million by the Howard Hughes Medical Institute for emerging pathogens research that will seek to better understand avian viruses in hopes of preventing them from spreading.

Energy Frontier Research Center – Jeffrey Moore is part of this Department of Energy funded center that is addressing fundamental scientific challenges facing manufacturing and end-of-life management of thermoset plastics.

Alzheimer's research – Jonathan Sweedler is part of a five-year research project, funded by the National Institutes of Health, that will use a unique combination of imaging techniques to study Alzheimer's disease on a scale that's never been done before with the goal of understanding what happens at the molecular level in a mouse model of Alzheimer's disease.

Research Highlights

Fighting drug-resistant bacteria – A team led by Paul Hergenrother published research about a new molecule that inhibits drug-resistant bacteria in lab experiments and in mice with pneumonia and urinary tract infections. The compound could one day be used to treat challenging infections in humans.



Potential Breakthrough Treatment for Cystic Fibrosis – Clinical testing is underway for a potentially groundbreaking new treatment for cystic fibrosis developed by Martin Burke. The inhalable drug acts as a molecular prosthetic by "standing in" for missing or dysfunctional protein channels associated with causing cystic fibrosis.

Mimicking biological enzymes may be key to hydrogen fuel production – An ancient biological enzyme known as nickel-iron hydrogenase may play a key role in producing hydrogen for a renewables-based energy economy, according to research led by Liviu Mirica, whose careful study of the enzyme led to the design of a synthetic molecule that mimics the hydrogen gas-producing chemical reaction performed by the enzyme.

AI, molecule machine generalize automated chemistry – Using artificial intelligence, "building-block" chemistry and a molecule-making machine, research led by Martin Burke has found the best general reaction conditions for synthesizing chemicals important to biomedical and materials research – a finding that could speed innovation and drug discovery and make complex chemistry automated and accessible.

Anti-cancer agent PAC-1 shows promise – A phase I clinical trial of PAC-1, a drug that spurs programmed cell death in cancer cells, found only minor side effects in patients with end-stage cancers, stalling growth of tumors in five people with neuroendocrine cancers and reduced tumor size in two of those patients. The drug was first identified and developed by UIUC scientists, including Paul Hergenrother.

Making drugs more efficient – A team led by Jeff Chan manipulated cyanine dye's tendency to break down when exposed to light as a mechanism to more efficiently deliver and release drugs to a specific target. The team pinpointed the release of a powerful chemotherapeutic drug at the site of a breast cancer tumor in mice, significantly shrinking the tumor without damaging surrounding healthy tissue.

Discovering new natural products – In a massive collaboration, a team of researchers that included Doug Mitchell and Wilfred van der Donk has discovered with unprecedented speed and scale a new group of natural products that have become a popular source of antibiotics.

Insights into photosynthesis – Nancy Makri has developed coherence maps, a technique to visualize quantum mechanics and understand the mechanisms that underpin photosynthesis. The maps elucidate the complex energy transfer process in photosynthesizing bacteria, providing a clear picture of how sunlight energy is channeled from the outer to the inner molecular ring of the light-harvesting complex.

Breast cancer research – John Katzenellenbogen and researchers found that targeting a specific estrogen receptor in certain breast cancers alters the activity of dozens of cancer-related genes and slows the growth and metastasis of the cancer.

Read more research stories at **go.chemistry.illinois.edu/ResearchImpact**

Students

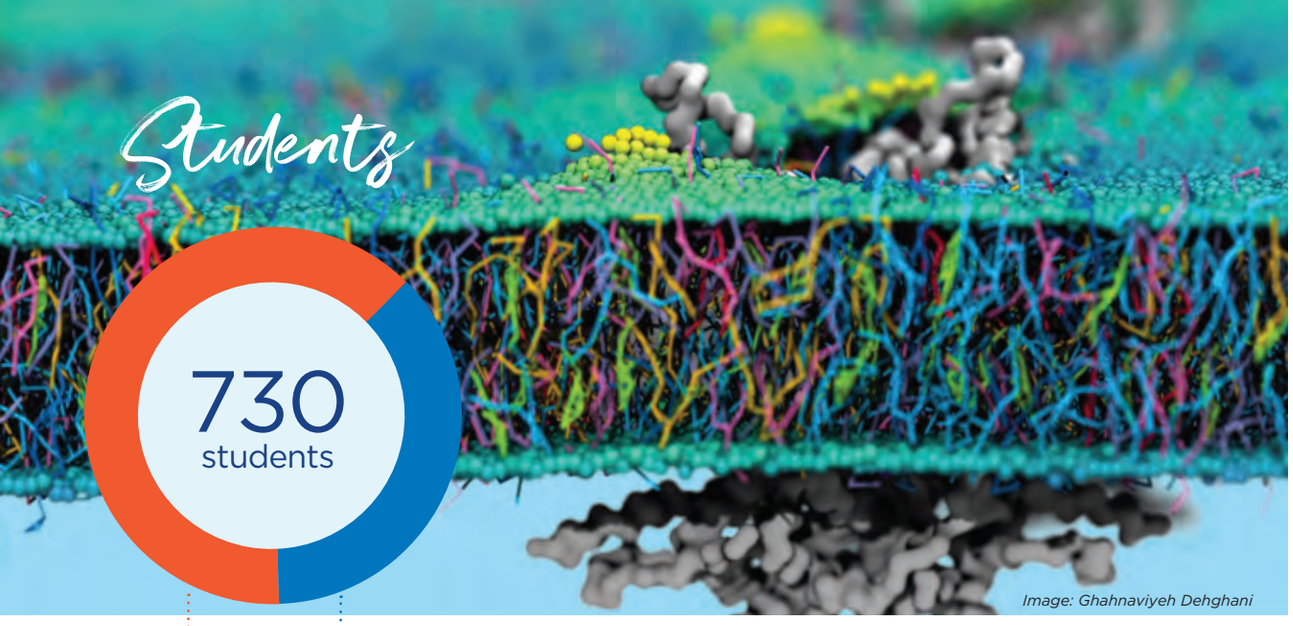


Image: Ghahnaviyeh Dehghani

460 undergraduate

87* participated in research in the Department of Chemistry

49 (10.6%) received a departmental/donor funded scholarship

$174,500 awarded in departmental donor-funded scholarships

$150,500 awarded in departmental donor-funded scholarships for summer undergraduate research

**This is an approximate number and may include undergraduates from other UIUC departments and/or from other higher education institutions who conducted research with Department of Chemistry faculty.*

270 graduate

FUNDING

47 Full Fellowships

140 Research Assistantships

83 Teaching Assistantships

FELLOWSHIPS (full & partial)

7 Campus

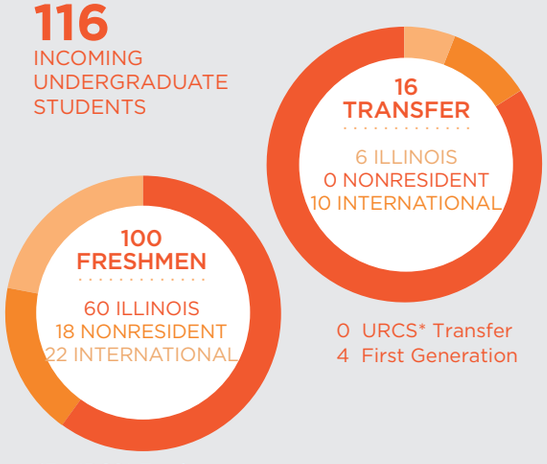
173 Departmental/Donor-Funded

14 External-NSF

10 External-Other

GET TO KNOW OUR INCOMING STUDENTS

116 INCOMING UNDERGRADUATE STUDENTS

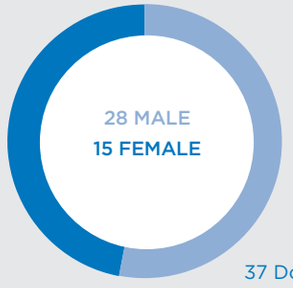


0 URCS* Transfer
4 First Generation

13 URCS* Freshmen
26 First Generation

53 INCOMING GRADUATE STUDENTS

459 → 205 → 53
APPLICANTS OFFERS ACCEPTED



37 Domestic
16 International

**Underrepresented in the Chemical Sciences (URCS)*

This data is for our newest class of students—incoming in 2023-2024.

Chemistry at Illinois students form a diverse, talented, and collaborative community of aspiring scientists and professionals engaged in a variety of learning opportunities, including research, teaching, mentoring, internships, study abroad, and they participate in and lead student organizations, activities, and events.

Aidan Lindsay

A junior chemistry major, **Aidan Lindsay** is a **Barry Goldwater Scholar and recipient of the Oliver J. Bell Merit Scholarship in Chemical Sciences, Glenn Rhodes Wilson Scholarship in Chemistry, and Thomas Remec and Susan Morisato Scholarship in Chemical Data Science**. He is an undergraduate researcher working on the light-driven electrocatalytic reduction of nitrate to ammonia using molybdenum oxide nanosheets as the catalyst. Lindsay's career goals include pursuing his PhD in theoretical and computational chemistry. In the REACT program, Lindsay and other UIUC undergraduates lead Urbana-Champaign area youth in hands-on chemistry experiments. He's also involved in the ACS Student Chapter and Illinois Biodiesel Initiative.

Danielle Loving

A chemistry PhD student, **Danielle Loving's** first research experience on campus was as a visiting **Snyder Scholar** doing summer undergraduate research in Prof. Martin Burke's lab, trying to make a derivative of amphotericin B for two different projects, including as a treatment for Cystic Fibrosis. A first-generation college student, Loving is a **National Science Foundation Graduate Research Fellow** and mentors students in three programs at UIUC. She aspires to be a professor at a primarily undergraduate institution.

Parmeet Kaur

A senior majoring in chemistry and minoring in Spanish, **Parmeet Kaur** is the recipient of the **J. J. Lagowski Scholarship in Chemistry** and is involved in undergraduate research, the ACS Student Chapter, Women in Chemical Sciences (WiCS), and welcomes new students to the UIUC campus as an orientation leader. An LAS Honors Student and member of the honor society Phi Eta Sigma, Kaur also participates in research in Prof. Jeffrey Moore's group and has presented during the Undergraduate Research Symposium on campus.

Carlos Juarez-Yescas

A chemistry PhD student, **Carlos Juarez-Yescas** is focusing his scientific curiosity on research to improve solid state batteries, a technology that could revolutionize the performance of electric vehicles. The first in his family to earn a college degree, Juarez-Yescas was drawn to UIUC after meeting chemistry Prof. Joaquín Rodríguez-López at a conference in Mexico.

"He introduced me to graduate student opportunities at UIUC... and I knew that I wanted to contribute to its high level of research and be a part of its learning community," said Juarez-Yescas, who is a mentor to undergraduate students in multiple programs, including the **C² program, Illinois Scholars Undergraduate Research program, and the Merit Mentoring and Professional Network**.

Image: Rachel Wallick

Private gifts are foundational to our continued ability to provide transformational learning experiences and produce innovative research that drives positive change in our local communities and across the globe.

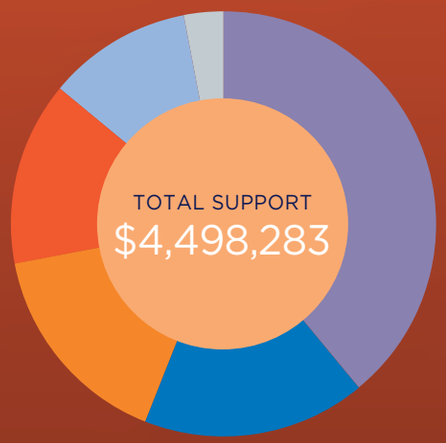
Thank you for partnering with us in support of these ambitious goals. They are attainable with your incredible generosity, for which we are deeply grateful.

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

NEW **GIFT FUNDS**

Chemical Biology Area Research Conference Fund
Dr. Allen Hartford Scholarship for Undergraduate Research Fund for Current Use
Dr. Eugene Kent Borchart Memorial Award in Chemistry Fund
George E. Inglett Scholarship Fund
Harry R. Beilfuss and Nancy B. Beilfuss Chemistry Scholarship Fund
Janssen Lectureship in Organic Chemistry Fund
Peter and Dorothy A. Kovacic Scholarship Fund
Professor Peter Beak Endowed Outstanding Graduate Student Teaching Award Fund
Spudich Undergraduate Research Scholarship in Chemistry Fund

This is a selection only.



**Does not include payments on major gift commitments made prior to 2022-23.*

348 DONORS

500 GIFTS

$4.5 MILLION IN GIFTS & COMMITMENTS*

Gifts in Action

Dedication to University of Illinois leads to purposeful giving to science and medicine

Jiri and Ana Jonas

As individuals, University of Illinois emeritus professors Jiri and Ana Jonas each stood out in their fields as educators and researchers. Together, they have established a philanthropic legacy at Illinois that will stand out forever.

Jiri and Ana have deep connections to the University of Illinois Urbana-Champaign and the University of Illinois Chicago. Over 55 years, the couple invested in the university in a myriad of ways. Now their passion for the university at which they spent so much of their careers has inspired them to support UIUC and UIC with gifts, including endowed scholarships in the sciences at UIC, support for junior faculty or graduate fellows in the Department of Chemistry at UIUC, and additional funding for scholarships at the Carle Illinois College of Medicine.

“As new immigrants we found a home and a purpose at the University of Illinois,” said Jiri and Ana Jonas, who came to the U.S. in the 1960s. “The University gave us amazing opportunities to grow in our professions and to prosper. Now we wish to share with new generations of students and young faculty the opportunities we were given.”

Jiri, a pioneer in the use of magnetic resonance imaging to study the structure of liquids and proteins, was a professor in the Department of Chemistry at UIUC and served as the School of Chemical Sciences director from 1983 to 1993. He also played an integral role in establishing the Beckman Institute for Advanced Science and Technology and was its second director.

Ana earned a PhD in biochemistry from UIUC in 1970 and worked in the Departments of Chemistry, Biochemistry, Molecular and Cellular Biology and had an appointment in the College of Medicine at UIUC, achieving the rank of full professor in 1985.

“We are incredibly grateful they have chosen to support the university where they spent so much of their careers in such a special way,” said UIF President/CEO Jim Moore.

Gift celebrates inspirational teachers and mentors

Sandra Murawski

Dr. Sandra Murawski started her 33-year career at Procter & Gamble after graduating with a PhD in Chemistry from UIUC in 1987. Now retired, Murawski decided to give back to the educational institutions that prepared her for the career she enjoyed so much.

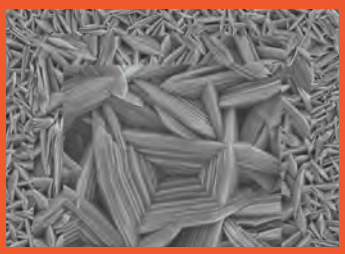
She said it was important to support the teaching and mentoring of Illinois chemistry graduate students, because she benefited from great teachers and mentors throughout her education and career.

The Dr. Sandra Murawski Award for Teaching Excellence and the Dr. Sandra Murawski Award for Mentoring Excellence were awarded for the first time in the 2022-23 academic year.

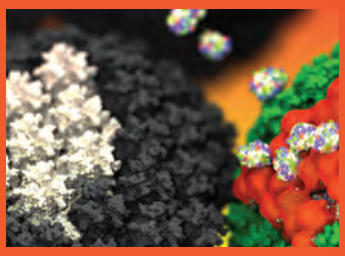
“I am happy to be able to play a role in celebrating and supporting mentoring and teaching, because I think it really makes a difference no matter where your career takes you,” Murawski said.

The science images appearing in this report were created by students, faculty, and postdoctoral researchers in the department.

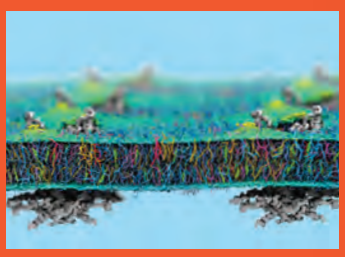
Nathan Forney (Catherine Murphy group)
Anisotropic Art
Presented is a false colored transmission electron microscopy image of gold nanorods. Their absorption peaks are tunable throughout the visible and near-infrared light regions. Additionally, gold nanorods can undergo a variety of surface modifications. This adaptability makes them highly useful for applications such as biosensing and photothermal therapy.



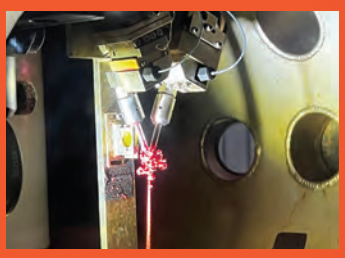
Carlos Juarez-Yescas (Paul Braun group)
Science Imitating Art, M.C. Escher's Relativity
Superimposed SEM images of electrodeposited LiCoO2 at different magnifications (scale bars 10mm; 1mm and 1mm from outside inward). LiCoO2 is directly grown on current collectors, and this novel method enables higher energy density Li-ion batteries in solid and liquid state cells.



Chun Kit Chan (Emad Tajkhorshid group)
COVID-19 Vaccines & Related Complications
During COVID-19 vaccinations, rarely, platelet factor 4 (colorful, small proteins) misrecognizes vaccine particles (green and black) as pathogens and binds to them, preluding the rare vaccine-induced thrombosis.



Ghahnaviyeh Dehghani (Emad Tajkhorshid group)
Sepehr
This image uses molecular dynamics simulations to show that prestin (sound amplifier of the auditory system) follows an astonishing pattern to maximize its effect.



Rachel Wallick (Liviu Mirica and Joshua Vura-Weis groups)
Iron Icicles
In-vacuum solution phase experiments can be complicated. Here the liquid jet that allows the solution to enter the vacuum chamber has a clog that caused the solution to freeze, leading to this pretty rock-like formation of the sample.

On the Cover

Gopika Gopan and Yuhan Wang
(Martin Gruebele group)
Solving the puzzle of protein trajectories
Volume element in a live human cell enlarged in the form of a Rubik's cube with voxels containing single protein trajectories. Live cell image from Confocal Microscope. Background: softened 3D trajectories of Streptavidin-CF633 conjugates in live cell tracked using MINFLUX.

College of Liberal Arts & Sciences
Department of Chemistry

600 South Mathews Avenue
Urbana, Illinois 61801

(217) 333-5071
chemistry@illinois.edu
www.chemistry.illinois.edu