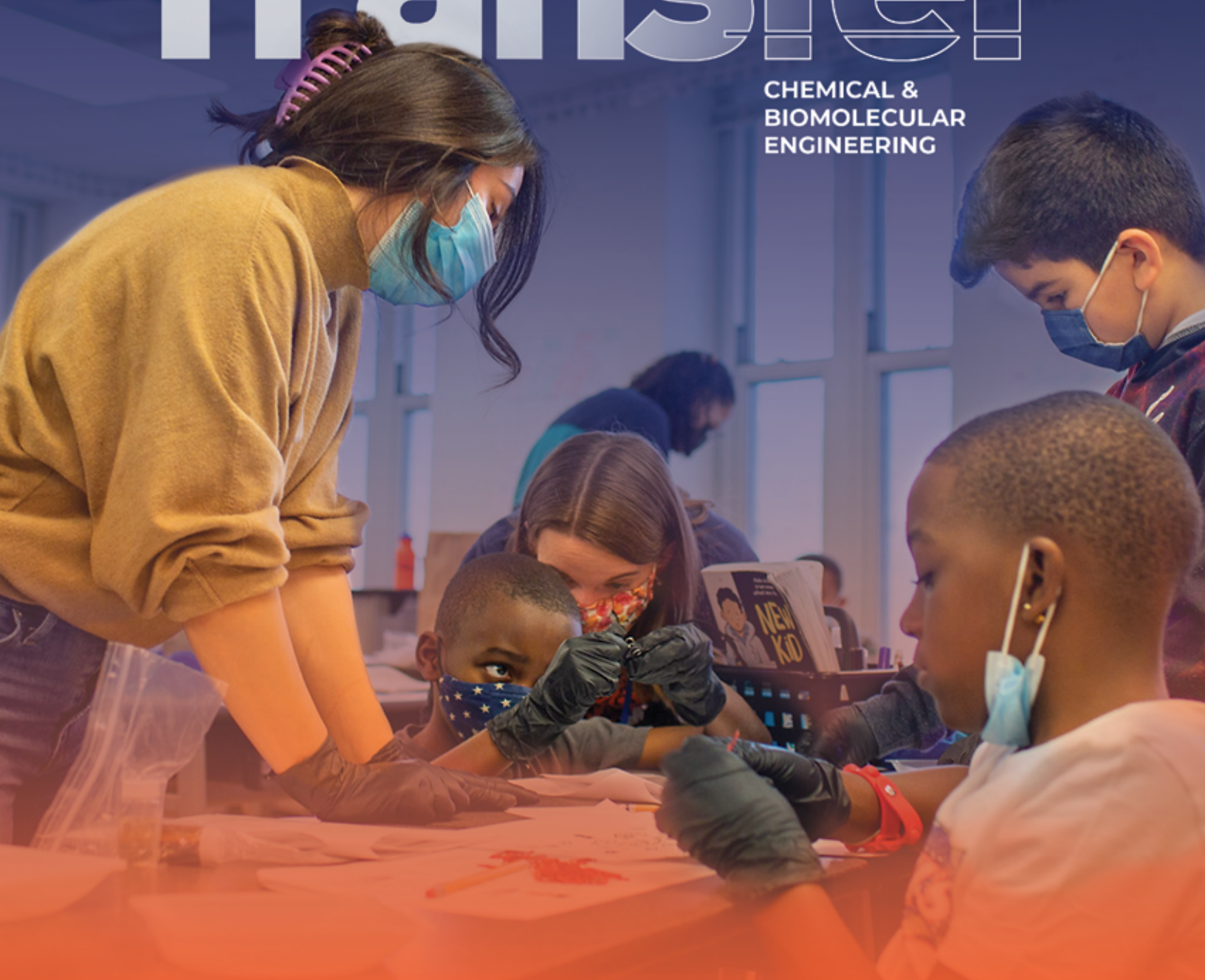
MASS Transfer

Fall/Winter 2021

CHEMICAL & BIOMOLECULAR ENGINEERING



St. Elmo Brady Academy

outreach event inspires future engineers

Read more on page 16.

MASS Transfer

Department Head
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Outreach

Graduate student Dani Harrier works with fourth-grade students at an outreach event held at the Booker T. Washington STEM Academy in Champaign, Illinois.

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Letter from the Department Head

Greetings from Illinois!

With great anticipation and gratitude, we were able to return to many of our usual departmental activities this fall. We hosted an outreach activity (pages 16-17) led by three of our faculty **Damien Guironnet, Charles Sing, and Antonia Statt** and 15 graduate students through the St. Elmo Brady Academy, which is named in honor of the first African-American to earn a Ph.D. in chemistry in the U.S. here at the University of Illinois Urbana-Champaign. It is a privilege to be able to share our excitement for, and the power of, science with 60 fourth-grade students at the Booker T. Washington school. We hope to expand this program to other schools in the region by partnering with other departments.


Paul Kenis

These endeavors remind us of what we are working towards—a healthier and more sustainable future made possible through chemical and biomolecular engineering. Our graduate students showcased a myriad of scientific pursuits at our 20th annual Graduate Research Symposium (page 18), which was judged by our alumni panel: **Daniel Crowl** (PhD '75), **Yongqi Lu** (PhD '97), **Qingjun Meng** (PhD '04), and **Fei Wen** (PhD '10). Later that day, we recognized the symposium winners along with our graduate student fellowship recipients (page 19) and departmental alumni award winners (page 5)—including Crowl and Wen as well as **Laura Banovic Flessner**, featured on pages 26-27.

This fall, we also honored our esteemed colleague, **Hyunjoon (Joon) Kong**, who has worked tirelessly to advance bio-inspired materials and was invested as the Robert W. Schaefer Professor (page 4). Read more about his research on pages 24-25. Another biomolecular engineer, graduate student **Aleczandria Tiffany**, who works with professor **Brendan Harley** to revolutionize how we treat severe skull injuries, is featured on pages 22-23.

This semester culminated in one of my favorite activities: convocation (pages 14-15). This in-person celebration of our graduates, with remarks from **Joseph Drago** (BS '74), has filled me with much optimism for the future of our discipline. Our undergraduate program continues to impress—now ranked #8 by U.S. News and World Report—thanks to our dedicated faculty and staff.

Like many, we swiftly adapted to an online world in 2020. We have permanently adapted several aspects, like virtual seminars that are more accessible to students and faculty, wherever they are. Still, the opportunities to reconnect in person this fall have reminded me how special our community is here at Illinois and the importance of interpersonal interactions. I look forward to connecting with more friends and alumni in 2022!

Yours sincerely,

Paul Kenis

Paul Kenis
Elio E. Tarika Chair in Chemical Engineering and Department Head

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Welcome to our newest administration team members

The Department of Chemical and Biomolecular Engineering has had several staffing changes over the past year or so, and we are excited to introduce some of our newest team members, who have already contributed energy and ideas to our operations.

Wendy Balthazor

Associate Director of Finance and Administration

Wendy Balthazor brings to us over 20 years of experience in business and budgeting from Wolfram, Shire Pharmaceuticals, and the University of Illinois Urbana-Champaign. Over the past eight years, she has held several roles at UIUC covering grants and contracts, finance, and administration for the College of Veterinary Medicine and University Library. She holds a BA in Japanese language and culture from UIUC as well as an MBA from Eastern Illinois University.

"I am delighted to join the department—everyone has been extremely welcoming. We have already made great strides to better organize the department's virtual files. I look forward to working with you all in this role."

Claire Benjamin

Associate Director of Communications

Claire Benjamin joins our department from Illinois' Carl R. Woese Institute for Genomic Biology. She was a science writer covering the IGB's research themes before moving on to publicize interdisciplinary, multi-institutional research projects aimed at producing more food and fuel. She has a BS in agricultural communications and MS in advertising from UIUC.

"Our department is brimming with innovators who have a vision for the future and are harnessing chemistry and molecular machinery to make it a reality. It's a privilege to help share your inspiring stories."

Connie Knight

Graduate Program Coordinator

Connie Knight transferred from the Department of Chemistry where she has been employed in various roles since 2006. She brings experience in the administration of Chemistry's graduate program. She will take on a central role to help with ChBE's graduate recruiting.

"The department offered me the opportunity to become more engaged in various facets of a graduate program, including admissions and recruiting, while still being involved in the day-to-day activities of a graduate coordinator. I have already enjoyed getting to know and work with our students and faculty who have made me feel 'at home' here in ChBE."

We are grateful to our former team members, who have moved on over the past 18 months but contributed much to ChBE's success during their tenure here.

Jenny Daly

Associate Director of Finance and Administration

Jenny Daly is now overseeing the administration of the School of Molecular and Cellular Biology at UIUC. She joined ChBE in November 2017 and worked with our faculty and staff to improve many processes to help the department run more smoothly.

Christine des Garennes

Associate Director of Communications

Christine des Garennes moved on to oversee the strategic communications of the School of Molecular and Cellular Biology at UIUC in April 2020. She joined our department in February 2015 and helped enhance ChBE's visibility through the website, social media, and many editions of this publication.

Cindy Dodds

Graduate Program Coordinator

Cindy Dodds retired from the university in June 2021, where she worked for 30 years. She joined ChBE in November 2017 and helped us recruit and oversee several cohorts of graduate students.

Braden Shain

Associate Director of Development

Braden Shain has become the senior director of development at the University of South Carolina School of Law. He joined the department in July 2016 and helped grow our advancement efforts tremendously.

Becky Lyle

Undergraduate Program Assistant

Becky Lyle retired from the university in December 2021. She joined the department in 2005 and has assisted in all aspects of the ChBE undergraduate program as well as with the needs of several research facilities and lectures.

We plan to hire replacements for Braden Shain and Becky Lyle in 2022.

Hyunjoon Kong named Robert W. Schaefer Professor in Chemical and Biomolecular Engineering

Faculty member honored for his work in multi-cellular engineered living systems

Hyunjoon (Joon) Kong, a leader in research on multi-cellular engineered living cell systems, has been named the Robert W. Schaefer Professor in Chemical and Biomolecular Engineering. The awarded position is named after an Illinois alumnus who graduated with a degree in chemical engineering in 1956.

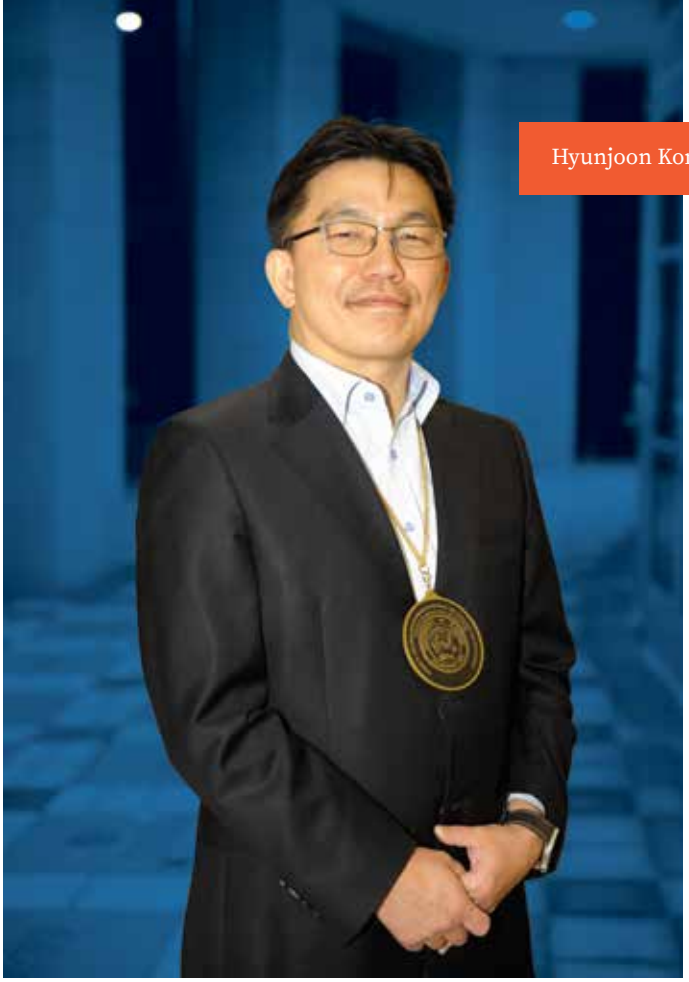
Kong joined the department in 2007. He is also affiliated with the Departments of Bioengineering, Mechanical Science and Engineering, and Pathobiology; the Neuroscience Program; and the Center for Biophysics and Quantitative Biology.

Kong has authored and coauthored more than 170 research papers and has more than eight issued and pending patent applications. He has received multiple research awards, and also serves as a member of the international editorial board of Biofabrication, and as an associate editor of Biomaterials Research.

"It's impossible to measure the impact Joon has had and will continue to have on our students and on our community," said Venetria Patton, the Harry E. Preble Dean of the College of Liberal Arts & Sciences.

The awarded position is named after the late Robert Schaefer (BS '56), who was a great supporter of the University of Illinois Urbana-Champaign throughout his life. After graduation, Schaefer served in the U.S. Navy in the Atlantic Fleet. He later joined the Monsanto Company in St. Louis, where he was part of the team that introduced I-Dopa, the break-through Parkinson's disease drug to the marketplace. After retiring in 1988, Schaefer traveled the world and served on the board of many organizations.

At the ceremony, speakers described the groundbreaking work that Kong and his students conduct every day. He was described as an outstanding teacher and researcher who has pushed forward new ideas in regards to fighting disease, and who has prepared students for their own professional roles.



Hyunjoon Kong

"He is a model for how faculty can contribute to the land grant mission of our institute," said Bill Bernhard, executive vice provost for academic affairs.

At Illinois, Kong has developed various active biohybrid materials including self-propelling antimicrobial microbubblers, soft manipulator machinery, stimulus-response soft materials, and neuromuscular and cardiovascular organoids. These materials are used for molecular and cell therapies of vascular and brain diseases and infection. Read more about Kong's work on pages 24-25.

Kong Group

2021 Graduate and Alumni Awards Ceremony

The Department of Chemical and Biomolecular Engineering held its second annual Graduate and Alumni Awards Ceremony on October 8, 2021, to recognize our Alumni Awards honorees, graduate student fellows, and the Graduate Research Symposium winners.

The event began with a warm welcome from department head **Paul Kenis**, the Elio Eliakim Tarika Endowed Chair, and **Matthew Ando**, the associate dean of the sciences in the College of Liberal Arts & Sciences.

First off, Kenis recognized the 2021 recipients of the Distinguished Alumni Achievement Award who were not able to attend the ceremony:

Monty Alger (PhD '82) is a professor at Pennsylvania State who served as president of the American Institute of Chemical Engineers in 2020.

H. Scott Fogler* (BS '62) served on the faculty at the University of Michigan for over 50 years. **H. Scott Fogler died earlier this year; his "In Memoriam" article is on page 30.*

Kit Gordon (BS '83) is known both for her semiconductor work at QuickLogic and advocacy on behalf of numerous environmental organizations.

Steve McLin (BS '68) retired from his career as an executive in the banking industry, where he was a top strategist for Bank of America.

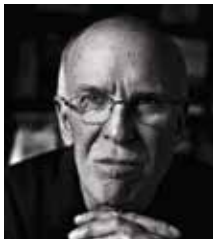
Marchoe Dill Northern (BS '97) is the senior vice president and global home care brand franchise leader for Procter & Gamble.

Next, **Huimin Zhao**, the Steven L. Miller Chair, recognized his former graduate student **Fei Wen** (MS '06, PhD '10), an associate professor at the University of Michigan. Wen is advancing our understanding, monitoring, and modulating of T cell function, which is crucial to our ability to address cancer and diseases. Wen received an inaugural Young Alumni Achievement Award in 2019.

Zhao also recognized **Joseph Glas** (MS '62, PhD '65), who received the 2020 Alumni Achievement Award from the University of Illinois Alumni Association and the department's 2021 Distinguished Alumni Achievement Award. Zhao commended Glas for his efforts to replace chlorofluorocarbons (used in refrigeration) with safe alternatives as a vice president and general manager at DuPont. Glas has supported the department through an endowed scholarship, as a 2011 convocation speaker, and as a member of ChBE's resource development and external advisory committees.

Professor **Christopher Rao**, the Morris Professorial Scholar, presented a 2021 Young Alumni Achievement Award to **Jacob Becraft** (BS '13) for launching a startup company called Strand Therapeutics that is figuring out how to use mRNA gene therapies to treat tumors.

Rao also presented a 2021 Young Alumni Achievement Award to **Laura Banovic Flessner** (BS '05), who founded Mindtap to provide advising, coaching, and workshops that bring together neuroscience and agile principles to fuel innovation. Read more about Flessner on pages 26-27.



Next, Kenis presented the 2021 Distinguished Alumni Achievement Award to **Daniel Crowl** (MS '73, PhD '75), the former Herbert H. Dow Professor for Chemical Process Safety at Michigan Technical University, for his contributions to chemical process safety, including a landmark textbook on the topic now in its 4th edition.

Kenis recognized **Robert Sankman** (BS '80) as a recipient of a 2019 Distinguished Alumni Achievement Award for his profound contributions to semiconductor and electronic packaging technologies over his 40-year career at Intel.

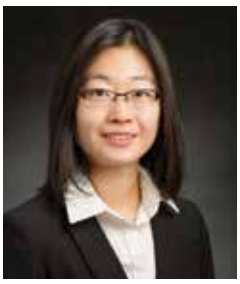
Lastly, professors **Mary Kraft** and **Hong Yang** recognized the fellowships awarded over the past two years to the department's graduate students, who were invited to stand to be recognized. The ceremony concluded with two representatives from the Graduate Student Advisory Council, **Richa Ghosh** (Flaherty Group) and **Jarom Sederholm** (Braun Group), who recognized the Graduate Research Symposium winners and alumni judges (page 18).

Nominations are accepted on a rolling basis with a deadline of July 1, 2022, to be considered for the 2022 Alumni Awards. Self-nominations are encouraged and all nominations are held for future consideration. For more information about the program, past recipients, or to submit your nomination, visit go.chbe.illinois.edu/AlumniAwards.

Save the date for our next fall awards ceremony on Friday, October 7, 2022.

Awards & Recognition

Diao named research co-chair at the Beckman Institute



In June 2021, associate professor **Ying Diao** was named co-chair of the Molecular Science and Engineering research theme at the Beckman Institute for Advanced Science and Technology at the University of Illinois Urbana-Champaign. With expertise in nanotechnology and a desire to address grand environmental, medical, and scientific challenges, she will continue to push the boundaries of the institute's interdisciplinary mission.

"Beckman is an inspiring model. There are no boundaries of departments or colleges. People from all disciplines come together to tackle challenges united under a shared vision," Diao said. "I am really hoping to facilitate community-building around molecular science and engineering. It's still a relatively young discipline, and there are still barriers to overcome. It is my role to break down those barriers."

Diao honored with 2021 Campus Distinguished Promotion Award

Associate professor **Ying Diao** received a 2021 Campus Distinguished Promotion Award from the University of Illinois in recognition of the scope, quality, and impact of her scholarship, teaching, service, and engagement efforts. The Campus Committee on Promotion and Tenure identified twelve scholars whose contributions were truly exceptional.

Flaherty selected to be Eastman Foundation Distinguished Lecturer

Associate professor **David Flaherty** was chosen to be among the Tenth Annual Eastman Foundation Distinguished Lecturers in Catalysis at the University of California, Berkeley, in 2021. His seminar was titled, "*Why Does the Catalyst Need to Be Wet?*"

Solvent molecules surround and interact with catalytic active sites in ways that change reaction rates and selectivities by orders of magnitude. Flaherty described the complex and previously unrecognized phenomena at solid-liquid interfaces during the direct synthesis of H_2O_2 ($H_2 + O_2 \rightarrow H_2O_2$), an environmentally benign oxidant.

Harley elected as Biomedical Engineering Society Fellow

Robert W. Schaefer Professor **Brendan Harley** has been elected to the Biomedical Engineering Society (BMES) Class of 2021 Fellows. This distinction recognizes members who demonstrate exceptional achievements and experience in the field of biomedical engineering and a record of membership and participation in BMES.

Harley's research group develops biomaterials for *in vivo* and *in vitro* tissue engineering applications within the body's spatially patterned and heterogeneous microenvironments to promote regeneration. Recently, Harley was awarded the Clemson Award from the Society For Biomaterials that also recognized his contributions to this area of research.

Kenis earns Energy Technology Division Research Award from the Electrochemical Society

The Electrochemical Society presented department head **Paul Kenis**, the Elio Eliakim Tarika Endowed Chair, with the 2020 Energy Technology Division Research Award, which was established in 1992 to encourage excellence in energy-related research. The award recognizes outstanding and original contributions to the science and technology of energy-related research areas.

Kenis presented his talk on "*Electrochemical CO_2 Reduction: Path Towards a Carbon Neutral Chemical Industry?*" via a live webinar presentation. He covered a summary of the status of CO_2 electrocatalysis, a techno-economic and life-cycle analysis to identify remaining hurdles, and the prospect of this technology to contribute to a sustainable chemical industry in the future.

Kong's teaching recognized with award from School of Chemical Sciences

The School of Chemical Sciences at the University of Illinois presented Robert W. Schaefer Professor **Hyunjoon Kong** with a 2020-2021 SCS Teaching Award, which recognizes the entire scope of educational efforts from course development to in-class instruction. Kong is known for his entertaining jokes and helpful lecture notes that he shares before each thermodynamics class (CHBE 321).

Leckband receives 2021 Langmuir Lectureship Award

Langmuir and the ACS Division of Colloid & Surface Chemistry named professors **Deborah E. Leckband** and **Ivan I. Smalyukh** from the University of Colorado Boulder as winners of the 2021 Langmuir Lectureship Award. The award recognizes individuals working in the interdisciplinary field of colloid and surface chemistry.

"Being selected as a 2021 Langmuir Lecturer is a terrific honor. Since my postdoc years with Jacob Israelachvili, I have been fascinated by the ways that surface science affects biology, from fundamental processes like cell adhesion to preventing marine fouling on ships. I have many superb colleagues in the field. Their recognition of my contributions in this way is both humbling and an honor," Leckband said.

Peters serves as 2021 Honoree of the Crystallization & Evaporation Area at AIChE

William H. and Janet G. Lycan Professor **Baron Peters** gave an invited talk as the 2021 Honoree of the Crystallization & Evaporation area. This award is a recognition of longstanding contributions to the field and also serves to introduce concepts that will be key going into the future.

Peters' talk, "*Computational Methods for Crystal Nucleation and Growth: Current Status and Future Directions,*" outlined classic models and modern developments in the theory of nucleation and growth, with emphasis on recent simulation advances for the calculation of phase diagrams, non-equilibrium driving forces, growth rates, and nucleation rates.

Shukla earns NIH Maximizing Investigator Research Award

This fall, Blue Waters Associate Professor **Diwakar Shukla** received a highly prestigious Maximizing Investigators' Research Award (MIRA) from the National Institute of General Medical Sciences, part of the National Institutes of Health. MIRA is the agency's major early career award.

The five-year award grants $1.94 million to support Shukla's efforts to develop both theoretical and computational tools to understand biophysical processes for applications in plant biology and human diseases. Shukla's team will investigate rare conformational transitions in proteins and help guide the design of experiments to validate the *in silico* predictions.

Shukla named LEAP scholar for contributions in teaching and research

Blue Waters Associate Professor **Diwakar Shukla** was among four professors recognized as Lincoln Excellence for Assistant Professors (LEAP) scholars by the College of Liberal Arts & Sciences. The LEAP award recognizes early-career faculty based on scholarly productivity and contributions to the educational mission of their departments and the College of LAS; LEAP scholars hold the title for two years.

Sing earns 35 Under 35 Award from AIChE

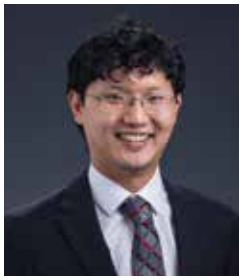
Associate professor **Charles Sing** received the 35 Under 35 Award from the American Institute of Chemical Engineers in 2020. The award honors engineers who have made significant contributions to AIChE and the chemical engineering profession; it was founded to recognize young chemical engineers who have achieved greatness in their fields. The winners are a group of driven, engaged, and socially active professionals, representing the breadth and diversity that chemical engineering exemplifies.

Sing named a 2020 Young Investigator by ACS PSME

Associate professor **Charles Sing** was among 15 Young Investigators honored by the American Chemical Society's Polymeric Materials: Science and Engineering (PMSE) in 2020 for significant contributions to the field.

The award provides a forum for PMSE Young Investigators to share their ideas and recent advances and recognizes their accomplishments. Sing gave an invited talk as part of the PMSE Young Investigator Symposium, which was held during the ACS fall meeting.

Su wins 2021 Elsevier Prize for Green Electrochemistry from ISE



The International Society of Electrochemistry awarded assistant professor **Xiao Su** the 2021 Elsevier Prize for Green Electrochemistry in recognition of his achievements in the field of environmental electrochemistry. The annual award is given to early-career scientists under the age of 35. Su will receive the award at the 2022 Annual ISE Meeting, where he will give a lecture on redox-mediated electrochemical processes for selective separations and environmental remediation.

Research Grants

FUTURE-MINDS-QB to increase participation from underrepresented groups in biomedical data science and quantitative biology

Fisk University, a historically Black university in Nashville, and the University of Illinois Urbana-Champaign have been awarded a five-year, $1.3 million T-32 training grant from the National Institute of General Medical Sciences, a member organization of the National Institutes of Health. This grant supports the program: Fisk-UIUC Training of Under-Represented Minds in Data Science and Quantitative Biology, known as FUTURE-MINDS-QB.

FUTURE-MINDS-QB offers two tracks from a master's degree program at Fisk to a doctoral degree program at Illinois in a field relevant to quantitative biology. Participants will receive rigorous training in the core computational and mathematical skills that are required to succeed in big-data research fields. Chemical and biomolecular engineering professors **Brendan Harley, Hyunjoon Kong, Mary Kraft,** and **Christopher Rao** are participating.

From left: Fisk undergraduate students Skye Faucher, Jaia Holleman, and Leiana-Lavette Woodard who participated in summer training workshops at UIUC.

$2.4M NIH grant will develop biomaterials to repair skulls and promote regeneration

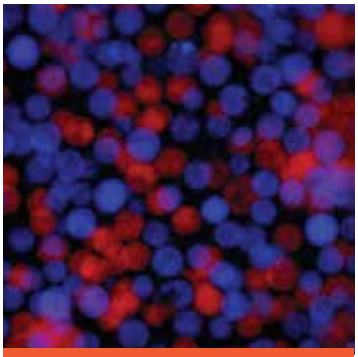
Led by Robert W. Schaefer Professor **Brendan Harley**, a new research project aims to develop biomaterials that are strong, malleable, and support stem cell growth to transform skull reconstruction surgeries with a $2.4 million grant over five years from the National Institute of Dental and Craniofacial Research, a branch of the U.S. National Institutes of Health.

From left: professor Brendan Harley and graduate students Aleczandria Tiffany and Vasiliki (Aliki) Kolliopoulos.

"Craniofacial bone reconstruction is difficult and time-intensive—relying on bone grafts and ill-fitting, non-regenerative plastic implants; the result is often poor healing and high complication rates," Harley said. "Our goal is to improve patient recovery by accelerating bone regeneration."

Harley to lead NIH grant on microdroplet materials

Robert W. Schaefer Professor **Brendan Harley** is teaming up with co-investigator **Andrés García**, executive director of the Parker H. Petit Institute for Bioengineering and Bioscience at Georgia Tech, for a two-year effort supported by the National Institutes of Health Exploratory/ Developmental Research Grant Award, which supports early and conceptual stages of project development.



Mixed microdroplet populations.

Their goal is to replicate the cascade of signals necessary to control stem cell behavior, which remains a central challenge for the regenerative medicine community. The hematopoietic system, where blood cell components are formed, offers an ideal biological system. The team will use the short diffusion lengths of microdroplets to study the impact of biophysical and metabolic signals on hematopoietic stem cells.

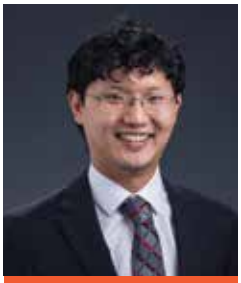
Kong receives 2021 Seed Awards to support collaborative cancer research

Robert W. Schaefer Professor **Hyunjoon Kong** will participate in two of nine new interdisciplinary projects at the University of Illinois supported by annual seed grant awards from the Cancer Center at Illinois. The two projects are called "FORce Control of Cancer Tumor μEnvironment" and "Multi-shape 3D Hanging Drop Array for Cancer Drug-screening." Kong will provide natural-synthetic extracellular matrices that can regulate cellular signaling and force with their chemical and mechanical properties.

Hyunjoon Kong

C3.ai Digital Transformation Institute awards energy and climate security grant to Su and Shukla

Diwakar Shukla



Xiao Su

Professors **Xiao Su** and **Diwakar Shukla** received funding through a seed award from the C3.ai Digital Transformation Institute to leverage artificial intelligence (AI), machine learning, and advanced analytics for more sustainable and energy-efficient separations for water purification, resource recovery, carbon capture, and more.

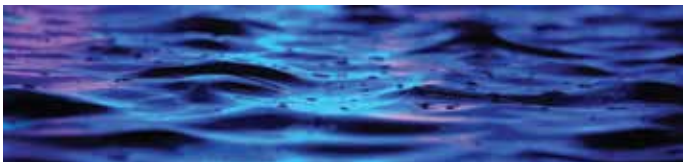
"Electrification of separation processes has the potential to make a significant impact on decarbonization and environmental sustainability by providing integration with renewable energy (green electrons) and modularity," said Su, who will lead the new project. "A significant challenge is designing selective electrodes for contaminant removal and resource recovery, and we believe data science/artificial intelligence can play a tremendous role in accelerating materials discovery."

"AI methods have tremendous potential for application in the field of energy efficiency and climate security," Shukla said. "Given the amount of fertilizer used in modern agriculture, efficient removal of nitrate from agricultural wastewater would save both energy and improve the climate."

Su receives seed funding to make Illinois' water supply more sustainable

Assistant professor **Xiao Su** joins one of eight research teams across the state awarded $229,000 in seed grants from the Illinois Innovation Network to create a more sustainable water supply system in Illinois.

Su's project will investigate the viability of a new electrochemical wastewater-treatment system. The research team also includes Northern Illinois University professors **Tomoyuki Shibata**, associate professor of public health, and **Kyu Taek Cho**, associate professor of mechanical engineering.



New U.S. and German collaboration aims to produce green hydrogen more efficiently

Through a new award program, the U.S. National Science Foundation and Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) have joined forces to award the University of Illinois and Technical University of Darmstadt a three-year, $720,000 research grant to explore opportunities to more efficiently produce green hydrogen, a clean and renewable source of energy.

Led by Richard C. Alkire Chair **Hong Yang**, the project is among the first supported by the NSF-DFG Lead Agency Activity in Electrosynthesis and Electrocatalysis (NSF-DFG EChem), an international effort to support collaborative work between U.S. researchers and their German counterparts on engineering science projects for novel and fundamental electrochemical reactions and studies. The project assembles a multidisciplinary team, including **Nicola Perry** at Illinois and professor **Andreas Klein** at TU Darmstadt.

A new research project that aims to produce green hydrogen more efficiently brings together a multidisciplinary team comprising professors Hong Yang and Nicola Perry at the University of Illinois Urbana-Champaign and Professor Andreas Klein at the Technical University of Darmstadt.

Research Highlights

Portable, affordable, accurate, fast—team invents new COVID-19 test

A new coronavirus test can get accurate results from a saliva sample in less than 30 minutes, researchers report in the journal Nature Communications. Many of the components of the hand-held device used in this technology can be 3D-printed, and the test can detect as little as one viral particle per 1-microliter drop of fluid.

"We developed a rapid, highly sensitive and accurate assay, and a portable, battery-powered device for COVID-19 testing that can be used anywhere at any time," said Steven L. Miller Chair **Huimin Zhao**, who led the research. Though it is still in the prototype stage, the device is estimated to cost less than $78 and the reagents and other materials needed for testing would amount to $6-$7 per test, the researchers found.

Current coronavirus testing technologies are complex, expensive, time-consuming, and require bulky equipment and expert analysts, whereas the new device can be operated by anyone with minimal training who is careful when loading samples, Zhao said.

The research team included (from front left) Stephan Lane, manager of the Illinois Biological Foundry for Advanced Biomanufacturing; graduate student Guanhua (Daniel) Xun; Huimin Zhao, the Steven L. Miller Chair; (from back left) undergraduate students Vassily Petrov and Brandon Pepa, who has since graduated. Photo by L. Brian Stauffer.

Scientists demonstrate a better, more eco-friendly method to produce hydrogen peroxide

Led by associate professor **David Flaherty**, a team has demonstrated a more efficient and environmentally friendly method to produce hydrogen peroxide (H_2O_2), according to a recent study published in the Journal of the American Chemical Society.

Decades ago, researchers proposed a simpler, cheaper, and "greener" one-step alternative method, where a catalyst (palladium–gold nanoparticles) drives the reaction. Flaherty's team found that a ratio of one palladium to 220 gold atoms generates almost 100 percent hydrogen peroxide, instead of the other potential product: water.

The organization of these atoms within the catalyst matters: palladium atoms touching one another favor water formation while palladium atoms surrounded by gold favor H_2O_2 formation. Significantly, these catalysts give stable performance over many days of use and continuously achieve these remarkable selectivities to H_2O_2—and do so using clean water as a solvent, avoiding problematic and corrosive additives that are often used.

Graduate student Tomas Ricciardulli (left) and professor David Flaherty (right)

Tiny porous crystals change the shape of water to speed up chemical reactions

A study in Nature Catalysis, led by associate professor **David Flaherty**, explains how water molecules assemble and change shape in some settings to help speed up chemical reactions critical to industry and environmental sustainability.

Zeolites, which can behave like tiny sponges, filters, or even catalysts, have been used for years in materials that soak up environmental spills and purify water and other chemicals. Researchers understand that the interactions with water inside

From left: graduate student Matthew Chan, professor David Flaherty, and graduate student Zeynep Ayla

zeolite pores greatly affect their stability as catalysts, but it has been unclear how or why this happens.

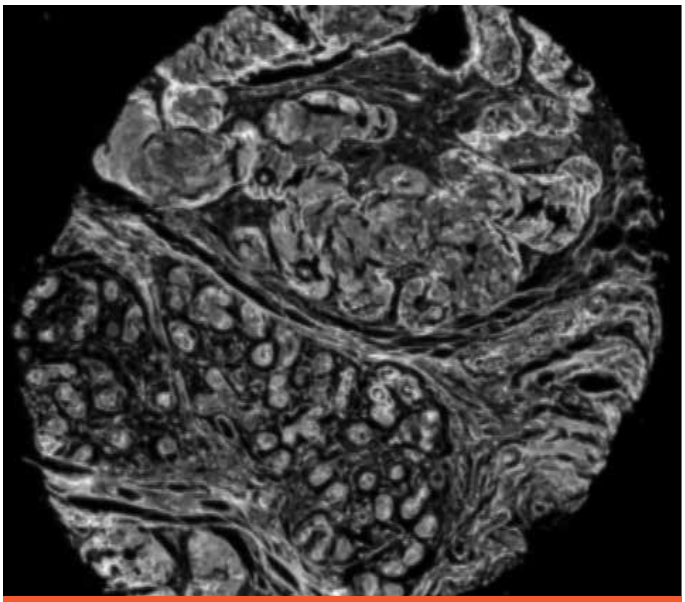
The team used spectroscopic methods to measure systematic differences between the shape and arrangement of water molecules in the bulk phase and those water molecules confined within a series of zeolites with progressively smaller pore size diameters.

“We saw higher rates of chemical reactions near small clusters of water molecules confined in the zeolite pores than in those without water or in bulk-like water,” Flaherty said. “Correlations between entropy changes in the water caused by the reaction, the reaction rates, and the size of the zeolite pores suggest that the changes in the structure of water clusters and chains are responsible for the improvement in catalytic rates.”

Bioengineers develop software to enhance IR-based cancer diagnosis

A team of researchers led by graduate student **Kianoush Falahkheirkhah** and Founder Professor of Bioengineering **Rohit Bhargava**, an affiliate professor of chemical and biomolecular engineering, developed new software to boost infrared imaging-based cancer diagnosis. In addition to computationally enhancing image resolution, this software will integrate data analysis and accelerate recording speeds of pathological imagery. Their research is published in Chemometrics and Intelligent Laboratory Systems.

“Most of the strategies for cancer diagnosis today are based on assessing the morphologic detail of the sample, which involves a pathologist analyzing the sample to ascertain the type and severity of the cancer. With IR imaging, we get the chemical composition of a sample, providing us with the volume of information necessary for automated tools to analyze tumors and their surrounding microenvironment,” Falahkheirkhah said.



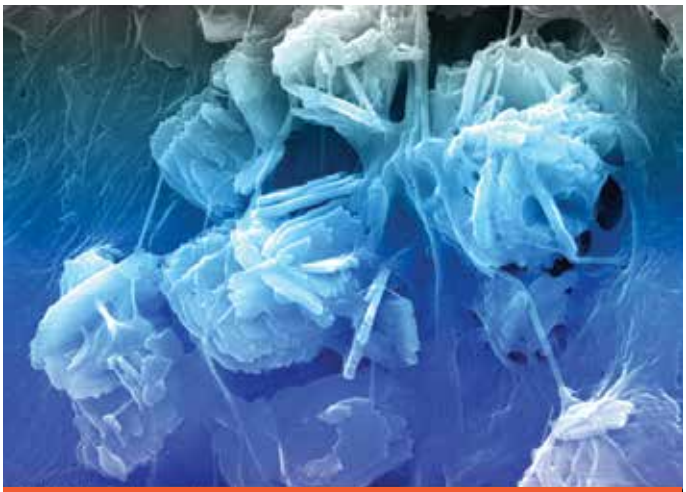
IR imaging data from breast tissue was used to evaluate the software’s performance. Image provided by Kianoush Falahkheirkhah.

Improving biomaterials design for bone regeneration

Bone injuries in the face and skull—known as craniomaxillofacial defects—can be caused by sports injuries, vehicle accidents, or battlefield injuries. Repairing such defects is complicated because different types of cells need to interact with each other. In a new study, led by Robert W. Schaefer Professor **Brendan Harley**, researchers are investigating the types of material used in reconstruction to see which one works best.

Harley’s group develops collagen scaffold biomaterials containing components that are found in bone, such as calcium and phosphate ions, and sugar compounds called glycosaminoglycans (GAGs). The researchers adapted a collagen biomaterial to include one of three different types of GAGs found in the bone tissue microenvironment: chondroitin-4-sulfate, chondroitin-6-sulfate, and heparin. They investigated how these materials influence processes important to bone regeneration, such as stem cell activity, immune cell activation, and endothelial cell activity, which is important for the formation of new blood vessels.

“Although heparin is known to directly influence blood vessel formation, to our surprise, we saw that the media generated by stem cells in chondroitin-6-sulfate scaffolds led to the greatest amount of blood vessel development compared to the other two scaffolds,” said Vasiliki "Aliki" Kolliopoulos, a graduate student advised by Harley.



Electron microscope image of the mineralized collagen scaffold showing the mineral crystals and collagen fibers. The color has been added by the researchers.

Less salt, more protein: Researchers address dairy processing’s environmental, sustainability issues

Researchers say the high salt content of whey—the watery part of milk left behind after cheesemaking—helps make it one of the most polluting byproducts in the food processing industry. In a new study, led by assistant professor **Xiao Su** and graduate student **Nayeong Kim**, chemists demonstrate the first electrochemical

A graphical representation of the new whey-processing method.

redox desalination process used in the food industry, removing and recycling up to 99% of excess salt from whey while simultaneously refining more than 98% of whey's valuable protein content.

The desalination process introduced in this study uses up to 73% less energy and functions at 62% of the operating cost associated with conventional desalination systems. The findings of the study are published in the Chemical Engineering Journal.

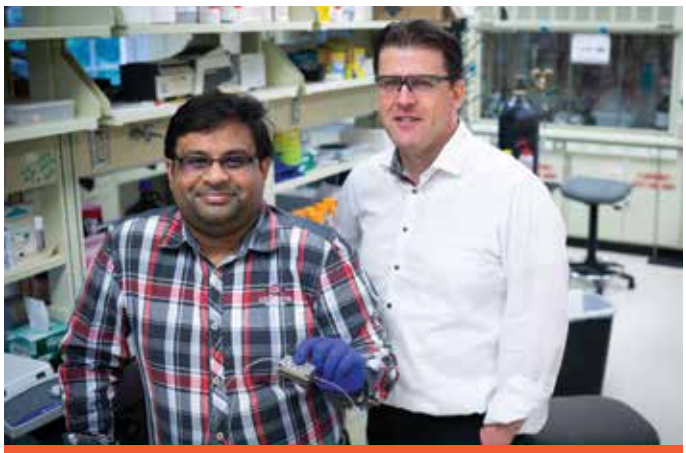
Unified theory explains how materials transform from solids to liquids

Years of meticulous experimentation have paid off for researchers aiming to unify the physics that defines materials that transition from solids to liquids. The researchers said a new theoretical model could help develop new synthetic materials and inform and predict civil engineering and environmental challenges such as mudslides, dam breaks, and avalanches.

The mucus layer on the underside of a snail's foot is one example of a soft material that yields to stress up to a certain point, then flows. This behavior, simplified in a new study from researchers at the University of Illinois, is what helps the snail move without unwieldy sliding, similar to that of many other natural and synthetic materials, from mud to the additives that make toothpaste flow when squeezed. Photo courtesy of Rodrigo Quarteu.

The study, led by assistant professor **Simon Rogers**, unveils a unified mathematical expression that defines how soft-yet-rigid materials transition from a solid into a liquid flow when they exceed their specific stress threshold. The findings are published in the journal Physical Review Letters.

"The behavior of yield-stress fluids has traditionally been defined by trying to combine the physics of two different types of materials: solids and liquids," said lead author and graduate student **Krutarth Kamani**. "But now, we have shown that these physical states—solid and liquid—can exist together in the same material, and we can explain it using one mathematical expression."



Department head Paul Kenis (right) and graduate student Saket Bhargava (left) report reducing the energy required for CO_2 electrolysis by more than 60% in a flow electrolyzer using magnetism.

Scientists intensify electrolysis, utilize carbon dioxide more efficiently with magnets

For decades, researchers have been working toward mitigating excess atmospheric carbon dioxide (CO_2) emissions. One promising approach captures atmospheric CO_2 and then, through CO_2 electrolysis, converts it into value-added chemicals and intermediates—like ethanol, ethylene, and other useful chemicals. While significant research has been devoted to improving the rate and selectivity of CO_2 electrolysis, reducing the energy consumption of this high-power process has been underexplored.

Led by department head **Paul Kenis**, the Elio E. Tarika Endowed Chair, researchers reported a new opportunity to use magnetism to reduce the energy required for CO_2 electrolysis by up to 60% in a flow electrolyzer. They used a magnetic field at the anode to achieve energy savings ranging from 7% to 64% by enhancing mass transport to/from the electrode. They also swapped the traditional iridium catalyst—a precious metal—with a nickel-iron catalyst comprised of abundant elements.

"The answer was staring us right in the face—of course, the trick is to reduce the energy consumption at the anode," said first-author **Saket Bhargava**, a graduate student advised by Kenis. "We decided that if oxygen evolution is the problem, why not use a magnetic field at the oxygen evolving electrode and see what happens to the entire system."

Clare Boothe Luce program supports two ChBE undergraduate students

*Two seniors in chemical and biomolecular engineering, **Melissa Manetsch** and **Briana Sobecks**, are represented in the 2021-2022 cohort of Clare Boothe Luce scholars. The CBL program supports eight women undergraduates who aim to study or teach science, mathematics, and/or engineering by creating a research pathway to graduate studies. CBL scholars are part of the Illinois Scholars Undergraduate Research (ISUR) program and also benefit from science communication opportunities (poster/oral presentations), monthly seminars, and interactions with faculty on topics ranging from research proposals to work-life balance.*

Melissa Manetsch (left) and Claudia Berdugo-Diaz (right)

Briana Sobeck (left) and Jiming Chen (right)

Melissa Manetsch

Melissa Manetsch is working with graduate student **Claudia Berdugo-Diaz** and associate professor **David Flaherty**. “Melissa is spectacular and brings enthusiasm to the research. She has helped us develop materials and processes with industrial relevance from renewable sources. It is a pleasure to have her in the lab," Flaherty said.

Manetsch’s research focuses on converting biomass into useful chemicals via heterogeneous catalysis. Recent work in the Flaherty lab has uncovered classes of catalysts that demonstrate a unique ability to selectively cleave C-O bonds in esters to produce ethers that are useful as surfactants and solvents. Her work investigates the activity and selectivity of these novel catalysts for the conversion of relevant esters. By varying carbon electronegativity, carbon chain length, and steric bulk, they aim to learn more about the mechanism of selective hydrogen transfer to inform further catalyst optimization and identify opportunities to translate this technology into practice.

“Through the Clare Boothe Luce Program, I have gained valuable insight into factors that are important for longevity and success in research,” Manetsch said. “This program has introduced me to a community of fellow students and scientists who have encouraged and motivated me on my scientific journey. I am continuously inspired by my mentor, Claudia Berdugo-Díaz, and her passion for science; she has tirelessly supported and challenged me to grow as a scientist.”

Manetsch works with Project for Less and co-founded (and is now the president of) Womxn in Chemical Sciences (WiCS) to advance inclusion in the School of Chemical Sciences. She enjoys jogging, reading, and learning languages. She plans to pursue a Ph.D. in chemical engineering or materials science and aims to contribute to sustainable energy technology in a national lab or academic setting.

Briana Sobecks

Briana Sobecks is pursuing a research project with graduate student **Jiming Chen** and Blue Waters Associate Professor **Diwakar Shukla**. “With support from the CBL program, Briana has made tremendous progress in research along with excellence in coursework. Her work in our lab has generated new molecular insights into the mechanisms of hormone perception in plants," Shukla said.

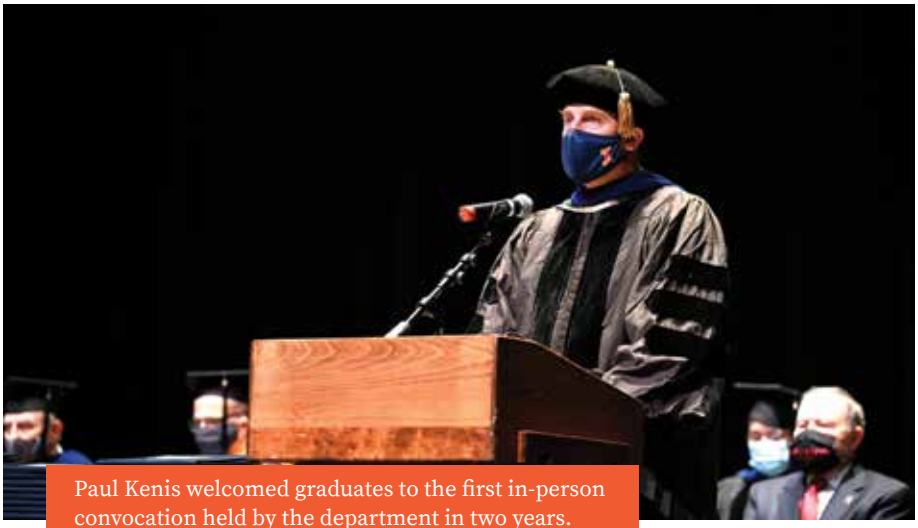
Sobecks aims to improve food security by eliminating the effects of parasitic weeds like witchweed, which destroys $10 billion in food crops annually. Witchweed feeds off strigolactone, a hormone secreted by host crops. Using computer models and simulations, Sobecks investigates how witchweed metabolizes strigolactones better than crops in order to help design better proteins to ward it off. She has determined a protein that interferes with the receptor’s active site shape and the hormone’s motion, decreasing the metabolism reaction rate of strigolactone in rice.

“I am grateful to Dr. Shukla, Jiming, and the Clare Boothe Luce program for helping me find success in research,” Sobecks said. “CBL has helped me grow tremendously as a researcher. I have gained confidence in my ability to describe my research with those outside my lab. The program has also given me the opportunity to connect with and learn from a variety of professors. ”

Sobecks chose Illinois for its strength in chemistry and chemical engineering. She is the vice president of the American Chemical Society student chapter. She also participates in the Campus Honors Program, student council, and sings in a church choir. After graduation, she plans to pursue a Ph.D. in chemical sciences, studying enzyme function using molecular dynamics.

ChBE returns to in-person convocation to celebrate December 2021 graduates

The Department of Chemical and Biomolecular Engineering held an in-person convocation ceremony on December 18, 2021, to celebrate nearly 50 graduates with remarks from ChBE alumnus Joseph Drago, an expert in nuclear and industrial safety.



Paul Kenis welcomed graduates to the first in-person convocation held by the department in two years.

To start, department head Paul Kenis, the Elio Eliakim Tarika Endowed Chair, welcomed graduates to the first in-person convocation held by the department in two years. "It is wonderful to gather here today, in person, to celebrate the accomplishments of this distinguished group, who have achieved much despite the unforeseen and extraordinary circumstances caused by the pandemic," Kenis said.

College of Liberal Arts & Sciences associate dean Matthew Ando echoed these sentiments in his welcome remarks, as did Drago.

"Each of you, the chemical engineers of the Class of 2021, has fulfilled the requirements which are challenging in normal times, but these last two years have been, and continue to be, far from normal times," Drago said. "The COVID-19 pandemic placed a formidable obstacle in front of you, and you overcame that barrier."

Drago described the value of pursuing, accepting, and providing opportunities.

"One day, you may find yourself as the only person in the room who understands the true risk of a proposed course of action… Your peers will see your personal and professional ethics manifest in your daily tasks long before that day," he said. "Pursue knowledge. Pursue understanding. But more importantly, pursue wisdom. Use your knowledge and experience to arrive at appropriate and ethical decisions."

He said accepting opportunities propelled his career first as a reactor engineer at an operating nuclear power plant and later when he was asked to perform nuclear safety assessments with the Department of Energy.

"I have also accepted opportunities to mentor colleagues," he said. "I often heard them thank me for helping them explore solutions, but I also benefited from the relationship, for those conversations sharpened my problem solving and communication skills."

This philosophy has led to unforeseen opportunities outside of work—being an early adopter of a home computer led to self-publishing a book.

He went on to share that "at every stage in your life, you can provide opportunities for others."

In celebration of his 50th class reunion coming up next year, and in memory and honor of his parents, Drago established the Philip and Anne Drago Scholarship to award funds to support a chemical engineer focused on chemical process, nuclear, or bio-related safety.

"In this small way, I am providing opportunities for students I do not know, but who will undoubtedly see further than I could ever see," said Drago, referring to a famous quote by Newton: If I have seen further, it is by standing on the shoulders of Giants.

"I challenge you to provide opportunities for others," he said. "To the class of 2021, congratulations on your achievements, and good luck with building a magnificent and impactful career."

Today's graduates join more than 5,000 departmental alumni who have graduated since 1901.

> "I challenge you to provide opportunities for others. To the class of 2021, congratulations on your achievements, and good luck with building a magnificent and impactful career."
>
> **Joseph Drago**

Alumnus Joseph Drago, an expert in nuclear and industrial safety, addressed the graduates.

Outreach event paints grim future for plastics, bright futures for engineers

Scientists thrive on their ability to piece together the story behind their data and describe something unknown to the world. Academics also thrive in the classroom, where they help students discover knowledge and skills that were unknown to them.

It is these twinning motivations that make outreach events that showcase the value of our scientific endeavors while educating and inspiring future scientists so meaningful.

At a recent outreach event, more than 20 graduate students and three chemical and biomolecular engineering professors Damien Guironnet, Charles Sing, and Antonia Statt, who is also affiliated with materials science and engineering, had the opportunity to witness nearly 60 fourth graders at a local elementary school discover the short lifespan—and diminishing supply—of plastic.

They organized this activity as part of the St. Elmo Brady Academy, an outreach program that encourages middle school youth from underserved backgrounds to pursue STEM careers. The Brady Academy was founded by former ChBE lecturer Jerrod Henderson, now an assistant professor at the University of Houston; it is now managed by Valerie O'Brien at the University High School.

"We want to empower these students to make a difference each and every day by choosing to reduce, reuse, and recycle," said graduate student Dani Harrier (Guironnet/Kenis Groups), who helped organize the event. "More than that, we want to show them the kinds of big-world problems that engineers like us—and perhaps one day them!—are tackling."

They showcased both how difficult it is to source the raw materials required for making plastic and the diminishing returns of recycling efforts.

First, the students "mined" for coal (bolts) and oil (paperclips) amongst tubs full of rocks. Next, they pretended to ship the coal

to the power plant and used the remaining crude oil to first perform separations and then built polymers by stringing together their paper clips. Then they exchanged their paperclips for playdough to compare the processes of molding and extruding.

"By the end of the first lesson, the students could figure out how plastic items in their classroom were produced, and they got a sense of all steps involved in the

production," Statt said. "They mastered the material, but what's more, they got excited about engineering concepts."

"However, when the students went back to mine for more materials to make more goods, they discovered the problem with depending on limited resources like fossil fuels," said Guironnet, who helped organize the event with his wife Sue Guironnet. "They also learned how difficult it is to recycle plastic, as demonstrated by trying to separate different colors of playdough—a concept I'm familiar with both as a plastics expert and parent."

"It's easy for us to lose sight of the big picture when we are working in our sub-disciplines and constantly hustling after the next deadline," Sing said. "These outreach efforts remind us of what we are working toward, who we are working for, and who we want to work with more in the future by making science more accessible and inclusive."

These lesson plans are available online to be used for other outreach efforts at go.chbe.illinois.edu/SEBA.

Paul Winterbotham

Support our outreach efforts, and the people who make them happen.

Your investment supports the best and brightest students with fellowships and scholarships; it supports world-renowned faculty and their innovative research and teaching; it funds essential upgrades to laboratories, classrooms, and technologies; and it funds outreach efforts to inspire the next generation of engineers.

You can make a gift by using the enclosed envelope, by phone at 217-244-0473, or online by scanning the QR code provided or visiting go.chbe.illinois.edu/give. In addition to outright gifts, you can support the Department of Chemical and Biomolecular Engineering as part of your overall financial, tax, and estate planning with deferred gifts such as bequests, charitable trusts and annuities, pooled income funds, retained life estates, retirement accounts, and life insurance.

If you take the standard deduction on your taxes, the Consolidated Appropriations Act allows for an adjustment up to $600 in cash gifts to qualified charities, effectively raising your standard deduction by the amount of your gift. Visit https://go.illinois.edu/CCAinfo for more information.

We will work with you to arrange options most suitable for you. If you are interested in learning more about these or other gift options, please contact **Paul Winterbotham**, assistant director of development, at paulww@illinois.edu or 217-300-6222.

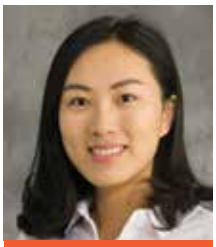
2021 Graduate Research Symposium

The Department of Chemical and Biomolecular Engineering and the Graduate Student Advisory Council (GSAC) hosted the 20th annual Graduate Research Symposium on October 8, 2021.

The event included poster and oral presentations by the department's graduate students on wide-ranging topics from robotic automation to coarse-grain modeling, developing organic solar cells, engineering cell factories, and speeding up COVID testing.

The presentations were judged by a panel of alumni: **Daniel Crowl** (MS '73, PhD '75), who is retired from Michigan Technical University; **Yongqi Lu** (PhD '97), a research chemical engineer at the Illinois State Geological Survey; **Qingjun Meng** (PhD '04), a discipline lead of Process Modeling and Simulations at BP; and **Fei Wen** (MS '06, PhD '10), an associate professor at University of Michigan. Thank you to the judges, organizers, and participants for making this event possible.

Poster Presentation Winners:



AChengyou Shi

First place
Chengyou Shi
"Accelerating the Discovery of Novel Ribosomally Synthesized and Post-transitionally Modified Peptides (RiPPs) through Pathway Refactoring and Robotic Automation" (Zhao Group)

Apurva Godbole

Second place
Apurva Godbole
"Raman Spectroscopy and Multivariate Analysis for Noninvasive Determination of Cell Phenotype in Hydrogel Cultures" (Kraft Group)

Azzaya Khasbaatar

Third place
Azzaya Khasbaatar
"Tuning the Molecular Assembly Pathway for Morphology Control in Organic Solar Cells" (Diao Group)

Oral Presentation Winners:

Danielle Harrier

First place
Danielle Harrier
"Biodegradable Latex: The Development of an Encapsulation Technique for the Ring-opening Polymerization of Cyclic Esters" (Guironnet/Kenis Groups)

Whitney Sinclair

Second place
Whitney Sinclair
"Lung-on-a-chip Platform that Enables in situ Imaging" (Leckband/Kenis Groups)

Yu-Heng Deng

Third place
Yu-Heng Deng
"Self-Locomotive, Antimicrobial Microtorpedo (SLAM) for Biofilm Removal through Swarm-Activating Cavitation" (Kong Group)

Front row from left: Qingjun Meng (PhD '04), Fei Wen (MS '06, PhD '10), Daniel Crowl (MS '73, PhD '75), and Yongqi Lu (PhD '97). Back row from left: graduate students Destiny Collazo, Brent Buchinger, Jarom Sederholm, Kyle Timmer, Rachel Gaines, Lauren Endress, and Richa Ghosh.

Would you like to be a judge for one of our student research symposiums?

The Undergraduate Research Symposium will be held on Friday, April 1, 2022, and the next Graduate Research Symposium will be held on Friday, October 7, 2022.

Email the department at chbe@illinois.edu if you're interested!

Graduate Student Fellowships

Every year, chemical and biomolecular engineering graduate students are recognized with a variety of fellowships that recognize their achievements. Congratulations to our outstanding students!

2020-2021 Fellowships

3M Corporate Fellowship
Jiangyan Feng
Alexander Horn
Uzoma Nwabara
Isamar Pastrana-Otero

A.T. Widiger Chemical Engineering Fellowship
Talha Al-Zoubi
Claudia Berdugo Diaz
Raylin Chen
Daniel Davies
Andrew Kuhn
Dinesh Kumar

Chemistry-Biology Interface Training Program
Melanie Brunet Torres
Jesse Horne

Chia-chen Chu Fellowship
Jiming Chen
Chengyou Shi

Dissertation Completion Fellowship
Mai Ngo

DuPont Science and Engineering Fellowship
Uzoma Nwabara

GEM Associate Fellow
Dejuante Walker

Glenn E. and Barbara R. Ullyot Graduate Fellowship
Ajit Vikram

Graduate College Fellowship
Vanessa DaSilva
Darien Raymond
Anaira Roman Santiago
Howard Weatherspoon

Harry G. Drickamer Graduate Research Fellowship
Prapti Kafle
Uzoma Nwabara

Illinois SLOAN Scholar
Danielle Harrier
Jason Madinya
Anaira Roman Santiago
Chris Torres
Dejuante Walker
Howard Weatherspoon

JME Graduate Student Award
Anshu Deewan
Tianwei Yan

Link Foundation Energy Fellowship
Saket Bhargava

Mavis Future Faculty Fellowship
Saket Bhargava
Kavinraaj Ella Elangovan
Richa Ghosh
Prapti Kafle
Andrew Kuhn
Jarom Sederholm
Meng Zhang

NIH NRSA National Institute Environmental Health Science
Whitney Sinclaire

NSF Emergent Behaviors of Integrated Cellular Systems Summer REI
Ryan Miller

NSF Graduate Research Fellowship Program
Paola Baldaguez Medina
Richa Ghosh
Danielle Harrier
Vasiliki "Aliki" Kolliopoulos
Jason Madinya
David Potts
Raul Sun Han Chang
Aleczandria Tiffany
Chris Torres

NSF Miniature Brain Machinery
William Baker
Ryan Miller

NSF Molecular Sciences Software Institute Fellowship
Matthew Chan

PPG-MRL Graduate Research Assistantship
Dinesh Kumar

Samuel W. Parr Fellowship
William Baker
Vanessa DaSilva
Richa Ghosh
Jesse Horne
Matthew Jacobson
Jemin Jeon
Azzaya Khasbaatar
Nayeong Kim
Ohsung Kwon
Darien Raymond
Anaira Roman Santiago
Jarom Sederholm
Gunnar Thompson
Siqing Wang
Howard Weatherspoon
Rui Hua Jeff Xu

Studying Abroad Scholarship by the Ministry of Education, Republic of China
Yu-Tong Connie Hong
Joanne Hwang

SURGE Fellowship
Zeynep Ayla
Melanie Brunet Torres
Vanessa DaSilva
Bryan Mejia-Sosa
Ryan Miller
Uzoma Nwabara
Tomas Ricciardulli
Anaira Roman Santiago
Dejuante Walker
Howard Weatherspoon

TechnipFMC Fellowship
Yu-Heng Deng

Thomas and Margaret Huang Award for Graduate Research
Kianoush Falahkheirkhah

Tom and Yolanda Stein Graduate Fellowship
Tianwei Yan

2021-2022 Fellowships

3M Corporate Fellowship
Claudia Berdugo Diaz
Jiming Chen
Azzaya Khasbaatar

A.T. Widiger Chemical Engineering Fellowship
Jason Adams
Apurva Godbole
Aleczandria Tiffany
Matthew Wade

Chateaubriand Fellowship
Saket Bhargava

Chemistry-Biology Interface Training Program
Melanie Brunet Torres
Jesse Horne

Chia-Chen Chu Fellowship
Chengyou Shi

DuPont Science and Engineering Fellowship
Daniel Davies

GEM Associate Fellowship
Liliana Bello Fernández
Destiny Collazo

Glenn E. and Barbara R. Ullyot Graduate Fellowship
Saket Bhargava

Graduate College Fellowship
Vanessa DaSilva
Darien Raymond
Anaira Roman Santiago
Howard Weatherspoon

Harry G. Drickamer Graduate Fellowship
Soumajit Dutta
Uzoma Nwabara

Illinois Distinguished Fellowship
Archana Verma

Illinois SLOAN Scholar
Liliana Bello Fernández
Genesis Rios-Adorno
Chris Torres

JME Graduate Student Award
Hao Yu

Mavis Future Faculty Fellowship
Jason Adams
Soumajit Dutta
Vasiliki "Aliki" Kolliopoulos
Victoria Kriuchkovskaia
Chris Torres

National Institutes of Health Fellowship
Whitney Sinclair

NSF Graduate Research Fellowship Program
Whitney Sinclair
Jason Adams
Paola Baldaguez Medina
Richa Ghosh
Danielle Harrier
Vasiliki "Aliki" Kolliopoulos
David Potts
Raul Sun Han Chang
Chris Torres
Archana Verma

Samuel W. Parr Fellowship
William Baker
Vanessa DaSilva
Richa Ghosh
Jesse Horne
Matthew Jacobson
Jemin Jeon
Azzaya Khasbaatar
Nayeong Kim
Ohsung Kwon
Darien Raymond
Anaira Roman Santiago
Jarom Sederholm
Gunnar Thompson
Archana Verma
Siqing Wang
Howard Weatherspoon
Rui Hua Jeff Xu
Song Yin
Zhixin Zhu

Studying Abroad Scholarship by the Ministry of Education, Republic of China
Joanne Hwang

SURGE Fellowship
Liliana Bello Fernández
Destiny Collazo
Genesis Rios-Adorno

Tom and Yolanda Stein Graduate Fellowship
Vinh Tran

Mavis Fellowship prepares graduate students to become professors

Five chemical and biomolecular engineering graduate students were selected as Mavis Future Faculty Fellows (MF3): **Jason Adams** (Flaherty Group), **Soumajit Dutta** (Shukla Group), **Vasiliki "Aliki" Kolliopoulos** (Harley Group), **Victoria Kriuchkovskaia** (Harley Group), and Chris Torres (Flaherty Group).

The Grainger College of Engineering at the University of Illinois Urbana-Champaign provides the Mavis Academy to facilitate the training of the next generation of great engineering faculty. MF3 addresses a potential gap between research-focused doctoral programs that may not prepare students to become productive faculty members.

MF3 fellows participate in a series of workshops, seminars, and activities that cover various aspects of an academic career—such as writing cover letters and CVs, preparing for campus interviews, and defining and achieving success as a faculty member. The program emphasizes research, teaching, and mentoring:

Research
Professional development activities include dedicated workshops on communicating engineering research through writing and presentations as well as writing proposals.

Teaching
MF3 Fellows gain significant teaching experience, typically through a teaching assistantship.

Mentoring
MF3 Fellows mentor a less experienced graduate or undergraduate student and advise them on a research project.

Get to know
ChBE's 2021 Mavis Fellows

Jason Adams

"I wanted to become a professor of chemical engineering as an undergraduate and have pursued my career fervently ever since. Ultimately, I want to make a lasting impact in this field to benefit humankind and satisfy my intellectual curiosity. I believe the Mavis program is an excellent opportunity to help educate myself in this journey."

Soumajit Dutta

"The Mavis program provides graduate students like me a structured chance to become proficient in faculty-related skills that we do not encounter in our everyday graduate life. This program will help me improve my proposal writing, teaching, and public speaking skills. It will also give me exposure to the very successful alumni base of previous MF3 fellows."

Aliki Kolliopoulos

"I aspire to contribute to the global scientific community by mentoring the next generation of scientists and engineers. My ultimate career goal is to become a leader and innovator in biotechnology and translate my research findings. MF3 provides opportunities that will allow me to succeed as a faculty member and mentor."

Victoria Kriuchkovskaia

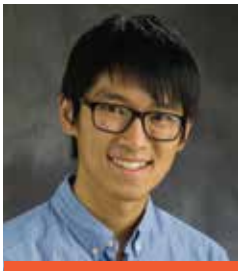
"My career aspiration has always been to continue my journey in academia and become a faculty member at a research university with a strong engineering program. However, this is an extremely challenging goal. The Mavis program is extremely beneficial to my success in graduate school and helps guide me through the process of gaining the necessary skills to become a productive faculty member."

Chris Torres

"I am excited to participate in the Mavis program as I know peers in our department who completed the program and felt like the experience was beneficial. This is an opportunity for me to hone the skills that will enable me to step into a faculty role to give back to students, who like me, come from backgrounds that are underrepresented in science and who must overcome unique obstacles to succeed in this challenging field."

Graduate Achievements

Chan develops protein prediction model through MolSSI fellowship

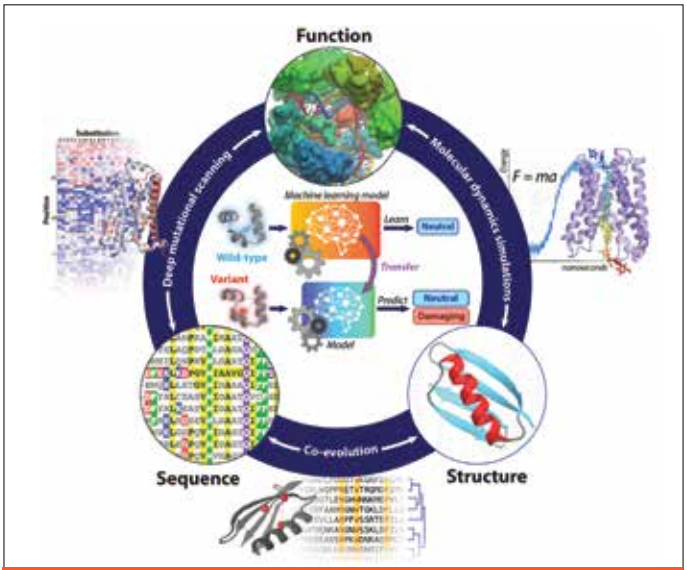


Matthew Chan

The Molecular Sciences Software Institute (MolSSI) awarded a 2021-A Seed Software Fellowship to graduate student **Matthew Chan** (Shukla Group) to develop a model using transfer learning that can decode the sequence, structure, and function of any protein.

Transfer learning is a machine learning method that can extrapolate information from known data and apply it to understand similar but unknown data. Chan's machine learning model aims to understand how a protein's specific amino acid sequence affects its structure and function. The applications are limitless, but one timely example is the ability to predict how mutations affect the viability of the coronavirus.

As a MolSSI fellow, Chan attended a week-long training camp. He also received six months of financial support coupled with weekly guidance, training, and mentorship from two of MolSSI's software scientists: **Doaa Altarawy** and **Sina Mostafanejad**. "I greatly benefited from having these scientists, who have real experience in machine learning, to advise me and plan out the next steps in this project," Chan said.



Transfer learning allows a machine learning model to first learn about a known protein from experimental data and then transfer the knowledge to predict the effect of an unknown variant. Graphic created by Matthew Chan.

ChBE graduate students awarded for their innovative proposals

The Carl R. Woese Institute for Genomic Biology at the University of Illinois Urbana-Champaign hosted its first Young Innovator Program that teaches participants all aspects of innovation, including patent law, technology transfer, market research, science communication, and entrepreneurship. The ten-week summer program, funded by the Catherine and Don Kleinmuntz Center for Genomics in Business and Society, concluded with an idea competition for participants to showcase their new skills. The three winners are all graduate students in the lab of Robert W. Schaefer Professor **Brendan Harley.**

Vasiliki "Aliki" Kolliopoulos (first place) plans to develop a novel 3D high-throughput platform to screen biomaterials for bone injuries using collagen scaffolds that are rapid and cost effective.

Aleczandria Tiffany (second place) is developing an implant for tissue regeneration that mimics aspects of children's growth plates that can be used to repair damaged tissue.

Victoria Kriuchkovskaia (third place) will develop a 3D model to screen cancer drugs that could be used to treat glioblastoma, a lethal brain tumor.

They were awarded tiered funds ranging from $5,000 to $20,000 to advance their novel innovations. All participants received one year of paid affiliation to EnterpriseWorks at the Research Park to access the shared working space and facilities, including support with visual branding and website development.

Aleczandria Tiffany's quest for knowledge knows no bounds

An academic journey from Los Angeles to Urbana-Champaign and abroad to Sydney, Australia

While she may not have foreseen her career trajectory, both in terms of discipline and location, each destination has brought her new opportunities to pursue her intellectual curiosity.

Like many scientists, innate inquisitiveness is the foundation upon which she has built her career. As a young girl, Tiffany would ask her parents "loads of questions" about the world around her that they couldn't answer, so they equipped her with books to find the answers for herself.

Tiffany has been seeking answers ever since.

"I would read books about animals in the ocean and animals in the Amazon," she said. "I just became obsessed with learning new things."

With each new topic came a potential career: marine biologist, botanist, forensic scientist, and geologist all made her list at some point. "Every time that I thought a subject was cool, I wanted to be that type of scientist," she said.

It was her high school science teacher who encouraged her to become an engineer; she chose chemical engineering based on her aptitude for chemistry.

Over time, her questions, and the tools that she employs, have grown in complexity.

At the University of Southern California, where she completed her bachelor's degree, Tiffany decided to participate in a work-study program that would look great on her resume and help her afford to live in LA.

In the lab of professor **Richard Robers**, she worked with a postdoctoral scholar to use mRNA display—a technique used for in vitro protein evolution—to design new peptides that selectively bound AGR2, a protein overexpressed in cancer.

It was this opportunity where she rediscovered her love to explore the unknown and her passion for biology.

"I found that I really like being in the lab because it was fun and exciting to be discovering something new," she said. "I asked, 'How can I do this all the time?'"

The graduate students in her undergraduate lab encouraged her to attend graduate school. She applied to several of the top chemical and biomolecular engineering programs across the country with the goal to attend the best school possible—several of which happened to be in the Midwest.

"When I was visiting the schools, I felt that Illinois had the realest people," she said. "I felt like they were honest with me, and they were willing to answer all of my questions. I felt like the students were comfortable around the professors, which I have found to still be mostly true."

At Illinois, with its broad expertise in both chemical and biomolecular engineering, Tiffany has been able to pivot from the industrial focus of her undergraduate program to her blossoming interest in biomedicine.

Before she began her PhD program, Tiffany took part in the Summer Predoctoral Institute (SPI), which provides an opportunity for incoming graduate students from underrepresented populations to start their graduate work at Illinois while creating a cohort of colleagues to grow with in academia.

Through SPI, she found her research project and graduate advisor, Robert. W. Schaefer Professor **Brendan Harley**.

"I got a jumpstart in the group by getting acclimated and trained that summer, which was really nice," said Tiffany, who now works on improving biomaterials for bone repair.

"I'm specifically interested in large-scale injuries caused by trauma, such as explosions to the face experienced by soldiers," she said. "I have been changing the composition of our materials in order to improve specific cellular outputs, including cell migration, vessel infiltration, and mineral deposition. We are increasing the speed at which these large-scale injuries, that normally wouldn't heal by themselves, are able to heal."

That goal is not too far off, she says. They are already testing these materials in animal models to refine the materials before pursuing human trials.

Not surprisingly, her intellectual curiosity has encouraged her to branch out from this project; she wants to explore how to repurpose these materials for other applications.

"Now, I'm thinking: How can we use our materials to study disease more in-depth?" she said. "How can we repurpose our existing materials to study bone cancer or osteoporosis *in vitro*?"

It was this line of thinking—and, admittedly, a distaste for Illinois winters—that led Tiffany to Sydney, Australia, to work with Scientia associate professor Kris Kilian at the University of New South Wales. Kilian's lab is interested in how the chemistry of materials influences the behavior of mammalian cells.

> "Even now, as a graduate student, I'm the same as I was when I was little. I read a paper about bone cancer or a paper on breast cancer, and I'm like, 'Oh, I want to do that. I want to do that. I want to do that'—I still am very interested in all these different topics. I'm doing exactly what I wanted to do back when I was an undergraduate: I'm working in a lab and learning something new all the time."

"They study cells in a variety of different 3D architectures to see how they behave and how to better study their biology," Tiffany said. "I worked on developing hydrogel models to mimic bone and the lung because when a type of bone cancer—called osteosarcoma—metastasizes to the lung, survivability decreases."

Through her work with Kilian, Tiffany learned about new materials, different cell types, 3D printing, and evaluation techniques like confocal microscopy. She mastered the process to culture endothelial cells, fibroblasts, and bone cancer cells.

When she wasn't working in the lab, she was exploring the Land Down Under with her husband, Kaelin. They visited Brisbane, Melbourne, and hopped over to New Zealand.

However, the year-long adventure was cut short by the pandemic; they returned to Illinois three months early in August 2020. Despite these unforeseen circumstances, Tiffany has no regrets.

This opportunity was made possible by her gumption, love to travel, and a grant from the National Science Foundation called Graduate Research Opportunities Worldwide, or GROW.

"One of my favorite things about science and math is that it is a global enterprise," she said. "You can really do it anywhere."

The grant was awarded based on Tiffany's research proposal, which she said was "honestly quite fun to put together"—contrary to popular belief.

"Even now, as a graduate student, I'm the same as I was when I was little," she said. "I read a paper about bone cancer or a paper on breast cancer, and I'm like, 'Oh, I want to do that. I want to do that. I want to do that'—I still am very interested in all these different topics. I'm doing exactly what I wanted to do back when I was an undergraduate: I'm working in a lab and learning something new all the time."

Currently, she is applying for postdoctoral research positions in cell biology and disease modeling.

"I have my PhD expertise in materials development and characterization, but I'd like to learn more complex cell biology techniques," she said. "I feel very lost when I'm reading complex biology papers, but I know that information would be beneficial to my work in biomaterials development."

While her next step in academia (or otherwise) remains to be seen, one thing is for certain: she won't be settling for anything less than the best opportunity to tackle big questions alongside like-minded scientists. For her, collaboration is key to both career success and satisfaction.

"I don't like doing things by myself; I love collaborating with people in and out of my lab," she said. "Collaboration is critical for science to advance, and diverse teams ask questions to push the boundaries of science. Someday, I want to create a cohesive research program that combines materials development with cell biology to create really fruitful collaborations."

Aleczandria Tiffany

Hyunjoon Kong:
An inspired biochemical engineer

"If I have seen further it is by standing on the shoulders of giants," said Sir Issac Newton, famously.

Today's scholars construct stories onto towering buildings begun by their predecessors—and thanks to these multi-generational scientific collaborations, we can see further than ever before. In the metropolis of chemical and biomedical engineering research, Robert W. Schaefer Professor **Hyunjoon Kong** has laid the foundation for a new area of study at the University of Illinois Urbana-Champaign.

At his recent investiture (read more on page 4), Kong shared that his uncle, who was an English professor, first came to UIUC on sabbatical and returned to describe the "large university campus, educational environment, and lifestyle" that so differed from their native country of South Korea.

Perhaps it was this experience, Kong suggests, that inspired his dream to study in the U.S.—yet he never would have imagined that his career would bring him to the same institution as his uncle so many years before.

Kong earned a BS and MS in industrial chemistry engineering from Hanyang University in Seoul, South Korea, before he would realize this dream at the University of Michigan.

He earned his PhD in macromolecular science and engineering with **Victor Li**, the James R. Rice Distinguished University Professor. For his thesis, Kong studied the literal foundation of construction: cement—specifically the development of a flowing and flexible cement composite.

Next, he transitioned to biomedical engineering as a postdoctoral researcher in the lab of Robert P. Pinkas Family Professor of Bioengineering **David Mooney** at the Harvard School of Engineering and Applied Sciences.

"You can see a correlation between the human body and building structures," Kong said. "Concrete is reinforced by iron bars; the iron bars are our bone, and then the concrete is like the connective tissues that make up our bodies."

It is this imaginative thinking that has propelled his career.

For Kong, this postdoctoral position was an opportunity to expand his research, but also to work on a variety of systems from which he could draw inspiration.

Kong joined UIUC in 2007 and established an independent research program at the interface of biology and materials.

Engineering Micro-Bots

Building upon his work with Mooney, Kong developed biomaterials to promote wound healing—but he soon witnessed challenges that must be overcome before these therapeutic products could be implemented.

"If there is an infection, it will neutralize all our efforts," he said. "What I found was that microorganisms are making their own tissue within our host tissue, called a biofilm, that acts as a physical barrier for our great drug delivery system or tissue engineering products."

Kong was inspired to learn how to control molecular and cellular transportation within our complex biological system to overcome these biochemical and biophysical barriers.

Today, he is designing synthetic machines—called antibacterial micro-bots—that can tackle these biofilms, or tissue made by microorganisms, which it turns out, are ubiquitous.

"Biofilms are everywhere," he said. "I don't want to scare you."

That yellow stuff that forms within an infected wound is a biofilm that is difficult to remove with antibiotics. Your bad morning breath can also be caused by biofilms. And the black stuff growing between your shower tiles? That's a biofilm, Kong says. In fact, he discovered biofilms after he came to the U.S. and was responsible for cleaning his bathroom for the first time. Truly, inspiration can strike anywhere.

Current cleaning options on the market only work on the surface of three-dimensional biofilms. His biomaterials use bubbles to penetrate biofilms and destroy them from the inside out. He is in talks to scale up the manufacturing of this product.

"I am quite confident that we are the first to demonstrate how to produce particles that can swim in the water and create bubbles to clear away biofilms," Kong said.

Now that Kong's team has laid the foundation, other research groups are investigating how to combat biofilms in various tissues, biomedical devices, and places with biomaterials.

Synthetic Engineering

Kong is also teaming up with colleagues to understand how cells cooperate and compete with each other, specifically in regards to the development of healthy or diseased tissues. The goal is to control the interaction between cells in order to mimic/accelerate disease progression outside of the body to enable clinical prediction and treatment studies.

Kong's team is interested in applying this knowledge to develop organoids that reproduce the patient-specific physiological function and biotransport of a beating heart and muscles activated by innervated neurons.

Kong is also developing microfluidic chips to study how the sleep cycle influences the interactions between blood vessels and the brain with **Martha Gillette**, Alumni Professor of Cell and Developmental Biology at UIUC and Bumsoo Han, Professor of Mechanical Engineering at Purdue.

"Sleep is very important to our body," Kong said. "During daily activities, our brain generates waste, but during the nighttime, our bodies must flush out the metabolic waste. We are studying a certain change in the permeability of the blood vessel during this process. My chemical engineering students are stunned to learn that this is basically a fluid dynamics problem."

Kong says, thanks to this line of research, he always encourages his students to sleep rather than cram before an exam. (He teaches thermodynamics and bio-transport courses, for which he was recently recognized with a teaching award from the School of Chemical Sciences.)

Building Collaborations

"I kind of always try to think out of the box—that has helped me to start something new," Kong said, adding that he shares this ambition with many of his collaborators.

Now, Kong is leading a group of like-minded scientists in a new research theme called "Multi-Cellular Engineered Living Systems" (M-CELS) at the Carl R. Woese Institute for Genomic Biology, an interdisciplinary life sciences research institute at UIUC.

"We can utilize M-CELS to assemble various transformative engineering systems, such as a biohybrid robot, a neuro computer, and energy generation device, as well as other new and unforeseen possibilities," Kong said in a 2020 announcement. "These systems may also encompass implantable 'hyper-organs' that sense a biological signal, and in response, synthesize, secrete, and deliver a biologic product via diffusion or pumping."

"Currently, theme members are working to engineer neuron-innervated muscle-based biohybrid robots that perform autonomous functions in response to external stimuli," Kong said. "These core technologies will provide enabling technologies and computational methods for the advancement of M-CELS, along with evolutionary insights and ethical considerations."

The new theme is an opportunity to build more collaborations, to see further together, which is the premise of the IGB.

Perhaps, it is also the epitome of Kong's dream to study in America at a large university brimming with colleagues, tools, and inspiration. Certainly, it is the culmination of his curiosity that was piqued in the unlikeliest of places, back in his graduate school bathroom.

2021 Alumni Award Winner

Laura Banovic Flessner

Innovation and leadership coach, speaker, and instructor—fueled by neuroscience

Laura Flessner coaches and trains on innovation and leadership from her office virtually.

Laura Banovic Flessner is a recipient of the 2021 Young Alumni Achievement Award (read more page 5) in recognition of her accomplishments since she graduated with a BS in chemical engineering in 2005. In a field where success is often measured by tangible metrics, Flessner is distinguished by the intangible: her character.

Yes, she has a resume chock-full of tangible achievements. She began her engineering career at Procter & Gamble where she helped design and test the packaging for PUR Flavor Options, which won the 2009 Consumers' Choice Product of the Year. Next, she would spearhead upstream product development, new consumer modeling, and new business models as a senior products research engineer at P&G.

She moved on to work in products research within R&D at Pfizer—where she drove over 70 technical consumer-led decisions over five years. As director of R&D Product Design for New Benefit Innovation, she helped create a consumer-grounded immunity innovation pipeline and a strategic plan to grow the business by $500 million in five years.

Then she pivoted out of R&D into a commercial role as a new venture founder and insights lead for GSK, a global healthcare company. There, she was a co-founder for a new business and supported two more internal start-ups.

Shortly after, Flessner founded her own business called Mindtap that blends together her corporate experiences and insight to help others unlock innovation through neuroscience and Agile innovation principles.

Efforts to describe Flessner sound like a motivational poster from the late 1990s—recall the headlines accompanying images of mountains, eagles, and butterflies: Integrity. Perseverance. Excellence. Imagination. All apt descriptions of Flessner.

What makes Flessner deserving of our Alumni Award are these qualities and her determination to package and share them with others.

The department's Alumni Awards ceremony was no different. Flessner's speech centered on not letting good ideas, or people, get mired in unconscious bias.

"We are more aware of diversity, but awareness doesn't fix the bias in our brains," she said in her speech. "I want to urge those of you who have ideas not to wait—to find the people who support you, because they are out there… Those who have ideas, step up, and those of you who hear ideas and see ideas from others, ask them: How can I support you?"

Early on in her career, Flessner asked for more responsibility, but opportunities were not given to her.

"Here I am, a woman, Asian, quiet, sweet, and nice, and I get along with everybody," she said. "But that isn't the image that you get when you think 'leader.'"

So she took matters into her own hands.

She envisioned an innovation space in "cubicle-land" where her colleagues could be inspired and collaborate—and she tracked down the supporters and resources to make it happen. Afterward, she finally got a promotion and more responsibilities, without having to ask.

"It was a powerful learning experience on how to bring people onto your side—helping others to see the vision that you have and being able to network through the organization to gain sponsorship," she said.

Flessner's anecdote hints at one of the key ingredients of any successful career: connections. "Network is important," she said, later on in an interview. "We hear about that, but when you experience it—it's like magic."

She was interviewed at Pfizer by the same connection who first helped hire her to work with the brand PUR within P&G. At Pfizer, she helped to build a new R&D function

> "It was a powerful learning experience on how to bring people onto your side. Helping others to see the vision that you have and being able to network through the organization to gain sponsorship."

using her expertise at leveraging market research to influence technical product development decisions from P&G.

It was in this role, harnessing these networking skills, that she was able to realize her innovation space.

Now, she is helping others bring their innovative ideas to life through Mindtap.

Throughout her career, Flessner has sought out opportunities that combine her passion for technology and people—which according to her speech—she inherited from her father and mother, respectively.

Her latest business venture connects all the dots.

Flessner aims to democratize and catalyze innovation by empowering and equipping young professionals with a suite of proven tools and techniques—like Agile, Lean, design thinking, and neuroscience—coupled with the leadership piece of being able to connect with others to make their ideas happen.

"I love this space where I am able to empower professionals who are not yet managers with innovative leadership skills that my experience has brought me," she said. "I want to bring innovation to people who wouldn't normally call themselves innovators; but they are if they're solving problems creatively—that's innovation."

Her bottom-up approach stands to help accelerate the impact of a new generation of leaders, operating at many levels across many companies and industries.

"It gives me chills to think that the value that I can provide for others is only going to be exponentially amplified by the impact that my clients are going to make...and then on and on," she said. "It is just so much bigger than me. It is what the world needs today with so many problems and so many things that we need to address to make the world better."

Laura Flessner shoots an introductory video of the innovation space she created, called the Greenhouse.

In Memoriam

Professor **H. Scott Fogler** (BS '62), Arthur F. Thurnau Professor and Vennema Professor of Chemical Engineering at the University of Michigan, passed away on August 21, 2021.

H. Scott Fogler was known to the chemical engineering world as a researcher, scholar, author, and, most importantly, a skilled and accomplished educator. He was passionate about teaching, and worked tirelessly to teach his students the tools and creative skills they would use throughout their careers to make a difference in the world.

Fogler earned a BS in chemical engineering from the University of Illinois Urbana-Champaign—where he was honored as a distinguished alumnus posthumously this fall (page 5). He went on to earn an MS and PhD from the University of Colorado, which named him a distinguished alumnus in 1987. He joined UM Chemical Engineering in 1965 as an assistant professor, spending over 50 years enriching the development of his students, his department, and the field of chemical engineering.

Well known for his work on the application of fundamental chemical reaction engineering principles to the petroleum industry, he published 240+ research articles with his students—more than 49 master's students and 45 doctoral students—in areas such as acidization of petroleum wells, upstream engineering gelation kinetics, wax deposition in subsea pipelines, and asphaltene flocculation and deposition kinetics. Over the last 20 years, Fogler focused his research on problems in upstream research with particular focus on asphaltene and paraffin deposition. He also authored or co-authored 12 textbooks, including "Elements of Chemical Reaction Engineering" and "Essentials of Chemical Reaction Engineering."

Fogler's most notable service was to AIChE, where he served as President in 2009, and, among other achievements, created the long-running and much lauded Chem-E-Car Competition®. In 2017, colleagues, friends, and former students established an endowment through AIChE to honor his legacy and commitment to the education of students and the practice of chemical engineering. This endowment supported the renamed "Scott Fogler AIChE Chem-E-Car Competition First Place Prize."

George T. Allen (BS ’79) passed away peacefully on Aug. 7, 2021, at the age of 64. He was born in Decatur, Illinois, the eldest of three siblings. While at the University of Illinois, he was an active member of the Kappa Sigma Fraternity and met the love of his life, Carol Ann Allen (Dow). They had two children and moved from Illinois to Georgia to California to Wisconsin, before settling in Greenville, South Carolina, for many years. He was a gifted and successful engineer and manager—his career spanned all aspects of his field and eventually brought him to Visalia, where he lived since 2003. Wherever and whatever his job, he was an active member in a local church and Rotary; he was also on Tulare County’s Mental Health Board and member of the Suicide Prevention Foundation. He retired in 2019. All along, he enjoyed spending time with his family, helping others, traveling, and walking the family dogs.

Larry Anderson (MS ’73) passed away on Aug. 22, 2021, at the age of 79. He was born in Tuscola, Illinois, and received his BS in chemical engineering from the Rose-Hulman Institute of Technology in Terre Haute, Indiana, and his MS in chemical engineering from the University of Illinois. He also served in the U.S. Army Corps of Engineers. He worked as a chemical engineer, devoting his career to designing and managing the construction of LNG terminals and chemical plants across the U.S. and internationally. He loved spending time with his family. His hobbies included golf and fishing. He served as the tournament chairman for the “Fun Timers” bass club. He was a boat captain for the Marshall County High School bass club. He was a member of First Christian Church of Paducah where he served as an elder and chairman of the Ministry Table. He is survived by his wife of 59 years, Beatrice Gwen (Rice) Anderson.

Wayne Edwin Gargrave (BS ’65) passed away on Oct. 16, 2021, following a long bout with an auto-immune disorder. He was born on June 18, 1942, in Platteville, Illinois. He attended Joliet Junior College before the University of Illinois and went on to earn an MS in chemical engineering from the University of California, Berkeley. Following graduation, he began his career at Standard Oil as an engineer in the research department at the Whiting, Indiana, refinery, where he met his wife, Janice. He retired from the company, then known as BP, in 1999 at age 57. He was known for his love of figuring stuff out and making things work, teaching his boys how to do stuff, and giving gifts to his children and grandchildren. He is survived by his wife of 51 years, Janice Patricia Gargrave.

Alfred “Al” G. Luebbers (BS ’74) died on Aug. 5, 2021, from complications of heart failure at the age of 69. He was born on Nov. 15, 1951, in Peoria, Illinois, the oldest of five brothers. After graduating from the University of Illinois, he moved to Minnesota with his wife, Pat, and began a 39-year career at 3M. As a manager at 3M, he strove to mentor and support the people he worked with. He had a special affinity for supporting talented women to rise to their potentials in an era when that was not common. Adaptive sailing brought him a freedom that he could rarely experience elsewhere. He loved music, especially jazz, and his guitars. He lived a life that modeled kindness and courage. He did this with steadfast determination and unwavering fortitude, which were hallmarks of his daily living.

Robert “Bob” Earl Schilson (BS ’50) died on Nov. 7, 2021, at the age of 94. He was born in Keokuk, Iowa, and grew up on the family farm near Carthage. He learned the importance of hard work, skipping third grade, and eventually going on to study at Carthage College on a scholarship. He left school to join the Navy during WWII, and after being honorably discharged, received his BS with honors from the University of Illinois. He moved to Richland, Washington, to work at the Hanford Nuclear Plant and met his wife of 69 years, Millie (Ham). He went on to earn his PhD in chemical engineering. He was the director for research for Marathon Oil in Littleton, Colorado, and served on the Executive Committee of the Colorado Environmental Commission. Bob and Millie retired early and joined the Peace Corps in 1987; they were stationed in Sierra Leone for two years. An avid hobbyist, he was an expert in woodworking, a master photographer, a creative home movie maker, an early computer wiz, a home improvement genius, a championship bowler and fast-pitch softball pitcher, a licensed airline pilot, a devoted genealogy detective, a world traveler, and a lifelong learner. His passion for excellence showed in everything he did.

William “Bill” P. Schultz (BS ’63) passed away on June 21, 2021, at the age of 81. He received his BS in chemical engineering from the University of Illinois and his MBA from the University of Chicago. He worked in a variety of roles for UOP in Des Plaines for over 30 years. He was the loving father of his three children. He was a devoted grandfather, spending much of his time as a spectator at their sporting events. He had a passion for hunting and fishing, developing some lifelong friendships in the process. He was known for his sense of humor, love of life, and pride in the relationships he had both with family and friends. He is survived by his spouse of over 50 years, Mary Ellen.

Class Notes

Rommie Amaro (BS ’99), a professor and endowed chair at the University of California, San Diego, led a team of 50 scientists to create a fascinating atomic simulation of the coronavirus in an airborne droplet of water, as seen in the New York Times at https://nyti.ms/30fA909.

John L. Anderson (Ph.D. ’71) was among four transformative leaders named as 2021 Commencement honorands at Rensselaer Polytechnic Institute; the others included Dr. Anthony Fauci, Sir Paul Nurse, and the Honorable Ash Carter. Anderson has served as president of the National Academy of Engineering (NAE) since 2019.

Jacob Becraft (BS ’13) was among MIT Technology Review’s 2021 list of Innovators Under 35. He is the founder and CEO of Strand Therapeutics, a company that’s figuring out other applications for mRNA beyond COVID-19 vaccines. (Becraft is an Alumni Award winner on page 5.)

Cory Berkland (MS ’01, PhD ’04), the Solon E. Summerfield Distinguished Professor at the University of Kansas, has co-founded Bond Biosciences, a biopharmaceutical company focused on the discovery and development of first-in-class non-absorbed oral therapeutics that bind excess ions locally in the gastrointestinal (GI) tract to treat or prevent human disease. The company has completed $5 million Series A financing to enable Phase 1b studies for lead candidate BBI-001 in patients with hereditary hemochromatosis.

Evan Lloyd (PhD ’21) received the Arthur K. Doolittle Award from the Division of Polymeric Materials: Science and Engineering (PMSE), a division of the American Chemical Society (ACS). The award recognizes an outstanding talk presented during the PMSE symposium at the ACS National Meetings. Lloyd presented “*Rapid, energy-efficient synthesis and recycling of degradable thermosets*” at the Spring 2021 ACS meeting.

Jillian Ryan (BS ’12), an engineering manager at the Henkel Corporation, was named a STEP Ahead Award Honoree and Emerging Leader by the Manufacturing Institute. Now in its ninth year, STEP showcases trailblazing women who are changing the manufacturing landscape for the better.

> “I enjoy solving complex problems to create a tangible benefit. Manufacturing is the perfect environment to do so. Every day I can see how my efforts make a positive impact such as improving our product, gaining efficiencies in our process, and making our operators’ experiences at work better.”
>
> **Jillian Ryan**

Professor Huimin Zhao gathered with colleagues and graduate students past and present at AIChE.

The Department of Chemical and Biomolecular Engineering at Illinois hosted many friends, alumni, and colleagues at a reception held at the 2021 Annual Meeting of the American Institute of Chemical Engineers in November. Thank you to all who helped us recognize two years of awards and recognition that have been bestowed upon our distinguished faculty members. We hope very much to see you at our reception next meeting in Phoenix. In the meantime, please keep in touch and send us your accomplishments to feature in our next issue of Mass Transfer. Let us know what you’ve been up to at chbe@illinois.edu.

REMEMBER WHEN...

Remember when department head Paul Kenis, the Elio Eliakim Tarika Endowed Chair, took polaroid photos at the beginning of the semester to help him memorize his students' names? You may spot a few familiar faces here, including Alumni Award winner Laura Flessner with her now husband, Ryan.

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