



THE UNIVERSITY OF CHICAGO  
PRITZKER SCHOOL OF  
MOLECULAR ENGINEERING



# ENGINEERING THE FUTURE

2022-23 ANNUAL REPORT

- Immunoengineering
- Materials Systems for Sustainability and Health
- Quantum Engineering
- Arts, Sciences, and Technology

**02 Introduction**

A Letter from the Dean  
Who We Are  
At a Glance Facts and Figures

**06 Facts and Figures**

Impressive Faculty Funding  
Growing Student Enrollment and Alumni Network  
Graduate Career Outcomes  
PME Alumni—A Growing Cohort

**08 Faculty Highlights**

Internationally Recognized Faculty

**12 Research Highlights**

Creating Transformative Impact through Research  
Research Highlights 2022-23

**18 Education Highlights**

Education That Empowers the Next Generation

**20 Partnership Highlights**

Partnering for Impact

**22 Community Involvement Highlights**

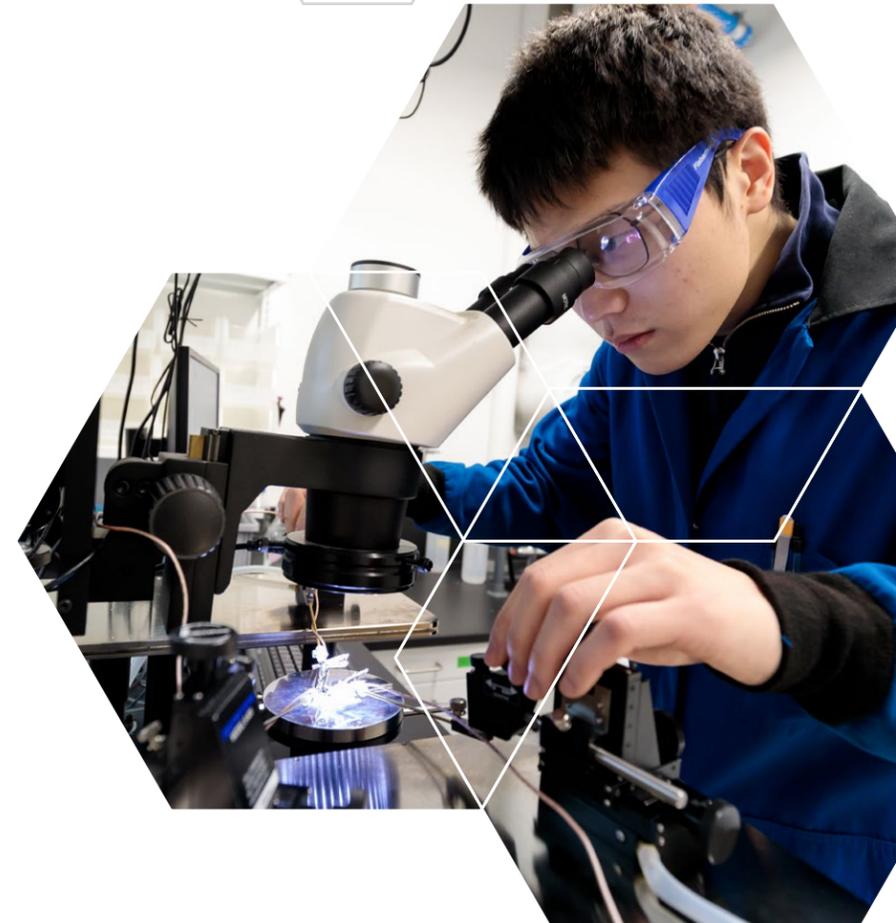
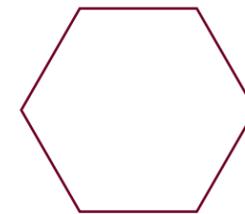
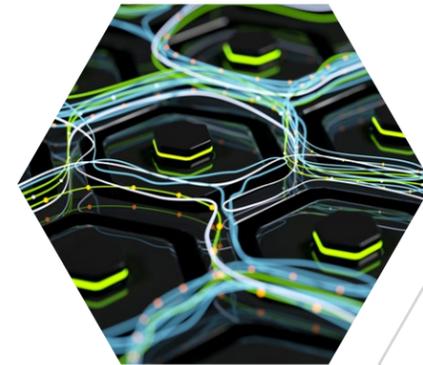
Committed to Building an Equitable Future

**26 Conclusion**

Engineering the Future—Our Goals  
Thank You

**28 Committee, Council, and Donors**

Executive Committee  
Advisory Council  
Founding Donors  
Individual Donors  
Organization Donors



## A LETTER FROM THE DEAN

Last year, I gave my reflections from the first 10 years since the founding of the Pritzker School of Molecular Engineering (PME) at the University of Chicago. This was a moment to celebrate accomplishments and articulate the next milestones that will help achieve PME's revolutionary potential. I outlined seven goals PME will seek to accomplish before 2030. These focus on fortifying the current themes and PME's role as a thought leader within them, expanding our facilities, and delivering value through revenue-generating activities and corporate partnerships. I am pleased to report that PME has achieved substantial progress toward these goals over the last year.

Within our established thematic areas, there has been major recognition of PME's thought leadership in engineering education and research. In August 2022, the Department of Energy awarded UChicago \$12.5 million to advance hydrogen energy research. The Catalyst Design for Decarbonization Center (CD4DC) is being led by Laura Gagliardi, Richard and Kathy Leventhal Professor in the Department of Chemistry, Pritzker School of Molecular Engineering, James Franck Institute, and the College, whose research straddles quantum engineering and materials science. Then in February, the Chan Zuckerberg (CZ) Initiative announced the creation of the Chan Zuckerberg Biohub Chicago, a \$250 million effort that will focus on inflammation and its function in the immune system and in diseases such as cancer, heart disease, and Alzheimer's disease. Jeffery Hubbell, Eugene Bell Professor in Tissue Engineering and PME vice dean and executive officer, was one of the architects of this vision, along with colleagues at Northwestern University and the University of Illinois Urbana-Champaign, and he will serve on the CZ Biohub Chicago executive committee. A consortium of leading universities from across the country competed to host the second CZ Biohub, and PME's success is a testament to Hubbell's visionary leadership alongside the other immunoengineering faculty at the University of Chicago.

Looking ahead, PME is further investing in its strengths. There are faculty searches in quantum engineering and immunoengineering, including active conversations with some remarkable scholars. Their quality speaks to the reputation that PME has established in the last decade as a center of engineering innovation. There are also discussions with faculty in the materials systems for energy and sustainability group about opportunities to expand their research area. I expect my successor will have new faces to introduce next year.

Last year, I shared that the University's Board of Trustees approved the appointment of HDR to design the new engineering and science building at the corner of 56th Street and Ellis Avenue, which will alleviate space pressures for faculty and allow PME to achieve its goal of doubling in size in the coming decade. Planning meetings have been ongoing with faculty, and construction is expected to begin in 2024 and conclude in 2028. To allow for continued growth in the meantime, in February the University announced its intention to lease a significant amount of space in a new facility called Hyde Park Labs, being built at 52nd Street and Harper Avenue. When completed in late 2024, Hyde Park Labs will serve as a hub for transformative science, engineering, and quantum research. The University is also helping to facilitate lab and commercial space for faculty startup companies and corporate collaborators, which will enable PME to further expand efforts to see its technologies leave the lab and achieve broader impact.

PME also continues to see increasing interest from students in its unique education offerings. Enrollment in PhD programs surpassed 250 for the first time this year, and there has been a record number of doctoral applicants for the 2023-24 academic year. PME has launched five new courses this year, including two new capstone design labs for undergraduates in quantum and bioengineering, which were both enrolled at capacity immediately on launch. The number of students majoring in molecular engineering continues to grow steadily and is now over 100, and the number of undergraduates enrolling in PME as a minor increased by more than 90 percent this year. These brilliant students are the engine of research and emerging engineering leaders, and I look forward to being able to accommodate them in the expanded labs in our new building.

It is my pleasure to share information about PME's activities in the following report, and I hope you join me in feeling pride in what we have accomplished together. PME has been able to create a new model for engineering research and education to address the grand challenges of the 21st century and beyond. Thank you.



Matthew Tirrell  
Dean, Pritzker School of Molecular Engineering





### WHO WE ARE

The Pritzker School of Molecular Engineering at the University of Chicago is the first school of molecular engineering in the nation. We integrate science and engineering to address pressing global challenges from the molecular level up, pioneering new solutions for a better future. With leading faculty experts spanning eight scientific and engineering disciplines and an innovative interdisciplinary curriculum, we boast a talented student body and world-class research facilities.

### Our Work

Organized by problem-solving themes—energy and sustainability, immuno-engineering and quantum engineering—rather than departments, we use an interdisciplinary lens to create transformative solutions to some of humanity’s biggest challenges. We are pioneering research advances in such areas as energy storage, clean water, plant-based plastics and sensors, eradicating cancer and diseases of the immune system, and driving quantum engineering advances in computing, networking, sensing, and information. A fundamental goal is to drive thoughtful solutions from the lab to the market to make a difference in the world today. We are engineered to drive impact.

### Education That Empowers

We train tomorrow’s science and engineering workforce in fundamental principles across multiple fields, providing a strong foundation for communicating, engaging, and leading across traditional boundaries.

### Collaboration Is in Our DNA

The Pritzker School of Molecular Engineering is part of a robust ecosystem that collaborates to help engineer solutions to some of humanity’s greatest challenges. PME maintains a robust network of academic, corporate, and government partnerships around a variety of initiatives. Our partnerships within UChicago and with Argonne National Laboratory, Fermilab, and leading academic, industry, nonprofit, and international partners make us active leaders in our fields.

### We Are Engineering the Future

At Pritzker Molecular Engineering, we are engineering a better future, today.

### AT A GLANCE FACTS AND FIGURES 2022-23

1st

molecular engineering school in the country

8+

Science and engineering fields represented

280+

patents held by faculty members

\$1.47M

average per faculty in annual grant expenditures

43

Faculty: 16 assistant professors, 1 associate professor, 16 professors, 10 secondary appointments

1st

UChicago faculty member to be elected to all three National Academies: engineering, medicine, and sciences

27

Argonne scientists working with PME faculty and students

62%

of PME graduates pursue jobs in industry after graduation



### IMPRESSIVE FACULTY FUNDING

The Pritzker School of Molecular Engineering has seen a significant increase in grant revenue growth in just five years, with a 300 percent increase in dollars granted since 2018. Among higher education engineering programs, PME was ranked third in grant expenditures per faculty member in the National Science Foundation’s 2020 Higher Education Research and Development Survey. PME’s tremendous sponsored research growth signifies the cutting-edge research PME faculty and students perform in our labs that attracts grant revenue.

PME has dedicated resources to increasing revenue streams from earned and contributed income. This has proven to be a strong investment, as PME’s dependence on University support is proportionally diminishing over time—down 16 percent over the last five fiscal years.

### GROWING STUDENT ENROLLMENT AND ALUMNI NETWORK

PME attracts undergraduate and graduate students from numerous disciplines to collaborate with researchers, postdocs, and faculty to solve complex problems. Through training in fundamental principles across multiple fields, PME provides a strong foundation for communicating, engaging, and leading across traditional boundaries.

PME now boasts more than 200 alumni around the world. PME graduates have entered roles in the private sector—as data scientists, engineers, research consultants, and more—and continued their research as postdoctoral scholars at prestigious academic institutions. We look forward to launching new initiatives to further engage our alumni and build a strong foundation for continued support.

OVERALL ENROLLMENT	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
<b>Total Graduate Students</b>	<b>51</b>	<b>73</b>	<b>99</b>	<b>128</b>	<b>178</b>	<b>207</b>	<b>247</b>	<b>264</b>
Molecular Engineering PhD Enrollment	51	73	99	128	178	202	203	199
Quantum Science and Engineering PhD Enrollment	—	—	—	—	—	—	37	56
Master’s Degree Enrollment	—	—	—	—	—	5	7	9
<b>Total Undergraduate Students*</b>	<b>12</b>	<b>33</b>	<b>66</b>	<b>73</b>	<b>82</b>	<b>103</b>	<b>110</b>	<b>132</b>
Majors	1	18	54	67	76	91	95	103
Minors	11	15	12	6	6	12	15	29

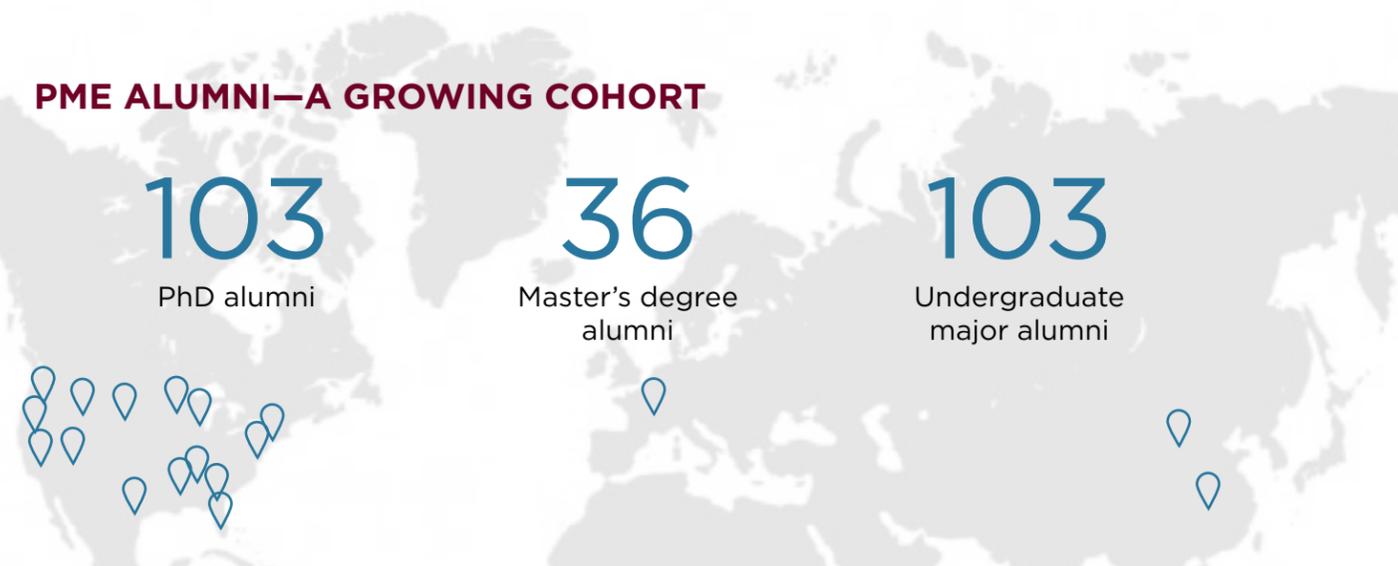
\*Figures indicate only students who have officially declared molecular engineering as their major within the University’s student information system in the stated year; figures do not include students who are pursuing the major but have yet to officially declare.

### GRADUATE CAREER OUTCOMES

PME is producing PhD graduates who are well poised for successful careers. While most of our PhD graduates obtain top-tier jobs at large corporations like 3M, Abbott, and Google, many continue to pursue academia.

- **INDUSTRIAL: 62%**
- **ACADEMIC: 32%**
- **POLICY/GOVERNMENT: 5%**
- **CONSULTING: 1%**

### PME ALUMNI—A GROWING COHORT



TOTAL GRADUATE ALUMNI (MS AND PHD)		
US Region		States Included
Midwest (excluding Chicagoland area)	7	ND, SD, NE, KS, MN, IA, MO, WI, IL, IN, MI, OH
Chicagoland area	21	Including surrounding suburbs
Mid-Atlantic (excluding New York City)	8	PA, NY, NJ, DE, MD, DC
New York City	6	
New England (excluding Boston)	3	VT, NH, ME, MA, CT, RI
Boston	10	
South	7	TX, OK, AR, LA, MS, AL, TN, KY, WV, VA, NC, SC, GA, FL
Southwest	1	NV, UT, CO, NM, AZ
West (excluding California)	1	ID, MT, WY
Southern California	8	
Bay Area	14	
Pacific Northwest	8	WA, OR
Unknown	33	
<b>International Region</b>		
Asia-China	5	
Asia-Other	1	
Europe	6	
<b>Total</b>	<b>139</b>	

## INTERNATIONALLY RECOGNIZED FACULTY

Maintaining a faculty with ambitious research agendas, robust lab groups, and novel teaching practices is a critical priority for the Pritzker School of Molecular Engineering. The remarkable impact PME has made within the field is a testament to their profound expertise. PME leadership remains committed to recruiting the most sought-after scholars to contribute to PME’s distinguished and growing faculty.

### New Faculty Amplifies PME’s Impact



Po-Chun Hsu, assistant professor  
Pritzker School of Molecular Engineering

Po-Chun Hsu joined PME as assistant professor of molecular engineering in July 2022. Prior to joining PME, Hsu was an assistant professor of mechanical engineering and materials science at Duke University. His research focuses on innovative dynamic materials for light and heat management, ranging from fundamental materials science to system-level mechanical engineering, which could transform wearable technology, net-zero energy architecture, carbon capture, and beyond. Driven by climate change, Hsu’s research group recently designed a nonflammable “electrochromic” building material that can retain or emit infrared heat—essentially, a smart material which can be applied to the external structure of a building to aid in cutting energy costs.

## Leading Awards and Honors

Since its inception, PME has positioned itself as an innovator in research and education, organizing itself around solving some of today’s most pressing issues, such as water scarcity, energy storage, treating disease at the cellular level, transforming the discussion of art and science, and developing secure quantum computing capabilities. PME students and faculty operate in close collaboration to address these critical challenges.



Dean Matthew Tirrell was awarded the title of Doctor Honoris Causa by the University of Bordeaux in recognition of his contributions to science and technology in France since 2011.



PME faculty were awarded \$2.5 million from the Department of Energy to investigate key barriers to next-generation energy storage and carbon reduction technologies. Faculty receiving the award include Asst. Prof. Chibueze Amanchukwu, Asst. Prof. Chong Liu, Prof. Y. Shirley Meng, and Asst. Prof. Shulong Yang.



The Department of Energy awarded UChicago \$12.5 million to launch the Catalyst Design for Decarbonization Center (CD4DC), which will be led by Laura Gagliardi, Richard and Kathy Leventhal Professor. This center’s work will be focused on finding innovative solutions for long-lasting hydrogen energy research, potentially offering a zero-emission alternative to fossil fuels.



The National Research Foundation of South Korea awarded David Awschalom, Liew Family Professor of Molecular Engineering, and Prof. Liang Jiang \$1 million to co-lead the creation of a new South Korea-US joint research initiative, the Center for Quantum Error Correction. This center will advance key research in quantum errors to drive forward quantum technology and will complement the work of five other South Korea-US partnerships.



Asst. Prof. Hannes Bernien was awarded the New Horizons in Physics Prize from the Breakthrough Foundation in recognition of his research developing optical tweezer arrays for use in quantum information science, metrology, and molecular physics.



Giulia Galli, Liew Family Professor of Molecular Engineering, received a Lifetime Achievement Award from the Italian Scientists and Scholars in North America Foundation for her seminal contributions to the development of methods for the prediction of materials' properties.



Prof. Supratik Guha was appointed faculty director of the Center in Delhi for a three-year term. Guha will direct the center's academic agenda, lead the Delhi Faculty Steering Committee in reviewing and awarding the annual Provost's Global Faculty Awards for India and South Asia, and ensure that the center meets the broad needs of the University of Chicago community.



The Chan Zuckerberg Initiative announced on March 2 that it will launch its next CZ Biohub in Chicago, to be co-led by the University of Chicago, Northwestern University, and the University of Illinois. This center will initially focus on inflammation and the function of the immune system. Jeffrey Hubbell, Eugene Bell Professor in Tissue Engineering, helped bring the CZ Biohub to Chicago and will serve on its executive committee.



Asst. Prof. Juan Mendoza was named a 2023 Freeman Hrabowski Scholar by the Howard Hughes Medical Institute. The scholarship recognizes outstanding basic researchers who have strong potential to become leaders in their fields and to advance diversity, equity, and inclusion in US science.



Prof. Y. Shirley Meng was awarded the US Clean Energy Education and Empowerment (C3E) Initiative's Innovation Award in recognition of her research on batteries. The C3E Initiative is led by the DOE and advances the contributions and leadership of women across the clean energy sector.



Asst. Prof. Mark Mimee received the prestigious Beckman Young Investigator Award from the Arnold and Mabel Beckman Foundation. This award is intended to foster the invention of methods, instruments, and materials to open new avenues of research in science. With the funding from this award, Mimee and his team aim to develop a microbiome editing platform using synthetic biology techniques.



Melody Swartz, William B. Ogden Professor of Molecular Engineering, was elected to the National Academy of Engineering, one of the highest professional distinctions for engineers. Swartz was elected for her research into lymphatic transport and immunobiology, informing novel approaches for cancer immunotherapy and vaccination. She also was elected as a foreign member of the Royal Academy of Medicine of Belgium.



Asst. Prof. Sihong Wang received the prestigious National Institutes of Health Director's New Innovator Award, with \$2.5 million in funding over five years to develop biomedical impacts that are more compatible with the human immune system. He also received the National Science Foundation's Faculty Early Career Development Award, with \$625,000 over five years to support his research in developing stretchable polymers necessary for next-generation wearable technologies.



Asst. Prof. Shuolong Yang was awarded \$300,000 from the National Science Foundation in support of his research to develop new superconducting materials to carry quantum information.



Nine PME faculty members were included in Clarivate's 2022 list of highly cited researchers.



Jeffrey Hubbell was elected to the National Academy of Sciences, becoming the first University of Chicago faculty member to be elected to all three national academies.

## CREATING TRANSFORMATIVE IMPACT THROUGH RESEARCH

The Pritzker School of Molecular Engineering transcends traditional boundaries by organizing our research into convergent themes focused on issues that have an impact on humanity and quality of life.

Current themes concentrate on quantum engineering, biotechnology and immunoengineering, advanced materials, energy storage, and ensuring a clean global water supply. A fourth theme, arts, sciences, and technology, or STAGE, investigates the intersection of scientific and artistic inquiry to facilitate public understanding and foster a greater appreciation for science.

Our distinctive approach brings together experts in diverse academic disciplines to examine and develop holistic solutions to complex problems.

**“Because we have so many research teams working in immunoengineering, we are able to really build off and learn from each other.”**



Melody Swartz, William B. Ogden  
Professor of Molecular Engineering

## RESEARCH HIGHLIGHTS 2022-23

### Immunoengineering

#### How stem cell therapies can provide new ways to stop tumors from spreading or growing back

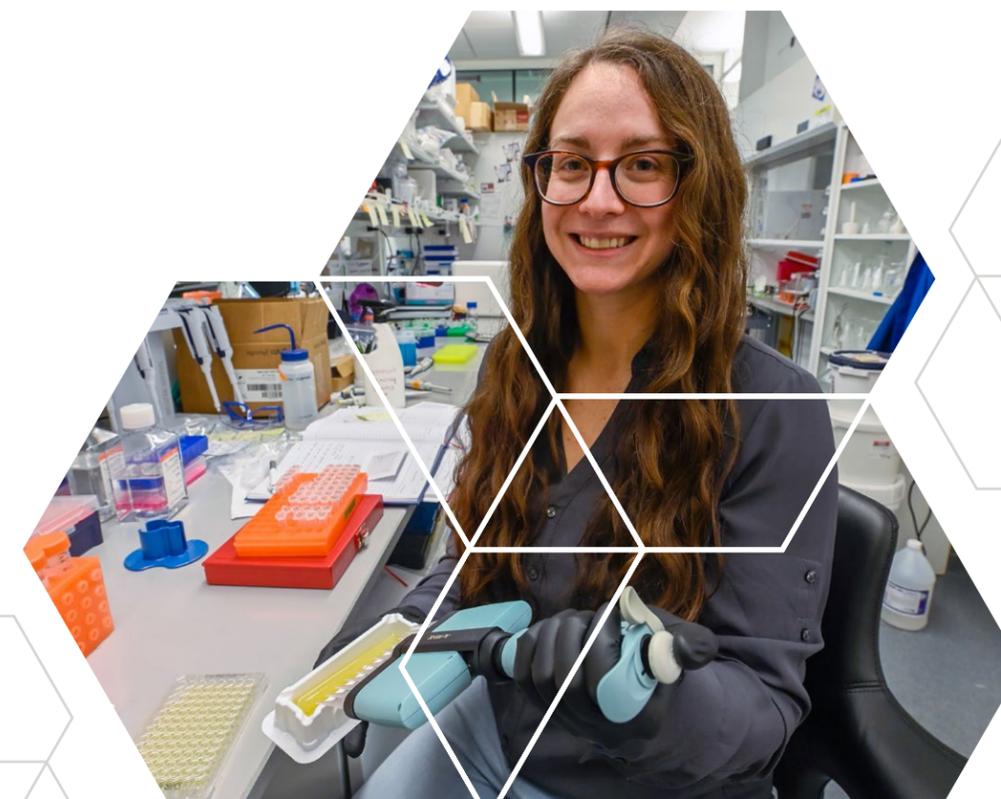
Huanhuan Joyce Chen, assistant professor in the Pritzker School of Molecular Engineering, Ben May Department for Cancer Research, and the College, is pursuing ongoing research on stem cells and how they can be used for such novel cancer treatments as differentiation therapy. The therapy focuses on persuading cancer cells to revert to their precancerous forms and has been successful in treating acute promyelocytic leukemia, an aggressive blood cancer.

#### To cure food allergies, treat the microbiome

The gut microbiome plays a significant role in the immune system’s tolerance of potential food allergens, such as milk or peanuts. Cathryn Nagler, Bunning Food Allergy Professor in the Departments of Pathology, Medicine, and Pediatrics, the Pritzker School of Molecular Engineering, and the College, has developed a breakthrough system for preventing and potentially treating food allergies through the use of polymer-encased butyrate, a short-chain fatty acid important in creating a healthy microbial community in the gut.

#### ‘Masked’ cancer drug sneaks through body to deliver anti-tumor treatment with fewer side effects

Many cancer treatments are notoriously savage on the body, but researchers at the PME have designed a method to keep one promising cancer drug from wreaking such havoc. The team led by Jeffrey Hubbell has developed a new “masked” version of the immunotherapy drug interleukin-12 that is activated only when it reaches a tumor. Researchers are now working with multiple partners to prepare their findings for clinical testing.



### Materials Systems for Sustainability and Health

Pioneering advances in energy and sustainability

#### Researchers zoom in on battery wear and tear

A pioneer in energy storage research, [Prof. Y. Shirley Meng](#) is combining high-powered electron microscopy and computational modeling to understand, at an atomic level, exactly what occurs when lithium-ion batteries degrade. Her latest research, published in *Joule*, will help usher in longer-lived lithium-ion batteries.

#### Temperature-sensing building material changes color to save energy

Chameleon-like building materials may one day drastically reduce global energy consumption used for heating and cooling. The new “electrochromic” technology was developed by [Po-Chun Hsu](#), assistant professor at PME, whose findings were published in *Nature Sustainability*.

**“Knowing how a material works at the molecular level helps predict how it will behave in a specific situation. The strength of that molecular understanding is invaluable towards any challenge, whether it’s in health and medicine or a sustainability issue.”**



[Stuart Rowan](#), Barry L. MacLean Professor for Molecular Engineering Innovation and Enterprise

#### Flexible AI computer chips promise wearable health monitors that protect privacy

A leap forward for wearable health technologies: PME [Asst. Prof. Sihong Wang](#) has developed a flexible, stretchable computing chip that processes information by mimicking the human brain. The new chip, which was described in the journal *Matter*, is designed to be worn on the skin where it can collect and analyze patient biometrics in real time.

#### To predict environmental changes, researchers create a new generation of wireless sensor networks

[Prof. Supratik Guha](#) is a key figure in the development of wireless sensor networks—arrays that surveil acre-wide swathes of land and water to track pollution, moisture levels, and chemical composition. These smart webs provide real-time, high-density data that are essential to creating an accurate picture of an ecosystem, facilitating more reliable ecology models and more efficient agricultural planning, and improving water conservation.

### Quantum Engineering

#### New tool disentangles the electronic states layer by layer in quantum materials

Researchers at PME have discovered a new material, MnBi6Te10, which can be used to create quantum highways along which electrons can move. These electron thoroughfares are potentially useful in connecting the internal components of powerful, energy-efficient quantum computers.

#### Chicago expands and activates quantum network, taking steps toward a secure quantum internet

Scientists with the Chicago Quantum Exchange at PME have, for the first time, connected the city of Chicago and suburban labs with a quantum network—nearly doubling the length of what was already one of the longest in the country. The Chicago network, which stretches 124 miles and links six nodes, is actively running quantum security protocols, distributing quantum encryption keys at a speed of over 80,000 quantum bits per second between Chicago and the western suburbs.

**Engineering robust and scalable molecular qubits**

Researchers from UChicago’s PME have found that molecular qubits, those placed in an asymmetric crystal array, are much more stable than qubits placed in a symmetrical environment. The findings, published in the journal *Physical Review X*, expand the possible applications of such qubits, especially as biological quantum sensors.

**“Global progress toward a quantum future will be driven by a skilled quantum workforce. Collaborating across borders to train the next generation of quantum engineers is crucial in pushing the frontiers of this technology to address complex global challenges in health, information security, and the environment.”**



David Awschalom  
Liew Family Professor of Molecular Engineering

**Global quantum alliances forged at London colloquium led by UChicago**

Leaders in quantum science, economics, defense, and data science from the United States and the United Kingdom met in London for a Quantum and Data Science Workshop hosted by the University of Chicago. The two-day conference gathered key representatives from both countries to forge new alliances and strengthen existing partnerships in the global race to establish quantum technology and explore the growing data science industry.



**Arts, Sciences, and Technology**

STAGE—Scientists, Technologists, and Artists Generating Exploration—is a full-scale laboratory embedded within PME devoted to collaborations among scientists and artists.

**Betting on quantum: How one PME lab uses game design to explain physics’ most complex laws**

STAGE Lab’s newest project, Quantum Casino, is a suite of analog and digital games designed to impart the core principles of quantum mechanics in a way that’s engaging and easy to understand. The lab has held multiple public demonstrations over the past year to rave reviews, including events at the American Physical Society conference and the US-Switzerland Quantum Symposium 2023.

**STAGE expands theater and science exploration**

The leaders of STAGE, a traditionally theater-based laboratory, reflect on how they adapted their projects and methods to work during the pandemic. STAGE plans to expand its current projects and explore new mediums for its work.

**“We want to create scalable, tangible works that can be distributed and experienced globally. Our goal is to get the public truly excited about science and dispel whatever mistrust has grown in recent years. We want our audiences to forge authentic, emotional connections with science.”**



Nancy Kawalek, director of STAGE; professor and distinguished fellow in the arts, science, and technology



### EDUCATION THAT EMPOWERS THE NEXT GENERATION

The Pritzker School of Molecular Engineering provides a transformative education in science and engineering. We offer master's and PhD degrees, and partner with the College at the University of Chicago on an undergraduate major and seven highly adaptable minors for molecular engineering and science majors, and two additional minors for undergraduates not enrolled in the molecular engineering program. We also lead multiple outreach programs to foster an ongoing relationship with the South Side Chicago community and to inspire the next generation of molecular engineers.

#### New Courses and Programs

In academic year 2022-23, PME undergraduate and graduate students were exposed to a curriculum spanning 63 courses, including 20 undergraduate courses, 10 graduate courses, and 33 courses cross-listed for undergraduates and graduates. Multiple new courses were added to the curriculum this year.

Two of these are hands-on laboratory courses: Experimental Bioengineering Laboratory offers hands-on experience in bioengineering and biomaterials. Topics include design and characterization of materials for biomaterials, cellular engineering, nanomedicine, synthetic vaccines, tissue engineering, and more. QuantumLab is an advanced laboratory course where students learn about a broad range of quantum technologies and instrumentation. Experiments reflect current research directions of quantum science and the University's quantum program, including experiments addressing quantum effects in different quantum systems.

The Quantum Science and Engineering PhD program launched in November 2021, and applications to the program have increased significantly, with 190 in academic year 2022-23. Students enrolled in this program conduct research alongside leaders in this emerging field.

### In Their Words: The PME Student Experience

"The problems we are answering here at the PME are more applicable to the wider world than anywhere else I could have applied."



Jeremiah Kim, PhD student  
Immunoengineering

"At PME, we're really trying to solve specific real-world problems by working across disciplines. It's great because everyone here cares about making an impact in some measurable way. If that's your goal, then this is the place to be."



Nicholas Boynton, PhD student  
Materials Systems for Sustainability and Health

"At PME, we are surrounded by amazing quantum faculty, and it's really easy to reach out to them and start collaborations. Because the faculty are so well-regarded and active in their fields, it's easy to start collaborations outside of the University as well."



Swathi Chandrika, PhD student  
Quantum Science and Engineering

"STAGE presents art that is inspired by science and makes science accessible through art, which is critically important. Ultimately, we want to reach audiences who are not usually involved in science, and we want to find the right language to talk to them."



Uri Zvi, PhD student  
Design lead on STAGE Lab's Quantum Casino

### PARTNERING FOR IMPACT

The Pritzker School of Molecular Engineering is part of a robust ecosystem that collaborates to help drive solutions to some of humanity's greatest challenges. PME maintains a robust network of academic, corporate, and government partnerships around a variety of initiatives, including the following partners.

#### Argonne National Laboratory

Argonne National Laboratory and PME continue to benefit from their collaborative relationship and geographical proximity, welcoming scientists to serve as academic instructors, mentors to students, co-principal investigators on grants, and co-organizers on seminars, workshops, and panels in the community.

In 2022, the University of Chicago and Argonne National Laboratory launched a new research project, the Predictive Intelligence for Pandemic Prevention initiative, with an award from the National Science Foundation. In partnership with team members from five other academic institutions across the United States, PME and Argonne will help design a center focused on monitoring, forecasting, and responding to future pandemics.

#### Fermi National Accelerator Laboratory

Fermilab, located near Chicago, is a United States Department of Energy national laboratory specializing in high-energy particle physics.

#### Chicago Quantum Exchange

Based at PME, the Chicago Quantum Exchange (CQE) is anchored by the University of Chicago, Argonne National Laboratory, Fermi National Accelerator Laboratory, University of Illinois Urbana-Champaign (UIUC), University of Wisconsin-Madison, and Northwestern University. In 2022-23, CQE expanded its private sector partnership to more than 40 companies, which now include quantum technology companies such as QuEra Computing and PsiQuantum, as well as sector leaders such as JPMorgan Chase and Discover. CQE also partnered with new international organizations, including Paris-based think tank Le Lab Quantique and Technion-Israel Institute of Technology.

Alongside the Polsky Center for Entrepreneurship and Innovation, Argonne, UIUC, and P33, CQE welcomed the second cohort of quantum startups to Duality, the nation's first accelerator program dedicated exclusively to companies focused on quantum science and technology. These companies—Icosa Computing, memQ, Quantescence, SCALINQ, and Wave Photonics—join the burgeoning set of quantum companies in the region, many of which were attracted through Duality.

Program alumni that now have a permanent footprint in the region include qBraid and Super.tech (acquired by Infleqtion), as well as Great Lakes Crystal Technologies, headquartered in Michigan; QuantCAD, headquartered in Iowa; and Quantopticon, headquartered in the United Kingdom.

#### Chicago Immunoengineering Innovation Center

The Chicago Immunoengineering Innovation Center is one of the leading partners behind an extraordinary new resource for the University and the city of Chicago: the Chan Zuckerberg Biohub Chicago. The CZ Biohub will focus on engineering technologies to make precise, molecular-level measurements of biological processes within human tissues, with an ultimate goal of understanding and treating the inflammatory states that underlie many diseases. Participating PME faculty will have access to state-of-the-art facilities and academic labs and will also receive funding for individual faculty-led projects. This will be an outstanding new resource for UChicago and our academic partners and will further catalyze the city's role as a center of biomedical innovation.

#### Corporate Partnerships

Part of PME's mission is to commercialize technology with the help of corporate partners. Building awareness of PME strengths, providing a framework for engagement, and leveraging multiple modes of repeated interaction facilitate and help maintain industry interest. In 2022-23, PME strengthened relationships with or was meaningfully introduced to more than 30 companies via local, regional, and national conferences, as well as personal and third-party introductions—about half of which were brand new connections.

#### UChicago Global

International partnerships are key to PME's mission of addressing important global challenges. Recent collaborative efforts include a groundbreaking agreement with IBM and the University of Tokyo to develop the blueprints for building a quantum-centric supercomputer, as well as the appointment of [Prof. Supratik Guha](#) as faculty director of the Center in Delhi, where Guha has already been deeply engaged in a long-running project to develop a sensor network for Indian rivers.

Other recent international collaborations include PME's participation in the first US-Switzerland Quantum Symposium; a conference in Paris to connect industry and academic leaders across Europe to discuss solutions to challenges in sustainability and quantum technology; and a conference between US researchers and European leaders on quantum technology at Chicago Booth's Rothman Campus in London.

### COMMITTED TO BUILDING AN EQUITABLE FUTURE

The Pritzker School of Molecular Engineering was founded with the idea that, in order to create a better world, institutions have to foster trusting, long-term relationships with the local community.

PME continues to develop and lead innovative educational programs and opportunities that encourage students from middle school to college to explore STEM concepts, skills, and pathways, and that make molecular engineering relevant to people in their everyday lives. PME programs are scalable, built through long-term partnerships, and take an approach to engagement in which everyone involved benefits and grows.

#### Education Initiatives

Having completed its third year in summer 2022, the PME City Colleges of Chicago Program introduces community college students to molecular engineering content and laboratory principles, and supports students in their transition from two-year to four-year college programs. All of the students from the summer 2022 program are now in four-year STEM programs, an impressive metric that demonstrates the power of these accessible pathways to learning.

In the After School Matters STEM Lab Internships, Chicago-area high school students conduct STEM research at the college level alongside faculty and graduate students, and gain insight on the process of science and engineering research in a collaborative environment.

In the Collegiate Scholars Program, PME faculty and graduate students lead a molecular engineering summer course for high-achieving and underrepresented Chicago Public Schools students.

In the TeachQuantum Program, South Side high school teachers engage in lab-based quantum experiments and collaboratively develop quantum-focused high school lessons for their classrooms.

Junior Science Cafés inspire middle school students with the latest research from PME graduate students. The 30-minute sessions feature topics like “Immune Detectives: Innocent Until Proven Pathogenic,” “Tiny DNA, Big Impact!”, and “Magic Gel Worms.”

During the No Small Matter molecular engineering fair, middle school students and their teachers learn how this emerging STEM field impacts their lives through a variety of hands-on activities and presentations led by graduate student researchers. More than 150 students from four neighborhood schools attended the event this year.

### Public Engagement Events

Our events inspire the exploration of STEM pathways and careers, build positive attitudes towards science, and raise interest and awareness of what molecular engineering can do for society.

#### Former President Barack Obama surprises Chicago high schoolers during demonstration of ultra-secure quantum technology for mock voting event

At an event put on by the Chicago Quantum Exchange, former President Barack Obama surprised a group of students from Kenwood Academy High School on Chicago’s South Side. The event invited the students to become the first members of the US public to utilize new quantum technology in a mock vote. Obama shared a few words about the dangers of disinformation online in an era where the students’ attention was a prized commodity for businesses.

#### Inaugural South Side Science Festival draws more than 2,500 Chicagoans for day of inclusive STEM engagement

South Side families and science fans of all ages flocked to the University of Chicago’s campus for a chance to meet UChicago scientists, marvel at live demonstrations, and dig into ice cream made with liquid nitrogen during the inaugural South Side Science Festival. The yearly event, conceived by a PME assistant professor and co-organized by PME, seeks to demonstrate the many ways science can be engaging—and accessible—for everyone.

#### UChicago programs aim to help build the quantum workforce of the future

To foster the workforce essential to the quantum future, PME launched Quantum Quickstart, a free, intensive, one-week program held on the UChicago campus for Illinois high school students interested in STEM. Participants learn from world-renowned quantum researchers, tour quantum labs, and get personalized advice about college applications and career paths.



## WORLD-CLASS FACILITIES

- The William Eckhardt Research Center, with 265,000 square feet of space across seven floors shared with the Physical Sciences Division, is where PME is headquartered.
- PME has more than 40 state-of-the-art laboratories across the UChicago campus.
- A new engineering and science building, of which PME will be the principal occupant, is anticipated to break ground in 2024; PME also will have labs in a new facility in Harper Court in Hyde Park.
- The Pritzker Nanofabrication Facility, a 10,000-square-foot ISO Class 5 cleanroom that specializes in advanced lithographic processing of hard and soft materials, is located in the William Eckhardt Research Center.
- PME also has a Soft Matter Characterization Facility, a facility with specialized instruments dedicated to study the structure, properties, and dynamics of soft materials.
- The Single Cell Immunophenotyping Core Facility provides access to specialized instrumentation for the phenotyping and genotyping of immune cells.



### ENGINEERING THE FUTURE—OUR GOALS

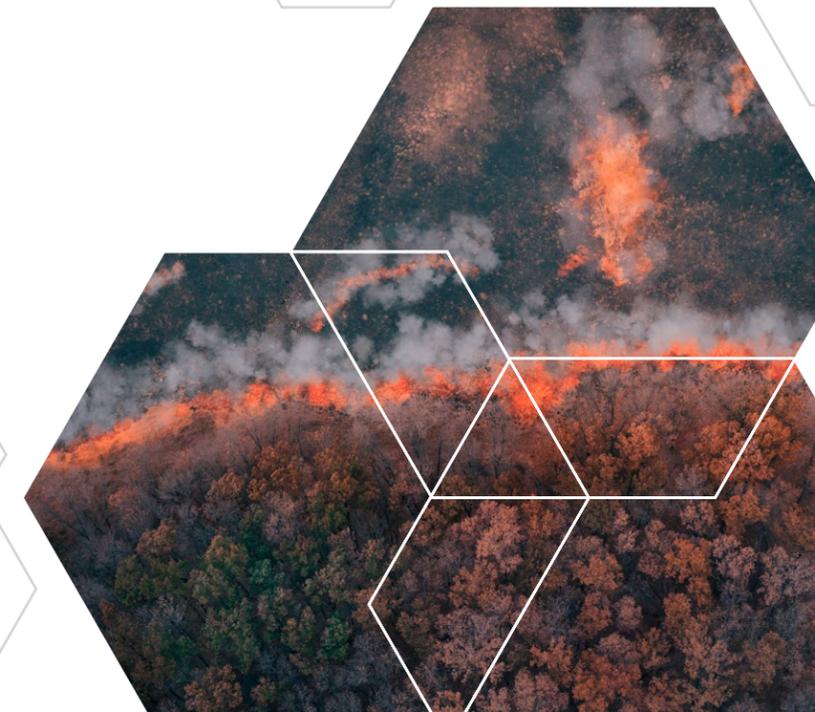
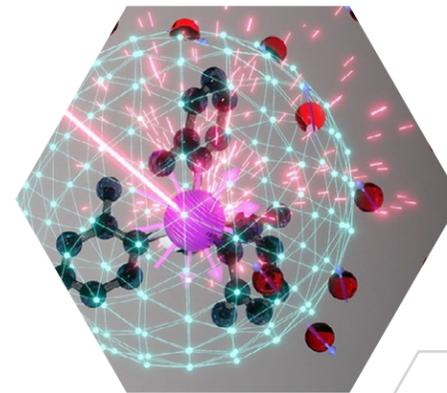
By 2030, the Pritzker School of Molecular Engineering aims to achieve the following seven goals, as set out by leadership. PME has already made substantial progress and continues its efforts to meet these challenges.

1. Focus and fortify our three current technical themes into internationally field-defining scientific domains.
2. Broaden the scope of PME's impact into additional powerful, distinctive themes and cross-cutting enabling capabilities.
3. Position PME as a recognized standard of academic excellence and thought leadership in molecular engineering.
4. Establish a new physical facility with unsurpassed functionality, innovative workspaces, and powerful instrumental capabilities.
5. Build capability to generate commercial activity meaningful to industry and society.
6. Deliver value that leads to revenue generation through philanthropy, tuition, new degree and certificate programs, corporate sponsorships, and fellowships.
7. Add substantial new diversity to PME in both the faculty and student body through recruitment of women and people from underrepresented groups.

**To read more about PME's continued accomplishments, visit [pme.uchicago.edu](https://pme.uchicago.edu).**

### THANK YOU

PME extends its deepest thanks to those who have contributed to its success over this past year—our staff, students, and faculty. Thanks also to our donors, whose generosity makes our work possible. We remain tremendously grateful to the Pritzker Foundation for the opportunity to steward their investment in the future of the University of Chicago.



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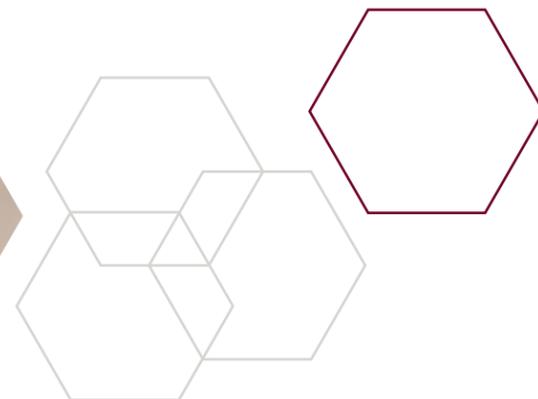
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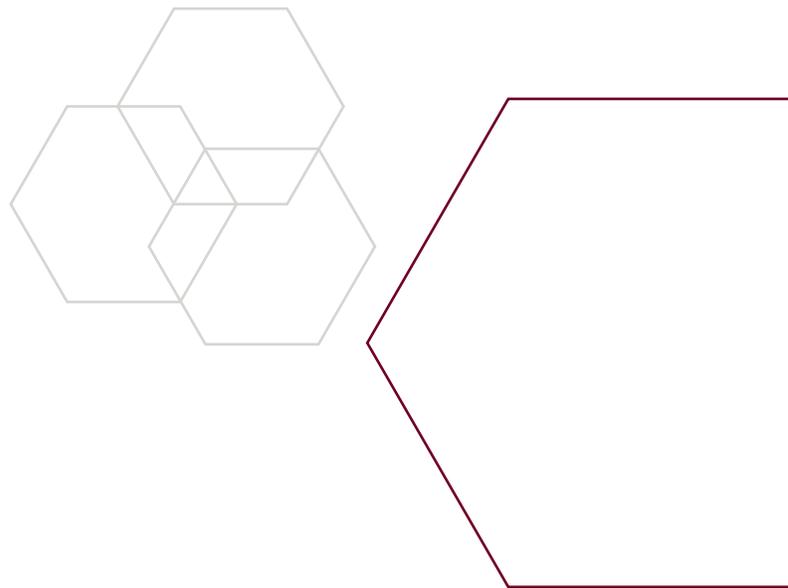
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