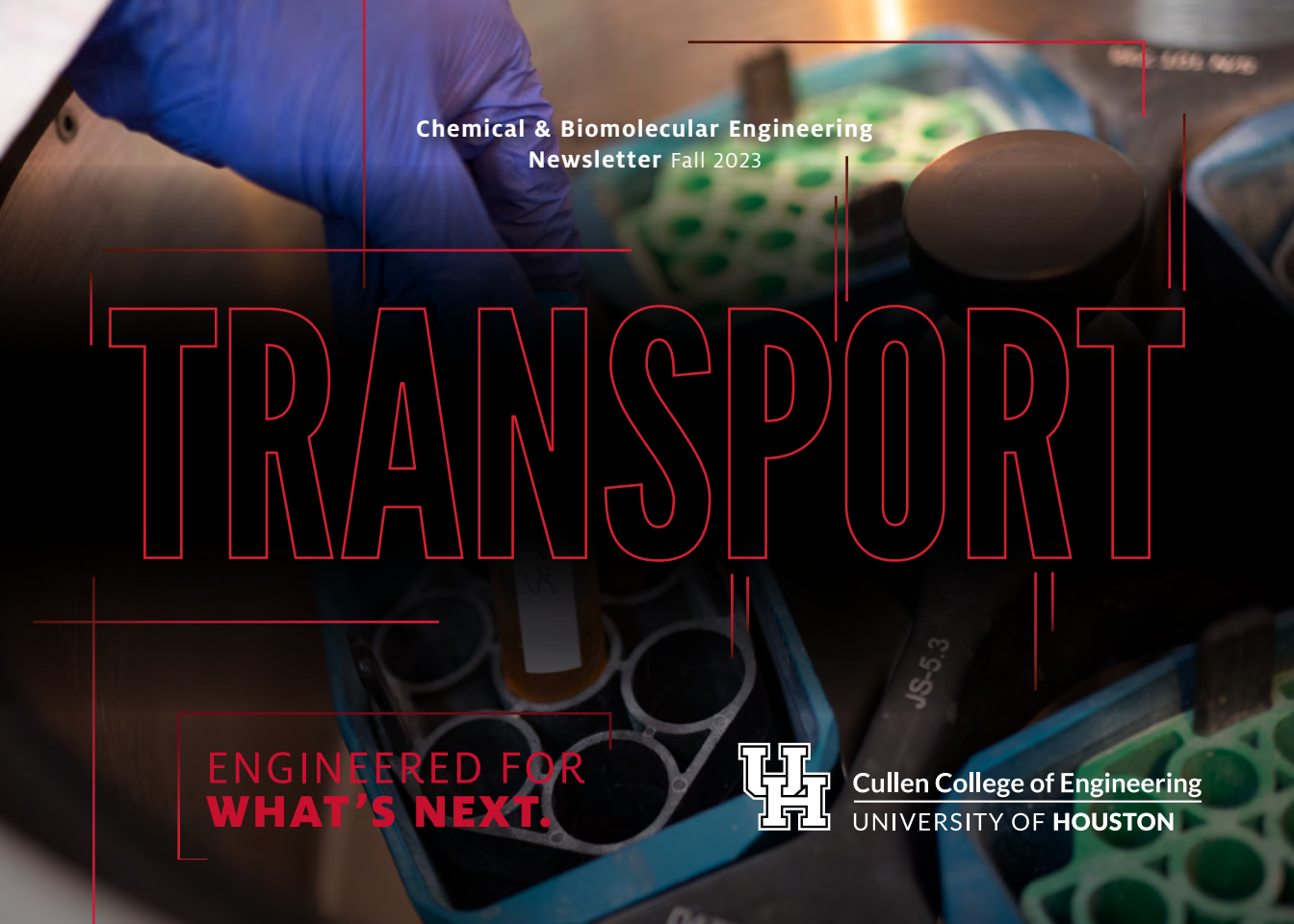


Chemical & Biomolecular Engineering
Newsletter Fall 2023

TRANSPORT

ENGINEERED FOR
WHAT'S NEXT.

Cullen College of Engineering
UNIVERSITY OF **HOUSTON**

Letter from the Chair

Dear Colleagues,

I am delighted to share some of the recent research highlights and accomplishments of our faculty and students. From the recent award of two inaugural Catalyst for Discovery grants from the Welch Foundation to establish two research centers, one focusing on bioactive materials crystallization and the other on converting plastic waste into useful materials, to breakthroughs in advancing kidney stone treatment and smartphone-based biosensors, there is no shortage of exciting research projects in the William A. Brookshire Department of Chemical and Biomolecular Engineering. I invite you to take a moment and look through the entries of our newsletter, and if any strike your interest, do not hesitate to reach out to me personally.

Warm Regards,

Triantafillos J. (Lakis) Mountziaris
William A. Brookshire Department Chair and Professor
William A. Brookshire Dept. of Chemical & Biomolecular Engineering
University of Houston

UH ChBE **BY THE NUMBERS**

FACULTY *(FY 2022)*

1 NATIONAL ACADEMY OF ENGINEERING MEMBER

2 NATIONAL ACADEMY OF INVENTORS FELLOWS

3 NATIONAL ACADEMY OF INVENTORS SENIOR MEMBERS

ENROLLMENT *(FALL 2023)*

348 UNDERGRADUATE STUDENTS

147 GRADUATE STUDENTS

LEARN MORE ABOUT CHBE PROGRAMS:
www.chee.uh.edu

DEGREES AWARDED
(FY 2023)

88 B.S. **7** M.S. **16** PH.D.

DEPARTMENT HIGHLIGHTS

UH BROOKSHIRE CHBE ENGINEERING GRADUATE PROGRAM RATING AMONG TOP 10 IN **U.S. NEWS & WORLD REPORT RANKINGS**

The Chemical and Biomolecular Engineering graduate program at the University of Houston's Cullen College of Engineering is among the top 25% chemical engineering graduate programs in the US according to the latest rankings by U.S. News & World Report. Its current rank is No. 34.

As of Fall 2023, the William A. Brookshire Department of Chemical and Biomolecular Engineering has 23 tenure-track and tenured faculty members, including 1 Member of the National Academy of Engineering, 2 Fellows and 3 Senior Members of the National Academy of Inventors, and multiple winners of prestigious national and early career awards. The Department has an undergraduate enrollment of 348 students and a graduate enrollment of 128 Ph.D. and 19 Master's students. The University of Houston is a Carnegie-designated Tier One public research university recognized by The Princeton Review as one of the nation's best colleges for undergraduate education. UH serves the globally competitive Houston and Gulf Coast Region by providing world-class faculty, project-based learning, high impact research and strategic industry partnerships. Located in the nation's fourth-largest city, UH serves more than 47,000 students in the most ethnically and culturally diverse region in the country.

For the full list of rankings from U.S. News and World Report, please visit:
https://www.usnews.com/best-graduate-schools

FACULTY

ACCOLADES

JEFFREY RIMER

Jeffrey Rimer, Abraham E. Dukler Professor of Chemical Engineering, known globally for his seminal breakthroughs that control crystals to help treat malaria and kidney stones, has been awarded an inaugural $5 million Catalyst for Discovery Program Grant from the Welch Foundation, to establish the Welch Center for Advanced Bioactive Materials Crystallization. The Welch center at the University of Houston aims to improve understanding of the intricate crystallization processes, inventing fresh ways, both through experiments and computer simulations, to predict and manage how crystals form.

MEGAN ROBERTSON

Megan Robertson, project director and professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, will lead a new interdisciplinary research project, funded by a $4 million grant from the Welch Foundation's new Catalyst for Discovery Program, aims to develop innovative chemical processes to transform plastic waste into useful materials**.** The team will tackle the challenges with polyolefins through a three-pronged approach: value-added recycling, upcycling plastics and enabling their circular reuse. Robertson, who is equally passionate about polymers and sustainability, was awarded two additional grants from the Welch Foundation this year.

JERROD A. HENDERSON

Jerrod Henderson, an assistant professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, is the Cullen College of Engineering's latest recipient of a National Science Foundation CAREER award.

Henderson's proposal, "Centering the Engineering Identity of Black Men to Enhance Representation and Degree Completion," seeks to strengthen the future U.S. engineering workforce by enabling and encouraging the participation of all citizens in the engineering enterprise, particularly Black men.

FACULTY
ACCOLADES

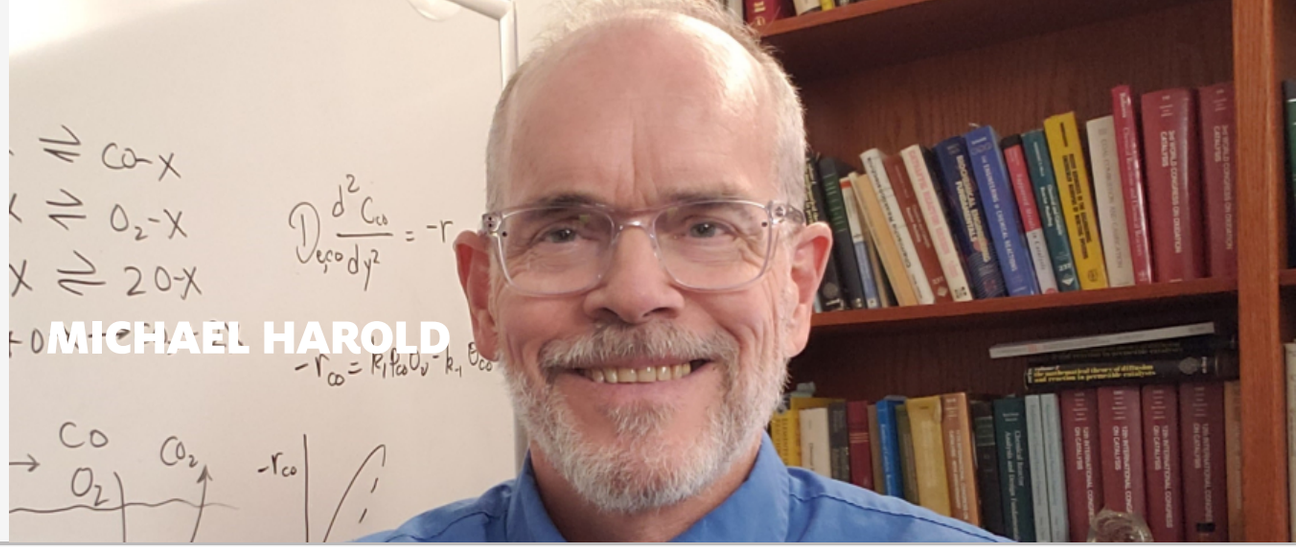
PETER VEKILOV

Peter Vekilov, Frank Worley Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, was named the winner of the 2022 Frank Prize from the International Organization for Crystal Growth. “I was extremely proud and honored,” he said. “I was a graduate student in the 1990s in the Soviet Union, and my advisor, Alexander Chernov, got the inaugural award in 1989.”

As a result, Vekilov said as far as he is aware of he and Chernov are the first pair with the advisor-mentor relationship to both have earned the Frank award. According to the IOCG, the honor is given every three years for “significant fundamental (not necessarily theoretical) contributions to the field of crystal growth.” Vekilov is the 14th recipient in its 34-year history.

FACULTY

ACCOLADES



A professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering at the Cullen College of Engineering has been recognized for his advancements in the field of chemical reaction engineering.

Michael P. Harold, Cullen Professor of Engineering, is the 2023 recipient of the American Institute of Chemical Engineers (AIChE) R. H. Wilhelm Award in Chemical Reaction Engineering, sponsored by ExxonMobil Research & Engineering Company. The award "recognizes an individual's significant and new contribution in chemical reaction engineering. The recipient will have advanced the frontiers of chemical reaction engineering through originality, creativity, and novelty of concept or application." Harold has been a member of the faculty at UH since 2000, and earned his doctorate from Cullen in 1985. Harold has served as advisor to 39 doctoral students, authored 185 peer-reviewed papers and chapters, and presented 130 invited lectures.

Pictured: *Jeffrey Rimer with research students*

KIDNEY STONE TREATMENT RESEARCH LEADING TO HUMAN TRIALS

Jeffrey Rimer, Abraham E. Dukler Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering Department, is well-known and recognized for his groundbreaking research into crystal engineering. His work in this area spans the rational design of catalytic materials to the prevention of crystals in human diseases. For nearly 17 years he has been examining new therapies for kidney stones, which are hard deposits of minerals and salts that form inside the body, and are typically passed through the urinary tract.

Rimer cautions that while they think HCA has potential for alleviating symptoms and preventing kidney stone growth better than citrate – the common treatment right now – it is not a magical cure. “When we first published the effects of HCA in 2016, there were news articles that were being published with headlines like, ‘Is this the end of kidney stones?’

Rimer said that HCA has the potential to effectively reduce the rate of calcium phosphate crystal growth without raising urine pH, which would be an added benefit over citrate, particularly if this project demonstrates that HCA is a more effective crystal growth inhibitor in vivo. He called it a “dual therapeutic effect.”

Pictured: *Chandra Mohan*

CHEMICAL AND BIOMOLECULAR ENGINEERING

EARLY DIAGNOSIS AND MONITORING OF LUPUS NEPHRITIS- **ON YOUR SMARTPHONE**

According to the Centers for Disease Control and Prevention, about 204,295 Americans have systemic lupus erythematosus, an autoimmune disease leading to chronic inflammation in multiple organs, including the kidneys. Nephritis flares are hard to recognize because their symptoms often masquerade as something else. A sufferer might think they have a cold or the flu or are just tired.

University of Houston researchers **Chandra Mohan**, Hugh Roy and Lillie Cranz Cullen Endowed Professor of biomedical engineering and **Richard Willson**, Huffington-Woestemeyer Professor of chemical and biomolecular engineering and professor of biochemical and biophysical sciences are reporting the success of their new method for the early diagnosis and monitoring of lupus nephritis – at home. If you've taken an at-home COVID-19 or pregnancy test, then you've taken what is scientifically called a lateral flow assay (LFA) test, a diagnostic tool widely used because of its rapid results, low cost and ease of operation. The team applied that same technology to assessing lupus nephritis, or inflammation of the kidneys, one of the most severe complications for patients with systemic lupus erythematosus (SLE, or lupus).

The home test – with results read on a smartphone – is meant to eventually replace the gold standard for diagnosis of active lupus nephritis, an invasive kidney biopsy, with its attendant morbidity which cannot be serially repeated.

Pictured: Richard Willson

University of Houston | Cullen College of Engineering

JOURNAL PUBLICATION

GLOW-IN-THE DARK MATERIALS USED FOR AT COVID TESTS **FEATURED IN CHEMISTRY JOURNAL**

Researchers at the University of Houston are using glow-in-the-dark materials to enhance and improve rapid COVID-19 home tests. If you've taken an at-home COVID-19 or pregnancy test, then you've taken what is scientifically called a lateral flow assay (LFA) test, a diagnostic tool widely used because of its rapid results, low cost and ease of operation. When you read test results, you see colored lines.

"We are making those lines glow-in-the-dark so that they are more detectable, so the sensitivity of the test is better," said **Richard Willson**, Huffington-Woestemeyer professor of Chemical and biomolecular engineering and professor of biochemical and biophysical sciences, who previously created a COVID smartphone-based app and test kit based on the technology underlying home pregnancy tests.

Willson reported in the Royal Society of Chemistry's Journal *Analyst*, "In this new development, there are two tricks. First, we use enzymes, proteins that catalyze reactions, to drive reactions that emit light, like a firefly. Second, we attached those light-emitting enzymes onto harmless virus particles, along with antibodies that bind to COVID proteins."

And while you might be able to read the results with your eye in a very dark room, the Willson team created a little plastic box to exclude light and let a smartphone camera do the reading.

Pictured: *Glow-in-the-Dark Stars*

CHBE'S SOLANKI NAMED CO-CHAIR OF

THE GORDON RESEARCH SEMINAR

Surya Pratap Singh Solanki, a Ph.D. candidate from the Cullen College of Engineering's William A. Brookshire Department of Chemical and Biomolecular Engineering, has been picked to serve as co-chair for the next Gordon Research Seminar (GRS), which is focused on Chemical Reactions on Surfaces.

This conference will take place in the first quarter of 2025. A venue and location have not been publicly announced yet.

During his time at UH, he has received numerous accolades, including the Kokes Student Award, the ACS Catalysis Division Travel Award, a Best Poster Award at the UH Graduate Showcase and Southwest Catalysis Society Research Symposium.

Pictured: Surya Pratap Singh Solank

The University of Houston
Cullen College of Engineering

The University of Houston Cullen College of Engineering addresses key challenges in energy, healthcare, infrastructure, and the environment by conducting cutting-edge research and graduating hundreds of world-class engineers each year. With research expenditures topping $40 million and increasing each year, we continue to follow our tradition of excellence in spearheading research that has a real, direct impact in the Houston region and beyond.

Cullen College of Engineering
UNIVERSITY OF HOUSTON

UH Cullen College of Engineering
William A. Brookshire Department of
Chemical and Biomolecular Engineering
Engineering Building 1, Room S222
4226 Martin Luther King Boulevard
Houston TX 77204-4004

@UHEngineering

TRANSPORT