



**Chemical & Biomolecular
Engineering Newsletter**
Spring 2022



TRANSPORT



**ENGINEERED FOR
WHAT'S NEXT.**

CULLEN
COLLEGE OF ENGINEERING
UNIVERSITY of HOUSTON

Letter from the Chair



Dear Colleagues,

Greetings from Houston!

I am delighted to welcome two new Assistant Professors to our department, Dr. Jerome Henderson and Dr. Gül Zerze. I am also delighted to share with you some of the exciting research highlights, faculty awards and student accomplishments to come out of our department in the last six months. From mapping T cells to improve immunotherapy outcomes, to developing point of care tests for leukemia, there is no shortage of exciting work going on at the William A. Brookshire Department of Chemical and Biomolecular Engineering. I hope that you enjoy reading through some of these highlights, and find inspiration and potential in them, as I have. If you see opportunities for collaboration, do not hesitate to reach out, and I hope that you find time to come visit our department in the very near future.

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 (FALL 2021)

1 NATIONAL ACADEMY OF ENGINEERING MEMBER

2 NATIONAL ACADEMY OF INVENTORS FELLOWS

2 NATIONAL ACADEMY OF INVENTORS SENIOR MEMBERS



ENROLLMENT (FALL 2021)

502 UNDERGRADUATE STUDENTS

136 GRADUATE STUDENTS



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DEGREES AWARDED

(FALL 2021)



71 B.S.



11 M.S.



23 PH.D.

NAVIN VARADARAJAN NAMED **NAI SENIOR MEMBER**

The research discoveries and innovations coming from the Single-Cell Lab of **Navin Varadarajan**, M.D. Anderson Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, have been recognized again with his election to Senior Member status of the National Academy of Inventors.

Varadarajan was notified of the honor in early February. He said he was thankful to receive it, but he was quick to acknowledge the work of his students and collaborators when it came to the award.

Varadarajan describes his research as being focused on harnessing the power of the immune system for treating cancers and for designing therapeutics and vaccines.

In October 2017, he earned a Career Development Award from the Department of Defense Peer Reviewed Cancer Research Program and in 2013 the Melanoma Research Alliance Stewart-Rahr Young Investigator Award. He has also won Cullen College of Engineering Teaching Excellence Awards in 2017-18 and 2012-13. ⚙️



Pictured: Navin Varadarajan at the UH central campus

Pictured: Jerrod Henderson (left) and Le Shorn Benjamin (right).



BENJAMIN RECEIVES INAUGURAL ASEE ENGINEERING POST DOCTORAL FELLOWSHIP



When **Le Shorn Benjamin**, Ph.D. initially saw the advertisement for a postdoctoral associate role focused on Engineering Education with **Jerrod Henderson**, Ph.D., Assistant Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, she knew that although her background was in educational research, she could transfer her knowledge and skills to the engineering context. In fact, she was excited since taking on new challenges has never been something she has shied away from.

Based on Benjamin's research interest, Henderson advised Benjamin to apply for the new eFellows program, which is administered by the American Society for Engineering Education (ASEE) with funding from the National Science Foundation (NSF). The program places early-career Ph.D.s in engineering fields in university research postdoctoral fellowships. In addition to hands-on academic research with a faculty advisor, each fellowship cohort will participate in professional development and mentoring activities designed to prepare them for future research careers.

Henderson has been advancing the development of Engineering Education at UH and the Cullen College of Engineering, and recently received a planning grant from the NSF for an Engineering Research Center. In addition to Henderson's nod, Benjamin's application was also endorsed by Department Chair, T.J. (Lakis) Mountziaris, Ph.D. and was ultimately selected by ASEE for inclusion in the inaugural cohort of the ASEE eFellowship. ⚙️

UH CHBE WELCOMES

NEW FACULTY

JERROD HENDERSON



Jerrod Henderson, assistant professor. Prior to joining the William A. Brookshire Department, Henderson was an instructional professor at UH and served the college in other roles. He was hired for a tenure-track position following a national search within the Brookshire Department in Fall 2021. ⚙️

GÜL ZERZE



Gül Zerze, assistant professor. Zerze was previously a post-doctoral research associate at Princeton University. Her research primarily covers the fundamental understanding of molecules of life via molecular simulation methods and theory. She joined the Cullen College in January 2022. ⚙️

Pictured: Katerina Kourentzi in her research lab testing Leukemia prototype test paper

DEVELOPING A TEST FOR LEUKEMIA

A research professor at the Cullen College of Engineering has received a federal grant for about \$700,000 to develop a rapid screening test for a specific form of leukemia that has severe health risks without prompt detection.

Katerina Kourentzi, Ph.D., a Research Associate Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering, received the funding from the U.S. Army Medical Research Acquisition Activity (USAMRAA). The \$699,828 grant, "Novel Point-of-Care Test for the Early Detection of Acute Promyelocytic Leukemia," is the first federal funding award that she has received as principal PI.

According to background information provided in the grant application, Acute Promyelocytic Leukemia (APL) accounts for about 5 to 8 percent of the annual 20,000 cases of acute myeloid leukemia (AML) cases in the United States. APL can occur at any age, but the median age is 40 years, younger than the 70 years for other AMLs. APL presentation is accompanied by severe, life-threatening bleeding in 40 percent of patients. If detected on time, the long-term survival rate is 90 percent with the available

treatment. There is not a standard rapid screening test to enable prompt initiation of the treatment.

The effort builds on previous research that Kourentzi has done, which improves a technology similar to that of the conventional home pregnancy test.

For this specific project, Kourentzi said she would be teaming with hematopathologists Dr. Youli Zu from Houston Methodist and Dr. Rashmi Kanagal Shamanna from the MD Anderson Cancer Center. Dr. Claudia Pedroza, from UT Health, is an expert statistician that will also be a collaborator for the project. ⚙️



Pictured Above: Prototype leukemia test

MAPPING THE COMPLEXITY OF T CELLS TO **IMPROVE IMMUNOTHERAPY**

It is not an exaggeration to say that immunotherapy has revolutionized cancer treatment. Nor is it boastful to say University of Houston M.D. Anderson Professor of chemical and biomolecular engineering, **Navin Varadarajan**, intends to make it better.

Recent data indicate that variability in the manufactured T cell products may be the primary determinant of clinical success.

Varadarajan will use a \$1.8 million grant from the National Institute of General Medical Sciences to develop and validate what he calls Multiscale Intelligent Convergence (MusIC). MusIC will integrate advances in molecular profiling, dynamic cellular imaging and artificial intelligence (AI) to offer unprecedented insights into the function of immune cells being prepared for immunotherapy.



Professor and Chair of electrical and computer engineering at UH; **Hien Van Nguyen**, assistant professor of electrical and computer engineering at UH; and Sattva Neelapu, a medical doctor at MD Anderson Cancer Center.

Varadarajan anticipates that successful implementation will enable the validation of MusIC as a platform for studying multi-scale cell biology which, in turn, will lead to more reliable biomanufacturing of T cell infusion products and engineering more potent immune cells that can have a broad impact on immunotherapy. ⚙️

Varadarajan's collaborators on the project include **Badri Roysam**, Hugh Roy and Lillie Cranz Cullen University

Pictured: Navin Varadarajan in his research lab



ANIL K. BHOWMICK



FACULTY

ACCOLADES

Anil K. Bhowmick, Ph.D., a research professor at the University of Houston's International Polymer & Soft Matter Center within the William A. Brookshire Department of Chemical and Biomolecular Engineering, will be the recipient of the 2022 Melvin Mooney Distinguished Technology Award.

The award, from the American Chemical Society's Rubber Division and sponsored by Lion Elastomers, honors someone who has exhibited exceptional technical competency by making significant and repeated contribu-

tions to rubber science and technology.

Bhowmick's highly cited work focuses on the development and properties of a series of polymer-based nanocomposites using various nanoparticles, such as clay, nanotubes and graphene. Structure property relationships of the nanocomposites have been elucidated, and applications of some of these nanocomposites have been successful.

Bhowmick also completed pioneering research work on the development of high temperature thermoplastic

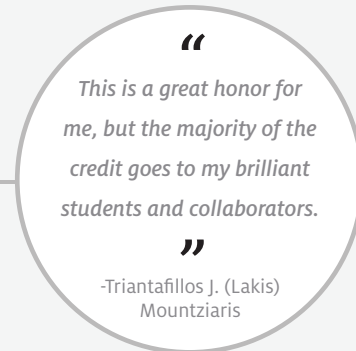
elastomers from polyamide, poly (ethylene terephthalate), poly (phenylene ether) and polyvinylidene fluoride.

Last year, Bhowmick received the James L. White Innovation Award from the Polymer Processing Society. He joined the faculty of the Cullen College of Engineering in 2019, after more than 30 years at IIT. His current research is focused on the behavior of polymers under extreme conditions, polymer nanocomposites and thermoplastic elastomers. ⚙️

FACULTY

ACCOLADES

TRIANTAFILLOS J. (LAKIS) MOUNTZIARIS



Triantafillos J. (Lakis) Mountziaris, Ph.D., the William A. Brookshire Department Chair of the William A. Brookshire Department of Chemical and Biomolecular Engineering in UH's Cullen College of Engineering, is the 2021 winner of the American Institute of Chemical Engineers' Thomas Baron Award in Fluid-Particle Systems, sponsored by Shell.

The award recognizes an individual's recent outstanding scientific or technical accomplishment, which has made a significant impact in the field of fluid-particle systems

or in a related field with potential for cross fertilization with relevance to the topics of interest to the particle technology community.

Mountziaris was quick to share the credit for the award with his students and research collaborators that he has had in his distinguished career.

Mountziaris has been a member of the AIChE since 1982. He was elected a Fellow of the Institute in 2019. He joined the University of Houston's Cullen College of

Engineering in January 2021 from the University of Massachusetts-Amherst, as the new Department Chair of the William A. Brookshire Department of Chemical and Biomolecular Engineering.

His key accomplishments recognized by the Thomas Baron Award are related to the design of reactors for biomass conversion to fuels and chemicals and to the development of a new process for producing semiconductor nanocrystals. ⚙️

STUDENTS RECOGNIZED BY **AXALTA BRIGHT FUTURES PROGRAM**

A pair of student researchers in the William A. Brookshire Department of Chemical and Biomolecular Engineering have been recognized for their work by the Axalta Bright Futures Scholarship Program.

The scholarship recipients are **Ted Kim**, a senior undergraduate, and **Aman Agrawal**, a doctoral student. Both will receive renewable, \$5,000 scholarships. Each year, a maximum of 16 students total are chosen from universities and colleges in five geographical areas – Houston, Philadelphia, Detroit, Rochester in New York and Fort Royal in Virginia.

Kim is an undergraduate researcher who is working in the

Vekilov Lab, under the supervision of **Peter Vekilov**, Ph.D., Moores Professor. Long-term, Kim would like to become a R&D scientist or engineer, working on developing carbon negative solutions in the energy and materials field.

Agrawal is working on two research topics in the Functional Polymer Nanocomposite Laboratory, which is run by **Alamgir Karim**, Ph.D., Dow Chair and Welch Foundation Professor. Agrawal's first research topic has been related to artificial cells and the origin of life. Agrawal's other research topics have been focused on making better polymer coatings, for applications ranging from waterproof packaging to anti-corrosion materials for the airline industry. ⚙️

Pictured: Ted Kim



Pictured: Aman Agrawal



Pictured: Annabelle Koehler



OPPORTUNITIES, COMMUNITY

ALLOW CHBE'S KOEHLER TO FLOURISH

For **Annabelle Koehler**, a junior student in the William A. Brookshire Department of Chemical and Biomolecular Engineering at the Cullen College of Engineering and the Honors College, the school has provided her with more than a place for her to earn her undergraduate degree and to pursue a minor in Energy and Sustainability.

Koehler immersed herself in college activities from the time she enrolled. She earned the Coogs Class of 2022 Freshman Engineering Scholarship, the Roy and Lillie Cullen College of Engineering Scholarship in Spring 2019 and the Honors College Outstanding First Year Student Award in May 2019.

Most recently, she earned the William A. Brookshire Scholarship in Spring 2021. In August 2018, she joined the Hon-

ors Engineering Program, and in August 2021, she became the social director of the UH branch of the American Institute of Chemical Engineering, and a member of the Society of Women Engineers.

The past two years have been especially busy for Koehler. In that time span, she completed two co-ops for the Marathon Petroleum Company – one at the Catlettsburg Refinery in Kentucky, and another at the Saint Paul Park Refinery in Minnesota – and in Spring 2020, a study abroad program in Wales. She's also gone from Annabelle O'Day to Annabelle Koehler, after marrying her husband, Griffin, in May 2021. After earning her degree in May 2023, she hopes to work in the petroleum or energy industry. ⚙️

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.



UNIVERSITY of **HOUSTON** | ENGINEERING

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

