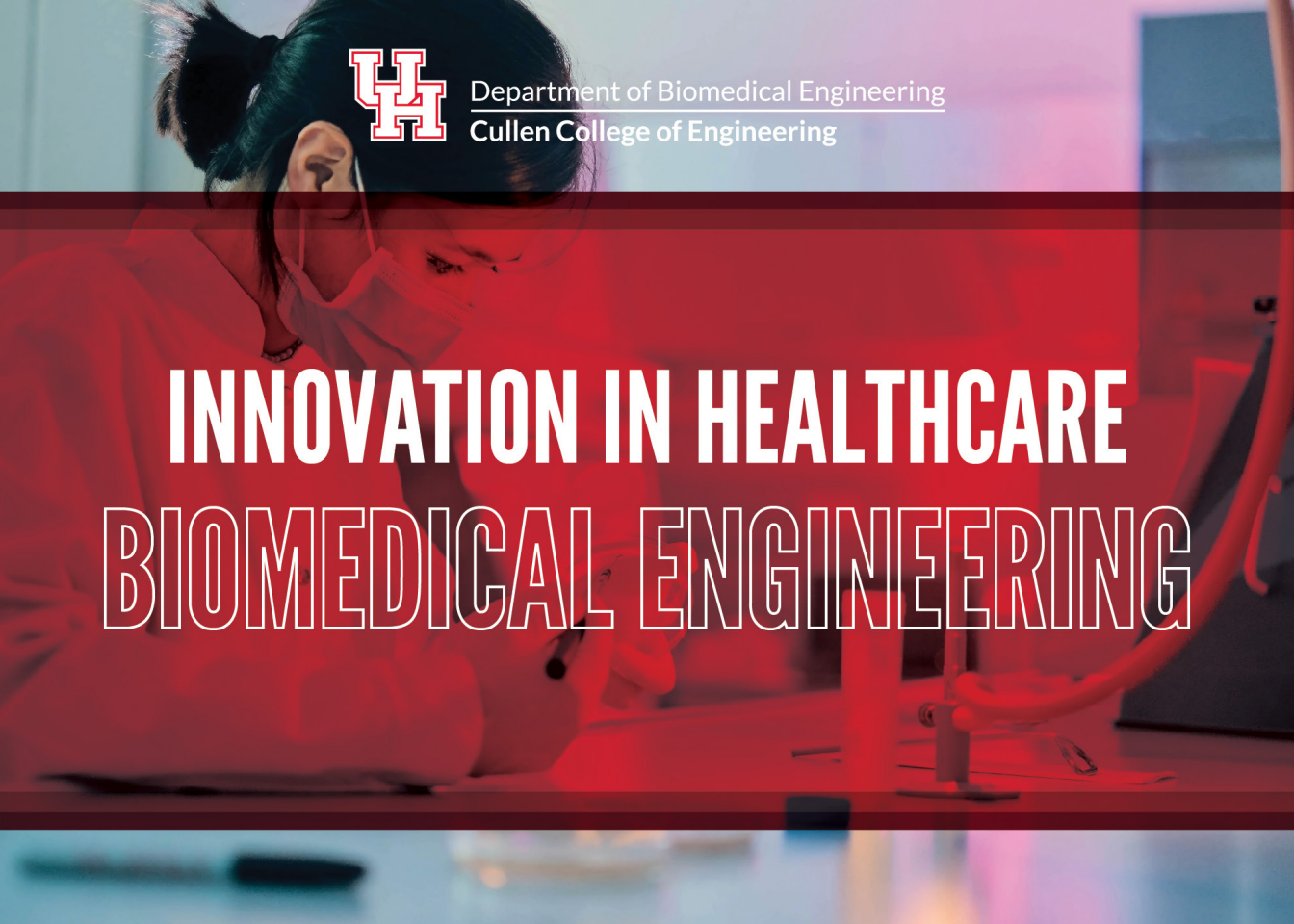

Department of Biomedical Engineering
Cullen College of Engineering

INNOVATION IN HEALTHCARE

BIOMEDICAL ENGINEERING

MOHAN REPORTS SIMPLE URINE TEST COULD TRANSFORM KIDNEY CARE

Noninvasive Testing Could Reshape Diagnosis for Lupus Nephritis

In a finding set to change the way disease is monitored, **Chandra Mohan**, an international expert and pioneer in lupus research at the University of Houston, is reporting that urine samples can indicate lupus nephritis in a noninvasive manner, without the need for repeat and painful renal biopsies.

This would be transformative for the lives of 5 million people worldwide who have some form of systemic lupus erythematosus, or lupus, with 50 percent of those experiencing kidney disease including lupus nephritis.

Lupus is an autoimmune disease that occurs when the body attacks its own tissues and organs. Lupus nephritis is one of the most frequent and severe clinical manifestations of SLE, and the leading cause of death. Death directly attributable to kidney disease occurs in 5% to 25% of patients with lupus nephritis within five years of onset.

The urgent need for noninvasive biomarkers

“Renal biopsy is invasive and inconvenient and associated with potential complications such as bleeding and infection. The reading of a renal biopsy by pathologists is subjective with substantial inter-pathologist discordance,” reports Mohan, Hugh Roy and Lillie Cranz Cullen Endowed Professor of Biomedical Engineering, in The Journal of Clinical Investigation.

“Noninvasive biomarkers precisely predicting histological activity and chronicity are urgently needed," Mohan said.

To identify urinary protein biomarkers that could predict kidney damage, Mohan’s team used proteomics — a method that examines all the proteins in a sample to find those linked to disease — to analyze 1,317 urine samples collected at the time of biopsy from subjects with lupus nephritis.

“In this study, we found that 57 different proteins in urine were much higher in subjects whose kidneys showed more signs of active damage,” Mohan said.

Chandra Mohan
Hugh Roy and Lillie Cranz Cullen Endowed Professor
Associate Chair for Research and Development

University of Houston | Cullen College of Engineering

UH LEADS TEXAS IN NATIONAL EYE INSTITUTE RESEARCH FUNDING, WITH HELP FROM CULLEN

Among Top 10 Institutions in Nation for NEI support

The University of Houston is a national leader in vision science, receiving more National Eye Institute research funding than any other institution in Texas and placing among the top 10 recipients nationwide. With 29 active NEI-funded projects totaling nearly $13 million, UH is advancing the frontier of eye and vision research through interdisciplinary innovation and clinical impact.

The majority of NEI funding at UH supports the College of Optometry, which accounts for more than 70 percent of the total funding, with the Cullen College of Engineering contributing nearly 30 percent. Together, these colleges are driving breakthroughs in areas such as:

- Myopia prevention: UH co-leads a $25 million clinical trial testing preventive atropine drops to study the delay of nearsightedness in children.
- Retinal disease and gene therapy: Researchers are investigating genetic causes of retinal diseases and blindness, supported by over $3.6 million in NEI funding.
- Retinal neuroscience: A $2.6 million grant supports ongoing research into the electrical signals that impact retinal function — continuing two decades of work in this area.
- Corneal healing: A $2.2 million project is exploring new treatments for corneal scarring.
- No-touch optical elastography for corneal biomechanics: A $2.9 million grant, awarded in 2022, is developing a novel “no-touch” optical coherence elastography system to measure corneal elasticity and improve diagnosis and treatment of diseases like myopia and keratoconus.
- Biomechanics of accommodation: UH researchers are pioneering a new instrument that enables direct, non-invasive measurement of the stiffness in the lens of the eye, facilitating new treatments for presbyopia, supported by a $3 million, multi-year grant.

University of Houston | Cullen College of Engineering

GRADUATE NASH NOW ASSISTANT PROFESSOR AT RICE UNIVERSITY

For **Amanda Nash**, there isn't one specific factor that can fully explain how she went from not planning on going to college at all, to becoming an Assistant Professor of Bioengineering with multiple degrees from the University of Houston and Rice University.

Rather, it was a series of decisions that built on one another as well as a strong support system from her family and her professors that encouraged and enabled her to explore this career path as it came to her.

"I originally was not planning to go to college, at least right away, because I had a reasonable job at the time and I was considering just making a career out of that," she said. "In the end, I chose UH because of the flexibility in course selection and scheduling. My first year, I was also working 30-plus hours per week, so I needed to be able to select classes that would fit into my schedule."

Nash graduated magna cum laude with her B.S. in Biomedical Engineering from UH in 2018. She also received multiple distinctions while an undergraduate student, for her student leadership and scholarship. She then earned her Ph.D. in Bioengineering from Rice in 2023.

At Cullen, Nash said the support of several professors was vital when it came to the decision of furthering her education and pursuing research.

"**Jerrod Henderson** and **Metin Akay** inspired me to stick with engineering during my time at UH and to consider a career in academia beyond my undergraduate degree," she said. "Dr. Akay played a huge role in selecting me for a BME research scholarship that allowed me to join a lab of my choosing and dedicate meaningful time to developing as a researcher. I joined **Vivien Coulson-Thomas**'s lab in the College of Optometry and studied extracellular matrix components. This experience shaped my entire career."

Originally, Nash planned to earn her undergraduate degree and then look for a job in industry. But the experience of conducting research with Coulson-Thomas, as well as the opportunities provided by the Houston metro area, caused her to change those plans.

Amanda Nash
Magna Cum Laude Graduate

STUDENT RESEARCHER SHAH PARTICIPATES IN EXCLUSIVE FRAUNHOFER PHOTONICA 2025 SUMMER SCHOOL

Sanidh Shah, an undergraduate honors biochemistry student and a student researcher in Cullen Endowed Chair and Professor of Biomedical Engineering **Kirill Larin**'s Biomedical Optics Lab (BOL), was selected to participate in the Fraunhofer Photonica Summer School hosted by the Fraunhofer Group for Light & Surfaces in Germany this past September 22 – 27.

The immersive, hands-on program offers students from around the world the opportunity to explore cutting-edge photonics and optical imaging technologies. During the Summer School, young scientists visited different Fraunhofer institutes across Germany, including Freiburg, Karlsruhe, Ettlingen and Aachen. At each site, they took part in a topical scientific program with hands-on practical elements that provide insight into and different perspectives on photonics.

"Sanidh's selection reflects his strong research foundation and growing interest in global innovation. His work in the lab and commitment to learning continue to distinguish him as a rising talent in biomedical engineering," said Biomedical Engineering Program Director **Tina Kazemi**.

Shah joined Larin's lab in the spring of his freshman year, interested in medical imaging and drawn to the work Larin's team was doing. Recently, he has worked on the visualization of embryonic morphology in mice.

"OCT works by using a gentle laser light and a technique called interferometry, which compares tiny differences in reflected light, to capture fine structural details. By repeating these measurements across the embryo, we can stitch them into a high-resolution 3D map of the whole body – or specific parts like the arm or the head – and use that to measure and quantify the individual features of a specific embryo," Shah explained.

Sanidh Shah
NSM undergraduate honors biochemistry student and a student researcher

STUDENT SUCCESS

GUZEL MUSINA RECEIVES SECOND AHA FELLOWSHIP AWARD

Biomedical Engineering Ph.D. student **Guzel Musina** has been awarded her second predoctoral fellowship by the American Heart Association (AHA) for her project, “Novel optogenetics tool for the mouse embryonic cardiodynamic research.”

The project’s aim is to develop a new optical tool for manipulating cardiodynamics in mouse embryos, which “involves creating and applying advanced optogenetic techniques to study the intricate processes within embryonic cardiac tissues.”

“My aim is to improve our understanding of the early cardiac conduction system development to advance identification and management of conduction related congenital heart defects,” said Musina. “My research focus remains consistent, but there have been exciting developments over the past year.

“I am continuing my work on using advanced optical imaging and optogenetic tools to study the earliest cardiac pacemaker cells in mouse embryos. Recently, I have expanded my experiments with new genetic models and have been developing improved mapping and analysis approaches to better understand how pacemaker regions change in mouse embryonic heart. This year has been especially productive in terms of both technical progress and refinement of the overall scientific questions.”

Musina describes her first year with the AHA fellowship was “an incredibly important and motivating experience.”

Guzel Musina
Ph.D. Student

NORDIN PART OF MULTI-DISCIPLINE EFFORT TO 'SHOW' CREATIVITY VIA EEG

Assistant professor **Andrew Nordin** is part of a collaborative effort, "Free Rein," to show via mobile EEG how music and dance influence the mind at a certain of performances recently.

He talked about this effort on Houston Public Media in January with collaborators Anthony Brandt, Professor of Composition and Theory at Rice University's Shepherd School of Music, and Andy Noble, Executive/Co-Artistic Director of NobleMotion Dance. The collaborative project studies the neural basis of creativity using mobile EEG during musical and dance performances. The appearance is viewable here.

Several performances were held general audiences and elementary school students at the Hobby Center for Performing Arts from Jan. 19 to Jan. 25. "Free Rein" will also be performed at Rice on Friday, March 13 as part of the Brains in Society Scientia/De Lange Conference XIV.

Andres Nordin
Assistant Professor

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.

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