RESEARCH MILESTONES

Biomedical Engineering • Spring 2021

INNOVATION IN HEALTHCARE

UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING
Department of Biomedical Engineering

Letter from the Chair

Dear Colleagues,

We are thrilled to share exciting news about our faculty, staff, and student success. We have continued to conduct highly impactful research to inspire future healthcare innovations despite the COVID-19 pandemic. If you would like to learn more about our program or collaborate with our department, please do not hesitate to let me know.

Warm Regards,

Metin Akay, Ph.D.
Founding Chair, John S Dunn Endowed Chair Professor
Department of Biomedical Engineering
Cullen College of Engineering
Univeristy of Houston

UH BME **BY THE NUMBERS**

#80
BEST BIOMEDICAL ENGINEERING PROGRAM IN THE U.S.
**Source: US News & World Report*

1
NATIONAL **A**CADEMY OF **E**NGINEERING MEMBER

18 TOTAL BIOMEDICAL ENGINEERING FACULTY

305 UNDERGRADUATE STUDENTS

101 GRADUATE STUDENTS

406 TOTAL STUDENTS IN DEPARTMENT
**Student Totals are from Fall 2020*

30+ ACTIVE RESEARCH GRANTS

100% PH.D. POST-GRADUDATE JOB PLACEMENT
**Numbers based on Fall 2020*

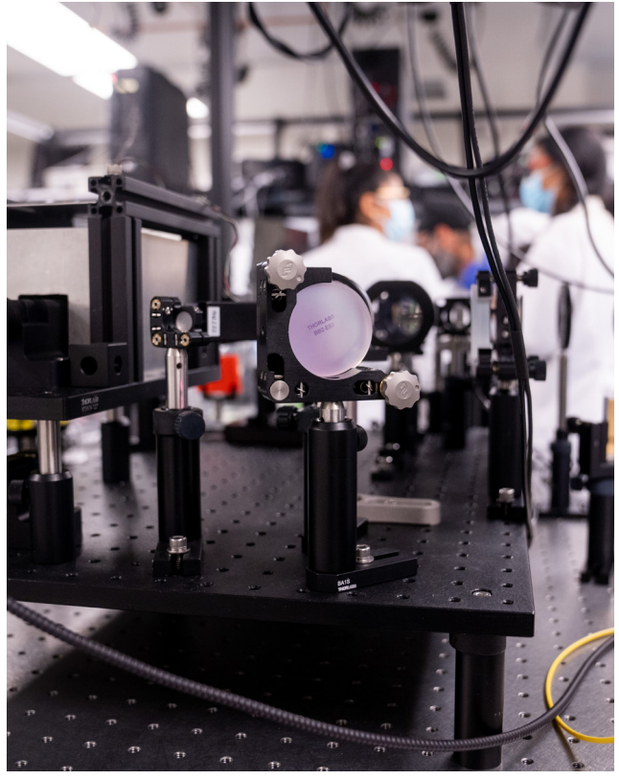
BME FOCUS AREAS:
NEURAL ENGINEERING & REHABILITATION, BIONANOSCIENCE & BIOMEDICAL IMAGING

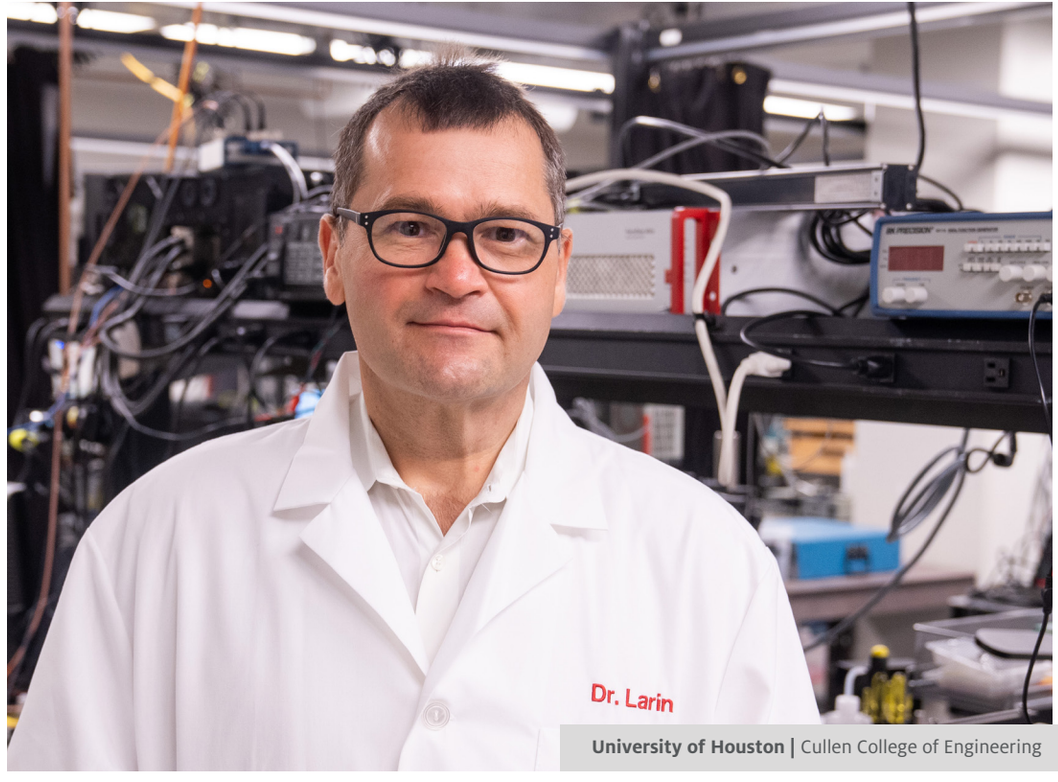
NEW TECHNOLOGY COULD

IMPROVE LASIK SURGERY, EYE DISEASE DETECTION

LASIK eye surgery – a laser reshaping of the cornea to improve vision – is one of the most popular elective surgeries in the United States, and a University of Houston professor of biomedical engineering intends to improve upon it by giving surgeons more information about the cornea before they begin. Specifically, **Dr. Kirill Larin** wants to provide measurement of corneal elasticity, a key component of visual acuity. Eye surgeons currently do not have a reliable method to perform a quantitative measurement of corneal elasticity in patients before the procedure.

Larin is using a $1.6 million continuation grant from the National Eye Institute to improve current Optical Coherence Tomography (OCT) to provide ultrafast 3D clinical imaging. The technology will combine Brillouin microscopy with Optical Coherence Elastography (OCE) – creating a new technology, dubbed BOE, a combination of the three aforementioned mechanics.





University of Houston | Cullen College of Engineering

BIOMEDICAL ENGINEERING

ROMERO-ORTEGA RECEIVES **$1.6M**

GRANT TO STUDY REVERSING URINARY INCONTINENCE

A University of Houston researcher is working to reverse pelvic floor dysfunction, which can result in urinary incontinence (UI), a condition affecting 30 percent to 60 percent of the female population and 5 percent to 15 percent of males.

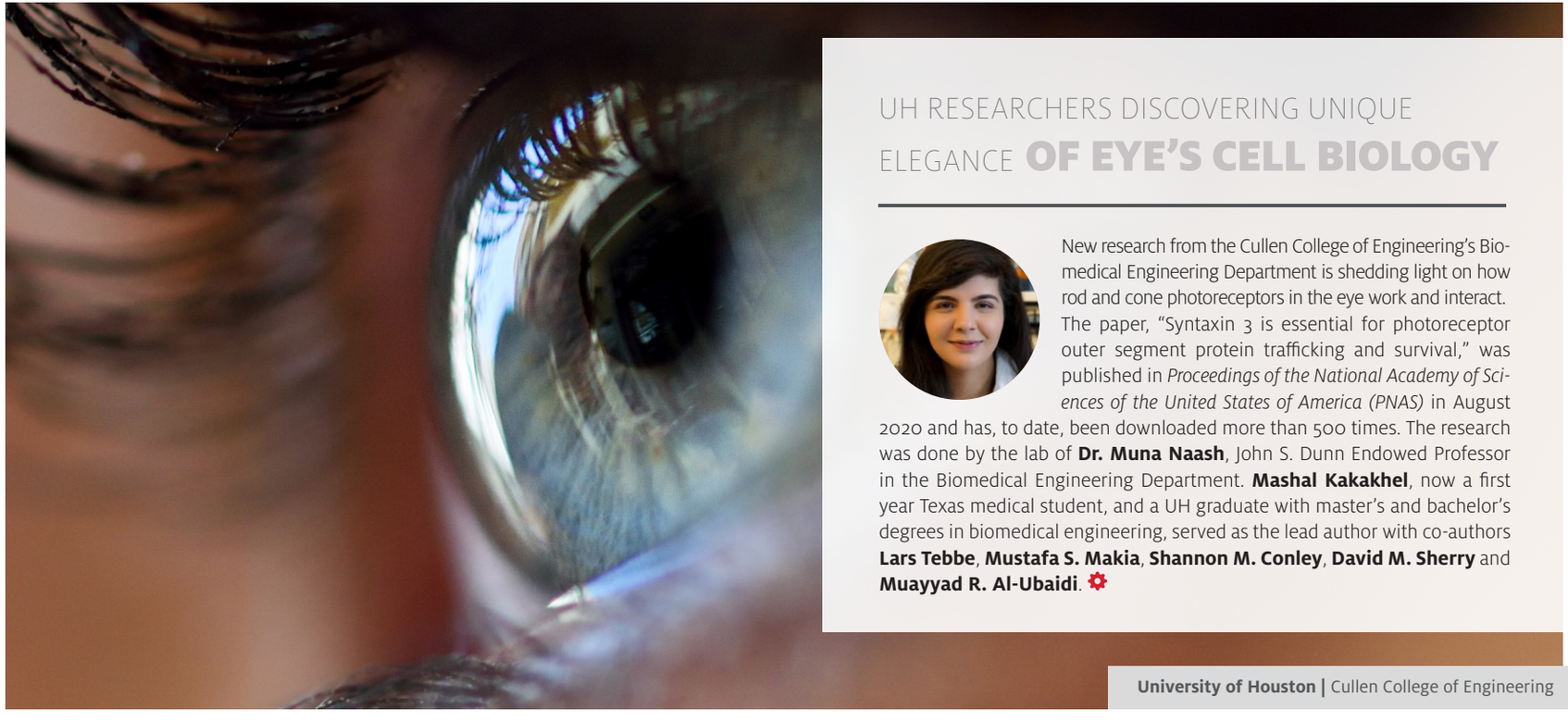
"Reduced amplitude or disorganized pattern of activity in individual muscles critically impact their ability to maintain the urethra closed, resulting in urine leakage," said **Dr. Mario Ignacio Romero-Ortega**, Cullen Endowed Professor of Biomedical Engineering. "We hypothesize that selective and coordinated stimulation of individual pelvic floor muscle (PFM) nerves will re-establish their normal strength and activity patterns, effectively reversing the symptoms of UI."

Romero-Ortega has received $1.6 million from the National Institute of Diabetes and Digestive and Kidney Diseases to prove his theory. The innovative work uses state-of-the-art miniaturized wireless electrodes to bring together small PFM efferent nerves and directly modulate their individual activity.

UH GRADUATE'S WORK IDENTIFIES **NEW CLUES BEHIND VISION LOSS** DUE TO IMPAIRED METABOLISM

Dr. Tirthankar Sinha, a graduate of the biomedical engineering doctorate program at the University of Houston's Cullen College of Engineering and now a postdoctoral research fellow in Dr. Claudio Soto's Lab at the McGovern Medical School at the University of Texas Health Science Center at Houston, has published new research about how vitamin and protein deficiencies can lead to metabolic abnormalities in the eye. The article, "Absence of retbindin blocks glycolytic flux, disrupts metabolic homeostasis and leads to photoreceptor degeneration" was published by *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* in early February.

Sinha was mentored on the work by **Dr. Muna Naash** and **Dr. Muayyad R. Al-Ubaidi**, professors in the Biomedical Engineering Department at the Cullen College of Engineering. Collaborators from outside the university included Dr. James Hurley, a professor at the University of Washington in Seattle, and Dr. Jianhai Du, an assistant professor at West Virginia University.



UH RESEARCHERS DISCOVERING UNIQUE ELEGANCE **OF EYE'S CELL BIOLOGY**

New research from the Cullen College of Engineering's Biomedical Engineering Department is shedding light on how rod and cone photoreceptors in the eye work and interact. The paper, "Syntaxin 3 is essential for photoreceptor outer segment protein trafficking and survival," was published in *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* in August 2020 and has, to date, been downloaded more than 500 times. The research was done by the lab of **Dr. Muna Naash**, John S. Dunn Endowed Professor in the Biomedical Engineering Department. **Mashal Kakakhel**, now a first year Texas medical student, and a UH graduate with master's and bachelor's degrees in biomedical engineering, served as the lead author with co-authors **Lars Tebbe**, **Mustafa S. Makia**, **Shannon M. Conley**, **David M. Sherry** and **Muayyad R. Al-Ubaidi**.

FACULTY

ACCOLADES

Dr. Renita Horton, assistant professor in the UH biomedical engineering department has been named to the list of 1,000 Inspiring Black Scientists in America by the Community of Scholars.

Dr. Yasemin Akay, instructional associate professor of biomedical engineering, was recently elevated to the rank of IEEE Senior Membership. Only 10% of IEEE members hold this rank.

Dr. Chandra Mohan, Hugh Roy and Lillie Cranz Cullen Endowed Professor of biomedical engineering at the University of Houston, was recently featured by Nature Communications. The paper discusses methods for identifying a spectrum of urinary biomarkers of lupus nephritis across ethnicities. Mohan was also recently listed as one of the most cited faculty in immunology in the world.

STAFF

ACCOLADES

BUSINESS ADMINISTRATOR SHOWCASES LEADERSHIP EXCELLENCE

My-Dung Lieu joined the Cullen College of Engineering in 2012, and has served as the Biomedical Engineering Department's Department Business Administrator since 2016. Leadership describes her as the cornerstone and foundation of the department's staff. Lieu often serves as a mentor to her peers, offering words of encouragement and helpful hints. Lieu's job duties are extensive, ranging from processing large federal grants, to keeping operations among faculty and staff running smoothly. Recently Lieu earned her MBA in December 2020, all while managing the department's accounts and functions, and never missing a beat. The UH BME congratulates Lieu on her extensive accomplishments. We are lucky to have you!

STUDENT

SUCCESS

BME STUDENT'S CAPSTONE AIMS TO HELP STROKE, SPINAL CORD INJURY PATIENTS

Arturo Velazquez, a senior at the University of Houston's Cullen College of Engineering, knows about the anxiety a medical issue can cause, and as a result, he's attempting to make a difference by studying the field of biomedical engineering. For his capstone project he is creating a micro-device that interacts with the brain to help patients suffering from stroke or spinal cord injuries strengthen their nerves by making a connection between thoughts to muscle contractions and movements. The device will be connected to a computer and custom software, in order to make it easy for anyone to modify the type, timing and intensity of the signal sent to the nerves, based on the patient's needs.

Velazquez has been recognized for his efforts in and outside of the classroom and research labs. In early 2020, he received the Most Active Member award from the UH chapter of the Society of Hispanic Professional Engineers, and also became the chapter's Mentoring Coordinator. Velazquez was also one of six 2020 UH student recipients of scholarships from the Great Minds in STEM program. He received the Villarreal Family Scholarship, sponsored by Raul and Cecile Villarreal. He is now looking forward to a master's program in Taiwan, to have a more global perspective of engineering, while also mastering his Mandarin and Japanese skills.

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 worldclass engineers each year. With research expenditures topping $35 million and increasing each year, we continue to follow our tradition of excellence in spear-heading research that has a real, direct impact in the Houston region and beyond.

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