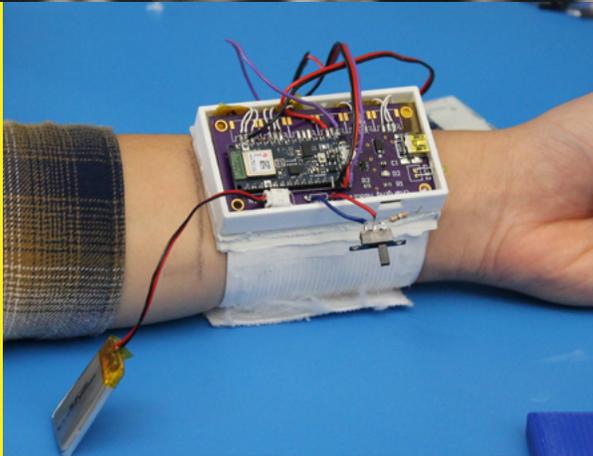
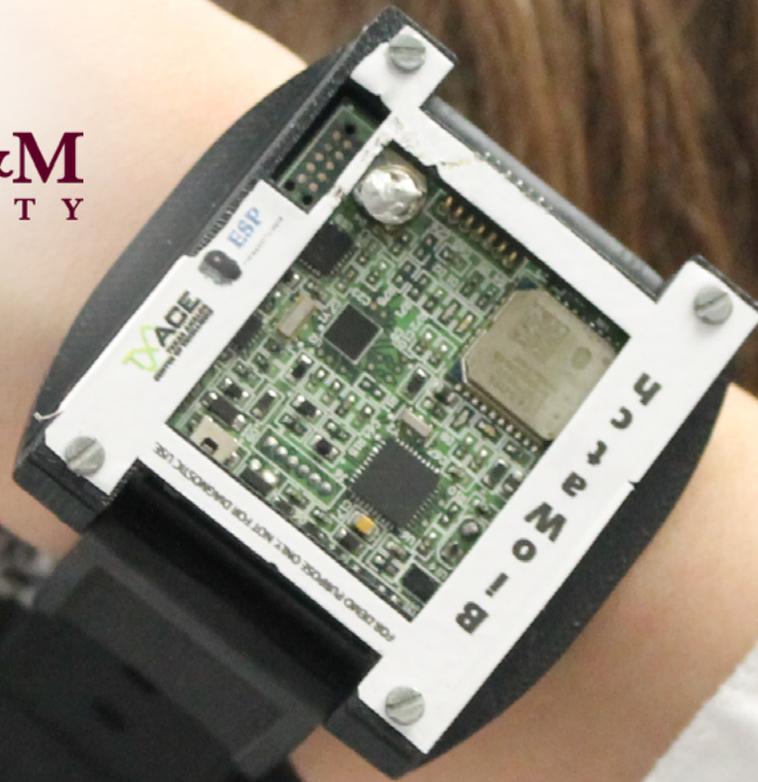




TEXAS A&M
UNIVERSITY



2020

DEPARTMENT OF
BIOMEDICAL ENGINEERING

LETTER FROM THE DEPARTMENT HEAD



At this time in history, innovative, service-minded people are needed to solve difficult problems. The Texas A&M biomedical engineering faculty, students and staff continue to adapt our educational and research activities to meet the new challenges of health care, education and public

service arising within a very dynamic, uncertain time. We remain optimistic about the future that we can help create, emboldened by the continued growth in numbers and stature of our faculty, increased research funding and productivity, and deeper engagement with both clinical and industrial partners. Recent grants, donations, and our own investments in both facilities and training programs promise to further

enhance the highly regarded experiential aspects of our curricula. Our faculty remain focused on the development and application of advanced technology to address both deficiencies and disparities in health care. We recognize and appreciate the partnership of many former students, research institutes, private foundations, companies and philanthropic supporters that assist us in providing world-class educational experiences while seeking to improve the quality of life for everyone. Take care and be well.

Sincerely,

Michael J. McShane, Ph.D.

Department Head and Professor
James J. Cain Professor II

BY THE NUMBERS

RESEARCH FUNDING **\$11.2** **MILLION**
(FY 2020 TOTAL)

ENROLLMENT* (FALL 2020)

496

Undergraduates

159

Graduates

**preliminary*

FACULTY

1 Professor of Instruction

25 Tenure Track

2 Lecturers

5 Professors of Practice

20 Affiliated Faculty

DEGREES AWARDED

(FALL 2019-SUMMER 2020)

149 B.S.

28 M.S./M.Eng.

16 Ph.D.

DIVERSITY

UNDERGRADUATE

45% Female **28%** Minority

GRADUATE

40% Female **13%** Minority



TEXAS A&M UNIVERSITY
Department of
Biomedical Engineering

FACULTY AWARDS & HONORS

IMPEDE® Embolization Plug team

Includes Texas A&M University,
Shape Memory Medical and Lawrence
Livermore National Laboratory



- R&D 100 Award, *R&D World Magazine*
- 2020 Excellence in Technology Transfer Award, Federal Laboratory Consortium for Technology Transfer
- Featured faculty: **Dr. Duncan Maitland**

Dr. Daniel Alge

Dean of Engineering Excellence Award,
Texas A&M University - Assistant Professor Level



Dr. Abhishek Jain

CAREER Award,
National Science Foundation

Dr. Gerard Coté

Walston Chubb Award for Innovation,
Sigma Xi

Dr. Akhilesh Gaharwar

Dean of Engineering Excellence Award,
Texas A&M University - Associate Professor Level



Dr. Roderic Pettigrew

Fellow,
American Academy
of Arts and Sciences

Dr. Tanmay Lele

Recruitment of Established Investigators Awards,
Cancer Prevention and Research Institute of Texas



Dr. Shreya Raghavan

ADVANCE Fellowship,
National Center for Faculty Diversity
and Development

Dr. Alexandra Walsh

Top Five Finalist,
Agilent Early Career Professor Award
Young Investigator Research Program Grant,
Air Force Office of Scientific Research



Dr. Jennifer Lewis

Harvard University
Hagler Distinguished Lecturer,
Hagler Institute for Advanced Study,
Texas A&M

CONTINUOUSLY MONITOR BLOOD PRESSURE DURING SLEEP



High blood pressure is the single biggest risk factor for heart disease, stroke and other health problems. While one in three American adults has high blood pressure, about 20% of people are unaware of their condition because it is largely asymptomatic. Researchers at Texas A&M hope to help remedy this with a wrist-worn system that monitors blood pressure during sleep.

Dr. Roozbeh Jafari and his team have received a \$3.6 million grant from the National Institutes of Health to create a system a user can wear all night while they sleep for constant readings.

"There is a significant need to understand how blood pressure fluctuates throughout the day and night," Jafari said. "Nobody knows that, and there's really no technology that can capture this continuously."

Jafari said there is value in measuring blood pressure continuously during sleep without the user being disturbed

by the instrument. Currently, the device allows for only infrequent measurements and is somewhat invasive and uncomfortable for the user. These challenges reduce the device's ability to effectively take measurements. The team is working to make the device more user-friendly so that continuous monitoring is possible.

Jafari is collaborating with the Yale School of Medicine on this project. Their proposed technology will provide a wealth of information to physicians, help identify certain short-term dynamics and variations of blood pressure, and allow effective monitoring of response to medication. ▽



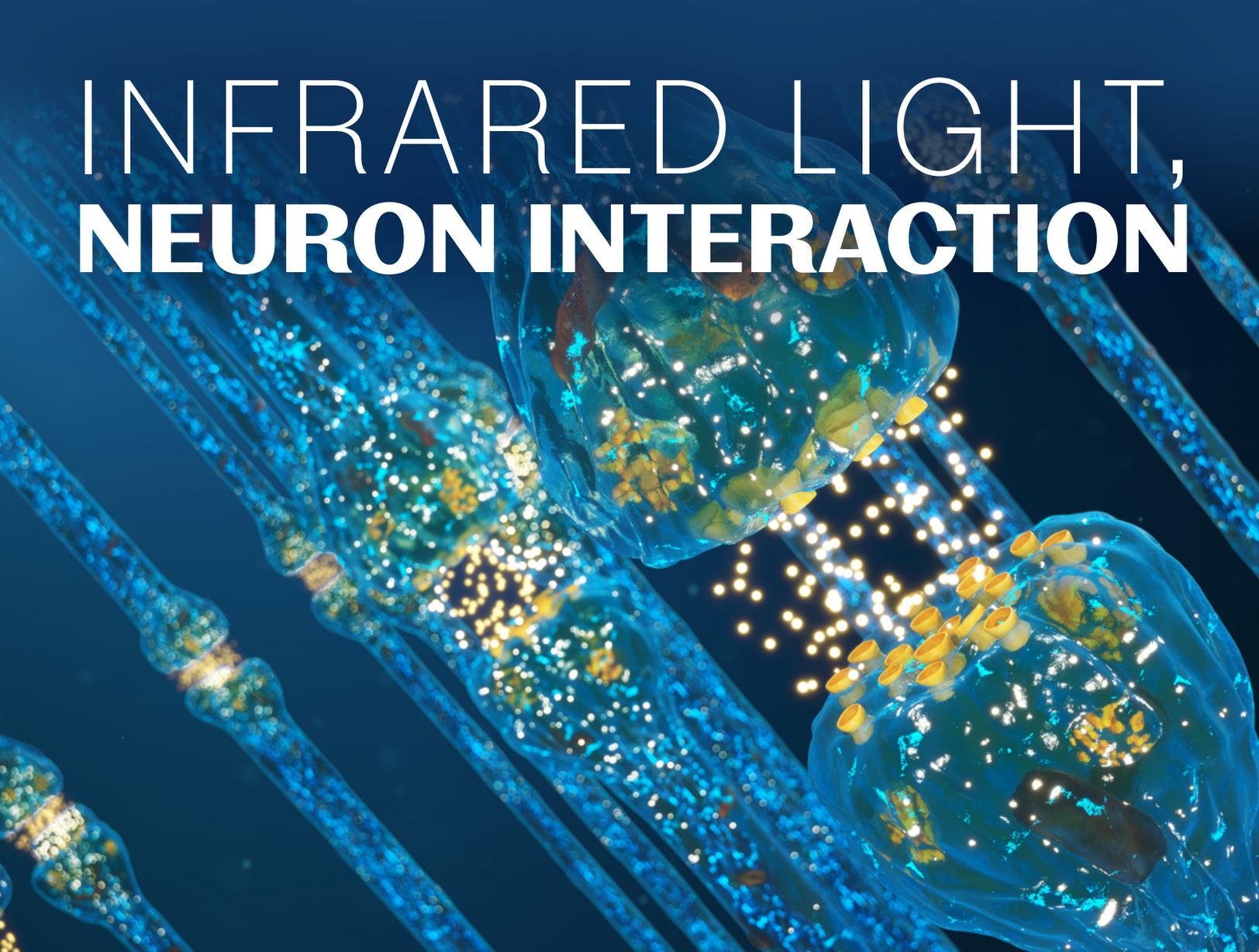
FEATURED RESEARCHER

Dr. Roozbeh Jafari

Professor

rjafari@tamu.edu

INFRARED LIGHT, NEURON INTERACTION

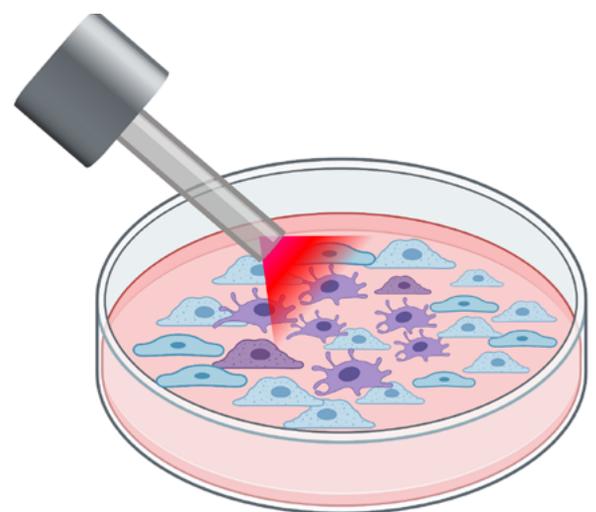


Dr. Alexandra Walsh recently received a grant through the U.S. Air Force Office of Scientific Research's Young Investigator Research Program to better understand why neurons in the brain are affected by infrared light.

"We know that the infrared light induces a thermal gradient, so it heats the neurons," Walsh said. "It happens very fast, within milliseconds, and changes the neuron's electrical signals. But we don't know how."

One hypothesis is that the stimulation affects the ion channels in neurons, but responses are observed even in cells that lack light- and heat-sensitive channels. With the grant, Walsh will pursue research to test if there is a relationship between infrared light and cellular metabolism. If the infrared light is impacting how cells produce energy, it could be modulating the neuron's activity because ion channels need energy to function.

Walsh said that the ability to stimulate neurons to control cell behavior could have a wide variety of applications in the health care field. Many diseases, ranging from seizures and pain management to heart arrhythmias, could be treated by stimulating neurons to turn off. This research can also be applied to other medical devices, including prosthetics, which use electrical stimulation to function. ▽

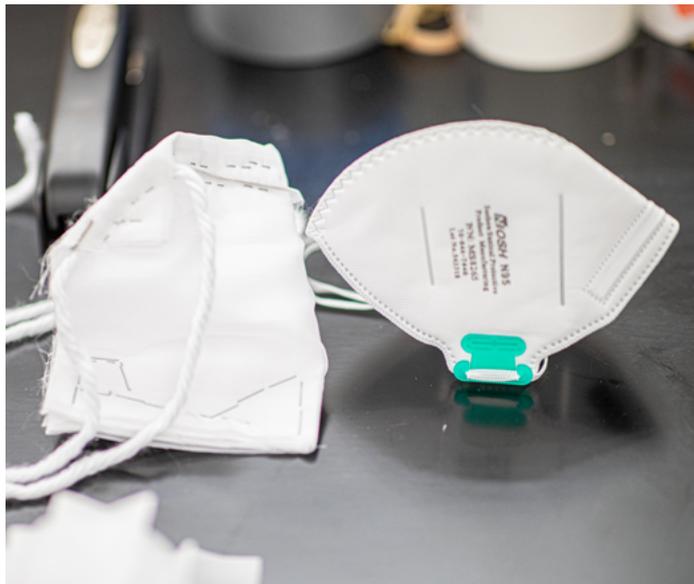


FEATURED RESEARCHER

Dr. Alexandra Walsh

Assistant Professor
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STEP-BY-STEP METHOD TO CREATE PROTECTIVE MEDICAL MASKS



Aggies have developed a way to make medical protective gear from readily available materials.

Dr. John Criscione and his colleagues figured out a way to build masks with materials such as air-conditioning filters, sheer curtains, staples and stretchable cords.

“If the gap between supply and demand continues to worsen, and particularly our emergency medical colleagues are forced to use DIY masks, we want them to have technical guidance as they make their choices of materials and construction,” Criscione said. ▽



FEATURED RESEARCHER

Dr. John Criscione

Stewart & Stevenson Professor II

jccriscione@tamu.edu

FEATURED STUDENT

ACCELERATING COVID-19 ANTIBODY IDENTIFICATION

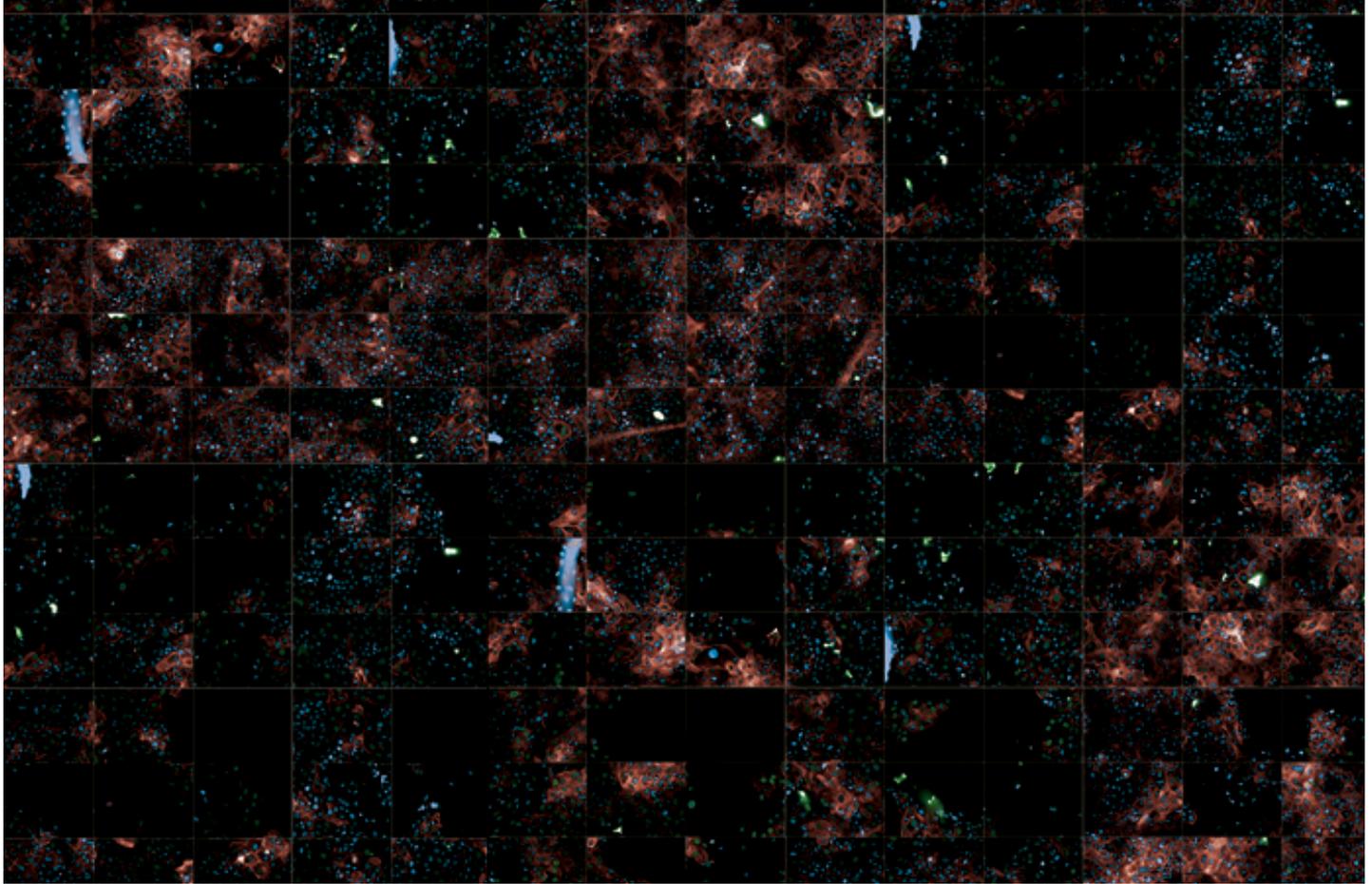
José Wippold, doctoral student, found a way to adapt a current project to help during the COVID-19 pandemic. He modified a high-throughput microfluidic sensor he developed to expedite the process of looking for neutralizing antibodies that can prevent COVID-19.

Called the “Platform for the Rapid Evaluation of antibody SuCcess using Integrated microfluidics ENabled Technology,” or PRESCIENT, the droplet microfluidics-based lab-on-a-chip allows human B cells encapsulated within a water-in-oil emulsion droplet to be scanned on a device the size of a credit card at a speed of 10s to 100s per second, much faster than what conventional tools can perform.

This speed can help expedite the process to further understand COVID-19 and what antibodies may be able to fight against it.

“I truly believe PRESCIENT has the chance to accelerate our neutralizing antibody discovery process and rapidly take it to a level that is capable of combating emerging viral threats,” Wippold said. ▽





STATE GRANT FUNDS **CANCER RESEARCH**

Dr. Tanmay Lele received a \$5 million Recruitment of Established Investigators grant from the Cancer Prevention and Research Institute of Texas (CPRIT) to further knowledge about cancer and how it progresses.

Lele's research focuses on mechanobiology — the mechanical aspects of biology — to understand how cells sense and generate external mechanical forces, as well as how these mechanical forces impact cell function.

In cancer, both cellular mechanical forces and the mechanical properties of resisting cellular structures go awry. This causes abnormalities in cell structure. A particularly striking feature of cancer cells is the highly irregular or distended shape of the nucleus.

"The nuclei in normal tissue have smooth surfaces, but over time the surfaces of cancer nuclei become irregular in shape," Lele said. "Now, why? Nobody really knows. We're still at the tip of the iceberg trying to figure this problem out."

Pathologists study biopsies and note abnormalities in the shape of the cell and its nucleus to grade the severity of

cancer. To understand the cause of abnormal cancer nuclear structures, Lele and his team are working to computerize the analysis of nuclear shapes.

Lele's team has developed a computational algorithm to measure the degree of irregularity in the nucleus. The team can run statistical analyses of the abnormalities and search for correlations between the extent of the irregularity, changes to genetic or molecular signatures in tumors and patient outcomes.

Lele's research aims to help the medical community develop new knowledge of human cancers and how they progress to better diagnose and manage cancers.

The cancer grant from CPRIT is a collaborative effort with Baylor College of Medicine. ▽

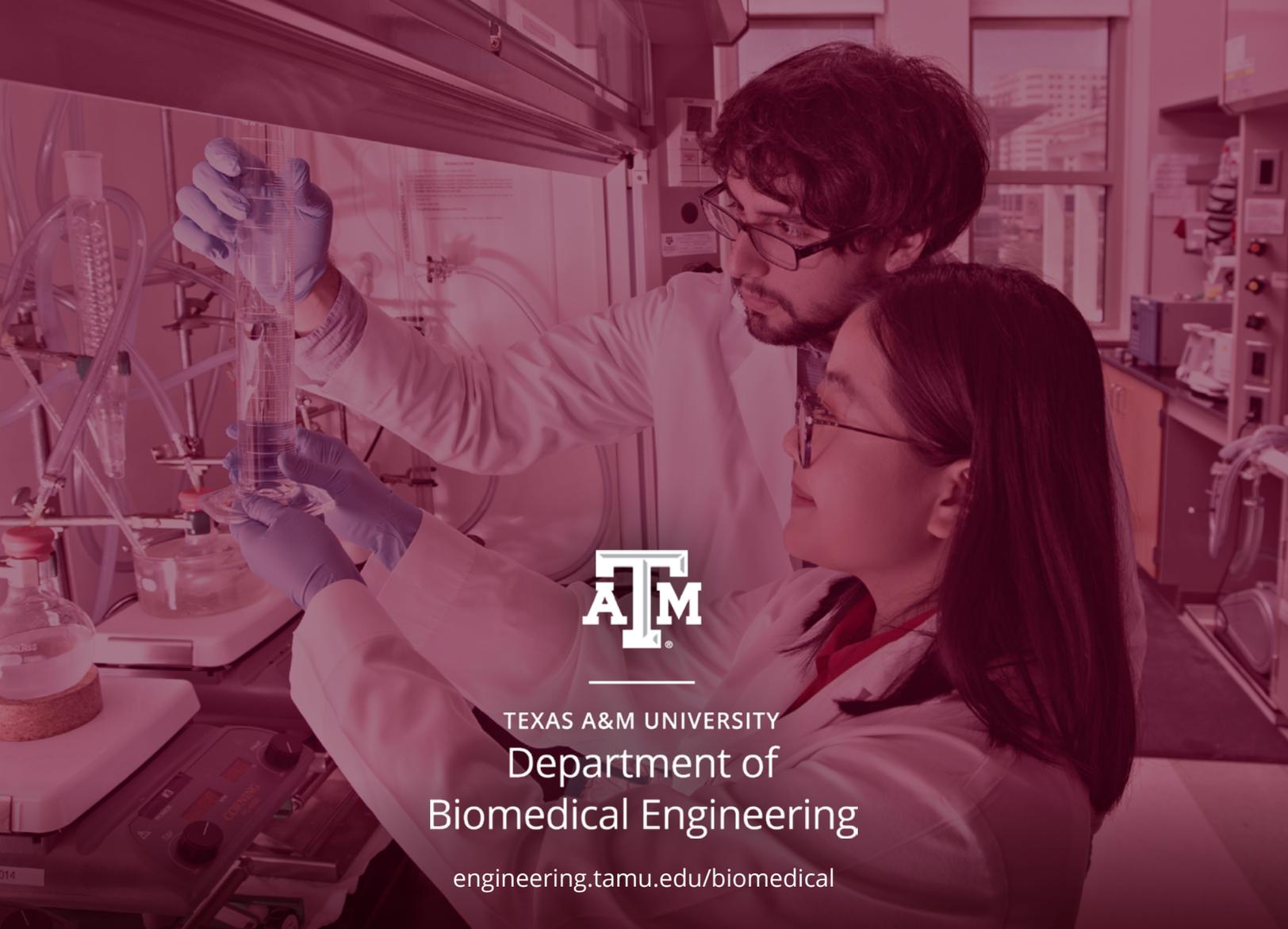


FEATURED RESEARCHER

Dr. Tanmay Lele

Professor

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Department of
Biomedical Engineering

engineering.tamu.edu/biomedical

DEPARTMENT OF BIOMEDICAL ENGINEERING

AREAS OF RESEARCH

Imaging Technologies

Regenerative Medicine

Medical Devices

Sensing and Monitoring Systems

UNDERGRADUATE TRACKS

Biomaterials

Bioinstrumentation

Biomechanics

Biomolecular and Cellular Engineering
