



TEXAS A&M  
UNIVERSITY

2021

DEPARTMENT OF

**BIOMEDICAL ENGINEERING**



# LETTER FROM THE DEPARTMENT HEAD



Greetings from Aggieland! While 2021 has brought its share of new challenges, the faculty, staff and students in biomedical engineering at Texas A&M University are continuing to impact health outcomes throughout the year. Our research efforts are resulting in promising strides toward

improvements in application areas, including trauma care, pediatric devices and chronic diseases such as cardiovascular disease, cancer and diabetes. The success of our former students continues to impress as they receive accolades from their professional societies, promotions within their companies and grant funding for their start-up ventures.

We are looking forward to enhancing the experiential aspects of our curriculum through the new design studio that will support our emphasis on hands-on device prototyping and testing work starting this fall. This investment has been made possible by the engagement and generous support of many former students, companies and philanthropic supporters — we are so grateful for their continued help that will enable further growth in people and programs, providing even greater opportunities for impact. Please visit our website or come visit us in person to see firsthand how our plans are coming together to make a difference in the world. Take care and be well.

Sincerely,

**Michael J. McShane, Ph.D.**

Department Head and Professor  
James J. Cain Professor II

## BY THE NUMBERS

### CELEBRATING DIVERSITY

**47%** Female Students

**24%** Underrepresented Minority Students

**DID YOU KNOW?** COE@TAMU is #1 in Hispanic students AND #2 in total minority undergraduate population  
Source: [top100.diverseeducation.com](http://top100.diverseeducation.com)

**ENROLLMENT\*** (FALL 2021)  
*\*preliminary, 5th class day*

**487** Undergraduates

**171** Graduates

**DEGREES AWARDED\***  
(AY 2020-21) *\*preliminary*

**149** B.S.

**40** M.S./M.Eng.

**16** Ph.D.

**\$23**  
**MILLION**  
**RESEARCH FUNDING**  
(FY 2021 TOTAL)

### FACULTY

**26** Tenure Track

**10** Professional Track

**30** Affiliated Faculty

**132**  
**JOURNAL  
PUBLICATIONS**



TEXAS A&M UNIVERSITY  
Department of  
Biomedical Engineering

# FACULTY AWARDS & HONORS

**Dr. Isaac Adjei**

"1,000 Inspiring Black Scientists" Distinction, Cell Press

**Dr. Daniel Alge**

Cain Faculty Fellow, Department of  
Biomedical Engineering

**Dr. Saurabh Biswas**

Senior Member, National Academy of Inventors

**Dr. Gerard Coté**

Distinguished Achievement Award for Graduate  
Mentoring, Association of Former Students

**Dr. Akhilesh Gaharwar**

Outstanding Contributions, College of Engineering  
Cain Faculty Fellow, Department of  
Biomedical Engineering

**Dr. Melissa Grunlan**

Chancellor's Enhancing Development and Generating  
Excellence in Scholarship Fellow, The Texas A&M  
University System

**Dr. Balakrishna Haridas**

Cain Faculty Fellow, Department of  
Biomedical Engineering

**Dr. Roozbeh Jafari**

Dean of Engineering Excellence Award, Texas A&M –  
Professor Level

Research Impact Award, Texas A&M Engineering  
Experiment Station

Senior Member, National Academy of Inventors

**Dr. Abhishek Jain**

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

BMEN Excellence Fellow, Department of  
Biomedical Engineering

**Dr. Tanmay Lele**

Unocal Professorship, College of Engineering

**Dr. Duncan Maitland**

Fellow, National Academy of Inventors

**Dr. Mary McDougall**

Senior Member, Institute of Electrical and  
Electronics Engineers

**Dr. Charles Peak**

Presidential Transformative Teaching Grant, Texas  
A&M University

**Dr. Shreya Raghavan**

High Impact/High Risk Research Award, Cancer  
Prevention and Research Institute of Texas

**Dr. Limei Tian**

Trailblazer Award, National Institutes of Health

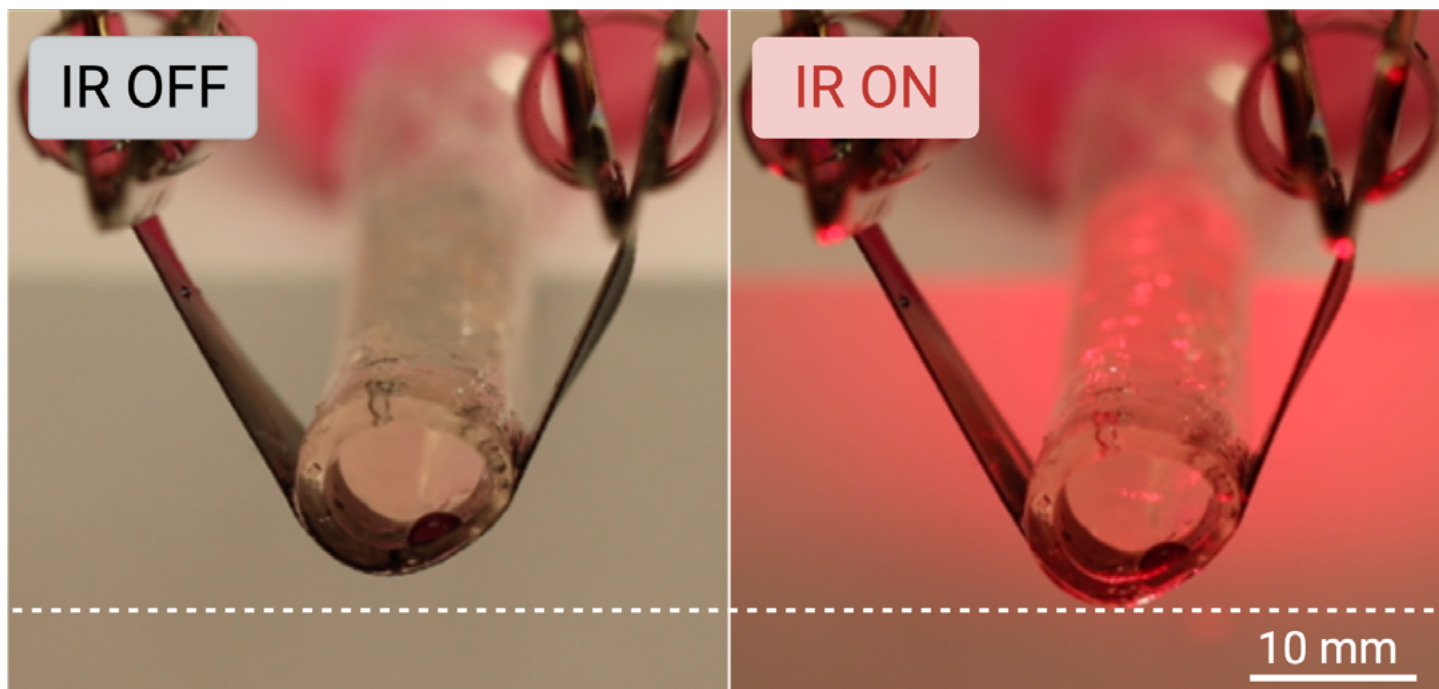
**Dr. Alexandra Walsh**

Fellow for the Advancing BiImaging initiative, Scialog  
Cain Developmental Faculty Fellow, Department of  
Biomedical Engineering

**Dr. Vladislav Yakovlev**

Harold E. Edgerton Award in High-Speed Optics,  
International Society for Optics and Photonics (SPIE)  
Faculty Fellow, Texas A&M Engineering  
Experiment Station

# BIOMATERIAL INNOVATIONS IN INCONTINENCE TREATMENT



While medical materials have come a long way toward treating conditions in the body, sometimes they are too stiff to be a perfect fit. Research at Texas A&M aims to engineer new biomaterials that provide effective treatment while also moving better with the body.

Dr. Taylor Ware is working on finding innovative material solutions to treat urinary incontinence — a condition denoted by any uncontrolled leakage of urine.

Treatment may include a surgical option in which a mesh sling is implanted underneath the urethra to provide support. This device has to balance between ensuring no leaking occurs

throughout daily activities while also allowing for release when needed. Current slings are limited because the clinician has to find the perfect balance to ensure the patient doesn't suffer unintended consequences.

Ware's research aims to develop an adaptive device similar to human tissue using a type of material called liquid crystal elastomers. The team's idea is to 3D print a material that will heat slightly and change shape when illuminated with infrared light, allowing a person to void their bladder easily. When the material cools, it returns to its original shape.

Ware said these types of biomaterials could open the door for a variety of applications in artificial muscle development, including surgical or wearable robots.

"We see these things as tools that can be reused in other areas where you might need mechanical motion in the human body, or perhaps even outside," Ware said. ▀

**Dr. Taylor Ware collaborates with Dr. Philippe Zimmern, professor and clinical urologist at the University of Texas Southwestern Medical Center, and biomedical engineering doctoral student Seelay Tasmin.**

The research is funded by the National Institute of Biomedical Imaging and Bioengineering at the National Institutes of Health.



## FEATURED RESEARCHER

**Dr. Taylor Ware**

Associate Professor

[taylor.ware@tamu.edu](mailto:taylor.ware@tamu.edu)



# MAITLAND RECRUITS TWO NSF FELLOWSHIP WINNERS

Among the incoming class of doctoral students are Elizabeth Bullard and Latifah Maasarani, who were named part of the 2021 NSF's Graduate Research Fellowships Program. Both will focus on optics in Dr. Kristen Maitland's lab; however, their approaches and background vary.

Bullard's interests involve imaging in the intestinal system. Past projects include using a spectroscopy probe to measure blood oxygenation and hemoglobin content in the colon for monitoring cancer. As part of her doctoral program, she hopes to work with the vet school to create an endoscopic system for imaging nanoparticles in colon cancer.

She has also applied the technology to ulcerative colitis, an autoimmune intestinal disease, to detect signs of healing in ulcers.

"It's such a difficult disease to manage, and I think there's so much more that we can do in that area," Bullard said.

Maasarani aims to become a biotechnical entrepreneur and has wanted to pursue a Ph.D. since she started on her engineering journey.

"I think that there's more for me to learn; there are more skills for me to develop, and I just believe there's more that I want to do to prepare myself to be a leader in my field," she said.

Maasarani's research focuses on quantitative phase imaging, an imaging method where pixel values in an image quantify how light slows down as it passes through a sample. The technique could be used concurrently with qualitative imaging techniques to better understand cell properties. ▀

**Latifah Maasarani also received the 2021 National Excellence Fellow position from the department. This award supports doctoral students who intend to pursue translational research.**



Elizabeth Bullard



Latifah Maasarani



# TRANSLATIONAL INNOVATION IMPACTS PATIENTS

Translational research in the department provides faculty and students with hands-on experience in not only developing medical devices, but also clinical applications.

Several faculty members have been recognized for their contributions to innovations. Dr. Duncan Maitland was named a National Academy of Inventors (NAI) Fellow in 2020. The NAI identifies and recognizes early-stage innovators and inventors whose patents have the potential to make an impact on society.

Maitland developed the IMPEDE Embolization Plug, a device that could provide doctors with a more effective and safer method for treating aneurysms. This led to the creation of Shape Memory Medical, Inc., which was awarded one of the Best University Startups for 2017 by the National Council of Entrepreneurial Tech Transfer. The IMPEDE device also received the 2020 Excellence in Technology Transfer Award from the National Federal Laboratory Consortium and an R&D 100 Award in 2019.

"There are patients who have been treated because of our devices who didn't have any other reasonable options," Maitland said. "Some of the applications that we're working on could be the first indications to the FDA for treating large populations."

## SEVERAL FACULTY IN THE DEPARTMENT ARE NAI SENIOR MEMBERS:

- **Dr. Saurabh Biswas,**  
Associate Professor of Practice
- **Dr. Balakrishna Haridas,**  
Professor of Practice
- **Dr. Roozbeh Jafari,**  
Professor

Along with emphasizing translational research among faculty, the department also involves students in this innovative work.

"It's fantastic exposure for students for companies to hire them and/or for (students) to get into the startup world themselves," Maitland said. "We have a significant number of students and former students who are leaders in entrepreneurship and doing translational work." ▼



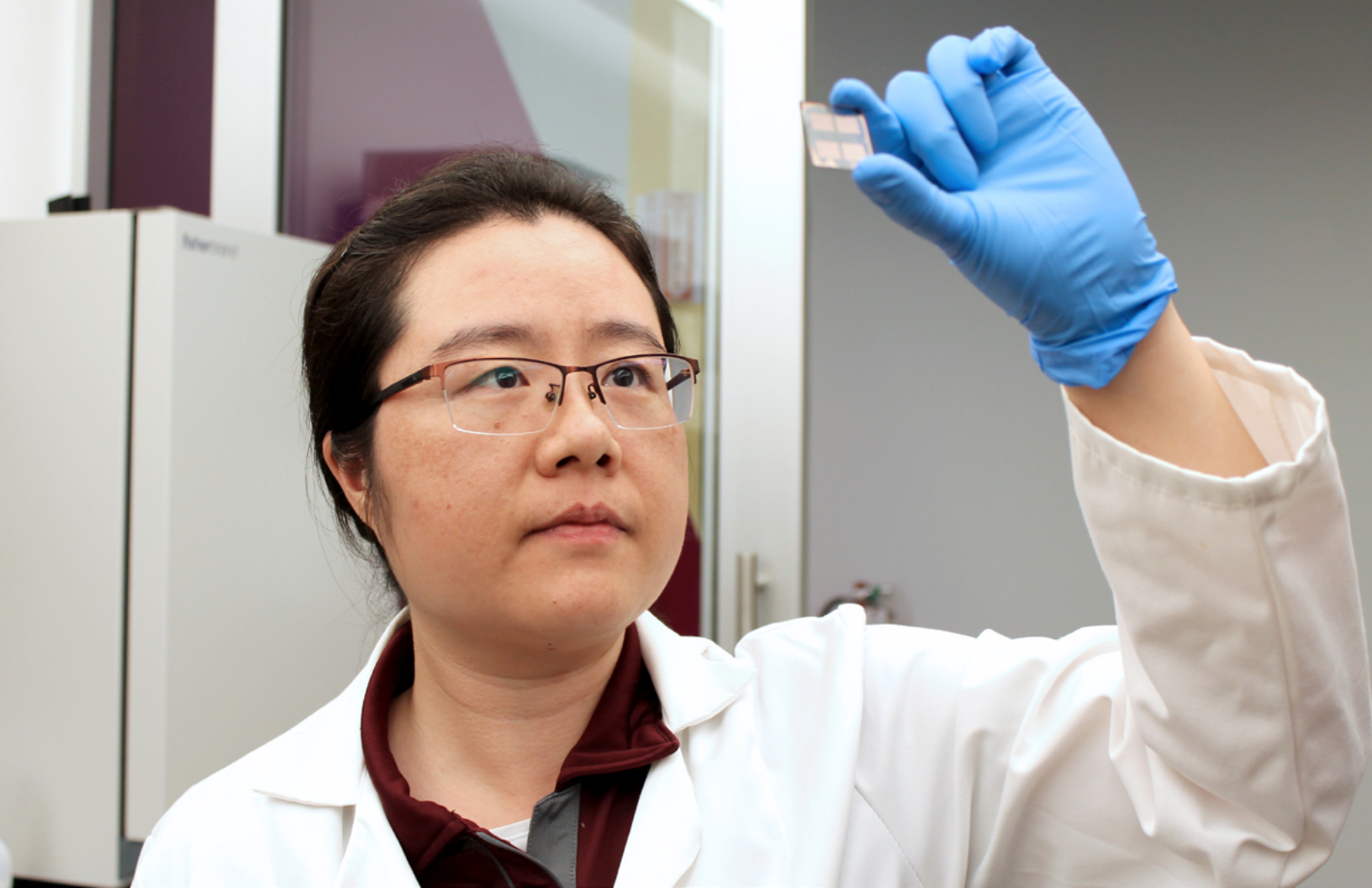
## FEATURED RESEARCHER

**Dr. Duncan Maitland**

Professor

[djmaitland@tamu.edu](mailto:djmaitland@tamu.edu)





# TRAILBLAZING BIOSENSORS

Dr. Limei Tian is developing biosensors to detect biomarkers for an acute kidney injury (AKI), in which the kidneys stop functioning normally. This would involve monitoring the concentration of proteins in urine. While there are established protein biomarkers, the challenge is continuously monitoring them.

The goal of this project is to design a biosensor that detects the concentration and provides an update every 30 minutes, which could provide more timely clinical intervention on the patient's behalf. The biosensor would be small and, ideally, easily integrated into a catheter or implanted into the bladder. Because the sensor would be designed in a soft electronic format, Tian said the applications for the biosensor extend outside of detecting AKI.

One example would be analyzing protein levels in the fluid outside cells, the interstitial fluid. By monitoring concentrations and comparing them to protein levels in the blood, researchers can better measure correlations between the two. Monitoring biomarkers could also lead to better diagnosis and treatment of heart injury and respiratory illnesses.

**Dr. Limei Tian recently received the Trailblazer R21 Award from the National Institute of Biomedical Imaging and Bioengineering, part of the National Institutes of Health, to support her research developing biosensors.**

"With this tool, we can answer those fundamental questions, which can impact many other areas," Tian said. "That's what we are excited about. We are developing an enabling technology not only for this project, but it's really a platform technology we're hoping not only revolutionizes disease diagnosis, but general health monitoring." ▼



## FEATURED RESEARCHER

**Dr. Limei Tian**  
Assistant Professor  
[ltian@tamu.edu](mailto:ltian@tamu.edu)



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[engineering.tamu.edu/biomedical](http://engineering.tamu.edu/biomedical)

DEPARTMENT OF BIOMEDICAL ENGINEERING

# AREAS OF RESEARCH

Imaging Technologies

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Medical Devices

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Regenerative Medicine

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Sensing and Monitoring Systems