



ERIK JONSSON SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

BIOENGINEERING

2021 ANNUAL REPORT

THE UNIVERSITY OF TEXAS AT DALLAS

CONTENTS

1. Department Head Welcome
2. 2020 –2021 Highlights
3. Research Excellence
4. Student Success
5. Community Engagement
6. Closing Remarks



DEPARTMENT HEAD WELCOME

The 2020-21 academic year marked a time both to reflect as we celebrated our 10th anniversary and to envision the future as we developed our department's five-year strategic plan.

Our year-long 10th anniversary celebration included a podcast series, a seminar series and a symposium. The podcast series featured a look back at the department's history, conversations with entrepreneurs and reflections by students and graduates. One bright spot in the virtual world brought about by the pandemic was the opportunity to feature researchers from multiple geographic locations in our seminar series. On April 8 and 9, our celebration culminated with a two-day symposium highlighting the latest research advancements, career opportunities in biomedical engineering, collaborations with UT Southwestern Medical Center (UTSW) and The University of Texas at Dallas faculty, alumni and student achievements.

Faculty, staff and students engaged in a year-long strategic planning process targeting three areas: research excellence, student success and outreach and community engagement.

Finally, we celebrate excellence! The UT Dallas Department of Bioengineering achieved its highest *U.S. News and World Report* ranking: No. 3 among Texas public universities, No. 33 among U.S. public universities and No. 61 among U.S. universities! According to the American Society for Engineering Education, our undergraduate program has the third largest enrollment in the U.S., and our MS program graduated the highest percentage of female graduates.



Dr. Shalini Prasad

Head of the Department of Bioengineering
Cecil H. and Ida Green Professor of Systems
Biology Science



2020 – 2021 HIGHLIGHTS



10th ANNIVERSARY HIGHLIGHTS

Departmental Seminar Series

During the 2020-21 academic year, the University of Texas at Dallas bioengineering seminar series featured speakers from across the globe. Students, faculty and staff gained insight into the latest research innovations that are advancing biomedical engineering and health care.

10th Anniversary Symposium

The year-long celebration culminated in a two-day symposium highlighting emergent research at UT Dallas and beyond, as well as collaborations and career opportunities in biomedical engineering. We were excited to host James B. Milliken, chancellor of The University of Texas System; Dr. Daniel K. Podolsky, president of UT Southwestern Medical Center; and Dr. Richard C. Benson, president of UT Dallas with us to kick off the event.





10th ANNIVERSARY HIGHLIGHTS

CONTINUED

Podcasts

Learn more about the history of bioengineering at UT Dallas; opportunities for engineers in health care and biotech innovation; and the entrepreneurial spirit of our students and alumni as Dr. Shalini Prasad talks with thought leaders in biomedical engineering. Recordings are available online.

Virtual Commencements

Fall 2020 and spring 2021 graduates were celebrated in virtual commencement ceremonies.



BIOENGINEERING QUICK FACTS

18

**Tenure System
Faculty**

8

**Instructional
Faculty**

\$14.7M

**FY2020 Research
Expenditures**

93

**2020 Peer-Reviewed
Faculty Publications**

75

PhD Students

58

MS Students

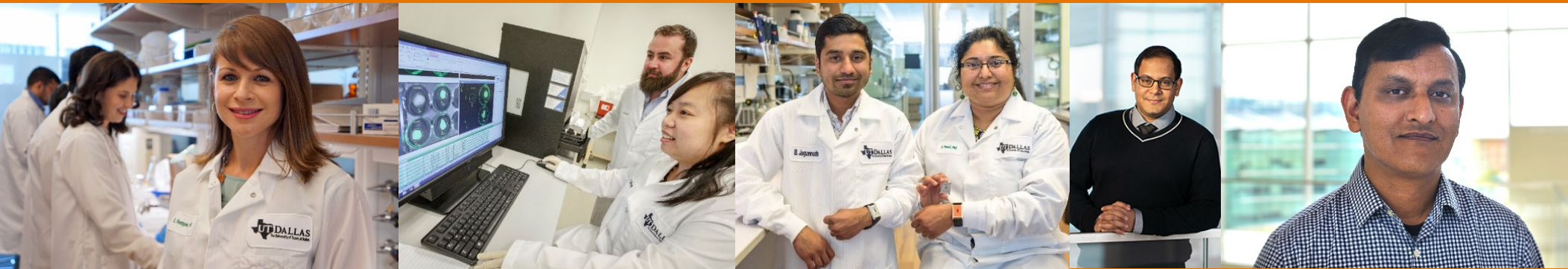
586

**Undergraduate
Students**

150+

**2020-21
BS, MS and PhD
Degrees in Biomedical
Engineering Awarded**

FACULTY RECOGNITION



Faculty pictured left to right include Dr. Danieli Rodrigues, Dr. Kenneth Hoyt (back), Dr. Shalini Prasad (right), Dr. Girgis Obaid and Dr. Tariq Ali.

Dr. Danieli Rodrigues, Associate Professor,
2021 Provost's Award for Faculty Excellence in
Undergraduate Research Mentoring

Dr. Girgis Obaid, Assistant Professor,
Advancing Bioimaging Fellow by the Research
Corporation for Science Advancement (RCSA)

Dr. Tariq Ali, Associate Professor of Instruction,
Honorable Mention President's Teaching Excellence
Award in Undergraduate Instruction

Dr. Kenneth Hoyt, Associate Professor,
Jonsson School Faculty Research Award at the Rank
of Associate Professor

Dr. Shalini Prasad, Professor,
Jonsson School Faculty Research Award at the Rank
of Professor

WELCOME NEW FACULTY

The Department of Bioengineering welcomed three new assistant professors in August 2020. Their research is focused in the areas of bioimaging, biomaterials and biomechanics. The interdisciplinary nature of their work provides opportunities for collaborations with researchers at UT Southwestern Medical Center.



WELCOME NEW FACULTY

Dr. Yichen Ding

Dr. Yichen Ding's research seeks to better understand cardiac injury and repair through light-sheet imaging, machine-based learning, virtual reality visualization and computational platforms.

Ding holds a PhD in biomedical engineering from Peking University in Beijing, China, and a BS degree in optomechanical engineering from Tsinghua University in Beijing, China.

Upon completion of his PhD, Ding was appointed as a visiting assistant project scientist and then as an assistant project scientist at the UCLA School of Medicine.



WELCOME NEW FACULTY

Dr. Jacopo Ferruzzi

Dr. Jacopo Ferruzzi researches the biomechanical behavior of cells and tissues. He focuses on cardiovascular biomechanics, mechanobiology and the biophysics of metastatic breast cancer.

Ferruzzi holds a PhD in biomedical engineering from Yale University, as well as MS and BS degrees in biomedical engineering from the University of Pisa, Italy.

Before joining UT Dallas, he was a postdoctoral researcher in the Department of Biomedical Engineering at Boston University.



WELCOME NEW FACULTY

Dr. Caroline Jones

Dr. Caroline Jones' research is in the area of microfluidics to quantify immune cell decision-making phenotypes with a focus on sepsis.

Dr. Jones holds a PhD in biomedical engineering from the University of California, Davis, and she holds an MS degree in biological engineering and a BS degree in biological and environmental engineering from Cornell University.

Jones was appointed as a postdoctoral research fellow in the Harvard Medical School. She joined UT Dallas from Virginia Tech, where she held an appointment as an assistant professor in the Department of Biological Sciences.

STRATEGIC PLAN OVERVIEW

Since the department's inception in 2010, UT Dallas' Department of Bioengineering has made remarkable progress in educating future bioengineers and performing groundbreaking research to improve human health. In the last decade, we have grown to become the third largest undergraduate program in the nation with an enrollment approaching 600. Our faculty members' research produced over \$14.7M in research expenditures in 2020, and our program is the No. 3 ranked biomedical engineering program among Texas public universities according to *U.S. News & World Report*.



STRATEGIC PLAN OVERVIEW

CONTINUED

During the 2020-21 academic year, the department envisioned the future through a strategic planning process that identified goals, key performance indicators and performance metrics for three focus areas:

Research Excellence

Student Success

Outreach and Community Engagement

Input from faculty, staff and students shaped the direction of the strategic plan. Diversity, equity and inclusion goals are incorporated across all three areas.

The strong community of bioengineering scholars conducting basic science, biomedical and transitional engineering research at UT Dallas, along with access to world-class facilities, position the Department of Bioengineering to achieve preeminent status.



RESEARCH EXCELLENCE





FACULTY

The Department of Bioengineering attracts top researchers and instructors. Full-time tenure system faculty lead robust, comprehensive research laboratories and collaborate with affiliated faculty within The University of Texas at Dallas and adjunct faculty at other institutions and in industry. The department has 18 tenure system faculty, 8 instructional faculty, 19 affiliated faculty and 20 adjunct faculty.

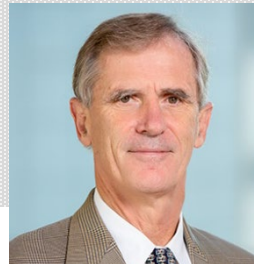
TENURE SYSTEM FACULTY



Orlando Auciello
Professor
Distinguished Chair
in Engineering



Leonidas Bleris
Professor
Fellow,
Cecil H. and Ida Green Professor
in Systems Biology Science



Stuart Cogan
Professor



Yichen Ding
Assistant Professor



Baowei Fei
Professor
Cecil H. and Ida Green Chair
in Systems Biology Science



Jacopo Ferruzzi
Assistant Professor



Heather Hayenga
Assistant Professor



Seth Hays
Associate Professor
Fellow,
Eugene McDermott Professor



Kenneth Hoyt
Associate Professor

TENURE SYSTEM FACULTY

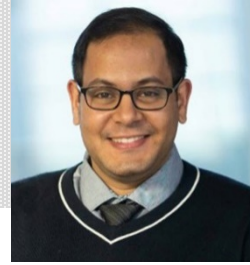
CONTINUED



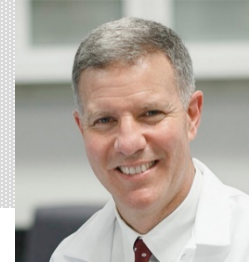
Caroline Jones
Assistant Professor



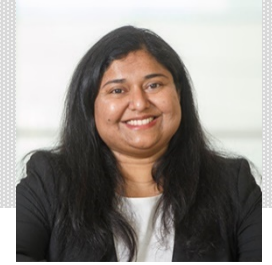
Stephen Levene
Professor



Girgis Obaid
Assistant Professor



Joseph Pancrazio
Vice President for Research
Professor



Shalini Prasad
Department Head
Professor
Cecil H. and Ida Green Professor
in Systems Biology Science



Danieli Rodrigues
Associate Professor



David Schmidtke
Professor



Shashank Sirsi
Assistant Professor



Victor Varner
Assistant Professor

INSTRUCTIONAL FACULTY



Tariq Ali
Associate Professor
of Instruction



Fang Bian
Research Scientist



**Soudeh Ardestani
Khoubrouy**
Associate Professor
of Instruction



Clark Meyer
Associate Professor
of Instruction



Kathleen Myers
Assistant Professor
of Instruction



Todd Polk
Associate Professor
of Practice



Ben Porter
Assistant Professor
of Instruction



Patrick Winter
Senior Lecturer I

AFFILIATED FACULTY

Dinesh Bhatia

Professor
Electrical & Computer
Engineering

Carlos Busso

Professor
Electrical and Computer
Engineering

Xianming (Simon) Dai

Assistant Professor
Mechanical Engineering

Crystal T. Engineer

Assistant Professor and
Researcher
Texas Biomedical Device
Center (TxBDC)

Francesca Filbey

Associate Provost, Bert Moore
Chair in Brain Health,
Professor; School of Behavioral
and Brain Sciences

Jeremiah Gassensmith

Associate Professor
Chemistry



John Hart Jr.

Professor
Behavioral and Brain
Sciences

Fatemeh Hassanipour

Associate Professor
Mechanical Engineering

Mahadevan (Devan) Iyer

Research Professor
Electrical and Computer
Engineering

Michael Kilgard

Professor
Behavioral and Brain
Sciences

David Lary

Professor
William B. Hanson Center
for Space Sciences, Physics

Yi Li

Postdoctoral Research
Associate

Faruck Morcos

Associate Professor
Biological Sciences

Issa Panahi

Professor
Electrical Engineering

Balakrishnan Prabhakaran

Professor
Computer Science

Zhenpeng Qin

Associate Professor
Mechanical Engineering

Mihaela C. Stefan

Professor
Chemistry and Biochemistry

Yonas Tadesse

Associate Professor
Mechanical Engineering

Jie Zheng

Cecil H. and Ida Green Professor
of Systems Biology; Professor,
Chemistry and Biochemistry

ADJUNCT FACULTY

Spencer Bowen

Associate Professor
Department of Radiology,
UT Southwestern

Yasin Dhafer

R. Wofford Cain Distinguished
Chair in Bone and Joint
Disease Research,
Bioengineering,
UT Southwestern

Nick Fey

Assistant Professor
Department of Mechanical
Engineering, The University of
Texas at Austin

Robert Gregg

Associate Professor
Department of Electrical
Engineering and Computer
Science; Robotics Institute,
University of Michigan

Ibrahim Hashim

Professor
Department of Pathology,
UT Southwestern

Anke Henning

Director of the Advanced
Imaging Research Center,
Professor,
Department of Bioengineering,
UT Southwestern

Lan Ma

Biocomputational Engineering
Assistant Director and Faculty
Instructor, Fischell Department of
Bioengineering,
University of Maryland

Alexander Pertsemidis

Associate Professor
Departments of Cell Systems and
Anatomy and Pediatrics,
UT Health San Antonio, Greehey
Children's Cancer Research Institute

Jay Shah

Assistant Professor
Department of Orthopaedic Surgery,
Sports Medicine Service,
UT Southwestern



Ananth Madhuranthakam

Associate Professor
Department of Radiology, Advanced
Imaging Research Center
UT Southwestern

Vinay Nagaraj

Medical Science Liaison
AngioDynamics

Hyun-Joo Nam

Consultant
RES Group Inc.

Matthew Petroll

Chair, Graduate Program in
Biomedical Engineering,
Professor
UT Southwestern

Manasi Reardon

Head of Advanced Development
Abbott Neuromodulation

Erika Ross

Director, Applied Research
Abbott Neuromodulation

Jennifer Seifert

Senior Director,
Research and Development
TissueGen, Inc.

Elena Vinogradov

Associate Professor
Departments of Radiology and Advanced
Imaging Research Center,
UT Southwestern

Taylor Ware

Associate Professor
Departments of Biomedical Engineering
and Materials Science & Engineering
Texas A&M University

Tre Welch

Assistant Professor
Department of Cardiovascular & Cardio
Thoracic Surgery, UT Southwestern

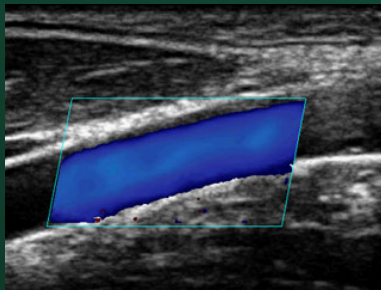
Joel Wells

Assistant Professor
Department of Orthopedic Surgery,
UT Southwestern

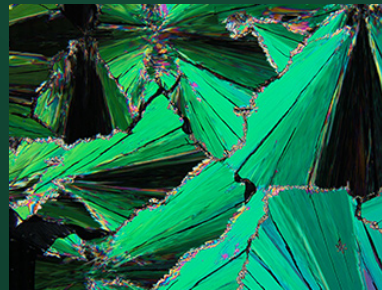
RESEARCH

Biomedical engineering is a broad field and includes virtually any application of engineering to medicine, biology or health care. The University of Texas at Dallas has chosen to focus its biomedical research in the following areas:

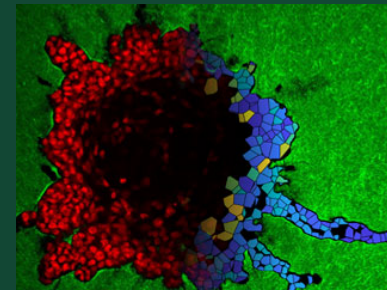
Bioimaging



Biomaterials



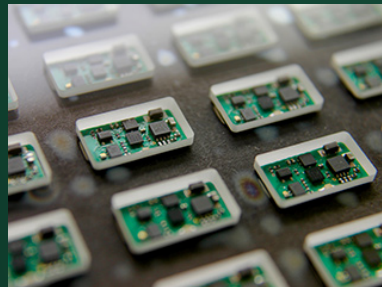
Biomechanics



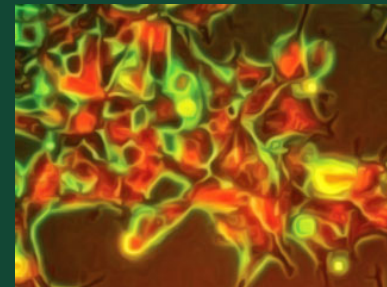
Biosensors and Bioelectronics



Neural Engineering



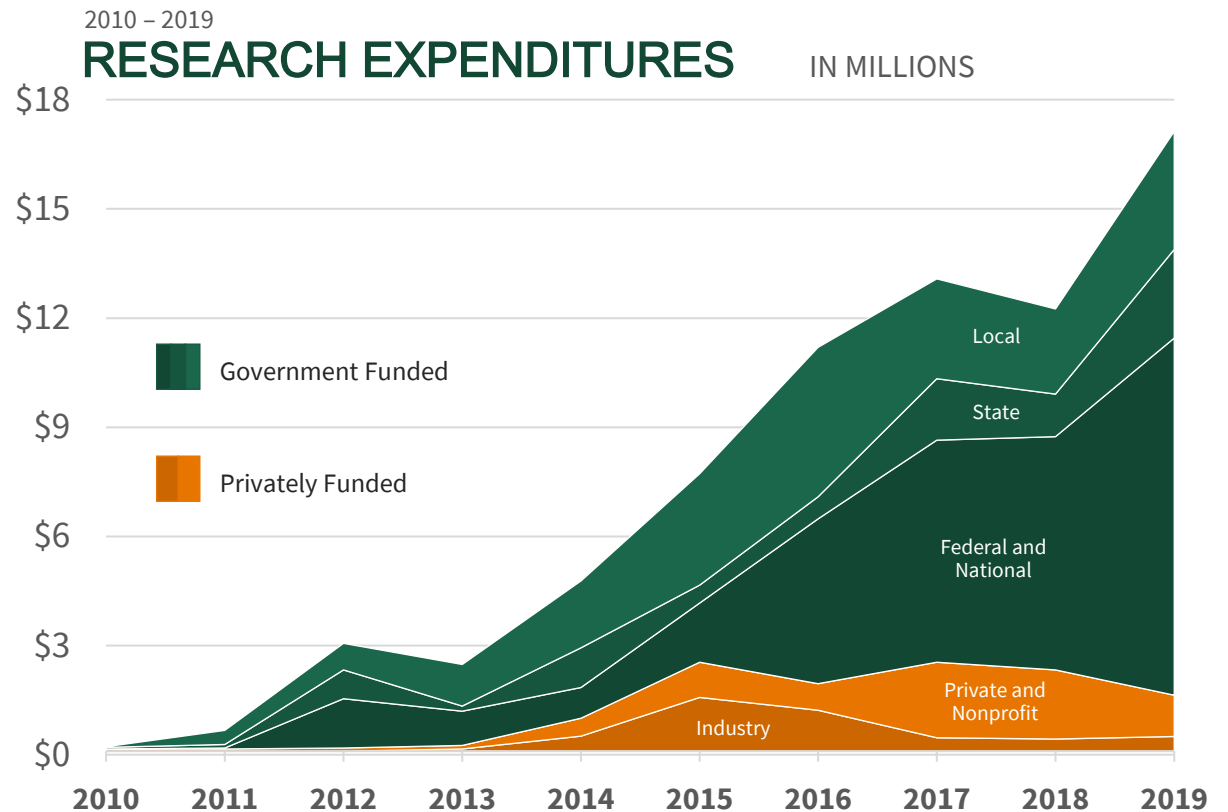
Systems Biology



RESEARCH EXCELLENCE

In 2020

- Average number of RAs supported per tenure system faculty was **3.5**
- Average number of peer-reviewed publications per tenure system faculty was **5.8**



STUDENT SUCCESS



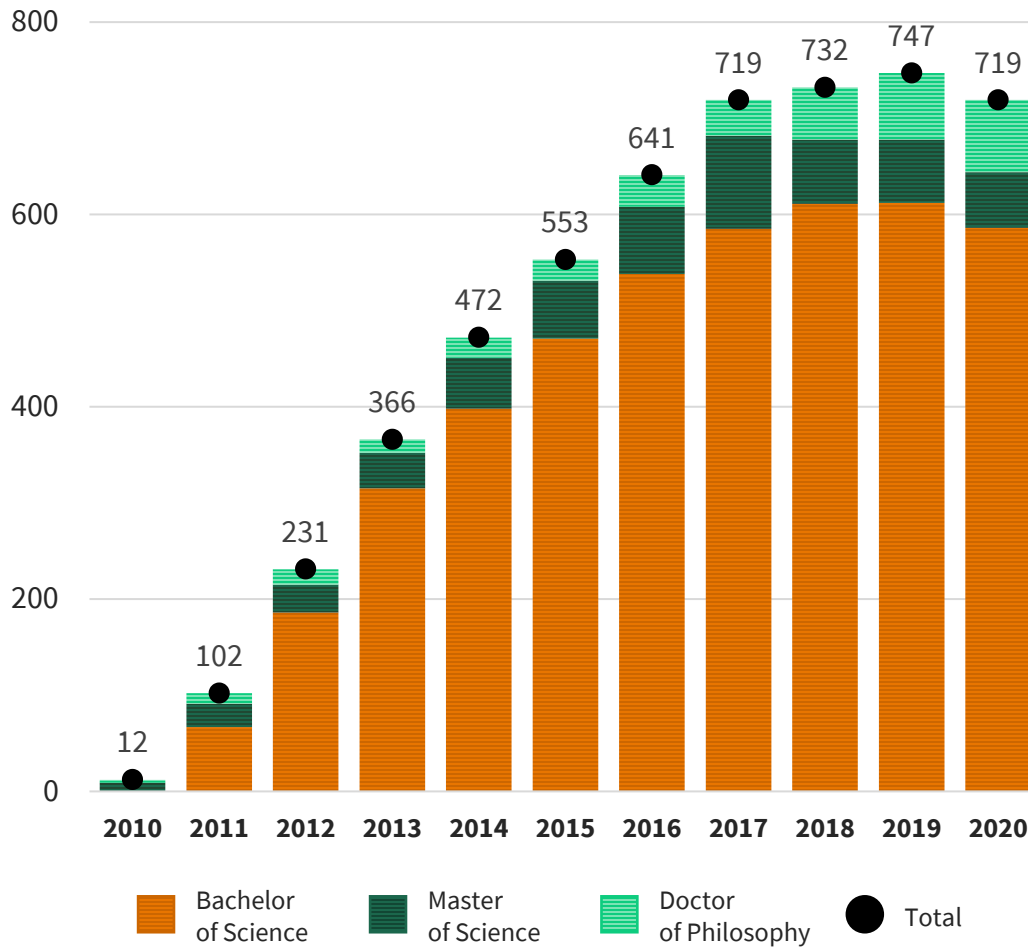


STUDENTS

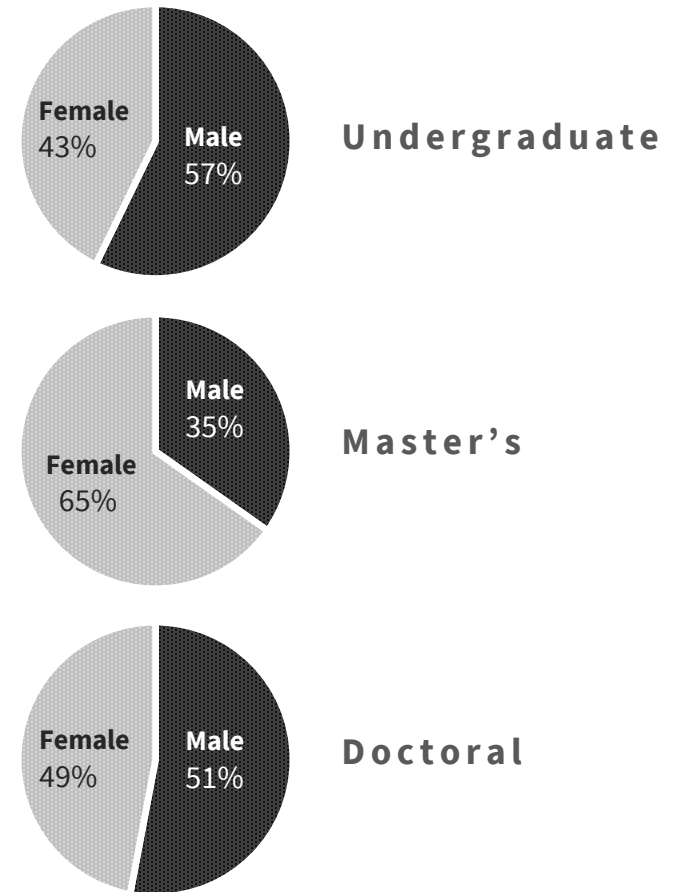
Bioengineering students have unique opportunities to excel in research, as well as to participate in the Jonsson School's signature UTDesign® Capstone Program where they put their expertise to work toward solving real-world problems.

ENROLLMENT AND DEGREES

HISTORICAL ENROLLMENT



BIOENGINEERING STUDENT DIVERSITY



BIOENGINEERING STUDENT AWARDS

Our students received numerous awards at the local and national levels. The Department of Bioengineering at The University of Texas at Dallas continues to attract students committed to pursuing excellence in research and education.



STUDENT AWARDS

Poster Competitions

Fall 2020 – 5th Annual BMEN Undergraduate Poster Competition

1st : Ka'Toria Edwards
2nd : Aashay Kothari
3rd : Betsiti Araya

10th Anniversary Poster Competition:

UNDERGRADUATE WINNERS

1st : Muhammed Shariff
2nd : Aashay Kothari
3rd : David A. Girata

GRADUATE WINNERS

1st : Sayali Upasham
2nd : Antra Ganguly
3rd : Ka'Toria Leitch

POSTDOCTORAL WINNER

Dr. Maysam Shahedi

STUDENT AWARDS

Nathan Churcher

Jeremy Warren

Bridge to Doctorate Fellowship

*Louis Stokes Alliance for Minority Participation
(NSF)*

Nundini Rawal BS'20

Erik Chow BS'19

2021 National Science Foundation
Graduate Research Fellowship

Kara Peak

American Society of Mechanical Engineers
PhD Student Paper Competition Finalist
*American Society of Mechanical Engineers at the
Summer Biomechanics, Bioengineering and Bio
Transport Conference*

Vikram Narayanan Dhamu

2020 Phi Kappa Phi Love of Learning
Award

The Honor Society of Phi Kappa Phi

Krithika Iyer

Diversity Participation Award

*National Science Foundation, National Institutes of
Health, and SB³C Diversity Sponsors*

Rachel Jones

2nd place Student Research

South Central American Society of Biomechanics

STUDENT ORGANIZATIONS



Biomedical Engineering Society (BMES) Officers

President: Emma Henderson
Vice President: Sruthi Dubagunta
Treasurer: Nareen Anwar
Secretary: Ifti Hossain



Alpha Eta Mu Beta (AEMB) Officers

Spring 2020 – Fall 2020
President: Emma Henderson
Vice President: Megan Zachariah
Treasurer: Han Lai
Secretary: Karel Lirazan



Spring 2021 – Fall 2021
President: Megan Zachariah
Vice President: Nicholas Ho
Treasurer: Vishvani Patel
Secretary: Karel Lirazan

STUDENT ORGANIZATIONS

BMEN Graduate Student Association

In its second year of operation, the BMEN Graduate Student Association seamlessly adapted to an all-virtual format and continued to host workshops, seminars and other events for bioengineering MS and PhD students.

The BMEN Graduate Student Association (GSA) kicked off its fall semester by arranging multiple rounds of peer-led practice sessions for first year PhD students preparing for their qualifying exams. The presenters gained valuable public speaking experience in a low-pressure environment. The group commenced its seminar series with a speaker from Brain Lab, a local medical technology company, who shared insights into how to successfully transition from student life to industry and imparted tips on charting a long-term growth path. This event was followed by an informal Lunch-N-Learn led by industry veteran Kathy Brown PhD'21 on the topic of fostering mentoring relationships.

The spring semester was launched with an Open Mic hour that featured four graduate students and two professors who gave talks on hobbies cultivated outside of the scientific arena. Finally, to round out the academic year, the BMEN GSA organized an 11-week symposium series for undergraduates participating in the department's first REU. The group's officers curated a list of special topics deemed relevant to students embarking on a summer research project, and the BMEN GSA moderated weekly roundtable discussions that showcased the perspectives of chosen graduate student panelists.

Officers:

President & Treasurer: Aditi Bellary

Vice President: Divya Subramanian

Public Relations Chair & Historian: Krithika Iyer

Alumni Outreach Chair: Arvin Honari



UTDESIGN[®] CAPSTONE

The UTDesign[®] Capstone Program is designed to provide a hands-on learning opportunity for students.

The UT Design Capstone experience is a two-semester course sequence in which interdisciplinary student teams including ones from biomedical engineering and other disciplines design solutions to real-world problems for corporate and university sponsors. UT Design is housed in a 40,000 square foot facility for student teams to ideate, create, assemble and test devices.

“We strive to provide our students with a real-world engineering experience and have organized UT Design[®] Capstone like a company,” said Dr. Todd Polk, associate professor of practice and UTDesign director of bioengineering.

Polk added, “We treat the students like working engineers from day one, and the overall experience has proved to be highly beneficial to them as they enter the professional world after graduation.”



UTDESIGN[®] CAPSTONE

At A Glance

SPRING 2021

21 teams with
bioengineering students

114 bioengineering
students participated

Team Sponsors Include

Abbott Labs, Adaptive 3D, Hill & Smith Inc., HoboLoco, Lockheed Martin Missiles, Max-IR Labs, Moonshot Wearables, Inc., UT Dallas and UT Southwestern

Award Winners

1st Place: Activity Observer Insole sponsored by UT Southwestern Medical Center

The device uses pressure, temperature and acceleration sensor inputs in a machine learning framework to monitor the activity of patients with diabetic neuropathy.

2nd Place: Autonomous and Portable Cell Culture System sponsored by the Bleris Lab at UT Dallas

The portable incubator maintains cell growth conditions to allow cell culturing during transportation.

3rd Place: Double Lumen Peripheral Catheter sponsored by the UT Southwestern Medical Center

The dual lumen catheter allows for faster, safer and more efficient apheresis treatments through simultaneous draw and return blood processes from a peripheral vein.

COMMUNITY ENGAGEMENT



UT SOUTHWESTERN MEDICAL CENTER CONNECTION

Faculty and students in the Department of Bioengineering at The University of Texas at Dallas collaborate with UT Southwestern researchers and clinicians to bring groundbreaking discoveries into practice.

Currently, five UT Dallas bioengineering doctoral students and over 20 undergraduate students conduct research in UT Southwestern faculty members' labs. Over **30%** of UT Dallas bioengineering faculty have research collaborations with UT Southwestern faculty and clinicians. UT Dallas Bioengineering faculty have secured fourteen grants totaling **\$6.9M** to support collaborative research with UT Southwestern.



COMMUNITY ENGAGEMENT

Dr. Stephen Levene and **Dr. Yair Lotan**, chief of urologic oncology at UT Southwestern, are developing a new class of biomarkers for bladder cancer.

Dr. Heather Hayenga and **Dr. Leonidas Bleris** are collaborating with **Dr. Helena Hwang**, associate professor of pathology at UT Southwestern, to develop a gene-editing treatment for NAB2-STAT6 fusions in cancer cells. They are also working with **Dr. Bruce Posner** in the High Throughput Screening Center to screen compounds with our cancer cell line.

Dr. Jacopo Ferruzzi and **Dr. Ravikanth Maddipati**, assistant professor of internal medicine and Children's Medical Center Research Institute at UT Southwestern, are exploring the multi-scale mechanical signatures of pancreatic ductal adenocarcinomas (PDACs), developing an in vitro hydrogel system that recapitulates salient features of the tumor microenvironment and associating PDAC mechanical changes with invasive potential and overall metastatic burden.

COMMUNITY ENGAGEMENT

CONTINUED

Dr. Yichen Ding collaborates with **Dr. Eric Olson**, professor and chair at UT Southwestern, and members of the Olson lab to implement a light-sheet system for cardiac imaging.

Dr. Yichen Ding along with UT Southwestern faculty **Dr. Li Liu**, associate professor in radiology, and **Dr. Ralph Mason**, professor and director of preclinical imaging research, to develop image postprocessing methods.

Dr. Danieli Rodrigues is collaborating with **Dr. Javier La Fontaine**, professor in the Departments of Plastic Surgery and Orthopaedic Surgery at UT Southwestern, on the development of new immunomodulatory coatings for the surface of metallic implants to target healing and osseointegration in diabetic patients.



COMMUNITY ENGAGEMENT

CONTINUED

Dr. Stephen Levene and **Dr. Andrew Fire**, professor of pathology and genetics at the Stanford University School of Medicine, are working to characterize and better understand functional genomics of extrachromosomal circular DNAs.

Dr. Stephen Levene and **Dr. Peter Scacheri**, professor in the Department of Genetics and Genome Sciences at Case Western Reserve University School of Medicine, seek to understand the functional genomics of extrachromosomal circular DNA in glioblastoma.

Dr. Stephen Levene and **Dr. Andreas Hanke**, professor in the Department of Physics and Astronomy at The University of Texas at Rio Grande Valley, are conducting theoretical and computational studies of enzyme systems that regulate DNA topology.

Dr. Seth Hays and **Dr. Chad Swank**, research scientist with Baylor Scott & White Institute for Rehabilitation, are collaborating on a clinical trial examining vagus nerve stimulation (VNS) paired with rehabilitation to improve recovery of upper limb function in patients with spinal cord injuries.



COMMUNITY ENGAGEMENT

CONTINUED

Dr. Seth Hays and **Dr. Rita Hamilton**, medical director of Baylor Scott & White Institute for Rehabilitation, are working together on a clinical trial testing VNS paired with rehabilitation and telerehabilitation in individuals with chronic stroke.

Dr. Seth Hays and **Dr. Mark B. Powers**, director of trauma research at Baylor Scott & White, are working together on a clinical trial evaluating the use of VNS paired with prolonged exposure therapy to reduce symptoms in individuals with posttraumatic stress disorder (PTSD).

Dr. Jacopo Ferruzzi collaborates with **Dr. Darren Roblyer** and **Dr. Muhammad Zaman** at Boston University College of Engineering and **Dr. Xaralabos Varelas** at Boston University School of Medicine to develop fundamental insights into the relationship between extracellular matrix mechanics and the signaling activity of the transcriptional coactivator yes-associated protein (YAP) and transcriptional coactivator with PDZ-binding motif (TAZ), specifically as it pertains to regulating cancer cell metabolism and invasion.



ENGINEERING EXCELLENCE IN BIOENGINEERING

We are now embarking on the launch of our five-year strategic plan in the 2021-22 academic year.

Throughout the next five years, the Department of Bioengineering aims to achieve goals aligned with specific metrics for achievement in three areas:

Research Excellence

Student Success

Outreach and Community Engagement

The background of the slide is a photograph of a modern building with large glass windows and a person walking in the foreground. The image is overlaid with a dark teal color. A solid orange vertical bar is on the right side of the slide.

ERIK JONSSON SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

BIOENGINEERING

THE UNIVERSITY OF TEXAS AT DALLAS

800 W. Campbell Rd., BSB 11, Richardson, TX 75080-3021

Office: BSB 11.102 • **Phone:** 972.883.5155 • **Email:** bioengineering@utdallas.edu

be.utdallas.edu