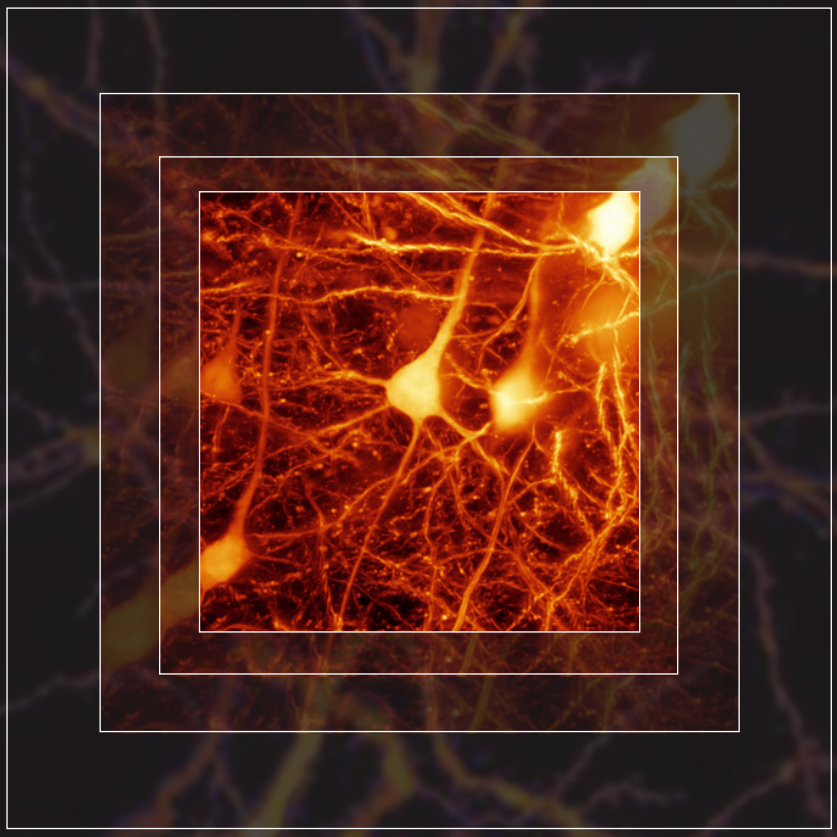
BOSTON UNIVERSITY

Boston University College of Engineering
Department of Biomedical Engineering

BIOMEDICAL ENGINEERING

2016-2017 ANNUAL REPORT



Neurophotonics

BU's New Neurophotonics Center Advances Understanding of the Brain

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CONTENTS

Cover photos:
Jerome Mertz Laboratory, John White Laboratory

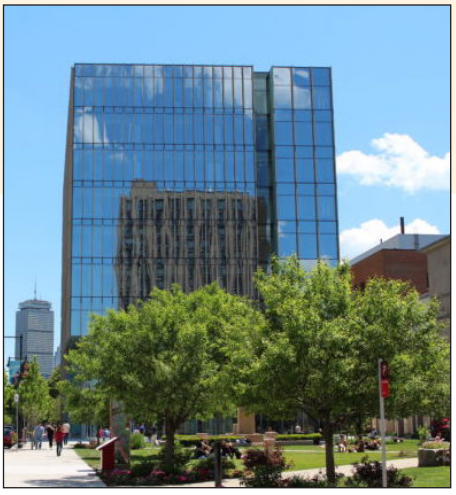
BU BME HIGHLIGHTS

ENGINEERING THE FUTURE

Symposium Celebrates Grand Opening of **Biological Design Center**

June 1: More than 200 researchers from industry, academia and healthcare gathered on campus to celebrate the formal launch of the Biological Design Center and its new home, the just-completed, nine-story Center for Integrated Life Sciences and Engineering (CILSE).

Professor Christopher Chen is the founding director of the BDC, bringing together the community to explore synthetic biology — the engineering of living systems to understand, control, and reengineer how biological components work.



CILSE is the new home of the Biological Design Center.

Neurophotonics Center Aims to Advance Understanding of the Brain

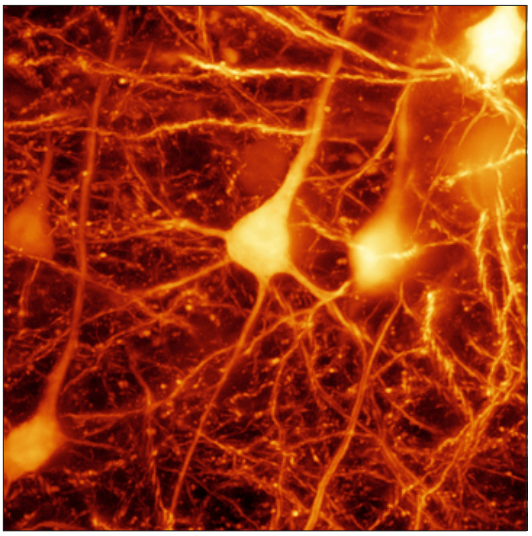
By Michael G. Seele

Efforts to understand the workings of the human brain have taken quantum leaps forward in recent years as researchers have developed non-invasive, light-based methods to observe its functioning in real time.

Now, the College of Engineering is capitalizing on Boston University's interdisciplinary expertise in neuroscience and photonics to create the Neurophotonics Center, led by one of the nation's preeminent researchers in the field.

Professor David Boas is joining the faculty from Massachusetts General Hospital, where he has pioneered new technologies to see deep into the brain in order to improve our understanding of the organ's healthy functioning, and offer new pathways to understand how strokes, migraines, Alzheimer's disease and other neurologic maladies affect it. Boas, the center's founding director, is recruiting faculty from throughout the College of Engineering and across Boston University to pool expertise and further accelerate neurophotonics technologies.

Professor David Boas (BME)



Two-photon microscopy image of in-vivo mouse neurons using an active illumination technique developed by Prof. Jerome Mertz. Regulation of the illumination power with real-time feedback provides high dynamic range that enables the visualization of fine details while avoiding detector saturation in bright regions. Many of the center's efforts will revolve around advancing such multi-photon imaging technologies.

"There are tremendous advantages to biomedical and photonics engineers working with neuroscientists," Boas said. "Neuroscientists have questions and problems that engineers want to solve. Those solutions advance the field and lead to new questions and new solutions. Boston University has a wealth of expertise in photonics, biomedical engineering and neuroscience that is excellent fuel for this virtuous cycle."

Many of the center's efforts will utilize multi-photon microscopy, a method which even 25 years after its advent is still accelerating in terms of its technological advances and its impact in the neurosciences. In addition, the center will be developing and applying novel approaches to measuring human brain function with light.

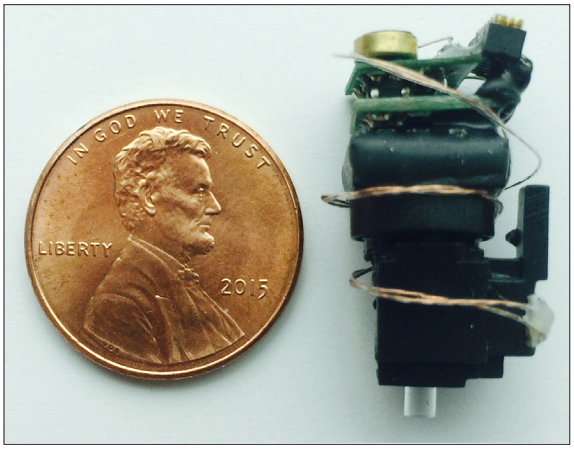
A functional near-infrared spectroscopy (fNIRS) cap uses optical fibers to bring light onto and detect light from the scalp of a volunteer. The reconstructed fNIRS image shows the cortical changes in oxygenated hemoglobin while the volunteer performs a simple motor task.

Human functional brain imaging has been done for several years using fMRI scans, which produce sharp images of brain blood oxygenation and flow, key to seeing which areas of the organ are being stimulated at a given time. But fMRI scans require the subject to lay perfectly still in a confining machine for an extended period, not a natural state and a difficult procedure to use with infants, small children and others. They are also expensive.

Instead, Boas uses functional near-infrared spectroscopy, which penetrates through the scalp and skull as much as a centimeter into the brain where it detects blood oxygenation, ultimately enabling the imaging of brain function. The images aren't as crisp as fMRI scans, but the wearable device allows the subject to move around naturally, engage socially and perform any number of activities while blood flow and oxygenation changes in the brain are observed in real time at a far lower cost. Furthering this research is expected to be one of the Neurophotonics Center's initial projects.

The Neurophotonics Center is expected to draw on the efforts of doctoral students through the new $2.9 million National Science Foundation Research Traineeship grant for neurophotonics, which will award its first fellowships this summer.

An array of faculty from the College of Arts & Sciences, Sargent College and the School of Medicine will join College of Engineering faculty in the center. In addition to Boas, founding ENG faculty include:



Developed by William Liberti of the Gardner Lab, the miniscope is a single-photon fluorescent imaging system made of readily available and 3-D-printed parts. It allows researchers to non-invasively monitor neural activity in awake, freely behaving rodents and birds over multi-month periods.

A fluorescently labeled neocortical pyramidal cell, imaged under multi-photon fluorescence. from the laboratory of Prof. John White.

Photonics Center Director Professor Thomas Bifano (ME),
BME Chair Professor John White,
Professor Jerome Mertz (BME, ECE),
Professor Barbara Shinn-Cunningham (BME),
Professor Howard Eichenbaum (Neuroscience, BME),
Professor Siddharth Ramachandran (ECE, MSE),
Professor Ji-Xin Cheng (ECE, BME),
Professor Irving Bigio (BME, ECE),
Associate Professor Kamal Sen (BME),
Assistant Professor Jerry Chen (Biology, BME),
Assistant Professor Timothy Gardner (BME),
Assistant Professor Xue Han (BME),
Assistant Professor Lei Tian (ECE),
Assistant Professor Darren Roblyer (BME),
Assistant Professor Michelle Sander (ECE, MSE),
Assistant Professor Allison Dennis (BME, MSE) and
Research Assistant Professor Helen Fawcett (ME).

Other BU faculty joining the center from outside the College of Engineering include:

Professor Chantal Stern (Psychology & Brain Sciences)
Professor Helen Tager-Flusberg (Psychology & Brain Sciences)
Professor Swathi Kiran (SAR),
Assistant Professor Ji Yi (MED)
Assistant Professor Alberto Cruz-Martin (Biology)
Assistant Professor Sam Ling (Psychology & Brain Sciences).

BME Department 2016-2017

Faculty

In academic year 2016-2017 the BME Department added two new faculty members, Assistant Professors Mary Dunlop and Allyson Sgro (start dates 1/1/17). Assistant Professor Xue Han was promoted to Associate Professor and granted tenure. At the end of FY17 the **BME Faculty numbered 36, making the department one of the largest in the country in terms of primary faculty.**

Graduate Program

Prof James Galagan was the Associate Chair for Graduate Programs. He will be succeeded next year by Prof Kamal Sen. The BME Ph.D. Program awarded 13 degrees this year, bringing our total Ph.D. degrees awarded to 279 since the program began in 1991. 28 MS degrees were awarded as well as 23 MEng degrees. Our graduate programs enrolled 176 students (128 PhD students; 3 MD/PhD; 22 MS; 23 MEng).

Graduate student recruitment was led by the Director of Graduate Admissions, Prof. Joe Tien. In the fall 2017 we expect 75 new graduate students (38 PhD, 24 MS and 19 MEng). Our Ph.D. applicant pool continues to be competitive with other top tier Biomedical Engineering Programs. In the 2016 – 2017 recruiting season we received **905 applications (PhD, MS and MEng).**

Undergraduate Program

Prof Michael Smith assumed this leadership role for the Undergraduate Program.
The BME Undergraduate Program awarded 114 Bachelor of Science degrees and enrolled 628 students in AY 16-17.

Research

In 2016-2017 the BME faculty was awarded $24,525,841 in extramural funds available for expenditure during the year. They expended $23,891,125. This translates to over **$660,000 per primary faculty member.** BME faculty submitted 149 research proposals for $129,740,421. Our faculty is comprised of world renowned scientists and engineers who work across every scale of biology and in a wide spectrum of bioengineering subspecialties. Their research is driven by advancing fundamental understanding of biology and physiology in health and disease and then translating these principles to new technologies that impact the human condition and the practice of medicine. The research laboratories of the research-active faculty members are listed on our web site (http://www.bu.edu/bme/research/labs/). They also participate in **seven interdisciplinary research centers that are directed by BME faculty: Biomolecular Engineering Research Center (BMERC), Center for Research in Sensory Communication and Emerging Neural Technology (CRESCENT), Nanotechnology Innovation Center (BUnano), Biological Design Center (BDC), Precision Diagnostics Center (PDC), Neurophotonics Center (NPHC), and Hearing Research Center (HRC).**

John A. White, BME Department Chair

2016-2017: BY THE NUMBERS

36 PRIMARY FACULTY

63 COURSES TAUGHT

$25 MILLION RESEARCH FUNDING

ADMINISTRATION

CHAIR
Dr. John A. White

ASSOCIATE CHAIR FOR GRADUATE PROGRAMS
Dr. James Galagan

ASSOCIATE CHAIR FOR UNDERGRADUATE PROGRAM
Dr. Michael Smith

DIRECTOR OF GRADUATE ADMISSIONS
Dr. Joe Tien

DIRECTOR OF PROFESSIONAL MASTERS PROGRAMS
Dr. Jonathan Rosen

DIRECTOR
Matthew Barber

ASSISTANT DIRECTOR
Nicole Ford Burley

COULTER PROGRAM DIRECTOR
Lee Tien

BME DEPARTMENT STAFF

ADMINISTRATIVE

Katie Clifford, *Global Health Programs*
Nancy Ferrer-Tatkowska, *Senior Program Coordinator, BDC*
Alexandria Gustin, *Senior Program Coordinator*
Mary-Ellen Palmer, *Administrative Assistant to the Chair*
Jessica Tytell, *Executive Director, BDC*

ACADEMIC

Christen Bailey, *Graduate Program Administrator*
Corinne Rosseel, *Professional Masters Programs Administrator*
Megan Wallander, *Undergraduate Program Administrator*

FINANCIAL

Lauren Daley, *Financial Administrator, HRC*
Fallon Fernandes, *Financial Administrator, BMERC*
Irene Orzechowski, *Financial Manager*
Laura Prusaitis, *Financial Manager, BDC*
Tara Sorrentino, *Financial Manager*

TECHNICAL

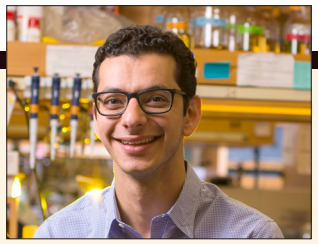
Phil Allen, *Manager, Micro/Nano Imaging Core Facility*
Xin Brown, *Manager, Biointerface Technologies Core Facility*
Ze'ev Feit, *Manager, Clean Room Core Facility*

New BME Faculty

Professor David Boas is joining the BME faculty from Massachusetts General Hospital, where he has pioneered new technologies to see deep into the brain in order to improve our understanding of the organ's healthy functioning, and offer new pathways to understand how strokes, migraines, Alzheimer's disease and other neurologic maladies affect it. Prof Boas joined BU BME on July 1, 2017.

Professor Ji-Xin Cheng is the 1st honorary Moustakas Chair Professor of Photonics and Optoelectronics. He comes to Boston University after performing cutting-edge research and creative teaching in biomedical engineering and chemistry at Purdue University for 14 years. He is a world leader in molecular spectroscopic imaging. His research focuses on the development of label-free microscopy for a range of medical applications to improve early diagnosis and treatment of human diseases. Cheng will hold a joint appointment in ECE and BME. Prof Cheng joined BU BME on July 1, 2017.

BU BME HIGHLIGHTS



PECASE AWARD RECIPIENT

Khalil Receives **Presidential Early Career Award**

Assistant Professor Ahmad Khalil (BME) is among 102 scientists and researchers honored as recipients of the Presidential Early Career Awards for Scientists and Engineers (PECASE). The PECASE award is the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers.

"BME is proud to now have two PECASE recipients among our assistant professors, which reflects the extraordinary quality of our young faculty as researchers," says Professor John White, Chair of BME.

BU BME HIGHLIGHTS Faculty Awards, Honors and Significant Events *Academic Year 2016-17*

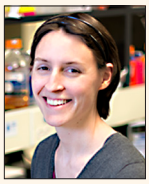
■ **Associate Prof Xue Han was tenured and promoted to Associate Professor this year.**

■ **Professor Joyce Wong, DeLisi Lecture.** The award recognizes faculty members with extraordinary records of well-cited scholarship and outstanding alumni who have invented and mentored transformative technologies that impact quality of life. Prof Wong's lecture highlighted collaboration and research in biomaterials to treat disease.

■ **Assistant Professor Mo Khalil, NIH New Innovator.** Assistant Professor Ahmad "Mo" Khalil has been awarded a $2.5M New Innovator Award under the High-Risk, High Reward program sponsored by the National Institutes of Health (NIH). His proposed project will focus on developing new and rapid techniques for diagnosing antibiotic resistance to more effectively manage and treat gonococcal infections. This award makes BU BME one of the only departments in the country to have 3 faculty with NIH New Innovator Awards at the same time (Khalil, W Wong, Han)

■ **Assistant Professor Mo Khalil, PECASE.** Assistant Professor Ahmad Khalil (BME) is among 102 scientists and researchers honored as recipients of the Presidential Early Career Awards for Scientists and Engineers (PECASE). The PECASE award is the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers. Khalil joins fellow PECASE recipient Assistant Professor Xue Han (BME,) who won the award in 2014.

■ **Assistant Professor John Ngo Receives Career Development Professorship.** The Reidy Family Career Development Professorship recognizes College of Engineering and Questrom School of Business faculty. Ngo's research applies principles of evolution, chemistry, and engineering to develop new tools for visualizing, measuring, and controlling biomolecules in cells and organisms. Currently, his lab studies how proteases—proteins that "chop up" other proteins—are used by cells to regulate gene expression in response to different biological signals.



■ **Assistant Professor Mary Dunlop is the winner of the 2017 ACS Synthetic Biology Young Investigator Award.** This award recognizes the contributions of a scientist who has made a major impact on the field of synthetic biology early on in their career.

■ **Prof Ed Damiano received a $12M grant from NIH to conduct the final pivotal trial for his iLet™ Bionic Pancreas.**

■ **Dean Kenneth Lutchen, NSF Engineering Advisory Panel.** Dean Kenneth R. Lutchen has been appointed to the National Science Foundation's Advisory Committee for Engineering, a panel of a dozen leaders from academia and industry that provides advice and recommendations on support for research, education and related activities to the agency's Directorate for Engineering.

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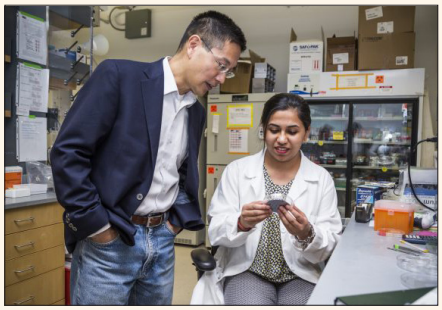
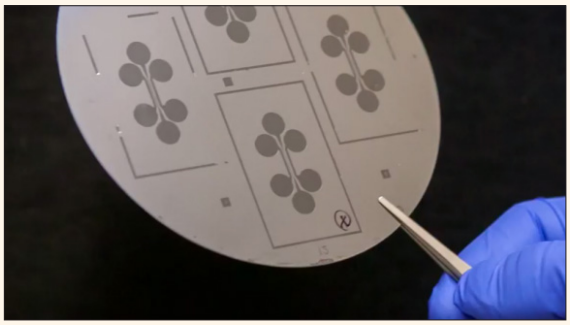
■ **US News Ranking.** The Biomedical Engineering program continues to be ranked among the elite nationally, at 12th among 120 graduate BME programs and 6th among private schools. Its peer assessment score was the seventh-highest.



ENG student Varnica Bajaj (BME '19) with Professor Christopher Chen (BME) .

■ **Professor Muhammad Zaman Profiled in Wall Street Journal.** Prof Muhammad Zaman was recently profiled in the Wall Street Journal. In the article, he talks about PharmaChk, the device he has developed to detect counterfeit drugs.

■ **Precision Dignostics Center.** The PDC builds on the success, momentum and infrastructure of the NIH Center for Future Technologies in Cancer Care (CFTCC), which Prof Catherine Klapperich also directs at BU and will now fall under the umbrella of the new center. The PDC's mission will expand to include cancer and innovations that leverage point-of-care technologies to enable precision medicine across a wider swath of diseases. Researchers from the College of Engineering in



collaboration with the BU schools of Medicine, Dental Medicine and Public Health will collaborate in the new center. The other founding core faculty members in the BME dept. include: Professor Edward Damiano, Professor Muhammad Zaman, Professor Mark Grinstaff, Associate Professor James Galagan, and Assistant Professor Allison Dennis.

■ **BMES Officers.** Two BME faculty members have been elected to leadership positions in the Biomedical Engineering Society (BMES). Professor Catherine Klapperich will join the Board of Directors for a term spanning 2016-2019. Professor John A. White, chair of BME, was elected as the secretary for a term lasting from 2016-2018.

■ **Neurophotonics Center.** Boston University has been a leader in the field and is now capitalizing on its expertise in neuroscience and photonics to create the Neurophotonics Center, led by one of the field's preeminent researchers, Prof David Boas. Other BME faculty who are members of the center are: BME Chair and Professor John White, Professor Jerome Mertz, Professor Barbara Shinn-Cunningham, Professor Ji-Xin Cheng, Professor Irving Bigio, Associate Professor Kamal Sen, Associate Professor Xue Han, Assistant Professor Darren Roblyer, and Assistant Professor Allison Dennis.

BU BME SEMINARS 2016-17

Jay Keasling, PhD UC Berkeley
Engineering Microbial Metabolism for Production of Chemicals and Fuels

Lihong Wang, PhD Washington Univ.-St.Louis
Redefining the Spatiotemporal Limits of Optical Imaging

Margrit Betke, PhD Boston University
Microscopic and Macroscopic Image Analysis: Crowdsourcing, Machine Learning, and 4D Modeling to Aid BME Research

Susan Marguiles, PhD Univ. of Pennsylvania
Mechanisms of Pediatric TBI – Integrating Computational and Experimental Approaches to Understanding Brain Injury

David Cook, PhD, CSO, Seres Therapeutics
The Human Microbiome: A Target for Ecobiotic Drugs

George Goetz, PhD Stanford
Photovoltaic Implants for Restoration of Sight to the Blind

Audrey Fan, PhD Stanford
Imaging of Brain Physiology in Neurological Disease

Jia Niu, PhD UCSB
Enabling Bioactive Functions Through Bioinspired Polymeric Materials

Vivek Venkatachalam, PhD Harvard
Pan-neuronal Imaging in Behaving C. elegans

David Schneider, PhD Duke
Neural Circuits for Making Predictions

Nandan Nerurkar, PhD Harvard
Molecular Control of Physical Forces During Morphogenesis of the Vertebrate Gut

Sethurama Sankaram, PhD Cornell
Personalized Blood Flow Simulations and Virtual Treatment Planning: A Stochastic Multi-Scale Framework

Jamie Spangler, PhD Stanford
Reshaping the Immune Response Through Molecular Engineering

Tatiana Engel, PhD Stanford
Discovering Dynamic Computations in the Brain From Large-Scale Neural Recordings

Courtney Hodges, PhD Stanford
The Physical Epigenome: Quantitative Approaches to Characterize Epigenetic Systems

Ivan Surovtsev, PhD Yale
Inside Bacterial Cells: Where Both Order and Disorder are Actively Pursued

Anard Pai, PhD UCSF
When the Same Genotype Leads to Multiple Phenotypes: Measuring and Manipulating Partial Penetrance Underlying Disease

Primary Faculty

TIMOTHY BARBARI
Professor, Biomedical Engineering
PhD, Chemical Engineering, University of Texas at Austin

Biomaterials, hydrogels, membranes, biomolecular transport and binding, biosensors.

IRVING J. BIGIO
Professor, Biomedical Engineering;
Electrical and Computer Engineering; Physics
PhD, Physics, University of Michigan

Medical applications of optics, lasers and spectroscopy; biomedical optics and biophotonics; biomolecular dynamics; applied spectroscopy, especially to biomedical problems; nonlinear optics; quantum electronics and laser physics.

CHRISTOPHER S. CHEN
Professor, Biomedical Engineering;
Director, Biological Design Center
MD, Harvard University; *PhD, Medical Engineering, MIT*

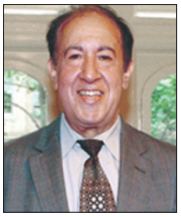
My laboratory seeks to understand how cells interact with their environment, and to use this knowledge to control cell function. In particular, we are studying the cooperation between adhesive, mechanical and biochemical signaling in the regulation of angiogenesis and stem cell biology.

H. STEVEN COLBURN
Professor, Biomedical Engineering;
Director, Hearing Research Center
PhD, Electrical Engineering, MIT

Measurement and modeling of binaural hearing performance; Modeling the activity of auditory brainstem neurons and measurement and modeling of spatial attributes of sound perception.

EDWARD DAMIANO
Professor, Biomedical Engineering
PhD, Applied Mechanics, RPI

Integrated cellular and extracellular biomechanics; biofluid dynamics; microhemofluidics; microcirculation; vestibular biomechanics; non-Newtonian rheology; closed-loop blood-glucose regulation.



CHARLES DELISI
Metcalf Professor of Science and Engineering;
Dean Emeritus, College of Engineering
PhD, Physics, New York University

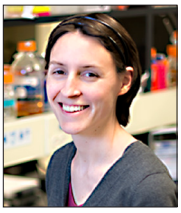
Developing and applying computational/mathematical methods, and high throughput experimental methods for inferring the structure and function of protein networks.

MICAH DEMBO
Professor, Biomedical Engineering
PhD, Biomathematics, Cornell University

Statistical mechanics in biological systems; cell information processing and signal transduction; thermodynamics and mechanics of cell adhesion; biophysics of cell deformation, active motility.

ALLISON M. DENNIS
Assistant Professor, Biomedical Engineering
PhD, Bioengineering, Georgia Institute of Technology

Nanobiotechnology; fluorescent biosensing; fluorescence resonance energy transfer (FRET); quantum dot chemistry; fluorescence microscopy; single molecule sensing/imaging.



MARY DUNLOP
Assistant Professor, Biomedical Engineering
PhD, Mechanical Engineering, California institute of Technology

Understanding how microorganisms use feedback to respond to changes in their environment, studying naturally occurring examples of feedback to understand their implications for survival in changing conditions, and engineering novel, synthetic feedback control systems.

SOLOMON EISENBERG
Professor, Biomedical Engineering;
Professor, Electrical and Computer Engineering;
Senior Associate Dean for Academic Programs,
College of Engineering
ScD, Electrical Engineering, MIT

Electrically mediated phenomena in tissues and biopolymers; cartilage biomechanics; computational modeling of electric field distributions in the human thorax and heart during defibrillation; transcranial magnetic stimulation.

MAXIM D. FRANK-KAMENETSKII
Professor, Biomedical Engineering
PhD, Biophysics, Moscow Physical-Technical Institute, ScD (IVth degree), Physical and Mathematical Sciences, Institute of Chemical Physics, USSR

DNA structures; DNA topology; DNA functioning; PNA (peptide nucleic acid).

JAMES GALAGAN
Associate Professor, Biomedical Engineering
and Microbiology, BUSM
PhD, Computational Neuroscience, MIT

Develop efficient and accurate methodologies for the analysis of genomic data, with a particular focus on infectious diseases.

MARK GRINSTAFF
Professor, Biomedical Engineering and Chemistry;
Director, Nanotechnology Innovation Center
PhD, University of Illinois at Urbana-Champaign

Biomaterials; tissue engineering; drug delivery; macromolecular chemistry and engineering, self-assembly; nanodevices.

XUE HAN

Associate Professor, Biomedical Engineering

PhD, Physiology, University of Wisconsin-Madison

Neurotechnology; optical neural modulation; optogenetics; neural prosthetics; neural network dynamics; brain rhythms; neurological and psychiatric diseases; cognition.

SIMON KASIF

Professor, Biomedical Engineering

PhD, Computer Science, University of Maryland

Bioinformatics; Computational Genomics; Algorithm Design; Artificial Intelligence; High Performance Systems.

AHMAD (MO) KHALIL

Assistant Professor, Biomedical Engineering

PhD, Mechanical Engineering, MIT

Synthetic biology; systems biology; programmable microfluidics; transcription regulation; mechanobiology; single-cell analysis; single-molecule biophysics.

CATHERINE KLAPPERICH

Professor, Biomedical Engineering;
Director, Precision Diagnostics Center;
Associate Dean for Research and Technology Development

PhD, Mechanical Engineering, University of California, Berkeley

Design of new molecular diagnostics and appropriate technologies for healthcare.

KENNETH R. LUTCHEN

Professor, Biomedical Engineering;
Dean, College of Engineering

PhD, Biomedical Engineering, Case Western

Airway and lung tissue mechanics and ventilation; Computational modeling of structure-function relations in the lung; Mechanical ventilation; Integrated biomechanics of the lung; linear and nonlinear systems identification; blood-glucose regulation.

JEROME MERTZ

Professor, Biomedical Engineering and Physics

PhD, Physics, Université Paris VI and University of California, Santa Barbara

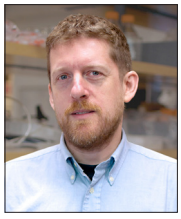
Development and application of new optical microscopy techniques to biological imaging.

JOHN NGO

Assistant Professor, Biomedical Engineering

PhD, Biochemistry and Molecular Biophysics California Institute of Technology

Fluorescence imaging; electron microscopy; protein and biomolecular engineering; localized translation; directed evolution.



JASON RITT

Assistant Professor, Biomedical Engineering

PhD, Neuroscience, Boston University

Neuroscience of sensorimotor behaviors; biological active sensing; role of embodiment in neural computation; brain machine interfaces; sensory prosthetics.

DARREN ROBLYER

Assistant Professor, Biomedical Engineering

PhD, Bioengineering, Rice University

Optical Functional Imaging; Diffuse Optics; Near Infrared Spectroscopy; Monitoring of Emerging Targeted and Cytotoxic Therapies in Oncology; Non-Invasive Monitoring of Tumor Metabolism.

KAMAL SEN

Associate Professor, Biomedical Engineering

PhD, Physics, Brandeis University

Electrophysiological recording of neural responses in auditory processing; theoretical methods to characterize neuronal encoding; computational models of natural sound processing.

ALLYSON SGRO

Assistant Professor, Biomedical Engineering

PhD, Chemistry, University of Washington

Developing a quantitative and predictive understanding of how cells coordinate their behavior and organize themselves as part of collectives by directly controlling cellular behavior and signaling

BARBARA G. SHINN-CUNNINGHAM

Professor, Biomedical Engineering;
Director, Center for Research in Sensory Communication and Emerging Neural Technology

PhD, EE and Computer Science, MIT

Auditory Neuroscience - Binaural and spatial hearing; perceptual effects of echoes and reverberation; speech and signal intelligibility in noise and reverberation; source segregation; auditory and cross-modal attention; plasticity and learning in spatial perception.

MICHAEL L. SMITH

Associate Professor, Biomedical Engineering

PhD, Biomedical Engineering, University of Virginia

Cellular mechanotransduction through the extracellular matrix; fibronectin structural biology; and microfabricated surfaces for engineering cell function.

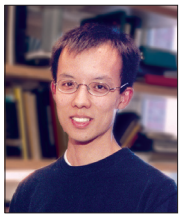
Primary Faculty Cont.

DIMITRIJE STAMENOVIĆ
Professor, Biomedical Engineering
PhD, Mechanics, University of Minnesota

Respiratory mechanics; cell mechanics; rheology of soft tissues; mechanics of foam-like structures.

BÉLA SUKI
Professor, Biomedical Engineering
PhD, Biomechanics, Jozsef Attila University, Szeged (Hungary)

Mechanical properties of living tissues; modeling the dynamic and nonlinear behavior of complex biological systems; pulmonary physiology.



JOE TIEN
Associate Professor, Biomedical Engineering
PhD, Physics, Harvard University

New techniques to vascularize biomaterials; focus on synthesis of microfluidic biomaterials (materials that contain open channels for perfusion); the quantitative physiology of engineered microvessels; the computational design of vascular systems.

LUCIA M. VAINA
Professor, Biomedical Engineering and Neurology
PhD, Mathematical Logic, Sorbonne, Doctorat d'Etat ès Sciences and in Médecine (MD PhD); Institut National Toulouse, France

Behavioral, functional imaging (fMRI and MEG) and theoretical & computational approaches to study the neural basis and the plasticity of high-level visual functions in the human brain.

SANDOR VAJDA
Professor, Biomedical Engineering;
Director, Biomolecular Engineering Research Center
PhD, Chemistry, Hungarian Academy of Science

Scientific computing applied to problems in engineering, biochemistry, and biology, with focus on molecular mechanics, protein structure determination, protein-ligand interactions, docking, and drug design.

HERBERT F. VOIGT
Professor, Biomedical Engineering
PhD, Biomedical Engineering, Johns Hopkins University

Auditory neurophysiology; neural circuitry; neural modeling.

JOHN WHITE
Professor and Chair, Biomedical Engineering
PhD, Biomedical Engineering, Johns Hopkins University

Mechanisms of Episodic Memory; Pathophysiology of Epilepsy; Computational Neuroscience; Design of Real-Time Instrumentation; Imaging of Activity in Neurons and Astrocytes.

JOYCE WONG
Professor, Biomedical Engineering
PhD, Materials Science and Engineering, Program in Polymer Science and Technology, MIT

Biomaterials, tailoring cell-material interfaces for drug delivery and tissue engineering applications; direct, quantitative measurement of biological interactions.

WILSON WONG
Assistant Professor, Biomedical Engineering
PhD, University of California Los Angeles

Synthetic and Systems Biology in immune cells.

MUHAMMAD ZAMAN
Professor, Biomedical Engineering
PhD, Physical Chemistry University of Chicago

Comprehensive and quantitative approaches to develop a multiscale understanding of cell-matrix interactions for fundamental biological and applied clinical research.

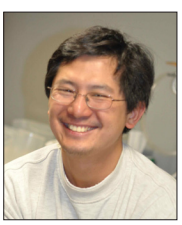
LECTURERS

JONATHAN ROSEN
Master Lecturer and Adjunct Professor, Biomedical Engineering;
Director, Professional Masters Programs
PhD, Biomaterials Engineering, Case Western Reserve University

Medical technologies for global health; pediatric and neonatal surgery systems.

WYNTER DUNCANSON
Lecturer,
Biomedical Engineering
PhD, Biomedical Engineering, Boston University

BE465, BE466, Senior Design



ANDY FAN
Lecturer,
Biomedical Engineering
PhD, Electrical Engineering, MIT

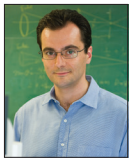
BE601, BE601, BE603, BE604, Mathematical Methods for Biomedical Engineering

Research Faculty

ELIZABETH BARTOLAK-SUKI
Research Assistant Professor, Biomedical Engineering
MD, General Medicine, Szent-Gyorgyi Medical School, Szegred, Hungary;
DSc, Molecular Cell biology, Semmelweis Medical School, Budapest, Hungary
Inter/intracellular signaling and molecular/ medical pathology.

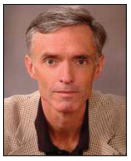
DIMITRI BEGLOV
Research Assistant Professor, Biomedical Engineering
PhD, Molecular Biophysics, Moscow Physical and Technical Institute
Computational chemistry and biology; protein structure and function; computational characterization and prediction of biomolecular interactions.

KATIE BENTLEY
Research Assistant Professor, Biomedical Engineering
PhD, Computer Science University College, London, UK
Integration of computer simulation with biological experimentation to understand the spatiotemporal dynamics of individual to collective cell behavior, during vascular morphogenesis, in health and disease.



MARIO CABODI
Research Assistant Professor, Biomedical Engineering
PhD, Cornell University
Microfluidic devices; tissue engineering, and biomaterials.

AARON COLBY
Research Assistant Professor, Biomedical Engineering
PhD, Biomedical Engineering, Boston University
Developing novel delivery systems including nanoparticles and drug concentrating devices as tools for treating cancer.



JAMES J. COLLINS
Research Professor; Biomedical Engineering
PhD, Mechanical Engineering, University of Oxford
Synthetic biology, systems biology, engineering gene networks

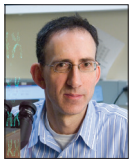
AURELIE EDWARDS
Research Professor, Biomedical Engineering
PhD, Chemical Engineering, MIT
Developing Mathematical Models of water and solute transport in the kidney, at different scales, to address physiological and pathological questions.

DANIEL EHRLICH
Research Professor, Biomedical Engineering
PhD, Optical Engineering, University of Rochester
Optics, lithography, biosensors and biomolecular assays, with a current emphasis on microfluidic instruments for high-content, high-throughput cell-based assays and deep-UV imaging.

FERNANDO FERNANDEZ
Research Assistant Professor, Biomedical Engineering
PhD, Neuroscience, University of Calgary
Electrophysiology, biophysics and computational neuroscience; understanding the underlying mechanisms of neuronal electrical activity and its implications for synaptic integration and spike output modulation in cortical circuits.

ODED GHITZA
Research Professor, Biomedical Engineering
PhD, Electrical Engineering, Tel Aviv University
Dr. Ghitza's current research focuses on the formulation of cortical computation principles that underlie the speech decoding process and that are capable of predicting human performance in speech perception tasks.

DMYTRO KOZAKOV
Research Associate Professor, Biomedical Engineering
PhD, Biomedical Engineering, Boston University
Development of protein-protein and protein-ligand docking algorithms, fast and efficient scoring functions for screening large number of potential docked complexes, protein homology models suitable for docking.



AMIT MELLER
Research Professor; Biomedical Engineering
PhD, Physics, Weizmann Institute of Science
Nanoforce Spectroscopy of RNA folding kinetics, DNA switches and transcription initiation kinetics, RNA helicase activity, transcription factor DNA/interaction ultra fast DNA sequencing, optical methods for single molecule detection.

IRINA V. SMOLINA
Research Associate Professor, Biomedical Engineering
PhD, Molecular Biology, Institute of Bioorganic Chemistry, Russian Academy of Science
Development of novel sensitive and selective techniques for molecular diagnostics; exploring the possible use of biological and synthetic DNA analogs for applications in bioengineering, molecular imaging and single-molecule analysis; new methodologies for multiplexed detection and target quantification.

BRIAN SNYDER
Research Professor, Biomedical Engineering
MD and PhD, Biomechanics, University of Pennsylvania
Basic and applied research in musculoskeletal biomechanics, cellular processes, and gene expression.

THOMAS L. SZABO
Research Professor, Biomedical Engineering
PhD, Physics, University of Bath, UK
Medical imaging, diagnostic ultrasound, tissue characterization, transduction, biomedical signal processing, wave propagation, nonlinear acoustics.

Emeritus

CHARLES CANTOR, PHD
Professor Emeritus, Biomedical Engineering
crcantor@bu.edu

EVAN EVANS, PHD
Research Professor Emeritus, Biomedical Engineering
cjd@bu.edu

ARTHUR ROSENTHAL, PHD
Professor of Practice Emeritus, Biomedical Engineering
arosenth@bu.edu

TEMPLE F. SMITH, PHD
Professor Emeritus, Biomedical Engineering
tsmith@bu.edu

MALVIN C. TEICH, PHD
Professor Emeritus, Electrical & Computer Engineering; Physics; Biomedical Engineering
teich@bu.edu

Adjunct Faculty

HERNAN JARA, PHD
Adjunct Associate Professor, Biomedical Engineering; Associate Professor of Radiology, BUSM

Affiliated Faculty

MARGRIT BETKE, PHD
Professor, College and Grad School of Arts & Sciences - Computer Science

DAVID CENTER, MD
Professor of Pulmonary Medicine, Medicine, and Biochemistry; Chief of Allergy, Pulmonary and Critical Care Medicine, BUSM

JERRY CHEN, PHD
Assistant Professor, Biology

CHRISTOPHER CONNOR, MD, PHD
Assistant Professor, Anesthesiology, BUSM

DOUGLAS DENSMORE, PHD
Associate Professor, Electrical and Computer Engineering

HOWARD EICHENBAUM, PHD
Professor, Psychological and Brain Sciences; Director, Center for Memory and Brain

THOMAS EINHORN, MD
Professor, Orthopedic Surgery; Chairman, Orthopedic Surgery, BUSM

SHYAMSUNDER ERRAMILLI, PHD
Professor, Physics

TIMOTHY GARDNER, PHD
Associate Professor, Biology

CAROLINE ATTARDO GENCO, PHD
Professor, Medicine and Microbiology, BUS

LEE GOLDSTEIN, MD, PHD
Associate Professor, Psychiatry, Neurology, Opthalmology, Pathology and Laboratory Medicine, BUSM

STEPHEN GROSSBERG, PHD
Professor, Mathematics; Psychology

FRANK GUENTHER, MS, PHD
Professor, Sargent College, Speech Language and Hearing Science

JAMES A. HAMILTON, PHD
Professor, Physiology and Biophysics, BUSM

MICHAEL HASSELMO, PHD
Professor, Biology; Director, Center for Systems Neuroscience

ALLYN E. HUBBARD, PHD
Professor, Electrical and Computer Engineering

LAERTIS IKONOMOU, PHD
Assistant Professor, Medicine, BUSM

W. CLEMENT KARL, PHD
Professor, Electrical and Computer Engineering

NANCY KOPELL, PHD
Professor, Mathematics

PANKAJ MEHTA, PHD
Associate Professor, Physics

ELISE F. MORGAN, PHD
Professor, Mechanical Engineering

S. HAMID NAWAB, PHD
Professor, Electrical and Computer Engineering

GEORGE O'CONNOR, MD, MS
Professor, Medicine, BUSM

BU BME HIGHLIGHTS

DELISI DISTINGUISHED LECTURE

Joyce Wong Highlights **Collaboration and Research** in Biomaterials to Treat Disease

Throughout her presentation, Wong stressed the important role global collaboration and how it has helped her research projects move forward.

The DeLisi Distinguished Lecture Award recognizes faculty members with extraordinary records of well-cited scholarship and outstanding alumni who have invented and mentored transformative technologies that impact quality of life.

IOANNIS PASCHALIDIS, PHD
Professor, Electrical and Computer Engineering

TYRONE M. PORTER, PHD
Associate Professor, Mechanical Engineering

DANIEL SEGRÈ, PHD
Associate Professor, Biology

SATISH K. SINGH, MD
Associate Professor, Gastroenterology, BUSM

H. EUGENE STANLEY, PHD
Professor, Physics; Chemistry

CARA STEPP, PHD
Assistant Professor, Sargent College, Speech, Language & Hearing Science

M. SELIM ÜNLÜ, PHD
Professor, Electrical and Computer Engineering

ARTURO VEGAS, PHD
Assistant Professor, Chemistry

DAVID WAXMAN, PHD
Professor, Biology; BioInformatics; Medicine

ALICE WHITE, PHD
Professor and Chair, Mechanical Engineering

KATHERINE YANHANG ZHANG, PHD
Professor, Mechanical Engineering

Postdocs

SENIOR POSTDOCTORAL ASSOCIATES

Baker, Brendon *(Chen)*
Choi, Colin *(Chen)*
Gritton, Howard *(Han)*
Parameswaran, Harikrishnan *(Lutchen)*
Tseng, Hua-an *(Han)*

POSTDOCTORAL ASSOCIATES

Agrawal, Deepak *(Dunlop)*
Akintewe, Olukemi *(Wong J)*
Alimperti, Stella *(Chen)*
Applegate, Matthew *(Roblyer)*
Badon, Amaury *(Mertz)*
Bano, Ishrat *(Zaman)*
Bellas, Evangelia *(Chen)*
Bloom, Alexander *(Zaman)*
Brot, Hilla *(Galagan)*
Chiesa, Giulio *(Khalil)*
Chopra, Anant *(Chen)*
Daringer, Nichole *(Collins)*
Dutta, Palash *(Chen)*
El Meouche, Imane *(Dunlop)*
Ferruzi, Jacopo *(Zaman)*
Gamble, Marissa *(Shinn-Cunningham)*
Han, Xiaoxing *(Mertz)*
Heydrick, Stanley *(J Wong)*
James, Nicholas *(Han)*
Jennings, Todd *(Colburn)*
Kim, Jaeyun *(J Wong)*
Kim, Sudong *(Chen)*
Kutys, Matthew *(Chen)*
Lee, Elaine *(Wong)*
Lee, Esak *(Chen)*
Li, Huishan *(Wong W)*
Li, Linqing *(Chen)*
Maleki-Tabriz, Nahal *(Galagan)*
Mirabella, Teodelinda *(Chen)*
Mohammed, Ali *(Han)*
Okuma, Atsushi *(Wong W)*
Pera, Vivian *(Roblyer)*
Polio, Samuel *(Parameswaran)*
Polacheck, William *(Chen)*
Reed, Darrin *(Shinn-Cunningham)*
Spill, Fabian *(Zaman)*
Tang, Jisi *(Vajda)*
Williamson, Ross *(Shinn-Cunningham)*
Yang, Jinling *(Chen)*
Yildrim, Funda *(Vaina)*

Research Staff

SENIOR RESEARCH SCIENTISTS

A'amar, Ousama *(Bigio)*
Cariani, Peter *(Colburn)*
Delhorne, Lorraine *(Colburn)*
Desai, Darash *(Zaman)*
El-Khatib, Firas *(Damiano)*
Ketten, Darlene *(Colburn)*
Klossvary, Igor *(Vadja)*

SENIOR RESEARCH ENGINEERS

Bressler, Scott *(Shinn-Cunningham)*

RESEARCH SCIENTISTS

Buczek-Thomas, Joann *(J Wong)*
Dreyfuss, Jonathan *(Kasif)*
Eyckmans, Jeroen *(Chen)*
Fan, Andy *(Klapperich)*
Jiang, John *(Damiano)*
Kilic, Kivilcim *(Boas)*
Mineava, Olga *(Goldstein)*
Pan, Hui *(Kasif)*
Varghese, Lenny *(Shinn-Cunningham)*
Wang, Le *(Shinn-Cunningham)*

RESEARCH ENGINEERS

Voysey, Graham *(Colburn)*

RESEARCH TECHNICIANS

Ching, Kimberley *(Han)*
Chinnala, Jyothsna *(Unlu)*
Irani, Atena *(Zaman)*
Keenan, Benjamin *(J Wong)*
Kelleher-Tang, Laurie *(Chen)*
Khalil, Haytham *(Khalil)*
Lambert, Katherine *(White)*
LeBourdais, Robert *(Damiano)*
Nadkarni, Devika *(Zaman)*
Nguyen, Thuy *(Dennis)*
O'Donovan, Alexander *(Damiano)*
Palmiere, Michael *(Ritt)*
Pant, Asha *(Roblyer)*
Selagamsetty, Rajendranath *(Damiano)*
Wakefield, Amanda *(Vajda)*
Zhang, Xiaoman *(Galagan)*

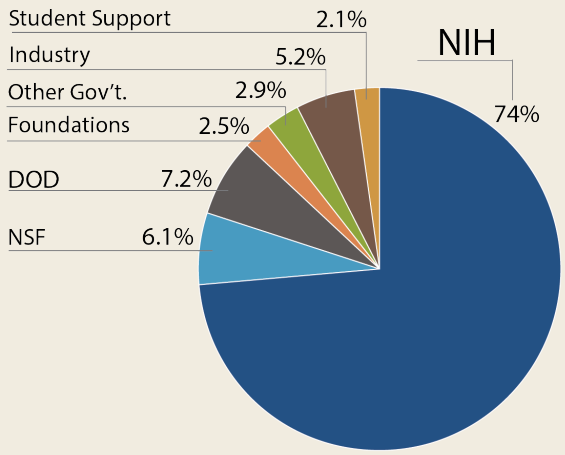
EXTERNAL RESEARCH FUNDING

Boston University's Biomedical Engineering Department maintains a vibrant research program in its approximately 73,000 square feet of space at 24-44 Cummington Mall on Boston University's Charles River Campus. We are comprised of 31 separate research laboratories, and our faculty lead 7 research centers.

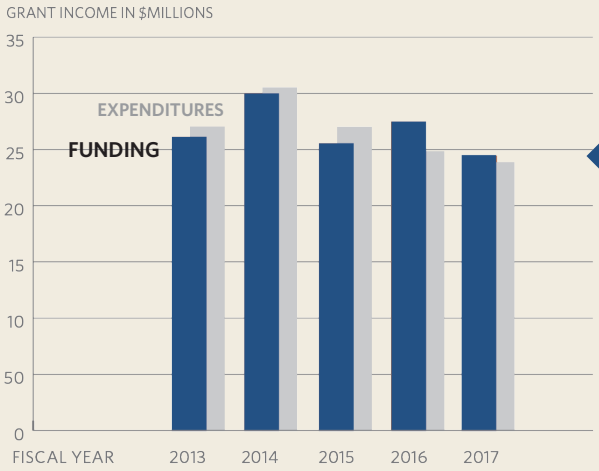
The research can be characterized by a combination of:

- Empirical and theoretical work with an attention to explicit mathematical models for the phenomena under study
- Intensive computer use for experimental and theoretical work
- A basic scientific flavor to the fundamental questions being asked
- An attention to the applications of improving health care, and a thorough understanding of the underlying physiological processes
- 3 NIH Training Grants funding 13 PhD students

BME GRANT FUNDING BY AGENCY



BME FACULTY ANNUAL TOTAL GRANT FUNDING



For new research funding, our faculty received

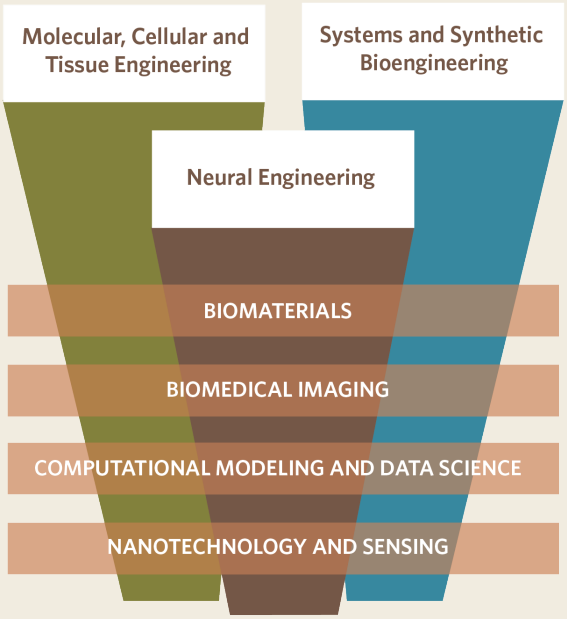
$24,525,841 *(7/1/16 - 6/30/17)*

85 NEW AND CONTINUING AWARDS were funded.

$129 MILLION in research proposals were submitted.

BU BME RESEARCH AREAS

We have world leaders in these areas of research: Synthetic and Systems Bioengineering, Molecular-Cellular-Tissue Engineering, and Neural Engineering, using the enabling technologies including Biomaterials, Biomedical Imaging, Computation Modeling and Data Sciences, and Nanotechnology and Sensing.



BU RESEARCH CENTERS

BU has seven interdisciplinary research centers that are directed by BME faculty:

BMERC — Biomolecular Engineering Research Center
Developing and applying computational methods for the analysis and design of structures, functions, interactions, regulation and evolution of biological macromolecules

CRESCENT — Center for Research in Sensory Communication and Emerging Neural Technology
Supporting basic research in the neuroscience of sensation and communication as well as technology development relevant to this research center for innovation in nonotechnology

BUnano — Nanotechnology Innovation Center
Where nanomaterials intersect medicine and energy through collaborative interdisciplinary research

BDC — Biological Design Center
To rigorously understand life's design principles and re-engineer them to revolutionize our approach to addressing critical challenges in human health and the environment

PDC — Precision Diagnostics Center
Discovery, design and development and clinical translation of technology for disease screening and monitoring, treatment management and health maintenance

NPHC — Neurophotonics Center
Advancing our understanding and treatment of brain disorders through advanced optical science and photonic systems

HRC — Hearing Research Center
Development and dissemination of knowledge that will improve the nation's auditory health and allow the fullest utilization of the sense of hearing

NIH AWARDS

PI	Award Title	Prime Sponsor	$ Amount
CHEN	APOE HDL, ARTERIAL BIOMECHANICS AND CARDIOVASCULAR DISEASE	NHLBI (sub UPENN)	74,087
CHEN	A VASCULARIZED 3-D BIOMIMETIC FOR ISLET FUNCTION AND PHYSIOLOGY	NIDDK (sub UPENN)	68,754
CHEN	RESBIO III: THE TECHNOLOGY RESOURCE FOR POLYMERIC BIOMATERIALS	NIBIB (sub Rutgers)	119,357
CHEN	ENGINEERING MULTICELLULAR TISSUE STRUCTURE, FUNCTION AND VASCULARIZATION	NIBIB	742,637
CHEN	LOCAL REGULATION OF ANGIOGENESIS BY MICROENVIRONMENT	NIBIB	370,125
CHEN	MECHANOELECTRICAL INTERACTIONS BETWEEN CARDIAC MYOFIBROBLASTS AND MYOCYTES	NHLBI (sub Johns Hopkins U)	157,006
CHEN	BILLING AGREEMENT FOR OFF-CAMPUS FUNDING: CHEN, ALIMPERTI, KELLEHER, LI, MIRABELLA, YANG	NIBIB (sub Wyss Inst)	220,223
CHEN	ENGINEERED HUMAN FAT DEPOTS ON A CHIP	NIDDK (sub Augusta U)	584,753
CHEN	STIFFNESS, CADHERINS, AND INTEGRINS IN MECHANOCHEMICAL SIGNALING	NHLBI (sub UPENN)	198,584
COLBURN	BINAURAL HEARING	NIDCD	542,053
DUNLOP	FEEDBACK AND NOISE IN A MULTIPLE ANTIBIOTIC RESISTANCE CIRCUIT	NIAID	469,303
EL-KHATIB	FINAL CLINICAL STUDIES FOR SUBMISSION OF A PRE-MARKET APPROVAL APPLICATION TO THE FDA FOR A BIONIC PANCREAS THAT AUTOMATES TYPE 1 DIABETES MANAGEMENT	NIDDK	11,957,319
EVANS	VISUALIZING SINGLE INTEGRIN CONFORMATIONAL CHANGES ON LIVING CELLS	NIAID (sub GA Tech)	8,104
GALAGAN	GLOBAL MAPPING AND ANALYSIS OF BACTERIAL TRANSCRIPTIONAL REGULATORY NETWORK	NIGMS	1,085,208
GALAGAN	PREDICTIVE MODELING OF THE MYCOBACTERIUM TUBERCULOSIS REGULATORY AND METABOLIC NETWORKS	NIAID	411,250
GRINSTAFF	DISSOLVABLE HYDROGEL DRESSING FOR THE TREATMENT OF BURNS	NIBIB	379,126
GRINSTAFF	EFFICACY AND SAFELY OF A NOVEL, IMPLANTABLE DRUG-ELUTING FILM IN SARCOMA	NIBIB (sub BWH)	110,768
GRINSTAFF	TRANSLATIONAL RESEARCH IN BIOMATERIALS	NIBIB	281,172
HAN	CHARATERIZE FUNCTIONAL CONNECTIVITIY OF HIPPOCAMPAL ADULT BORN NEUROGENESIS DURING CRITICAL PERIOD	NIMH	185,062
HAN	CAUSAL ANALYSIS OF ELECTRICALLY CONNECTED NEURAL NETWORKS	NINDS	323,550
HAN	LIGHT-ACTUATABLE NANOROBOTS FOR MOLECULAR UNCAGING	NINDS	493,750
KASIF	EXPANSION OF THE DIABETES RESEARCH CENTER'S PILOT AND FEASIBILITY PROGRAM	NIDDK (sub Joslin)	99,999
KASIF	DIABETES RESEARCH CENTER-GENOMICS CORE	NIDDK (sub Joslin)	236,689
KHALIL	COMBATING ANTIBIOTIC RESISTANCE WITH SYNTHETIC BIOLOGY TECHNOLOGIES	NIAID	2,472,375
KLAPPERICH	RAPID MOLECULAR DIAGNOSTS FOR CHLAMYDIA AND GONORRHEA AT THE POINT-OF-CARE	NIAID	409,039
KLAPPERICH	RAPID PAPER-BASED DIAGNOSTICS OF CT/TRICH	NIAID (sub Micro Analysis LLC)	50,247
KLAPPERICH	CENTER FOR INNOVATION IN POINT OF CARE TECHNOLOGIES FOR THE FUTURE OF CANCER CARE	NIBIB	1,775,820
MERTZ	HIGH RESOLUTION PHASE CONTRAST ENDOSCOPY	NCI	345,234
MERTZ	ULTRA-MINIATURIZED SINGLE FIBER PROBE FOR FUNCTIONAL BRAIN IMAGING IN FREELY MOVING ANIMALS	NEI	246,750
MERTZ	HIGH DYNAMIC RANGE MULTIPHOTON MICROSCOPY FOR LARGE-SCALE IMAGING	NEI	239,010
RITT	SPATIOTEMPORAL CONTROL OF LARGE NEURONAL NETWORKS USING HIGH DIMENSIONAL OPTIMIZATION	NEI	254,496
SHINN-CUNNINGHAM	INDIVIDUAL DIFFERENCES IN SUPRA-THRESHOLD SOUND ENCODING	NIDCD	347,863
SHINN-CUNNINGHAM	TRAINING IN COMPUTATIONAL NEUROSCIENCE: INTEGRATING EXPERIMENT, THEORY, AND TECHNOLOGY	NIDA	155,706
SUKI	PERSONALIZED MECHANICAL VENTILATION FOR THE INJURED LUNG	NHLBI (sub U Vermont)	230,703
TIEN	ENGINEERED INVASIVE HUMAN BREAST TUMORS WITH INTERGRATED CAPILLARIES AND LYMPHATICS	NCI	571,159
TIEN	(RE)VASCULARIZATION OF DECELLULARIZED SCAFFOLDS	NIBIB	82,250
VAJDA	ANALYSIS AND PREDICTION OF MOLECULAR INTERACTIONS	NIGMS	512,029

NIH AWARDS Cont.

PI	Award Title	Prime Sponsor	$ Amount
WHITE	CALCIUM SIGNALING IN A MODEL OF TEMPORAL LOBE EPILEPSY	NINDS (sub U of Utah)	184,605
WHITE	REAL-TIME CONTROL SYSTEM FOR BIOLOGICAL EXPERIMENT	NIBIB (sub Cornell U)	32,130
WONG J	DOUBLE-REPORTER INDUCED PLURIPOTENT STEM CELLS FOR VACULAR CELL SHEET ENGINEERING	NHLBI	31,529
WONG J	MODELS TO PREDICT PROTEIN BIOMEDICAL PERFORMANCE	NIBIB (sub Tufts)	186,810
ZAMAN	PHYSICS OF COLLECTIVE CELLULAR MIGRATION IN LUNG HEALTH AND DISEASE	NHLBI (sub Harvard)	186,140
ZAMAN	EPITHELIAL LAYER JAMMING IN CANCER CELL MIGRATION	NCI (sub Harvard)	106,964
ZAMAN	MODELING BI-DIRECTIONAL SIGNALING AND CYTOSKELETAL DYNAMICS IN 3D CELL MIGRATION	NCI	571,427

NSF AWARDS

PI	Award Title	Prime Sponsor	$ Amount
CHEN	SCIENCE AND TECHNOLOGY CENTER FOR ENGINEERING MECHANO-BIOLOGY	NSF (sub UPENN)	54,567
GRINSTAFF	GLYCEROL POLYCARBONATES AS NEW BIOMATERIALS	NSF	60,420
KHALIL	CAREER: EVOLUTION AND ENGINEERING OF CELLULAR BET-HEDGING DEVICES	NSF	153,222
VAJDA	AF: SMALL: MANIFOLD OPTIMIZATION ALGORITHMS FOR PROTEIN-PROTEIN DOCKING	NSF (sub SUNY)	82,903
WONG W	CAREER: DECIPHERING AND RECORDING TEMPORAL EVENTS IN MAMMALIAN CELLS USING SYNTHETIC BIOLOGY	NSF	200,886
WONG W	BILATERAL BBSRC/NSF/BIO:REWRITABLE BIOCOMPUTERS IN MAMMALIAN CELLS	NSF	664,746
WONG W	EAGER: BIOMANUFACTURING: ENGINEERING GENETIC CLASSIFIERS TO INCREASE THE HOMOGENEITY OF CAR T CELLS WITH CENTRAL MEMORY PHENOTYPE	NSF	299,307

AWARDS FROM FOUNDATIONS

PI	Award Title	Prime Sponsor	$ Amount
DAMIANO	THE SET-POINT STUDY: EVALUATING EFFECTS OF CHANGING GLUCOSE TARGET ON BIONIC PANCREAS PERFORMANCE	HELMSLEY CHARITABLE TRUST (sub MGH)	109,669
KHALIL	DETECTING ANTIBIOTIC RESISTANCE WITH RAPID RNA SENSORS	Hartwell Fndn	100,000
SGRO	GREATER AS A WHOLE: BRIDGING INTRACELLULAR SIGNALING AND POPULATION BEHAVIORS IN COLLECTIVE SYSTEMS	Burroughs Wellcome Fund	395,000

AWARDS FROM DOD

PI	Award Title	Prime Sponsor	$ Amount
COLBURN	CHINCHILLA AND HUMAN ORGAN OF CORTI PROPERTIES	DOD/AMRO (sub L-3 Applied Tech Inc)	70,000
DUNLOP	ACHIEVING CLOSED-LOOP RNA-BASED CONTROL WITH A CELL-FREE TESTBED	DOD/DARPA (sub U Minnesota)	202,900
HAN	NEW TOOLS AND PRINCIPLES FOR UNDERSTANDING THE BIOPHYSICAL MECHANISMS OF ULTRASOUND NEUROMODULATION	DOD/DARPA	249,845
KHALIL	ADVANCED GENETIC CONTROL FOR GENE THERAPY USING SYNTHETIC BIOLOGY	DOD/DARPA	469,341

AWARDS FROM OTHER GOVERNMENT AGENCIES

PI	Award Title	Prime Sponsor	$ Amount
BIGIO	PERSONNEL AGREEMENT FOR RESEARCH SERVICES OF ELADIO RODRIGUEZ-DIAZ	VA BOSTON	90,170
ZAMAN	PHARMACHK: SUBSTANDARD AND COUNTERFEIT MEDICINES RAPID DETECTION AND SCREENING PLATFORM	USAID	633,289

AWARDS FROM INDUSTRY

PI	Award Title	Prime Sponsor	$ Amount
BIGIO	DEVELOPMENT OF OPTICAL INSTRUMENTS FOR SENSING SKIN DISEASE	DERMASENSOR, INC.	112,062
CHEN	EVALUATION OF LOX(L) FAMILY INHIBITORS ON MATRIX REMODELING IN AN ENGINEERED 3D MICROTISSUE MECHANICAL TESTING	PHARMAKEA, INC.	112,992
COLBURN	HOW THE BRAIN CREATES A SENSE OF AUDITORY SPACE	AUSTRALIAN RESEARCH COUNCIL (sub Macquirie U)	110,529
COLBURN	COMPREHENSIVE MODELS OF HEARING IN TWO SPECIES OF MYSTICETES	Int'l Assoc of Oil and Gas	250,000
GRINSTAFF	BASIC RESEARCH ON NEW IONIC LIQUID ELECTROLYTES: SYNTHESIS	Samsung	119,999
KASIF	BILLING AGREEMENT FOR JONATHAN DREYFUSS	Joslin Diabetes Ctr	16,016
KASIF	BILLING AGREEMENT FOR HUI PAN	Joslin Diabetes Ctr	90,160
KHALIL	SPONSORSHIP OF THE FOURTH INTERNATIONAL MAMMALIAN SYNTHETIC BIOLOGY WORKSHOP	PFIZER, INC.	10,000
WONG J	ATHEROSCLEROTIC RESERVOIRS: CONTROLLING ASPHALTENES' DESTABILIZATION USING NANOPARTICLES IN MICROMODELS	SHELL INT'L	145,000
ZAMAN	NEW AWARDS FOR SCIENCE EDUCATION TO HHMI PROFESSORS	HHMI	200,000
ZAMAN	APTAMER DEVELOPMENT PARTNERSHIP	GLAXOSMITHKLINE R&D	101,495
ZAMAN	CO-ARTEM TESTING ON PHARMACHK	NOVARTIS PHARMA AG	9,870

AWARDS FOR STUDENT FUNDING

PI	Award Title	Prime Sponsor	$ Amount
BIGIO	BILLING AGREEMENT FOR HAO LI - RESPIRATORY GATING RECONSTRUCT	JIANGSU SAINUOGELAN MED TECH CTR (sub MGH)	23,364
COLLINS	BILLING AGREEMENT FOR LIN JIN	NASA (sub MGH)	38,597
DELISI	BILLING AGREEMENT FOR ARJAN VAN DER VELDE	NIGMS (sub UMASS)	48,296
DELISI	EDAC: ENCODE DATA ANALYSIS CENTER/ BILLING AGREEMENT FOR ARJAN VAN DER VELDE	NICHD (sub UMASS)	41,138
GRINSTAFF	CBL GRADUATE FELLOWSHIP FOR SAMANTHA BERRY	Henry Luce Fndn	74,588
KHALIL	BILLING AGREEMENT FOR JAMES CHUANG	NIGMS (sub Harvard)	9,649
SEN	BILLING AGREEMENT FOR YAQING SU	MEEI	38,597
STAMENOVIC	BILLING AGREEMENT MINGXIN ZHENG	DOD/AMRO (sub BIDMC)	38,597
SUKI	BILLING AGREEMENT FOR PEIJIANG WANG	MIT	41,654
VAINA	BILLING AGREEMENT TO SUPPORT KUNJAN RANA	Draper Lab	73,738
VAINA	BILLING AGREEMENT FOR JIARUI YANG	JIANGSU SAINUOGELAN MED TECH CTR (sub MGH)	35,088
WONG J	HARVARD MEDICAL SCHOOL - PORTUGAL PROGRAM IN TRANSLATIONAL RESEARCH AND INFORMATION (BILLING AGREEMENT - DONGJIAN HU)	MGH (sub Harvard)	12,046
WONG J	DOMIAN SUNDRY FUND (BILLING AGREEMENT - DONGJIAN HU)	MGH	24,798

Coulter Foundation Translational Partnership

For the past ten years, the mission of the Coulter Translational Partnership (CTP) program has been to promote, develop and support translational research collaborations between biomedical engineers and clinicians in order to accelerate the successful translation of appropriate innovations to improve patient care. For the past 5 years, the Coulter Foundation commitment provided $500,000 per year with an equivalent cost share provided by the university.

- **Electromagnetic Metamaterials: Potentiating Magnetic Resonance Imaging ($99,632)**
  ZHANG AND ANDERSON
- **Single-molecule Counter for High-Throughput Allergy Diagnostics ($99,995)**
  UNLU AND LITTLE
- **qOximetry: A new real-time Intravital Optical Oxygenation Monitoring Technique for Improved Patient Care ($100,139)**
  ROBLYER
- **Evaluation of Low-cost Manufacturing Methods for Paper Microfluidics ($149,228)**
  KLAPPERICH
- **Nucleic Acid Isolation and Enrichment Kit ($100,000)**
  GRINSTAFF
- **A Rapid and Sensitive Antibiotic Test for Pediatric Urinary Tract Infections ($83,934)**
  EKINCI

Seed Funding Awards ($25,000 each)

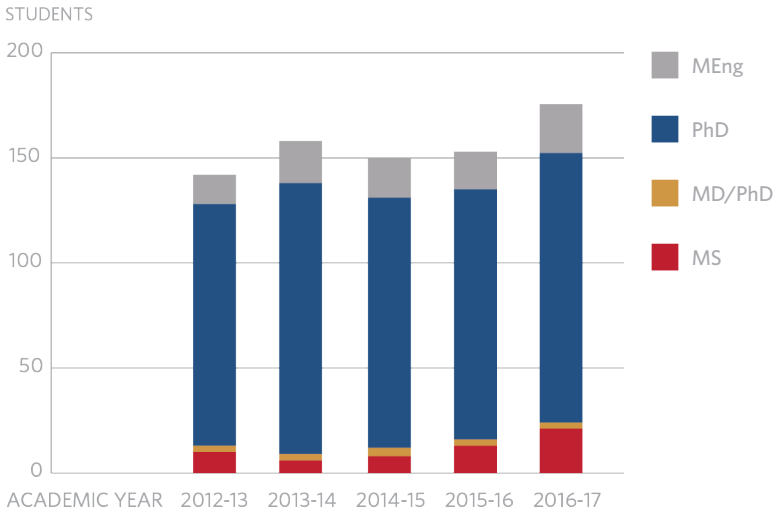
- **Natural Ribcage Retraction During Internal Mammary Artery Harvesting**
  ROSEN
- **Neonatal Vitals Monitor (2)**
  ROSEN
- **Pediatric Head Stabilization System for Neuro Surgery**
  ROSEN
- **Novel Polymer Depot for Oxytocin Delivery**
  GRINSTAFF
- **Next-generation, Cartilage-lubricating Injectable Device**
  GRINSTAFF

Graduate Enrollment

ENROLLMENT FOR AY 2016-2017

DEGREE		MS	MD/PhD	PhD	MEng	TOTAL
US	M	12	3	47	11	**73**
	F	3	0	40	10	**53**
INT'L	M	3	0	24	0	**27**
	F	4	0	20	2	**26**
TOTAL		**22**	**3**	**131**	**23**	**179**

GRADUATE PROGRAM POPULATION

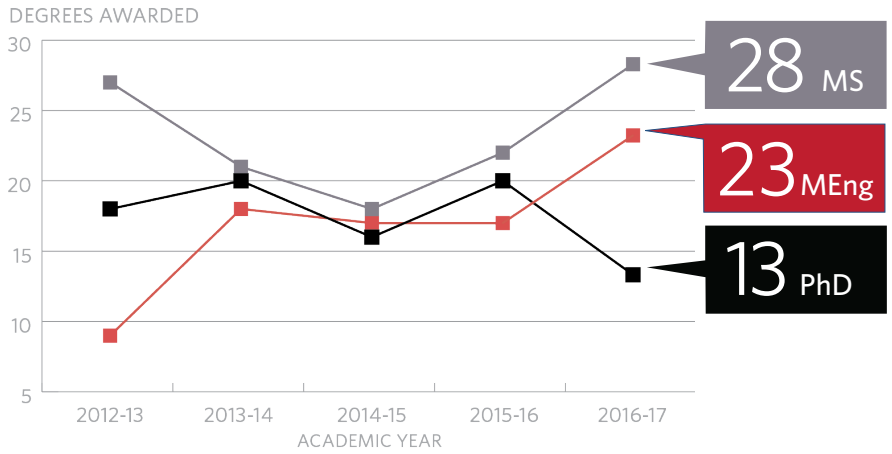


GRADUATE FUNDING AY 2016-2017

FELLOWSHIPS AND GRANTS	PhDs
Research Fellows	98
BME Distinguished Fellowships	16
NIH Quantitative Biology and Physiology Training Grant	7
NIH Biomaterials Training Grant	6
NSF Fellowship	8
BUSM Infectious Diseases Training Grant	1
HHMI Fellowship	1
Clare Booth Luce Fellowship	1
Ford Foundation Fellowship	1
BU-BWH Imaging Fellowship	3
BUnano Fellowship	2
Computational Neuroscience Fellowship	2
BUSM Pulmonary Training Grant	1
NIH Fellowship	6
TOTAL	**153**

Graduate Degrees Awarded

DEGREES AWARDED



ADMISSION RESULTS FOR AY 2016-2017

		APPLICANTS				MATRICULATIONS			
		MEng	MS	PhD	TOTAL	MEng	MS	PhD	TOTAL
US	M	32	62	163	257	7	8	9	24
	F	36	59	137	232	9	13	6	28
INT'L	M	23	56	103	182	0	3	4	7
	F	21	55	87	163	1	1	4	6
TOTAL		**112**	**232**	**490**	**834**	**17**	**25**	**23**	**65**

ADMISSION PROJECTIONS FOR FALL 2017

		APPLICANTS					ACCEPTED OFFERS				
		LEAP	MEng	MS	PhD	**TOTAL**	LEAP	MEng	MS	PhD	**TOTAL**
US	**M**	25	42	60	158	285	10	11	11	21	53
	F	14	31	31	148	224	2	6	2	5	15
INT'L	**M**	2	20	57	128	207	0	1	5	7	13
	F	3	18	64	48	133	0	1	6	5	12
TOTAL		**44**	**111**	**212**	**482**	**849**	**12**	**19**	**24**	**38**	**93**

PHD Graduates 2016

THESIS TITLE & ADVISOR(S)

SEPTEMBER 25, 2016

Erika Jo Fong
(Maxim Shusteff and Muhammad Zaman, Advisors)
"Microscale Methods to Investigate and Manipulate Multispecies Biological Systems"

JANUARY 25, 2017

Ali Hussein Badreddine
(Irving Bigio, Advisor)
"Optical Tracking of Nerve Activity Using Intrinsic Changes in Birefringence"

Laura Catherine Blaha
(Mario Cabodi and Joyce Wong, Advisors)
"In Vitro Characterization of Cancer Cell Morphology, Chemokinesis, and Matrix Invasion Using a Novel Microfabricated System"

Junzi Dong
(Steve Colburn and Kamal Sen, Advisors)
"Physiology-Based Model of Multi-Source Auditory Processing"

Christopher David Hartman
(Joyce Wong, Advisor)
"Effects of Extracellular Matrix Type in Modulating Cell Migration on Highly Tunable Mechanical Gradient Hydrogels"

Jasmin Imsirovic
(Bela Suki, Advisor)
"Effects of Variable Mechanical Stimuli on Vascular Smooth Muscle Contractility"

Lauren Michelle Mangano Drenkard
(Elise Morgan, Advisor)
"Non-Invasive Assessment of Cartilaginous Tissues in Small Animal Models of Injury and Disease"

MAY 20, 2017

Joseph Paul Angelo
(Irving Bigio and Sylvain Gioux, Advisors)
"Real-Time Tissue Viability Assessment Using Near-Infrared Light"

Andrew Michael Fisher
(Lee Goldstein, Advisor)
"Modeling Acute and Chronic Effects of Blast- and Impact-Related Neurotrauma in Mice"

Matthew Michael Jacobsen
(Michael Smith and Joyce Wong, Advisors)
"Peptide Processing via Silk-Inspired Spinning Enables Assembly of Multifunctional Protein Alloy Fibers"

Emily Anne Lough
(Tyrone Porter, Advisor)
"Exploration of a Doxorubicin-Polymer Conjugate in Lipid-Polymer Hybrid Nanoparticle Drug Delivery"

Tyler Eugene Wagner
(Doug Densmore and Ron Weiss, Advisors)
"Engineering a Regulatory Framework for Synthetic Self-Amplifying RNA Circuits"

Bing Xia
(Sandor Vajda, Advisor)
"Improving the Accuracy and Efficiency of Docking Methods"

MENG Graduates 2016

SEPTEMBER 25, 2016

Shreya Sridhar

JANUARY 25, 2017

Michael Anthony Becker
Alexandra Lynn Birch
Wing Hang Wilkins Cheng
Sabrina Cloud Li

MAY 20, 2017

Arshia Ali
Kevin Callahan Bauckman
Chandler Whitney Burke
Sandesh Sadashiv Gourkar
Sara Renee Gravelyn
Nicholas Raj Gulati
Tanya Husain
Nicholas Leung
Thomas J Madathany
Michael Ryan Palmiere
Vivian Christine Ramirez
Meredith Cozette Rittman
Kyle Savidge
Micael Ann-Merrell Trexler
Megan McCloskey Tschirch
Caroline Nicole Via
Justin Wang
Lauren Elizabeth Wojtowicz

GRADUATE STUDENT AWARDS AND HONORS

Marianna Keaveney
• NIH F31 Training Fellowship (NINDS); Invited speaker at MIT's "Rising Stars in Biomedical Sciences" Conference in November 2016

Nicholas Rim
• HHMI Fellowship renewal

Tayler Pauls
• Ford Foundation Fellowship

Jialiu Zeng
• BU Nano Cross-disciplinary Fellowship 2016; Travel Fellowship for Global Young Scientist Summit 2016

Andrew Acevedo
• NSF East Asia and Pacific Summer Institute (EAPSI) Fellowship Award

Kehan Zhang
• American Heart Association Predoctoral Fellowship

Wenkang An
• Hariri Graduate Fellowship

Navid Nazari
• Magna Cum Laude Merit Award from International Society of Magnetic Resonance in Medicine (2017)

Mingfu Chen
• Won the 2017 BUnano Terrier Tank competition

Nicolas Shu
• Won the 2017 BUnano Terrier Tank competition

Uros Kuzmanovic
• Won the 2017 BUnano Terrier Tank competition

Jessie Song
• BU Nano Cross-Disciplinary Fellowship 2016

Dan Reynolds
• Fellow for the MIT IMPACT Program (Spring 2017

David Bernstein
• Won BU Bioinformatics Student-Organized Symposium 3rd Place Poster Award

Hannah Peterson
• Received a BU-BMC Cancer Center Travel Award to attend AACR Annual Meeting 2017

Remy Peace
• Received the Finn Wold Travel Award from The Protein Society to go to the 31st Annual Symposium in Montreal in July 2017

GRADUATE STUDENT FELLOWSHIPS

BME Distinguished Fellowship
Winko An
Israel Desta
Megan Egbert
Usman Ghani
Sam Ghilardi
Shwan Javdan
Seunghee Lee
Justin Letendre
Huaxiu Li
Jeff McMahan
Jad Noueihed Noueihed
Raj Setty
Michael Twardowski
Xin Ye
Dana Zemel

BU-BWH Imaging Fellowship
Joanna Chiu
Navid Nazari
Chenguang Peng

Clare Booth Luce Fellowship
Samantha Berry

Ford Foundation Fellowship
Jasmine Kwasa

NSF Graduate Research Fellowship
Saloni Jain Agarwal
Iriny Ekladious
Catie Gormley
Kyle Hansen
Jasmine Kwasa
Lauren Mangano Drenkard
Chris Sloas
Julia Wang
Jenny Vojtech

NIH Quantitative Biology and Physiology Training Grant
Mitch Clough
Cam Condylis
Megan Griebel
Gwen Hoffmann
Joshua Kays
Sandee Moed
Sanaya Shroff

NIH Translational Research in Biomaterials Training Grant
Drew Martin
Henry Li
Jarred Mondonedo
Tayler Pauls
Elliot Tague
Juliann Tefft

HHMI International Student Research Fellowship
Nicholas Rim

BUSM Pulmonary Training Grant
Anant Balijepalli

BUSM Infectious Diseases Training Grant
Cari Meisel

BUnano Fellowship
Jessie Song
Jialiu Zeng

Computational Neuroscience Fellowship
Lia Bonacci
Yuqi Deng

NIH Fellowship
Joe Angelo
Laura Blaha
Dan Cheng
Marianna Keaveney
George Kwong
Dan Reynolds

MS Graduates 2017

THESIS TITLE & ADVISOR(S)

SEPTEMBER 25, 2016

Mitchell Yao Bigelow
(Katherine Zhang, Mentored Project Advisor)
"Fatigue Apparatus Design and Cyclic Loading of Glucose-Treated Arterial Elastin"

Cari Lynn Meisel
(Joyce Wong, Advisor)
"Superparamagnetic Iron Oxide Nanoparticles for Diagnosis of Calcific Aortic Valve Disease"

Christine Sarah Nykyforchyn
(David Waxman, Advisor)
"Elucidating the Role of Long Non-Coding RNAs in the Regulation of Sex-Biased Gene Expression and Liver Sexual Dimorphism"

Hannah Marie Peterson
(Darren Roblyer, Advisor)
"Clinical Feasibility of Diffuse Optical Spectroscopic Imaging in Sarcoma"

Dustin Toshio Shigaki
(Kamal Sen, Mentored Project Advisor)
"Neural Coding of Multidimensional Stimuli in Auditory Cortex"

Alyssa Ashley Torjesen
(Darren Roblyer, Advisor)
"An Ultra-Fast Digital Diffuse Optical Spectroscopic Imaging System for Neoadjuvant Chemotherapy Monitoring"

Graham Elliott Voysey
(Steve Colburn, Advisor)
"Development of a Flexible Modeling Environment for Evaluating Subcortical Auditory Systems"

Zhaojie Yao
(Xue Han, Advisor)
"Development of Analysis Approaches to Calcium-Imaging Data of Hippocampal Neurons Associated with Classical Conditioning in Mice"

Yanyu Zhao
(Darren Roblyer, Advisor)
"Hyperspectral Spatial Frequency Domain Imaging (SFDI) for Monitoring Water, Lipids and Collagen"

JANUARY 25, 2017

Daniel Ian Cheng
(Chris Chen, Advisor)
"Multiscale 3D Printing Technologies for Studying Cell Biology"

Joanna Gwonyue Chiu
(Tyrone Porter, Advisor)
"A Lipid Coated Calcium Phosphate Nanoparticle for Delivery of siRNA to the Brain"

Anastasia Gomez
(Irina Smolina, Advisor)
"Molecular Diagnostics of Rapid Detection of Food-Borne Pathogens"

Jessica Kim
(Muhammad Zaman, Advisor)
"Analysis of Cellular Response to Chemotherapeutic Treatment in a 3D in vitro Breast Cancer Model"

Ruohui Yang
(Jerome Mertz, Advisor)
"High Dynamic Range Multi-Photon Microscopy"

Bonnie Yeh
(Steve Colburn, Mentored Project Advisor)
"Binaural Cochlear Implant Simulation"

Alicia Joan Zollinger
(Michael Smith, Advisor)
"Role of Inflammation and the Extracellular Matrix in Maintenance of Tensional Homeostasis"

MAY 20, 2017

Mahtab Alam
(Lucia M. Vaina, Advisor)
"An Integrated System for Quantitatively Characterizing Different Handgrips and Identifying Their Cortical Substrates"

Cong Ba
(Jerome Mertz, Advisor)
"New Techniques for Fluorescence and Phase Contrast Laser Scanning Endomicroscopy"

Seth Ian Bensussen
(Xue Han, Advisor)
"The Development of High Spatial Resolution Molecular Tools for Studying Synaptic Activity and Morphology"

David Bedig Bernstein
(Daniel Segre, Advisor)
"Gaining Mechanistic Insight into the Structure and Function of Microbial Communities"

Yuqi Deng
(Barb Shinn-Cunningham, Advisor)
"Cortical Mechanisms Underlying Auditory Spatial and Non-Spatial Selective Attention"

Yansong Geng
(Lucia M. Vaina, Advisor)
"Neural Mechanisms Underlying Specific Visual Tasks During Self-Motion"

Kyle Rollins Hansen
(Xue Han, Advisor)
"Neuronal Network Analysis Tools for Large Calcium Imaging Datasets"

Sarah Emily Hocevar
(Kamal Sen, Mentored Project Advisor)
"Neural Coding of Multidimensional Stimuli in Auditory Cortex"

Divya V Israni
(Mo Khalil, Advisor)
"Synthetic and Orthogonal Genetic Regulation in Mammalian Cells"

Jun Ma
(Kamal Sen, Mentored Project Advisor)
"Spatial Processing in Mouse Auditory Cortex"

Ai-Yun Shih
(Irina Smolina, Mentored Project Advisor)
"Detection of Viruses by Using Pseudo-Complimentary Primers"

Nicolas Shijie Shu
(James Galagan, Mentored Project Advisor)
"Detection of Analytes in Cell-Free Mixtures"

Undergraduate Enrollment

ENROLLMENT FOR AY 2016-2017

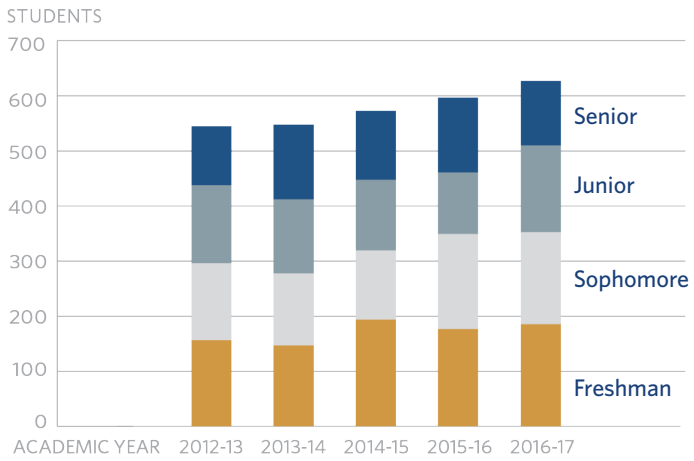
628 STUDENTS
in the BME program

38%
of the College of Engineering

	BME Department			All College of Engineering		
	F	M	TOTAL	F	M	TOTAL
FRESHMAN	105	81	186	151	262	413
SOPHOMORE	75	90	165	148	271	419
JUNIOR	76	85	161	139	292	431
SENIOR	50	66	116	120	279	399
TOTAL	**306**	**322**	**628**	**558**	**1104**	**1662**

BME ENROLLMENT HISTORY

15% INCREASE
in enrollment over 5 years

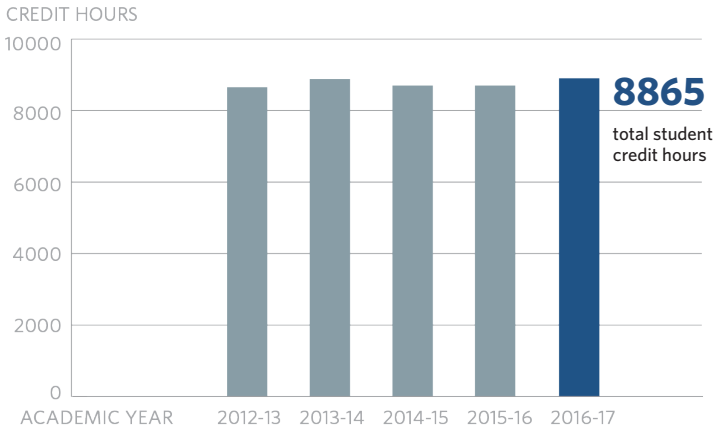


BME TEACHING HISTORY

63 COURSES
taught during AY 2016-2017

36 PRIMARY FACULTY
taught during AY 2016-2017

$25 MILLION
in research funding



Undergraduate Degrees Awarded

BS DEGREES BREAKDOWN

The Department awarded

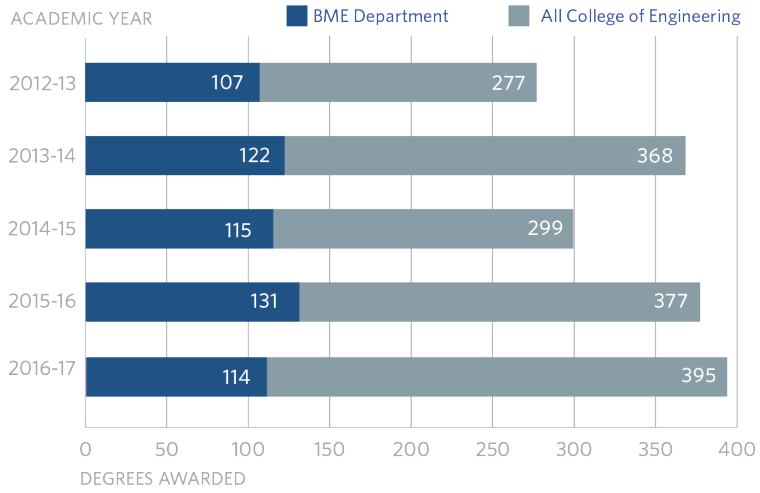
114

BACHELOR OF SCIENCE DEGREES

this academic year,

29%

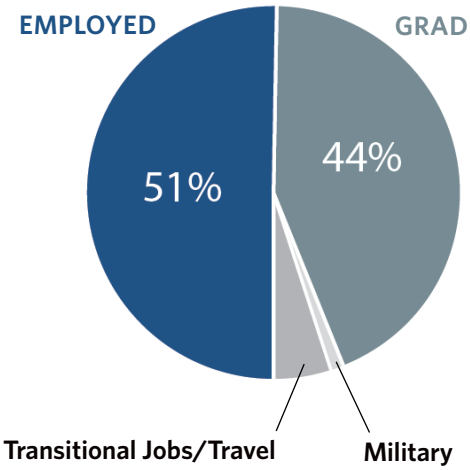
of all the BS degrees awarded by the College this academic year.



TRACKING ALUMNI

95% EMPLOYED OR GRADUATE SCHOOL of 2016-2017 graduates

POST GRADUATION PLANS - 2016-2017 BME GRADUATES



In an effort to obtain reliable statistics regarding the immediate career plans of our graduating seniors, the College of Engineering conducts an exit survey in late April/early May and continues to compile data until the end of the following fall semester. The results of these interviews are shown for the graduating class of May/Sept. 2016.

ENGMEDIC

The ENGMEDIC program is an early selection program that leads to a BS in Engineering and an MD from the Medical School. This program is offered and administrated in collaboration with our School of Medicine and is designed to train biomedical engineers who have the MD as their ultimate degree objective. ENGMEDIC admits to the School of Medicine a small number of highly qualified students who have completed two years of the premedical option of the biomedical engineering curriculum. The program is not designed to accelerate the engineering or the medical training but rather to effect a better transition from undergraduate engineering study to graduate medical training. The BS in Biomedical Engineering is normally earned after 4 years of undergraduate study and the MD after an additional 4 years of study at the Boston University Medical School.

Undergraduate Student Awards

In 2017, several of the BME seniors were recognized for achievements and contributions to the Boston University community and BME profession.

Adam M. Miller Memorial Award:	Awarded by the Biomedical Engineering Department to the graduating senior who has best advanced the reputation and prestige of the department through his/her involvement in department, college, university, professional activities, or organizations, as well as through the academic and senior project programs. This year the award was presented to **Kathryn Hardin.**
Earle and Mildred Bailey Memorial Award:	Presented to a graduating senior in the College of Engineering to recognize outstanding scholarship and service to the college. This year the award was presented to **Yash Agarwal.**
Engineering Alumni Association Student Leader Award:	Presented to seniors who have made outstanding contributions to the College and University through their involvement in activities and organizations. The award winner this year is **Nikita Purushottam Patil.**
Ging S. Lee Community Service Award:	Presented to a graduating senior in the College of Engineering to recognize outstanding community service. This year the award was presented to **Wali Ashraf Sabuhi.**
Outstanding Dean's Host Awards:	Two of the three award winners this year were BME seniors: Jaclyn Renee Grode, Archana Jeyaram, **Wali Ashraf Sabuhi.**
Outstanding Senior Project Award:	The team of **Yash Agarwal, Nikita Purushottam Patil, and Kathleen Victoria Ryan** was recognized with the Department's 2017 Outstanding Senior Design Project Award for their project "Understanding Design Priciples of CRISPR Based Activation of Gene Transcription in Mammalian Cells" under the supervision of Assistant Professor Wilson Wong.
Student Advisor Award:	Among the 22 ENG winners for outstanding assistance in advising this year, the following BME seniors were recognized: **Yash Agarwal, Kyle Cheng, Mohit Ratan Dangeti, Undina Osk Gisladottir, Ander Gregory Gomez, Wayne J. Huynh, Archana Jeyaram, Michelle Anne Rose, Tania Waiyan To.**

Boston University Student Chapter of the Biomedical Engineering Society

The purpose of the Biomedical Engineering Society is: "To promote the increase of biomedical engineering knowledge and its utilization." The student chapter at Boston University works towards this goal in all of its activities. The Biomedical Engineering Society provides a focus for community building among BME students with activities which strengthen their understanding of and interest in Biomedical Engineering. The Society provides students with literature, field trips, films and guest lectures, which provide them with a "resource center" concerning such vital areas as career opportunities and graduate study in Biomedical Engineering.

BMES Officers AY 2016-2017

President – Shamsh Shaikh '18

Vice President – Kathryn Hardin '17

Corresponding Secretary – Constantine Hartofilis '18

Recording Secretary – Dylan Samperi '19

Treasurer – Katherine Lo '19

Outreach Chair – Ezira Yimer Wolle '19

BMES

Alpha Eta Mu Beta Biomedical Engineering Honor Society

Alpha Eta Mu Beta is the honor society for Biomedical Engineering. The society promotes an understanding of the profession and recognizes and encourages excellence within the field. The purpose of the society is to bring into closer union and to mark in an outstanding manner those biomedical engineers who have manifested a deep interest and marked ability in their chosen life work so as to promote an understanding of their profession and to develop its members professionally.

AEMB Officers AY 2015-2016

President – Mina Botros '16

Vice President – Kyle Cheng '16

Secretary – Kayla Myers '16

BU BME HIGHLIGHTS

INTERNATIONAL GENETICALLY ENGINEERED MACHINE

BU Teams Earn Top Honors at **iGEM Jamboree**

Two student teams representing BU in the International Genetically Engineered Machine (iGEM) Jamboree netted recognition and gold medals in five categories. The iGEM Jamboree, held at the Hynes Convention Center in Boston at the end of October, is the world's premier synthetic biology competition for students and hosted more than 5,600 participants from 42 countries this year.

The two teams, BostonU Foundational Advance and BostonU Hardware, were comprised of undergraduate students conducting research projects since last May.

Undergraduate Research Activities

The BME Department, College of Engineering and Boston University have several programs that allow undergraduates to participate in research activities.

Under the **Bell, FIRST** and **Trustee Scholarships,** the recipients are eligible for research funding for up to 10 hours of research per week for one semester.

The Presidential/Engineering Scholars Program (Presidential/ENG Scholars) is a merit award given to students at the time of admission to Boston University. Presidential/Engineering Scholars receive a package of benefits, including a half-tuition scholarship to Boston University. Scholarships are renewable for up to eight semesters, provided a 3.20 GPA is maintained. Additionally, students receive funding for up to 10 hours of research per week for one semester during the academic year, and automatic admission to a Boston University College of Engineering Master's in Engineering program (provided students maintain a 3.40 grade point average).

Each year, 10 Lutchen Fellows from the **Kenneth R. Lutchen Distinguished Fellowship Program** spend the summer engaged in a transformative research experience under the guidance of a faculty member. Students must maintain a 3.0 average to be eligible for the fellowship, and may conduct their projects during the summer following either their sophomore or junior year.

College of Engineering undergraduates engaged in faculty-mentored full-time research experiences during the summer may apply for the **Summer Term Alumni Research Scholars (STARS)** program. STARS participants will receive 10 or 12 weeks of housing in a Boston University residence hall OR up to $2750 towards off-campus housing costs (reimbursement is for actual cost of housing). To be eligible, students must receive a weekly stipend from an engineering faculty mentor to participate in full-time research during the summer (summer courses are not allowed).

The College of Engineering **Supplemental Undergraduate Research Funds (SURF)** program encourages faculty to involve undergraduates in their research programs during the academic year by providing matching funds for undergraduate students who are working on faculty-sponsored research. Requests for SURF funds are made by individual students when they have found positions in faculty labs.

The **Undergraduate Research Opportunities Program (UROP)** is a University-wide academic program which promotes participation by Boston University undergraduates in faculty-mentored research across all disciplines and throughout the calendar year.

Lutchen Fellows Summer 2016

Rachita Chaudhury
Jaclyn Grode
Kyle Hallock
Rachel Hanlon
Harshit Harpaldas
Henry Hwang
Zachary Lasiuk
Christian Mancini
Eric Rapp
Claire Rodman

STARS Summer 2016

Varnica Bajaj
Aditya Cavale
Daniel Brewster
Aislinn Keane
Meghan Kupratis
Napassorn Lerdsudwichai
Jordann Marinelli
Jeong Min Park
Nikita Patil
Rachel Petherbridge
Suzanne Stasiak
Phillip Teng
Tania To
Ezira Yimmer Wolle
Shane Mccormack

SURF AY 2016-2017

Gabrielle Abad
Moona Abdulkerim
Natasha Amaravadi
Kyra Benavent
Sonia Benzor
Drew Bergman
Rutvi Bhatt
Jessica Bonet
Daniel Brewster
Katherine Chandler
Evan Chung
Stacey Cunnington
Abigale Eichelman
Tsion Fikre
Liliana Filipowska
Chen Garber
Taborda Gomez
Emily Hatheway
Andrew Hoang
Anna Howard
Kevin Huang
Joy Jarnagin
Robb Kessel
Steven Larochelle
Sarah Maggipinto
Andrew Mahler
Kassandra Nealon
Walter Obrochta
Prachi Patel
Rachel Petherbridge
Barrios Pojoy
Vivian Ramirez
Sarem Rashid
Arthur Rezayev
Sabrina Riley
Michael Rothko
Brando Salussolia
Darshi Shah
Suzanne Stasiak
Tina Ta
Russell Thompson
Tania To
Stephen Tucker
Ella Vandeventer
Marysa Walsh
Amber Willbanks
Patrick Williamson
Meiling Xu
Alice Yih
Jian Yu
Tarik Zahr
Kimberley Zak
Dean Zeldich
Aleksandra Zielonka

UROP Fall 2016

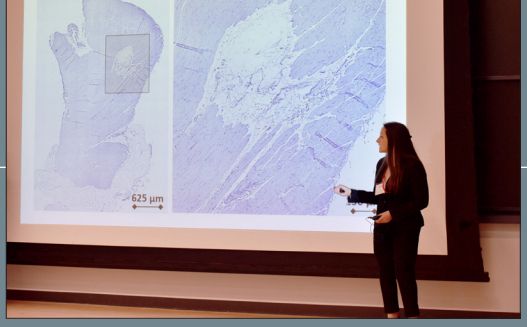
Varnica Bajaj
Rachita Chaudhury
Nicole Enos
Ryan Jamieson
Mayisha Khan
Meghan Kupratis
Caitlin Kwan
Austin Lent
Napassorn Lerdsudwichai
Joseph Liba
Katherine Lo
Christian Mancini
Melanie Martinsen
Miles Massidda
Jeong Min Park
Dimitrios Psaltos
Michael Rigor
Ryan Shimizu
Alessio Tamborini
Phillip Teng
Srinidhi Venkatesan Kalavai
William Yen

UROP Spring 2017

Varnica Bajaj
Caroline Foster
Andre Gonzaga
Kathryn Hardin
Katherine Ilia
Ryan Jamieson
Jessica King
Caitlin Kwan
Napassorn Lerdsudwichai
Katherine Lo
Christian Mancini
Miles Massidda
Kara Nelson
Calin Nicolescu
Jacob Noordzij
Jeong Min Park
Rachel Petherbridge
Dimitrios Psaltos
Sabrina Riley
Claire Rodman
Abigail Sasdelli
Ryan Shimizu
Hannah VanBenschoten
Srinidhi Venkatesan Kalavai
Alice Yih

UROP Summer 2017

William Benman
Amogh Chandupatla
Arianna DiGregorio
Nicole Enos
Michael Fogg
Anant Gupta
Anna Helfrich
Sunny Kapadia
Robb Kessel
Jessica King
Jonathan Ko
Meghan Kupratis
Steven LaRochelle
Jessica Lin
Andrew Mahler
Christian Mancini
Emily Margolis
Kara Nelson
Thanh Nguyen
Calin Nicolescu
Jacob Noordzij
Michael Rigor
Taylor Rohan
Sucheta Tamragouri
Laura Torres
Tommi Tsao
Bonnie Walton
Rebecca Williams



The Senior Design Project Experience

Every BME senior is required to develop a project proposal with an individual faculty member, local area scientific mentor, or a bioengineering corporate technical advisor (with a BME faculty co-supervisor). The project is intended to bring together elements of engineering science and engineering design. In coordination with the technical work, the course includes experience in planning, establishing priorities, and training in technical communication including proposal, abstract, progress reports and oral and written presentations of the final work. The course also includes lectures from our industry partners to expose the students to elements of entrepreneurship, business plans, intellectual property, marketing, and clinical regulatory issues. The project continues over the full academic year and culminates in a Senior Design Project Conference that is attended by students, faculty, and representatives from BME industry, hospitals and other academic institutions.

Kenneth Lutchen,
Dean, College of Engineering

32ND ANNUAL

MAY 7, 2017

SENIOR DESIGN PROJECT CONFERENCE

Session I

DIAGNOSTICS I

Chair: Prof. Catherine Klapperich

Rapid Detection of Zika Virus for Point-of-Care Diagnostics During Pandemics
Connor Beck, Jordan Haburcak, Jenna Schroeder

A Low-Cost Diagnostic Test for Cervical Cancer Screening
Allison Ramsey, Tania To

Simple Visual Pathogen Detection on Paper Strips
Carmen Li, Lisa Nguyen

Session IIa

DIAGNOSTICS II

Chair: Prof. Joyce Wong

Ear Biometric Scanner for Improved Patient Identification in Zambia
Rachael Campion, Lauren Etter (ME), David Martinez (ME)

Flexible Electrodes for Portable Microfluidic Diagnostics
Kyle Cheng, Matthew Kim

Biosensor to Measure Oxidative Stress in Marine Coral Populations
Peter Cho, Rahul Daftari, Rishi Jain

Identifying Pathogens Using Real-Time PCR and Pseudo-Complementary Primers with Label-Free Multiplex Capabilities
Jennifer Asaro, Arjun Patel, Nicholas Serdaru

Saving Lives through Telemedicine: The Pneumonia Diagnosing App
Anna Hughes, Kenny Song

Session IIb

BIOMECHANICS

Chair: Prof. Dimitrije Stamenovic

pMPC: A Synthetic Crosslinked Polymer Biolubricant
Kamila Drezek, Archana Jeyaram, Wali A. Sabuhi

A Comparative Biomechanical Study of the Surgical Reconstruction of the Scapholunate Ligament
Beatrice Baumberger Altirriba, Isaac Dashefsky, Riley Morien

Assessment of Tendon Tear Progression In-Vivo
Ved Patel, Daniel Ripley, Vanessa Zoghbi-Harb

Method to Obtain Facet Joint Displacement in Healthy and Degenerated Spines
Cameron Curtiss, Caeleigh Higgins, Lindsay Hulley

Lesion-Specific QCT to Improve Prediction of Pathologic Vertebrae Fracture Load
Bryan Chiakpo, Mohit Dangeti, John Ziamandanis

Session IIIa

HEALTH MONITORING

Chair: Prof. Michael Smith

Neonatal Vitals Monitoring Pad
Josef Atmaz Al-Sibaie, Teja Karri, Eric Loreaux

Project BraveHeart: Sleep Tracking for Patients with Congestive Heart Failure
Moustafa Amin, Michael Hanna, Dimitrios Psaltos, Dewey Robinson IV

Micro Battery-Free Wireless Sensor for In-hospital Neonatal Monitoring
Chen Dong, Andrew Russo, Zhengyang Zhang, Zhiqian Zhou

Design of an iPhone-Based Nitric Oxide (NO) Meter
Ashley Hartman, Chase Richard, Michelle Rose

Design of an iPhone-Based Instrument for Monitoring Blood Alcohol
Noura Al Zayed, Christian A. Montero, Ziqi Zhang

Session IIIb

TISSUE ENGINEERING/DRUG DELIVERY/ DISEASE MODELS I

Chair: Prof. Allyson Sgro

3D Bioprinting for Tumor Engineering
Kevin Huang

Does the Inter-Epithelial Transfer of Exosomal NOS and P-gp Promote Inflammation in Sinonasal Cells?
Ander Gomez, Conor Sullivan

Nanoparticles for Oligonucleotide and Curcumin Delivery to Breast Cancer Cells
Erin Chang, Alexander Czaja

Engineered Adipose Tissue That Can Grow
Margaret Ann Bolick, Samantha Chua, Melissa Garcia, Tyler Ryan

Optimizing Calcium Phosphate Particles for Growth Factor Delivery
Shahd Bawarith, Lidia De Barros, Shaheer Piracha, Sruti Raja, Fiza Shaukat

Session IVa

IMAGING & TRACKING

Chair: Prof. Irving Bigio

2-Photon Imaging: Simplifying time and labour-intensive post-experimental data processing
Eric Tam, Sherry Yan, William Yen

Optical tracking of anesthetized Caenorhabditis elegans
Danielle Dougherty, Padric Garden

Real Time Muscle Movement Quantification by Ultrasound for Individuals After Stroke
Monika Lee, Jennifer Rock, Paul Sliwinski

Wireless Optical Recording of Neural Activity in Behaving Mice
Jessica Lin, Paul Yao

Simultaneous localization and mapping using biologically inspired interactions of visual feature angle and spatial location
Micheal Gutman, Clark Ikezu, Avninder Singh

Modelling and Measuring Particle Deposition in Asymmetric Airways Using 3D Printing
Edward Taylor, Daniel Wiley

Session IVb

DEVICES

Chair: Prof. Mary Dunlop

Comparison and Implementation of Trapezoidal and FOC Commutation Methods
Eugene Kwan, Evan Reynolds

Exploration of Lubricity in Transcatheter Delivery Systems
Undina Gisladottir, Wayne Huynh, Megan Priem

PID Control of Treadmill Speed Using Human Kinematics
Jacob Ferriero, Matti Groll, Elizabeth Kenny, Brian Weden

Optimizing Epinephrine Auto Injector Storage Strategies
Mohammad Alaghband, Brandon DeLeva, John Kleitz, Patricia Pikura

Design of an Electromyographic Switch for Communication System Access
Victoria Frick, Katherine Girouard, Evi Shiakolas (ME)

HeartinSole: A Remote Monitoring Device for Congestive Heart Failure Patients
Susanna Chen, Austin Lent, Brianna Rodgers

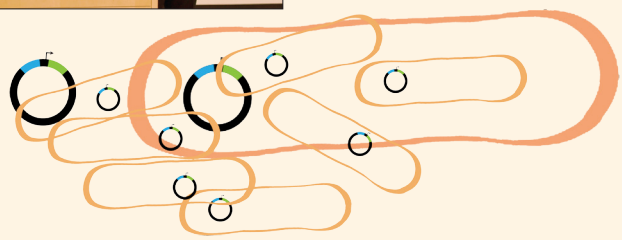
SENIOR DESIGN PROJECT

Conference Winners on **Design Principles of CRISPR** Based Activation

Senior BME Team of Yash Agarwal, Nikita Patil, and Kate Ryan, presented "Design Principles of CRISPR based Activation of Gene Transcription in Mammalian Cells".

BME Seniors Nikita Patil and Kate Ryan, May 5, 2017.

Below: Diagram of competent E coli cells from the presentation.



Session V

TISSUE ENGINEERING/DRUG DELIVERY/DISEASE MODELS II

Chair: Prof. John White

Development of a Novel Progressive Supranuclear Palsy Mouse Model
Aaron Bockmiller, Mina Botros

Examining Muscle-Bone Crosstalk: Design of Muscle Trauma Model for Study of Stem Cell Recruitment in Injury Repair
Jaclyn Grode, Kathryn Hardin, Blake Oberfeld

Design and Implementation of an Automated Bioreactor System to Investigate the Development of Hyperreactivity in Airways
Daniel Brewster, Suzanne Stasiak

Engineering Nanoparticles for Cancer Immunotherapy Application
Melissa Kallander, Kayla Myers, Ashika Patel

Understanding Design Principles of CRISPR Based Activation of Gene Transcription in Mammalian Cells
Yash Agarwal, Nikita Patil, Kathleen Ryan

REGISTERED COMPANIES:

3M
Accenture Life Sciences
Advanced Instruments, Inc.
AltraBio
Altran
Applied Medical Resources
ArQule, Inc.
Atrium Medical
Avedro, Inc.
BD Medical
BD Advanced Diabetes Care
Beth Israel Deaconess Medical Center
BioTrove, Inc.
Biotronik
Bioventus LLC
Boston Engineering
Boston Medical Center, Dept. of Anesthesiology
Boston Medical Center, Dept. of Clinical Engineering
Boston Scientific
Boston Medical Center, Dept. of Orthopedic Surgery
Boston University, Dept. of Athletic Training and Physical Therapy
Boston University, Dept. of Biology
Boston University, Dept. of Biology (Neuroscience)
Boston University, Dept. of Mechanical Engineering
Boston University, Dept. of Physiology and Biophysics
Boston University, Dept. of Physiological and Brain Sciences
Boston University, Dept. of Speech, Language and Hearing Sciences
Boston University School of Management
Boston University School of Medicine
Boston University School of Public Health
Brandeis University
Brigham and Women's Hospital
Broad Institute
Bruker Daltonics
CAE Healthcare
CBS Local
Center for Global Health and Development
Charles Stark Draper Laboratory
Children's Hospital Boston
CIMIT
CKD Associates
Clark & Elbing LLP Cleveland Clinic
Codman Neuro, Johnson & Johnson
Colorado Nepal Alliance, Dept. of Veterans Affairs
Columbia University, College of Physicians and Surgeons
Comprehensive Health Management Inc.
ConforMIS, Inc.
Consult and Design
Covidien
CSA Medical
Cynosure
Davison
Davol - C.R. Bard, Inc.
Decision Resources
DEKA Research and Development Corporation
DePuy Spine, Inc.
DocBox, Inc.
Draeger Medical Systems, Inc.
Eastman Kodak Company
Eaton-Peabody Laboratory
Elm Electrical & Automation
EndoCore
Enumeral Biomedical Holdings, Inc.
Essex Orthopedics & Optima Sports Medicine
Fellers Snider et al.
Ferrotec Corporation
Foundation Medicine
Fraunhofer USA-CMI
GE Healthcare
Gems Sensors
Genzyme Corporation
GlobalData Healthcare
Grant Street Group
Goodyear-Veyance Technologies, Inc.
Harvard Business School
Harvard Medical School
Harvard University
Harvard-MIT Division of Health Sciences and Technology
HeartWare, Inc.
Hologic
Hypertherm
Iandiorio Teska & Coleman
IDEXX Laboratories
Image Stream Medical
Instrumentation Labs, Inc.
Integra LifeSciences
Ironwood Pharmaceuticals
iWorx Systems, Inc.
Jana Care Inc.
JH Technologies
Johnson & Johnson
Lux Research
Massachusetts Eye and Ear Infirmary
Massachusetts General Hospital
Massachusetts Institute of Technology
Medtronic, Inc.
METI
Minnesota State University
Mankato National Instruments
Motility Biomedical, Inc.
nanoView Diagnostics , Inc.
Navinet
Neuroptix Corporation
New Health Sciences
Novartis Institutes for BioMedical Research
NuOrtho Surgical, Inc. Optasia Medical, Inc. O'Shea Getz PC
Olympus Surgical Technologies America
Oregon Health & Science University
Parexel
Perceptive Informatics
PerkinElmer
Pfizer Biotherapeutics
Philips Healthcare
Philips Ultrasound
Praxis Advisors LLC Pulmatrix, Inc.
Raytheon
Regeneron Pharmaceuticals
Respiratory Motion, Inc.
Sanofi
Sapient
Schepens Eye Research Institute
Schneider Electric
Solace Therapeutics, Inc.
SoundMedicine
St. Jude Medical
Teleflex Medical
Ten15Ventures
Toxikon Corporation
Tufts University
UMASS
Universidad de Valencia
University of Texas at Austin
University of Wisconsin-Madison
US Army Institute of Environmental Medicine
USA Research Institute of Environmental Medicine
VA Boston Healthcare System
Vantage Management Group Verbal Care
Vertex Pharmaceuticals
Veterans Administration
Visus Technologies
Worcester Polytechnic Institute
Wyss Institute for Biologically Inspired Engineering
Xcellerex

Department of Biomedical Engineering

Boston University
Department of Biomedical Engineering

Annual Report 2016-2017

This report provides a description of the instructional and research activities of the Department of Biomedical Engineering at Boston University during the 2016-2017 academic year.

Boston University's policies provide for equal opportunity and affirmative action in employment and admission to all programs in the university.

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bu.edu/bme

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