BU BME 2014-2015

TOP - Semiconductor quantum dots, which are photoluminescent nanocrystals used in biosensing and biomedical imaging applications.

CENTER - Undergraduates making their own Electrocardiogram in Professor Roblyer’s Bioinstrumentation class.

BOTTOM - The Suki Lab discovered that blood pressure-induced mechanical fluctuations govern ATP production by vascular cells.

COVER - Architectural sketch of the new CILSE building (page 2)
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FOR DECADES, some of the most exciting research at Boston University has been unfolding in a row of buildings hidden on Cummington Mall, designed originally for making carriages instead of studying the life sciences. Now University President Robert A. Brown is giving science a more prominent address on the University’s main thoroughfare. In early summer of 2015, at what was a parking lot at 610 Commonwealth Avenue, BU broke ground for its new Center for Integrated Life Sciences & Engineering (CILSE), a $140 million, state-of-the-art, nine-story research facility that will bring together life scientists, engineers, and physicians from the Medical and Charles River Campuses. The building will be dedicated to systems neuroscience, cognitive neuroimaging, and biological design. With shared, flexible lab spaces, meeting rooms and other common areas, it is being designed to encourage the kind of collaborative, interdisciplinary research that will be the hallmark of 21st-century science.

"Today, many of the outstanding challenges in science lie at the boundaries between traditional disciplines or the unchartered spaces between them," says President Brown. These unchartered spaces will be explored at CILSE, a place, says Brown, that will foster "major interdisciplinary research efforts led by faculty from many departments and schools, but with common interests." It will contain lab space for approximately 160 researchers, postdoctoral students, and staff, 270 graduate students, and additional space for future faculty. CILSE will be built adjacent to historic Morse Auditorium and is expected to be finished in late 2016 or early 2017. The architects are from Payette, a Boston firm that has built prize-winning science buildings for major research universities and other institutions around the world.

The 170,000-square-foot building will house the Center for Systems Neuroscience, the Biological Design Center, the Center for Sensory Communication and Neuroengineering Technology, and a Cognitive Neuroimaging Center with a 3 Tesla fMRI—a fundamental tool for studying the brain’s trillions of neural connections and how they relate to human behavior.

The University boasts one of the nation’s largest clusters of researchers in the emerging fields of systems neuroscience, which examines brain function at the cellular, molecular, and cognitive levels; and biological design, which seeks to build new biological systems with the tools and techniques of engineering. These interdisciplinary fields tackle some of the thorniest problems in science and medicine, like the detection and treatment of infectious diseases, treatments for Parkinson’s and Alzheimer’s diseases, how memory works, and the root causes of autism. These problems draw researchers from diverse fields who are currently spread across both campuses. The new Center for Sensory Communication and Neuroengineering Technology will be directed by BME Professor Barbara Shinn-Cunningham, and will bring together neuroscientists and sensory physiologists who study hearing, speech, and language, as well as mathematicians who investigate neural coding. The center will connect scientists in these areas to enhance technological innovation, and develop technologies such as neural prosthetics and brain-computer interfaces.

Joining Shinn-Cunningham in the CILSE Building when construction is completed in May 2017, will be two other BME faculty, John White, Professor and Chair of Biomedical Engineering and Assistant Professor Xue Han, both leaders in the field of neuroengineering. Professor White’s
laboratory uses engineering approaches to understand how information is processed in the brain, with the goal of exploiting these findings to improve the human condition, and in Prof Han’s lab they are working to design principles for novel neuromodulation therapies by inventing and applying various genetic, molecular, pharmacological, optical, electrical and nano tools to build functional connectomes of the brain. Ultimately, they hope to develop novel neurotechnologies to treat neurological and psychiatric disorders.

The building will also house the state-of-the-art 21st-century life sciences and engineering Biological Design Center (BDC) that will bring together forward-thinking researchers from the hottest fields in bioengineering. These scientists would combine genomic technologies like DNA sequencing and synthesis, 3-D printers, and robots to make new molecules, tissues, and entire organisms. The inaugural BDC faculty will include Christopher Chen (director), a College of Engineering Distinguished Professor and one of the world’s leading experts in tissue engineering and regenerative medicine, and three young stars in synthetic biology—Ahmad (Mo) Khalil (Associate Director), Wilson W. Wong and Douglas Densmore.

Through advances in genomics and stem cell research, many of the molecular and cellular building blocks of life have been cataloged. A central challenge is to understand, control, and reengineer how these component parts fit together to bring about functional biological systems that define life and solve important societal problems, ranging from producing clean energy to fighting infection and attacking cancer. That is the fundamental quest that brought Chen, Khalil, Wong, and Densmore together and that will drive the new center.

Four to six new researchers—all exceptional innovators, says Chen—will be added to the center’s faculty over the next several years.

Up until now fields such as synthetic biology and tissue engineering have arisen as separate disciplines. Synthetic biology involves designing and synthesizing genes, genetic and signaling networks, and genomes to predictably control cellular behavior. Tissue engineering involves trying to manipulate and combine cells and extracellular materials to induce the assembly of tissues. “But we realized that even though these two fields may involve slightly different tools,” Chen says, “they belong under one roof.” Housing the group at the CILSE, says Gloria Waters, University vice president and associate provost for research, “is a prime example of the goals of the new building—bringing together great scientists from different fields and breaking down the barriers to collaboration.”

“One of the great things about BU is that we have spectacular faculty from many different disciplines,” says Gloria Waters, vice president and associate provost for research. “This building will allow us to bring them together in ways that wouldn’t happen if they occupied space in their individual school or college. By placing new groups in proximity to one another, we are hoping to develop collaborations that would not happen otherwise, and ultimately some unique areas of excellence.”

President Brown has emphasized that the research inside the building be reflected in its exterior, says principal architect Charles Klee. Just as EPIC (the new Engineering Product Innovation Center on Commonwealth Avenue) allows the public to see the hands-on nature of engineering, CILSE’s glass-walled exterior will provide a window onto basic science research at BU. “This is not a building that wants to be ashamed that it’s a research building,” says Klee. “You’ll be able to see the exhaust fans on the roof, for example. It’s transparent. You can see life in it. A lot of buildings are opaque—you have no idea whether it’s a dorm, an office building, or a bank. We’re giving science a front door on Commonwealth Avenue.”
In academic year 2014-2015 the BME Department added two new faculty members, Professor and Chair John White and Assistant Professor John Ngo (Start date 7/1/15). Associate Professors Edward Damiano, Catherine Klapperich and Muhammad Zaman were promoted to Professor. Professor Carlo De Luca retired and became an Emeritus Professor of Biomedical Engineering, Professor Jim Collins resigned his tenured position and left Boston University. Sadly, Prof David Mountain passed away in November 2014 from an extended illness, he will be sorely missed. **At the end of FY15 the BME Faculty numbered 34, making the department one of the largest in the country in terms of primary faculty.**

The BME Graduate Program was led by Prof Catherine Klapperich as the Associate Chair for Graduate Programs through December 2014 and was relieved by Prof Michael Smith who served for the remained of the academic year. **The BME Ph.D. Program awarded 16 degrees this year,** bringing our total Ph.D. degrees awarded to 246 since the program began in 1991. 18 MS degrees were awarded as well as 17 MEng degrees. Our graduate programs enrolled 150 students (119 PhD students; 4 MD/PhD; 8 MS; 19 MEng).

Graduate student recruitment was led by the Director of Graduate Admissions, Prof. Joe Tien. In the Fall 2015 we expect 57 new graduate students (27 PhD, 13 MS and 17 MEng). Our Ph.D. applicant pool continues to be competitive with other top tier Biomedical Engineering Programs. In the 2014 – 2015 recruiting season we received 643 applications. The quality of the students matriculating remains very high with a mean GPA of 3.6 (US students only).

The Associate chair for the BME Undergraduate Program was Prof Muhammad Zaman. **The BME Undergraduate Program awarded 115 Bachelor of Science degrees and enrolled 573 students.**

During 2014-2015 the **34 primary BME faculty attracted over $25 million in extramural funds available for expenditure during the year. This translates to over $751,000 per faculty member.** 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/) and they also participate in five interdisciplinary research centers that are directed or co-directed by BME faculty: Biomolecular Engineering Research Center (BMERC), Center for Computational Neuroscience and Neural Technology (CompNet), Center for Nanoscience and Nanobiotechnology (CNN), Biological Design Center (BDC), and Hearing Research Center (HRC).
NEW BME FACULTY

JOHN NGO

Dr. Ngo received his PhD in Biochemistry and Molecular Biophysics in 2011 from the California Institute of Technology, then did a Post Doc with Dr. Roger Tsein at UCSD. Dr. Ngo’s research focuses on two areas, biomaterials design and neuronal cell biology. He uses visible and infrared light to construct biomaterials and engineers self-destructing proteins and polymers that cleave themselves at tunable rates for controlling the half-life of macromolecules in vivo. He will also be developing molecular tools for electron microscopy that will be broadly applicable in cell biology but specifically useful in his work on determining if translation occurs in axons and presynaptic axon terminals of adult neurons.

JOHN A. WHITE

Professor John A. White in the new Chair of the Biomedical Engineering starting May 1, 2015. He was recruited from the University of Utah and succeeds Professor Sol Eisenberg, who remains Senior Associate Dean for Academic Programs. John was a BME faculty member for 13 years before he joined the University of Utah in 2007 as a Professor of Bioengineering. During his tenure at the College of Engineering, he served as BME chairman ad interim and as associate chair for undergraduate and graduate studies, and received the ENG Faculty Service Award in 2002. At the University of Utah, John was a USTAR professor and was the executive director of the Brain Institute, an interdisciplinary institute that spanned the medical school, life sciences, and the school of engineering. Prof White has used engineering approaches to better understand how information is processed in the brain. Combining computational modeling, electrophysiological and optical techniques, and imaging methods, he has worked to advance new biomedical devices to treat memory disorders and epilepsy. Supported by more than $50 million in funding from the NIH, National Science Foundation and other sources, he has published over 70 peer-reviewed papers, is a Fellow of the American Institute for Biological and Medical Engineering and of the Biomedical Engineering Society, and has served as meeting chair for the Biomedical Engineering Society Fall Meeting in 2014 and Visiting Fellow at the University of Washington in Seattle and at research institutions in Germany. John received his PhD in Biomedical Engineering from Johns Hopkins University in 1990.
Edward Damiano, Catherine Klapperich and Muhammad Zaman were promoted to Professor of Biomedical Engineering.

Edward Damiano gave the 2015 University Lecture - Creating a Bridge to Cure Diabetes

Charles Delisi presented the College of Engineering with a monetary gift to fund a Distinguished Lecture Series.

Mark Grinstaff received the inaugural Charles Delisi Award and Lecture, titled Design of Biomaterials for Clinical Applications.

Xue Han received a Presidential Early Career Award for Scientists and Engineers, presented by President Obama in Washington DC.

Ahmad (Mo) Khalil was selected as one of 77 innovative early-career educators to participate in the National Academy of Engineering’s (NAE) sixth Frontiers of Engineering Education (FOEE) symposium on October 26-29 in Irvine, California.

Catherine Klapperich was selected by Dean Lutchen as the College of Engineering Associate Dean for Research.

Darren Roblyer received a DOD Breast Cancer Research Program Era of Hope Scholar Award, 5 year $4M grant.

Herb Voigt received a Fulbright Scholar grant to work at the Pontifical Catholic University of Peru (PUCP) during the 2014-2015 academic year.

Joyce Wong was selected as an inaugural Distinguished Professor of Engineering.
Muhammad Zaman was selected as a HHMI Professor; elected as a 2015 AIMBE Fellow (30 BME Faculty are elected fellows of AIMBE); and received a $2M Saving Lives at Birth: A Grand Challenge for Development Grant for PharmaChk, a user-friendly, low-cost, portable, fast and accurate detector for screening counterfeit and substandard medicines.

BME Senior Project Team of Poling Yeung, Michaelina Dupnik and William Moik under the guidance of Assistant Professor Jason Ritt took second place in the National Institute of Biomedical Imaging and Bioengineering (NIBIB) Design by Undergraduate Biomedical Engineering Teams (DEBUT) competition. The BME team’s entry, a “Sensory Substitution Glove for the Visually Impaired,” is designed to enable users to detect obstacles at head-height as well as sudden drop-offs, and do so early enough to change course and prevent injury. The team received $15,000 at a ceremony at the Biomedical Engineering Society (BMES) conference in October.

Jonathan Rosen, Sr Lecturer in BME, has developed a yearlong 8-credit course in Advanced Biomedical Design and Development. A required sequence for students enrolled in the BME Master of Engineering program, students will work with leading clinicians to observe and identify unmet clinical challenges, design and develop innovative engineering solutions to those challenges, and explore the regulatory, intellectual property, and reimbursement pathways that will ultimately advance the standard of patient care through the deployment of their innovations.

College of Engineering alumni from across the country converged on Cummington Mall on September 18-20 to celebrate the College’s first 50 years with faculty and students. They learned about high-impact ENG research and entrepreneurial achievements, toured new facilities, participated in a design challenge and engaged in spirited conversations about the past and future of the College.


The 2015 North East Bioengineering Conference (NEBEC) senior design competition awarded the BME team of Courtney Ellenson, Gil Covarrubias, Jr., Danielle Conneely and Nelson Boland, second prize on April 17 at Rensselaer Polytechnic Institute in New York. Advised by Professor Catherine Klapperich, the team developed a credit card-sized, microfluidic chip with molecular diagnostic capabilities that promises to improve diagnosis of gonorrhea in any health setting. The competition fielded entries from 79 teams based at 19 different universities.
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Professor, Biomedical Engineering;  
Associate Provost for Graduate Affairs  
PhD, Chemical Engineering, University of Texas at Austin  
bu.edu/provost/about/administration/timothy-barbari/  
Biomaterials, hydrogels, membranes, biomolecular transport and binding, biosensors

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Professor, Biomedical Engineering;  
Electrical and Computer Engineering; and Physics  
PhD, Physics, University of Michigan  
bu.edu/research/labs/bo  
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  
MD, Harvard University, PhD, Medical Engineering, MIT  
thttp://sites.bu.edu/chenlab/  
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  
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Director, Hearing Research Center  
PhD, Electrical Engineering, MIT  
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Measurement and modeling of binaural hearing performance. Modeling the activity of auditory brainstem neurons and measurement and modeling of spatial attributes of sound perception.

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vbu.edu/research/labs/damiano  
Integrated cellular and extracellular biomechanics; biofluid dynamics; microhemofluidics; microcirculation; vestibular biomechanics; non-Newtonian rheology; closed-loop blood-glucose regulation.

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

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

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

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Neurotechnology, optical neural modulation,
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Design of new molecular diagnostics and
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Neuroscience of sensorimotor behaviors; biological active
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Binaural and spatial hearing, perceptual effects
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Respiratory mechanics; cell mechanics; rheology of soft tissues; mechanics of foam-like structures.

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

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

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

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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.

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Microfluidic devices; tissue engineering, and biomaterials.

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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.

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Nano-microracle biomechanics; ultra-sensitive force probes, extreme resolution optical techniques; material properties of cellular structure; role of structural forces in cell biochemistry.

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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.

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Bashor, Caleb (Collins)
Belenky, Ryan (Collins)
Bellas, Evangelia (Chen)
Burrill, Devin (Collins)
Calabro, Finnegar (Vaina)
Cameron, Owen (Collins)
Chan, Clement (Collins)
Choi, Colin (Chen)
Chopra, Anant (Chen)
Cohen, Nadia (Collins)
Daringer, Nichole (Collins)
Desai, Darash (Zaman)
Furuta, Yoshikazu (Collins)
Gritton, Howard (Han)
Gutierrez, Arnaud (Collins)
Hayashi, Gosuke (Collins)
Heydrick, Stanley (J Wong)
Keung, Albert (Khali)
Kohman, Richard (Han)
Kondabolu, Krunsknakanth (Han)
Kumar, Roshan (Collins)
Kutys, Matthew (Chen)
Lee, Elaine (Wong)
Lee, Jeong Wook (Collins)
Linnes, Jaqueline (Klapperich)
Mak, Michael (Zaman)
Mamonov, Artem (Vajda)
Meylan, Sylvain (Collins)
Mirabella, Teodelinda (Chen)
Nahhas, Michael (Vaina)
Olivera Nunes, Claudia (Suki)
Pardee, Keith (Collins)
Perrone, Benjamin (Ritt)
Polacheck, William (Chen)
Porter, Caroline (Collins)
Shapiro, Rebecca (Collins)
Slomovic, Shimyn (Collins)
Spill, Fabian (Zaman)
Squires, Allison (Meller)
Takahashi, Ayuko (Suki)
Tseng, Hua-an (Han)
Walsh, Anthony (W Wong)
Wellman, Tyler (Suki)
Wong, Sharon (Klapperich)
Wu, Gracie (Zaman)
Yang, Jason (Collins)
Zhou, Jiamin (Han)

SENIOR POSTDOCTORAL ASSOCIATES
Baker, Brendan (Chen)
Eyckmans, Jeroen (Chen)
Fan, Andy (Klapperich)
Parameswaran, Harikrishnan (Lutchen)
Trappmann, Britta (Chen)

ADJUNCT FACULTY
SYLVAN GIoux, PHD
Adjunct Assistant Professor, Biomedical Engineering, Beth Israel Deaconess Medical Center for Molecular Imaging
HERNAN JARA, PHD
Adjunct Associate Professor, Biomedical Engineering, Associate Professor of Radiology, Boston University School of Medicine
MARCOS VIDAL MELO, MD, PHD
Adjunct Associate Professor, Biomedical Engineering, Massachusetts General Hospital
TILO WINKLER, PHD
Adjunct Assistant Professor, Biomedical Engineering, Massachusetts General Hospital

RESEARCH TECHNICIANS
Chen, Li-Yang (Leon) (Vaina)
Chinnala, Jyothsna (Unlu)
Fernandes, Andrea (Zaman)
Guerra, Kevin (Han)
Gungordu, Hatice (Zaman)
Imada, Allicia (Ritt)
Irani, Atena (Zaman)
Istfan, Raef (Roblyer)
Kelleher-Tang, Laurie (Chen)
MacDonald, Cody (Collins)
McKeon, Katherine (Damiano)
Palmiere, Michael (Ritt)
Quintero-Cadena, Porfirio (Collins)
Schwarz, Eric (Collins)
Selagamsetty, Rajanranath (Damiano)
Telian, Greg (Ritt)
Ye, Jonathan (Collins)

RESEARCH SCIENTISTS
Atas, Evrim (Meller)
Beg, Qasim (Segre)
Buczek-Thomas, Joann (Wong, J)
Dreyfuss, Jonathan (Kasif)
Haddock, Traci
Jiang, John (Damiano)
Kuznetsov, Igor (Evans)
Mineava, Olga (Goldstein)
Molla, Michael (Kasif)

RESEARCH ENGINEERS
Andreson, David (Colburn)
Brughera, Andrew (Colburn)
Studer, Roger (Martin)
Voysey, Graham (Colburn)
Zosuls, Alex (Colburn)

SENIOR RESEARCH SCIENTISTS
A'amar, Ousama (Bigio)
Bartolak-Suki, Elizabeth (Suki)
Cariani, Peter (Colburn)
Delhorne, Lorraine (Colburn)
Dwyer, Dan (Collins)
El-Khatib, Firas (Damiano)
Ramey, Kirk (Damiano)
Scolnick, Scott (Damiano)
The Biomedical Engineering Department maintains a vibrant research program in its approximately 73,000 square feet of space at 24-44 Cummington St., on Boston University’s Charles River Campus. We are comprised of 31 separate research laboratories and 6 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 the work to the improvement of health care, and a thorough understanding of the underlying physiological processes

BU faculty received $25,556,223 in new research funding (7/1/2014 - 6/30/2015)

### RESEARCH AREAS IN BME
- Synthetic Biology and Quantitative Systems Biology
- Neuroengineering & Hearing Research
- Cellular, Subcellular & Systems Biomechanics
- Molecular Bioengineering
- Biomedical applications of Nanotechnology
- Biomedical Optics & Imaging
- Biomaterials, Tissue Engineering & Regenerative Medicine
- Engineering Global Health

### BME FACULTY ANNUAL TOTAL GRANT FUNDING

<table>
<thead>
<tr>
<th>FISCAL YEAR</th>
<th>GRANT INCOME</th>
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<tr>
<td>2011</td>
<td>$8 mil</td>
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<td>2012</td>
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<td>2014</td>
<td>$32 mil</td>
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<td>2015</td>
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77 NEW AND CONTINUING FUNDING AWARDS. OVER $160M IN RESEARCH PROPOSALS SUBMITTED.
BME’s largest funding source is NIH (68%) followed by NSF (9%), then DOD (8%), Foundations (6%), industry (3%) and other Government Sources (2%). 4% of the funding received in FY13 was dedicated to graduate student funding through 3 training grants and funding from local area hospitals and universities.

**BME GRANT FUNDING BY AGENCY**

<table>
<thead>
<tr>
<th>Agency</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>NIH</td>
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<tr>
<td>NSF</td>
<td>9%</td>
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<tr>
<td>DOD</td>
<td>8%</td>
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<tr>
<td>Foundations</td>
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<tr>
<td>Student Support</td>
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<tr>
<td>Industry</td>
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<tr>
<td>Other Govt</td>
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**NIH AWARDS**

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Institute</th>
<th>Amount</th>
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<tbody>
<tr>
<td>BAKER</td>
<td>MECHANICS OF FIBROSIS IN 3D BIOMIMETIC EXTRACELLULAR MATRICES</td>
<td>NHLBI</td>
<td>130,356</td>
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<tr>
<td>BIGIO</td>
<td>OPTICAL IMAGING OF CHEMOTHERAPY FOR BRAIN TUMORS (SUB COLUMBIA U)</td>
<td>NCI</td>
<td>72,740</td>
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<td>CHEN</td>
<td>ALLIANCE CHALLENGE PROJECT: THE EMP TUMOR METASTASIS MODEL SYSTEMS (SUB JOHNS HOPKINS)</td>
<td>NCI</td>
<td>32,740</td>
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<tr>
<td>CHEN</td>
<td>STIFFNESS, CADHERINS, AND INTEGRINS IN MECHANOCHEMICAL SIGNALING (SUB UPENN)</td>
<td>NHLBI</td>
<td>138,403</td>
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<td>CHEN</td>
<td>APOE HDL, ARTERIAL BIOMECHANICS AND CARDIOVASCULAR DISEASE (SUB UPENN)</td>
<td>NHLBI</td>
<td>74,087</td>
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<td>CHEN</td>
<td>RESBIO: THE TECHNOLOGY RESOURCE FOR POLYMERIC BIOMATERIALS (SUB RUTGERS)</td>
<td>NIBIB</td>
<td>112,469</td>
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<td>CHEN</td>
<td>INTEGRATED HEART-LIVER-VASCULAR SYSTEMS FOR DRUG TESTING IN HUMAN HEALTH AND DISEASE (SUB WYSS)</td>
<td>NIBIB</td>
<td>242,129</td>
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<td>CHEN</td>
<td>A VASCULARIZED 3-D BIOMIMETIC FOR ISLET FUNCTION AND PHYSIOLOGY (SUB UPENN)</td>
<td>NIDDK</td>
<td>202,629</td>
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<td>COLBURN</td>
<td>CORE CENTER GRANT</td>
<td>NIDCD</td>
<td>461,924</td>
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<td>COLLINS</td>
<td>CHROMATIN-BASED CELLULAR MEMORY AND SPATIAL GENOMIC REGULATION</td>
<td>NIGMS</td>
<td>54,194</td>
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<td>DAMIANO</td>
<td>TRANSLATIONAL STUDIES OF A BIONIC PANCREAS FOR OUT-PATIENT DIABETES MANAGEMENT</td>
<td>NIDDK</td>
<td>593,701</td>
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<td>DAMIANO</td>
<td>A MULTICENTER OUTPATIENT TRIAL OF A BIHORMONAL BIONIC PANCREAS</td>
<td>NIDDK</td>
<td>1,440,000</td>
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<td>DELISI</td>
<td>VISANT-PREDICTOME: A SYSTEM FOR INTEGRATION, MINING, VISUALIZATION AND ANALYSIS</td>
<td>NIGMS</td>
<td>750,810</td>
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<td>EVANS</td>
<td>KINETIC AND MECHANICAL PROPERTIES OF ALB2 INTEGRIN (SUB GA TECH)</td>
<td>NIH</td>
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<td>GALAGAN</td>
<td>SYSTEMS BIOLOGY OF THE CIRCADIAN CLOCK OUTPUT NETWORK (SB TEXAS A&amp;M)</td>
<td>NIGMS</td>
<td>151,445</td>
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<td>GALAGAN</td>
<td>GLOBAL MAPPING AND ANALYSIS OF BACTERIAL TRANSCRIPTIONAL REGULATORY NETWORK</td>
<td>NIGMS</td>
<td>570,271</td>
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<tr>
<td>GRINSTAFF</td>
<td>SYNTHESIS, CHARACTERIZATION, AND EVALUATION OF POLYMERIC TISSUE LUBRICANTS</td>
<td>NIAMS</td>
<td>745,269</td>
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<td>PRINCIPAL INVESTIGATOR</td>
<td>TITLE OF PROJECT</td>
<td>INSTITUTE</td>
<td>AMOUNT</td>
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<tr>
<td>Grinstaff</td>
<td>Characterizing electrostatic interactions between glycosaminoglycans and cationic small molecules</td>
<td>NIH</td>
<td>274,341</td>
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<tr>
<td>Han</td>
<td>Causal analysis of electrically connected neural networks</td>
<td>NINDS</td>
<td>320,314</td>
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<tr>
<td>Han</td>
<td>Light controllable nanorobot for uncaging arbitrary bioactive molecules</td>
<td>NINDS</td>
<td>491,100</td>
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<td>Kasif</td>
<td>Diabetes Research Center-Genomics Core (Sub Joslin)</td>
<td>NIDDK</td>
<td>236,689</td>
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<td>Kasif</td>
<td>Expansion of the Diabetes Research Center's Pilot and Feasibility Program (Sub Joslin)</td>
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<td>99,999</td>
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<td>Klapperich</td>
<td>Bacterial drug susceptibility identification by surface enhanced Raman microscopy (Sub Fraunhofer)</td>
<td>NIAID</td>
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<td>Klapperich</td>
<td>Rapid molecular diagnostics for Chlamydia and Gonorrhea at the Point-of-care</td>
<td>NIAID</td>
<td>547,484</td>
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<td>Klapperich</td>
<td>Center for Innovation in Point of Care Technologies for the Future of Cancer Care</td>
<td>NIBIB</td>
<td>1,783,107</td>
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<td>Klapperich</td>
<td>Center for Innovation in Point of Care Technologies for the Future of Cancer Care</td>
<td>NIBIB</td>
<td>1,810,561</td>
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<td>Klapperich</td>
<td>Paper microfluidic chip for isothermal amplification and lateral flow detection of HPV DNA (Sub MGH)</td>
<td>NIBIB</td>
<td>139,425</td>
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<td>Klapperich</td>
<td>A rapid instrument free molecular diagnostic for B. Pertussis</td>
<td>NIAID</td>
<td>57,962</td>
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<td>Mertz</td>
<td>High resolution phase contrast endoscopy</td>
<td>NCI</td>
<td>345,234</td>
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<tr>
<td>Parameswaran</td>
<td>Extracellular determinants of airway smooth muscle force: A new paradigm for sustained airway constriction</td>
<td>NHLBI</td>
<td>113,724</td>
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<td>Ritt</td>
<td>Multi-region, extended-depth imaging of neural activity via a novel needle microendoscope</td>
<td>NIBIB</td>
<td>245,550</td>
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<tr>
<td>Shinn-Cunningham</td>
<td>Training in computational neuroscience: Integrating experiment, theory, and technology</td>
<td>NIDA</td>
<td>328,021</td>
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<tr>
<td>Shinn-Cunningham</td>
<td>Individual differences in supra-threshold sound encoding</td>
<td>NIDCD</td>
<td>347,863</td>
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<td>Smolina</td>
<td>The development of multiplexed, label-free isothermal diagnostic for rapid identification of bacterial pathogens</td>
<td>NIAID</td>
<td>245,550</td>
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<td>Sukii</td>
<td>Endogenous Surfactant therapy for the developing lung</td>
<td>NHLBI</td>
<td>486,935</td>
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<td>Sukii</td>
<td>Personalized mechanical ventilation for the injured lung (Sub UVM)</td>
<td>NHLBI</td>
<td>435,398</td>
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<td>Tiern</td>
<td>In vivo microsurgical anastomosis of prevascularized tissues</td>
<td>NIBIB</td>
<td>163,700</td>
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<td>Vajda</td>
<td>A multistage approach to protein-protein docking</td>
<td>NIGMS</td>
<td>269,015</td>
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<tr>
<td>Vajda</td>
<td>Computational mapping of proteins for the binding of ligands</td>
<td>NIGMS</td>
<td>372,783</td>
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<tr>
<td>Wong J</td>
<td>Models to predict protein biomaterial performance (Sub Tufts)</td>
<td>NIBIB</td>
<td>193,062</td>
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<tr>
<td>Wong J</td>
<td>Mechanical conditioning of tissue engineered blood vessels for atherosclerosis (F32 NRSA)</td>
<td>NHLBI</td>
<td>54,194</td>
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<tr>
<td>Wong J</td>
<td>Biomechanical determinants of lung cell fate in pluripotent stem cells</td>
<td>NHLBI</td>
<td>812,361</td>
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<tr>
<td>Wong W</td>
<td>Synthetically reengineered T cells as the next generation of smart cancer therapy</td>
<td>NCI</td>
<td>491,100</td>
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<tr>
<td>Zaman</td>
<td>Modeling bi-directional signaling and cytoskeletal dynamics in 3D cell migration</td>
<td>NCI</td>
<td>609,098</td>
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<tr>
<td>Zaman</td>
<td>Physics of collective cellular migration in lung health and disease (Sub Harvard SPH) Tests</td>
<td>NHLBI</td>
<td>196,440</td>
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### NSF AWARDS

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Directorate</th>
<th>Amount</th>
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<tbody>
<tr>
<td>CHEN</td>
<td>Collaborative Research: The Effects of Extracellular Matrix Alignment of Cellular Mechanotransduction in 3D Architectures</td>
<td>Engineering (ENG)</td>
<td>300,000</td>
</tr>
<tr>
<td>GRINSTAFF</td>
<td>Suschem: Environmentally Friendly Microfiber Polycarbonate Meshes for Continuous Oil Retrieval</td>
<td>Mathematical and Physical Sciences (MPS)</td>
<td>420,000</td>
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<tr>
<td>KHALIL</td>
<td>Career: Evolution and Engineering of Cellular Bet-Hedging Devices</td>
<td>Biological Sciences (BIO)</td>
<td>146,685</td>
</tr>
<tr>
<td>MERTZ</td>
<td>Uns: Fluorescence Light-Field Imaging with a Lensless Flexible Fiber Bundle</td>
<td>Engineering (ENG)</td>
<td>299,997</td>
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<tr>
<td>SMITH</td>
<td>Career: Regulation of Multicellular Behavior with an Extrace</td>
<td>Engineering (ENG)</td>
<td>90,000</td>
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<tr>
<td>STAMENOVIC</td>
<td>Maintenance of Mechanical Tension for Normal Tissue Function Requires Intercellular Cooperation</td>
<td>Engineering (ENG)</td>
<td>387,061</td>
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<td>VAIDA</td>
<td>ABI Development: Utilization of Diverse Data in Exploring Protein-Protein Interactions</td>
<td>Biological Sciences (BIO)</td>
<td>605,088</td>
</tr>
<tr>
<td>WONGJ</td>
<td>I-Corps: Tissue-Engineering Vascular Grafts using Autologous Cell Sheets</td>
<td>Engineering (ENG)</td>
<td>50,000</td>
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### AWARDS FROM FOUNDATIONS

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<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Foundation</th>
<th>Amount</th>
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<tbody>
<tr>
<td>CHOPRA</td>
<td>Effect of Mechanical Load on the Structure and Function of Engineered-3D Human Stem Cell Derived Cardiac Tissues</td>
<td>AHA</td>
<td>42,300</td>
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<tr>
<td>DAMIANO</td>
<td>An Outpatient Feasibility Study of an Insulin-Only Bionic Pancreas</td>
<td>Helmsley Trust</td>
<td>775,061</td>
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<tr>
<td>EISENBERG</td>
<td>Coulter Foundation Translational Partners in Biomedical Engineering</td>
<td>Wallace H. Coulter Foundation</td>
<td>500,000</td>
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<tr>
<td>FURUTA</td>
<td>Multi-Omics Analysis of Adaptive Evolution</td>
<td>Takeda Science Foundation</td>
<td>7,623</td>
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<tr>
<td>ROBLYER</td>
<td>Personalized Chemotherapy Through Rapid Monitoring with Wearable Optics</td>
<td>ACS</td>
<td>194,000</td>
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<tr>
<td>ZAMAN</td>
<td>The Development of a Reliable and Robust Oxygen Concentrator Platform for Use in Low-Resource Settings</td>
<td>Bill and Melinda Gates Foundation</td>
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### AWARDS FROM DOD

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<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
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<tbody>
<tr>
<td>COLBURN</td>
<td>Primary Audiograms of Hearing in Baleen Whales: A Model System for Mitigating Sound Impacts (Sub WHO)</td>
<td>DOD/NAVY</td>
<td>33,863</td>
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<tr>
<td>COLLINS</td>
<td>Utilizing Synthetic Biology to Create Programmable Micro-Bio-Robots</td>
<td>DOD/ONR</td>
<td>1,100,000</td>
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<td>COLLINS</td>
<td>Synthetic Mammalian Gene Regulatory Circuits for In Vivo Biomedical Applications</td>
<td>DOD/ARO</td>
<td>595,000</td>
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<tr>
<td>GHITZA</td>
<td>Cascading Oscillators in Decoding Speech: Reflection of a Cortical Computation Principle</td>
<td>DOD/AFOSR</td>
<td>252,651</td>
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# Awards from Other Government Agencies

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<th>Title of Project</th>
<th>Granting Agency</th>
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<tbody>
<tr>
<td>Zaman</td>
<td>Developing Superior Screening Technology for Medicine Quality Control in Low Resource Countries (Sub USPC)</td>
<td>USAID</td>
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<td>Zaman</td>
<td>Implementation of Pharmacheck to Assure the Quality of IMCDrugs in Indonesia (Sub U Indonesia)</td>
<td>USAID</td>
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<tr>
<td>Zaman</td>
<td>Pharmachk: Substandard and Counterfeit Medicines Rapid Detection and Screening Platform</td>
<td>USAID</td>
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# Awards from Industry

<table>
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<tbody>
<tr>
<td>Chen</td>
<td>Bioengineering of Fibrosis</td>
<td>Biogen Idec</td>
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<td>Zaman</td>
<td>New Awards for Science Education to HHMI Professors</td>
<td>HHMI</td>
<td>200,000</td>
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<tr>
<td>Damiano</td>
<td>Method and Scheduling for Testing Glucagon PK, and Stability in Diabetic Swine Models</td>
<td>Latitude Pharmaceuticals Inc.</td>
<td>29,621</td>
</tr>
<tr>
<td>Han</td>
<td>Analysis of Biodesign as Drug Permeable Dural Replacement in Blood-Brain Barrier Permeabilizing Mucosal Graft Reconstruction of the Skull Base</td>
<td>Meei</td>
<td>5,000</td>
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<tr>
<td>Grinstaff</td>
<td>Downhole Li-Ion Batteries Based on Network Ionic Liquids</td>
<td>University of Texas</td>
<td>149,999</td>
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# Awards from Student Funding

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<tr>
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<td>Predoctoral Fellowship (F31 NRSA)</td>
<td>Niddk</td>
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<td>Bigio</td>
<td>Funding for Graduate Student (MGH)</td>
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<td>Training Program in Quantitative Biology and Physiology (T32)</td>
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<td>Funding for Graduate Student (Harvard)</td>
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<td>Collins</td>
<td>Funding for Graduate Student (Harvard)</td>
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<td>Delisi</td>
<td>Funding for Graduate Student (U Mass)</td>
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<tr>
<td>Kasif</td>
<td>Funding for Graduate Student (Joslin T32)</td>
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<td>Khalil</td>
<td>Funding for Graduate Student (Harvard)</td>
<td>Harvard Medical School</td>
<td>35,355</td>
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<td>Mertz</td>
<td>Funding for Graduate Student (MGH)</td>
<td>Massachusetts General Hospital</td>
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<td>Sen</td>
<td>Funding for Graduate Student (Meei)</td>
<td>Meei</td>
<td>35,355</td>
</tr>
<tr>
<td>Stamenovic</td>
<td>Funding for Graduate Student (bidmc)</td>
<td>DOD</td>
<td>42,268</td>
</tr>
<tr>
<td>Vaina</td>
<td>Funding for Graduate Student (Draper)</td>
<td>Draper Laboratory, Inc.</td>
<td>58,038</td>
</tr>
<tr>
<td>Wong J</td>
<td>Funding for Graduate Student (MGH)</td>
<td>Massachusetts General Hospital</td>
<td>35,355</td>
</tr>
<tr>
<td>Wong J</td>
<td>Funding for Graduate Student (CHB)</td>
<td>Children's Hospital Boston</td>
<td>72,726</td>
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</tbody>
</table>
For the past nine 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 4 years the Coulter Foundation commitment provides $500,000 per year with an equivalent cost share provided by the university.

Funding was provided to the following projects for 2014-2015:

- Interpenetrating Phase Ceramic Matrix Composite for Dental Implant Structures (R. Giordano/X. Lin)
- Novel Sternal Approximation Device (J. Rosen/K. Karlson)
- A dissolvable, hydrogel-based aerosolized sealant dressing for the treatment of superficial to deep-second degree burns (M. Grinstaff/E. Rodriguez/ A. Nazarian)
- Specialized Breast Biopsy Introducer – Pilot Clinical Study (J. Brooks/ J. McDaniel)

For the 2015-2016 funding year, a total of 19 projects were evaluated, 13 projects were invited to submit full proposals to the Coulter Oversight Committee and 8 projects were invited to make an oral presentation. The new projects selected for funding include:

- Effectiveness of home-based electronic cognitive therapy in Alzheimer’s disease, C. Stepp, and A. Budson
- Next-generation, cartilage-lubricating injectable device, M. Grinstaff and B. Snyder
- Non-invasive neutrophil counts to improve chemotherapy delivery in lymphoma patients, J. Mertz and E. Hochberg
- Individualized hearing-aid signal processing strategies for listeners with “hidden” hearing loss, B. Shinn-Cunningham and S. Kujawa
## Graduate Enrollment

### Enrollment for AY 2014-2015

<table>
<thead>
<tr>
<th></th>
<th>USA</th>
<th>International</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♀</td>
<td>♂</td>
<td></td>
</tr>
<tr>
<td>MENG</td>
<td>6</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>MS</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>PHD</td>
<td>30</td>
<td>48</td>
<td>119</td>
</tr>
<tr>
<td>MD/PHD</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>37</strong></td>
<td><strong>66</strong></td>
<td><strong>150</strong></td>
</tr>
</tbody>
</table>

## Graduate Program Population

![Bar chart showing graduate program population by year and degree type]

## Graduate Funding AY 2014-2015

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Assistants</td>
<td>67</td>
</tr>
<tr>
<td>BME Distinguished Fellowships</td>
<td>20</td>
</tr>
<tr>
<td>Dean’s Fellowships</td>
<td>1</td>
</tr>
<tr>
<td>NIH Quantitative Biology and Physiology Training Grant</td>
<td>7</td>
</tr>
<tr>
<td>NIH Biomaterials Training Grant</td>
<td>2</td>
</tr>
<tr>
<td>NIH Training Grant at BUSM</td>
<td>4</td>
</tr>
<tr>
<td>NSF Fellowship</td>
<td>9</td>
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<tr>
<td>NSF XTNC Training Grant</td>
<td>2</td>
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<tr>
<td>NSERC Fellowship</td>
<td>1</td>
</tr>
<tr>
<td>Lawrence Livermore National Laboratory Fellowship</td>
<td>1</td>
</tr>
<tr>
<td>HHMI Fellowship</td>
<td>1</td>
</tr>
<tr>
<td>BU-BWH Imaging Fellowship</td>
<td>2</td>
</tr>
<tr>
<td>Genzyme</td>
<td>1</td>
</tr>
<tr>
<td>LOA</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119</strong></td>
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ADMISSION RESULTS FOR AY 2014-2015

<table>
<thead>
<tr>
<th></th>
<th>APPLICANTS</th>
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<th>MATRICULATIONS</th>
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<td>PhD</td>
<td>Total</td>
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<td>MS</td>
<td>PhD</td>
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<tr>
<td>US</td>
<td>39</td>
<td>31</td>
<td>152</td>
<td>222</td>
<td>6</td>
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<tr>
<td></td>
<td>34</td>
<td>24</td>
<td>94</td>
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<tr>
<td>INT'L</td>
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<td>84</td>
<td>131</td>
<td>2</td>
<td>1</td>
<td>7</td>
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<td>TOTAL</td>
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<td>114</td>
<td>404</td>
<td>624</td>
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ADMISSION PROJECTIONS FOR FALL 2015

<table>
<thead>
<tr>
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<th>APPLICANTS</th>
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<th>ACCEPTED OFFERS</th>
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<td>PhD</td>
<td>Total</td>
<td>MEng</td>
<td>MS</td>
<td>PhD</td>
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<tr>
<td>US</td>
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<td>41</td>
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<td>189</td>
<td>11</td>
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<td>94</td>
<td>161</td>
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<tr>
<td>TOTAL</td>
<td>120</td>
<td>142</td>
<td>381</td>
<td>643</td>
<td>17</td>
<td>13</td>
<td>27</td>
</tr>
</tbody>
</table>
PH.D GRADUATES 2015
THESIS TITLE & ADVISOR(S)

SEPTEMBER 25, 2014

Paul C Iazzetti
(James Galagan, advisor)
“High-throughput Binding Characterization of Bacterial Transcription Factors”

Suma Jaini
(James Galagan, advisor)
“Methods for Functional Characterization of Transcription Factor Binding Sites in Bacteria”

Jason Paul Keller
(James Galagan and Catherine Klapperich, advisors)
“A Microfluidic Platform for Quantitative Analysis of Single Mycobacteria Cells”

Elizabeth Sloan Peruski
(Michael Smith and Dimitrije Stamenovic, advisors)
“Multiscale Regulation of Cellular Mechanical Properties”

Rachel Christine Stewart
(Mark Grinstaff, advisor)
“A Diagnostic Imaging Technique and Therapeutic Strategy for Early Osteoarthritis”

Raphael Turcotte
(Charles Lin (Harvard Medical School, Dermatology) and Jerome Mertz, advisors)
“An Integrated Optical Platform for Micromanipulation of Cells and Tissues in Live Animals”

Hao Wang
(Jerome Mertz and Guillermo Tearney (Harvard Medical School, Pathology), advisors)
“Near Infrared Autofluorescence Augmentation of Optical Coherence Tomography for Diagnosis of Coronary Atherosclerosis”

Xirui Zhang
(M. Selim Unlu, advisor)
“Dual-Spectral Interferometric Sensor for Quantitative Study of Protein-DNA Interactions”

JANUARY 25, 2015

Benjamin Alan Lakin
(Mark Grinstaff, Advisor)
“Developing a Cationic Contrast Agent for Computed Tomographic Imaging of Articular Cartilage and Synthetic Biolubricants for Early Diagnosis and Treatment of Osteoarthritis”

Zhuting Li
(Xue Han and Shelley Russek, Advisors)
“Activity-Dependent Gene Regulation in Neurons: Energy Coupling and a Novel Biosensor”

Joseph Stefano Maffei
(Muhammad Zaman, Advisor)
“Analysis of Matrix Metalloproteinases in Cancer Cell Signaling and Extracellular Behavior”

Tuan Anh Pham
(James Hamilton and Joyce Wong, Advisors)
“Early Detection and Treatment Strategies for Vulnerable Atherosclerotic Plaques”

MAY 17, 2015

Daniel Edwin Backman
(Joyce Wong, Advisor)
“Biomechanics of Aligned Cell Sheets for Arterial Tissue Engineering”

Oliver Bates
(Peter Spector and Bela Suki, Advisors)
“Studies on the Dynamics of Chaotic Multi-Wavelet Reentrant Propagation using a Hybrid Cellular Automation Model of Excitable Tissue”

TIMOTHY M Jackman
(Elise Morgan, Advisor)
“Prediction of Vertebral Fractures Under Axial Compression and Anterior Flexion”

Xirui Zhang
(M. Selim Unlu, advisor)
“Dual-Spectral Interferometric Sensor for Quantitative Study of Protein-DNA Interactions”

MENG GRADUATES

9/25/2014
Karina Mae Kidd
Dana Michele Daukss
Rui Sun
Yu Zuo
GRADUATE STUDENT FELLOWSHIPS

NSF Fellowships
Angelo, Joseph
Cheng, Daniel
Eklaaidous, Iriny
Israni, Divya
Jain, Saloni
Mangano, Lauren
Reynolds, Daniel
Wang, Julia
Weinberg, Benjamin

NIH Fellowships
Blaha, Laura
Kwong, George
Meisel, Cari
Ramirez, Alfred

XTNC Fellowships
(Cross- disciplinary Training in Nanotechnology for Cancer)
Chiu, Joanna
Vargas Arango, Diego

NIH Quantitative Biology and Physiology Fellowships
Acevedo, Andrew
Gormley, Catherine
Hansen, Kyle
Istfan, Raeef
Kwasa, Jasmine
Seager, Robert
Zollinger, Alicia

NIH Translational Research in Biomaterials Fellowship
Cha, Susie
Kim, Jessica

BU-BWH Imaging Fellowship
Lough, Emily
Zhao, Yanyu

HHMI Fellowship
Rim, Nae Gyune

Canadian CHIR Fellowship
Mee, Michael

Lawrence Livermore National Lab Fellowship
Fong, Erika

Dean’s Fellowship
Weber, Timothy

BME Distinguished Fellowship
Balijepali, Anant
Bonacci, Lia
Bou Jawde, Sameer
Deng, Yuqi
Huang, Shuo
Karrobi, Kavon
Law, Billy
Li, Xuanuy
Nazari, Navid
Nykyforchyn, Christine
Padhony, Dimitry
Porter, Kathryn
Roberts, Eric
Stettner, Arion
Sun, Zhuyei
Wang, Peijiang
Wong, Meng Li
Nicole
Xu, Han
Zeng, Jialiu
Zhang, Kehan

MS GRADUATES 2015

SEPTEMBER 25, 2014
Joseph Paul Angelo
(Irving Bigio, advisor)
“Real-time Tissue Viability Assessment Using Near-infrared Light”

Ali Hussein Badreddine
(Irving Bigio, advisor)
“Using Birefringence to Track Action Potentials in Brain Tissue”

Christopher David Hartman
(Joyce Wong, advisor)
“The Role of Extracellular Matrix Composition in Vascular Smooth Muscle Cell Durotaxis”

Anna Katz Hawes
(Jason Ritt, project advisor)
“Experimental Dissociation of Active Sensing Strategies during Tactile Discrimination”

Nga Thuy Ho
(Muhammad Zaman, advisor)
“Multiplexed, Affordable and Portable Platform for Real Time Quantitative Detection of Substandard and Counterfeit Pharmaceuticals”

Yu-An Lien
(Cara Stepp, advisor)
“Optimization and Automation of Relative Fundamental Frequency for Objective Assessment of Vocal Hyperfunction”

Lauren Michelle Mangano
(Elise Morgan, advisor)
“Non-invasive Assessment of Cartilaginous Tissues in Small Animal Models of Injury and Disease”

Carlos Segura
(Irving Bigio and Bryan McLaughlin (Draper Laboratory), advisors)
“Development of an Optrode for Characterization of Tissue Optical Properties at the Neural Tissue-Electrode Interface”

JANUARY 25, 2015
Laura Catherine Blaha
(Mario Cabodi and Joyce Wong, Advisors)
“A Microfluidic Platform to Examine Competition in Soluble Signaling in the Extravasation Microenvironment”

Junzi Dong
(Steve Colburn and Kamal Sen, Advisors)
“Neural Network Model of Spatial Sound Source Segregation”

Andrew Michael Fisher
(Lee Goldstein, Advisor)
“Animal Model of Acute and Chronic Effects of Blast Traumatic Brain Injury”

George Kwong
(Joyce Wong, Advisor)
“Double-Reporter Induced Pluripotent Stem Cells for Vascular Cell Sheet Engineering”

Emily Anne Lough
(Tyrone Porter, Advisor)
“Co-Delivery of Cisplatin and Paclitaxel in Targeted Lipid-Polymer Hybrid Nanoparticle”

Ruei-Jr Wu
MS with Engineering Practice

MAY 17, 2015
Dustin Christopher Clark
(Patrick McNamara, Project Advisor)
“Mapping the Effective Connectivity in Parkinson’s Disease with Canonical Granger Causality”

Elizabeth Marie Shenko
(Neil Ganem and Tyrone Porter, Advisors)
“Identifying and Targeting the Adaptive Mechanisms Made by ALT-Positive Near-Tetraploid Tumor Cells”

Billy Law
MS with Engineering Practice

5/17/2015
Ahmed Yahya A Aljefri
Adam Debosier
Jonathan Zachary Egan
Jennifer Si He
Brian Allen Hemmat
Sten Kaeding
Savitha Koushik
Mikel Douglas Lipschitz
Bissrat Melakeberhan
Eric Richard Meyer
Lauren Elizabeth Styskal
Debbie Teodorescu
Tyler Winston
The BME Department had 573 students enrolled this year, 37% of the total enrollment of the College of Engineering. The percent of female and male students was 43% and 57%, respectively.

### Tracking Alumni

#### Status of 2014-2015 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 of all such graduating students in late April/early May. The results of these interviews are shown at left.
The MMEDIC 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 administered in collaboration with our School of Medicine and is designed to train biomedical engineers who have the MD as their ultimate degree objective. MMEDIC 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.
In 2015, 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 Courtney Ellenson.

**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. Among the six award winners this year were BME seniors Jeray Thelwell, Jennifer Larbi, and Kayla Duval.

**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 Ryan Paul Schoeplein.

**Outstanding Senior Project Award:** The team of Kayla Duval and Dennis Marquis were recognized with the Department’s 2015 Outstanding Senior Design Project Award for their project “Application of Multi-Photon Microscopy to Assess the Microscopic Impact of Stretch on Airway Wall Mechanics” under the supervision of Dean Kenneth Lutchen.

**Student Advisor Award:** Among the 19 ENG winners for outstanding assistance in advising this year, the following BME seniors were recognized: Bradley Chiga, Michael Chin, Danielle Conneely, Gil Covarrubias, George Jiao, Shireen Kheradpey, James Kugler, Olivia Joy Lutz, Dennis Marquis, Ryan Paul Schoeplein, Jeray Anthony Thelwell, and William Yanli Wang.
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 2014-15**

**President** – Ronak Nair ’15

**Vice President** – Julianne Tefft ’15

**Corresponding Secretary** – Ryan Schoeplein ’15

**Recording Secretary** – Courtney Ellenson ’15

**Treasurer** – Hallie Thorp ’15

**Social Chair** – William Wang ’15

**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 2014-2015**

**President** – Courtney Ellenson ’15

**Vice President** – Shreya Deshmukh ’15

**Secretary** – Nelson Boland ’15

**Treasurer** – Keith George ’15
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 a 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).

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.

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 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 2014**
- Yash Agarwal
- Timothy Chong
- Samantha Chua
- Young Guang
- Thomas Lozanoski
- Shane McCormack
- Samantha Pipe
- Jarrod Risley
- Jordan Sweer

**Stars Summer 2014**
- Erin Chang
- Cameron Curtiss
- Aubrey Glasson
- Katherine Girouard
- Anna Hughes
- Zachary King
- Nikita Patil
- Shikha Sharma
- Joshua Shelefosky
- Maria Torres

**SURF AY 2014-2015**
- Esmael Moona
- Alexander O’Donovan
- Shaheer Piracha
- William Wang
- Aubrey Glasson
- Andrew Colletta
- Allison Durkan
- Angela Voss
- Maciej Walkosz
- Gil Covarrubias
- Wanwen Li
- Mazya Mowlod
- Deana Novin
- Danielle Stonely
- Katherine Truelson
- Kyle Mitchell
- Veena Dali
- Deana Novin
- Jeffrey Baker
- Leo Shapiro

**UROP Spring 2015**
- Yash Agarwal
- Davis Borucki
- Pin-Hao Chao
- Max Cotler
- Kayla Duval
- Samuel Ghilardi
- Jaclyn Grode
- Kathryn Hardin
- Tadafumi Ikeyu
- Rishi Jain
- Leticia Kim
- Adrienne Lee
- Raleigh Linville
- Thomas Lozanoski
- Ryan McNoughton
- Charina Ortega
- Alan Pacheco
- Shaheer Piracha
- Amir Soltanianzadeh
- Maciej Walkosz
- Monica Weitekamp
- Alec Wong
- Zhengyang Zhang

**UROP Summer 2015**
- Davis Borucki
- Matthew Brown
- Jeffery Chen
- Cameron Curtiss
- Kamila Drezek
- Emily Fitzgerald
- Aubrey Glasson
- Katherine Girouard
- Kevin Huang
- Raleigh Linville
- Emily Margolis
- Emily Misnick
- Lisa Nguyen
- Sanjana Pannem
- Nikita Patil
- Abha Patil
- Shaheer Piracha
- Kathleen Ryan
- Wali Subuhi
- Nicholas Salvador
- Shikha Sharma
- John Viola
- Maciej Walkosz
- Patrick Williamson
- Jing Xu
- Zhengyang Zhang
- Kavin Zhu

**UROP Fall 2014**
- Yash Agarwal
- Callen Bragdon
- Pin-Hao Chao
- Phuong Diep
- Leticia Kim
- Adrienne Lee
- Bauer LeSavage
- Raleigh Linville
- Ryan McNoughton
- Bethany Moore
- Charina Ortega
- Alan Pacheco
- Abha Patil

Undergraduate Program 2014-2015
The Senior Design Project continues to be a major strong point of our undergraduate program. Every BME senior is required to develop a project proposal with an individual faculty member, local area scientific mentor, or even a bioengineering corporate technical advisor (with a BME faculty co-supervisor). The project is then carried out with the guidance of the student’s technical advisor. This brings together elements of engineering science and engineering design. In coordination with the technical work, this course includes experience in planning, establishing priorities and formal training in technical communication including proposal, abstract, progress reports and oral and written presentations of the final work. In conjunction with the BME Department’s Visiting Committee, we have additional 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. The proceedings cover is shown above and the companies that registered for this year’s conference are listed below, followed by a listing of the project presentations.

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, Department of Clinical Engineering
Boston Scientific
Boston University School of Management
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—Department of Veterans Affairs
Columbia University,
College of Physicians and Surgeons
Comprehensive Health Management Inc.
ConforMIS, Inc.
Consult and Design
Covidien
CSA Medical
Cynosure
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
Hologic
Iandiorio Teska & Coleman
IDEXX Laboratories
Image Stream Medical Integra LifeSciences
Ironwood Pharmaceuticals
iWorx Systems, 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.
Navinet
Neuroptix Corporation
New Health Sciences
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
Veterans Affairs Boston Healthcare System
Worcester Polytechnic Institute
Wyss Institute for Biologically Inspired Engineering
Xcellerex
Session I
TISSUE ENGINEERING & DRUG DELIVERY
Chair: Prof. Catherine Klapperich

Dextran Fiber-Hydrogel Composite to Study Angiogenesis
James Kugler and William Wang

Device for Uniformly Loading a Scaffold with Osteogenic Protein
Zachary Decker, Alex Heubeck, Bethany Moore, and Eric Schmidt

Design of an Airway Tree to Test a Smart Inhaler for Targeted Drug Delivery
Mike Basile, Ishaan Puranam, and Adam Sonnenberg

In Vitro Culture Conditions for Bioprinting of iPSC-derived Human Hepatocytes
Namrita George, Ruohan Wang, and Zhe Zhong (Monica)

Positioning System and 3-D Printed Mouse Phantom for Accurate and Precise Animal MRI Scanning
Phuong Diep, Shrinjoy Sahoo, Yong Song, and Evan Vincent

P-glycoprotein Regulation in Primary Nasal Epithelial Cell Cultures
Chris Simons, Amy Singleton

Session IIa
DIAGNOSTICS
Chair: Prof. Ahmad Khalil

Detection of Serum Circulating miRNAs for Lung Cancer Diagnostics Using Rolling Circle Amplification and Nanoparticle Signal Enhancement
Alejandra Cambonchi and Andrea Szabo

Detecting Antibiotic-Resistant Meningitis with Technology Adapted for Developing Countries
Leticia Kim, David Lin, Kimberly Lu

Optimization of a Quantum Dot Point-of-Care Diagnostic
Carlos Diclear, Jay Ishimaru, Carolina Mesa, and Thuy Nguyen

Expanding Access to Diagnosis of Drug Resistant Tuberculosis with a Compact DNA Extraction Device
Declan Bowman, Shreya Deshmukh, and Garrett Moore

Fabrication of Functionalized Nanoparticles for Increased Specific Immunoprecipitation
Hersh Bendre, Keith George, and Shivem Shah

A Novel Point-of-Care Diagnostic for Sexually Transmitted Infections
Nelson Boland, Danielle Conneely, Gil Covarrubias, and Courtney Ellenson

Session IIb
IMAGING
Chair: Prof. Irving Bigio

Innovating an Ultrasound Bone Healing System to Provide Consistently Accurate Alignment with a Fracture Site
Michelle Barton, Kara Le Fort, James Parsons, and Jenny Tran

Application of Multi-Photon Microscopy to Assess the Microscopic Impact of Stretch on Airway Wall Mechanics
Kayla Duval and Dennis Marquis

Modeling Biopsies in a Lung Cancer Spheroid
Sabrina Barbas, Ryan Cecchi, Andres Ortiz, and Jeray Thelwell

Developing a Platform for Imaging Cellular Inflammatory Phenotype on Strained Fibrillar Fibronectin
Claire Bridges, Michael Chin, Mike Zebiak

Novel MRI Approaches to Detect Brown Fat
Jennifer Larbi and Erik Samuelsson

Fabricating Multi-Layered Human Skin Tissue Using 3D Bioprinting Technology
Jeremy C. Gaerlan, Hsiang-Wei (Kevin) Ma, and Minh-Thuy Nguyen

Contrast-Enhanced CT Imaging of Cartilage for Predictions of Skeletal Repair
Amanda Grafilo, Brittany Pack, and Kamolnat Tabattanon
Session IIIa
SYSTEMS, SIGNALS & SYNTHESIS
Chair: Prof. Steven Colburn

Assessing Challenges Related to Hearing Impairments in Acoustically Complex and Dynamic Conditions
Matthew Lima, Dustin Shigaki, and Jason Porter

In Silico Characterization of Peptide Coding Small Open Reading Frames (smORFs)
Eduardo Coronado and Joseph Mendoza

Developing a Novel Brd2 Small Molecule Inhibitor to Therapeutically Modulate Inflammation, Improve Metabolism and Reduce Cancer Risk.
Frank Lombardi, Courtney Lyons and, Kate Slyngstad

Simulating Binaural Cochlear Implants to Process Various Cases of Stimuli
Sana Hashmani, Sarah Hocevar, Grace Ingalls, and Trisha Serquina

Stair Safe: Stair Support System for the Elderly and Physically Challenged
Ariele Friedman and Justin Tocci

Engineering RNA Regulator in Live Cells
Augustus Thorkildsen and Bethany Zettler

Session IIIb
MODELS OF TISSUE & DISEASE
Chair: Prof. Allison Dennis

The Effect of Humeral Positioning on Glenohumeral and Subacromial Forces in a Cadaveric Model of Simulated Pitching
David Cohen, Chun Liu, Ronak Nair

A Microfluidic Model for the Study of Breast Cancer Metastatic Tropism to the Lung
Maria Barrios and Elias Exarchos

Automated Blood Sample Deployment and Retraction for Acoustic Tweezing Rheometer
Peter Ishiguro (ME), Shireen Kheradpey, Jeremy Lee (ME), Frank Lin (ME), and Ryan Schoeplein
Ultrasound Visualization of an Interventional Device in the Mitral Valve
Nathanael Lee and Anthony Tranakas

Mechanical Characterization of Bone and Bone Marrow Lesions in the Osteoarthritic Hip
Jordan Desauntels, Kathryn Gikas, and Young Guang

Analysis of a Sternal Approximation and Stabilization System for Median Sternotomy
Bradley Chiga and Musab Siddiqui

Session IV
DEVICES
Chair: Prof. Michael Smith

Non-Invasive Mapping of Interstitial Fluid Pressure using Optical Microscopy
Luis Carrasquillo and Rebecca Thompson

Use of Directional Microphones to Detect Cardiac Irregularities in Heart Failure Patients
Jose Camero (ECE), Portia Considine (ECE), Cong Liu (ECE), Jennifer Ma, Xinghan Xiong (ECE), Thomas Your

Fluorescence Measurement in a High Throughput Turbidostat Platform
Zhi (George) Jiao, Harsh Patel, and Jean-Marc Tsang

A Modular System for Optical Measurement of pH in a Continuous Culture Turbidostat
Alan Pacheco, Juliann Tefft and Hallie Thorp

Minimalist Ankle Support Technology
Will Livingston and Luke Mertins

Fabrication of Microfluidic Chip for Monitoring Neural Network Development
Pin-Hao Chao and Kevin Colelli

A Microfluidic Device to Study How Unsteady, Recirculating Flows Affect Trans- Endothelial Lipid Transport
Isaiah Ho, Andrew Ivanov, Gina Jimenez, and Michael Lau

3D Printed Electrodes in a Microfluidic Device to Measure Transepithelial Electrical Resistance (TEER)
Yiorgos Christakis, Parker Dow, Nikhil Mahadevan, and Jaedon Scott

Developing Methods for Assessing Auditory Function in Minimally Verbal Individuals with Autism
Nicole Ouellette, Olivia Lutz, and Monica Weitekamp
This report provides a description of the instructional and research activities of the Department of Biomedical Engineering at Boston University during the 2014-2015 academic year.

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CENTER - The Partnership for Global Health Technologies Program provides an undergraduate experience in Zanzibar.
BOTTOM - Roblyer Lab, PhD program