Global Health

Global Health has become a very active area for the BME Faculty. Articles here highlight some of the activity of the BME Faculty and students.

Zaman Receives “Saving Lives at Birth” Grant

July 25th, 2012 in BME News

Funding to Advance Counterfeit and Substandard Drug Detection Device

By Mark Dworzans

The Saving Lives at Birth event drew hundreds of attendees, including Melinda Gates (center), who appeared at the innovation awards ceremony and visited four posters, including Professor Muhammad Zaman’s (BME) (left).

Saving Lives at Birth: A Grand Challenge for Development, a program launched in 2011 to stimulate innovative preventative and treatment methods to improve health outcomes for mothers and newborns around the time of delivery, has named Associate Professor Muhammad Zaman (BME) as one of 12 recipients of a two-year, $250,000 innovation seed grant. The grant will enable Zaman to develop his project, PharmaCheck: Counterfeit and Substandard Drug Detector Device for the Developing World, and qualify for an additional $2 million to demonstrate its impact at scale.

The first BU project to be honored by the Saving Lives at Birth program, PharmaCheck was chosen from more than 500 proposals from 60 countries.

The main objective of the PharmaCheck project is to develop a user-friendly, low-cost, high-throughput, accurate device that local health authorities can use to screen for substandard anti-malarials and antibiotics, thereby improving adverse maternal and neonatal health outcomes with respect to malaria and sepsis. The need for such a device is particularly acute in the developing world, where the prevalence of these diseases is high and counterfeit and substandard drugs are commonplace.

BME Graduate Student Wins Prestigious Fellowship

August 22nd, 2012 in BME News

By Mark Dworzans

The U.S. Pharmacopeial (USP) Convention has selected BME graduate student Darash Desai as a USP Research Fellow, awarding him one of three $50,000 fellowships for the 2012-13 academic year.

The first College of Engineering student to receive this honor, Desai is the main developer of PharmaCheck, a low-cost, portable, robust, comprehensive diagnostic device that he and his PhD advisor, Associate Professor Muhammad Zaman (BME), are advancing to enable local health authorities to screen for substandard or counterfeit anti-malarials, antibiotics and other essential medicines. The need for such a device is particularly acute in the developing world, where counterfeit and substandard drugs are commonplace, leading to thousands of preventable deaths.

Founded in 1820, the USP is a scientific nonprofit organization that sets standards for the identity, strength, quality and purity of medicines, food ingredients and dietary supplements manufactured, distributed and consumed worldwide—standards enforceable in the U.S. by the Food and Drug Administration, and relied upon in more than 140 countries.
Collins Nets Gates Foundation Grant for Cholera Prevention Research

May 15th, 2012 in BME News

By Mark Dwortzan

The Bill and Melinda Gates Foundation has awarded Professor James J. Collins (BME, MSE, SE) a Grand Challenges Explorations grant to encourage his lab’s pursuit of a novel approach to cholera prevention. In their proposed project, Collins and two postdoctoral fellows in his lab, Ewen Cameron and Peter Belenky, seek to use synthetic biology techniques to engineer a probiotic yogurt bacterium, Lactobacillus gasseri, to detect and kill the cholera bacterium, Vibrio cholerae, in the human intestine. The probiotic could be supplied as an inexpensive, freeze-dried powder to endemic populations to prevent cholera, an acute, food or water-borne diarrheal infection leading to more than 100,000 deaths each year.

The Gates Foundation’s Grand Challenges Explorations program funds promising early-stage projects offering novel solutions to global health problems. Initial grants of $100,000 are awarded two times a year, and successful projects are eligible for a follow-on grant of up to $1 million. Collins’ project is one of 15 to be funded by an eighth-round Grand Challenges Explorations grant to apply synthetic biology techniques to health challenges impacting the developing world.

The Klapperich Laboratory for Diagnostics and Appropriate Healthcare Technologies

Many new and exciting portable molecular testing technologies are emerging for application in both personalized and global medicine. The potential to provide fast, isothermal, and quantitative molecular diagnostic information to clinicians in the field and at the bedside will soon be a reality. What many of these technologies lack is a robust front end for sample clean up and nucleic acid preparation. Such a technology would enable many different downstream molecular assays.

Professor James Galagan Studies What Makes Tuberculosis Tick

Associate Professor James Galagan and co-principle investigator Prof Gary Skhoolnik (Stanford University) have an NIH grant to study the bacteria that cause tuberculosis. More than 14 million people have been diagnosed with tuberculosis (TB) worldwide, and up to one-third of the world’s population may have a latent, non-symptomatic form of TB infection, according to World Health Organization statistics. The team’s research efforts could lead to the development of more effective drugs and detection methods to combat the disease. The team uses systems biology – an approach that studies the function of a whole organism rather than picking it apart to examine individual genes or proteins — to investigate the inner workings of the bacteria Mycobacterium tuberculosis. The National Institute of Allergy and Infectious Disease (NIAID), awarded the $19.8 million five-year grant.
Overview

The BME Department continues to be among the largest Biomedical Engineering departments in the country in terms of the number of primary faculty. During the last fiscal year, our 36 primary faculty attracted over $23 million in extramural funds available for expenditure this year. This translates to $650,000 per faculty member. Our graduate and undergraduate programs continue to be ranked among the top programs in the most recent US News and World Report rankings.

The BME Ph.D. Program awarded 24 degrees this year, bringing our total Ph.D. degrees awarded to 192 since the program began in 1991. Our graduate programs currently enroll 162 students (129 Ph.D. students; 3 M.D./Ph.D.; 16 M.S.; 14 M.Eng.). In the Fall we expect 43 new graduate students (26 Ph.D., 5 M.S. and 12 M.Eng.) with the great majority being US citizens. Our Ph.D. applicant pool continues to grow; in 2011 we had 615 applications, and the quality of the students matriculating remains very high with a mean GPA of 3.7 (US students only). The BME Undergraduate Program awarded 94 Bachelor of Science degrees and has a current enrollment of 531 students.

Our faculty members are 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. There are five interdisciplinary research centers directed or co-directed by BME faculty: Center for Computational Neuroscience and Neuronal Technology (CompNet), Biomolecular Engineering Research Center (BMERC), Center for Nanoscience and Nanobiotechnology (CNN), Hearing Research Center (HRC), and NeuroMuscular Research Center (NMRC).
The **BME Visiting Committee** is comprised of BME chairs and professors from peer departments, as well as industry representatives, and is intended to provide feedback and advice regarding our BME department, the challenges and opportunities we face in our academic and research programs, and the strategic initiatives we should be focusing on over the next several years.

**RAVI BELLAMKONDA, Ph.D.**
PROFESSOR OF BIOMEDICAL ENGINEERING
WALLACE H. COULTER DEPT. OF BIOMEDICAL ENG.
GEORGIA INSTITUTE OF TECHNOLOGY

**BECKY BERGMAN, Ph.D.**
VICE PRESIDENT, NEW THERAPIES AND DIAGNOSTICS
CARDIAC RHYTHM DISEASE MANAGEMENT
MEDTRONIC

**JIM BURNS, Ph.D.**
HEAD OF SANOFI BOSTON R&D
GENZYME A SANOFI CO.

**ART COURY, Ph.D.**
CONSULTANT

**STEVE GIROUARD, Ph.D.** (ALUMNUS ’89)
SENIOR DIRECTOR, EMERGING TECHNOLOGIES
JOHNSON & JOHNSON COSAT

**TODD GIORGIO, Ph.D.**
PROFESSOR AND CHAIR
DEPARTMENT OF BIOMEDICAL ENGINEERING
VANDERBILT UNIVERSITY

**WARREN M. GRILL, Ph.D.** (ALUMNUS ’89)
ADDY PROFESSOR OF BIOMEDICAL ENGINEERING
DEPARTMENT OF BIOMEDICAL ENGINEERING
DUKE UNIVERSITY

**SHEILA HEMEON-HYEYER, JD, RAC**
(ALUMNA ’81)
PRESIDENT, HEYER REGULATORY SOLUTIONS, LLC

**PATRICK LOUGHLIN, Ph.D.** (ALUMNI ’85)
WILLIAM KEPLER WHITEFORD PROFESSOR OF BIOENGINEERING, AND ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY OF PITTSBURGH

**DAVID F. MEANEY, Ph.D.**
PROFESSOR AND CHAIR
DEPARTMENT OF BIOENGINEERING
UNIVERSITY OF PENNSYLVANIA

**KRISTINA ROPELLA, Ph.D.**
PROFESSOR AND CHAIR
DEPARTMENT OF BIOMEDICAL ENGINEERING
MARQUETTE UNIVERSITY

**Faculty Overview**

The Biomedical Engineering Department added two primary faculty this year increasing our number to 36.

Dr. Ahmad (Mo) Khalil joined the faculty January 1, 2012. Dr. Khalil completed his PhD in Mechanical Engineering in 2008 at MIT with Profs. Angela Belcher and Matthew Lang, and was a HHMI Fellow at Boston University with Prof. Jim Collins. His research vision is to understand and rewire the biological systems that give rise to complex cellular phenotypes, such as differentiation and mechanotransduction, by integrating reverse engineering, synthetic biology, and “digital microfluidic” approaches. More broadly, he seeks to uncover design principles underlying biological systems and, in turn, engineer new biological properties that may address global challenges in medicine, energy, and the environment.

Dr. Wilson Wong also joined the faculty on January 1, 2012. He was a postdoctoral scholar in Professor Wendell A. Lim’s lab at the University of California at San Francisco and he received his Ph.D. in Chemical Engineering from UCLA under the supervision of Professor James C. Liao. Dr. Wong’s expertise is in the application of metabolic engineering and synthetic biology to microbial and mammalian immune systems. His overall research goal is to rapidly and predictably engineer desired properties in living cells, ranging from microbes to human cells. The outcomes will have direct and immediate impact on therapy for cancer and other chronic diseases.

The Department promoted 2 faculty in 2011; Dr. Jerome Mertz was promoted to Professor and Dr. Muhammad Zaman was granted tenure and promoted to Associate Professor.

On July 1, 2012 Prof. Evan Evans will become a Research Professor in the Department, dropping from the Primary BME Faculty to the Research Faculty ranks.

We also added 2 affiliated faculty members both from the ECE Department, Professors Douglas Densmore and Hatice Altug.
Primary Faculty

IRVING J. BIGIO
Professor, Biomedical Engineering, Electrical and Computer Engineering; and Physics
PhD, Physics, University of Michigan
Biomedical Optics Lab
bu.edu/bme/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.

H. STEVEN COLBURN
Professor, Biomedical Engineering, Director, Hearing Research Center
SB, SM, PhD, Electrical Engineering, MIT
Binaural Hearing Lab
bu.edu/bme/research/labs/bh
Measurement and modeling of binaural hearing performance. Modeling the activity of auditory brainstem neurons and measurement and modeling of spatial attributes of sound perception.

JAMES J. COLLINS
Professor, Biomedical Engineering; University Professor
AB, Physics, College of the Holy Cross; PhD, Medical Engineering, University of Oxford
Collins Lab
bu.edu/bme/research/labs/abd
Synthetic biology; systems biology; engineered gene networks.

EDWARD DAMIANO
Associate Professor, Biomedical Engineering
PhD, Applied Mechanics, RPI; MS, Mech Eng, Washington Univ;
BS, Biomedical Engineering, RPI
Vascular Interface and Microhemofluidics Lab
bu.edu/bme/people/primary/damiano
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
BA, Physics, City College of New York, PhD, Physics, New York University
Biomolecular Systems Lab
bu.edu/bme/research/labs/bmolec
 Developing and applying computational/mathematical methods, and high throughput experimental methods for inferring the structure and function of protein networks.

CARLO J. DE LUCA
Professor, Biomedical Engineering & Neurology, Research Professor Electrical and Computer Engineering; Director, NMRC
BASc, U of British Columbia, MSc, U of New Brunswick, PhD, Queens University (Canada)
Motor Unit Lab
bu.edu/bme/research/labs/mu
Motor control of normal and abnormal muscles; objective evaluation of muscle fatigue, objective assessment of functional activities in humans; biosignals.

MICAH DEMBO
Professor, Biomedical Engineering
BS, Mathematics, Allegheny College,
PhD, Biomatics, Cornell University
Cellular and Sub-cellular Mechanics Lab
bu.edu/bme/research/labs/csm
Statistical mechanics in biological systems; cell information processing and signal transduction; thermodynamics and mechanics of cell adhesion; biophysics of cell deformation, active motility.

SOLOMON EISENBERG
Professor, Biomedical Engineering; Professor, Electrical and Computer Engineering, Assoc Dean for Undergrad Programs, College of Engineering
SB, SM, ScD, Electrical Engineering, MIT
Fields and Tissues Lab
bu.edu/bme/research/labs/ft
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.

EVAN EVANS
Professor, Biomedical Engineering
BS, MS, Engineering Physics, Rensselaer Polytechnic Institute, PhD, Engineering Science, University of CA at San Diego
Cellular and Subcellular Mechanics Lab
bu.edu/bme/research/labs/csm
Nano-microscale biomechanics; ultra-sensitive force probes; extreme resolution optical techniques; material properties of cellular structures; role of structural forces in cell biochemistry.

MAXIM D. FRANK-KAMENETSKII
Professor, Biomedical Engineering
MSc, PhD, Biophysics, Moscow Physical-Technical Institute, ScD (Vth 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, Associate Director, Systems Biology of Infectious Disease Core NEIDL; PhD, Computational Neuroscience, MIT
National Emerging Infectious Diseases Laboratory
bu.edu/neidl
Develop efficient and accurate methodologies for the analysis of genomic data, with a particular focus on infectious diseases.

MARK GRINSTAFF
Professor, Biomedical Engineering & Chemistry
PhD, University of Illinois at Urbana-Champaign; AB, Chemistry Honors, Occidental College
Biomaterials, tissue engineering, drug delivery, macromolecular chemistry and engineering, self-assembly, nanodevices.
Primary Faculty Contd.

XUE HAN
Assistant Professor, Biomedical Engineering
PhD, Physiology, University of Wisconsin-Madison; BS, Biophysics, Beijing University
Neuroengineering Lab
bu.edu/neuroengineering
Neurotechnology, optical neural modulation, optogenetics, neural prosthetics, neural network dynamics, brain rhythms, neurological and psychiatric diseases, cognition.

ANDREW C. JACKSON
Professor, Biomedical Engineering
BS, MS, Mechanical Engineering, University of Nevada, PhD, Biophysics and Physiology, University of Mississippi Medical School
Respiratory Research
bu.edu/bme/research/labs/rr
Respiratory physiology, respiratory mechanics, role of airway closure in asthma.

SIMON KASIF
Professor, Biomedical Engineering
BSc, Mathematics, Tel Aviv University; MS & PhD, Computer Science, University of Maryland
Computational Genomics
bu.edu/bme/research/labs/cg

AHMAD (MO) KHALIL
Assistant Professor, Biomedical Engineering
BS, Mechanical Engineering, Stanford University; M.S & PhD, Mechanical Engineering, Massachusetts Institute of Technology
Synthetic biology; systems biology; programmable microfluidics; transcription regulation, mechanobiology; single-cell analysis; single-molecule biophysics.

CATHERINE KLAPPERICH
Associate Professor, Primary Appointment
Mechanical Engineering
PhD, Mechanical Engineering, UC, Berkeley; SM, Engineering Sciences, Harvard University
Biomedical Microdevices and Microenvironments
bu.edu/bme/research/labs/bmm
Her research is focused on the design of new molecular diagnostics and appropriate technologies for healthcare.

KENNETH R. LUTCHEN
Professor, Biomedical Engineering,
Dean, College of Engineering
BS, Engineering Science, University of Virginia, MS, PhD, Biomedical Engineering, Case Western Reserve University
Respiratory and Physiological Systems Identification
bu.edu/bme/research/labs/rpsi
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.

AMIT MELLER
Associate Professor, Biomedical Engineering
PhD, Msc, Physics, Weizmann Institute of Science, Rehovot Israel, BS, Tel Aviv University
Nanopore force 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.

JEROME HERTZ
Associate Professor, Biomedical Engineering & Physics
PhD, Physics, Université Paris VI & University of California, Santa Barbara, BA, Physics Princeton University
Biomicroscopy Lab
bu.edu/bme/research/labs/bl
Development and application of new optical microscopy techniques to biological imaging.

DAVID C. MOUNTAIN
Professor, Biomedical Engineering & Otolaryngology
MS, PhD, Electrical Engineering, University of Wisconsin
Auditory Biophysics and Simulation Lab
bu.edu/bme/research/labs
Auditory information processing; sensory biophysics; computer simulation; biomedical electronics; biomedical signal processing; environmental engineering.

JASON RITT
Assistant Professor, Biomedical Engineering
BS, MA Mathematics, PhD Neuroscience Boston University
Ritt Lab
bu.edu/bme/research/labs/ritt-lab/
Neuroscience of sensorimotor behaviors; biological active sensing; role of embodiment in neural computation; brain machine interfaces; sensory prosthetics.

KAMAL SEN
Associate Professor, Biomedical Engineering; Hearing Research Center
BA, Physics, Bates College, MA, PhD, Physics, Brandeis University
Natural Sounds and Neural Coding
bu.edu/bme/research/labs/nsnc
Electrophysiological recording of neural responses in auditory processing, theoretical models to characterize neuronal encoding, computational models of natural sound processing.

BARBARA G. SHINN-CUNNINGHAM
Professor, Biomedical Engineering
ScB EE Brown University, MS & PhD EE and Computer Science, MIT
Auditory Neuroscience
bu.edu/bme/research/labs/ans
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.

CASSANDRA L. SMITH
Professor, Biomedical Engineering; Biology, & Pharmacology
BA, Biology & MS, Medical Microbiology, West Virginia University Medical School, PhD, Genetics, Texas A&M University
Molecular Biotechnology Lab
bu.edu/bme/research/labs/ml
Molecular Biotechnology and Genomics.
Primary Faculty Contd.

MICHAEL L. SMITH
Assistant Professor, Biomedical Engineering
BS Mechanical Engineering University of Memphis, MS & PhD, Biomedical Engineering, University of Virginia, 2004
Michael Smith Lab
bu.edu/bme/people/primary/smithm
Cellular mechanotransduction through the extracellular matrix; fibronectin structural biology; and microfabricated surfaces for engineering cell function.

DIMITRIJE STAMENOVIĆ
Associate Professor, Biomedical Engineering
Dipl. Ing., Mechanical/Aeronautical Engineering, University of Belgrade (Yugoslavia), MS, PhD, Mechanics, University of Minnesota
Cell and Tissue Mechanics Lab
bu.edu/bme/research/labs/ctm
Respiratory mechanics; cell mechanics; rheology of soft tissues; mechanics of foam-like structures.

BÉLA SUKI
Professor, Biomedical Engineering
MS, Physics, and PhD, Biomechanics, Jozsef Attila University, Szeged (Hungary)
Cell and Tissue Mechanics Lab
bu.edu/bme/research/labs/ctm
Mechanical properties of living tissues; modeling the dynamic and nonlinear behavior of complex biological systems; pulmonary physiology.

JOE TIEN
Associate Professor, Biomedical Engineering
BS, Physics, BS, Mathematics, University of California, Irvine, AM, PhD, Physics, Harvard University
Tien Lab
bu.edu/bme/research/labs/tien-lab
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.

LUCIA M. VAINA
Professor, Biomedical Engineering & Neurology
MS, U. Timisoara and Urbino; PhD Mathematical Logic, Sorbonne, Doctorat d’Etat és Sciences & Médecine (Neurologie), Human & Computational Vision, Institut National Politechnique de Toulouse
Brain and Vision Lab
bu.edu/bme/research/labs/bv
Computational visual neuroscience; biological and computational learning; functional and structural neuroimaging.

SANDOR VAJDA
Professor, Biomedical Engineering
MSc, Electrical Eng, Gubkin Institute (Former USSR), MSc, Applied Mathematics, Eötvös Lorand U. (Hungary), PhD, Chemistry, Hungarian Academy of Science
Structural BioInformatics
bu.edu/bme/research/labs/ib
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; Associate Research Professor, Otolaryngology, School of Medicine
PhD, Biomedical Engineering, Johns Hopkins University BE (EE), City College of New York
Auditory Neurophysiology Lab
bu.edu/bme/research/labs/anp
Auditory neurophysiology; neural circuitry; neural modeling.

JOYCE WONG
Associate Professor, Biomedical Engineering
SB, Materials Science and Engineering, MIT, PhD, Materials Science and Engineering, Program in Polymer Science and Technology, MIT
Biomimetic Materials Engineering Lab
bu.edu/bme/research/labs/wong
Biomaterials, tailoring cell-material interfaces for drug delivery and tissue engineering applications; direct, quantitative measurement of biological interactions.

WILSON WONG
Assistant Professor, Biomedical Engineering
BS, Chemical Engineering, University of California Berkeley, PhD, University of California Los Angeles 2007
Lab for Engineering Education & Development
bu.edu/leed
Comprehensive and quantitative approaches to develop a multiscale understanding of cell-matrix interactions for fundamental biological and applied clinical research.

MUHAMMAD ZAMAN
Assistant Professor, Biomedical Engineering
BS, Arkansas Tech Univ, SM, Chemistry and PhD, Physical Chemistry University of Chicago 2003
Lab for Engineering Education & Development
bu.edu/leed
Comprehensive and quantitative approaches to develop a multiscale understanding of cell-matrix interactions for fundamental biological and applied clinical research.
Research Faculty

NATALIA BROUDE
Research Professor, Biomedical Engineering
BS, MS Organic Chemistry, Moscow State University; PhD, Organic Chemistry, DSc Molecular Biology, Institute of Bioorganic Chemistry
Functional genomics, structure/function relationships in nucleic acids, development of advanced methods for genomic studies.

IRINA V. SMOLINA
Research Assistant Professor, Biomedical Engineering
BS in Applied Mathematics and Physics, Moscow Institute of Physics and Technology, Moscow, Russia; MSc in Biophysics, Moscow Institute of Physics and Technology, Moscow, Russia; PhD in Molecular Biology, Institute of Bioorganic Chemistry, Russian Academy of Science, Moscow, Russia
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.

MARIO CABODI
Research Assistant Professor, Biomedical Engineering
PhD Cornell University, 2003; MSc Imperial College of Science and Technology, London, UK
Microfluidic devices; tissue engineering, and biomaterials.

THOMAS L. SZABO
Research Professor, Biomedical Engineering
PhD, Physics, University of Bath, UK; MS, Electrical Engineering, University of Rochester; BS, Electrical Engineering, University of Virginia School of Medicine
Medical imaging, diagnostic ultrasound, tissue characterization, transduction, biomedical signal processing, wave propagation, nonlinear acoustics.

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Emeritus

ODDED GHIITZA
Research Professor, Biomedical Engineering
BSc, MSc, PhD Electrical Engineering, Tel Aviv University
bu.edu/bme/research/labs/decoding_speech
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.

Professor of Practice

ARThUR ROSENTHAL, PhD
Professor of Practice; Biomedical Engineering
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DMYTRO KOZAKOV
Research Assistant Professor, Biomedical Engineering
BS & MS Applied Math and Physics, Moscow Inst of Physics and Tech; PhD Biomedical Engineering Boston University, 2006
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.
Affiliated Faculty

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CHRISTOPHER CONNOR, MD, PhD
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DOUGLAS DENSMORE, PhD
Assistant Professor; Electrical & Computer Engineering, Biomedical Engineering

THOMAS EINHORN, MD
Chairman; Orthopedic Surgery, Professor; Orthopedic Surgery, Biomedical Engineering

SHYAMSUNDER ERRAMILLI, PhD
Professor; Physics, Biomedical Engineering

BENNETT GOLDBERG, PhD
Professor; Physics, Biomedical Engineering

LEE GOLDSMITH, MD, PhD
Associate Professor; Psychiatry, Neurology, Ophthalmology, Pathology & Laboratory Medicine, Biomedical Engineering

STEPHEN GROSSBERG, PhD
Professor; Mathematics, Psychology, Biomedical Engineering

FRANK GUENTHER, MS, PhD
Associate Professor; Sargent College, Speech Language & Hearing Science, Biomedical Engineering

JAMES A. HAMILTON, PhD
Professor; Physiology & Biophysics, Biomedical Engineering

JOEL HENDERSON, MD, PhD
Assistant Professor; Pathology & Laboratory Medicine, Biomedical Engineering

ALLYN E. HUBBARD, PhD
Professor; Electrical & Computer Engineering, Biomedical Engineering

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Professor; Electrical & Computer Engineering, Biomedical Engineering

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Professor; Mathematics, Biomedical Engineering

ELISE F. MORGAN, PhD
Associate Professor; Mechanical Engineering, Biomedical Engineering

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MATTHEW NUGENT, PhD
Professor; Biochemistry, Ophthalmology, Biomedical Engineering

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Associate Professor; Mechanical Engineering, Biomedical Engineering

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Associate Professor; Psychology, Biomedical Engineering

DANIEL SEGRÈ, PhD
Associate Professor; Biology, Biomedical Engineering

SATISH K. SINGH, MD
Assistant Professor; Gastroenterology, Biomedical Engineering

H. EUGENE STANLEY, PhD
Professor; Physics, Chemistry, Biomedical Engineering

MARTIN STEFFEN, PhD
Assistant Professor; Pathology & Laboratory Medicine, Biomedical Engineering

MALVIN C. TEICH, PhD
Professor Emeritus; Electrical & Computer Engineering, Physics, Biomedical Engineering
Affiliated Faculty Contd.

M. SELIM ÜNLÜ, PhD
Professor; Electrical & Computer Engineering, Biomedical Engineering

YU (BRANDON) XIA, PhD
Assistant Professor; Chemistry, Biomedical Engineering

KATHERINE YANHANG ZHANG, PhD
Associate Professor; Mechanical Engineering, Biomedical Engineering

Adjunct Faculty

SYLVAN GIOUX, PhD
Adjunct Assistant Professor; Biomedical Engineering, Beth Israel Deaconess Medical Center for Molecular Imaging

DAVID KACZKA, MD/PhD
Adjunct Assistant Professor; Biomedical Engineering Beth Israel Deaconess Medical Center Department of Anesthesia, Critical Care & Pain Medicine

JONATHAN ROSEN, PhD
Adjunct Professor; Biomedical Engineering

HERNAN JARA, PhD
Adjunct Associate Professor, Biomedical Engineering, Associate Professor of Radiology, Boston University School of Medicine

POSTDOCS

Bashor, Caleb, Postdoctoral Associate (Collins)
Belenky, Ryan, Postdoctoral Associate (Collins)
Brenke, Ryan, Postdoctoral Associate (Vajda)
Brynilde, Mark, Postdoctoral Associate (Collins)
Calabro, Finnegan, Postdoctoral Associate (Vainu)
Cameron, Ewen, Postdoctoral Associate (Collins)
Chan, Clement, Postdoctoral Associate (Collins)
Choi, Han-Pil, Postdoctoral Associate (Kasif)
Choi, Nadin, Postdoctoral Associate (Collins)
Costello, James, Postdoctoral Associate (Collins)
De La Torre, Ruby, Postdoctoral Associate (Collins)
Dusconchet, Julien, Postdoctoral Fellow (Collins)
Dwyer, Dan, Senior Postdoctoral Associate (Collins)
Fan, Andy, Postdoctoral Associate (Klapperich)
Hayashi, Gosuke, Postdoctoral Associate (Collins)
Huang, Shichou, Postdoctoral Associate (Klapperich)
Isenberg, Brett, Senior Postdoctoral Associate (Wong)
Kalghagi, Sameer, Postdoctoral Associate (Collins)
Keung, Albert, Postdoctoral Associate (Collins)
Kohman, Richard, Postdoctoral Associate (Han)
Krueger, Andrew, Postdoctoral Associate (Galagan)
Kumar, Roshan, Postdoctoral Fellow (Collins)
Lee, Elaine, Postdoctoral Fellow (Wong)
Lee, Jeong Wook, Postdoctoral Associate (Collins)
Lepzelter, David, Postdoctoral Associate (Zaman)
Levy-Moonsshine, Amy, Postdoctoral Associate (Kasif)
Li, Hu, Postdoctoral Associate (Collins)
Lin, Jianxun, Postdoctoral Associate (Meller)
Linnes, Jaqueline, Postdoctoral Associate (Klapperich)
Lobritz, Michael, Postdoctoral Fellow (Collins)
Majumdar, Arnab, Postdoctoral Associate (Suki)
Mamonov, Artem, Postdoctoral Associate (Vajda)
Mineava, Olga, Postdoctoral Associate (Goldstein)
Modi, Sheetal, Postdoctoral Associate (Collins)
Morones, Ruben J., Postdoctoral Associate (Collins)

RESEARCH STAFF

A’amar, Ousama, Senior Research Engineer (Bigio)
Anderson, David, Research Engineer (Mountain)
Atas, Evrim, Research Scientist (Meller)
Bartolak-Suki, Elizabeth, Senior Research Scientist (Suki)
Beg, Quasim, Research Scientist (Segre)
Beglov, Dimitri, Senior Research Scientist (Vajda)
Berardino, Alexander, Laboratory Assistant (Ritt)
Brughera, Andrew, Research Engineer, (Mountain)
Canham, Amy, Laboratory Assistant (Zaman)
Cariani, Peter, Senior Research Scientist (Colburn)
Cheung, Man Ching, Research Scientist (Ehrlich)

Chinmala, Jyothsna, Laboratory Assistant (Unlu)
Delhorne, Lorraine, Senior Research Scientist (Colburn)
Dellon, Brian, Research Engineer (Colburn)
El-Khatib, Firas, Senior Research Scientist (Damiano)
Fernandes, Andrea, Laboratory Assistant (Zaman)
Jiang, John, Research Scientist (Damiano)
Kuznetsov, Igor, Research Scientist (Evans)
MacDonald, Cody, Laboratory Assistant (Collins)
McKenna, Brian, Research Engineer (Ehrlich)
McKeon, Katherine, Laboratory Assistant (Damiano)
Molla, Michael, Research Scientist (Kasif)
Orucoglu, Rozana, Laboratory Assistant (Collins)
Faculty Awards & Honors

Kern Faculty Fellows

Irving Bigio
James Collins
Edward Damiano
Mark Grinstaff
Catherine Klapperich
Joyce Wong

Carlo De Luca: The Borelli award from the American Society of Biomechanics

Xue Han: Pew Scholar: The Pew Scholars Program in the Biomedical Sciences supports young investigators of outstanding promise in basic and clinical sciences relevant to the advancement of human health.

Peter Paul Award: The award gives junior faculty members $40,000 for three years to support their research.

Kenneth Lutchen: President of American Institute for Medical and Biomedical Engineering (AIMBE)

Jason Ritt: Appointed a Junior Fellow of the BU Rafik B. Hariri Institute for Computing and Computational Science & Engineering

Barbara Shinn-Cunningham: Member, Executive Council of the Acoustical Society of America (elected). Elected by general membership of the ASA (about 7000 members) to the board overseeing all society activities; Appointed Member, National Academies of Science Soldier Systems Panel

Herbert Voigt: President of International Federation for Medical and Bioengineering.

POSTDOCS contd.

O’Gorman, David, Senior Postdoctoral Associate (Colburn)
Oh, Herin, Postdoctoral Associate (Smith, C.)
Parameswaran, Harikrishnan, Senior Postdoctoral Associate (Lutchen)
Paardee, Keith, Postdoctoral Associate (Collins)
Park, Yoonjee, Postdoctoral Associate (Wong)
Perrone, Benjamin, Postdoctoral Associate (Ritt)
Smovovic, Shimyn, Postdoctoral Associate (Collins)
Solski, Patricia, Postdoctoral Associate (Wong)
Szabari, Margit, Postdoctoral Associate (Suki)
Takahashi, Ayuko, Postdoctoral Associate (Suki)
Truslow, James, Postdoctoral Associate (Tien)
Tseng, Hua-an, Postdoctoral Associate (Han)
Winkler, Jonathan, Postdoctoral Associate (Collins)
Wong, Keith, Postdoctoral Associate (Tien)
Zhou, Jiamin, Postdoctoral Associate (Han)

RESEARCH STAFF contd.

Pyenson, Nora, Laboratory Assistant (Collins)
Telian, Greg, Laboratory Assistant (Ritt)
Tubelli, Andrew A., Laboratory Assistant (Mountain)
Voysey, Graham, Research Engineer (Mountain)
Zosuls, Alex, Research Engineer (Mountain)
The Biomedical Engineering Department maintains a vibrant research program in its approximately 68,000 square feet of space at 24-44 Cummington St., on Boston University’s Charles River Campus. We are comprised of 34 separate research laboratories and 6 research centers (described separately at the end of this section). 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.

RESEARCH AREAS IN BME

Biomechanics & Biomaterials
- Cellular & Subcellular
- Tissue & Biochemistry
- Systems Biomechanics
- Posture Control
- Biomedical Optics

Biomolecular Eng. & Biotech
- Bioinformatics
- Protein Modeling
- Genome Sequencing
- DNA Structure-Function
- Genetic, Protein & Cell Regulation
- Functional Genomics

Sensory Systems
- Cochlear Structure-Function
- Auditory Signal Processing
- Psychophysics
- Visual Perception Models
- fMRI Structure-Function
- Photoreceptor Biology

Cardiopulmonary Engineering
- Structure-Function in Lungs
- Noninvasive Diagnostics
- Blood Cell Biology
- Arrhythmia Control
- Nonlinear Dynamics

Neuroscience
- Ion-Channel kinetics
- Neural Firing Systems
- Neuromuscular Control
- Functional Activities

Micro & Nano Biosystems
- Cell & Tissue Engineering
- BioMEMs
- Cell Encapsulation
- Programmable Cell Environments
- Biotherapeutics & Drug Delivery

BME FACULTY ANNUAL TOTAL GRANT FUNDING
During the period 7/1/2011 through 6/30/2012 the BME faculty received funding from 90 new and continuing funding awards for a total of $23,395,279.

Over $33M in research proposals were submitted. Awards and proposals were received from and submitted to federal agencies such as NIH, NSF, and DOD, international agencies such as the Engineering and Physical Sciences Research Council of the United Kingdom and the Burroughs Wellcome Fund, private agencies such as the The Bill and Melinda Gates Foundation, The Wallace H. Coulter Foundation, The Henry Luce Foundation, Inc, The Michael J. Fox Foundation, and the American Federation for Aging Research and private industry such as The Advanced Energy Consortium, Insulet Corp., and Karl Storz GmbH & Co. KG.

NIH AWARDS

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Bigio</td>
<td>Enhanced Intraaterial Delivery of Chemotherapeutic Drugs to the Brain</td>
<td>NCI (sub Columbia U)</td>
<td>91,671</td>
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<tr>
<td>I. Bigio</td>
<td>Optical Imaging of Chemotherapy for Brain Tumors</td>
<td>NCI (sub Columbia U)</td>
<td>83,654</td>
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<tr>
<td>I. Bigio</td>
<td>Training Program in Quantitative Biology &amp; Physiology</td>
<td>NIGMS</td>
<td>312,582</td>
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<tr>
<td>S. Colburn</td>
<td>Bilateral Cochlear Implants: Physiology &amp; Psychophysics</td>
<td>(sub MEEI)</td>
<td>79,191</td>
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<td>S. Colburn</td>
<td>Binaural Hearing</td>
<td>NIDCD</td>
<td>581,167</td>
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<td>S. Colburn</td>
<td>Core Center Grant - Engineering (CORE 3)</td>
<td>NIDCD</td>
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<tr>
<td>J. Collins</td>
<td>Network Biology Approach to Antibiotic Action &amp; Bacterial Defenses</td>
<td>NIH</td>
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<td>J. Collins</td>
<td>Boston OAIC: A Translational Approach to Function Promoting Anabolic Therapies</td>
<td>(sub BMC)</td>
<td>65,366</td>
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<td>J. Collins</td>
<td>Customized Cells for Clinical Applications in Blood Disorders</td>
<td>(sub CHB)</td>
<td>175,000</td>
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<td>J. Collins</td>
<td>Immgen: A gene expression Compendium for Immune Cells</td>
<td>(sub BMC)</td>
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<tr>
<td>J. Collins</td>
<td>Syscode: Tooth Germ Design &amp; Engineering</td>
<td>(sub BWH)</td>
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<tr>
<td>E. Damiano</td>
<td>Clinical Trials: Closed-Loop Control System for Type 1 Diabetes management</td>
<td>NIDDK</td>
<td>640,267</td>
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<td>C. Delisi</td>
<td>Visant-Predictome: A System for Integration, Mining, Visualization &amp; Analysis</td>
<td>NICHRR</td>
<td>809,825</td>
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<td>C. De Luca</td>
<td>Harnessing Motoneuron Activity: From Lab to Clinic</td>
<td>NICHHD</td>
<td>555,311</td>
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<td>M.Dembo</td>
<td>Core C: Traction Force Microscopy</td>
<td>NIH (sub U Rochester)</td>
<td>85,408</td>
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<tr>
<td>M.Dembo</td>
<td>Force Microscopy of Endothelial Cells on Novel Peptide Materials</td>
<td>NIH (sub U Penn)</td>
<td>105,000</td>
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<td>E. Evans</td>
<td>Kinetic &amp; Mechanical Properties of ALB2 Integrin</td>
<td>NIH (sub Georgia Tech)</td>
<td>78,160</td>
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<td>J. Galagan</td>
<td>A Systems Biology Approach to Infectious Disease Research</td>
<td>NIH (sub Stanford U)</td>
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<td>J. Galagan</td>
<td>Dedicated Tuberculosis Gene Expression Database</td>
<td>NIH (sub Stanford U)</td>
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<td>J. Galagan</td>
<td>Functional Analysis &amp; Systems Biology of Filamentous Fungi</td>
<td>(sub Dartmouth Col.)</td>
<td>195,008</td>
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TOTAL FUNDING: $23,395,279
### NIH AWARDS Contd.

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
<th>Amount</th>
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<tbody>
<tr>
<td>M. Grinstaff</td>
<td>Flexible, Conformal, Polymeric Films for Lung Resection Margins</td>
<td>NCI</td>
<td>707,324</td>
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<tr>
<td>M. Grinstaff</td>
<td>Synthesis &amp; Eval. of Antibacterial Anionic Dendriticamphiles</td>
<td>NIGMS</td>
<td>49,214</td>
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<tr>
<td>M. Grinstaff</td>
<td>Bacteriophobic Coatings for Inhibition of Pathogenic Biofilms</td>
<td>NIAMS</td>
<td>34,876</td>
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<tr>
<td>M. Grinstaff</td>
<td>Char. Electrostatic Interactions Between Glycosaminoglycans &amp; Cationic Small Molecules</td>
<td>NIBIB</td>
<td>269,789</td>
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<td>M. Grinstaff</td>
<td>Translational Research in Biomaterials</td>
<td>NIMH</td>
<td>181,397</td>
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<td>X. Han</td>
<td>Cross Region Neural Computation Subserving Attention</td>
<td>NHLBI</td>
<td>536,282</td>
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<tr>
<td>C. Klapperich</td>
<td>Bacterial Drug Susceptibility Identification by Surface Enhanced Raman Microscopy</td>
<td>(sub Fraunhofer USA)</td>
<td>72,691</td>
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<tr>
<td>C. Klapperich</td>
<td>Portable Low Power Nucleic Acid Extraction Module</td>
<td>(sub PATH)</td>
<td>51,164</td>
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<tr>
<td>K. Lutchen</td>
<td>Factors Determining Hyperresponsiveness for Intact Airways</td>
<td>NHLBI</td>
<td>536,282</td>
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<td>A. Meller</td>
<td>Single Molecule Sequencing by Nanopore Induced Proton Emission</td>
<td>NHGRI</td>
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<td>J. Mertz</td>
<td>Development of Photothermal Microscopy for Biomedical Applications</td>
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<td>J. Mertz</td>
<td>Ultrascan-Enabled Two-Photon Fret Microscopy</td>
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<td>J. Mertz</td>
<td>Development of Hybrid Widefield Imaging of Out-of-Focus Background Rejection</td>
<td>NIBIB</td>
<td>350,709</td>
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<td>D. Mountain</td>
<td>Training in Comp Neuroscience: Integrating Experiment, Theory &amp; Technology</td>
<td>NIDA</td>
<td>322,053</td>
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<tr>
<td>B. Shinn-Cunningham</td>
<td>Perception in Complex, Multisource Environments</td>
<td>NIDCD</td>
<td>774,800</td>
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<td>I. Smolina</td>
<td>Development of Novel Field-Appropriate Differential Diagnostics of Multiple Pathogens and Their Drug</td>
<td>NIAID</td>
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<td>B. Suki</td>
<td>Regulatory Roles of Variable Mechanical Stimuli in Cell Function</td>
<td>NHLBI</td>
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<td>S. Vajda</td>
<td>Multistage Approach to Protein-Protein Docking</td>
<td>NIGMS</td>
<td>261,196</td>
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<td>S. Vajda</td>
<td>Computational Mapping of Proteins for Binding of Ligands</td>
<td>NIGMS</td>
<td>814,360</td>
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<td>M. Zaman</td>
<td>Quantitative Analysis of Tumor Cell Migration in 3 Dimensional Matrices</td>
<td>NCI</td>
<td>279,334</td>
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### NSF AWARDS

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
<th>Amount</th>
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<tbody>
<tr>
<td>N. Broude</td>
<td>RNA Localization &amp; Movement in Bacteria</td>
<td>NSF</td>
<td>12,500</td>
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<tr>
<td>M. Grinstaff</td>
<td>Synthesis &amp; Characterization of Expansible Polymeric Nanoparticles for Drug Delivery</td>
<td>NSF</td>
<td>140,001</td>
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<tr>
<td>M. Smith</td>
<td>Career: Regulation of Multicellular Behavior with an Extracellular Matrix Signaling Scaffold</td>
<td>NSF</td>
<td>90,000</td>
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<tr>
<td>S. Vajda</td>
<td>ABI Development: Refinement Algorithms &amp; Server for Protein Docking</td>
<td>NSF</td>
<td>184,068</td>
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</table>
## AWARDS FROM OTHER GOVERNMENT AGENCIES

<table>
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<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
<th>Amount</th>
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<tbody>
<tr>
<td>J. Collins</td>
<td>Genetic Systems for Reordering Misuse &amp; Escape of Microbes</td>
<td>DOD (sub Harvard U)</td>
<td>371,890</td>
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<tr>
<td>J. Collins</td>
<td>Synthetic Mammalian Gene Regulatory Circuits for in Vivo Biomedical Applications</td>
<td>DOD</td>
<td>1,291,347</td>
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<tr>
<td>J. Collins</td>
<td>Utilizing Synthetic Biology to Create Programmable Micro-Bio-Robots</td>
<td>DOD</td>
<td>2,000,000</td>
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<td>O. Ghitza</td>
<td>Cascading Oscillators in Decoding Speech: Reflection of a Cortical Computational Principle</td>
<td>DOD</td>
<td>384,424</td>
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<tr>
<td>C. Klapperich</td>
<td>Rapid PCR-Based, Point of Care (POC) Test to Discriminate Between Sterile &amp; Infectious Sirs</td>
<td>DOD (sub BIDMC)</td>
<td>48,871</td>
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<tr>
<td>K. Lutchen</td>
<td>Professor of Bioengineering &amp; Associate Director of Systems Biology Core at NEIDL</td>
<td>DOD (sub MLSC)</td>
<td>250,00</td>
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<tr>
<td>D. Mountain</td>
<td>ESME Model Enhancements</td>
<td>DOD</td>
<td>177,027</td>
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<tr>
<td>D. Mountain</td>
<td>ESME Workbench Innovations</td>
<td>DOD</td>
<td>175,000</td>
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<tr>
<td>D. Mountain</td>
<td>Underwater Hearing: Whales &amp; Dolphins</td>
<td>DOD (sub WHOI)</td>
<td>19,974</td>
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<tr>
<td>B. Shinn-Cunningham</td>
<td>Depur Equipment: Human Electrophysiological Study of Grouping, Figure/ Ground Sevregation &amp; Surface Perception</td>
<td>DOD</td>
<td>111,124</td>
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<tr>
<td>B. Shinn-Cunningham</td>
<td>Managing Acoustic Communications in High-Stress Settings</td>
<td>DOD</td>
<td>600,000</td>
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<tr>
<td>B. Shinn-Cunningham</td>
<td>Managing Acoustic Communications in High-Stress Settings (Supplement)</td>
<td>DOD</td>
<td>323,077</td>
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<tr>
<td>B. Shinn-Cunningham</td>
<td>Focusing, Sustaining &amp; Switching Attention</td>
<td>DOD</td>
<td>106,248</td>
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<tr>
<td>M. Zaman</td>
<td>Making an “Impact” (Integrated Measuring Platform for Identifying &amp; Testing Anti-Cancer Therapeutics) on Pediatric Cancers</td>
<td>Engineering &amp; Physical Sciences Research Council/UK (sub U Manchester)</td>
<td>9,511</td>
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<tr>
<td>M. Zaman</td>
<td>Developing Superior Screening Technology for Medicines Quality Control in Low Resource Countries</td>
<td>USAID (sub US Pharmacopeial Conv)</td>
<td>70,000</td>
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## AWARDS FROM INDUSTRY

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<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
<th>Granting Agency</th>
<th>Amount</th>
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<tbody>
<tr>
<td>E. Damiano</td>
<td>Preclinical Studies of a Transcutaneous Continuous Glucose Sensor in Diabetic Swine</td>
<td>Insulet Corp</td>
<td>82,384</td>
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<tr>
<td>M. Grinstaff</td>
<td>Downhole Li-Ion Batteries Based on Network Ionic Liquids</td>
<td>AEC (sub UT)</td>
<td>350,00</td>
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<tr>
<td>M. Grinstaff</td>
<td>Biolubricants for Viscosupplementation</td>
<td>Flex Biomedical, Inc.</td>
<td>454,000</td>
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<tr>
<td>M. Grinstaff</td>
<td>Preparation of Electrospun Meshes</td>
<td>FifthBase, LLC</td>
<td>18,839</td>
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<tr>
<td>C. Klapperich</td>
<td>Integrated Molecular Diagnostic System for Point-of-Care</td>
<td>BioHelix Corp</td>
<td>104,748</td>
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<tr>
<td>D. Mountain</td>
<td>Underwater Acoustics Propagation Model Development</td>
<td>Science Applications International Corp</td>
<td>39,830</td>
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<tr>
<td>T. Szabo</td>
<td>Multiwave Imaging of the Subsurface to Improve Spatial Resolution</td>
<td>Weatherford Intl LTD (sub MIT)</td>
<td>22,000</td>
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<tr>
<td>S. Vajda</td>
<td>STTR: High Throughput Portable Software for Fragment-Basededdrug Design</td>
<td>ACPHARIS, Inc.</td>
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## AWARDS FROM FOUNDATIONS

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<tr>
<th>Principal Investigator</th>
<th>Title of Project</th>
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<th>Amount</th>
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<tbody>
<tr>
<td>J. Collins</td>
<td>Synthetic Probiotic that will Identify &amp; Prevent Cholera</td>
<td>Bill &amp; Melinda Gate Fnd.</td>
<td>$100,000</td>
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<tr>
<td>S. Eisenberg</td>
<td>Coulter Foundation Translational Partners in Biomedical Engineering</td>
<td>Wallace H. Coulter Fnd.</td>
<td>$1,000,000</td>
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<tr>
<td>M. Grinstaff</td>
<td>Clare Boothe Luce Fellowships</td>
<td>The Henry Luce Fnd. Inc.</td>
<td>$30,822</td>
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<tr>
<td>X. Han</td>
<td>Blood-Brain Barrier MOD using Heterotrophic Nasal Mucosal Grafting for Enhanced Symptomatic &amp; Disease Modifying Drug Delivery in Parkinson’s Disease</td>
<td>MJ Fox Fnd (sub MEEI)</td>
<td>$40,000</td>
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<tr>
<td>X. Han</td>
<td>Functional Disconnection in Alzheimer’s Disease &amp; it’s potential Rescue</td>
<td>AFAR</td>
<td>$51,854</td>
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<tr>
<td>A. Meller</td>
<td>Clare Boothe Luce Fellowships</td>
<td>The Henry Luce Fnd. Inc.</td>
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## AWARDS FOR STUDENT FUNDING

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<tbody>
<tr>
<td>J. Collins</td>
<td>Off-Campus Funding for Devora Cohen-Karni</td>
<td>NE Biolabs, Inc.</td>
<td>$43,736</td>
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<td>J. Collins</td>
<td>Off-Campus Funding for Sam Pevzner</td>
<td>DFCI</td>
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<td>J. Collins</td>
<td>Off-Campus Funding for Arthur Yun Sun</td>
<td>Harvard U</td>
<td>$31,556</td>
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<td>J. Collins</td>
<td>Off-Campus Funding for James DiCarlo</td>
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<td>J. Collins</td>
<td>Off-Campus Funding for Michael Mee</td>
<td>Harvard U</td>
<td>$33,134</td>
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<td>C. Delisi</td>
<td>Off-Campus Funding for Sowmya Iyer</td>
<td>U Mass</td>
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<td>M. Grinstaff</td>
<td>Stipend Support for Benjamin Lakin</td>
<td>CHB</td>
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<tr>
<td>J. Mertz</td>
<td>Off-Campus Support for Hao Wang</td>
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<td>J. Mertz</td>
<td>Off-Campus Support for Whan Wook Chang</td>
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<td>M. Smith</td>
<td>Off-Campus Funding for Kayle Shapero</td>
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<tr>
<td>B. Suki</td>
<td>Off-Campus Funding for John Casey Olson</td>
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<td>B. Suki</td>
<td>Off-Campus Funding for Lisa Campana</td>
<td>BWH</td>
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<td>Off-Campus Funding for Jared Mondenedo</td>
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<tr>
<td>L. Vaina</td>
<td>Off-Campus Funding for Kunjan Rana</td>
<td>MGH</td>
<td>$16,494</td>
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<tr>
<td>J. Wong</td>
<td>Bioengineering for Bruch’s Membrane for the Treatment of Age-Related Macular Degeneration (Salary Support for Kevin McHugh)</td>
<td>Schepens Eye Research Inst.</td>
<td>$41,750</td>
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<tr>
<td>J. Wong</td>
<td>Tissue Vascularization (Off-Campus Funding for Patrick Allen)</td>
<td>CHB</td>
<td>$74,610</td>
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</table>
This year the department entered Phase II of the Coulter Foundation Translational Partnership Award renewing the award for another 5 years. The Coulter Foundation commitment provides $500,000 per year with an equivalent cost share provided by the university.

On January 2012 a dedicated full time Program Director joined the program and new members from industry and venture capital were added to the Coulter Oversight Committee, which now consists of 20 representatives.

Funding was provided to the following projects for 2011-2012:

- Multiplexed, Rapid, Point of Care Device to Quantify Specific IgE to Food Allergens (M. Selim Unlu/ Frederic Little)
- FNA Tools for Elastic Scattering Spectroscopy (ESS): Clinical Application to Thyroid Cancer (Irving Bigio/Jennifer Rosen)
- Clinical Testing of a Closed-Loop Control System for Blood-Glucose Regulation in the ICU (Ed Damiano/Steven Russell)
- Improving Health Choices with Wireless Devices (Daniel Imler/ David Mountain)
- Targeting IgE-Mediated Diseases (Lisa Ganley-Leal/ Joyce Wong)
- Compound Multimodality Brest Biopsy Clip (B. Nicolas Bloch/ Mark Grinstaff)
- PharmaCheck: A Robust, High-Throughput Microfluidic Platform to Detect Counterfeit and Substandard Pharmaceuticals (Muhammad Zaman/Christopher Gill)

In an attempt to encourage clinically driven programs, in early 2012 increased efforts were devoted to promoting awareness of the program at the BU School of Medicine and the Boston Medical Center, including numerous outreach activities and more than 70 individual meetings with translational faculty interested in learning about the Coulter program. As a result of this targeted effort, in this cycle the Coulter Oversight Committee was offered the opportunity of reviewing 22 new projects, which included individual market and IP analysis prepared by the Coulter team. After two rounds of selections, six new projects were selected for funding and three renewal applications of previously funded projects were approved.

The new projects funded include:

- Point of care rapid testing of antibiotic susceptibility in sepsis (Khalli A. Collins J. Klemperner J.)
- Phase microscopy on hand held device for malaria detection (Merz J.; Gill C.)
- Clinical testing of variable ventilation compared to continuous ventilation (Suki B; O’Connor G)
- Lipid microbubble formulation of drug combinations to prevent post surgical adhesion formation (Wong J.; Stucchi A)
- In vivo testing of AhR formulators as therapeutics for triple negative breast cancer (Grinstaff M.; Sherr D.)
- Constant therapy- a tablet based therapy for aphasia (Stepp C.; Kiran S)

The approved renewed applications include:

- FNA Tools for Elastic Scattering Spectroscopy (ESS): Clinical Application to Thyroid Cancer (Irving Bigio/Jennifer Rosen)
- Compound Multimodality Brest Biopsy Clip (B. Nicolas Bloch/ Mark Grinstaff)
- PharmaCheck: A Robust, High-Throughput Microfluidic Platform to Detect Counterfeit and Substandard Pharmaceuticals (Muhammad Zaman/Christopher Gill)

Significant translational successes of the Coulter program to date include:

- Flex Biomedical, Inc., a corporation created around the technology developed by Grinstaff on polysaccharide surrogates for the treatment of osteoarthitis and funded by the Coulter program in 2007-2008 raised a total of ~$3.3M to date from investors and the State of Wisconsin. In addition, Flex has signed a ~$27M deal over a three year period with Arthrex (~$8M in milestones and ~$19M for commercial development). The deal is contingent upon successful completion of a canine efficacy study that is currently underway.
- Acuity Bio, Inc, another start-up based on a Grinstaff technology funded by the Coulter program in 2008-2009 has raised to date more than 1.7M in SBIR grants and has reached agreement with the FDA on its orphan drug development strategy to expedite the regulatory development of this innovative anti-cancer therapy.
- A fluorescence endomicroscopy technology developed by Mertz and funded by Coulter in 2007 and 2008 has been licensed to a significant player in the field, Karl Stortz.
- A more recently funded Coulter project, Pharmacheck, the technology developed by Zaman for identification of counterfeit drugs in the developing countries has been awarded 250K by the Bill and Melinda Gates Foundation.
Graduate Enrollment

24
Number of students awarded their PhD degrees this year

24
Number of students completed their MS degrees this year

10
Number of students completed their MEng degrees this year

33
Number of MEng degrees awarded since the program’s inception in 2009.

192
Number of PhD’s awarded in BME since the program’s inception in 1991.

GRADUATE PROGRAM POPULATION

ENROLLMENT FOR AY 2011-2012

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MD/PhD Fellows: 3
### Graduate Degrees Awarded

**Degrees Awarded**

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### Admission Results for AY 2011-2012

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### Admission Projections for AY 2012-2013

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### GRADUATE PROGRAM

#### MEng Graduates

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<tr>
<td>Matthew Batterton</td>
<td>(1/25/12) <strong>A Breadboard for Synthetic Gene Networks</strong>, Prof. James Collins, Advisor</td>
</tr>
<tr>
<td>Wei-Hsiang Chang</td>
<td>(5/20/12) <strong>Neural Code of Circadian Rhythm: Efferent Modulation of Limulus Visual Sensitivity</strong>, Prof. Christopher Passaglia, Advisor</td>
</tr>
<tr>
<td>Esteban Chavez</td>
<td>(5/20/12) <strong>Developing an Ultra-fast DNA Sequencing Technology Using Nanopores and Optical Readout</strong>, Prof. Amit Meller, Advisor</td>
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<tr>
<td>Sean Cotton</td>
<td>(5/20/12) <strong>Identification and analysis of ligand binding sites by computational mapping</strong>, Prof. Sandor Vajda, Advisor</td>
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<tr>
<td>Christopher Dubois</td>
<td>(5/20/12) <strong>Neural Selectivity in the Secondary Auditory Forebrain of the Zebra Finch</strong>, Prof. Kamal Sen, Advisor</td>
</tr>
<tr>
<td>Yuvval Harel</td>
<td>(5/20/12) <strong>Individual Differences in Processing of Supra-threshold Sound</strong>, Prof. Barbara Shinn-Cunningham, Advisor</td>
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<tr>
<td>Dale McGrath</td>
<td>(5/20/12) <strong>High-Throughput Detection of DNA Orientation and Conformation for Characterization of Protein-DNA Interactions</strong>, Prof. Selim Ünlü, Advisor</td>
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<tr>
<td>Timothy Ford</td>
<td>(5/20/12) <strong>pH/Thermosensetive liposomes modified with poly(N-isopropylacrylamide-co-propylacrylic acid) copolymers for focused ultrasound-triggered release of Doxorubicin</strong>, Prof. Tyrone Porter, Advisor</td>
</tr>
<tr>
<td>Rikin Patel</td>
<td>(5/20/12) <strong>Normalization of microvascular physiology in engineered microvessels via cyclic adenosine monophosphate supplementation and artificial lymphatic drainage</strong>, Prof. Joe Tien, Advisor</td>
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<tr>
<td>Zhuting Li</td>
<td>(5/20/12) <strong>Computational characterization of protein hot spots</strong>, Prof. Sandor Vajda, Advisor</td>
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<tr>
<td>Raffi Afeyan</td>
<td>(5/20/12) <strong>Concentrating Complex Biological Samples for Point-of-Care Diagnostics</strong>, Prof. Catherine Klapperich, Advisor</td>
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#### Ph.D GRADUATES 2012: Thesis Title & Advisor(s)

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Patrick Allen</td>
<td>(5/20/12) <strong>Rapid Formation Of Cell-Mediated Microvascular Networks In Collagen, Fibrin, And Puramatrix Provisional Matrices</strong>, Profs. Joyce Wong and Joyce Bischoff (Harvard Medical School/Surgery), Co-Advisors</td>
</tr>
<tr>
<td>Jarred Callura</td>
<td>(5/20/12) <strong>Synthetic Biology Applications of Engineered Riboregulation</strong>, Prof. James Collins, Advisor</td>
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<tr>
<td>Lisa Campana</td>
<td>(5/20/12) <strong>The Effect of Lung Stretch During Sleep on Respiratory Mechanics and Variability in Asthma</strong>, Prof. Selim Ünlü, Advisor</td>
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<td>Ryan Carey</td>
<td>(5/20/12) <strong>Processing Of Temporally Dynamic Olfactory Input</strong>, Prof. D. Matt Wachowiak</td>
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<td>Michael Economo</td>
<td>(1/25/12) <strong>Investigating the mechanisms of cellular and network rhythemogenesis in the hippocampal formation and neocortex</strong>, Prof. John White, Advisor</td>
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<tr>
<td>Alexander</td>
<td>Fichtenholtz (1/25/12) <strong>In silico bacterial gene regulatory network reconstruction from sequence</strong>, Prof. James Collins, Advisor</td>
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<td>David Hall</td>
<td>(5/20/12) <strong>Analysis of Molecular Interactions in the Presence of Side Chain Flexibility</strong>, Prof. Sandor Vajda, Advisor</td>
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<td>Dewi Harjanto</td>
<td>(5/20/12) <strong>Effects of three-dimensional extracellular matrix properties on tumor cell behavior</strong>, Prof. Muhammad Zaman, Advisor</td>
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<td>Lauren Hayward</td>
<td>(5/20/12) <strong>Investigations Into The Quantitative Relationship Between The Mechanical Environment And Skeletal Healing</strong>, Prof. Elise Morgan, Advisor</td>
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<tr>
<td>Walter Heine</td>
<td>(MD/Ph.D.) (5/20/12) <strong>A Quantitative analysis of the retinal ganglion cell density and spatiotemporal receptive field properties in the Brown Norway rat</strong>, Prof. Christopher Passaglia, Advisor</td>
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<tr>
<td>Abhishek Jain</td>
<td>(1/25/12) <strong>Blood Rheology and Biomimetic Rare Cell Segregation on Microfluidic Platforms</strong>, Profs. Michael Smith and Lance Munn (MGH, Harvard Med), Co-Advisors</td>
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<td>Henry Lee</td>
<td>(1/25/12) <strong>A System Approach to the Evolution of Antibiotic Resistance</strong>, Prof. James Collins, Advisor</td>
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<td>Kevin Litcofsky</td>
<td>(1/25/12) <strong>A Breadboard for Synthetic Gene Networks</strong>, Prof. James Collins, Advisor</td>
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<td>Jiahui Liu</td>
<td>(1/25/12) <strong>Neural Code of Circadian Rhythm: Efferent Modulation of Limulus Visual Sensitivity</strong>, Prof. Christopher Passaglia, Advisor</td>
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<td>Benjamin McNally</td>
<td>(1/25/12) <strong>Developing an Ultra-fast DNA Sequencing Technology Using Nanopores and Optical Readout</strong>, Prof. Amit Meller, Advisor</td>
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<td>Chi Ho Ngan</td>
<td>(1/25/12) <strong>Investigations into the Physiology and Pathophysiology of the Endothelial-Cell Surface Glycocalyx Using Micro-Particle Image Velocimetry</strong>, Prof. Edward R. Damiano, Advisor</td>
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<td>Benjamin Perrone</td>
<td>(1/25/12) <strong>Development of a Solid-State Nanopore-Based Molecular Diagnostics Platform</strong>, Prof. Amit Meller, Advisor</td>
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<td>Dorea Ruggles</td>
<td>(1/25/12) <strong>Individual Differences in Processing of Supra-threshold Sound</strong>, Prof. Barbara Shinn-Cunningham, Advisor</td>
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<td>Michele Savery</td>
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<td>(5/20/12) <strong>High-Throughput Detection of DNA Orientation and Conformation for Characterization of Protein-DNA Interactions</strong>, Prof. Selim Ünlü, Advisor</td>
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<td>Philipp Spuhler</td>
<td>(1/25/12) <strong>pH/Thermosensetive liposomes modified with poly(N-isopropylacrylamide-co-propylacrylic acid) copolymers for focused ultrasound-triggered release of Doxorubicin</strong>, Prof. Tyrone Porter, Advisor</td>
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<td>Terence Ta</td>
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<td>Ho Ki Keith Wong</td>
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<td>Jane Zhang</td>
<td>(5/20/12) <strong>Concentrating Complex Biological Samples for Point-of-Care Diagnostics</strong>, Prof. Catherine Klapperich, Advisor</td>
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Raffi Afeyan
(5/20/12)
Synthetic Gene Networks for Signal Recognition: Engineering Spatially Organized Interactions in Bacteria,
Prof. James Collins, Advisor

Vivek Bhatia
(1/25/12)
High-throughput Strategies for Proteomic Biomarker Discovery and Clinical Diagnostics Using Software and Biosensors,
Prof. Bennett Goldberg, Advisor

Whan Wook Chang
(9/25/11)
Dynamic optical coherence tomography: applications in otolaryngology,
Prof Jerome Mertz and Dr. Andy Yun Wellman Center for Photomedicine, MGH, Co-Advisors

Alexander Fichtenholtz
(9/25/11)
Construction of an ab initio pipeline for prediction of gene regulatory networks from genome sequence,
Prof. James Collins, Advisor

Timothy Ford
(1/25/12)
Optically Sectioned Fluorescence Endomicroscopy with HiLo,
Prof Jerome Mertz, Advisor

Christopher Garay
(5/20/12)
Integration of Large-Scale Genomics Profiling Dataset with a Genome-Scale Metabolic Model of Mycobacterium Tuberculosis, Prof. James Galagan, Advisor

Michelle Kinahan
(9/25/11)
Tunable Silk: Using Microfluidics to Fabricate Silk Fibers with Controllable Properties and Investigate Sequence-Structure-Property Relationships,
Prof. Joyce Wong, Advisor

Zhuting Li
(1/25/12)
Epilepsy and Metabolism: Role of Nuclear Respiratory Factor 1 in Regulating GABA Receptor α4 Subunit Expression, Profs Xue Han and Shelly Russek (Pharmacology) Co-Advisors

Kevin Litcofsky
(9/25/11)
A Breadboard for Synthetic Biology, Prof. James Collins, Advisor

Benjamin McNally
(1/25/12)
Developing Ultra Fast DNA Sequencing using Nanopoles and Optical readout, Prof. Amit Meller, Advisor

Sheetal Modi
(9/25/11)
Understanding Bacterial Mechanisms of Stress Adaptation with Systems Biology, Prof. James Collins, Advisor

Margo Monroe
(1/25/12)
Self-Calibrated and multiplexed sensing biochip to quantify allergen-specific IgE, Prof. Selim Ünlü, Advisor

Charlotte Naylor
(5/20/12)
Radiolucent Device to Apply Compression and Flexion for the Study of Vertebral Failure Mechanisms, Prof. Elise Morgan, Advisor

Rikin Patel
(1/25/12)
A Two-Chambered Experimental Apparatus for the Mongolian Gerbil Cochlea, Prof. David Mountain, Advisor

Matthew Peterson
(5/20/12)
Identification of transcriptional regulation in Mycobacterium tuberculosis and Neurospora crassa using ChIP-seq, Prof James Galagan, Advisor

Eduard Reznik
(1/25/12)
Dynamics and the Interface of Metabolism and Genetic Regulation, Prof Daniel Segre, Advisor

Sean Serell
(9/25/11)
Influence of Alterations in Bone Tissue Properties on Whole Bone Strength, Prof. Catherine Klapperich, Advisor

Rachel Stewart
(9/25/11)
Cationic Contrast Agents for Imaging Articular Cartilage with Computed Tomography, Prof. Mark Grinstaff, Advisor

Brian Talbot
(1/25/12)
Characterization of Phase Estimation Techniques to Guide Phasic Stimulation for Brain Machine Interfacing, Prof. Steven Colburn, Advisor

Tyler Wellman
(5/20/12)
Functional and Mechanical Determinants of Regional Lung Inflammation in Acute Lung Injury Assessed With Positron Emission Tomography, Profs. Bela Suki and Marcos Vidal Melo (Anesthesia, MGH, Research Advisor)

Jon Woodward
(1/25/12)
Graphical User Interface Framework for Earlab, Prof. David Mountain, Advisor

Raphael Yao
(1/25/12)
The Effects of Mechanical Stimulation on Controlling and Maintaining Mesenchymal Stem Cell Differentiation into Vascular Smooth Muscle Cells, Prof. Joyce Wong, Advisor

Eunice Yi
(5/20/12)
Mechanical Forces accelerate Collagen Digestion by Bacterial Collagenase in Lung Tissue Strips, Prof. Bela Suki, Advisor

Stefan Yohe
(9/25/11)
Hydrophobic, Doped Electrospun Polymer Meshes for Drug Delivery to Prevent Local Recurrence in Lung Cancer, Prof. Mark Grinstaff, Advisor

Grad Student Awards
Kyle Allison
Winner Collegiate Inventors Competition
BU BME Department Paper of the Year
On Forbes 30 under 30 list for Science
Provosts Award at BU’s Science and Engineering Research Symposium
Best Poster at BU’s Clinical and Translational Science Institute Third Annual Translational Research Symposium

Emily Palmer
Biomolecular Pharmacology Training Fellowship 9/11-6/12
CIMIT Fellowship 7/12-12/12
Cross-disciplinary training in nanotechnology for cancer fellowship 1/13-8/13

Lauren Mangano
NSF Fellowship 6/12 - 6/14

Kevin McHugh
Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting Travel Grant, National Eye Institute, 2012
GEN TEN Award, Genetic Engineering and Biotechnology News, 2012
Poster Award, Third Annual Translational Research Symposium, Boston University Clinical & Translational Science Institute, 2012

Michael Mee
Canadian Institutes of Health Research (CIHR) Doctoral Research Award
Number of BME students currently enrolled this year, 40% of the total enrollment of the College of Engineering. The percent of female & male students was 39% and 61%, respectively.

### Undergraduate Enrollment

**531**

**ENROLLMENT FOR AY 2011-2012**

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### BME Enrollment History

- **Seniors**
- **Juniors**
- **Sophomores**
- **Freshmen**

![Graph showing enrollment history](image-url)
The Department awarded 94 Bachelor of Science degrees this academic year, 33% of all the BS degrees awarded by the College.

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<td>TOTAL (2006-2007)</td>
<td>57</td>
<td>252</td>
</tr>
<tr>
<td>TOTAL (2005-2006)</td>
<td>70</td>
<td>266</td>
</tr>
</tbody>
</table>

The BME department was responsible for teaching 63 courses during the AY 2011-2012. These courses and their enrollments are listed in the table on the next page. The student credit hours for these courses total 8,220. The trend in annual credit hours taught over the past 10 years is illustrated above in “BME Teaching History.”
MISSION STATEMENT

The Mission of the Biomedical Engineering Department is to pursue excellence in biomedical engineering education, research and innovation; creating and imparting knowledge for improving society, human health and health care. To achieve our educational mission, we cultivate our students’ problem-solving and communication skills, nurture their creativity, promote their ability to think critically and independently, and help them to understand scientific and engineering approaches.
Graduates of our undergraduate program are expected:

- to become successful practitioners of biomedical engineering or other professions (e.g., medicine, law, management) drawing upon and guided by their knowledge of biomedical engineering;

- to continue improving and expanding their technical and professional skills through formal or informal means (e.g., continuing education and training, attending conferences, learning new tools and methods); and

- to contribute to community and professional groups using the unique competencies provided by their biomedical engineering educational experiences.

**PROGRAM EDUCATIONAL OBJECTIVES**

a) an ability to apply knowledge of mathematics, science and engineering;

b) an ability to design and conduct experiments, as well as to analyze and interpret data;

c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, healthy and safety, manufacturability and sustainability;

d) an ability to function on multi-disciplinary teams;

e) an ability to identify, formulate and solve engineering problems;

f) an understanding of professional and ethical responsibilities;

g) an ability to communicate effectively;

h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context;

i) a recognition of the need for, and an ability to engage in life-long learning;

j) a knowledge of contemporary issues;

k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice;

**PROGRAM OUTCOMES**

- a) an ability to apply knowledge of mathematics, science and engineering;

- b) an ability to design and conduct experiments, as well as to analyze and interpret data;

- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, healthy and safety, manufacturability and sustainability;

- d) an ability to function on multi-disciplinary teams;

- e) an ability to identify, formulate and solve engineering problems;

- f) an understanding of professional and ethical responsibilities;

- g) an ability to communicate effectively;

- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context;

- i) a recognition of the need for, and an ability to engage in life-long learning;

- j) a knowledge of contemporary issues;

- k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice;
Among the 28 ENG winners for outstanding assistance in advising this year, the following BME seniors were recognized: Cassidy Blundell, Kali Brong, Rachel Deraney, Joseph Greenspun, Nicholas Luzod, Keri Mroszczyk, Imaly Nanayakkara, Stephanie Nelson, Olurotimi Ogunbiyi, Joseph Pirrello, Megan Sperry, Natalia Vieira, Sharon Wolfson and Benjamin Weinberg.

In 2012, several of the BME seniors were recognized for achievements and contributions to the Boston University community and BME profession.

For the graduating senior who has best advanced the reputation and prestige of the BME department through his/her involvement in department, college, university, or professional activities, organizations, as well as through academic and Senior Design Project achievements. This year the award was presented to Megan Sperry.

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 Sharon Wolfson.

Presented to seniors who have made outstanding contributions to the College and University through their involvement in activities and organizations. Among the eight award winners this year were BME seniors Cassidy Blundell, Keri Mroszczyk, Joseph Pirrello and Natalia Vieira.

Three of the five award winners this year were BME seniors Joseph Greenspun, Nicholas Luzod and Natalia Vieira.

The team of Andrew Schiff and Angela Xie were recognized with the Department’s 2012 Outstanding Senior Design Project Award for their project “Control of Organization in a Tissue-Engineered Vascular Patch” under the supervision of Professor Joyce Wong (BME).

Two of the three places were awarded to senior projects performed by BME seniors. 1st Place: Caitlin Monahan and Dayana Rojas with “Robust Dissolution System for the Detection of Counterfeit Drugs in Resource-Limited Settings” and 3rd Place: Rachel Deraney, Kaitlin Gargiulo and Chelsea Saniel with “System for Nucleic Acid Preparation for TB Diagnostics (SNAP-TB)”.

Among the 28 ENG winners for outstanding assistance in advising this year, the following BME seniors were recognized: Cassidy Blundell, Kali Brong, Rachel Deraney, Joseph Greenspun, Nicholas Luzod, Keri Mroszczyk, Imaly Nanayakkara, Stephanie Nelson, Olurotimi Ogunbiyi, Joseph Pirrello, Megan Sperry, Natalia Vieira, Sharon Wolfson and Benjamin Weinberg.
Research Activities for Undergraduates

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).

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.
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 administered 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.

Senior Design Project Experience

A major strong point of our undergraduate program continues to be the Senior Design Project. 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 Industrial Advisory Board, 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 on the next page, followed by a listing of the project presentations.
REGISTERED COMPANIES 2012

3M
Advanced Instruments, Inc.
AltraBio
Altran
Applied Medical Resources
ArQule, Inc.
Atrium Medical
BD Medical
Beth Israel Deaconess Medical Center
BioTrove, Inc.
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
Center for Global Health and Development
Charles Stark Draper Laboratory
Children’s Hospital Boston
CIMIT
CKD Associates
Clark & Elbing LLP
Cleveland Clinic
Columbia University, College of Physicians and Surgeons
Comprehensive Health Management Inc.
ConforMIS, Inc.
Covidien
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
Essex Orthopedics & Optima Sports Medicine
Fellers Snider et al.
Fraunhofer USA-CMI
GE Healthcare
Gems Sensors
Genzyme Corporation
Goodyear-Veyance Technologies, Inc.
Harvard Business School
Harvard Medical School
Harvard University
Harvard-MIT Division of Health Sciences and Technology
Hologic
Iandiorio Teska & Coleman
Integra LifeSciences
iWorx Systems, Inc.
Johnson & Johnson
Massachusetts Eye and Ear Infirmary
Massachusetts General Hospital
Massachusetts Institute of Technology
Medtronic, Inc.
METI
Minnesota State University, Mankato
National Instruments
Neuroptix Corporation
NuOrtho Surgical, Inc.
Optasia Medical, Inc.
O’Shea Getz PC
Parexel
Perceptive Informatics
Pfizer
Philips Healthcare
Praxis Advisors LLC
Pulmatrix, Inc.
Raytheon
Respiratory Motion, Inc.
Schepens Eye Research Institute
Solace Therapeutics, Inc.
St. Jude Medical
Teleflex Medical
Toxikon Corporation
Tufts University
UMASS
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
Vertex Pharmaceuticals
Veterans Administration
Veterans Affairs Boston Healthcare System
Worcester Polytechnic Institute
Wyss Institute for Biologically Inspired Engineering
Xcellerex
SESSION I
We Have the Technology: Helping the Human Body

Session Chair: Prof. Steve Colburn

Optical Walking Stick: A Vibrotactile Sensory Substitution Aid
Mark Guirguis, Arjun Patel, Parth G. Patel

Investigating Electroencephalography-Based Brain-Computer Interfaces for Communication in Healthy Populations and Individuals with Motor Impairment
Xudong Chen, Anthony Rinaldi, Dante Smith

Design of an Experimental Environment for Investigating Hand Movement Coordination
Leslie Kim, Linda Nguyen

Stochastic Resonance Knee Brace
Nathaniel Hixon, Victor Radulescu

Continuous Monitoring of Functional Activities and Movement Disorders in Individuals with Parkinson's Disease
Dan Chin, Aubrey Gasbarre, Alexandra Walco

Design of a Novel Video Game-Based Rehabilitation Tool for Velopharyngeal Dysfunction
Elias Thorp, Boris Virnik

SESSION IIa
Status Report: Diagnostic Technologies

Session Chair: Prof. Solomon Eisenberg

Visual Detection of Emerging Pathogens
Vedran Beganovic, Zachary Tochka, Anastasia Yaroslavsky

Compact Interferometric Reflectance Imaging Sensor for Biomolecular Interaction Analysis
Joseph Greenspun, Nicholas Luzod

Extraction of DNA from Blood Samples for Point-of-Care Sepsis Diagnostic Chip
Rubayath Mohsen, Alexis Rodriguez Valenti

Impedance Array for Single Cell Studies
George Chapman, Alexander Paloranta, Eric Schwarz

Quantitative High-Throughput Biomarker Discovery by Mass Spectrometry on Label-Free Arrays
Julian Anding, Herve Mathelier, Michael Shaw

Functional Imaging of the Intervertebral Disc
David Berry, Daniel Grasso, Megan Sperry

Contrast-Enhanced Computed Tomographic Imaging of Fracture Calluses
Chantal de Bakker, Keri Mroszczyk
SESSION IIb
Small Things: Molecules, Cells and Nanobits
Session Chair: Prof. Thomas Szabo

Tantalum Oxide-Based Nanoparticles as Contrast Agents in Biomedical Imaging
Jae Yeon Kim, Ajinkya Nene

Mesenchymal Stem Cell Matrix Remodeling
Molly Ford Dacus

Cellular Traction Force Measurement of Mesenchymal Stem Cells under Biochemical Stimulation
Dongjian Hu, Katheryn Rothenberg

Automated Design and Assembly of Reconfigurable Genetic Regulatory Networks
Aaron Berliner, Joshua Hodgson, Vanessa Yanez

A Novel Kidney Glomeruli Isolation System (KGIS)
Magi El Manchy, Xhorxhi Gjoka, Rahul Modi

Patterning of Multiple Extracellular Adhesion Molecules
Ian Cody MacDonald, Anne Marie Weber

Control of Organization and Function in a Tissue-Engineered Vascular Patch
Andrew Schiff, Angela Xie

SESSION IIIa
Just a Spoonful: Drug Delivery and Compliance
Session Chair: Prof. Catherine Klapperich

Multifunctional Targeted Colloidal Particles for Inhibition of Endothelial Cell Inflammation
Oluwatosin Adedokun, Christopher Hernandez

Localized siRNA Delivery with Lipid-Coated Modified Polyethylenimine
Morgan Giles, Steven Mathews, Teena Varghese

In vitro Mucosal Membrane Culture Model for Drug Delivery
Hufsa Iqbal, Angela Nocera

Design of an Algorithm Incorporating the Glycemic Index in Insulin Bolus Delivery Estimations for the Treatment of Type 1 Diabetes
Julian Hart, David Nathaniel Tan

Design of a Microfluidic Device for the Preparation of pH-Sensitive Expandable Nanoparticles to Prevent Local Recurrence of Intrapertioneal Mesothelioma
Raeef Istfan, Ashish Malladi, Benjamin Weinberg

Paper Microfluidics for HAART Drug Adherence Monitoring
Suhina Minocha, Evelyn Orozco

SESSION IIIb
Connections: Interfacing to Living Systems & Tissue
Session Chair: Prof. Jason Ritt

System for Sensing, Characterizing and Displaying the Neural Signal Response of Stimulated Rat Brain Tissue in vitro
Parth P. Patel

Neurocognitive Assessment Using the iPad Platform
Raymond Byrne, Raphael Landaverde

Portable Proportional Myoelectric Controller
Rachel Carande, Jessica Fraser, Benjamin Huey

Ergonomic Redesign of a Laparoscopic Clip Applier
Katherine Black, Ryan Pope

Glenohumeral Joint Kinematics and Contact Pressures during Simulated Pitching: A Cadaveric Study
Megan Lee, Max Lerman, Natalia Vieira

Development of LabVIEW-Based Data Acquisition System for the Evaluation of Respiratory Mechanics
Jacob Herrmann, Frank Zong

Design of an Isolated Airway System to Establish How Long-Term Exposure to Inflammatory and Contractile Mediators Alters Airway Reactivity
Dorothea Crowley, Sharon Wolfson

SESSION IV
We are the World: Global Health Technologies
Session Chair: Prof. Muhammad Zaman

Robust Dissolution System for the Detection of Counterfeit Drugs in Resource-Limited Settings
Caitlin Monahan, Dayana Rojas

Tissue Diagnostic Instrument for Global Health Applications Based on Optical Spectroscopy: Phase II
Lisa Cervia, Vincent Zuo

Robust Device for Reagent Storage in Resource-Limited Settings
Cassidy Blundell, Imaly Nanayakkara, Joseph Pirrello

System for Nucleic Acid Preparation for TB Diagnostics (SNAP-TB)
Rachel Deraney, Kaitlin Gargiulo, Chelsea Saniel

Point-of-Care Diagnostic Device for Liver Cancer and Hepatitis B in Resource-Limited Settings
Supriya Jain, Hang Su, William Tsang

Miniaturization of a System for Nucleic Acid Preparation for HIV Diagnostics (miSNAP)
Pawel Kalinowski, Rotimi Ogunbiyi

Modeling of Artificial Sputum for Use in Tuberculosis Diagnostics
Kali Brong, Stephanie Nelson, Shahar Torton
This report provides a description of the instructional and research activities of the Department of Biomedical Engineering at Boston University during the 2011-2012 academic year.

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

For more information or to download this report as a PDF, please visit our website at: bu.edu/bme