



Boston University College of Engineering
Department of Biomedical Engineering



BME Annual Report

Advancing MEDICINE
Through TECHNOLOGY

**2010
-2011**

Contents

Department of Biomedical Engineering

Boston University
Department of Biomedical Engineering

Annual Report 2010-2011

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Content: BME faculty and staff

This report provides a description of the instructional and research activities of the Department of Biomedical Engineering at Boston University during the 2010-2011 academic year. Instructional activities are reported from the Fall 2010 through Summer 2011 semesters while scholarly activities and budget information are reported from July 1, 2010 to June 30, 2011.

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

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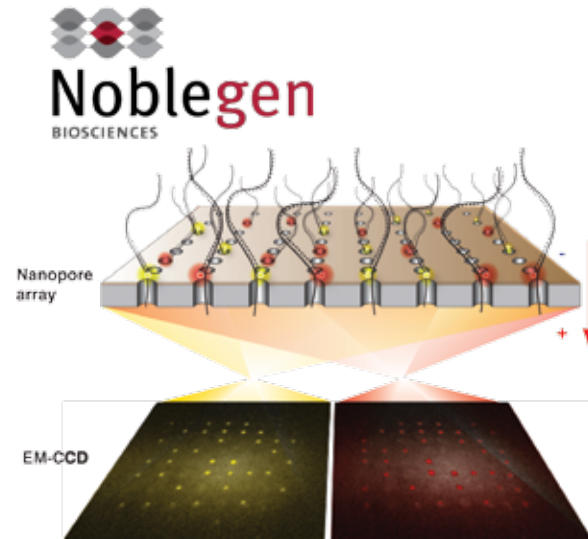
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Highlights

Over the past year, the Biomedical Engineering Department furthered its goal of advancing medicine through technology by translating several research projects to the commercial marketplace.

NobleGen Biosciences was formed by holding exclusive license from Harvard and BU to commercialize breakthrough fourth-generation nanopore sequencing technology. Professor **Amit Meller**, an internationally recognized leader in nanopore physics, developed the technology. NobleGen aims to be first to meet all the requirement for clinical all genome sequencing, and is run by Meller and CEO Frank Feist.

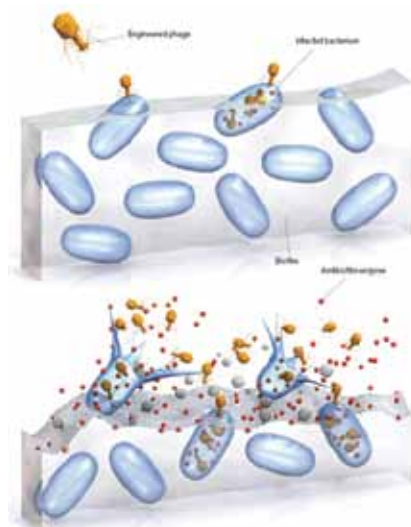


Flex Biomedical, a company founded in 2007 based on a technology out of Prof. **Mark Grinstaff's** lab (BME/CHEM) surpassed \$2M in funding for its development of innovative treatments for orthopedic diseases. The company's lead product, the Flex Polymer™, is a synthetic polymer designed to treat osteoarthritis, an incurable, debilitating joint disease that affects 27 million people in the United States and 100 million people worldwide.



HiLo, a novel CCD-based widefield imaging technique, was licensed by Karl Storz, Inc. to be used as part of their flexible endoscopy imaging package. The team of Prof. **Jerome Mertz** and Dr. **Satish Singh** (BUSM Gastroenterology/BU BME) developed a novel imaging method (referred to as HiLo microscopy) as well as a clinical prototype that allows confocal like out-of-focus fluorescence background rejection without the use of a confocal scanning mechanism or moving parts. The prototype is specifically designed for clinical applications and performs real-time imaging (10Hz) through an imaging fiber bundle. This technology has also been adapted to provide a box that can be added to a bench top fluoresce microscope to get confocal-like images at a fraction of the cost. HiLo is currently seeking commercial partners for this endeavor.

Novophage (a BU and MIT spin-out company) wrapped up its first round of Venture Capital funding in 2010, raising \$5.75 million. The start-up is engineering customized viruses called phages whose job is to seek and destroy the bacteria that gum up all kinds of industrial processes, from paper-making to oil exploration to heating and cooling big buildings. Novophage will initially focus on battling biofilms in HVAC systems and paper production. The technology emerges out of Prof. **Jim Collins** lab as part of his synthetic biology initiative. Novophage had participated in entrepreneurship competitions at MIT, Harvard Business School, UC Berkeley, the University of Texas, Boston University, Purdue University, and the University of Nebraska. Their winnings from these business plan competitions helped to keep the company running before closing on this round of VC funding.



We continue to invest in the growth of our department through the addition of new faculty.

We added two primary faculty members, Professor Barbara Shinn-Cunningham and Associate Professor Catherine Klapperich. Both of these new faculty members come from other departments at BU.



Dr. Barbara Shinn-Cunningham joined the BME Faculty on October 1, 2010, transferring from her previous position in the Cognitive and Neurological Systems (CNS) Department in CAS. She has been a faculty member at BU and a member of the BME affiliated Hearing Research Center since 1997. Her research interests include: auditory attention, spatial hearing, neuro-electric imaging, neural coding, plasticity and learning in auditory tasks.



Dr. Catherine Klapperich joined the department September 1, 2010 transferring from the Mechanical Engineering Department. She has had an affiliated appointment in the BME Department since her hire in 2003. Her research is focused on the design of new molecular diagnostics and appropriate technologies for healthcare.

During the last fiscal year, our 34 primary faculty attracted over \$24 million in extramural funds available for expenditure this year.

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 34 primary faculty attracted over \$24 million in extramural funds available for expenditure this year. This translates to over \$710,000 per faculty member. Our graduate and undergraduate programs continue to be ranked in the top ten in the most recent *US News and World Report* rankings.

The BME Ph.D. Program awarded 23 degrees this year, bringing our total Ph.D. degrees awarded to 168 since the program began in 1991. In AY 2011 our graduate programs enrolled 153 students (116 Ph.D. students; 7 M.D./Ph.D.; 16 M.S.; 14 M.Eng.). In Fall 2011 we expect 40 new graduate students (27 Ph.D., 2 M.S. and 11 M.Eng.) with the great majority being US citizens. Our Ph.D. applicant pool continues to grow; in AY 2010-2011 we had 552

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 81 Bachelor of Science degrees and has a current enrollment of 474 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 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 BioDynamics (**CBD**), Biomolecular Engineering Research Center (**BMERC**), Center for Nanoscience and Nanobiotechnology (**CNN**), Hearing Research Center (HRC), and NeuroMuscular Research Center (**NMRC**).



Dr. Ahmad (Mo) Khalil will join the BME Department January 1, 2012. Dr. Khalil completed his PhD in Mechanical Engineering in 2008 at MIT with Profs. Angela Belcher and Matthew Lang, and is currently 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 to address global challenges in medicine, energy, and the environment.



Dr. Wilson Wong will join the BME department on January 1, 2012. He is currently 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.



Dr. Darren Roblyer will join the department in July 2012. He is currently a postdoctoral fellow at the Beckman Laser Institute at the University of California, Irvine with Professor Bruce Tromberg. He received his Ph.D. from the Bioengineering Department at Rice University studying

under Professor Rebecca Richards-Kortum, where he was a HHMI fellow and developed a clinical autofluorescence imaging system used to detect and delineate oral cancer lesions in human subjects. Dr. Roblyer’s current research utilizes diffuse optical spectroscopy to both predict and better understand tumor response to chemotherapy. He is also highly active in instrumentation development, preclinical, and clinical studies.

Our faculty searches were also very successful this year, attracting over 500 high caliber applications.

*As a result of these searches 3 new junior faculty members will join BME in the next year: **Dr. Ahmad (Mo) Khalil, Dr. Wilson Wong, and Dr. Darren Roblyer.***

*In AY11/12 BME will also welcome three additional faculty members: **Allen Tannenbaum, Rina Tannenbaum and Cara Stepp.***



Prof. Allen Tannenbaum joined Boston University on July 1, 2011 with a joint appointment in BME and ECE. From August 1999-June 2011, Dr. Tannenbaum was a faculty member in the School of ECE at the Georgia Institute of Technology, where he set up the

Laboratory for Computational Computer Vision. He has held faculty positions at the Weizmann Institute of Science, Ben-Gurion University of the Negev, the Technion (Israel Institute of Technology), and the University of Minnesota. Dr. Tannenbaum has over 230 publications and has authored or co-authored three research texts on systems and control. He has played a leading role in developing new mathematical techniques for various engineering problems in systems and control, vision, signal processing, and cryptography.



Prof Rina Tannenbaum will join the department in AY11/12 as a Research Professor, jointly appointed in Biomedical Engineering and the Mechanical Engineering Department, with affiliation with the Division of Materials Science and Engineering. Prof Tannenbaum

received her D.Sc. in Chemical Engineering and Catalysis from ETH, The Swiss Federal Institute of Technology in 1982, and comes to BU from her former position as a Professor of Materials Science and Engineering, Bioengineering and Biotechnology, and Paper Science and Engineering at the Georgia Institute of Technology. Her research interests include: Bio-nanostructures and hierarchical nanoplatforms for targeted drug delivery, nanofluids, self-assembly of nanostructures, nanocomposites from renewable resources, soft condensed matter and complex fluids, interfacial and surface phenomena, bio-based functional materials, biomaterials for bone implants, bioadhesion, hierarchical materials design, nucleation and growth of nanostructures, mechanical and thermal properties of nanocomposites, nanostructures for optoelectronic applications, inorganic reactions in viscous media, photonic materials and thin films, catalysis.



Assistant Professor Cara Stepp joined Boston University on July 1, 2011 as an Assistant Professor at Sargent College of Health and Rehabilitation, with an affiliated appointment in BME. Dr. Stepp received her PhD from MIT in Biomedical Engineering in 2009 through the Harvard-

MIT Division of Health Sciences and Technology and a S.M. in Electrical Engineering and Computer Science from MIT in 2008. Her dissertation focused on quantitative methods for characterization of vocal disorder through surface electromyography, biomechanical modeling, and kinematic measurements. Her research program will incorporate multimodal sensory feedback and virtual reality to engineering solutions for sensorimotor rehabilitation through multidisciplinary, clinically relevant research, and will act as a critical link between engineering and rehabilitation medicine.

Faculty Awards and Honors

Irving Bigio
Elected Fellow of the SPIE

James Collins
Elected to the National Academy of Engineering

Mark Grinstaff
Stevenson Biomaterials Lecturer,
Syracuse Biomaterials Institute, Syracuse University

Professeur Invité and Certificat sur Honneur,
Université de Bordeaux (Bordeaux II)

Xue Han
Alfred P. Sloan Research Fellowship

Kenneth Lutchen
President of American Institute for Medical and Biological Engineering (AIMBE) 2010-2013

Michael Smith
Award for Teaching Excellence,
Biomedical Engineering Department, 2011
(voted by BME Senior Class 2011)

Herb Voigt
President, International Federation for Medical and Biological Engineers (IFMBE)

Muhammad Zaman
Institute of Health and Biomedical Innovation,
Queensland University of Technology,
International Fellow 2011

Boston University College of Engineering Early Career Award for Research Excellence 2010

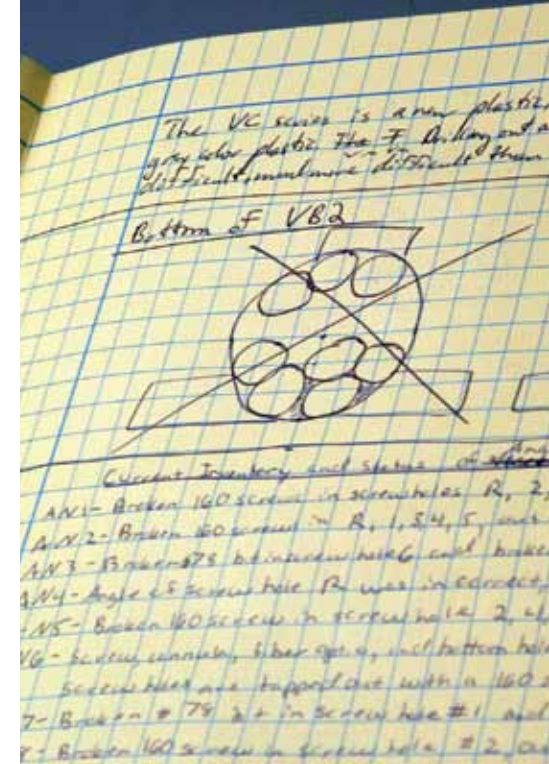
Japan-USA Frontiers of Engineering Symposium,
Tsukuba, June 2011

National Academy of Engineering Frontiers of Engineering Education, December 2010

Our Vision and Goals

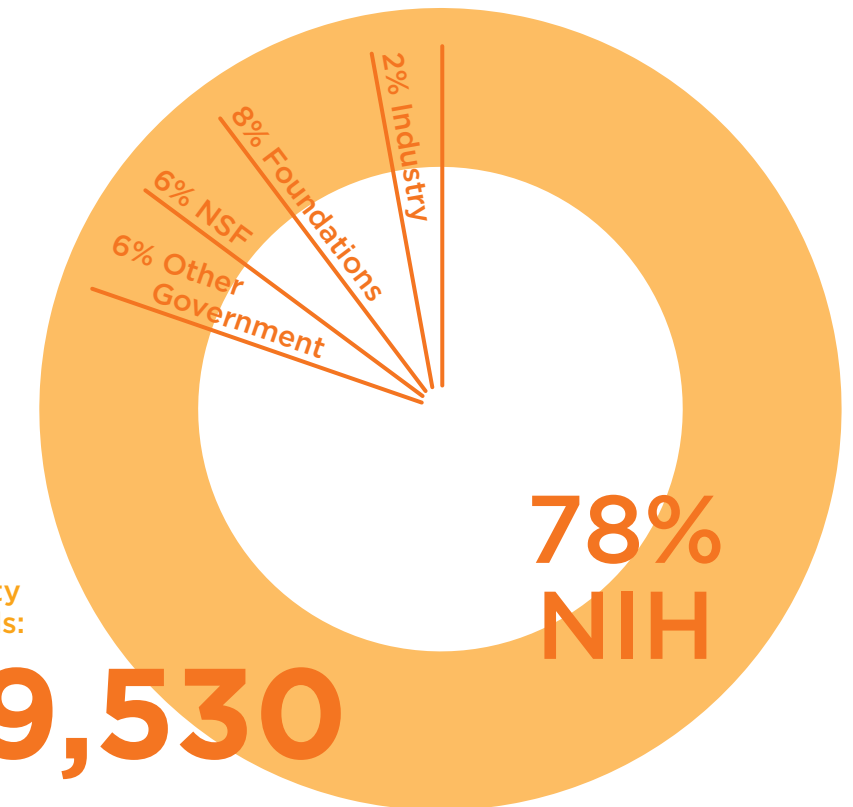
Our short-term goals focus on re-invigorating and leveraging our existing strengths. The BME department has made substantive recent investments in faculty and core facilities; we will leverage these strengths to ensure and sustain leadership status in BME, particularly in emerging cross-disciplinary areas consistent with University goals, eg.: biomaterials, micro/nano biosystems, synthetic and systems biological engineering, multiscale and multimodality imaging, and multiscale modeling and computation in biology and physiology. Through the Coulter Translational partnership program we have developed a translational research model that we will sustain which embraces all University components working at the interface of technology and medicine. We will also enhance contextual learning throughout the curriculum including core courses in the undergraduate program and cross-disciplinary approaches at the graduate level.

Building on the core strengths that BU BME has built as a result of the Whitaker Leadership Award, the next 5-10 years will focus on translating core research to address societal and healthcare needs, such as cancer detection, infectious diseases, and neurological disorders. We have identified several cross-disciplinary research areas that we believe should be prioritized. Over the next five to ten years, BME expects to continue its leadership position or emerge as a leader in the following areas: (1) Synthetic and Systems Biological Engineering; (2) Neuroengineering; (3) Cellular, subcellular & molecular bioengineering and (bio) nanotechnology; (4) Biomedical Optics; (5) Biomaterials, Biosurfaces, Tissue Engineering & Regenerative Medicine.



Faculty Research

BME GRANT FUNDING BY AGENCY



These funds were distributed by agency as indicated in the chart to the right.

Funding received by BME faculty from new and continuing awards:

\$24,259,530

Faculty Research Accomplishments

The Cell and Subcellular Bioengineering group had a very successful year. Professor **Evan Evans** continued a NIH R01 to study the dynamic strengths of leukocyte adhesion bonds. Professor **Micah Dembo** continued work on his NIH subcontracts from the University of Pennsylvania from NIH to study force microscopy of endothelial cells on novel peptide materials and the University of Rochester on Traction Force Microscopy. Professor **Joyce Wong** continued with her NIH R01 grant on vascular cell phenotype on physiologically relevant bioengineered substrata, her award from the Hartwell Foundation to develop tissue engineering solutions to pediatric vascular surgical repair and reconstruction, and a grant from the Advanced Energy Consortium via a subcontract from the University of Texas at Austin to study the use of magnetic, sub-pore scale metal oxide particles for enhanced magnetic resonance and optical characterization of rock pore structure and fluid composition in reservoir rock, and funding from NIH via a subcontract with Children's Hospital, Boston for her graduate student Patrick Allen

to study Tissue Vascularization. Dr. **Mark Grinstaff** continues to study bacteriophobic coatings for inhibition of pathogenic biofilms, and flexible, conformal, polymeric films for lung resection margins with funding from NIH. He also has funding from NSF to study synthesis and characterization of expansile polymeric nanoparticles for drug delivery; supramolecular ionic networks: synthesis, rheology, and modeling. He also has funding from the Advanced Energy Consortium through a subcontract from UT Austin to study downhole Li-Ion batteries based on network ionic liquids. Mark is also PI of one of an NIH Training Grants, Translational Research in Biomaterials, which supports 4 BME PhD students each year. Dr. **Joe Tien** continues his two NIH awards; an R01 award to study the synthesis and characterization of patterned microvascular networks, and an R21 to engineer functional lymphatic networks in vitro. He also is continuing his award from the Army Research Office to study the effect of interstitial pressure on epithelial invasion from human mammary ducts. Dr. **Ed Damiano** is continuing with his research and clinical trials of his closed loop control system for type

1 diabetes management funded from NIH, the Juvenile Diabetes Research Foundation International, Mass General Hospital and a Coulter Foundation Award through the BME Department's Coulter Foundation Translational Research Partnership. He is also PI of one of our two NIH Training Grants, Quantitative Biology and Physiology, which supported 10 BME PhD Students this year. Dr. **Michael Smith** is working on an NSF collaborative project with Cornell University to study molecular mechanics that dictate the mechanical behavior of an extracellular matrix fiber. Dr. **Catherine Klapperich** received new funding to study bacterial drug susceptibility identification by surface enhanced raman microscopy from NIH through Fraunhofer USA. She is also continuing her research on: a portable low power nucleic acid extraction module funded by NIH through the Program for Appropriate Technology in Health (PATH); a micro solid phase extraction module development for EO-NAT-HIV rapid point-of care diagnostic device for resource-limited settings, funded by an NIH contract through a subcontract from WWave 80 Biosciences; a microchip to detect influenza infection and type in nasopharyngeal swabs, funded by an NIH R01 grant, and disposable microfluidic devices for point-of-care diagnostics, funded by an NIH R21 grant. Dr. **Muhammad Zaman** received new funding from NIH via a subcontract from Harvard University to study the mechanics of

monolayer migration, and he continues work funded by NIH on the quantitative analysis of tumor cell migration in three dimensional matrices and theranostic molecular automata for specific cell elimination. His work in global health initiatives continued with funding from the Engineering and Physical Sciences Research Council, United Kingdom via a subcontract from the University of Manchester/MIMIT Making for a grant titled "Making an IMPACT" (Integrated Measuring Platform for Identifying and Testing Anti-Cancer Therapeutics on Pediatric Cancers). He also is developing superior screening technology for medicines quality control in low resource countries with funding from the Agency for International Development via the United States Pharmacopeial Convention.

In the area of Synthetic Biology and BioDynamics Dr. **Jim Collins**, in addition to the support he receives from the Howard Hughes Medical Institute (HHMI), received funding from grants from NIH, DOE, the Ellison Medical Foundation, and the Harvard Institute for Biologically Inspired Engineering. He is advancing design and application of synthetic genetic regulatory networks and using a systems identification approach for distilling out natural gene regulation networks. Dr. Collins work has received visibility ranging from the lay press to the most prestigious scientific

journals. Dr. **James Galagan** is working on an integrated platform for drug discovery for tuberculosis with funding from the Bill and Melinda Gates Foundation and with funding from NIH is using a systems biology approach in infectious disease research.

We have world leading researchers in biomedical optics. Dr. **Irving Bigio** received a new grant from CIMIT to study the validation of colon cancer screening by optical sensing of field effect in the rectal mucosa. He also continued with his two NIH R21 grants to use optical imaging to study fast neural activation patterns in brain tissue and to develop instrumentation for optical monitoring of apoptosis in unlabeled cell cultures. He is also studying enhanced intra-arterial delivery of chemotherapeutic drugs to the brain and optical imaging of chemotherapy for brain tumors through two subcontracts from Columbia University. Dr. **Jerome Mertz's** research synthesizes biomedical optics with neuroscience. He continues working on his three NIH grants, an R01 for the development of hybrid widefield imaging of out-of-focus background rejection and an R21 grant to develop photothermal microscopy for biomedical applications, and an R03 grant to study ultrasound-enabled two-photon FRET microscopy. He also was awarded a grant from BME's Coulter Translational Partnership Award to develop a novel CCD-based wide field sectioning endomicroscope, and he received new funding from the Karl Storz Company to develop new endoscopic devices. He has funding from NIH through a subcontract with MGH to fund two of his graduate students, Wan Wook Chang and Hao Wang.

In the pulmonary engineering group, Dr. **Ken Lutchen** continued his NIH R01 to study factors determining hyperresponsiveness in intact airways. Dean Lutchen is also PI of an award from the Massachusetts Life Sciences Center to support faculty growth in Bioengineering and Systems Biology and an award from the KERN Family Foundation for the innovation and entrepreneurial mindset program. Professor **Bela Suki** continued his 2 NIH R01 awards to study the effects of mechanical forces on lung injury and repair and the regulatory roles of variable mechanical stimuli in cell function. He also is continuing with his project funded by DOD through a subcontract at the BU Medical School to study acute lung injury. He also has funding support for two grad students and a postdoctoral associate via billing agreements from local area hospitals. Professor **Dimitrije Stamenovic** continued his work on a NIH R21 award to study cell orientation control of airway smooth muscle by contractile torque.

In the area of neuroengineering, Dr. **Jason Ritt** is working on active sensing in natural and robotic organisms funded by a Career Award at the Scientific Interface from the Burroughs Wellcome Fund. Dr. **Xue Han** is working on a NIH R00 award to study cross region neural computation subserving attention, and new faculty award from the DoD via the Photonics Center. She also recently was awarded a prestigious Sloan Fellowship that will start in FY12. Dr. **Carlo De Luca** has two NIH grants on harnessing motoneuron activity and wearable-sensor system for monitoring motor activity. Dr. **Chris Passaglia** continues a NSF CAREER award on deciphering the neural basis of visual behavior and has a NIH R01 grant to study the retinal physiology in glaucoma. Dr. **Lucia M. Vaina** is working on perception recovery of motion for visually guided behavior in humans with funding from a NIH R01 award. She also receives funding for her graduate student via a billing agreement with a

local hospital. In the Hearing Research Center Dr. **Steve Colburn** continued his projects funded from NIH to study bilateral cochlear implants in a subcontract through the Mass, Ear and Eye Institute, binaural hearing, and Core Center grant to fund research in the Hearing Research Center. Dr. **David Mountain's** project for ESME Workbench Innovations continues with funding from the DOD/Navy, and he continued a project on underwater hearing in whales and dolphins also funded by DOD/Navy. He is working on his project on active filtering in the cochlea funded by an NIH R01 award, a project on an acoustic mobility aid for the hearing impaired funded through BioMimetic Systems Inc., and an auditory clue based speech enhancement processing technology funded by the DOD/Air Force. He also continued a project funded by a Coulter Foundation Award through the BME Department's Coulter Foundation Translational Research Partnership studying accurate prediction of difficult intubation. Dr. **Kamal Sen** continued his NIH R01 award to study auditory cortical processing of communication sounds. Dr. **Barbara Shinn-Cunningham** has funding from DOD/Navy to study that managing acoustic communications in high-stress settings and focusing, sustaining, and switching attention. She has funding from NIH to study perception in complex, multi-source environments. She also is PI of a NRSA Fellowship from NIH to fund a BME student

In Biomolecular and Genomic Engineering, Professor **Amit Meller** is studying single molecule sequencing by nanopore induced proton emission (SN-SNIPE), and high throughput DNA sequencing using design polymers and nanopore arrays with funding from two NIH R01 awards. He has NSF funding for electronic recognition of gene regulatory proteins bound to DNA, and he continued work on his contract from Oxford Nanopore Technologies LTD to develop and evaluate composite solid state/protein nanopores for high throughput applications. He also started a new project to study single molecule sequencing with engineered nanopores with funding from the NIH via a subcontract from the Scripps Institute. Dr. **Dan Ehrlich** continued his research on high throughput BioMEMs DNA sequencing with funding from a NIH R01 award. He also finished a project working on developing a high-brightness light source for UV-VIS spectroscopic imaging with Energetiq Inc. Dr. **Sandor Vajda** is studying protein docking problems and molecular modeling with funded from multiple NIH awards. Dr. **Charles DeLisi** is studying computational methods for transcriptional mapping of eukaryotic genomes with funding from NSF, and a system for integration mining visualization and analysis with an award from NIH. Dr. **Simon Kasif** continued work on his project with Dr. **Martin Steffen** and NIH funding to study a new methodology for scientific collaboration and gene function determination called COMBEX. Drs. **Irina Smolina** and **Maxim Frank-Kamenetskii** are working on ultra-specific in situ detection of short sequences in human genomic DNA under non-denaturing conditions with funding through a NIH R21 award. Dr. **Natalia Broude** received a new grant to study RNA localization and movement in bacteria with funding from NSF.

Dr. **Sol Eisenberg** as the department chair oversees the Department's Coulter Foundation Translational Partnership Program to enhance the department's ability to move translational research from the lab to clinical settings.

Coulter Foundation Translational Partnership:

Funding was provided to the following projects for 2010-2011:

- Continuous Monitoring of Functional Activities and Movement Disorders in Individuals with Parkinson's Disease (Robert Wagenaar/Lucia M. Vaina)
- 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)
- Accurate Prediction of Difficult Intubation (Chris Connor/David Mountain)
- Chemotherapy-Eluting Strips for the Prevention of Locally Recurrent Lung Cancer (Mark Grinstaff/Yolonda Colson)
- Fluorescence Endomicroscopy with Out of Focus Rejection (Jerome Mertz/Satish Singh)
- Computed Tomography Contrast Agent for Diagnosis of Osteoarthritis (Mark Grinstaff/Brian Snyder/Ali Guermazi)
- Development and Preclinical Testing of a Closed-Loop Control System for Blood-Glucose Regulation in the ICU (Ed Damiano/Steven Russell)

In the Spring of 2011, the Coulter Oversight Committee met to select the next round of Coulter Awardees (start date of July 1, 2011). The new projects funded include:

- Improving Health Choices with Wireless Devices (Daniel Imler/David Mountain)
- Targeting IgE-Mediated Diseases (Lisa Ganley-Leal/Joyce Wong)
- Compound Multimodality Breast Biopsy Clip (B. Nicolas Bloch/Mark Grinstaff)
- PharmaCheck: A Robust, High-Throughput Microfluidic Platform to Detect Counterfeit and Substandard Pharmaceuticals (Muhammad Zaman/Christopher Gill)

Of these, the first four awards were ideas generated from clinicians at the BU Medical Center. The Coulter Translational Partnership team has increased efforts to promote awareness at the BU School of Medicine, Boston Medical Center, and other Boston-area hospitals.

This year marked the close of the fifth year of the department's initial Coulter Foundation Translational Partnership Award, which provided

\$4.58M over 5 years.

The Coulter Translational Partnership was renewed for another 5 years, commencing on July 1, 2011.



Department Administration

Chairman
Dr. Solomon R. Eisenberg

Associate Chair for Graduate Programs
Dr. Irving Bigio

Director of Graduate Admissions
Dr. Kamal Sen

Director
Matthew Barber

Associate Chair for Undergraduate Programs
Dr. H. Steven Colburn

Administrative Director for Research
Jen Marron

Committees

Executive	Graduate	Graduate Admissions	Undergraduate	Faculty Search	Sys Bio Search
S. Eisenberg (Chair)	I. Bigio (Chair)	K. Sen (Chair)	S. Colburn (Chair)	D. Mountain (Chair)	J. Collins (Chair)
I. Bigio	J. Galagan	M. Frank-Kamenetskii	A. Jackson	I. Bigio	C. Belta
S. Colburn	M. Grinstaff (spring)	X. Han	D. Mountain	B. Goldberg	D. Densmore
K. Sen	S. Kasif	J. Ritt	C. Passaglia	C. Klapperich	J. Galagan
M. Barber	C. Klapperich (fall)	D. Stamenovic	C. Smith	B. Shinn-Cunningham	D. Segre
J. Marron	J. Mertz (fall)	B. Suki	M. Smith		M. Zaman
	S. Vajda	J. Tien	H. Voigt		Seminar
		L. Vaina	M. Zaman		M. Zaman (Chair)
					B. Suki
					M. Smith

BME Visiting Committee

The BME Visiting Committee is comprised of BME chairs and professors from peer departments, as well as industry representatives (several from the IAB), 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.

VISITING COMMITTEE MEMBERS

Jim Burns, Ph.D. (Chair)
Senior Vice President and
Head of Drug and Biomaterial R&D
Genzyme Corporation

Ravi Bellamkonda, Ph.D.
Professor of Biomedical Engineering
Wallace H. Coulter Dept. of Biomedical Eng.
Georgia Institute of Technology

Art Coury, Ph.D.
Consultant

Steve Girouard, Ph.D. (Alumnus '89)
Senior Director, Emerging Technologies
Johnson & Johnson COSAT

Warren M. Grill, Ph.D. (Alumnus '89)
Addy Professor of Biomedical Engineering
Department of Biomedical Engineering
Duke University

Sheila Hemeon-Heyer, JD, RAC (Alumna '81)
Vice President, Global Regulatory Affairs
Boston Scientific Corporation

Patrick Loughlin, Ph.D. (Alumnus '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

Art Rosenthal, Ph.D.
Professor of Practice, BME
Coulter Project Director



BME Industrial Advisory Board

The BME Industrial Advisory Board (IAB) was formed in 1999 to more closely link the department with industry. The IAB currently meets approximately once a year in the fall, and provides advice and guidance regarding evolving industry needs, and how to best match student experiences to those needs to ensure that our students receive the skills and tools necessary to succeed in industry. The IAB has also been a valuable resource in the development of our design curriculum.

INDUSTRIAL ADVISORY BOARD MEMBERS

Arthur Rosenthal, Ph.D. (Chair)
Professor of Practice, BME
Coulter Project Director

Tracey Accardi
Vice President, Global Research and Development, Vascular
Therapies
Covidien

Mark A. Beck
Division VP& Deputy General Mgr.
Life Sciences—Corning Incorporated

Robert W. Clarke, Ph.D. (Alumnus '90)
Director, Biology and Preclinical Dev.
Pulmatrix, Inc.

James W. Burns, Ph.D.
Senior Vice President and
Head of Drug and Biomaterial R&D
Genzyme Corporation

John Gillespie, MS, MBA (Alumnus '85)
Vice President, R&D
Solace Therapeutics

Steven D. Girouard, Ph.D. (Alumnus '89)
Senior Director, Emerging Technologies
Johnson & Johnson, COSAT

David R. Jones
Director, Quality Assurance, Regulatory
Affairs and Phillips Business Excellence
Philips Home Healthcare Solutions

Bruce H. KenKnight, Ph.D.
Vice President, Research & Business Dev.
Boston Scientific CRM

Walt Olson, Ph.D.
Vice President, CRM Research (retired)
Medtronic, Inc.

Gregg A. Vandesteeg, Ph.D.
Vice President, Research & Development
3M Health Care

Faculty

The BME Department was led again this year by Professor Solomon Eisenberg as Chair. Professor Irving Bigio served as the Associate Chair for Graduate Programs, and Professor Steve Colburn served as the Associate Chair for Undergraduate Programs. Professor Kamal Sen was the Director of Graduate Admissions. The Biomedical Engineering Department added two primary faculty this year and one faculty member retired increasing our number to 34. Early in this fiscal year a long valued member of the BME department Prof Charles Cantor retired and transitioned to Professor Emeritus.

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, Co-Director, Center for BioDynamics
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, Biomathematics, Cornell University

Cellular and Subcellular 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 Genomics
bu.edu/bme/research/labs/csm
 Nano-microscale biomechanics; ultrasensitive force probes, extreme resolution optical techniques; material properties of cellular structure; role of structural forces in cell biochemistry.



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

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



JAMES GALAGAN
Associate Professor, Biomedical Engineering and Microbiology, BUSM, 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.



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



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.

RESEARCH FACULTY



KENNETH R. LUTCHEN
Professor, Biomedical Engineering,
Dean, College of Engineering
BS, Engineering Science, University of Virginia,
MS, PhD, Biomedical Engineering, Case Western
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 MERTZ
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/abs
 Auditory information processing; sensory biophysics;
 computer simulation; biomedical electronics; biomedical
 signal processing; environmental engineering.



CHRIS PASSAGLIA
Assistant Professor, Biomedical Engineering
PhD, Biomedical Engineering and Neuroscience,
Syracuse University; B.S., Biomedical Engineering,
University of Iowa
Visual Information Processing
bu.edu/bme/research/labs/vip
 Visual information processing and transmission; retinal
 physiology in normal and diseased states; computational
 models of neural coding, visual prostheses.



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 methods 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/mbl
 Molecular Biotechnology and Genomics.



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 ès Sciences &
Médecine (Neurologie), Human & Computational
Vision, Institut National Polytechnique 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/sb
 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.



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.



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



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.



DANIEL EHRLICH
Research Professor, Biomedical Engineering
BS Physics, PhD Optical Engineering,
University of Rochester, 1977
 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.



ODED GHITZA
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.



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.



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.



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.

PROFESSOR OF PRACTICE



ARTHUR ROSENTHAL
Professor of Practice in Translational Bioengineering
BA, Bacteriology and Chemistry, University of Connecticut, PhD, Biochemistry, University of Massachusetts
 Former Chief Scientific Officer and Senior Vice President, Boston Scientific Corp. Coulter Project Director, Chair, Industrial Advisory Board. Teaches BE467, since 2004

EMERITUS FACULTY



CHARLES R. CANTOR
Emeritus Professor, Biomedical Engineering & Pharmacology
AB, Chemistry, Columbia Univ, PhD, Biophysical Chemistry, U of California, Berkeley CSO Sequenom Inc
 Human genome analysis; molecular genetics; new biophysical tools and methodologies; genetic engineering.



TEMPLE F. SMITH
Emeritus Professor, Biomedical Engineering; BioMolecular Engineering Research Center
BS, Physics, Purdue Univ, PhD, Nuclear Physics, University of Colorado
 The syntactic and semantic structure of the genetic information in biomolecular sequences, structures, and their evolution.

AFFILIATED FACULTY

CHRISTOPHER CONNOR
 Assistant Professor, Primary Appointment Anesthesiology, BMC

THOMAS A. EINHORN
 Professor, Primary Appointment Orthopedic Surgery BUSM (Chair)

SHAYAMSUNDER ERRAMILI
 Professor, Primary Appointment Physics

BENNETT GOLDBERG
 Professor, Primary Appointment Physics

LEE GOLDSTEIN
 Professor, Primary Appointment Psychiatry BUSM

STEPHEN GROSSBERG
 Professor, Primary Appointment Wang Professor of Cognitive and Neural Systems, Founding Chair, Dept of Cognitive and Neural Systems

JAMES A. HAMILTON
 Professor, Primary Appointment Research Professor of Medicine, Physiology and Biophysics, BUSM

ALLYN E. HUBBARD
 Professor, Primary Appointment Electrical and Computer Engineering

W. CLEMENT KARL
 Professor, Primary Appointment Electrical and Computer Engineering

NANCY KOPELL
 Professor, Primary Appointment Mathematics and Statistics

ELISE F. MORGAN
 Assistant Professor, Primary Appointment Mechanical Engineering

HAMID NAWAB
 Professor, Primary Appointment Electrical and Computer Engineering

MATTHEW NUGENT
 Professor, Primary Appointment Departments of Biochemistry and Ophthalmology BUSM

TYRONE PORTER
 Assistant Professor, Primary Appointment Mechanical Engineering

MICHELE RUCCI
 Associate Professor
 Primary Appointment Psychology

DANIEL SEGRÉ
 Assistant Professor, Primary Appointment Bioinformatics & Biology

SATISH SINGH
 Assistant Professor, Primary Appointment BUSM

EUGENE STANLEY
 Professor, Primary Appointment Physics

MARTIN STEFFEN
 Assistant Professor, Primary Appointment Genetics and Genomics BUSM

MALVIN CARL TEICH
 Professor, Primary Appointment Electrical and Computer Engineering

SELIM UNLU
 Professor, Primary Appointment, Electrical and Computer Engineering

MATTHEW WACHOWIAK
 Assistant Professor, Primary Appointment Biology

BRANDON (YU) XIA
 Assistant Professor, Primary Appointment Chemistry

KATHERINE ZHANG
 Assistant Professor, Primary Appointment Mechanical Engineering

ADJUNCT FACULTY

HEATHER CLARK
 Adjunct Research Assistant Professor

- PhD University of Michigan, 1999
- Principle Member of the Technical Staff, Charles Stark Draper Lab
- Research Collaboration with BME Faculty and supervises BME Senior Project Students

FRANK GUARNIERI
 Adjunct Professor

- PhD New York University, 1996
- Chief Technology Officer, Solmap Pharmaceuticals Inc
- Course development and research collaboration with Prof Sandor Vajda

HERNAN JARA
 Adjunct Associate Professor

- PhD University of Illinois at Chicago, 1985
- Assoc. Prof. of Radiology and Director of Radiological Sciences Boston Medical Center
- Teaches BE515, Intro to Medical Imaging, 1998

JONATHAN ROSEN
 Adjunct Professor

- PhD Case Western Reserve University, 1975
- MBA Columbia University,
- Teaches EK131/132, Introduction to Engineering, Advisor for BME MEng Program

ALEXIS SAUER-BUDGE
 Adjunct Research Assistant Professor

- PhD Harvard University 2002
- Senior Scientist, Fraunhofer Center for Manufacturing Innovation.
- Research Collaboration with BME faculty and supervises students.

STELIOS SMIRNAKIS
 Adjunct Assistant Professor

- PhD Harvard University, 1997; M. D. Harvard Medical School, 1997
- Clinical Fellow in Neurointensive Care and Stroke Neurology at Mass General Hospital
- Supervises Students and collaborates on research in the Brain and Vision Research Lab.

ZHIPING WENG
 Adjunct Professor

- PhD Boston University, 1997
- Professor and Chair, Bioinformatics Department, University of Massachusetts Medical Center
- Research collaborations with BME faculty and supervises BME Graduate Students

JOHN WHITE
 Adjunct Professor

- PhD Johns Hopkins University, 1990
- Professor of Biomedical Engineering, University of Utah Research collaborations with BME faculty and supervises BME graduate students

VISITING FACULTY

ELNAZ BAUM-SNOW
 Visiting Researcher
 Postdoctoral Fellow, University of Connecticut,
 Advisor: Dembo

LAURIE GROVE
 Visiting Researcher
 Lecturer and Adjunct Professor of chemistry
 Wentworth Institute of Technology, Advisor: Vajda

ROBERT PITTS
 Visiting Researcher
 Consultant, Advisor: Vaina

SCOTT BEARDSLEY
 Visiting Assistant Professor
 Assistant Professor, Marquette University
 Advisor: Vaina

YIMEI MAO
 Visiting Researcher
 Associate Professor
 Shanghai, Jiao Tong University, Advisor: Han

KHAWAJA SIDDIQUE
 Visiting Researcher
 Clinical Research Fellow, Harvard University
 Advisor: Vaina

PAUL DIMILLA
 Visiting Researcher
 Senior Staff Engineer, Research & Development,
 Organogenesis Inc. Canton, MA, Advisor: Wong

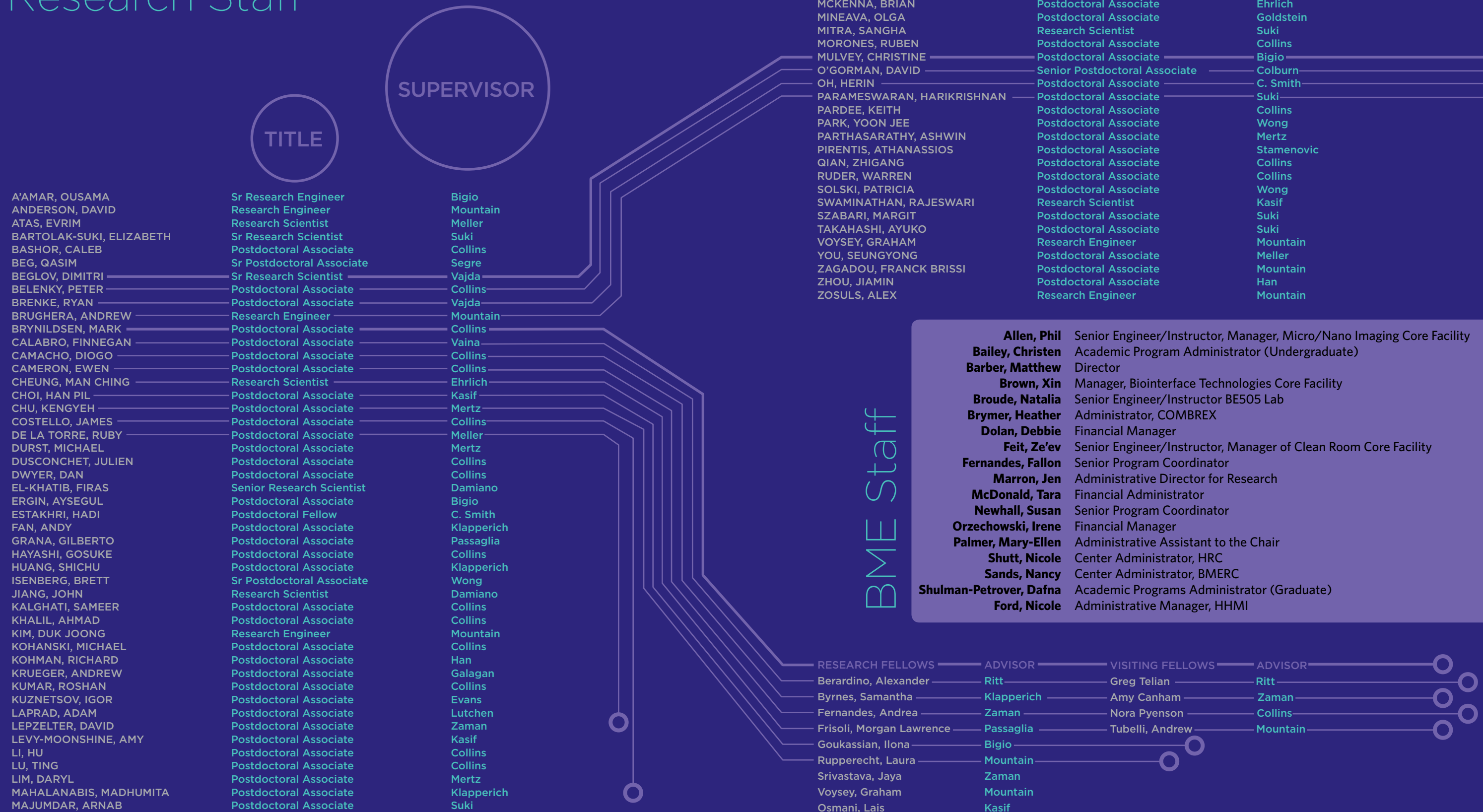
ROSSEN MIRACHEV
 Visiting Researcher
 Research Associate, Department of BCMP, Harvard
 Medical School, Advisor: Evans

TAO WEI
 Visiting Researcher
 Associate Professor Shanghai, Jiao Tong University
 Advisor: Han

NATHANIEL DURLACH
 Visiting Researcher
 Research Scientist, Massachusetts Institute
 of Technology, Advisor: Colburn

CELESTE NELSON
 Visiting Assistant Professor
 Assistant Professor Princeton University, Advisor: Tien

Research Staff



A'AMAR, OUSAMA	Sr Research Engineer	Bigio
ANDERSON, DAVID	Research Engineer	Mountain
ATAS, EVRIM	Research Scientist	Meller
BARTOLAK-SUKI, ELIZABETH	Sr Research Scientist	Suki
BASHOR, CALEB	Postdoctoral Associate	Collins
BEG, QASIM	Sr Postdoctoral Associate	Segre
BEGLOV, DIMITRI	Sr Research Scientist	Vajda
BELENKY, PETER	Postdoctoral Associate	Collins
BRENKE, RYAN	Postdoctoral Associate	Vajda
BRUGHERA, ANDREW	Research Engineer	Mountain
BRYNILDSEN, MARK	Postdoctoral Associate	Collins
CALABRO, FINNEGAN	Postdoctoral Associate	Vaina
CAMACHO, DIOGO	Postdoctoral Associate	Collins
CAMERON, EWEN	Postdoctoral Associate	Collins
CHEUNG, MAN CHING	Research Scientist	Ehrlich
CHOI, HAN PIL	Postdoctoral Associate	Kasif
CHU, KENGYEH	Postdoctoral Associate	Mertz
COSTELLO, JAMES	Postdoctoral Associate	Collins
DE LA TORRE, RUBY	Postdoctoral Associate	Meller
DURST, MICHAEL	Postdoctoral Associate	Mertz
DUSCONCHET, JULIEN	Postdoctoral Associate	Collins
DWYER, DAN	Postdoctoral Associate	Collins
EL-KHATIB, FIRAS	Senior Research Scientist	Damiano
ERGIN, AYSEGUL	Postdoctoral Associate	Bigio
ESTAKHRI, HADI	Postdoctoral Fellow	C. Smith
FAN, ANDY	Postdoctoral Associate	Klapperich
GRANA, GILBERTO	Postdoctoral Associate	Passaglia
HAYASHI, GOSUKE	Postdoctoral Associate	Collins
HUANG, SHICHU	Postdoctoral Associate	Klapperich
ISENBERG, BRETT	Sr Postdoctoral Associate	Wong
JIANG, JOHN	Research Scientist	Damiano
KALGHATI, SAMEER	Postdoctoral Associate	Collins
KHALIL, AHMAD	Postdoctoral Associate	Collins
KIM, DUK JOONG	Research Engineer	Mountain
KOHANSKI, MICHAEL	Postdoctoral Associate	Collins
KOHMAN, RICHARD	Postdoctoral Associate	Han
KRUEGER, ANDREW	Postdoctoral Associate	Galagan
KUMAR, ROSHAN	Postdoctoral Associate	Collins
KUZNETSOV, IGOR	Postdoctoral Associate	Evans
LAPRAD, ADAM	Postdoctoral Associate	Lutchen
LEPZELTER, DAVID	Postdoctoral Associate	Zaman
LEVY-MOONSHINE, AMY	Postdoctoral Associate	Kasif
LI, HU	Postdoctoral Associate	Collins
LU, TING	Postdoctoral Associate	Collins
LIM, DARYL	Postdoctoral Associate	Mertz
MAHALANABIS, MADHUMITA	Postdoctoral Associate	Klapperich
MAJUMDAR, ARNAB	Postdoctoral Associate	Suki

MAKSAD, ALMAZ	Research Engineer	Kasif
MAMONOV, ARTEM	Postdoctoral Associate	Vajda
MARTINEZ-GUTIERREZ, NURIA	Postdoctoral Associate	Suki
MCKENNA, BRIAN	Postdoctoral Associate	Ehrlich
MINEAVA, OLGA	Postdoctoral Associate	Goldstein
MITRA, SANGHA	Research Scientist	Suki
MORONES, RUBEN	Postdoctoral Associate	Collins
MULVEY, CHRISTINE	Postdoctoral Associate	Bigio
O'GORMAN, DAVID	Senior Postdoctoral Associate	Colburn
OH, HERIN	Postdoctoral Associate	C. Smith
PARAMESWARAN, HARIKRISHNAN	Postdoctoral Associate	Suki
PARDEE, KEITH	Postdoctoral Associate	Collins
PARK, YOON JEE	Postdoctoral Associate	Wong
PARTHASARATHY, ASHWIN	Postdoctoral Associate	Mertz
PIRENTIS, ATHANASSIOS	Postdoctoral Associate	Stamenovic
QIAN, ZHIGANG	Postdoctoral Associate	Collins
RUDER, WARREN	Postdoctoral Associate	Collins
SOLSKI, PATRICIA	Postdoctoral Associate	Wong
SWAMINATHAN, RAJESWARI	Research Scientist	Kasif
SZABARI, MARGIT	Postdoctoral Associate	Suki
TAKAHASHI, AYUKO	Postdoctoral Associate	Suki
VOYSEY, GRAHAM	Research Engineer	Mountain
YOU, SEUNGYONG	Postdoctoral Associate	Meller
ZAGADOU, FRANCK BRISSI	Postdoctoral Associate	Mountain
ZHOU, JIAMIN	Postdoctoral Associate	Han
ZOSULS, ALEX	Research Engineer	Mountain

Allen, Phil	Senior Engineer/Instructor, Manager, Micro/Nano Imaging Core Facility
Bailey, Christen	Academic Program Administrator (Undergraduate)
Barber, Matthew	Director
Brown, Xin	Manager, Biointerface Technologies Core Facility
Broude, Natalia	Senior Engineer/Instructor BE505 Lab
Brymer, Heather	Administrator, COMBEX
Dolan, Debbie	Financial Manager
Feit, Ze'ev	Senior Engineer/Instructor, Manager of Clean Room Core Facility
Fernandes, Fallon	Senior Program Coordinator
Marron, Jen	Administrative Director for Research
McDonald, Tara	Financial Administrator
Newhall, Susan	Senior Program Coordinator
Orzechowski, Irene	Financial Manager
Palmer, Mary-Ellen	Administrative Assistant to the Chair
Shutt, Nicole	Center Administrator, HRC
Sands, Nancy	Center Administrator, BMERC
Shulman-Petrover, Dafna	Academic Programs Administrator (Graduate)
Ford, Nicole	Administrative Manager, HHMI

RESEARCH FELLOWS	ADVISOR	VISITING FELLOWS	ADVISOR
Berardino, Alexander	Ritt	Greg Telian	Ritt
Byrnes, Samantha	Klapperich	Amy Canham	Zaman
Fernandes, Andrea	Zaman	Nora Pyenson	Collins
Frisoli, Morgan Lawrence	Passaglia	Tubelli, Andrew	Mountain
Goukassian, Ilona	Bigio		
Rupperecht, Laura	Mountain		
Srivastava, Jaya	Zaman		
Voysey, Graham	Mountain		
Osmani, Lais	Kasif		

Enrollment

474 **36%** **41%** **59%**

Number of **students** the BME Department enrolled this year

Percent of the **total enrollment** of the College of Engineering

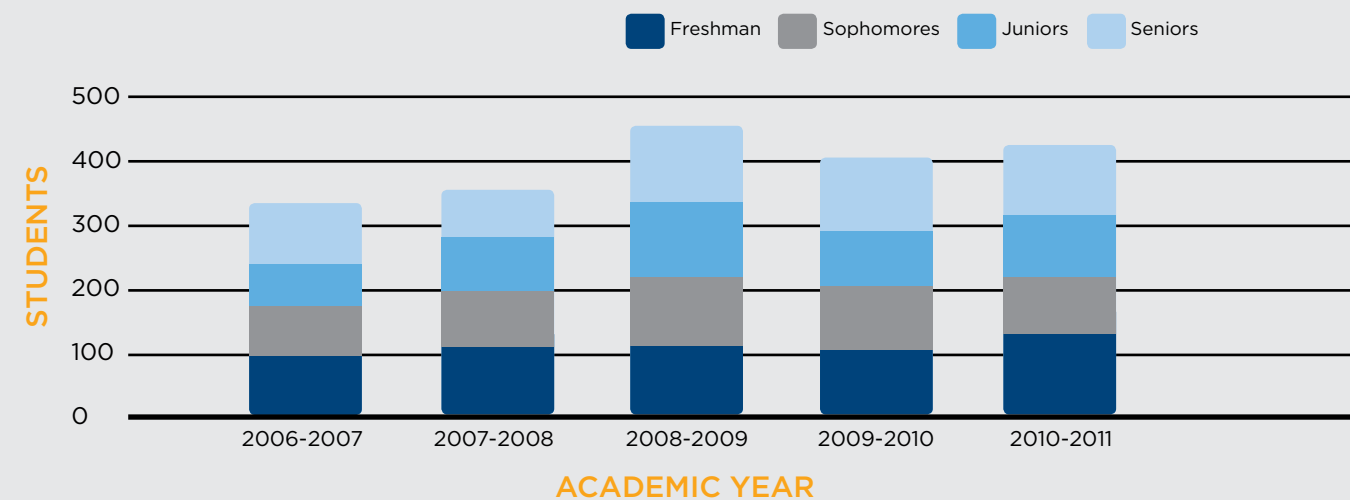
The percent of **female** students

The percent of **male** students

ENROLLMENT FOR AY 2011-2012

	Biomedical Engineering			College of Engineering		
	♀	♂	Total	♀	♂	Total
Freshmen	65	102	167	116	316	432
Sophomore	46	76	122	88	216	304
Junior	41	52	93	78	198	276
Senior	43	49	92	75	225	300
TOTAL	195	279	474	357	955	1312

BME ENROLLMENT HISTORY



Degrees Awarded

Bachelor of Science degrees awarded this academic year from the BME department

81 = 30%

of the BS degrees awarded by the college this academic year.

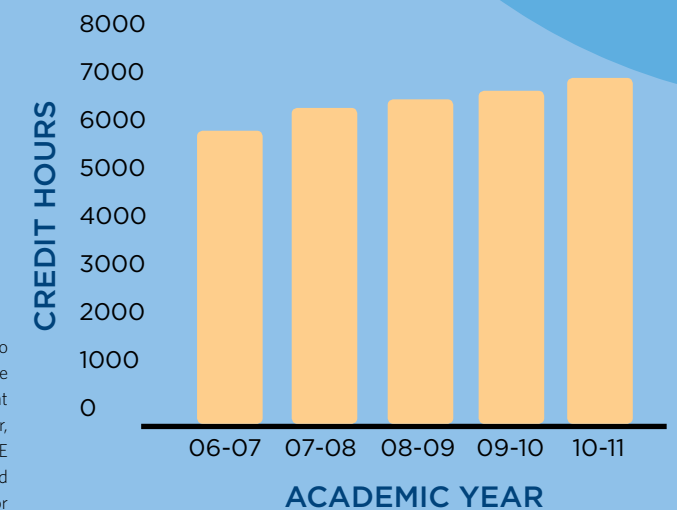
TOTAL BS DEGREES

ACADEMIC YEAR	BME	COLLEGE
2010-2011	81	272
2009-2010	97	247
2008-2009	96	257
2007-2008	78	269
2006-2007	57	252
2005-2006	67	268

Courses Offered

The BME department was responsible for teaching 62 courses during the AY 2010-11. These courses and their enrollments are listed in the table below. The student credit hours for these courses total 7,084. The trend in annual credit hours taught over the past ten years is illustrated right.

BME TEACHING HISTORY



UNDERGRADUATE COMMITTEE

The primary responsibility of the Department's Undergraduate Committee is to oversee the undergraduate curriculum in Biomedical Engineering. As such, the committee serves as the focal point for continued review and further development of the undergraduate programs. In his capacity as Undergraduate Associate Chair, Professor Colburn was the Chair of the BME Undergraduate Committee. The BME Undergraduate Committee also oversees ABET accreditation efforts, and supported Professor Voigt in preparing the accreditation self-study. As Accreditation Coordinator for Biomedical Engineering, Professor Voigt was responsible for coordinating the self-study process, preparing the self-study document, and overseeing preparations for the ABET accreditation visit in the Fall.

The BME Undergraduate Committee (UGC) undertook a number of new and continuing initiatives in AY 2010-11:

In addition to the ongoing assessment of each undergraduate course, including 500 level electives, the UGC made a concerted effort to assess four of our core courses - BE 209; BE 401; BE 491 and BE 492, to evaluate the evolution of each course from its original course requisition to the current course content, and to make suggestions for improvement to the individual course instructors.

Two new courses were approved by the UGC as BME electives: BE 503/703, Computational Methods in Biomedical Engineering and BE 514, Speech Signal Processing. A course title change for both BE 491 and BE 492 to "Biomedical Measurements I and II" was approved.

ME/MS 504, Polymers and Soft Materials, was approved as a cross-listed course with BE.

The UGC created sample paths for elective choices, called "clusters", to provide examples for the students to follow according to their specific interests. The clusters were suggested for the following areas: mechanical engineering, photonic-imaging, instrumentation, biochemistry/biotechnology, cell and tissue engineering, biomedical signal processing, systems physiology and signal processing with software engineering.

The Undergraduate Program Office continued the BME Industry Night tradition where students have the chance to interact with company representatives at a casual reception. This year it was held on March 30th.

The UGC revised BME Program Planning Sheets to reflect changes to prerequisites and the semesters in which some course are offered. When courses are offered both semesters, the program planning sheet reflects a possible order, usually the one that is newly available. It was suggested that there should be some bullets about studying abroad and an indication that EK 301 is required to be taken in the fall semester so that EK 307 can be taken abroad in the spring of the sophomore year.

Research Activities for Undergrads

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 **Engineering Scholars Program (ENG Scholars)** is a merit award given to students at the time of admission to Boston University. ENG 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, and automatic admission to a Boston University College of Engineering Master of Science 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.

The **Research Experience for Undergraduates (REU)** is a summer program funded by the National Science Foundation (NSF) in which students work on faculty-mentored research projects. Participants receive a weekly stipend and free on-campus housing.

The 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 \$2500 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.



Recipients of the Engineering Alumni Association Student Leader Award



Recipients of the Student Advisor Award

Student Awards

Adam M. Miller Memorial Award

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 **Michael Sutton**.

Anita Cuadrado Memorial Award

Presented to one or more undergraduates within the College of Engineering who best exemplify Anita's generous spirit, commitment to the College and the University, and dedication to helping undergraduates. This year the awards were presented to BME seniors **Kristen Lee** and **Stephanie Steichen**.

Earle & Mildred Bailey Memorial Award

Presented to a graduating senior in the College of Engineering to recognize outstanding scholarship and service to the College. This year the award was presented to **Mary Louise Fowler**.

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 was BME senior **Handi Wu**.

Ging S. Lee Community Service Award

In honor of Ging S. Ling, a 1970 graduate of the College, this award is presented to one or more seniors at the College of Engineering who have made outstanding contributions in the area of community service. **Nicholas Giordano** was one of the two recipients for 2011.

Student Advisor Award

Among the 19 ENG winners for outstanding assistance in advising this year, the following BME seniors were recognized: **Meredith Duffy**, **Mary Louise Fowler**, **Shannon Grover** and **Stephanie Steichen**.

Outstanding Senior Project Award

The team of **Alessandra Forcucci**, **Maureen Keenan** and **Alison Lo** were recognized with the Department's 2011 Outstanding Senior Design Project Award for their project "Tissue Diagnostic Instrument for Global Health Applications Based on Optical Microscopy" under the supervision of Professor Irving Bigio (BME).

Outstanding Dean's Host Awards

Two of the three award winners this year were BME seniors **Pamela Hyde** and **Samantha MacDougall**.



(from left to right): Chairman Sol Eisenberg, Pamela Hyde, Neha Dave, Samantha MacDougall, Dean Ken Lutchen

Student Organizations

Boston University Student Chapter of The Biomedical Engineering Society

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

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.

The Fifteenth Annual BME Day

BME Day at BU is a nationally recognized event when the Department of Biomedical Engineering opens its doors to the Boston University and local communities. This year's BME Day was on Tuesday, February 22nd. The program was sponsored by the College of Engineering, the Department of Biomedical Engineering, Alpha Eta Mu Beta (AEMB) biomedical engineering honor society and the Biomedical Engineering Society (BMES). BME Day aims to expose individuals outside of the discipline to biomedical engineering, as well as to allow undergraduates

BMES Officers AY 2010-11

President	Kristen Lee '11
Vice President	Paul Vermilion '11
Corresponding Secretary	John-Michael Sungur '11
Recording Secretary	Laura Blaha '11
Treasurer	Christopher Reyes '11
Social Chair	Steven Goetz '11

AEMB Officers AY 2010-11

President	Michael Sutton '11
Vice President	Stephanie Steichen '11
Secretary	Hani Mayassi '11
Treasurer	Melanie Zile '11

and graduates to explore career options in the field. This year's BME Day highlights included a banquet dinner and Alpha Eta Mu Beta induction ceremony followed by a presentation by Michael Eppihimer, PhD. Dr. Eppihimer is the Director of Preclinical Sciences at Boston Scientific. A Boston University alumnus, he received his BS in Biomedical Engineering in 1990. He obtained both his MS and PhD in Bioengineering at Penn State University, graduating in 1995. His primary research focuses on the areas of vascular biology and thrombosis.

The Senior Design Project Experience

REGISTERED COMPANIES AT SENIOR DESIGN PROJECT CONFERENCE



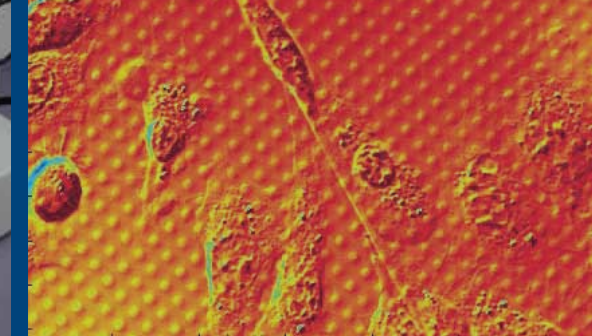
3M Health Care	St. Paul, MN
3Wave Optics, LLC	Boston, MA
ABIOMED, Inc.	Danvers, MA
Advanced Instruments, Inc.	Norwood, MA
Altran Solutions Corporation	Boston, MA
Angell Animal Medical Center	Boston, MA
ArQule, Inc.	Woburn, MA
Aspect Medical Systems, Inc.	Norwood, MA
AstraZeneca	Waltham, MA
Atrium Medical Corporation	Hudson, NH
BAMM Labs	Cambridge, MA
BD Medical	Waltham, MA
Beth Israel Deaconess Medical Center	Boston, MA
Bolton Chiropractic	Bolton, MA
Boston Medical Center	Boston, MA
Boston Scientific	Natick, MA
Boston University School of Medicine	Boston, MA

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 at right and the companies that registered for this year's conference are listed on the next page, followed by a listing of the project presentations.



Senior Design Project Conference proceedings cover



Brandeis University	Waltham, MA	Medical Education Technologies, Inc.	Sarasota, FL
Brigham and Women's Hospital	Boston, MA	Medtronic, Inc.	Danvers, MA
Broad Institute of MIT and Harvard	Cambridge, MA	National Instruments	Woburn, MA
Bruker Daltonics	Billerica, MA	NeuroMuscular Research Center	Boston, MA
Cambridge Polymer Group, Inc.	Boston, MA	Neuroptix Corporation	Acton, MA
Center for Global Health and Development	Boston, MA	NMT Medical, Inc.	Boston, MA
Center for Nanoscience and Nanobiotechnology	Boston, MA	Novartis AG	Cambridge, MA
Children's Hospital Boston	Boston, MA	Nuance Communications, Inc.	Burlington, MA
CIMIT	Boston, MA	NuOrtho Surgical, Inc.	Fall River, MA
Clark & Elbing LLP	Boston, MA	Oakwood Medical Investors	St. Louis, MO
Cleveland Clinic	Cleveland, OH	Observant LLC	Waltham, MA
Codman & Shurtleff, Inc.	Raynham, MA	Ocular Therapeutix, Inc.	Waltham, MA
Columbia University	New York, NY	OmniSonics Medical Technologies, Inc.	Wilmington, MA
Comprehensive Health Management, Inc.	Tampa, FL	Optasia Medical	Sudbury, MA
ConforMIS, Inc.	Burlington, MA	Orion Industries, Inc.	Ayer, MA
Corning, Inc.	Corning, NY	O'Shea Getz P.C.	Springfield, MA
Covidien	Mansfield, MA	Paraxel	Boston, MA
Davol, a Bard Company	Warwick, RI	Partners Healthcare	Boston, MA
Decision Resources	Burlington, MA	Perceptive Informatics	Waltham, MA
DEKA Research and Development Corporation	Manchester, NH	Personica Intelligence, Inc.	Framingham, MA
DeSys, Inc.	Boston, MA	Pfizer Inc.	Andover, MA
DePuy Spine, Inc.	Raynham, MA	Philips Healthcare	Andover, MA
DocBox, Inc.	Cambridge, MA	Philips Respironics	Cambridge, MA
Draeger Medical Systems, Inc.	Andover, MA	Praxis Advisors LLC	Wellesley, MA
Draper Laboratory	Cambridge, MA	Pulmatrix, Inc.	Lexington, MA
Elm Electrical, Inc.	Westfield, MA	Raytheon Company	Waltham, MA
Essex Orthopaedics and Optima Sports Medicine	Salem, NH	Respiratory Motion Inc.	Weston, MA
Ethicon	Somerville, NJ	Rogers Corporation	Rogers, CT
Fraunhofer Center for Manufacturing Innovation	Brookline, MA	Schepens' Eye Research Institute	Boston, MA
Fraunhofer USA	Brookline, MA	SensoMotoric Instruments, Inc.	Needham, MA
GE Healthcare	Lawrence, MA	Solace Therapeutics, Inc.	Framingham, MA
Gems Sensors - Controls	Plainville, CT	SOLX, Inc.	Medway, MA
Genzyme Corporation	Cambridge, MA	SonaMed Corporation	Waltham, MA
Glemser Technologies	Woburn, MA	Stryker Development	Cambridge, MA
Harvard Medical School	Boston, MA	SurgiQuest, Inc.	Orange, CT
Harvard-MIT Division of Health Sciences and Technology	Cambridge, MA	Teleflex Medical	Woburn, MA
Harvard School of Dental Medicine	Boston, MA	Teradyne, Inc.	North Reading, MA
Harvard University	Cambridge, MA	TransForm Pharmaceuticals, Inc.	Lexington, MA
Hologic, Inc.	Marlborough, MA	Tufts University	Medford, MA
Iandiorio, Teska and Coleman	Waltham, MA	University of Massachusetts	Boston, MA
Infoscitex	Waltham, MA	University of Texas at Austin	Austin, TX
InfraReDx, Inc.	Burlington, MA	University of Wisconsin-Madison	Madison, WI
Instrumentation Laboratory	Bedford, MA	UpToDate, Inc.	Waltham, MA
Integra LifeSciences	Burlington, MA	US Army Research Institute of Environmental Medicine	Natick, MA
iWorx Systems, Inc.	Dover, NH	VA Boston Healthcare System	Boston, MA
Massachusetts Eye and Ear Infirmary	Boston, MA	Vertex Pharmaceuticals	Cambridge, MA
Massachusetts General Hospital	Boston, MA	Veterans Affairs Boston Healthcare System	Boston, MA
Massachusetts Institute of Technology	Cambridge, MA	Worcester Polytechnic Institute	Worcester, MA
		Wyle, Inc.	Burlington, MA
		Wyss Institute for Biologically Inspired Engineering	Boston, MA
		Xceed Molecular	Wellesley, MA
		Xcellerex	Marlborough, MA

26th Annual Senior Project Conference

Lend Me a Hand: Interfacing to the Human Body

Session Chair: Prof. Muhammad Zaman

Continuous Monitoring of Functional Activities in the Home and Community Setting in Individuals with Parkinson's Disease
Mary Louise Fowler, Jonathan Sawicki

Development of a Lead-Based System for Respiratory Variation Monitoring
Haley Marks, Jarred Mondoñedo, Patrick Robinson

Frequency Response Characteristics of Motor Unit Activity
Adam Jendrisak, Hani Mayassi

Analysis of Injuries on Shoulder Girdle Kinematics: Data Processing and Representation Software
Brett McKenzie, Sneha Shah

Design and Development of a Drop-Foot Gait Mechanical Assistance Device
Christopher Reyes, John-Michael Sungur, Cynthia Warman

Sensory Substitution Vibrotactile Device
Louis Gao, Handi Wu



Small Things: Molecules, Cells and Things That Mimic Nature

Session Chair: Prof. Michael Smith

The Effects of Perturbations of Metabolites at the Folate, Methionine, Transulfuration and Dopamine (FMTD) Hub Associated with Schizophrenia
Chelsea Peragallo, Chian Yang

Cellular Traction Forces on Native Fibronectin Fibers
Victor Angel, Yuan Yin

Engineering of Implantable Bone Constructs from Early-Lineage Adult Stem Cells and Hydrogel Materials Using 3D Bio-Printing
Anne Bradlee, Jemma Taipan

Mesenchymal Stem Cell Matrix Remodeling on Patterned Substrates
Kristen Lee

Tissue Engineering of the Kidney: A Cell Culture Model of the Glomerular Capillary Wall
Ian Flaherty, Nicholas Fountoulakis

Design and Application of an Improved Method to Measure Vascular Permeability in Vascularized Biomaterials
Alexander Leung, Matthew Selbach

A Dynamic Tissue Phantom System for Studies of Drug Delivery
Samantha MacDougall, Brittany Phillips

A Picture Is Worth...: Imaging Technologies and Applications

Session Chair: Prof. David Mountain

Development of MRI Cardiac Protocols to Monitor Inflammation through Serial Imaging
Julia Kleven, Ura Nahar

X-ray Ventilator Synchronization Application
Kunal Bhatia, Sanchit Bhatia, Michael Sutton

Medical Imaging of Obesity
Paul Brown, Tess Forster, Jacqueline Prendergast

Accurate Imaging of Vessels: Removing Distortion to Provide True Representations of Microscopic Objects in Medical Ultrasound
Betty Chan, Caroline Smith

Developing a CBI System: Ultrasound to Rodent Motor-Cortex
Emmanuel Filandrianos, Javid Taghados

Transcranial Ultrasound Hemorrhage Detection
Nicholas Giordano, Mufaddal Jafferji, Charles Maneval

Design and Development of a Multi-Modality Dynamic Forcing and Imaging System to Probe the Reactivity of Isolated Airways
Stephanie Steichen, Hiba Younis



Wired: Hearing Research and Neuroscience

Session Chair: Prof. Steven Colburn

The Influence of Tinnitus on Human Sound Localization Abilities

Gozde Guckaya, Theresa Svrjcek

Sound Source Localizer

Pamela Hyde, Megan McGhee, Melanie Zile

Designing a Training System to Improve Attention Switching During Rapid Speech Sequences

Salwa Masud, Neesha Nathwani

Development and Implementation of a Light-Delivery Module for Neural Control in Mice Brains

Annie Cho, Christopher Hsieh, Paril Mehta

Multiple-Site Neural Recordings in Awake, Behaving Zebra Finches

Margaux Canevari, Steven Goetz

Shear Stress Induced Rapid Antibiotic Susceptibility Testing

Minori Shimizu, Joshua Villanueva

A Microfluidic Single-Cell Registration System Based on Dielectrophoresis

Harry Driscoll, Kevin Khoo, Alexander Nguyen

Integrated Device for Label-Free Infectious Disease Diagnosis

Nikka Ghalili, Shannon Grover



It Takes a Village: Global Health Technologies

Session Chair: Prof. Irving Bigio

Robust Immunoassay Diagnostic Platform for Resource-Limited Settings

Alexander Giannakos, Christopher Myers

Portable Nucleic Acid Extraction Device

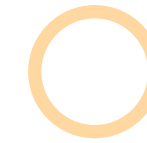
Laura Blaha, Ellen Reavey

A Robust Platform for Drug Quality Verification

Meredith Duffy, Nadia Ouhib, Paul Vermilion

Tissue Diagnostic Instrument for Global Health Applications Based on Optical Spectroscopy

Alessandra Forcucci, Molly Keenan, Alison Lo



Little Squirts: Microfluidic Devices and Biosensors

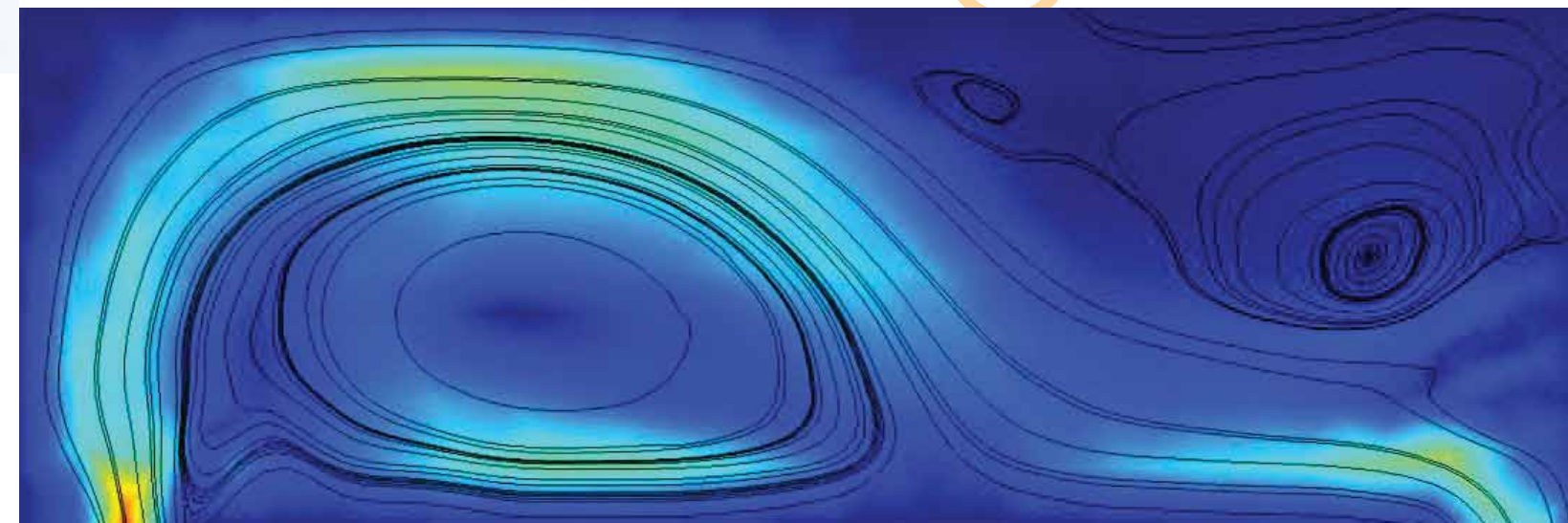
Session Chair: Prof. Sol Eisenberg

Microfluidic Evaporative Concentration Chip for Point-of-Care Viral Diagnostics

Brendan Carey, Joyce Chan, Tanvir Muktadir

Continuous-Flow, Real-Time PCR through a Microfluidic Chip

Nicholas Dunn, Mark Moosburner, Alexander Winters



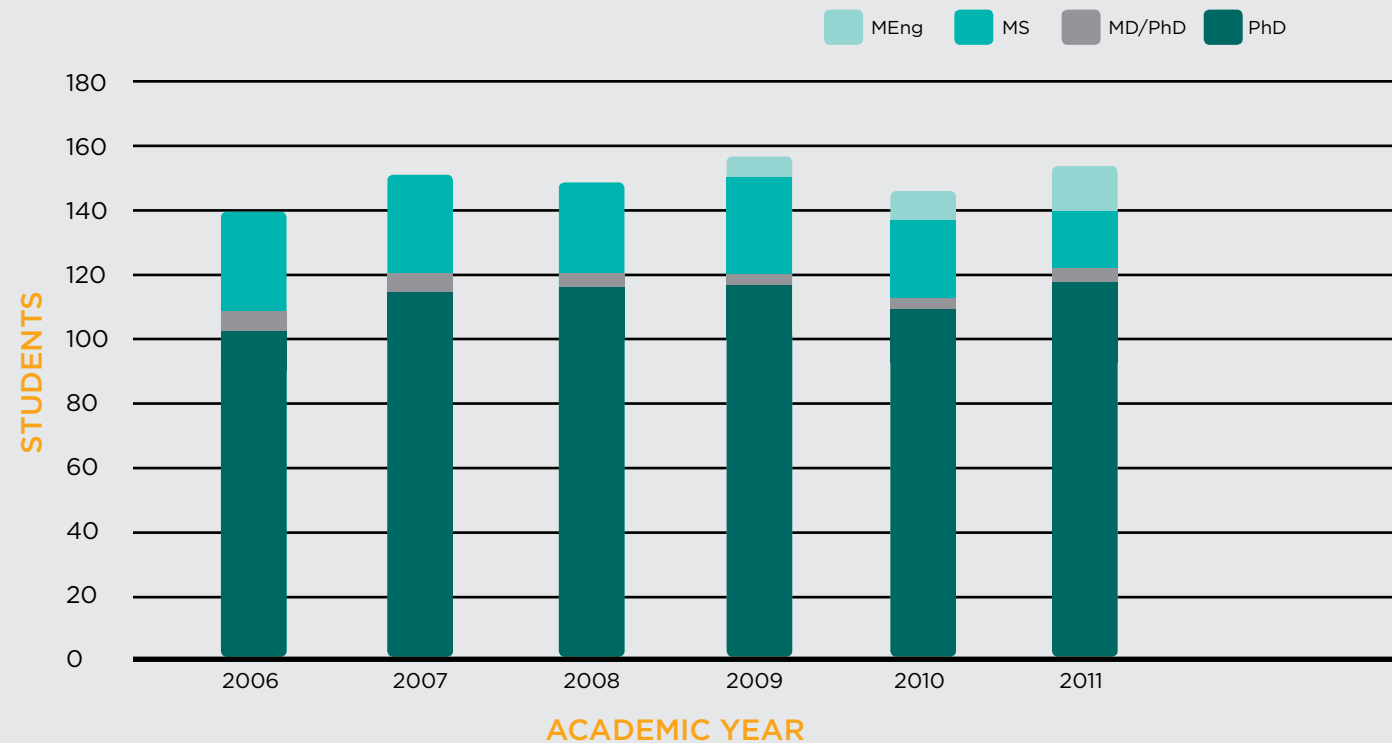
Enrollment

153 | Number of students currently enrolled in BME graduate programs

TABLE 1: GRADUATE STUDENT BREAKDOWN

	US		INTERNATIONAL		TOTAL
	♀	♂	♀	♂	
MS	2	12	1	1	16
MD/PhD	1	6	0	0	7
PhD	24	66	8	18	116
MEng	4	9	1	0	14
TOTAL	31	93	10	19	153

GRADUATE PROGRAM POPULATION



Graduate Student Funding

TABLE 2: GRAD STUDENT FUNDING SOURCES FOR AY 2010-11

	MEng	MS	PhD	Total
Research Assistants	1	7	72	80
NIH QBP Training Grant			10	10
NIH Biomaterials Training Grant			4	4
NSF Fellowship			1	1
NSERC Fellowship			1	1
NSF Research Training Grant (CBD)			3	3
NIH NRSA Fellowship			2	2
GAANN Fellowship			2	2
Clare Boothe Luce Fellowship			2	2
Biomolecular Pharmacology Training Grant			1	1
BUSM Fellowship			1	1
K-12 Fellowship			1	1
Internal Funding			16	16
Independent	13	9	2	24
MD/PhD Medical Program			4	4
Leave of Absence			1	1
TOTALS	14	16	123	153

Degrees Awarded

Emphasis has been placed on reviewing student status and encouraging steady progress through the program.

168

Number of PhD's awarded since 1991 in Biomedical Engineering, and the rate is increasing

23

Number of students awarded their PhD degrees this year (Table 4)

24

Number of students completed their MS degrees this year (Table 5)

13

Number of students completed their MEng degrees this year (Table 6)

DEGREES AWARDED

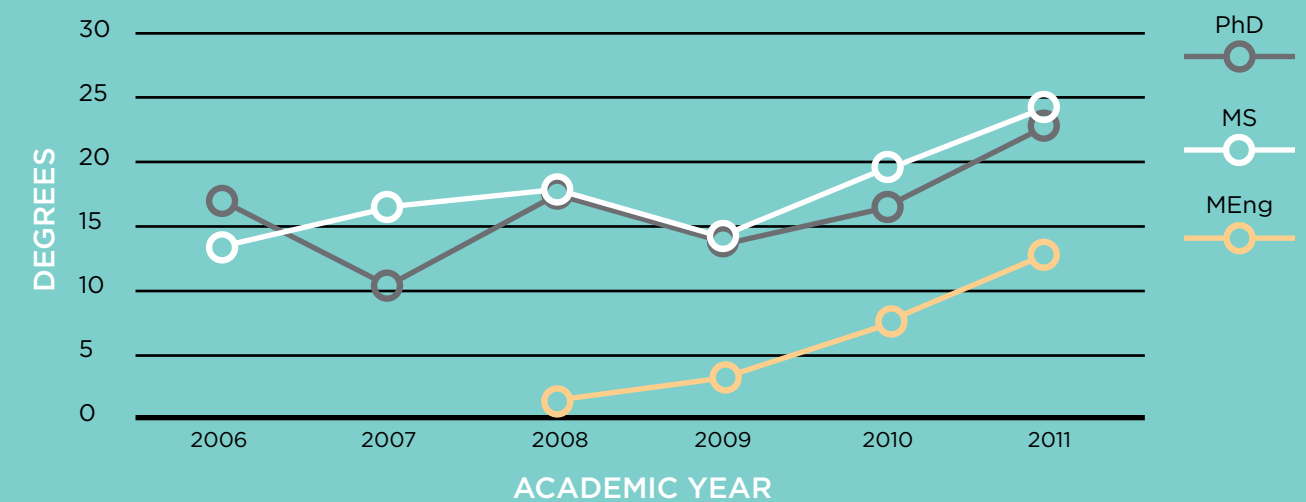


TABLE 4: AY 2010-2011 PHD DEGREES AWARDED

(Alphabetized by Student Last Name)

Name/Defense Date	Title & Committee
Prashant Bansal January 25, 2011	Contrast Enhanced Computed Tomographic Imaging of Articular Cartilage & Interrelationships with Biomechanical and Biomechanical Properties Committee Members: Prof. Mark Grinstaff, Advisor (BME) Prof. Elise Morgan (BU, ME), Prof. Bryan Snyder (CHB, Orthopedic Surgery), Prof. Ed Damiano (BME)
Kengyeh Chu January 25, 2011	Novel Nonlinear Techniques in Biomicroscopy Committee Members: Prof. Jerome Mertz, Advisor (BME) Prof. Steven Colburn (BME), Prof. Irving Bigio (BME), Prof. Selim Unlu (BME), Prof. Tom Bifano (BU, ME), Prof. Shyamsunder Erramilli (BU, Physics)
Todd Jennings May 22, 2011	An Inferior Colliculus Cell Model For Interaural Time Difference Analysis Committee Members: Prof. Steven Colburn, Advisor (BME) Prof. David Mountain, (BME), Prof. Kamal Sen, (BME), Prof. Ken E. Hancock (Eaton-Peabody Laboratories)
Xiaojuan Khoo January 25, 2011	PEGylated-Peptide Coatings for the Preparation of Infection Resistant Orthopedic Implant Surfaces Committee Members: Prof. Mark Grinstaff, Advisor (BME) Prof. Joyce Wong (BME), Prof. Bryan Synder (CHB, Orthopedic Surgery), Dr. Daniel Kenan (Duke University)
Michael Kohanski May 22, 2011	A Systems Biology Approach to Antibiotic-Mediates Cell Death Committee Members: Prof. Jim Collins, Advisor (BME) Prof. Timothy J. Gardner (BME), Prof. Daniel Serge (BME), Dr. Mark Klempner (BUSM, Microbiology). Prof. James Galagan (BME)
Adam LaPrad May 22, 2011	Uncovering the Principles Governing the Responsiveness of the Intact Airway System: The Role of the Dynamic Mechanical Environment of Breathing Committee Members: Prof. Kenneth R. Lutchen Advisor (BME), Prof. Béla Suki (BME), Prof. Thomas L. Szabo (BME). Prof. Jason H.T. Bates (University of Vermont College of Medicine)
Eric Larson January 25, 2011	Modeling Processing of Complex Sounds by Neurons at the Cortical Level Committee Members: Prof. Kamal Sen (BME) Prof. Barbara Shinn-Cunningham (BME), Prof. Steven Colburn (BME), Prof. Michael Hasselmo (BU, Psychology)
Pui Leng Leong January 25, 2011	Spatial Localization of Mechanical Stimuli and Cellular Responses During Bone Healing in Vivo Committee Members: Prof. Elise Morgan, Advisor (BU, ME/BME) Dr. Louis Gerstenfeld (BUSM, Orthopedic Surgery), Dr. Thomas Einhorn (BUSM, Orthopedics), Prof. Dimitrije Stamenovic (BME), Prof. Catherine Klapperich (BME)
Daryl Lim January 25, 2011	HiLo Microscopy with Speckle Illumination Committee Members: Prof. Jerome Mertz, Advisor (BME) Prof. Irving Bigio (BME), Prof. Selim Unlu (COE), Prof. Shyamsunder Erramilli (PHY) Prof. Peter So (ME, MIT)
Jesse Lock January 25, 2011	Modeling, Stability, and Control of Concentric Tube Robots Committee Members: Prof. Pierre DuPont, Advisor (ME/BME) Prof. Sean B. Anderson BU, ME), Prof. Andrew Jackson (BME), Prof. Ed Damiano (BME)
Ross Maddox May 22, 2011	Using and Ignoring Acoustic Feature Differences in Auditory Object Recognition Committee Members: Prof. Kamal Sen, Advisor (BME) Prof. Barbara G. Shinn-Cunningham (BME) Prof. Steven Colburn (BME), Prof. Timothy J. Gardner (BME)
Christine Mulvey January 25, 2011	Development of an Optical Method for Detection and Monitoring of Apoptosis in Cell Cultures Committee Members: Prof. Irving Bigio, Advisor (BME) Prof. Shyam Erramilli (BU, Physics) Prof. Satish Singh (BUSM, Gastroenterology) Prof. David Waxman (BU, Biology) Prof. Joyce Wong (BME)
Olga Sazonova May 22, 2011	Cell-Cell Interactions and ECM Presentation Mediate the Effects of Substrate Stiffness on Vascular Smooth Muscle Cell Behavior Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Matthew Nugent, Advisor (BME), Prof. Michael Smith (BME), Prof. Vickery Trinkaus Randall (BU, Biochemistry)
Hennady Shulha January 25, 2011	Bioinformatics Tools for the Elucidation of Genomic Properties Committee Members: Prof. Zhiping Weng, Advisor (BME) Dr. Schahram Akbarian (UMass Medical School, Bioinformatics & Computational Biology), Prof. Maxim Frank-Kamenetskii (BME), Prof. Martin Steffen (BME), Prof. Dima Kozakov (BME)
Sikoglu Elif Sikoglu January 25, 2011	Mechanisms and Neural Substrate Involved in Psychophysical Tasks Underlying Visually Guided Navigation in Humans Committee Members: Prof. Lucia Vaina, Advisor (BME) Prof. Scott Beardsley (Marquette University). Prof. Constance Royden, (College of the Holy Cross), Prof. Carlo DeLuca (BME), Prof. Maxim Frank-Kamenetskii(BME)

Joshua Thaden May 22, 2011	Examination of the Quorum-Sensing Transcriptional Regulatory Network in Pseudomonas Committee Members: Prof. Tim Gardner, Advisor (BME) Prof. Steve Lory (Harvard Medical School), Prof. Daniel Serge (BME), Prof. Jim Collins (BME), Prof. Natalia Broude (BME)
James Truslow May 22, 2011	Design and Analysis of Engineered Microvasculature via Computational Methods Committee Members: Prof. Joe. Tien, Advisor (BME) Prof. Ed. Damiano (BME), Prof. Katherine Zhang (BU, ME), Prof. Bela Suki (BME)
Rui Wan January 25, 2011	Investigation and Evaluation of Binaural Models Applied to Speech Perception in Complex Environments Committee Members: Prof. Steve Colburn, Advisor (BME) Prof. Barbara Shinn-Cunningham (BME), Prof. Nathaniel Durlach (BU, HRC), Prof. Hamid Nawab (BU, ECE)
Corin Williams January 25, 2011	Controlling Cell Shape, Organization, and Behavior: Towards the Development of Vascular Patches that Recapitulate Native Artery Structure and Function Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Michael Smith (BME), Prof. Bela Suki (BME), Prof. Kathleen Morgan (BU, Sargent College), Dr. Sitaram Emani (CHB, Cardiac Surgery)
Jia Xu May 22, 2011	Bioinformatics Analysis for Small RNA Deep Sequencing Data Committee Members: Prof. Zhiping Weng, Advisor (BME) Prof. William Theurkauf, (UMass Medical School, Program in Molecular Medicine), Prof. Yu Xix (BME), Prof. Zhenjun, Hu (BU, Bioinformatics), Prof. Simon Kasif (BME)
Boyan Yordanov January 25, 2011	A Formal Framework For Analysis and Design of Synthetic Gene Networks Committee Members: Prof. Calin Belta (BU, ME) Research Advisor, Prof. Jim Collins, Academic Advisor (BME) Prof. John Baillieul (BU, ME), Prof. Daniel Segre (BME)
Xiaohan Zheng January 25, 2011	Neural Modeling of the Dorsal Cochlear Nucleus: Notch Noise Responses and Response Maps With and Without the Parallel Fiber System Committee Members: Prof. Herbert Voigt, Advisor (BME) Prof. Steve Colburn (BME), Prof. Shin-Cunningham (BME), Prof. Kamal Sen (BME)
Kimberly Zubris May 22, 2011	Polymeric Nanoparticles for the Intracellular Delivery of Paclitaxel in Lung and Breast Cancers Committee Members: Prof. Mark W. Grinstaff, Advisor (BME) Prof. Joyce Y. Wong (BME), Prof. Tyrone Porter (BU, ME), Dr. Yolonda L. Colson (Harvard Medical School, Thoracic Surgery)

TABLE 5: AY 2010-2011 MS DEGREES AWARDED

(Alphabetized by Student Last Name)

Name/Defense Date	Title & Committee
Kyle Allison May 22, 2011 <small>(prospectus in lieu of thesis)</small>	Metabolite Mediated Eradication of Bacterial Persisters by Aminoglycosides Committee Members: James Collins, PhD, Advisor Timothy Lu, PhD, Daniel Segre, PhD, Muhammad Zaman, PhD
Aaron Blanke January 25, 2011	Advancing Experimental Methodologies in Neural and Behavioral Discrimination Tasks in the Zebra Finch Committee Members: Prof. Kamal Sen, Advisor (BME) Prof. Steven Colburn (BME), Prof. Nancy Kopell, (COE, Mathematics)
David Blum May 22, 2011	Cell-Cell Interactions and ECM Presentation Mediate the Effects of Substrate Stiffness on Vascular Smooth Muscle Cell Behavior Committee Members: Prof. David Mountain, Advisor (BME) Prof. Steven Colburn (BME), Eric Schwartz (BU, CNS Department)
Jared Callura May 22, 2011 <small>(prospectus in lieu of thesis)</small>	Synthetic Switchboard, Programmable Death Switch, and Advanced Microbiology Experiments Based on Synthetic Riboregulation Committee Members: Prof. James Collins Advisor (BME) Dr. Timothy Lu (MIT, EECS), Prof. Daniel Segrè (Biology/BME), Prof. Martin Steffen (BME, BUSM)
Lisa Campana September 25, 2010 <small>(prospectus in lieu of thesis)</small>	Advancing Experimental Methodologies in Neural and Behavioral Discrimination Tasks in the Zebra Finch Committee Members: Prof. Kamal Sen, Advisor (BME) Prof. Steven Colburn (BME), Prof. Nancy Kopell, (COE, Mathematics)
Jessie Chang September 25, 2010	Characterization and Toxicity Assessment of PEGylated Iron Oxide Nanoparticles Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Michael Smith (BME), Dr. Elizabeth Bartolak-Suki (BME)
Cara Farrell September 25, 2010	Impact of Osmotic Stress on Hydration, Intracellular Ca²⁺ release, and F-Actin Assembly in Human Neutrophils Committee Members: Prof Evan Evans, Advisor, (BME) Prof. Joyce Wong (BME), Dr. Rossen Mirchev (Harvard MS)

Mary Goldsmith September 25, 2010	A Robotic Assessment of Lower Extremity Motor Adaptation Committee Members: Prof. Paolo Bonato (Harvard Medical School) Research Adviser, Dr. Lucia Vaina (BME) Academic Advisor Prof. James Collins (BME)
Dewi Harjanto May 22, 2011 (prospectus in lieu of thesis)	Collective Tumor Cell Migration in Three-Dimensional Environments Committee Members: Prof Muhammad Zaman Advisor (BME) Prof. Bela Suki (BME), Prof Michael Smith (BME), Prof Roger Kamm (MIT ME/BE)
Lauren Hayward May 22, 2011 (prospectus in lieu of thesis)	Mechanical and Genetic influences on Skeletal Healing Committee Members: Prof. Elise Morgan Advisor (BME/ME) Prof. Solomon Eisenberg (BME), Prof. Bela Suki (BME), Prof. Louis Gerstenfeld (Orthopedic Surgery BUSM)
Surbhi Kumari September 25, 2010 (prospectus in lieu of thesis)	The Effects of Aging on Speech Intelligibility with Speech Maskers: Effects of Reverberation, Pitch, and Spatial Separation Committee Members: Prof. Steven Colburn, Advisor (BME) Prof. Shinn-Cunningham (BME), Prof. Clarke Cox (BUSM, Otolaryngology)
Tatiana Laivins May 22, 2011	A Pulsatile Bioreactor for Pediatric Cardiovascular Tissue Culture Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Ed Damiano (BME), Dr. Brett Isenberg (BME, Postdoctoral Fellow), Dr. Elizabeth Bartolak-Suki (BME)
Henry Lee May 22, 2011 (prospectus in lieu of thesis)	Bacterial charity work leads to population-wide resistance Committee Members: Prof James Collins Advisor (BME) Dr. Michael Molla (Joslin Diabetes Center), Prof. Martin Steffen (BUSM/BME), Prof. Muhammad Zaman (BME)
Jianing Li January 25, 2011	The Effects of Aging on Speech Intelligibility with Speech Maskers: Effects of Reverberation, Pitch, and Spatial Separation Committee Members: Prof. Steven Colburn, Advisor (BME) Prof. Shinn-Cunningham (BME), Prof. Clarke Cox (BUSM, Otolaryngology)
Adam Luce September 25, 2010	The Fabrication and Characterization of Novel Monodisperse Microbubbles for Molecular Imaging and Targeted Drug Delivery Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Mario Cabodi (BME), Prof. Katherine Klapperich (ME)
Stacey Markovic September 25, 2010	The Accuracy of a Small, Wireless Activity Monitor in Detecting Functional Activities and its Movement Patterns Using Accelerometer Technology Committee Members: Prof. Lucia M. Vaina, (BME/Advisor) Prof. Thomas Little (ECE), Prof. Robert Wagenaar (SAR)
Lauren Ouellette January 25, 2011	Characterizing the Pressure Behavior of Intraaortic Balloon Catheters to Optimize System Dynamics and Patient Care Committee Members: Prof. Bela Suki, Advisor (BME) Pat Hanlon, Sr. Marketing and Product Manager, Teleflex, Prof. David Mountain (BME).
Robert Saphirstein January 25, 2011 (prospectus in lieu of thesis)	Investigating the Role of Adhesion Plaques in Regulating Vascular Tissue Stiffness Committee Members: Prof. Kathleen Morgan Research Advisor (SAR), Prof. Joyce Wong, Academic Advisor (BME) Prof. Bela Suki (BME), Prof. Michael Smith (BME)
Jared Smith January 25, 2011	Characterization and Toxicity Assessment of PEGylated Iron Oxide Nanoparticles Committee Members: Prof. Joyce Wong, Advisor (BME) Prof. Michael Smith (BME), Dr. Elizabeth Bartolak-Suki (BME).
Lenny Varghese January 25, 2011 (prospectus in lieu of thesis)	Behavioral and Neural Correlates of Working Memory and Attentional Specificity for Artifact Auditory Stimuli Committee Members: Prof Barbara Shinn-Cunningham Advisor (BME) Prof. H Steven Colburn (BME), Prof. David Somers (Psych), Prof Nancy Kopell (Math/BME)
Rui Wan September 25, 2010 (prospectus in lieu of thesis)	Characterizing the Pressure Behavior of Intraaortic Balloon Catheters to Optimize System Dynamics and Patient Care Committee Members: Prof. Bela Suki, Advisor (BME) Dr. Pat Hanlon, Sr. Marketing and Product Manager, Teleflex, Prof. David Mountain (BME).
Dali Wang January 25, 2011	Influences of Auditory Object Formation on Phonemic Restoration Committee Members: Prof Barbara Shinn-Cunningham Advisor (CNS/BME) Prof. H. Steven Colburn (BME), Prof. Gerald Kidd (SAR), Prof. Kamal Sen (BME)
Ho Ki Keith Wong January 25, 2011 (prospectus in lieu of thesis)	Effect of Cardiac Interstitial Mechanical Properties on Functional Vascularization Committee Members: Prof Joe Tien, Advisor (BME) Prof. Bela Suki (BME), Prof Matthew Nugent (BUSM/BME), Prof Kevin Parker (Harvard SEAS)
Jia Xu January 25, 2011 (prospectus in lieu of thesis)	Bioinformatics Analysis for Small RNA Deep Sequencing Data Committee Members: Prof. Zhiping Weng, Advisor (BME) Prof. William Theurkauf, (UMass Medical School, Program in Molecular Medicine), Prof. Yu Xix (BME), Prof. Zhenjun, Hu (BU, Bioinformatics), Prof. Simon Kasif (BME).



TABLE 6: MENG DEGREES AWARDED

(Alphabetized by Student Last Name)

Carlson, Lindsay Elizabeth	May22, 2011	Lewis, Casey Scott	May22, 2011
Dadgar, Kiani Maisam	May22, 2011	Narain, Abhinav	May22, 2011
Dierksen, Gregory Andrew	May22, 2011	Ou, Yuanyuan	May22, 2011
Ghodous, Majid	September 25, 2010	Saad, Caroline Elizabeth	May22, 2011
Hage, Erik Bernt	January 25, 2011	Truesdell, Samuel Spencer	May22, 2011
Hull, Robert	January 25, 2011	White, Margaret Maureen	May22, 2011
Kaiser, Jonathan Robert	May22, 2011		

Recruitment

Recruitment of outstanding students is one of the Admissions Committee's and Graduate Committee's most crucial and challenging tasks. In AY 2010-11, the department's goal was to recruit a class of 25-30 new Ph.D. students, while maintaining the quality of students matriculating. A second goal was to recruit a small group of MS students, also of outstanding quality. The third goal was to recruit and sustain enrollment in the MEng program. Graduate recruitment has become more challenging over the last few years due to the explosive growth of BME graduate programs in the United States. Nonetheless, we were able to meet our goals.

Recruiting efforts included: updating and continual development of the website, and the Annual Graduate Recruitment visits. This year three recruitment week-ends were held, 58 students visited; 20 accepted our offer of admission for an overall yield of 35%.

In academic year 2010/2011 the BME program received 552 applications, of which 186 were admitted, and 47 students matriculated (Table 7). For fall 2011 we received 615 applications, 128 were admitted and we expect 40 to matriculate in the Fall 2011 (Table 8).

During our recruiting efforts this year offers of financial aid were made to 95 students, including fellowships, research assistantships and ½ tuition scholarships. 40 students accepted our offer of admission (27 PhD, 2 MS and 11 MEng) to form the entering class for fall 2011. As has been typical over the last few years, the BU BME program has competed directly with the top programs in Biomedical Engineering in recruiting the best students.

Of the 40 expected matriculating students in fall 2011, 27 are fully funded (all PhDs), and two students will receive a

½ Tuition Scholarship. The new students come from several strong programs, including California Institute of Technology, Cornell University, Drexel University, Georgia Institute of Technology, Johns Hopkins University, MIT, Northeastern University, Rensselaer Polytechnic Institute, Rowan University, Tufts University, University of California at Berkeley, University of California at San Diego, University of California at Santa Barbara, University of Hartford, University of Iowa, University of Utah, Washington University at St. Louis, Worcester Polytechnic University, and our own Boston University. Ten entering Ph.D. students attended international universities: Beijing University, National Taiwan University, Technical University Munchen, Tsinghua University, Universite Laval, and Zhejiang University. The entering PhD class has a mean undergraduate GPA of 3.7 (US students only).

Recruitment of underrepresented minorities remained a challenge and a priority in AY 2010-11. Despite aggressive efforts in advertising and recruiting, only a small number of applications from underrepresented minorities were received.

TABLE 7: ADMISSION RESULTS FOR AY 2010-2011

		US		INTERNATIONAL		TOTAL
		♂	♀	♂	♀	
Applicants	MEng	35	34	11	11	91
	MS	44	20	29	15	108
	PhD	157	68	76	52	353
	Total	236	122	116	78	552
Admissions	MEng	28	26	6	5	65
	MS	14	6	3	6	29
	PhD	47	24	13	8	92
	Total	89	56	22	19	186
Matriculations	MEng	7	3	1	0	11
	MS	4	1	0	1	6
	PhD	16	6	5	3	30
	Total	27	10	6	4	47

TABLE 8: ADMISSION PROJECTIONS FOR FALL 2011

		US		INTERNATIONAL		TOTAL
		♂	♀	♂	♀	
Applicants	MEng	21	21	22	13	77
	MS	33	16	26	33	108
	PhD	167	88	96	79	430
	Total	221	125	144	125	615
Admissions	MEng	11	13	6	2	32
	MS	2	0	0	1	3
	PhD	42	28	8	15	93
	Total	55	41	14	18	128
Matriculations	MEng	5	3	3	0	11
	MS	1	0	0	1	2
	PhD	12	5	6	4	27
	Total	18	8	9	5	40



Ongoing and Future Initiatives

Improving outreach to minority applicants:

In January 2011 Dean Lutchen appointed Dr. Gretchen Fougere as Assistant Dean of Outreach and Diversity. She is working to develop programs that strengthen and broaden the pipeline of students pursuing engineering degrees. The role also addresses the College's commitment to Diversity at all levels, including the graduate programs. Dr. Fougere has begun recruiting under-represented minorities into the Engineering graduate programs. She traveled with minority faculty member, Dr. Tyrone Porter, and recruited engineers at the National Society of Black Engineers graduate fair. Over 8,000 black engineers attended the March annual meeting. Together, they reached over 30 minority students interested in graduate education. These engineers were predominantly interested in the Biomedical Engineering PhD program. Dr. Porter is a strong proponent of diversity initiatives, and more importantly, conducts interdisciplinary research in the applications of acoustics to medical problems such as drug delivery and cancer treatment. Dr. Porter is a QBP faculty mentor and has already connected several qualified minority candidates to appropriate researchers in their areas of interest for follow-up conversations and visits. In February, Dr. Fougere spoke to 70 Morehouse College students interested in pursuing doctorates in STEM fields. Dr. Fougere personally greeted the Dr. John H. Hopps, Jr. Research Scholars and gave introductory remarks during their visit to the Boston-area.



The College of Engineering has had a presence at other graduate recruiting events such as SACNAS (Advancing Hispanic/Chicanos & Native Americans in Science) and ABRCMS (Annual Biomedical Research Conference for Minority Students), thanks to a joint effort with Dr. Tom Gilmore, director of the Undergraduate Research Opportunity Programs (UROP) office. Historically, Dr. Gilmore and engineering staff have attended these conferences, and collected and shared the contact information of prospective students with the Graduate Programs Office in the College of Engineering. Dr. Fougere will partner with Dr. Gilmore to provide the resources and materials to continue our presence at these conferences.

Oral Qualifying Examination: The Graduate Committee is continuing to review the Oral Qualifying Examination process for future changes to improve efficacy and efficiency.

The graduate curriculum: The graduate committee will continue to evaluate the core courses: BE505/605 and BE 706, and look for opportunities for improvement. The Committee will also conduct annual reviews of other elements of the graduate curriculum and make recommendations to the faculty for improvements and enhancements. Two years ago the department eliminated the requirement for thematic electives and expanded the available selection of electives to include all BME graduate level courses. The list of elective courses has been expanding significantly.

Improving the web page: We recognize that prospective students acquire much of their information from the departmental web site; we considered it a priority to update and improve the site. Improvements to the web site included better organization of financial aid information, as well as updating of pages describing faculty research. Information regarding graduate program requirements and milestone deadlines for students have been clarified and made consistent with the Graduate Student Handbook, also available online. Improving the online experience is a work in progress, which will continue.



Graduate Student Accomplishments

Graduate students made presentations this year at a number of national conferences. These presentations are chronicled below. (Table 9).

Seven BME graduate students received special recognition this year. Mr. George Daaboul was awarded the Center for Integration of Medicine and Innovative Technology (CIMIT) 2011 CIMIT Prize in Primary Healthcare, the designation comes with \$150,000 to advance Daaboul's research project, a diagnostic platform that can perform a multi-pathogen test that's rapid and easy enough to be used at the point of care. The Center for Integration of Medicine and Innovative Technology

(CIMIT) also selected three BME doctoral students for this year's Applied Healthcare Engineering Fellowship awards; Elif Cevik, Grace Wu and Margo Monroe. Mr. Ryan Carey and Ms. Dorea Ruggles received prestigious NIH individual pre-doctoral Ruth L. Kirschstein National Research Service Awards (NRSA). Mr. Oliver Bates received a Natural Sciences and Engineering Research Council of Canada (NSERC) Alexander Graham Bell Canada Graduate Scholarship (CGS).

TABLE 9: GRADUATE STUDENT PRESENTATIONS 2010-2011

Student Name	Conference
Patrick Allen	Graduate BME Open House - Feb 25th March 4th, & March 25th 2011: "Human progenitor cells rapidly generate perfused vasculature in collagen, fibrin, and hydrogel extracellular matrices." Oral Presentation: Vascular Biology Program. Cambridge, MA. November 2010. Chalk Talk: "Building Vascular Networks." Dr. M. Judah Folkman Research Day, Children's Hospital. Boston, May 2011 & 7th Annual Symposium of Cellular, Molecular & Clinical Research in Surgery, Children's Hospital. Boston. November 2010. "Human progenitor cells rapidly generate perfused vasculature in collagen, fibrin, and hydrogel extracellular matrices."
Kyle Allison	American Institute of Chemical Engineers Annual Meeting. Salt Lake City, UT. November, 2010. "Metabolite-mediated eradication of bacterial persisters by aminoglycosides at the American Institute of Chemical Engineers."
Vivek Bhatia	American Society for Mass Spectrometry Annual Meeting. Denver, CO. June 5-9, 2011. Bhatia, V.N., Perlman, D.H., Costello, C.E., McComb, M.E. "Software and Algorithm for Differential Characterization of Post-Translational Modifications." CBSS IUCRC Poster Session, Photonics Center, Boston University, Boston, MA. April 28, 2011. Bhatia, V.N., Anding, J.M, McComb, M.E., Goldberg, B.B. "Integration of Spectroscopy and Spectrometry for Biomarker Characterization."
Katherine Calabro	Graduate BME Open House - Feb 25th March 4th, & March 25th 2011: "Influence of skin variations on Elastic Scattering Spectroscopy measurements." Oral Presentation: SPIE Photonics. San Francisco, California. January 2011. "Variations in the Optical Scattering Properties of Skin in Marine Animal Models."
Jarred Callura	Oral Presentation: 10th Annual New England Science Symposium presented by Harvard Medical School. "Tracking, tuning, and terminating microbial physiology using synthetic riboregulators." Invited speaker at the Boston Area Systems and Synthetic Biology Meeting at the Harvard School of Public Health, Boston (2010). "Tracking, tuning, and terminating microbial physiology using synthetic riboregulators." 2010 Nucleic Acids Conference presented by Zing Conferences, Cancun, Mexico (2010). "Tracking, tuning, and terminating microbial physiology using synthetic riboregulators." Invited speaker at Monthly Meeting of the New England RNA Data Club at Harvard Medical School (sponsored by New England Biolabs, Abcam, Qiagen, and Exiqon), Boston (2010). "Tracking, tuning, and terminating microbial physiology using synthetic riboregulators."
Ryan Carey	Association for Chemoreception Sciences Annual Meeting. St. Pete Beach, Florida. April 2010.

	Organization for Computational Neuroscience Annual Meeting. San Antonio, TX. July 2010 Society for Neuroscience. San Diego, CA. November 2010. Computational and Systems Neuroscience. Salt Lake City & Snow Bird, UT. March 2011. Association for Chemoreception Sciences Annual Meeting. St. Pete Beach, Florida. April 2011.
Aaron Colby	Oral Presentation: Fifth Annual Conference on Advanced Materials and Nanotechnology. Wellington, New Zealand. February 2011. "Tunable pH-Responsive Nanoparticles for Delivering Paclitaxel Prevent Malignant Peritoneal Mesothelioma In Vivo." Oral Presentation: Society for Biomaterials Annual Meeting and Exposition 2011. Orlando, Florida. April 2011. "Characterizing pH-Responsive Nanoparticles for Treatment of Mesothelioma Malignancies." Johns Hopkins Institute for NanoBioTechnology (INBT): Nanotechnology for Cancer Medicine Symposium. Baltimore, MD. May 2011. "pH-Responsive, Expansile Nanoparticles for Drug Delivery."
James DiCarlo	Boston University Nanomedicine Retreat, May 2011. "pH-Responsive, Expansile Nanoparticles for Drug Delivery." Synthetic Biology 5.0. Stanford, CA. June 15-17, 2011. "Multiplex Automated Genome Engineering in <i>S. cerevisiae</i> ."
Timothy Ford	Novel Techniques in Microscopy. Monterey, CA. April 6, 2011, "Optically Sectioned Fluorescence Endomicroscopy with HiLo."
David Hall	Graduate BME Open House - Feb 25th & March 25th 2011: "Prediction of Druggability of Protein Interaction Sites."
Dewi Harjanto	BMES (Biomedical Engineering Society). Austin, TX. October 7, 2010. "Effect of varying 3D collagen matrix density on prostate cancer cell clustering."
Brian Harvey	Biomedical Engineering Society (BMES). Austin, TX. October 8, 2010. "Impact of Mean Pressure vs. Dynamics during Breathing-Like Fluctuations on Intact Airway Responsiveness." American Thoracic Society (ATS) Denver, CO. May 17, 2011. "Relative Impact of Static and Dynamic Components of Breathing on Intact Airway Responsiveness."
Lauren Hayward	Graduate BME Open House - Feb 25th March 4th, & March 25th 2011: "A Cationic CT Contrast Agent for Imaging of Soft Callus Formation in Fracture Healing."
Michelle Kinahan	BMES (Biomedical Engineering Society) 2010 Annual Meeting. Austin, TX. October 6-9 2010. "Tunable Silk Fibers: Mimicking Natural Silkworm Processing with Microfluidics." Graduate BME Open House. Feb 25th & March 4th 2011: "Tunable Silk Fibers: Mimicking Natural Silkworm Processing with Microfluidics."
Benjamin Kraus	Graduate BME Open House - Feb 25th, March 4th & March 25th 2011. "Time and distance dependence of rat hippocampal neuron responses." Online Presentation: Society for Neuroscience. San Diego, CA. November 2010. Kraus, B.J.; Robinson R.J.; Hasselmo M.E.; Eichenbaum H.; White, J.A.. Program No. 100.16. "Time and Distance Dependence of Rat Hippocampal Neuron Responses."
	Online Presentation: Society for Neuroscience. San Diego, CA. November 2010: "Kraus B.J.; Fortin, N.; Salz, D.M.; McKenzie, S.A.; Allen, T.A.; Kim, J.C.; Hasselmo, M.E.; Eichenbaum, H.. Program No. 100.18. "Hippocampal Neuron's Code for Sequences of Non-Spatial Events."
Benjamin Lakin	Graduate BME Open House March 4th 2011, & Poster presentation. ORS Conference, Kirkland, Washington. January 2011. "Effect of Mechanical Convection on Diffusion Kinetics of an Anionic Iodinated Contrast Agent into Cartilage Matrix for Contrast Enhanced CT Imaging of Cartilage."
Kevin McHugh	Annual Meeting of the Harvard Medical School Department of Ophthalmology 6/17/11 - 6/19/11. "A novel poly (e-caprolactone) scaffold for retinal pigment epithelium transplantation." Association for Research in Vision and Ophthalmology. Ft Lauderdale. FL. 5/1/11 - 5/5/11. "New poly(e-caprolactone) scaffolds for retinal pigment epithelium transplantation."

	Society for Biomaterials Annual Meeting & Exposition. Orlando, FL. 4/13/11 - 4/16/11. "Microfabrication of an artificial Bruch's membrane for the treatment of age-related macular degeneration."
	Materials Research Society 2010 Fall Meeting. Boston, MA. 11/29/10 - 12/3/10. "Template fabrication of a nanoporous polycaprolactone thin-film for retinal tissue engineering."
	Fourth Biennial Military Vision Research Symposium. West Palm Beach, FL. 9/26/10 - 9/29/10. "Nanopatterning of poly(e-caprolactone) thin film scaffolds for retinal rescue."
Sheetal Modi	ASM conference on Regulating with RNA in Bacteria. San Juan, Puerto Rico. March 10, 2011. "Functional Characterization of Bacterial sRNAs Using a Network Biology Approach."
Margo Monroe	Graduate BME Open House - Feb 25th, March 4th 2011. "Multiplexed, Rapid, Point of Care Device to Quantify Specific IgE."
Casey Olson	American Thoracic Society. Denver, CO. May 16th, 2011. "Effect of Expansion Thoracoplasty on Pulmonary Hypoplasia in Thoracic Insufficiency Syndrome."
Sam Polio	ASME 2011 Summer Bioengineering. University of Pittsburgh. 6/23/2011. (Polio, Samuel R; Rothenberg, Kathryn E; Stamenovic, Dimitrije; Smith, Michael) SBC2011-53898. "Simplifying Cell Traction Forces Using Fibronectin Patterned Polyacrylamide Gels."
Dorea Ruggles	Journal of the Acoustical Society of America, 128, 2360 [invited talk] Ruggles, D and BG Shinn-Cunningham (2010). "Reverberation and bottom-up cues in spatial selective auditory attention." Mid-Winter Meeting of the Association for Research in Otolaryngology, Baltimore, MD, 19-23 February, Ruggles D and BG Shinn-Cunningham (2011). "Beyond normal hearing: The importance of supra-threshold temporal fine structure processing." Journal of the Acoustical Society of America, 129, 2383, Ruggles D and BG Shinn-Cunningham (2011). "Relationships linking age, selective attention, and frequency following in the brainstem."
Rachel Stewart	Gordon Research Conference on Musculoskeletal Biology and Bioengineering. Andover, NH. August 2010. "Affinity and Exclusion of Cationic and Anionic Contrast Agents for Imaging Articular Cartilage." American Chemical Society fall meeting, Boston, MA. August 2010. "Computed Tomography (CT) Contrast Agents for Determining Cartilage Health." Radiological Society of American annual meeting, Chicago, Ill. November 2010. "Affinity and Exclusion of Charged Contrast Agents for Imaging Articular Cartilage." Oral Presentation: Orthopedic Research Society annual meeting, Long Beach, California. Jan 2011. "Electrostatic Attraction Between Charged Contrast Agents and Glycosaminoglycans Improves CT Imaging of Articular Cartilage."
Yingjie Sun	Biophysical Society (BPS). Baltimore, MD. March 7, 2011. "Single-molecule studies of the eukaryotic initiation factor eIF4A/eIF4H complex."
Tyler Wellman	Oral Presentation: 2010 Biomedical Engineering Society Meeting, Austin, TX. (10/08/10). "Quantification of Lung Pressure Volume Curves and Regional Expansion with Respiratory-Gated 13N2 PET" 2011 American Thoracic Society. Denver, CO. 05/15/11: "Comparison of Computed Tomography Techniques to Measure Regional Lung Strain." "Ventilation Heterogeneity is Reduced with Application of PEEP in Healthy Supine Sheep."
Keith Wong	Biomedical Engineering Society Annual Meeting Austin, Texas. October 6-9, 2010. "Cyclic AMP normalizes the physiology of engineered human blood microvessels in microfluidic collagen gels." Graduate BME Open House. Feb 25th 2011. "Engineering Functional Microvessels In Vitro."
Eunice Yi	BMES (Biomedical Engineering Society) 2010. Austin, TX. 10/6/10- 10/9/10. "Effects of Static Stretch on the Deterioration of Lung." ATS (American Thoracic Society). Denver, CO. 5/13/11- 5/18/11. "Static stretch accelerates collagen digestion and stiffness decline in lung."
Stephen Yohe	American Chemical Society. Boston, MA. August 2010. "Prevention of In Vivo Lung Tumor Growth by Prolonged Local Delivery Hydroxycamptothecin Using Poly(ester-carbonate)-collagen Composites."
Brandon Zerbe	Graduate BME Open House March 4th & 25th 2011. "The relationship between protein druggability and alanine scanning."

Current Status of the Graduate Program

During Academic Year 2010-11 the Department of Biomedical Engineering Graduate Committee members were: Irving Bigio, Chair, James Galagan, Mark Grinstaff (Spring), Simon Kasif, Catherine Klapperich (Fall), Jerome Mertz (Fall) and Sandor Vajda.

The Admissions Committee members were: Kamal Sen, Director, Maxim Frank-Kamenetskii, Xue Han, Jason Ritt, Dimitrije Stamenovic, Bela Suki, Joe Tien and Lucia Vaina.

The mission of the admissions committee was:

- Review, admit and recruit all applicants to the MEng., MS, PhD, and MD/PhD graduate programs.
- Identify financial aid candidates for new and continuing students. Forms of financial aid include departmental, college and university fellowships.

The central mission of the Graduate Committee is the governance and administration of the graduate programs (MEng, MS, PhD and MD/PhD) within the Biomedical Engineering Department. This mission is carried through the following specific activities:

- Develop and maintain quality graduate MEng, MS and PhD curricula.
- Develop policies and procedures associated with the degree requirements and maintain written set of guidelines.
- Manage, administer and grade the Biomedical Engineering PhD Qualifying Examinations.
- Review student petitions, waivers and appeals.
- Maintain and review academic records of students, including tracking the degree progress, degree deadlines of each student
- Advertise the graduate programs (web page, Departmental brochures, bulletins, Peterson's Guides, etc.).
- Contribute to the Annual Reports of the Department and the College of Engineering.

The above list emphasizes day-to-day management of the graduate program. A more global mission is to maintain the quality of the program so as to retain the high national ranking of the department's graduate program.

Other Initiatives from Academic Year 2010-11:

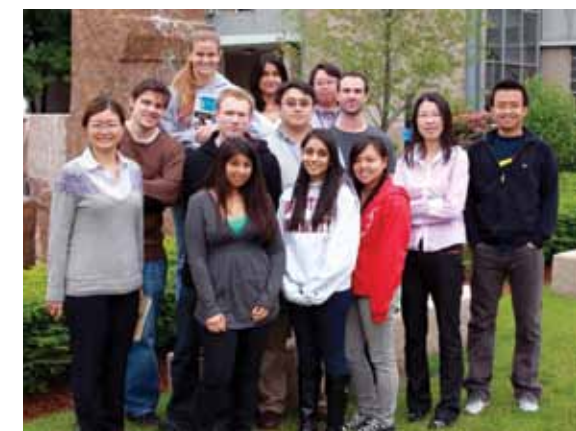
AY 2010-11 was the 10th year of the NIH training program in Quantitative Biology and Physiology. The program now has 48 trainees who are in or completed the program with 33 current students. No new students will join in September 2011. Two students completed their degree requirements and graduated in January 2011 and three in May 2011. The NIH journal club continues to be student-run.

Fall 2010 was the third year that the department admitted students for the Master of Engineering (MEng) degree. Ten students matriculated in AY 2010-11 and 13 students received their MEng degrees this year. Another eleven students are expected to enter in the fall 2011. Prof Jonathan Rosen has provided leadership and helps mentor students in the MEng program. He has organized networking events and has helped many of the students find jobs after graduation.

On February 4, 2011, the NIH Trainees held their seventh annual symposium. It was also the first time that the symposium was held jointly with the Translational Research in Biomaterials Training Grant. More advanced students presented their thesis work, along with some outside guests of the students. The keynote speaker was Dr. David Kaplan, Stern Family Professor of Engineering, Professor and Chair, Department of Biomedical Engineering, Professor, Chemical Engineering and Director, Bioengineering and Biotechnology Center at Tufts University.

The department continued to sponsor career planning seminars in conjunction with the College of Engineering Career Development Office.

Several initiatives were undertaken this year to try to reduce the routine paperwork required for BME graduate students; primarily by providing many forms in electronic format, consolidating forms and eliminating some.



External Research Funding

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 5 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 and Subcellular
Tissue and Biorheology
Systems Biomechanics
Posture Control
Biomedical Optics

Biomolecular Eng. & Biotech.

Bioinformatics
Protein Modeling
Genome Sequencing
DNA Structure-Function
Genetic, Protein & Cell Regulation
Functional Genomic

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

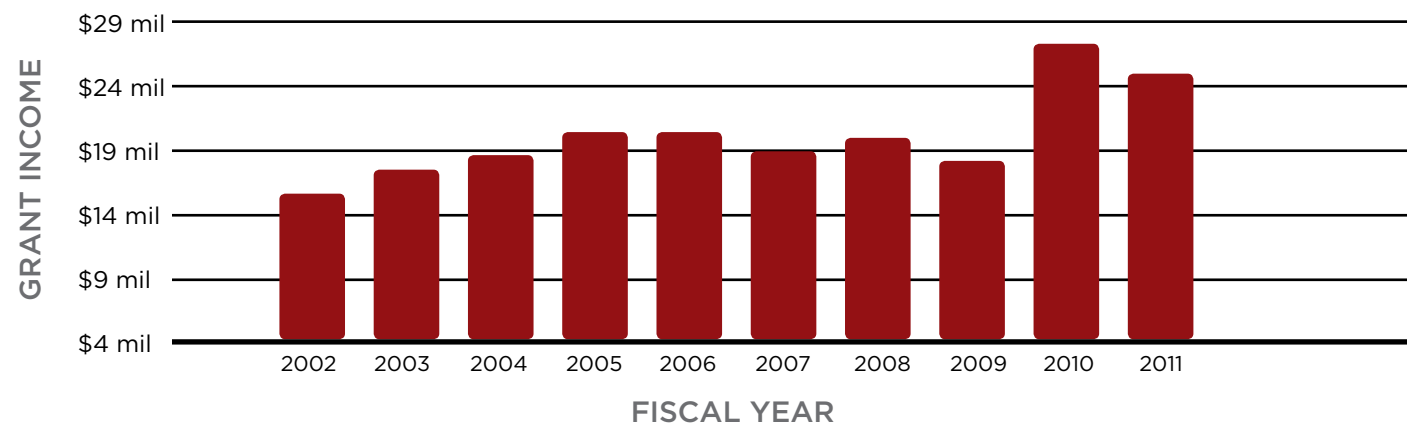
Neuroscience

Ion-Channel kinetics
Neural Firing Systems
Neuromuscular Control
Functional Activities

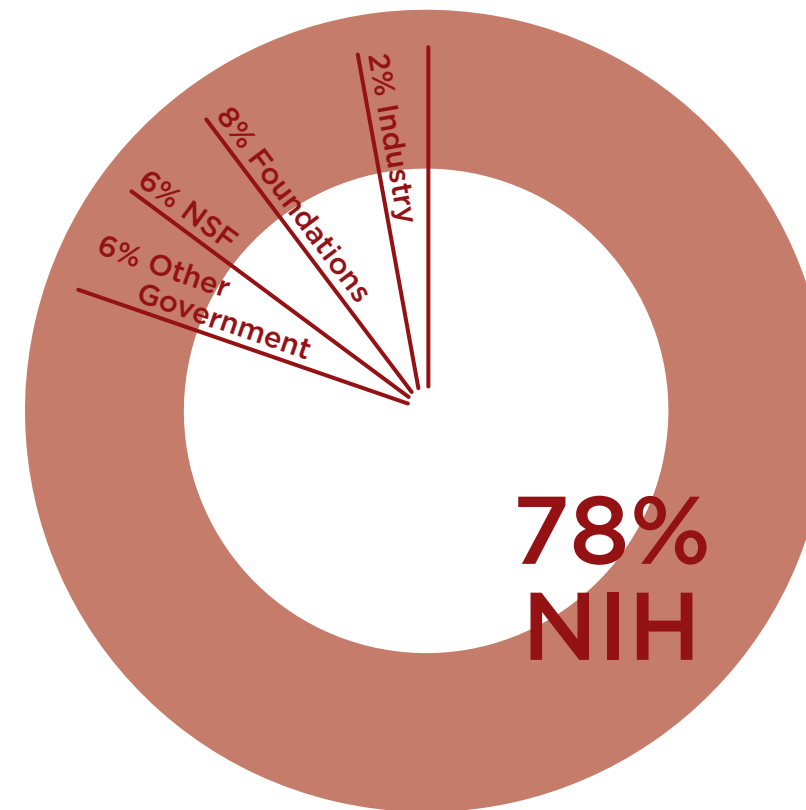
Micro and Nano Biosystems

Cell & Tissue Engineering
BioMEMs
Cell Encapsulation
Programmable Cell Environments
Biotherapeutics & Drug Delivery

BME FACULTY ANNUAL TOTAL GRANT FUNDING



BME GRANT FUNDING BY AGENCY



During the period 7/1/2010 through 6/30/2011 the BME faculty received funding from 77 new and continuing funding awards for a total of \$24,259,530.

Over \$34M 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 Juvenile Diabetes Research Foundation International, The Bill and Melinda Gates Foundation, The Ellison Medical Foundation, The Kern Foundation, The Hartwell Foundation, The Wallace H. Coulter Foundation, and The Alfred P. Sloan Foundation, and private industry such as The Advanced Energy Consortium and Karl Storz GmbH & Co. KG.

NIH AWARDS

Principal Investigator	Title of Project	Granting Agency	Amount
Bigio, Irving	Enhanced Intraarterial Delivery of Chemotherapeutic Drugs to the Brain	NIH/NCI (sub Columbia U)	\$88,668
Bigio, Irving	Optical Imaging of Chemotherapy for Brain Tumors	NIH/NCI (sub Columbia U)	\$83,448
Colburn, H. Steven	Binaural Hearing	NIH/NIDCD	\$587,037
Colburn, H. Steven	Core Center Grant - Engineering (Core 3)	NIH/NIDCD	\$229,806
Colburn, H. Steven	Bilateral Cochlear Implants: Physiology and Psychophysics	NIH/NIDCD (sub MEEI)	\$79,201
Collins, James	A Network Biology Approach to Antibiotic Action and Bacterial Defense Mechanisms (Director's Pioneer Award)	NIH	\$812,500
Collins, James	Comparative Phenotypic, Functional, and Molecular Analysis of ESC and IPSC	NIH/NHLBI (sub Children's Hospital)	\$151,519
Collins, James	Boston OAIC: A Translational Approach to Function Promoting Anabolic Therapies	NIH/NIA (sub BMC)	\$48,750
Collins, James	ImmGen: A Gene Expression Compendium for Immune Cells	NIH/NIAID (sub Harvard)	\$190,850
Collins, James	SysCODE: Tooth Germ Design and Engineering	NIH/NIDCR (sub BWH)	\$72,407
Damiano, Edward	Clinical Trials of a Closed-Loop Control System for Type 1 Diabetes Management	NIH/NIDDK	\$671,665
De Luca, Carlo	Wearable-Sensor System for Monitoring Motor Function	NIH/NIBIB	\$654,993
De Luca, Carlo	Harnessing Motoneuron Activity: From Lab to Clinic	NIH/NICHHD	\$555,311
DeLisi, Charles	Integration of VisANT and NCIBI Tools for Multi-Scale Visualization, Analysis, and Modeling of Biological Networks/Pathways	NIH/NIDA (sub U Michigan)	\$136,540
Dembo, Micah	Core C: Traction Force Microscopy	NIH/NHLBI (sub U Rochester)	\$97,500

Principal Investigator	Title of Project	Granting Agency	Amount
Ehrlich, Daniel	High-Throughput BioMEMS	NIH/NHGRI	\$1,419,779
Evans, Evan	Dynamic Strengths of Leukocyte Adhesion Bonds	NIH/NHLBI	\$346,550
Galagan, James	A Systems Biology Approach to Infectious Disease Research	NIH/NIAID (sub Stanford U)	\$1,224,620
Grinstaff, Mark	Flexible, Conformal, Polymeric Films for Lung Resection Margins	NIH/NCI	\$361,745
Grinstaff, Mark	Bacteriophobic Coatings for Inhibition of Pathogenic Biofilms	NIH/NIAMS	\$523,159
Grinstaff, Mark	Translational Research in Biomaterials	NIH/NIBIB	\$177,962
Han, Xue	Cross Region Neural Computation Subservicing Attention	NIH/NIMH	\$495,311
Kasif, Simon & Steffen, Martin	SciBay: A New Methodology for Scientific Collaboration and Gene Function Determination	NIH/NIGMS	\$1,549,434
Klapperich, Catherine	Bacterial Drug Susceptibility Identification by Surface Enhanced Raman Microscopy	NIH/NIAID (sub Fraunhofer)	\$162,500
Klapperich, Catherine	Portable Low Power Nucleic Acid Extraction Module	NIH/NIBIB (sub PATH)	\$109,660
Lutchen, Kenneth	Factors Determining Hyperresponsiveness for Intact Airways	NIH/NHLBI	\$441,713
Meller, Amit	Single Molecule Sequencing by Nanopore Induced Proton Emission (SM-SNIPE)	NIH/NHGRI	\$2,018,054
Meller, Amit	Single-Molecule DNA Sequencing with Engineered Nanopores	NIH/NHGRI (sub Scripps Inst)	\$99,999
Mertz, Jerome	Development of Photothermal Microscopy for Biomedical Applications	NIH/NIBIB	\$244,876
Mertz, Jerome	Ultrasound-Enabled Two-Photon FRET Microscopy	NIH/NIBIB	\$81,626
Mertz, Jerome	The Development of Hybrid Widefield Imaging for Out-of-Focus Background Rejection	NIH/NIBIB	\$350,709
Mountain, David	Active Filtering in the Cochlea	NIH/NIDCD	\$713,343
Shinn-Cunningham, B	Perception in Complex, Multi-Source Environments	NIH/NIDCD	\$330,920
Smolina, Irina	Ultra-Specific in situ Detection of Short Sequences in Human Genomic DNA Under Non-Denaturing Conditions	NIH/NCRR	\$305,084
Suki, Bela	PET Imaging of Local Inflammation and Function in Ventilator Induced Lung Injury (Off Campus Funding)	NIH/NHLBI (sub MGH)	\$41,715
Tien, Joe	Engineering Functional Lymphatic Networks in Vitro	NIH/NHLBI	\$203,125
Vajda, Sandor	A Multistage Approach to Protein-Protein Docking	NIH/NIGMS	\$261,196
Vajda, Sandor	Computational Mapping of Proteins for the Binding of Ligands	NIH/NIGMS	\$354,731
Wong, Joyce	Vascular Cell Phenotype on Physiologically-Relevant Bioengineered Substrata	NIH/NHLBI	\$406,250
Zaman, Muhammad	Quantitative Analysis of Tumor Cell Migration in Three Dimensional Matrices	NIH/NCI	\$250,351
Zaman, Muhammad	Quantitative Analysis of Tumor Cell Migration in Three Dimensional Matrices - ARRA Administrative Supplement	NIH/NCI	\$310,687
Zaman, Muhammad	Theranostic Molecular Automata for Specific Cell Elimination	NIH/NCI (sub U Texas)	\$149,423
Zaman, Muhammad	Mechanics of Monolayer Migration	NIH/NHLBI (sub Harvard)	\$81,626

AWARDS FROM FOUNDATIONS

Principal Investigator	Title of Project	Granting Agency	Amount
Han, Xue	Alfred P. Sloan Research Fellowship	Alfred P. Sloan Foundation	\$50,000
Galagan, James	Dedicated Tuberculosis Gene Expression Database	Bill & Melinda Gates Foundation	\$144,320
Ritt, Jason	Career Award at the Scientific Interface	Burroughs Wellcome Fund	\$60,000
Collins, James	Collins Lab Wyss Funds	Hansjorg Wyss Institute/Harvard University	\$150,000
Damiano, Edward	Bihormonal CGM-Based Closed-Loop Control: A Clinical Trial in the MGH CRC	JDRF	\$312,829
Lutchen, Kenneth	Kern Foundation KEEN Initiative, Phase II	Kern Family Foundation	\$73,500
Lutchen, Kenneth	Kern Foundation Phase III Innovation and Entrepreneurial Mindset Program	Kern Family Foundation	\$762,500
Collins, James	A Network Biology Approach to Aging: Integrating Synthetic Biology and Systems Biology	The Ellison Medical Foundation	\$243,750
Wong, Joyce	Development of Tissue Engineering Solutions for Pediatric Vascular Surgical Repair and Reconstruction	The Hartwell Foundation	\$100,000

AWARDS FROM NSF

Principal Investigator	Title of Project	Granting Agency	Amount
Broude, Natalia	RNA Localization and Movement in Bacteria	NSF	\$253,669
Grinstaff, Mark	Synthesis and Characterization of Expansile Polymeric Nanoparticles for Drug Delivery	NSF	\$139,999
Grinstaff, Mark	Supramolecular Ionic Networks: Synthesis, Rheology, and Modeling	NSF	\$510,000
Grinstaff, Mark	Synthesis and Characterization of Expansile Polymeric Nanoparticles for Drug Delivery	NSF	\$140,000
Smith, Michael	Collaborative Research: Molecular Mechanics Dictate the Mechanical Behavior of an Extracellular Matrix Fiber	NSF	\$300,371
DeLisi, Charles	Computational Analysis of Nucleosome Positioning Signals in Eukaryotic Genomes	NSF (sub U Mass)	\$70,997

AWARDS FROM OTHER GOVERNMENT AGENCIES

Principal Investigator	Title of Project	Granting Agency	Amount
Shinn-Cunningham, B	Managing Acoustic Communications in High-Stress Settings (National Security Science and Engineering Faculty Fellowship Program)	DOD	\$600,000
Shinn-Cunningham, B	Focusing, Sustaining, and Switching Attention	DOD	\$102,162
Mountain, David	Auditory Cues-Based Speech Enhancement Processing Technology (ACSEPT) (STTR)	DOD (sub Mayflower Comm)	\$35,000
Bigio, Irving	Validation of Colon Cancer Screening by Optical Sensing of Field Effect in Rectal Mucosa	DOD (sub MGH/CIMIT)	\$140,000
Mountain, David	Underwater Hearing: Whales and Dolphins	DOD (sub WHOI)	\$142,700
Grinstaff, Mark	Multi-Compartment Carriers for Fighting Inflammation	Engineering and Physical Sciences Research Council/United Kingdom (sub U Manchester)	\$82,757
Zaman, Muhammad	Making an "IMPACT" (Integrated Measuring Platform for Identifying and Testing Anti-Cancer Therapeutics on Pediatric Cancers)	Engineering and Physical Sciences Research Council/United Kingdom (sub U Manchester)	\$70,244

AWARDS FROM INDUSTRY

Principal Investigator	Title of Project	Granting Agency	Amount
Grinstaff, Mark	Downhole Li-ion Batteries Based on Network Ionic Liquids	Advanced Energy Consortium (sub UT Texas)	\$323,973
Wong, Joyce	Magnetic, Sub-Pore Scale Metal Oxide Particles for Enhanced Magnetic Resonance and Optical Characterization of Rock Pore Structure and Fluid Composition in Reservoir Rock	Advanced Energy Consortium (sub UT Texas)	\$128,107
Zaman, Muhammad	Developing Superior Screening Technology for Medicines Quality Control in Low Resource Countries	Agency for International Development (sub United States Pharmacopeial Convention)	\$99,999
Mertz, Jerome	Sponsored Research Agreement with Karl Storz	Karl Storz GmbH & Co. KG	\$65,000

AWARDS FOR STUDENT FUNDING

Principal Investigator	Title of Project	Granting Agency	Amount
Eisenberg, Solomon	Calcium Signaling in Astrocytes (Off Campus Funding)	NIH/NINDS (sub U Utah)	\$41,977
Grinstaff, Mark	Synthesis and Evaluation of Antibacterial Anionic Dendritic Amphiphiles (NRSA)	NIH/NIGMS	\$46,346
Shinn-Cunningham, B	Roles of Fine Time Processing and Reverberation in Spatial Selective Auditory (NRSA)	NIH/NIDCD	\$28,988
Shinn-Cunningham, B	Perception in Complex, Multi-Source Environments - Diversity Supplement (Miguel Cepeda)	NIH/NIDCD	\$55,704
Wachowiak, D. Matthew	Processing of Temporally Dynamic Olfactory Inputs	NIH/NIDCD	\$28,873
Wong, Joyce	Tissue Vascularization - Graduate Student Stipend Support	NIH/NHLBI (sub Children's Hospital)	\$41,903
Zaman, Muhammad	Quantitative Analysis of Tumor Cell Migration in Three Dimensional Matrices (Research Supplement to Promote Diversity in Health-Related Research)	NIH/NCI	\$65,907
Broude, Natalia	RNA Localization and Movement in Bacteria (REU Supplement)	NSF	\$2,500

Publications

The BME Department primary faculty published 10 book chapters, 96 journal articles (refereed), 36 conference proceedings and abstracts, 6 patents and gave 75 invited lectures; the research faculty published 1 book chapters, 5 journal articles (refereed), 5 conference proceedings and abstracts, 2 patents and gave 10 invited lectures; and the affiliated faculty published 2 book chapters, 117 journal articles (refereed), 28 conference proceedings and abstracts, 3 patents and gave 47 invited lectures.

PEER REVIEWED PUBLICATIONS

Irving Bigio

"Scanned Elastic Scattering Spectroscopy detects metastatic breast cancer in sentinel lymph nodes," MR Austwick, B Clark, CA Mosse, K Johnson, DW Chicken, SK Somasundaram, Y Zhu, M Falzon, G Kocjan, T Fearn, SG Bown, IJ Bigio, MRS Keshtgar, J. Biomedical Optics 15(4) 047001 (July 2010).

"Temporal variations of skin pigmentation in C57Bl/6 mice affect optical bioluminescence quantitation," A Curtis, KW Calabro, J Galarneau, IJ Bigio, T Krucker, Molecular Imaging and Biology, (published online Oct. 2010)

"Integrated optical tools for minimally invasive diagnosis and treatment at gastrointestinal endoscopy," E Rodriguez-Diaz, IJ Bigio, SK Singh, Robotics and Computer-Integrated Manufacturing 27 (April, 2011) 249-256. (online Dec. 2010)

"Inconsistent blood brain barrier disruption by intraarterial mannitol in rabbits: implications for chemotherapy," Joshi S, Ergin A, Wang M, Bruce JN and Bigio IJ, Journal of Neuro-Oncology (published online 13 Dec., 2010; April 2011)

"Gender Variations in the Optical Properties of Skin in Murine Animal Models," K Calabro, A Curtis, J Galarneau, T Krucker, IJ Bigio, J. of Biomedical Optics 16(1), 011008 (Jan 2011)

"Optical Measurement of Photosensitizer Concentration in vivo," MR Austwick, J Woodhams, V Chalau, CA Mosse, C Eliot-Laize, L Lovat, AJ MacRobert, IJ Bigio, SG Bown, J. of Innovative Optical Health Sciences 4(2), pp. 97-111 (April, 2011)

"Elastic light-scattering spectroscopy for discrimination of benign from malignant disease in thyroid nodules," H Suh, S Kim, O A'amar E Rodriguez-Diaz, IJ Bigio, S Lee, JE Rosen, Annals of Surgical Oncology 18, 1300-1305 (May, 2011).

"Spectral Classifier Design with Ensemble Classifiers and Misclassification-Rejection: Application to Elastic-Scattering Spectroscopy for Detection of Colonic Neoplasia," E Rodriguez-Diaz, DA Castañon, SK Singh, and IJ Bigio, J. Biomedical Optics 16(6), 067009 (June 2011)

"Retention of Indocyanine Green as a Potential Marker for Optical Detection of Blood Brain Barrier Disruption," A Ergin, S Joshi, M Wang, I. J. Bigio, Proc. SPIE 7907-21 (Jan. 2011).

"Variations in the optical scattering properties of skin in murine animal models," Katherine Calabro, Allison Curtis, Jean-Rene Galarneau, Thomas Krucker, Irving J. Bigio, Proc. SPIE 7907-28 (Jan. 2011).

"Design, conduct and challenges of a clinical trial utilizing elastic light scattering spectroscopy in vivo in patients undergoing thyroidectomy," Jennifer E. Rosen, Hyunsuk Suh, Stephanie Lee, Ousama M. Aamar, Irving J. Bigio, Proc. SPIE 7883C-163 (Jan. 2011).

"Optical Sensing of a Field Carcinogenesis in Colonic Mucosa using Elastic-Scattering Spectroscopy," E Rodriguez-Diaz, L Jepeal, CS Huang, A Sharma, IJ Bigio, SK Singh, Proc. AGA Digestive Disease Week, (May, 2011)

"Elastic Scattering Spectroscopy (ESS) for Discrimination of Benign from Malignant Disease in Thyroid Nodules," SS Kim, SC Orzell, O A'amar, SL Lee, IJ Bigio, JE Rosen, Proc. American College of Surgeons (Oct. 2010)

Steve Colburn

O'Gorman DE, Colburn HS, Shera CA. (2010) "Auditory sensitivity may require dynamically unstable spike generators: evidence from a model of electrical stimulation," J Acoust Soc Am., 128: EL300-5.

Xia, J., Brughera, A.R., Colburn, H.S., and Shinn-Cunningham, B.G. (2010) "Physiological and Psychophysical Modeling of the Precedence Effect" J. Assoc. Res. Otolaryn. 11, 495-513.

Wan, R., Durlach, N.I., and Colburn, H.S. (2010) "Modified EC Model Applied to Speech Intelligibility with Spatially Distributed Maskers," J. Acoust. Soc. Am., 128, 3678-3690.

James Collins

Allison KR, Brynildsen MP and Collins JJ. Metabolite-enabled eradication of bacterial persisters by aminoglycosides. Nature 473: 216-220 (2011)

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Edward Damiano

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Carlo De Luca

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Micah Dembo

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Herant, M., and M. Dembo (2010). Form and Function in Cell Motility: From Fibroblasts to Keratocytes. Biophysical Journal 98:1408-1417.

Herant, M. and M. Dembo (2010): Cytospede: a Three-dimensional Tool for Modeling Cell Motility on a Flat Surface. Journal of Computational Biology. 17:1639-1677

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Mark Grinstaff

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"Staphylococcus aureus Resistance on Titanium Coated with Multivalent PEGylated-peptides." Xiaojuan Khoo, George A. O'Toole, Shrikumar A. Nair, George A. O'Toole, Brian D. Snyder, Daniel J. Kenan, and Mark W. Grinstaff *Biomaterials*, 2010, 31, 9285-9292. doi:10.1016/j.biomaterials.2010.08.031 PMID: 20863561

"Acidic Polysaccharide Mimics via Ring-opening Metathesis Polymerization." Michel Wathier, Stephanie S. Stoddart, Matthew J. Sheehy, and Mark W. Grinstaff *Journal of the American Chemical Society*, 2010, 132, 15887-15889. doi:10.1021/ja106488h PMID: 20964329

"Synthesis and Creep-Recovery Behavior of a Neat Viscoelastic Polymeric Network Formed Through Electrostatic Interactions." Michel Wathier and Mark W. Grinstaff *Macromolecules*, 2010, 43, 9529-9533. doi:10.1021/ma101506p

"Biomedical Applications of Dendrimers: A Tutorial." Meredith A. Mintzer and Mark W. Grinstaff *Chemical Society Reviews*, 2011, 40, 173 - 190 (invited tutorial review). doi: 10.1039/b901839p PMID: 20877875

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"The Role of Supramolecular Chemistry in Responsive Vectors for Gene Delivery" Caroline M. LaManna and Mark W. Grinstaff in *Supramolecular Chemistry*, 2011, in press (invited manuscript).

"Cationic Contrast Agents Improve Quantification of Glycosaminoglycan (GAG) Content by Contrast Enhanced CT Imaging of Cartilage." Neel S. Joshi, Prashant N. Bansal, Bethany C. Malone, Vahid Entezari, Rachel C. Stewart, Brian D. Snyder, and Mark W. Grinstaff *Journal of Orthopaedic Research*, 2011, 29, 704-709. PMID: 21437949. DOI:10.1002/jor.21312.

"A Versatile Reagent to Synthesize Diverse Ionic Liquids Ranging from Small Molecules to Functionalized Proteins." Michel Camplo, Michel Wathier, Jennifer Chow, and Mark W. Grinstaff *Chemical Communications*, 2011, 47, 2128 - 2130. PMID: 21180737 DOI:10.1039/c0cc04459h

"Summer Scholar Report: Synthesis and Characterization of Functional Polymeric Nanoparticles." Jiazuo (Henry) Feng and Mark W. Grinstaff *The Nucleus NESACS*, 2011, 139, 8-10.

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"Novel Infection-Resistant Surface Coatings: A Bioengineering Approach." Xiaojuan Khoo and Mark Grinstaff *MRS Bulletin, Special Issue on Bateria Biofilms*, 2011, 36, 357-366 (invited article).

"Macropinocytosis is the Major Pathway Responsible for DNA Transfection by a Charge-Reversal Amphiphile in CHO Cells." Xiao-Xiang Zhang, Phillip G. Allen, and Mark Grinstaff *Molecular Pharmaceutics*, 2011, 8, 758-766.

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Catherine Klapperich

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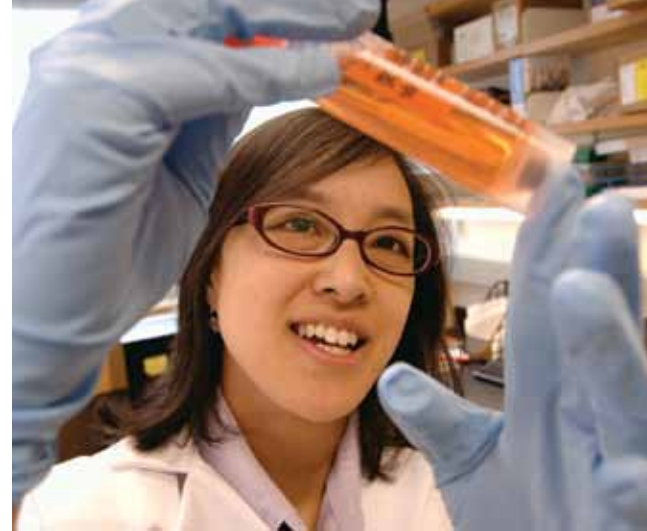
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Active Research Laboratories

A wide variety of Research Laboratories and Centers provide facilities for the research activities of our faculty, students, postdoctoral fellows and visiting scientists. The Research Laboratories are within the Department of Biomedical Engineering, and are typically under the direction of one or two faculty members. In many cases, these laboratories have strong collaborations with Centers or other institutions in the Boston area. Research Centers bring together a number of faculty from different departments in the College of Engineering, as well as from other Colleges at Boston University. Below is a list of all the Research Centers and Laboratories. Please also view our Research Facilities.

Auditory Biophysics and Simulation Laboratory
 Auditory Neurophysiology Laboratory
 Auditory Neuroscience Laboratory
 Binaural Hearing Laboratory
 Biomedical Microdevices and Microenvironments Laboratory
 Biomedical Optics Laboratory
 Biomicroscopy Laboratory
 Biomimetic Materials Engineering Laboratory
 Biomolecular Systems Laboratory
 Brain and Vision Laboratory
 Cell and Tissue Mechanics Laboratory
 Cell Photometrics Laboratory
 Cellular and Subcellular Mechanics Laboratory
 Collins Laboratory
 Computational Genomics Laboratory
 Cortical and Computational Decoding of Speech Laboratory
 Fields and Tissues Laboratory
 Frank-Kamenetskii Laboratory
 Galagan Laboratory
 Grinstaff Group
 Matrix Mechanotransduction
 Medical Acoustics Laboratory
 Molecular and Cellular Dynamics Laboratory

Professor Mountain
 Professor Voigt
 Professor Shinn-Cunningham
 Professor Colburn
 Professor Klapperich
 Professor Bigio
 Professor Mertz
 Professor Wong
 Professor Delisi
 Professor Vaina
 Professor Stamenovic
 Professor Ehrlich
 Professors Dembo and Evans
 Professor Collins
 Professor Kasif
 Professor Gitza
 Professor Eisenberg
 Professor Frank-Kamenetskii
 Professor Galagan
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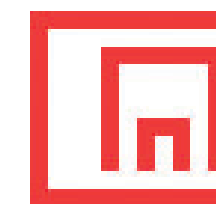
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 Sandor Vajda, Director
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"Defining the Molecular Determinants of Melanoma Metastasis"

December 14, 2010: Klaus Ley

LaJolla Institute

"Nanometer resolution imaging of rolling neutrophils"

January 11, 2011: Christian Kastrup

Massachusetts Institute of Technology

Seminar Title: "Understanding and Controlling Blood Coagulation Using Models, Materials and Devices"

January 26, 2011: Steven Chase

University of Pittsburgh

Seminar Title: "Visuomotor adaptation observed through a brain-computer interface"

February 9, 2011: Cara Stepp

University of Washington

Seminar Title: "Human-Machine Interactions for Rehabilitation of Sensorimotor Function"

February 16, 2011: Erkin Seker

Massachusetts General Hospital

Seminar Title: "Nanoporous Gold: Fabrication, Characterization, and Biomedical Applications"

February 23, 2011: Christopher Snow

California Institute of Technology

Seminar Title: "Empirical and Computational Models for Protein Design"



March 2, 2011: Cynthia Chestek

Stanford University

Seminar Title: "Long-term stable neural prosthetic systems"

March 7, 2011: Madhavi Krishnan

ETH Zurich

Seminar Title: "Force-free' trapping, stretching, sorting and assembly of nanometric objects in a fluid"

March 9, 2010: Keisuke Goda

UCLA

Seminar Title: "High-Throughput Optical Technology for Real-Time Screening of Rough Events in Biomedicine"

March 21, 2011: Darren Roblyer

UC Irvine

"Optical Imaging of Cancer Metabolism and Response to Therapy"

March 23, 2011: Jeanne Stachowiak

Sandia National Laboratory

Seminar Title: "Reverse Engineering Biological Membranes"

March 30, 2011: Soren Konecky

UC-Irvine

Seminar Title: "Quantitative Optical Imaging of Cerebral Hemodynamics"

April 1, 2011: Kalin Vetsigian

Harvard Medical School

Seminar Title: "Microbial Interaction Networks in Soil and in Silico"

April 8, 2011: Ahmad "Mo" Khalil

Boston University

Seminar Title: "Programming Biological Systems from the Inside and Out"

April 15, 2011: Wilson Wong

UCSF

Seminar Title: "Synthetic Biology in translational medicine: Engineering T-cell receptor signaling dynamics for cancer therapy"

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MIT Media Laboratory

Seminar Title: "Genetic Engineering at the Genome Scale"

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A Symposium Celebrating

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October 15, 2010

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Micah Dembo, Boston University

"The Adhesion Dance of Breast Epithelium"

Hans Günther Döbereiner, Max-Planck Institut, Potsdam, Germany

"This is Not in Landau-Lifshitz: Micromanipulation People, Vesicles and Cells"

Herman Gaub, Ludwig-Maximilian University, Munich, Germany

"Force and Function: Where Might the Control of individual Molecules Bring a Cutting Edge?"

Tom Lubensky, University of Pennsylvania

"Auxetic and Other Nearly Isostatic Periodic Lattices"

David Needham, Duke University

"Evans and Needham, 1983-87. The Rest is History"

Adrian Parsegian, University of Massachusetts-Amherst

"Pushing and Pulling with Evan"

Joachim Radler, Ludwig-Maximilian University Munich, Germany

"Functional Noise in Bacterial Gene Regulation"

Erich Sackmann, Ludwig-Maximilian University Munich, Germany

"How Cells Crawl, Swim and Stride on Stilts"

Samuel Safran, Weizmann Institute for Science, Israel

"Active Elastic Response and Rigidity Sensing of Stem Cells"

Sidney Simon, Duke University

"My Life with Evan: 1973 - 2010"

Wesley Wong, Harvard

"New Approaches in Force Spectroscopy: From Enzyme Kinetics to Single-Molecule Centrifugation"

Cheng Zhu, Georgia Institute of Technology

"Watching Molecular Binding and Conformational Changes Via Evan's BFP"

Wolfgang Helfrich, Freie Universitaet, Germany

"Three Apparently Unresolved Problems in the Physics of Fluid Membranes and a New Direction of Research"

THE CENTER FOR BIODYNAMICS AND COGNITIVE RHYTHMS COLLABORATIVE

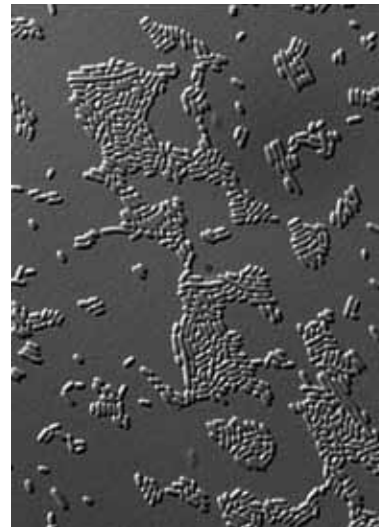
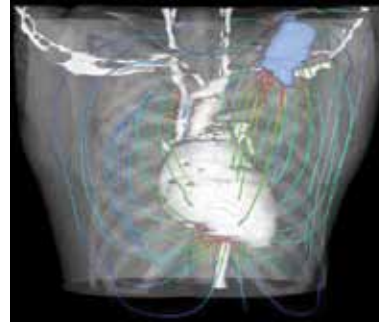
**Spring 2011 Mini-Symposium:
"Brain Rhythms and Audition"**
Thursday, April 14th, 1:00pm

Hillel House at Boston University
213 Bay State Road
Conservative Chapel

Hosted by
The Center for BioDynamics
(Nancy Kopell, Co-Director)
&
The Bahaa Hariri Institute for
Computational Science and Engineering
(Azer Bestavros, Director)

Sponsored by the Center for BioDynamics

1:00-1:15	Registration
1:15-2:00	Dr. Miles Whittington , University of Newcastle, UK "Multiple gamma rhythms and the rate vs. temporal code dilemma"
2:00-2:45	Dr. Charles Schroeder , Nathan Kline Institute "Rhythmic entrainment as a mechanism of auditory representation, parsing and perceptual selection"
2:45-3:00	Break
3:00-3:45	Dr. Oded Ghitza , Boston University "Speech decoding guided by cascaded oscillators locked to the input rhythm: what can a phenomenological model tell us?"
3:45-4:30	Dr. Barbara Shinn-Cunningham , Boston University "Observing and hijacking oscillations to understand auditory attention"
4:30	Discussion / Reception



HEARING RESEARCH CENTER SEMINAR SERIES

Jul 23rd 2010
Dr. Oded Ghitza, Research Professor, Boston University
"Speech Perception and Brain Rhythms"

Aug 27th 2010
Dr. Cyrus Billimoria, Research Assistant Professor, Boston University
"Neural and Behavioral Discrimination of Natural Auditory Objects"

Sep 17th 2010
Dr. Alexey Lukin, Zotope Inc.; Image Processing Lab, "Moscow Lomonosov" State University
"Multiresolution Short-Time Fourier Transform for Analysis and Processing of Audio"

Sep 24th 2010
Dr. Stephen David, Neural Systems Laboratory, University of Maryland
"Behavior, Reward and the Routing of Auditory Information Through Cortex"

Oct 1st 2010
Dr. Jennifer Bizley, Royal Society Senior Research Fellow; Department of Physiology, Anatomy and Genetics, University of Oxford
"Listening to Auditory Cortex; Searching for Neural Correlates of Complex Sound Perception"

Oct 22nd 2010
Dr. Laurel Carney, Department of Biomedical Engineering, University of Rochester
"Detection of Amplitude-Modulations in Sounds: Behavioral and Physiological Studies"

Oct 29th 2010
Dr. Charlotte Reed, Senior Research Scientist, Research Laboratory of Electronics, MIT and Dr. Joseph G. Desloge, Research Scientist, Sensimetrics Corporation
"Hearing-Loss Simulation as a Tool for Understanding the Role of Audibility in Hearing Impairment"

Nov 5th 2010
Dr. Christopher Clark, Lab of Ornithology Bioacoustics Research Program, Cornell University
"Voices of the Great Whales, Drowning in a Sea of Noise"

Nov 10th 2010
Dr. Richard Rabbit, Dept of Bioengineering, University of Utah; Marine Biological Laboratory, Woods Hole.
"Pulsed Infrared Excitability of Inner-Ear Hair Cells and Cardiac Myocytes"

Nov 11th 2010
Dr. David McAlpine, UCL Ear Institute
"Biophysical Limits to Binaural Temporal Coding"

Nov 12th - 13th 2010
BINAURAL BASH
Les Bernstein (w/ Tino Trahiotis)
"Lateralization Produced By Interaural Intensive Disparities: Differences Between High- and Low-Frequency Stimuli"

Bill Yost
"Localizing Multiple Sound Sources"

Michael "Q" Qin
"Underwater Sound Localization: Two Cue Better Than One?"

Jonas Braasch
"Physiological Considerations For a Binaural Localization Model That Resolves Front Back Confusions Through Head Movements"

Eric Macauley
"Free field localization of AM tones"

Mathias Dietz
"Lateralization Based on ITDs in the Second Order Enevelope"

David McAlpine
"Binaural Biophysics and Limits on Temporal Hearing"

Michael Slama
"Neural Coding of Amplitude Modulation in Reverberation: Denyamic Aspects"

Todd Jennings
"An Inferior Colliculus Cell Model for Interaural Time Difference Analysis"

Andrew Brown
"Assessing 'Buildup', 'Breakdown' and 'Re-Buildup' of the Precedence Effect for ITD and ILD"

Bob Carlyon
"Evidence that Huggins Components and Spectral Components are Processed in a Common Pitch Processor"

Erick Gallun
"Listener-Specific Variables Associated With Spatial Release in Multitalker Environments"

Culling John
"A Model of Spatial Unmasking for Speech"

David Griesinger
"A Neral Model for the Simultaneous Detection Of Pitch, Timbre, Azimuth, And Distance of Multiple Sound Sources"

Ross Maddox
"Masking Sounds Reveal a Location Dependence in Songbird Auditory Neurons"

1ST JOINT BME SYMPOSIUM IN QUANTITATIVE BIOLOGY AND PHYSIOLOGY AND TRANSLATIONAL RESEARCH IN BIOMATERIALS

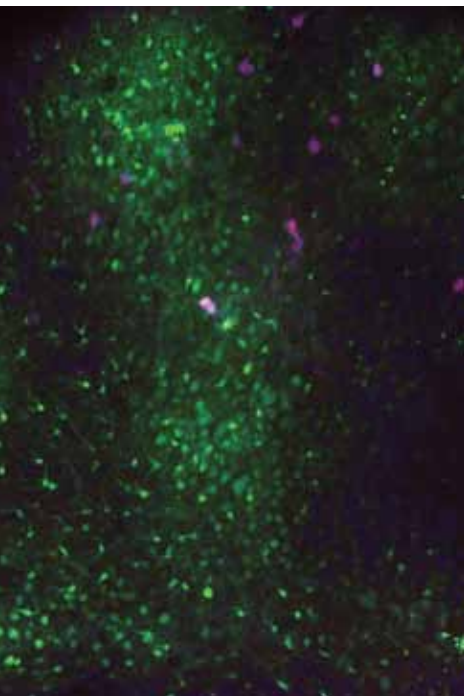
Friday, February 4, 2011
ERB 203

Keynote Speaker - Dr. David Kaplan: Silk Proteins for New Biomedical Materials

Speakers:

Benjamin Kraus - "Time and Distance Dependence of Rat Hippocampal Neuron Responses"
Brandon Zerbe - "Relationship Between Hot Spots From Alanine Scanning and Small Compound Screening"
Kimberly Zubris - "Paclitaxel-Loaded Expansile Nanoparticles for the Treatment of Breast Cancer"
Katherine Calabro - "Variations in the Optical Scattering Properties of Skin in Murine Animal Models"
Margo Monroe - "Multiplex, Rapid, Point of Care Device to Quantify Specific Antibody"
Rachel Stewart - "Development of a Cationic Contrast Agent for Determining Cartilage Health"

Poster Session for TRB trainees



Bill Rabinowitz
"The 'C' in 'EC' in a Non-Auditory Application"

Phillip Joris
"The Tau Axis - an Armin Impersonation"

Duck Kim
"Azimuth Tuning of Neurons in Unanesthetized Rabbit Inferior Colliculus: Results With Virtual Auditory Space Stimuli"

Ken Hancock
"A Physiologically Constrained Van Bergeijk Model of Interaural Time Difference Coding Predicts Bandwidth-Dependent Localization"

Rich Stern
"The Impact of the Distribution of Internal Delays in Binaural Models on Predictions for Psychoacoustical Data"

Steve Colburn
"Prising of Interaural Differences in Physiological Data: Relation to Psychophysics"

Nov 19th 2010
Dr. Mark A. Parker, Department of Communication Sciences & Disorders, Emerson College; Research Associate, Eaton-Peabody laboratories, MEEI
"Genetic Engineering in the Treatment of Hearing Loss: Novel Approaches to Hair Cell Regeneration"

Dec 17th 2010
Dr. Jayaganesh Swaminathan, Research Laboratory of Electronics, MIT
"Interactions Between Neural Coding of Temporal Fine-Structure and Envelop are Critical for the Perception of Noise Degraded Speech"

Jan 11th 2011
Dr. Rich Stern, Professor in the Electrical and Computer Engineering, Computer Science, and Biomedical Engineering Departments Carnegie Mellon University
"The Impact of the Distribution of Internal Delays in Binaural Models on Predictions for Psychoacoustical Data"

Dr. Yi Zhou, Johns Hopkins University
"Spatial and Spectral Processing in the Primary Auditory Cortex of Awake Primate"

Jan 28th 2011
Dr. Lee Miller, University of California, Davis
"Neural Bases of Speech Perception in Noise: Integrating What We Hear, See, and Know"

Feb 4th 2011
Dr. Olaf Strelcyk, Starkey Hearing Research Center
"Peripheral Auditory Processing and Speech Reception in Impaired Hearing"

Mar 24th 2011
Dr. Peter Kroon, Senior Director, Multimedia Concept Engineering, Intel Mobile Communications
"Speech and Audio Processing in Mobile Phones"

Apr 7th 2011
Dr. Juergen Schroeter, AT&T Labs - Research
"The Evolution of Text-to-Speech Synthesis"

Apr 8th 2011
Dr. Lori Holt, Carnegie-Mellon University
"Speech, Melodies and Invaders from Space: The Formation Tuning of Auditory Categories"

Apr 13th 2011
Ross Maddox, PhD Candidate
"Using and Ignoring Acoustic Feature Differences in Auditory Object Recognition"

Apr 15th 2011
Dr. Heidi Nakajima,
"Intracochlear Pressure Measurements in Human Temporal Bones and Non-Invasive Diagnostic Methods for Patients With Conductive Hearing Loss"

Apr 19th 2011
Dr. Jim Glass, MIT Computer Science and Artificial Intelligence Laboratory
"How Two Wreck a Nice Beach: Supervised and Unsupervised Methods"

Apr 22nd 2011
Dr. Mounya Elhilali, Department of Electrical and Computer Engineering, Johns Hopkins University
"Speech Analysis by Brains and Machines: Implications of Coding Strategies in Auditory Cortex"

Apr 22nd 2011
Dr. Alec Salt, Department of Otolaryngology Washington University School of Medicine
"Can Wind Turbines be Bad for You?"

Apr 29th 2011
Dr. Frank Guenther, Department of Speech, Language, and Hearing Sciences, Sargent College of Health and Rehabilitation Sciences, Department of Cognitive and Neural Systems, Boston University
"The Neural Mechanisms of Speech: From Computational Modeling to Neural Prosthesis"

May 13th 2011
Dr. Douglas L. Oliver, Department of Neuroscience, University of Connecticut Health Center
"New Concepts for Neural Circuits in the Inferior Colliculus: Not Just a Simple Relay in the Auditory Pathway"

Jun 3rd 2011
Dr. Kyle Nakamoto, Post-Doc, Northeastern Ohio Universities Colleges of Medicine and Pharmacy (NEOUCOM)
"Projections and Effects of the Auditory Cortex on the Ipsilateral and Contralateral Inferior Colliculus"

Jun 17th 2011
Dr. Matt Goupell, Binaural Hearing and Speech Lab, University of Wisconsin-Madison
"Interaural Decorrelation Detection and Other Binaural Processing in Cochlear-Implant Users"

Jun 24th 2011
Dr. Jasmine Grimsley, Post-Doc, Northeastern Ohio Universities Colleges of Medicine and Pharmacy (NEOUCOM)
"Processing of Communication Calls in the Guinea Pig Auditory Cortex"

2ND ANNUAL SYSTEMS BIOLOGY PROGRAMMATIC AND SBWG MEETING

Sunday, November 7 - Tuesday, November 9, 2010

Host - James Galagan, Boston University

Project Updates - Valentina Di Francesco
Moderators: Gary Schoolnik & Peter Doherty

Computational Modeling and Analysis
Moderators: Reinhard Laubenbacher & Tom Kepler

Shannon McWeeney
Summary of Computational Working Group Satellite Meeting

Bernhard Palsson
Genome-Scale Reconstructions of Salmonella and Yersinia as Frameworks for Integrated Analysis of Omics Data

Jaap Kaandorp
A Simulation Framework to Investigate in vitro Viral Infection Dynamics.

Jason McDermott
Predictive modeling of host response to influenza infection identifies conserved pathways between macaque, mouse, and human

Host Pathogen Interactions
Moderators: Mike Farzan, Denise Monack, Tom Braciale

Eisfeld Amie
An Integrative Approach for Identifying Pathogenicity Determinants of Highly Pathogenic Avian Influenza Viruses

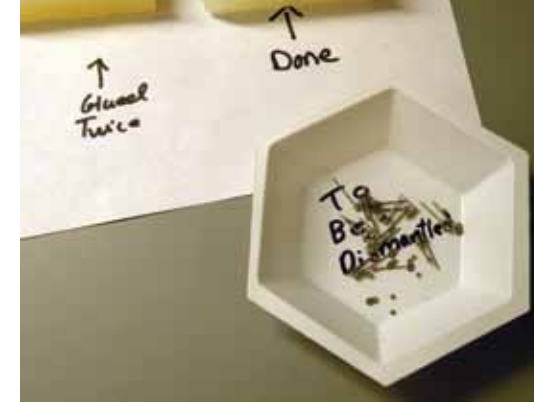
Paul Thomas
The early response of primary human airway epithelial cells (hAE) to infection with the pandemic H1N1 in comparison to its parent strains and to seasonal influenza.

Carrie Rosenberger
microRNA-144 is a negative regulator of the host response to influenza infection

Lisa Gralinski
Comparative Analysis of Gene Expression in SARS-Coronavirus-or H5N1 Influenza-Infected Mice

Metabolism and Regulation
Moderators: Shelley Payne & Josh Adkins

Fred Heffron
Regulatory processes in the pathogen Salmonella that enable extensive host pathogen interactions



Edward Dennis
The Fatter Side of Metabolomics: The Emerging Field of Lipidomics

Thomas Metz
Gas Chromatography-Mass Spectrometry (GC-MS)-Based Metabolomics Analyses of Salmonella enterica serotype typhimurium

BRAIN AND VISION SEMINAR SERIES

Network Medicine: From Complex Networks to the Human Diseasesome

Dr. Albert-László Barabási Center of Complex Networks Research, Northeastern University and Department of Medicine, Harvard University, Jan. 28, 2011

"Signals Under Noise and Networks"
Leonid Perlovsky
Air Force Research Laboratory and Harvard University
Nov. 19, 2010

"A Robotic Assessment of Lower Extremity Motor Adaptation"
Mary Goldsmith, Aug. 10, 2010

"Mechanisms and Neuronal Substrate Involved in Psychophysical Tasks Underlying Visually Guided Navigation in Humans"
Elif M. Sikoglu Brain and Vision Research Laboratory
Jun. 3, 2010

Facilities

RESEARCH LABORATORIES

The Biomedical Engineering Department maintains state of the art instructional laboratories to support its educational programs. These facilities are enumerated below and comprise a total of ~8400 sqft. Additionally, Department facilities support a vibrant research program in approximately 42,600 square feet of research laboratories at 24-44 Cummington St., on Boston University's Charles River Campus. These facilities include 44 separate research laboratories and 6 research centers. While these facilities primarily support research and graduate education, they are inherently tied to the environment experienced by undergraduates. Additionally, these facilities support the Senior Design Project Courses as well as serve as homes for all students who become engaged in undergraduate research.

INSTRUCTIONAL LABS

Biomedical Engineering Instructional Laboratory, ERA 209/211 (1,837 sqft)

The Biomedical Engineering Instructional Laboratory is a 14 workstation wet lab designed to aid in teaching core Biomedical Engineering concepts and skills in several courses. Each station is equipped with a dual-core processor PC (2.2 GHz Core2Duo, 2 GB system memory), a data acquisition card (DAQ) and breakout box, and benchtop testing equipment (triple power supply, digital multimeter, function generator, low-noise differential amplifier, and oscilloscope). Students are able to design and conduct experiments to record a variety of physiologically important signals such as electrocardiograms, nerve conduction, and lung volumes. Each PC is also loaded with analytical software including Matlab, Mathcad, LabView, and SigmaPlot for data analysis and professional presentation.

BME Computational Simulation Facility, LSEB B03/B04 (1,851 sqft)

The Biomedical Engineering Computational Simulation Facility is a high-performance computing laboratory located at 24 Cummington Street, basement rooms B03 and B04, with a smaller computational classroom located at 48 Cummington Street, basement room B11. The satellite facility in 48 Cummington was completed in 2001 and the main facility in LESB was completed in 2005. The facility consists of high-performance Linux workstations at each of over fifty seats and rack-mounted computational nodes in a separate server room. The facility is available for classroom instruction, homework and research projects requiring high computational power, and all machines are clustered together as part of a parallel computing

grid for remote access to regular scientific applications and for processing long, computationally intensive jobs.

Cell and Biomolecular Mechanics Instructional Laboratory, ERB B08 (1,276 sqft)

The Cell and Biomolecular Mechanics Instructional Laboratory supports BME courses in Cellular and Subcellular Biomechanics and Molecular Bioengineering. The laboratories focus is on methods for study and manipulation of biomolecules and structural components of cells. Some of the equipment used in lab projects include: DSC microcalorimeter, ITC microcalorimeter, Freezing Point Osmometer, Vapor Pressure Osmometer, Microforge, Multitrough/Film balance, Video cameras, Micropipette puller, computers for automated experimentation and professional data analysis and representation, Real-time PCR machine, PCR thermocycler, UV-spectrophotometer equipped with thermo-regulated compartment, protein and DNA gel electrophoresis, gel documentation, Optical microscope equipped with: fluorescent attachment, optional Hoffman Modulation Contrast illuminating system, accessories for micromanipulation and pipette aspiration

CORE FACILITIES

BME Micro/Nano Imaging Facility (1,000 sqft)

Core Director: Phil Allen, Ph. D., The Micro and Nano Imaging (MNI) Facility suite is a central teaching and research facility with a focus on imaging biological materials ranging from tissues to individual molecules. Instrumentation includes Confocal, TIRF and multiple Widefield systems with the ability to maintain cells and tissues under appropriate conditions.

Micro and Nano Fabrication Facilities (1000 sqft)

The Micro/Nano Fabrication Facilities are the focal point for all soft lithography. Two clean rooms (a class 100 and class 1000) house all of the necessary capabilities to write patterns and create devices that span the nano to micro size scale in nonstandard organic/inorganic biomaterials. Micro/nano fabrication classes will utilize both the Class 100 and Class 1000 clean rooms, but the Class 1000 area will allow space for items that do not need the ultra clean environment of the Class 100 room.

Biointerface Technology Core (1000 sqft)

Core Director: Xin Brown, Ph. D., The BioInterface Technologies Facility is a central teaching and research facility with a focus on biomaterial and tissue engineering. It offers instrumentation and service in biomaterial synthesis, property (chemical, physical, mechanical) analysis and biological assessment.



**BOSTON
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