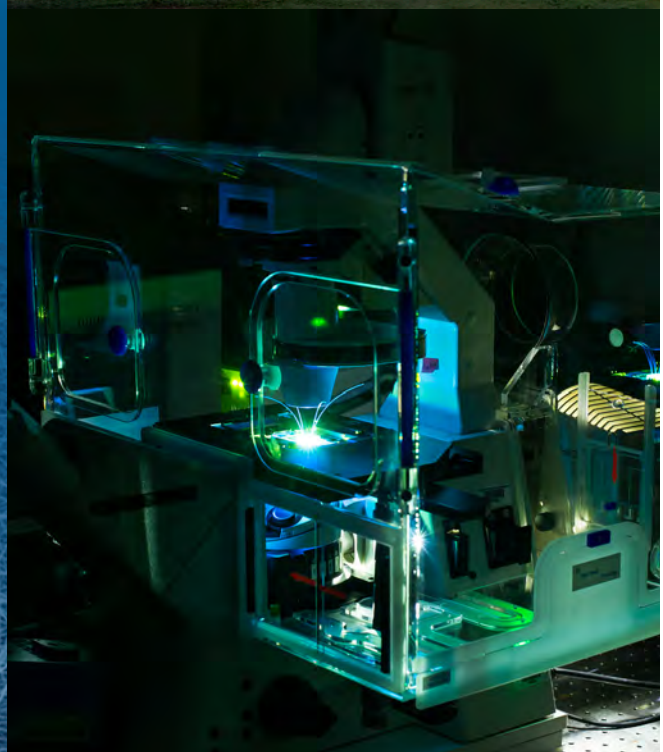
UR BME

University of Rochester Department of Biomedical Engineering

Newsletter | Fall 2014

Inside this Issue:



The BME Mission

"Discover, create, and educate to engineer ever better solutions in biomedical research and health care."

The UR BME Newsletter

The UR BME Newsletter is published once a year by the Department of Biomedical Engineering at the University of Rochester.

BME by the Numbers

15	**Primary Faculty**
10	**Affiliated Research Centers**
$400,000	**Research Expendentures per Primary Faculty member**
37	**Graduate Faculty**
22	**Secondary Faculty**
73	**Post-docs & Graduate Students**
370	**Undergraduate Students**

BME Areas of Research

Biomechanics
Biomedical Acoustics
Biomedical Nanotechnology
Biomedical Optics
Cell & Tissue Engineering
Medical Imaging
Neuroengineering

About the Cover

Microfluidic Bioreactors: This device is a flow-based cell co-culturing system consisting of two chambers separated by a nanoporous silicon membrane. It allows investigators to perform in situ cell manipulation, optical imaging, and flow-based assays using minimal amounts of reagent. The ultrathin silicon membrane provides an excellent mimic of biological barrier properties (McGrath Lab). Photo by J. Adam Fenster / University of Rochester.

www.bme.rochester.edu

Message from the Chair

Alumni and Friends,

It's a wonderful time in Rochester. The fall colors are exceptional this year, and the Department is continuing to flourish.

In research, our direct expenditures exceeded $400K per faculty member this past year, and we have received news of six newly funded awards, three in the past month alone. Our graduate students continue to garner recognition, including two of the prestigious Whitaker International Fellow awards. Our undergraduate program, the largest in the engineering school, continues to attract top students. Between graduate students, undergrads and alums, Rochester has accounted for three Whitaker International awards, six NSF fellowships (plus an honorable mention), and nine NIH graduate fellowships in the past year. We are also proud of our achievements in Design. Rochester teams have placed in the top three at the Coulter College in each of the past three years, and our teams have dominated the University's annual entrepreneurship competition, finishing first in nine out of the last ten years, a reflection of our continuing excellence in design education at both the undergraduate and masters levels. We all have a lot to be proud of and thankful for. On behalf of the entire faculty I extend our best wishes and hopes for your success and prosperity. Meliora!

Rick Waugh
Chair, Department of Biomedical Engineering

Waugh honored with Lifetime Achievement Award

Richard Waugh "has served our university incredibly well in many capacities for 34 years" said Dean Robert Clark in presenting Waugh with the school's Lifetime Achievement Award.

One of the most noticeable successes here is the growth of the Department of Biomedical Engineering under Waugh's leadership – at the inception of the department in 2010; there were only ten students. Now BME is the Hajim School of Engineering's largest department, with a total enrollment expected to top 450 undergraduate and graduate students this fall. Waugh's lab is one of the leading facilities for investigating red blood cell mechanical properties and the stability of biological membranes. Long before "multidisciplinary collaboration" became the buzzword it is today, Waugh was collaborating with researchers on both the River Campus and the School of Medicine and Dentistry – and with other institutions. He is a team leader working with researchers at the University of Rochester, Cornell University, and the University of Pennsylvania to investigate white blood cell response to injured tissue. This project has attracted more than $20 million in federal funding since 2004.

Waugh's efforts have not gone unnoticed. Last year, he received the Biomedical Engineering Society Distinguished Service award; he served as president from 2010 to 2012. The previous year, he was elected as a fellow of the American Association for the Advancement of Science for his distinguished contributions to the study of cell and membrane mechanics and for leadership in biomedical engineering. Dean Clark chose Waugh to be his associate vice president for research last year as well - "In other words, Rick does many things for our school and our university, and he does them extraordinarily well."

BME Students Intern with Idea Boxx, Recognized as Co-Inventors

Throughout the past year, UR BME students have been working with Idea Boxx on assessing and testing a cleaning process known as Hydra Rinse™. Because of the dedication, hard work, and relationships fostered throughout this past year, Idea Boxx opened up two summer internship positions. Facilitated by CMTI Executive Director Greg Gdowski, Jacob Parisi (BME junior) and Edward Ruppel (BME sophomore) began their three-month summer internship with Idea Boxx this past June.

Jacob and Edward's summer work focused on the commercialization process of the Hydra Rinse™ system: they helped prototype, test the product, and interacted with the customers who were using the first models to come from their bench top. In addition to working on the Hydra Rinse™ system, Edward also worked on the design of a variety of products for the commercial food service industry to facilitate effective disinfection and sanitation. One of the unique projects was fine-tuning a Taylor 706 ice cream machine to cut the cleaning time from an hour and a half to just under eight minutes. "The personal accessibility to every aspect and position within the company was like nothing else and it really spoiled Jake and me... Idea Boxx is full of excellent mentors with unconventional backgrounds, leading to an excellent dynamic… It was honestly one of the greatest experiences I have ever had." Edward said.

"The Idea Boxx/CMTI relationship has been very successful and fruitful for both of us and I look forward to continuing with the group over the next year. Idea Boxx is a breeding ground for new ideas and it is an ideal platform for translating new concepts to commercialization." Gdowski said. Jacob and Edward are both being acknowledged as co-inventors on the Hydra Rinse™ patent application and both will be working with Idea Boxx on a part-time basis throughout the school year. Gdowski adds, "What I have enjoyed the most about this process is that it has created very passionate engaged young engineers and Idea Boxx deserves much of the credit for that. That has occurred because they were given the freedom to apply what they have learned here at UR… Their summer experience will be something they remember — likely for the rest of their lives."

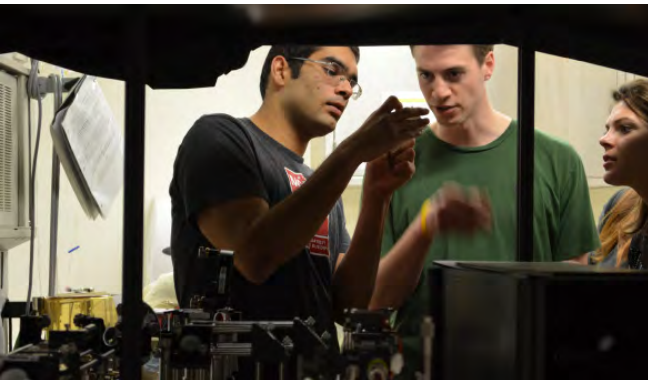
Pictured above from left to right: Idea Boxx COO Al Mustardo, Edward Ruppel, Jacob Parisi, and Idea Boxx CEO Richard Aab.

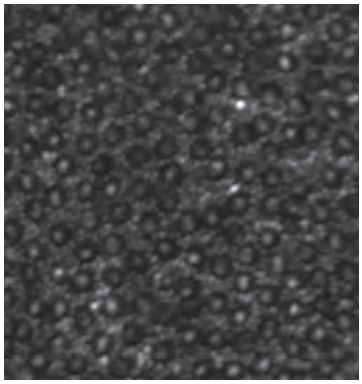
BMES Coulter College

BMES
ADVANCING HUMAN HEALTH AND WELL BEING™

A team of BME students took second place at the BMES Coulter College training program, which focuses on translation of biomedical innovations. Nineteen student design teams, guided by faculty and clinical experts, participated in this year's program, including over 200 students, faculty, and clinical collaborators. BME team members Namita Sarraf, Ling Yang, Rachel Niu, Stephanie Rigot, Nuley Seo, and Benjamin Dengler, led by Professor Scott Seidman, developed a concept for a device to monitor a condition called autonomic dysreflexia, which is a potentially fatal syndrome that is common in people with spinal cord injuries. This is the second year in a row that one of our Biomedical Engineering teams has placed in the top three at Coulter College.

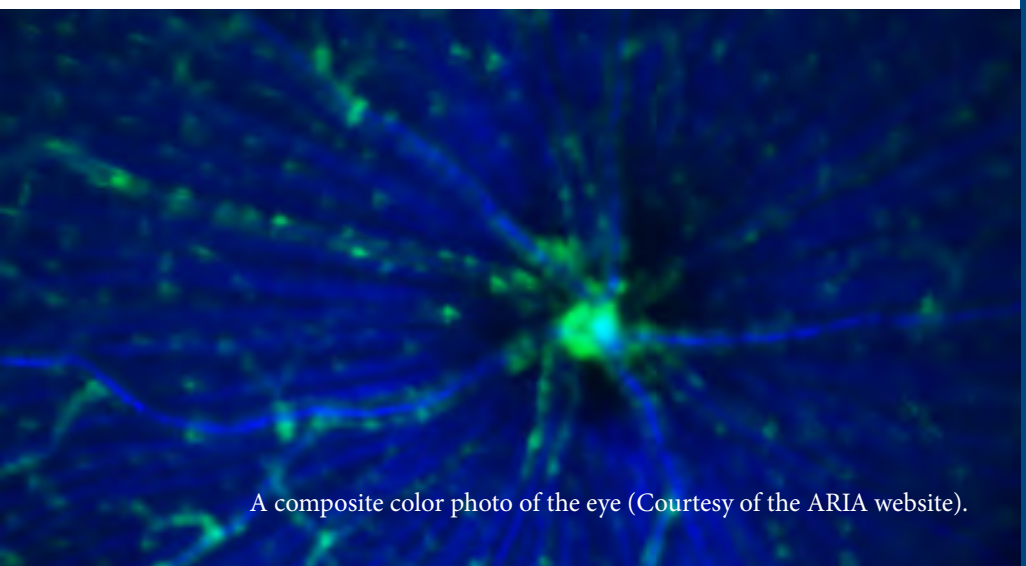
Senior Design Team Creates Model 'Eye' for Adaptive Optics Imaging





Left: Graduate student Robin Sharma of the ARIA works with Phantomize Design team in the lab (Heather Deal / University of Rochester). Right: Rods and cones in the eye (Courtesy of ARIA website).

This past year, BME Senior Design Team 'Phantomize Designs' (Gwen Musial, Taylor McKenty, and Scott Levy) worked inside the URnano facilities during development of their Senior Design project. URnano is a center at the University that consists of a 1,000 sq. foot metrology facility and a 2,000 sq. foot cleanroom fabrication facility. These facilties allow for production of high temperature nanomaterials and incorporate the University's expertise in optics and optical device technology. The team worked with Jennifer Hunter, Assistant Professor, Department of Ophthalmology, and Principal Investigator of the Advanced Retinal Imaging Alliance (ARIA), to develop their project – a model 'eye' that includes features similar to the cellular structure of the retina. This model would enable the ARIA group, and others across the world utilizing adaptive optics, to calibrate their systems. Adaptive optics imaging is unique in that it allows for single rod and cone photo- receptors in the eye to be visible. ARIA is a multidisciplinary lab comprised of researchers from the Flaum Eye Institute, the Center for Visual Science, and The Institute of Optics at the University of Rochester. For more information about ARIA: http://aria.cvs.rochester.edu. Read more about Senior Design at: www.bme.rochester.edu.



A composite color photo of the eye (Courtesy of the ARIA website).

The 7th Annual World Congress of Biomechanics

Left to right: Caitlin O'Connell, Andrea Morrell, Megan O'Donovan, Ben Freedman, and Professor Amy Lerner

Several BME faculty and students attended the 7th Annual World Congress of Biomechanics in Boston, Massachusetts. The World Congress of Biomechanics (WCB) is an international meeting held once every four years, rotating among Europe, Asia, and the Americas. The meeting brings together engineers, scientists, and clinical specialists with applications ranging from basic biology to medical devices to the latest technologies. The meeting is attended by researchers, engineers from industry, medical doctors, academics, and students.

Faculty, students, and alumni who attended:

Faculty: Amy Lerner, Stephen McAleavey, Richard Waugh, Marvin Doyley, Kevin Parker, Mark Buckley, and Paul Funkenbusch.

Students/Post-docs: Molly Zapkin, Luis Delgadillo, Ruth Chimenti, Jonathan Langdon, Graham Marsh, and Frank DiLiberti.

Alumni: Ben Freedman, Andrea Morrell, Jiang Yao, Nick Vavalle, Nicole Varble, Hanna Isaksson, Sijia Zhang, Sally Crawford, Woojin Han, Meghan O'Donovan, Emily Robbins, Alison Altman, Caitlin O'Connell, Daniel Shedd.

FACULTY GRANTS & AWARDS

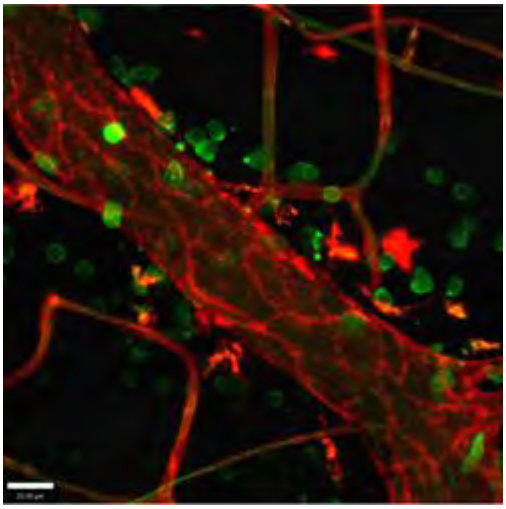
Professor **Laurel Carney** received a five year renewal for her NIH-NIDCD grant entitled "Auditory Processing of Complex Sounds." The new emphasis for the next five years is to investigate neural coding of speech sounds, starting with vowels. This new direction is possible thanks to a collaboration with Professor Joyce McDonough from the Linguistics Department.

Professor **Mark Buckley** has been awarded a pilot grant from the University of Rochester Core Center for Musculoskeletal Biology and Medicine (URCCMBM) for his research in collaboration with A. Samuel Flemister from the Department of Orthopaedics and Mike Richards from the Department of Surgery. This grant will support their research to improve treatment for insertional Achilles tendinopathy (IAT), a common and painful disease that resists standard forms of non-operative care.

Professor **Jong-Hoon Nam** lab's research titled "Computational analysis of microfluidic mechanotransduction in the mammalian cochlea" will be supported by the University of Rochester Office of the Provost and the School of Medicine and Dentistry Dean's office via the HSCCI (Health Sciences Center for Computational Innovation). The HSCCI supports health sciences research using high performance computational resources. Dr. Nam's lab investigates the mechano-transduction of the inner ear and how the inner ear selects and amplifies external stimuli.

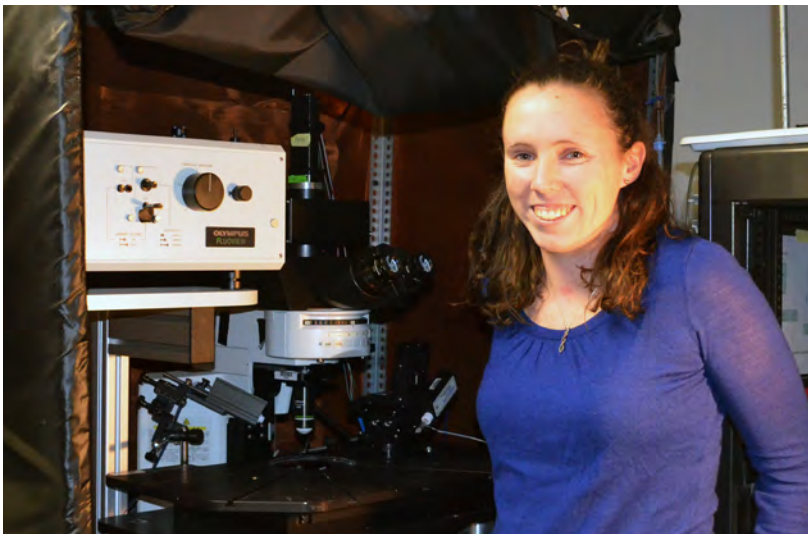
Professor **Danielle Benoit** has been awarded a five year grant from the National Institutes of Health, specifically NIAMS, for the project entitled: "Tissue engineering strategies to revitalize bone allografts." This project focuses on the revitalization of allografts using tissue engineering strategies to recapitulate critical healing functions of the periosteum.

Team of Investigators Awarded $3.5 Million to Study Mechanism of Sepsis



A team of investigators led by **Minsoo Kim, Ph.D.** (Department of Microbiology & Immunology, UR), **BME Chair Richard Waugh, Ph.D.** (Department of Biomedical Engineering, UR) and **Jonathan Reichner, Ph.D.** (Department of Surgery, Brown University) in collaboration with **James McGrath, Ph.D.** (Department of Biomedical Engineering, UR), and **Anthony Pietropaoli, M.D.** (Department of Medicine, Pulmonary Diseases and Critical Care, UR) recently received a five-year grant from the National Institutes of Health for just over 3.5 million dollars. This grant is in support of their research to understand the mechanisms of damage to the endothelium during sepsis. Sepsis, which is thought to affect over 1 million Americans each year, is one of the leading causes of death in the United States, accounting for over 250,000 deaths annually. It involves whole-body inflammation in response to a severe infection. Damage to the vascular endothelium resulting from the immune response to infection is a key step that can lead to impaired blood flow, organ failure, and death. Their research will result in improved understanding of the mechanisms leading to endothelial damage and will enable development of more effective therapeutic strategies to treat this growing threat to public health. *Pictured: Immune cells (green) break through blood vessel walls in sepsis.*

Using Second Harmonic Generation to Predict Metastasis



Edward Brown, Ph.D. has received a $140k grant from the Department of Defense Breast Cancer Research Program for his project entitled "Prediction of Metastasis Using Second Harmonic Generation." The goal of this one year project is to expand upon a recent finding from Dr. Brown's laboratory that an optical scattering phenomenon called second harmonic generation (SHG), when applied to breast cancer biopsy specimens, can help predict metastatic outcome in 10-year patient follow-up data. This has significant clinical implications because current data suggests that about half of patients that are systemically treated after their tumor is removed would not have experienced a metastasis, did not need to suffer the toxic effects of systemic therapy, and therefore were "overtreated". Hence there is a pressing need to predict who will, and will not, experience metastasis, to minimize overtreatment. The current work, conducted in collaboration with **Dr. Peter Salzman** (Biostatistics), **Dr. Ping Tang** (Pathology), and **Dr. Kristin Skinner** (Surgery), will validate their recent findings in a second patient cohort and determine the most powerful predictive formula incorporating SHG signatures as well as other clinical data. **Kathleen Burke**, a Ph.D. candidate in the Brown lab, was awarded a National Cancer Institute F31 Ruth L. Kirschstein National Research Service Award for Individual Predoctoral Fellows. This three years of funding will be used to study collagen changes throughout breast cancer progression and metastasis using second harmonic generation. *Pictured: Kathleen Burke, Ph.D. candidate in the Brown Lab.*

Ultrasound for Vascular Engineering

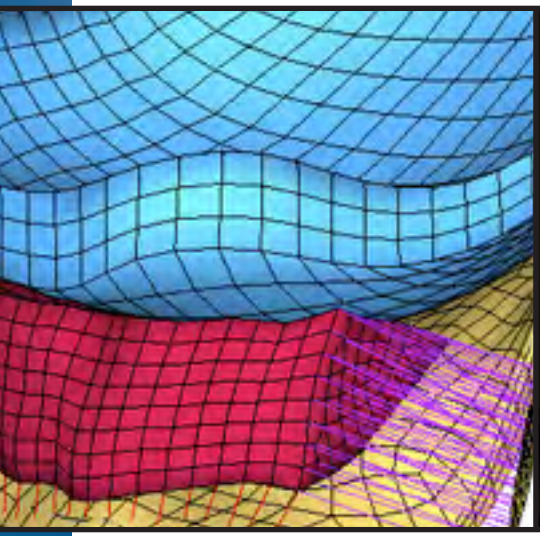
Diane Dalecki, Ph.D. (BME) and **Denise C. Hocking, Ph.D.** (Pharmacology & Physiology) have received a $1.8 million grant from the National Institute of Biomedical Imaging and Bioengineering (NIBIB) for their project titled "Ultrasound standing wave fields for vascular engineering." The goal of this 4-year project is to advance a novel ultrasound technology to fabricate complex, functional microvascular networks within three-dimensional engineered constructs. Collaborators on this project are **Maria Helguera, Ph.D.** (Imaging Sciences, RIT), **Ingrid Sarelius, Ph.D.** (Pharmacology & Physiology) and **Angela Glading, Ph.D.** (Pharmacology and Physiology). New, versatile vascularization strategies are needed to produce small-scale 3D tissue models and are critical for the fabrication of large-scale engineered tissues. The noninvasive capacity of ultrasound also enables innovative capabilities for fabricating microvessel networks within hydrogels injected within tissues. The successful completion of this project will provide new tools for tissue engineering and for a variety of clinical reconstructive and vascular surgery applications. *Pictured: Professor Dalecki and Professor Hocking in the lab. Watch the YouTube video that accompanies the story here:* https://www.youtube.com/watch?v=ZL-cx21SGn4

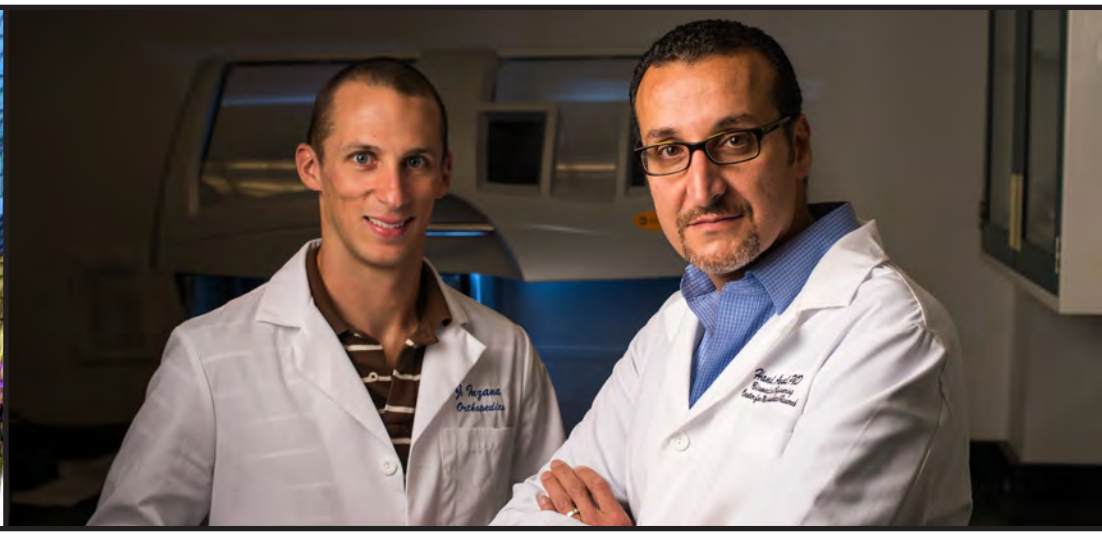
UR BME: THE SCOPE OF RESEARCH

Biomedical Engineering research at the UR is highly multidisciplinary and spans laboratories in the Hajim School of Engineering and Applied Sciences and the University of Rochester Medical Center. Faculty research expertise encompasses the field of BME and includes biomechanics, biomedical acoustics, biomedical nanotechnology, biomedical optics, cell and tissue engineering, medical imaging, and neuroengineering. Research in biomedical engineering does not stop in the laboratory. The Clinical and Translational Science Institute, the Center for Medical Technology and Innovation, and the Center for Entrepreneurship all provide opportunities to enable biomedical discoveries to move from the laboratory bench to the patient's bedside. With facilities both in the Robert B. Goergen Hall for Biomedical Engineering and Optics and the nearby University of Rochester Medical Center, the UR BME program offers state-of-the-art facilities for research and training. BME faculty and students benefit by multidisciplinary collaborations with numerous departments and affiliated research centers at the UR, including those listed below.

Affiliated Research Centers:

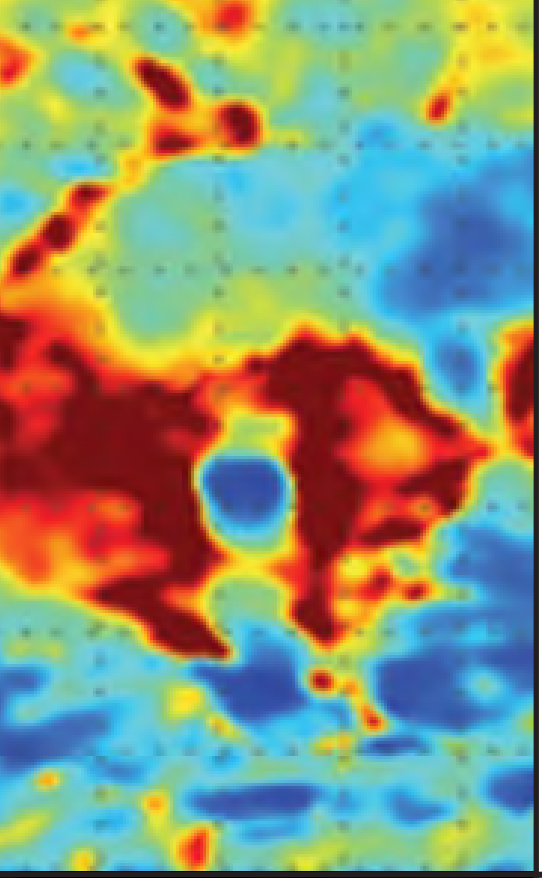
Aab Cardiovascular Research Institute
Center for Medical Technology & Innovation
Center for Musculoskeletal Research
Center for Navigation and Communication Sciences
Center for Translational Neuromedicine
Center for Visual Science
Wilmot Cancer Center
Rochester Center for Biomedical Ultrasound
Rochester Center for Brain Imaging
UR Stem Cell and Regenerative Medicine Institute





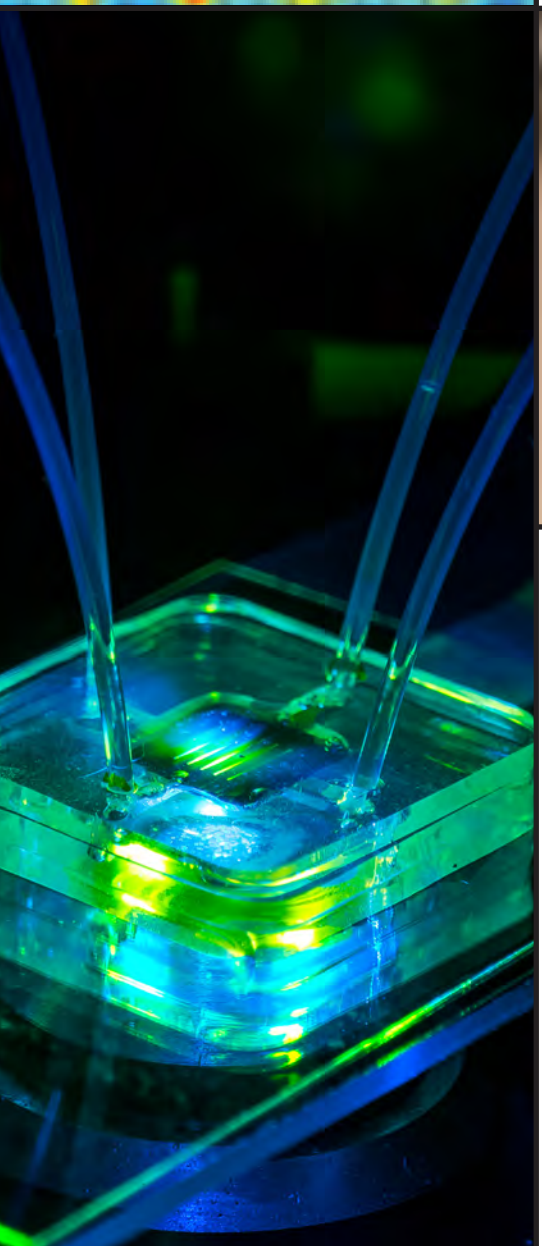
BIOMECHANICS

Biomechanics research at the UR is conducted on multiple levels – from nano-scale molecular interactions between proteins, micro-scale cellular interactions with their extracellular environment, macro-scale mechanics of tissue and systems including joints and circulatory systems, all the way up to whole body (organism) dynamics. Whether studying cellular interactions with their surroundings, or the mechanics of walking, our research is extremely interdisciplinary, integrating concepts and techniques from a wide range of related fields and combining experimental and computational methods. The Center for Musculoskeletal Research at the UR has consistently ranked in the top 5 NIH-funded musculoskeletal programs in the nation for nearly a decade. *Current Researchers: Hani Awad, Danielle Benoit, Mark Buckley, Robert Clark, Sheryl Gracewski, Amy Lerner, Elena Lomakina, James McGrath, Jong-Hoon Nam, Renato Perucchio, J. Edward Puzas, Edward Schwarz, Richard Waugh, and Michael Zuscik.*



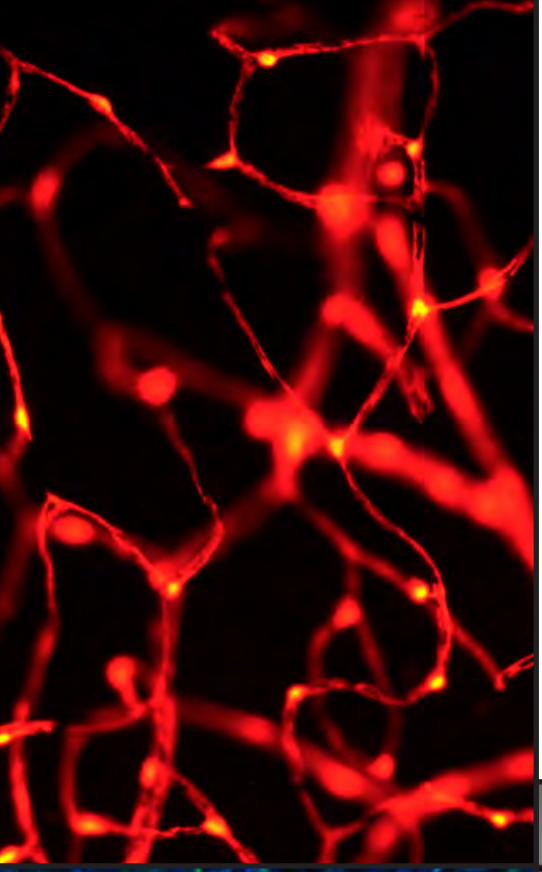
BIOMEDICAL ACOUSTICS

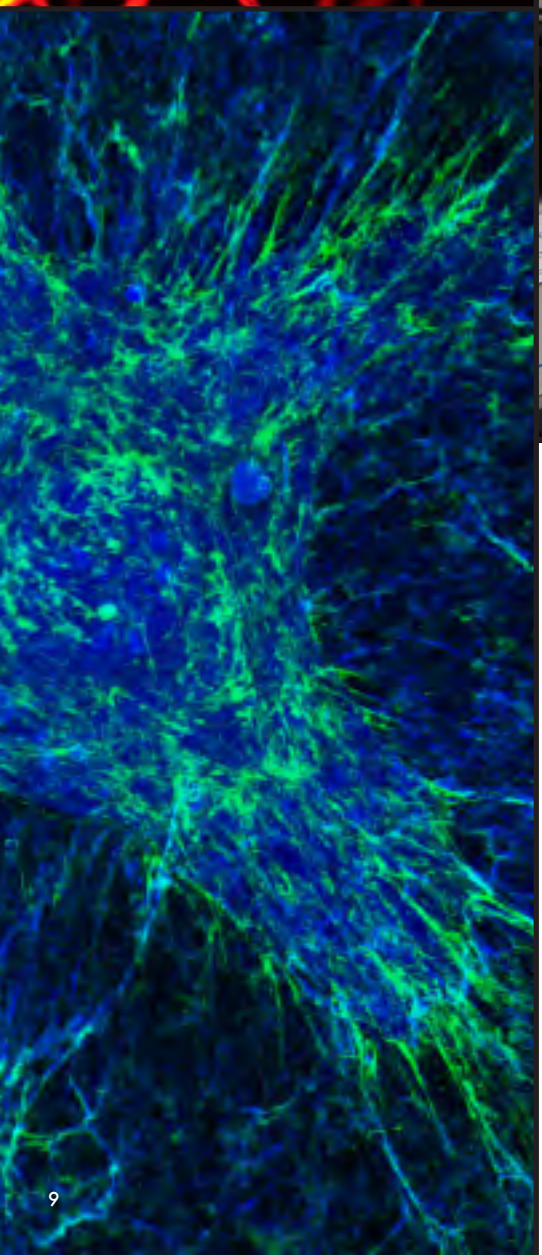
Biomedical acoustics research focuses on interactions of sound fields with cells, tissues, and organ systems. Hearing research at the UR ranges from cellular and molecular studies of the process of sensory reception in the inner ear, to the development of drug delivery devices, to behavioral studies of hearing, related to sound localization and the processing of complex sounds. At the UR, research laboratories are advancing the use of biomedical ultrasound for diagnostic imaging and discovering new therapeutic applications of ultrasound. The UR is home to the Rochester Center for Biomedical Ultrasound (RCBU), which consists of nearly 100 scientists, engineers, physicians, and clinicians dedicated to researching the use of ultrasound in medicine and biology. *Current Researchers: David Borkholder, Laurel Carney, Diane Dalecki, Vikram Dogra, Marvin Doyley, Sheryl Gracewski, Denise Hocking, Anne Luebke, Stephen McAleavey, Jong-Hoon Nam, Gary Paige, Kevin Parker, Deborah Rubens, and Scott Seidman.*



BIOMEDICAL NANOTECHNOLOGY

Nanotechnology research at the University of Rochester ranges from nano-structured materials for biological sensing, nanoporous membranes, nanoparticle-based drug delivery, imaging, transport, toxicity properties of semiconductor nano-crystals, and nano-biomechanics. Goergen Hall is also home to the URnano facility, which offers a unique set of nanofabrication tools for lithography, deposition, etch and materials characterization. *Current Researchers: Danielle Benoit, Robert Clark, Lisa DeLouise, James McGrath, Benjamin Miller, J. Edward Puzas, Richard Waugh.*



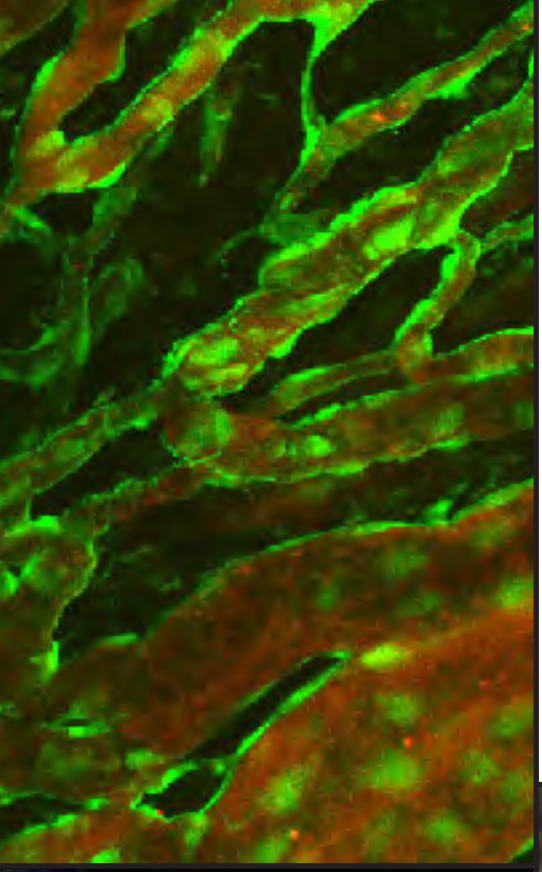


BIOMEDICAL OPTICS

Biomedical Optics focuses on the design and application of advanced optical techniques to solve pressing problems in medicine and biology. This work is enhanced by the collaborative opportunities with the Institute of Optics and the Center for Visual Science. The Institute of Optics at the University of Rochester has been educating the next generation of leaders in the field since its founding in 1929 as the first optics department in the country, and approximately half of all optics degrees awarded nationwide have been awarded by The Institute of Optics. Biomedical optics at the UR includes areas as diverse as second harmonic generation microscopy of tumor pathophysiology, Raman spectroscopy of oral bacteria, and the application of adaptive optics to study human vision. *Current Researchers: Andrew Berger, Edward Brown, Regine Choe, Thomas, Foster, Jennifer Hunter, Duncan Moore, Seth Perry, Jannick Rolland, David Williams, Geunyoung Yoon, James Zavislan.*

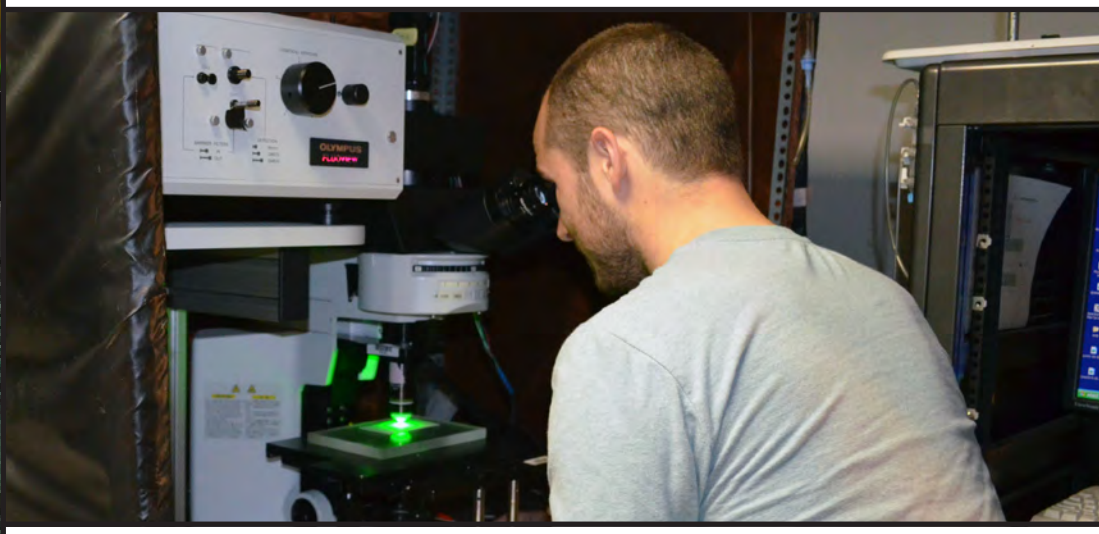
CELL & TISSUE ENGINEERING

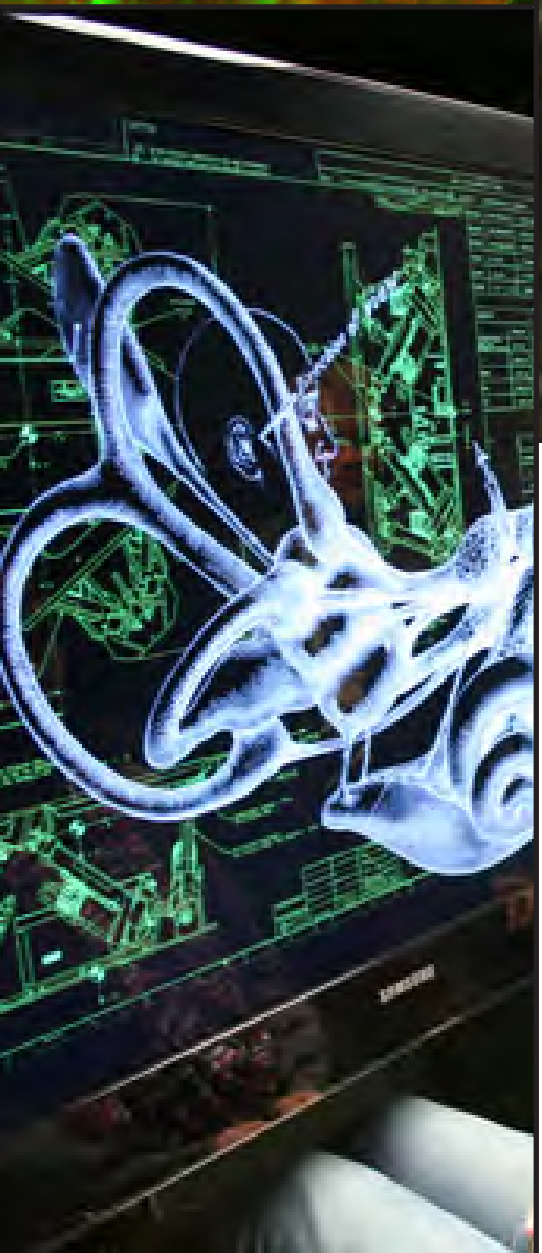
Advances in tissue engineering and regenerative medicine have the potential to revolutionize the treatment of a wide variety of diseases and injuries. Research in UR BME faculty laboratories spans a wide range of topics in this field including, the study of cellular interactions with the extracellular matrix, stem cell therapies, design of bioreactors, musculoskeletal tissue engineering, innovations in biomaterials for drug delivery, and the development of new technologies for the fabrication and monitoring of engineered tissues. Therapeutic biomaterials research at the UR focuses on controlling biomaterial functionality and architecture in order to treat diseases, control cell behavior, or answer fundamental biological questions. *Current Researchers: Hani Awad, Danielle Benoit, Mark Buckley, Patricia Chess, Robert Clark, Diane Dalecki, Denise Hocking, Lisa DeLouise, Anne Luebke, Elena Lomakina, Angela Glading, James McGrath, Jong-Hoon Nam, J. Edward Puzas, Ingrid Sarelius, Edward Schwarz, Richard Waugh, and David Wu.*



MEDICAL IMAGING

Medical imaging research at the UR involves many different imaging modalities and ranges from basic science to clinical applications. Areas of research include ultrasound imaging techniques, biomedical optics and microscopy, multi-modal and spectroscopic imaging, magnetic resonance imaging, and image segmentation, registration, and processing to enable computer-aided diagnosis. Research projects are highly interdisciplinary, typically involving engineers, radiologists, clinicians, imaging scientists, physicists, and computer scientists. Research in medical imaging at the UR is strengthened by collaborative opportunities offered by the Rochester Center for Biomedical Ultrasound, the Rochester Center for Brain Imaging, and the Institute of Optics. *Current Researchers: Edward Brown, Regine Choe, Diane Dalecki, Marvin Doyley, Amy Lerner, Stephen McAleavey, Ruola Ning, Kevin Parker, Seth Perry, Jannick Rolland, Edward Schwarz, Axel Wismüller, and Jianhui Zhong.*





NEURO-ENGINEERING

Research in Neuroengineering at the University of Rochester involves the study of biological mechanisms of neural systems and the integration of these systems with devices and diagnostic techniques. In particular, our faculty has special interests in the vestibular, auditory, and visual sensory systems. Students have opportunities in clinical, translational and basic science research involving both experimental and computational neuroscience. *Current Researchers: Laurel Carney, Benjamin Crane, Greg DeAngelis, Greg Gdowski, Anne Luebke, Jong-Hoon Nam, Maiken Nedergaard, Gary Paige, Tatiana Pasternak, Marc Schieber, Scott Seidman, and David Williams.*

STUDENT HONORS & AWARDS

NSF FELLOWSHIPS

Maureen Newman (Benoit Lab), **Jason Inzana** (Awad Lab), **Michael Baranello** (CHE graduate student, Benoit Lab), and **Amanda Chen** (Benoit Lab) were recipients of NSF graduate research fellowships. **Bentley Hunt** received an NSF Honorable Mention and BME alums **Greg Fedorchak** and **Ian Marozas** were also recognized with NSF fellowships. The fellowship, which is part of a federally sponsored program, provides up to three years of graduate study support for students pursing doctoral or research-based master's degrees.

NIH AWARDS

Andrew Shubin (MSTP, Benoit Lab) has received a 6% on his F30 application entitled: "Poly(ethylene glycol) Hydrogels for Salivary Gland Regeneration." The award will support Andrew's remaining Ph.D. training and also his final two years of medical school. **Kathleen Burke** (Brown Lab) received a fellowship to support her research from the NIH-sponsored F32 grant "Exploring the Role of Collagen Structure in Breast Cancer Metastatic Progression."

Echoe Bouta (Schwarz Lab), **Youssef Farhat** (Awad Lab), **Michael Hoffman** (Benoit Lab), and **Sara Nowacki** (Awad Lab) received fellowships to support their Ph.D. research from the NIH-sponsored T32 grant administered through the Center for Musculoskeletal Research (Training Program in Orthopaedic Research). **Christopher Farrar** (Hocking Lab) received support for Ph.D. research from the NIH-sponsored T32 grant "Multidisciplinary training in pulmonary research."

Adam Bosen (Paige Lab) received support for his PhD research from an NIH Training Grant: "Training in hearing, balance, and spatial orientation." **Mark Lifson** (Miller Lab) received support for his Ph.D. research from an NIH Training Grant: "Training in HIV Replication and Pathogenesis."

WHITAKER FELLOWSHIPS

Echoe Bouta (Schwarz Lab), **Jason Inzana** (Awad Lab), and **Amanda Chen** (Benoit Lab) have each been awarded a 2014-2015 Whitaker International Program Scholarship grant.

HOWARD HUGHES GRANT

Tejas Khire (Waugh Lab/McGrath Lab) will be receiving graduate study support under the Cardiovascular Research Institute's HHMI (Howard Hughes Medical Institute) training grant.

UR FELLOWSHIPS

Maureen Newman received a prestigious Robert L. & Mary L. Sproull Fellowship. Robert L. Sproull was a distinguished physicist and was the University's seventh president. The fellowship program named in his honor reflects his commitment to intellectual excellence.

Incoming student **Raul Rodriguez** received a Provost Fellowship and both **Karla Mercado** and **Daniel Marnell** are current Provost Fellows. First awarded in 1990, the Provost Fellowship has provided stipend support to students in 30 different doctoral programs.

Kathleen Chamberlain received a Dean's Fellowship. The fellowship will provide a stipend for her first two years of graduate study.

Daniel Marnell (Nam Lab) received a travel fellowship from NSF's East Asia and Pacific Summer Institutes (EAPSI) Program for study in summer 2014 in Singapore.

Mahesh (Max) Nagarajan received the 2013-2014 BME Outstanding Dissertation Award. Max also won honorable mention in the Hajim school-wide competition for meritorious Ph.D. thesis.

Maggie Thomas received the 2013-2014 BME Graduate Student TA Award for distinguished service as a teaching assistant in BME.

THE 2014 CHARLES & JANET FORBES ENTREPRENEURIAL COMPETITION

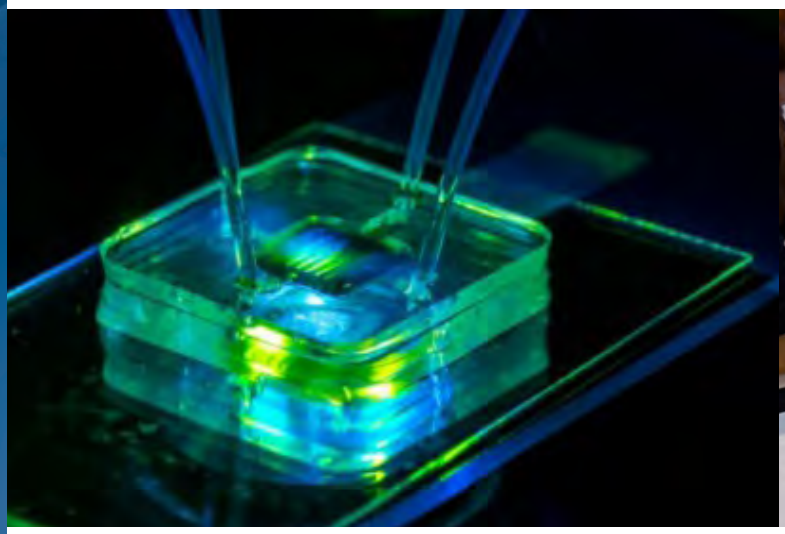
The 2014 Charles and Janet Forbes Entrepreneurial Competition took place on Friday, May 2nd in Schlegel Hall. During the competition, Hajim undergraduate students competed for cash prizes while presenting their technical business plans to a panel of alumni and faculty judges. This year, BME teams took both first and second place.

UR DermMates won First Place and a cash prize of $5,000. Their goal was to develop a cost-effective device for measuring skin barrier permeability and resistance by streamlining device and epidermis sample assembly and preventing inter-compartmental leakage within the device. The **UR DermMates** team was **Amanda Chen '14**, **Qihui (Fiona) Pu '14**, **Kyle Fedorchak '14**, and **Jacob VanderBurgh '14**.

Hemo-Box won Second Place and $3,000. Hemo-Box was a device that can be labeled specifically for patients to effectively store and transport blood in hospitals while maintaining the FDA regulated temperature range for up to 24 hours. Team **Hemo-Box** was **Courtney Astemborski '14**, **David Abplanalp '14**, **Casey Dahlbeck '14**, **Max Winkelman '14**, and **Chad Pickering '14**.

Qihui (Fiona) Pu and Kyle Fedorchak from UR DermMates (Top photo) and Courtney Astemborski and Chad Pickering from Hemo-Box (Bottom photo) pictured with (from left to right): Duncan Moore, Vice Provost for Entrepreneurship, Ann Forbes '75, Teacher of Gifted & Talented, Fairport Elementary Schools, Michael Wohl '89, Managing Partner, ClimateHedge Investments, and Bob Tobin, Lecturer in Entrepreneurship, Simon Business School.

The Center for Emerging & Innovative Sciences STAR Program Winners: SimPore and Micropen



Left: SimPore's ultra-thin silicon membrane. Right: CMTI student Laura Hobbs in the lab working with Micropen technology.

The Center for Emerging & Innovative Sciences has announced SimPore and Micropen Technologies as the winners of the 2013-2014 Short Term Applied Research (STAR) program.

SimPore is a Rochester, N.Y. based nanotechnology company co-founded by James McGrath, Professor of Biomedical Engineering and Graduate Program Director of Biomedical Engineering. SimPore designs and produces membranes and membrane-enabled products based on its unique patent-pending platform technology: the NanoBarrier™ ultrathin nanoporous silicon membrane. The NanoBarrier™ membrane is the world's first membrane to offer both tunable nanometer-scale thickness and pore size. SiMPore is developing products that take advantage of these one-of-a-kind features, including filters for separating and concentrating biological molecules and nanoparticles, cell culture substrates for growing cells, and electron microscopy grids for preparing and imaging samples at the nanoscale.

Micropen Technologies is a design, development, and manufacturing resource and partner to electronics companies and medical device companies in the specialized technology of applying functional materials to surfaces. Micropen Technologies has collaborated with the University of Rochester for more than a year on medical balloons with ablation electrodes and temperature sensors that can precisely apply energy to deactivate or destroy targeted nerves. In particular, denervation of renal nerves holds great promise in treating patients with drug-resistant hypertension. The work started as a Senior Design Project in the Biomedical Engineering Department and has continued at the Center for Medical Technology & Innovation. The goal is to develop a universal printed balloon solution for denervation therapies applied anywhere in the body.

Adarza BioSystems Raises $6.8 Million

University of Rochester spin-off company Adarza BioSystems has some big news this quarter - $6.8 million dollars big. Benjamin Miller, Professor of Dermatology, Biochemistry and Biophysics, and Biomedical Engineering, co-founded Adarza in 2008. BME graduate students Joe Bucukovski, Mark Lifson, and Rashmi Sriram have also been working with Adarza on research and development. The $6.8 million in funds raised will be used toward development of its immunoassay product and will accelerate development of even more sensitive tests for a mix of biological targets. Adarza BioSystems, Inc is an early stage medical diagnostics company developing a rapid and label-free biological assay platform for measuring clinical and point-of-care (POC) samples. In addition to performing sophisticated clinical tests within minutes, this technology is fully arrayable, potentially allowing hundreds of tests to be run simultaneously on a single chip.

BME Alumni News

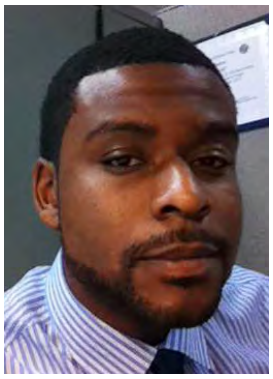
Kareen Coulombe, B.S. 2001

After graduating from our program, Kareen went to the Bioengineering Department at the University of Washington as a Whitaker Predoctoral Fellow where she earned a Ph.D. in 2007. She then took a post-doctoral position in the Pathology Department of the School of Medicine at the University of Washington. She has won a prestigious Pathway to Independence Award (K99/R00) from the NIH National Heart, Lung, and Blood Institute. In January 2014, Kareen started as a tenure-track Assistant Professor of Engineering at Brown University and is faculty in the Biomedical Engineering Program. Her research lab focuses on the electromechanical properties of engineered human cardiac tissue for heart repair after heart attack or due to congenital heart defects. "My time at Rochester shaped my career. I was first introduced to the heart through my senior research project in Dr. Renato Perucchio's lab, where I worked on a nonlinear FEM model of embryonic heart development. I was entranced by this organ's complexity during development, and that curiosity fueled my Ph.D. dissertation in normal adult muscle and my postdoctoral studies in cardiac pathologies," says Kareen.

Aasim Padela, B.S. 2001

Dr. Aasim Padela graduated from our undergraduate program in 2001, with a double major in Biomedical Engineering and Arabic. During his time here he demonstrated passion for both medical research and the humanities, and found time to study abroad to explore his interests. Upon graduation, he attended the Weill Cornell Medical College of Cornell University in NYC. He then returned to Rochester for his residency in Emergency Medicine, even playing a role as a customer for our senior design program. In 2008, Dr. Padela was selected as a Robert Wood Johnson Foundation Clinical Scholar at the University of Michigan, and is now an Assistant Professor of Medicine at the University of Chicago. He serves as the Director of the Initiative on Islam and Medicine and has developed numerous conferences and courses providing a forum for discussion of the intersections of religion, policy and bioethics.

Tony Broyld, B.S. 2009



I currently work as a process limited yield engineer, within the System and Technology Group at IBM. My specialty is characterizing defects within our hardware, proposing integration changes and tracking our overall improvement. As a BME student, I focused on instrumentation specializing in ultrasound and understanding diagnostic principles. The interdisciplinary nature of the program was most beneficial because it was the first time I was able to collaborate with a diverse group of engineers on large projects and assignments. The BME program gave me the flexibility in my schedule to take non-engineering courses like Anatomy and Philosophy. I had the opportunity to work in Professor McAleavey's lab through the Ronald E. McNair Program and learned the value of meticulously unpacking key principles in ultrasound. The program is special because it trains engineers to be technically proficient while encouraging us to view engineering as a means to help others. I learned a lot in this program and it helped shaped me to become a better engineer and an even better person.

Chantal McMahon, B.S. 2008

I had the pleasure of graduating from the BME program in 2008 with a concentration in Cell and Tissue Engineering. In addition to thorough courses spanning sciences, mathematics and programming, the education covered numerous engineering disciplines as well as courses in scientific methods and research. The program and its faculty provide its students with the confidence to think critically and the courage to push the envelope of science and technology. Through the guidance and leadership of the faculty, my experiences led me to pursue a Ph.D. in Biomedical Engineering with a focus in Neural Engineering at Drexel University in Philadelphia, PA. Since graduating from Drexel University, I have begun an exciting career track as a Senior Biomedical Engineer in the Research and Development Department at Medtronic Diabetes in Northridge, California. The position requires many of the academic and personal skills gained from the BME program and I will be forever grateful for my time there.

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UR BME

UR Innovation

Engineers in the OR: Students tackling the design challenges right at the source. The Center for Medical Technology & Innovation is in it's fourth year, with the highest number of graduate students to date. More info: www.cmti.rochester.edu