UR BME mission

“DISCOVER, CREATE, AND EDUCATE TO ENGINEER EVER BETTER SOLUTIONS IN BIOMEDICAL RESEARCH AND HEALTHCARE”

Second-year PhD candidate Xuan (Sabrina) Pan is pictured in the lab of Catherine K. Kuo, Associate Professor in the Department of Biomedical Engineering, in Goergen Hall. Her current projects focus on the role of lysyl oxidase in regulating mechanical property elaboration of embryonic tendon during development. “We hope to improve upon tendon healing and engineering by simulating mechanisms of forming normal tendon in embryos,” Sabrina says.

about this publication

This magazine is an annual publication of the Department of Biomedical Engineering at the University of Rochester. For questions or comments about this issue, or to request a hard copy, please email dalecki@bme.rochester.edu.

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funding news

For information on how to support the research of our BME faculty, please contact Eric Brandt at ebrandt@alumni.rochester.edu or 585.273.5901

Center for Emerging Sciences (CEIS) Awards

The following awards were made possible through the Center for Emerging and Innovative Sciences (CEIS). The CEIS works with university researchers to facilitate collaboration between university faculty and companies with similar research goals. The CEIS utilizes state funding to support company-sponsored research conducted at Universities including the University of Rochester.

James McGrath received funding for the project titled, “Electrical Monitoring of Exosome Capture on Nanomembranes.” The project is funded jointly by the CEIS and SimPore.

Stephen McAleavey received funding for the project titled, “Continuation of Towards Automated Clinical Evaluation of Tendon through Shear Wave Elastography.” The project is funded jointly by the CEIS and Carestream Health, Inc.

Diane Dalecki received funding for the project titled, “High-frequency Quantitative Ultrasound Systems for Tissue Engineering.” The project is funded jointly by the CEIS and Imaginant, Inc.

University Research Awards

Two of our BME faculty members were awarded 2017 University Research Awards to pursue promising projects that have the ability to leverage external funding.

Scott Seidman will work with Alice Quillen, professor of physics and optics and Hesam Askari and Jessica Shang, assistant professors of mechanical engineering, on new strategies for developing miniature robotic devices that can explore hard-to-reach places, provide targeted delivery, and do exploratory sensing. The project is titled, “Robotic Physics of Miniature Crawlers, Swimmers and Burrowers.”

Mark Buckley will evaluate two approaches to minimizing the loss of corneal endothelial cells during cornea transplants. The project is titled, “Protection of Corneal Endothelial Cells from Surgical Trauma.”

message from the chair

As Chair of the Department of Biomedical Engineering at the University of Rochester, I am eager to share with you our latest advances in research, developments in education, and updates on achievements of our BME students, faculty, and staff.

This year our BME faculty members had outstanding success in securing new funding for their research laboratories. Their successes include new grants, from the NIH, NSF, and other agencies, on BME topics as diverse as nanoporous membranes for hemodialysis, diffuse optical imaging technologies, virtual reality, tendon biomechanics, therapeutic biomaterials, biomedical ultrasound, multisensory processing, second harmonic imaging, and other innovative topics (pages 6-9). Our faculty have also engaged in exciting new industry partnerships, many of which were enabled by the Center for Emerging and Innovative Sciences (page 5).

I’m also delighted to share with you some outstanding honors of our faculty and staff (pages 10-13). Special congratulations are in order for Professor Amy Lerner as she was the recipient of the prestigious Goergen Award for Excellence in Undergraduate Teaching. Professor Kevin Parker was named a Fellow of the National Academy of Inventors for his outstanding inventions in medical imaging and image processing. Professor Danielle Berloz was named Rochester’s Young Engineer of the Year. Donna Porcelli, our long-standing BME Graduate Program Administrator, was honored with the Wilmer Award for Distinguished Service.

Our talented BME undergraduate and graduate students continue to garner numerous awards and honors (pages 14-17). Our students have been recipients of new fellowships, won design and entrepreneurial competitions, and have been recognized with national and local awards. Be sure to also review some of our BME students’ projects that were presented at the Hajim School Design Day (page 18).

These are exciting times for UR BME and I hope you enjoy reading about all of these wonderful updates from Rochester in this issue of the UR BME magazine.

Diane Dalecki
Chair, Department of Biomedical Engineering
funding news cont.

Professor Ross Maddox receives AR/VR Pilot Funding for collaborative project

Professor Ross Maddox (BME and Neuroscience) and collaborators Zhiyao Duan (ECE), Chenliang Xu (CS), and Zhiyao Duan (ECE), have received a pilot grant from the University of Rochester Arts Sciences and Engineering & the Center for Emerging and Innovative Sciences. Their project is titled, “Real-time Synthesis of a Virtual Talking Face from Acoustic Speech.” It’s easy to understand someone speaking to you in a noisy room when they can see your face. This is especially true for people who are hard of hearing. One of the “blind” Rehabilitation of the Blind (ROB) research team aims to develop an augmented virtual reality system for generating a realistic speaking face from real-time audio speech by pushing the state of the art in deep neural networks for audio and video processing.

Professor Ed Lalor receives AR/VR Pilot Funding

Professor Ed Lalor has been awarded AR/VR pilot funding through Arts, Sciences and Engineering and NYS Center for Emerging and Innovative Sciences. His project is titled, “Characterizing the Neuropsychology of Multisensory Integration in Natural and Virtual Reality Environments.” The human brain has a nearly seamless integration of knowledge received by multiple sensory systems. How to present information to these multiple senses so that the user’s experience is unified and maximally realistic. To do that, it is imperative that we understand how the brain integrates multiple sensory inputs in real-world environments. However, the field of multisensory integration research remains dominated by classic paradigms that are decidedly unrealistic. Recently, the Lalor Lab has developed approaches for analyzing neurophysiological data in the context of more real-world, naturalistic multisensory stimuli. The present research remains dominated by classic paradigms that are

Professor James McGrath receives NSF grant titled, “Development of a smart nanofluidic device for controlling and monitoring the growth of cells”

Professor Jim McGrath recently received a Dean’s Office PumpPrimer II Grant for his research project titled, “Desalinization News cont.”

Professor Regine Cho receives NIH funding

Professor Regine Cho has received an NIH ROI grant for her project, “Longitudinal Monitoring of Bone Fracturing and Healing Using Diffusion Optical and Correlation Tomography.” Vascularization is a key step in bone fracture healing, but is often measured only once or not at all due to technical limitations or cost. Professor Cho proposes to develop and validate advanced optical instruments for non-invasive, longitudinal monitoring of blood flow, volume and oxygenation in bone fractures and surrounding tissues to predict bone healing. This approach will significantly expedite the development of new bone fracture treatments based on regenerative medicine and the diagnosis of impaired healing. Professor Cho’s collaborators include Danielle Benoit (Biomedical Engineering), A. Samuel Flemister (Orthopaedics), John Ketz (Orthopaedics), Wing Chi Edmund Kwok (Imaging Sciences) and Tong Wu (Biostatistics).

Professor Buckley receives Center for Musculoskeletal Research Pilot Grant

Professor Mark Buckley has received pilot funding from the University of Rochester Center for Musculoskeletal Research (CMSR) for his project titled, “The Influence of Chondrocyte Mechanotransduction on the Progression of Osteoarthritis.” Osteoarthritis (OA) – a painfull and complex joint disease characterized by progressive degeneration of articular cartilage and bone--is a major cause of disability in the United States. Yet, there are no FDA-approved treatments proven to stop or reverse OA and preserve joint health. Professors Buckley and McAleavey’s goal is to demonstrate that mechanical forces are key in the development of OA, enhancing CAMS may help to slow or prevent OA. As a first step towards their long term goal of developing translatable therapies that protect cartilage from degeneration through stimulation or enhancement of CAMS, they seek in this project to use a mouse model to determine if CAMS influences long- term degenerative changes in the knee after an in vivo injury.

Professor Waugh awarded STTR with SimPore, Inc.

Professor Rick Waugh has been awarded a subcontract with SimPore, Inc. for his research project titled, “Microfabrication-based Biomimetic Inkjet Printing of Osteomimetic Maturation.” The overall goal of this proposal is to develop systems for efficient ex vivo maturation of functional human red blood cells (RBCs), which holds tremendous potential for addressing supply bottlenecks for delivering new therapeutic options to chronically transfused patients with severe alloimmunization and for novel strategies for delivering therapeutics via engineered RBCs. Non-phagocytic RBCs have so far shown the ability to produce both encapsulated and mature RBCs that are capable of survival or viability upon transfusion. Their hypothesis is that in existing culture systems, late stage erythroid/early reticulocytes lose too much surface area during encelulation and membrane remodeling, leading to more spherical cells that are susceptible to hemolysis. They propose a biomimetic approach wherein cells are passed through micropores filters to recapitulate in vivo mechanical deformations that appropriately constrain cell volume, promote bioconive disc morphology and limit potentially harmful extensional stretching.

Professor McGrath receives NSF funding for research collaboration with RIT and SimPore, Inc.

A collaborative project including Rochester Institute of Technology, SimPore, Inc., and BME Professor Jim McGrath titled, “Development of Ultrathin Nanomembranes for Home-based Hemodialysis,” has been awarded NSF funding. This collaboration between UR, RIT, and SimPore Inc. continues the development of large area silicon nanomembranes to meet the high efficiency of the ultrathin nanomembranes enables new form factors for hemodialysis that can dramatically improve patient quality of life and health outcomes for those with end stage renal failure.

Professor Choe receives NIH grant titled, “Mechanically-facilitated Cochlear Fluid Homeostasis.”

Professor Jong-Hoon Nam has received funding from the National Science Foundation (NSF) for his research project in collaboration with Professor Douglas Kelley, entitled, “Mechanically-facilitated Cochlear Fluid Homeostasis.” Different types of hearing loss/difficulty are ascribed to imbalance of two lymphatic fluids in the cochlea. Operating like an electrochemical battery, the cochlea is partitioned into three compartments filled with the lymphatic fluids. The separation of the two fluids provides an electric potential of approximately 80 mV that is crucial for hearing. To translate sounds into neural signals, there exists constant leaking (depolarizing) currents between the two fluid spaces through the sensory epithelium called the organ of Corti. Sodium ions are pumped out of Corti must transport ions to maintain the electric potential. According to current theory, cochlear fluid homeostasis is responsible for the loss of auditory receptor cells.

Professor Regine Cho has received funding from the National Science Foundation (NSF) for her research project titled, “Using Second Harmonic Generation to Predict Metastatic Outcome in Colon Adenocarcinoma.” Professor Cho previously discovered that an optical scattering phenomenon from primary tumor samples provides an independent prognostic indicator of true metastasis in colon cancer patients. “With this grant we will explore if and how this technique can be used to improve prediction of outcomes for individual patients, leading to improved therapy decisions,” Professor Brown says.

Dr. Stephen McAleavey receives an NIH grant titled, “Assistive and Autonomous Breast Ultrasound Screening: Improving PPV and Reducing RSI.”

Professor Stephen McAleavey has received a grant from the National Science Foundation for his project titled, “Assistive and Autonomous Breast Ultrasound Screening: Improving PPV and Reducing RSI.” Professor McAleavey’s objective is to demonstrate that the synergistic combination of an anthropomorphic robotic arm, providing precise targeting, positioning and force measurement, can enable high-resolution viscoelasticity and nonlinear modulus imaging to provide additional lesion classification features to improve PPV. He and his co-investigator, Professor Tom Howard (ECE) will implement a sonographer-guided, anthropomorphic robotic arm to position the transducer, set and maintain controllable pressure in spite of patient movement or respiratory motion, and implement shear wave and strain imaging methods that are currently impractical in vivo with handheld ultrasound transducers.
Professor McGrath receives NIH funding for collaborative research project with the University of Ottawa

Professor Jim McGrath has received funding from the NIH for his research project, “Solid-State Nanopores Integrated with Nanoporous Membranes for Enhanced Single-Molecule Counting of Low-abundance Biomarkers,” in collaboration with the University of Ottawa. This project aims to create robust biosensors by combining a University of Ottawa technology for the electrical detection of individual DNA molecules with University of Rochester’s nanomembrane technology. The porous nanomembranes serve as protective filters for the DNA sensors and prevent large molecules and debris from reaching the biosensor while still allowing the unobstructed passage of DNA. The technology will be used in a strategy in which designer DNA “barcodes” serve as amplified surrogates for low abundance biomarkers present in biological fluids.

Danielle Benoit is co-PI on new NIH grant

In collaboration with Associate Professor Catherine Ovitt of the Department of Biomedical Genetics, Professor Benoit is the co-PI on the recently funded NIH research project: “Salivary Gland-specific Radioprotection.” Briefly, salivary glands are extremely sensitive to ionizing radiation (IR) used as a curative treatment for head and neck cancers. However, mechanisms governing radiation-damage induced losses in salivary gland function is unknown. Therefore, this work focuses on the quality of life for survivors of head and neck cancer.

Professor Daniel Roy receives NIH R01 grant for his project, “Modulation of Insertional Achilles Tendinopathy by Multiaxial Mechanical Strains.” Insertional Achilles tendinopathy (IAT) is a common and painful disease that responds poorly to conservative (i.e., non-operative) care. Improved outcomes for IAT patients require interventions that target its fundamental cause. Thus, this study aims to elucidate the patterns of mechanical strain (i.e., deformation) that cause and reverse IAT in vitro, and determine how to induce these strain patterns in vivo through exercise-based physical therapy. The findings of this study will motivate effective, targeted non-surgical therapies for IAT. Collaborators for this project include Alayna Loisel (Orthopaedics and CMSR), Michael Richards (Surgery), Sam Flemister (Orthopaedics), John Ketz (Orthopaedics) and Tongtong Wu (Biostatistics).

Mark Buckley receives NIH funding

Professor Mark Buckley has received an NIH R01 grant for his project, “Modulation of Insertional Achilles Tendinopathy by Multiaxial Mechanical Strains.” Insertional Achilles tendinopathy (IAT) is a common and painful disease that responds poorly to conservative (i.e., non-operative) care. Improved outcomes for IAT patients require interventions that target its fundamental cause. Thus, this study aims to elucidate the patterns of mechanical strain (i.e., deformation) that cause and reverse IAT in vitro, and determine how to induce these strain patterns in vivo through exercise-based physical therapy. The findings of this study will motivate effective, targeted non-surgical therapies for IAT. Collaborators for this project include Alayna Loisel (Orthopaedics and CMSR), Michael Richards (Surgery), Sam Flemister (Orthopaedics), John Ketz (Orthopaedics) and Tongtong Wu (Biostatistics).

Professor Scott Seidman receives new Wadsworth C Sykes Engineering Faculty Award

Professor Seidman has received the Wadsworth C Sykes Engineering Faculty Award from the University of Rochester Hajim School of Engineering and Applied Sciences. The award is intended to help in developing a new online course in the Hajim School called “Interfacing Concepts for Microcontrollers.”

Scott Seidman receives grant for clinical research and data analysis

Professor Scott Seidman has received a grant for clinical research and data analysis from Johnson & Johnson. The project is titled, “Assessment of Eye Strain using Electromyography of Orbicularis Oculi Muscle.” Following milestone review of the reanalysis of EMG data from orbicularis oculi muscle provided by Johnson and Johnson, investigators will design, and implement, and test a system to assess eyestrain. The system will have the highest likelihood for establishing a robust relationship between EMG activity and eyestrain resulting from inaccurate correction or misalignment of an interface supporting this protocol will also be developed. The system and protocol will be tested in 10 individuals recruited from the student population at the University of Rochester.

Professor Rick Waugh named interim dean for arts, sciences & engineering

Professor Waugh, former BM&E chair, and a biomedical engineer with more than 35 years of academic and leadership appointments at the University of Rochester, will serve as interim dean for arts, sciences and engineering. Professor Waugh joined the Rochester faculty in 1980, beginning a 35-plus year tenure as a teacher, researcher, and administrator. The founding chair of the Department of Biomedical Engineering, he is credited with overseeing the launch of what is now one of Rochester’s fastest-growing and most popular majors. As a scientist, he has been widely recognized for his study of cell and membrane mechanics and the structural basis for the mechanical behavior of cells and membranes. Since 2013, he has served as a leader in efforts to expand research initiatives and funding, as well as Rochester’s prominence among the nation’s research universities.

Denise Dalecki and Professor Mark Buckley receive US technology development fund award

Denise Dalecki, Ph.D., and Professor Mark Buckley, who is working on technologies to accelerate wound healing, have received a $300,000 grant from the U.S. Department of Defense Small Business Innovative Research Program. The goal of the project, which was supported by a $50,000 seed grant from the Rochester Technology Development Fund, is to develop cell membranes that are used to create robust biosensors.

Figure: Nanoporous Nitride nanomembrane used as a pre-filter for a DNA biosensor

The Department of Defense office of the Congressionally Directed Medical Research Programs has awarded Professor Edward Brown and Professor Catherine K. Kuo a grant for their project titled “Interfacing Concepts for Microcontrollers.” The goal of this project is to evaluate molecular mechanisms underlying the ability of an optical scattering phenomenon to predict metastatic outcome in patient samples.

Daniel Roy is a Scientist at KeraNetics, LLC, a biotechnology company that focuses on the quality of life for survivors of head and neck cancer.

New appointment

Robert J. Seidman, Ph.D., has been named interim dean for arts, sciences and engineering. Seidman is a professor of chemical and biomedical engineering and a medical physicist. He has led the Rochester Center for Biomedical Ultrasound since 2001, where he has directed research projects funded by the National Institutes of Health and the National Science Foundation. Seidman’s research focuses on the use of ultrasound to image and treat disease.

New patent issued for Professor Hocking

Professor Rick Waugh is a Professor of Biomedical Engineering at the University of Rochester. He is known for his research on the use of ultrasound to image and treat disease. Waugh has received a patent for a new technology that uses ultrasound to pattern cells volumetrically. The technology is expected to have a significant impact on the treatment of diseases such as cancer and wound healing.

New patent issued for Professor Seidman

Professor Scott Seidman is a Professor of Biomedical Engineering at the University of Rochester. He is known for his research on the use of ultrasound to image and treat disease. Seidman has received a patent for a new technology that uses ultrasound to pattern cells volumetrically. The technology is expected to have a significant impact on the treatment of diseases such as cancer and wound healing.
Amy Lerner receives Goergen Award for Excellence in Undergraduate Teaching

Professor Amy Lerner is one of three recipients of the Goergen Award for Excellence in Undergraduate Teaching this year. This award aims to acknowledge the full scope of work that contributes to excellence in undergraduate education. It is given for distinguished teaching in large introductory courses or advanced seminars. In addition to being given for superior classroom performance, it recognizes innovation in course design or teaching methods.

Professor Lerner was nominated by BME Chair Diane Dalecki and chosen by Richard Feldman, dean of the College, Gloria Culver, dean of the School of Arts and Sciences; and Wendi Heinzelman, dean of the Hajim School for Engineering and Applied Sciences. She was presented with the award by her former student Alex Kotelsky during a special ceremony in the the Hawkins Carlson Room in Rush Rhees Library on October 5. Two other longtime professors, Beth Jörgensen and Bradley Nilsson, also received the honor.

“Beth Jörgensen and Bradley Nilsson and Amy Lerner exemplify all that we strive for in the College,” Feldman says. “These recipients of the Goergen Award are all extremely accomplished scholars. Yet in addition to their research, they also excel as teachers. In interestingly different ways, they’ve all committed to working with students, providing guidance, and connecting them to resources, often spending significant amounts of time outside of the classroom to help them succeed.”

Amy Lerner earned her MSE and PhD in mechanical engineering at the University of Michigan. In 1997, she joined the Departments of Mechanical Engineering and Orthopaedics and served as a core faculty member in the biomedical engineering program. Once the Department of Biomedical Engineering was established in 2000, she maintained her role as assistant professor and later assumed the role of academic director of the Center for Medical Technology and Innovation. As a leader in biomedical engineering, Professor Lerner’s exceptional work both in and out of the classroom exemplifies her passion for the field, and she continues to foster that same passion in her students.

Professor Lerner has been instrumental in the development of the biomedical engineering curriculum. She created and implemented the capstone senior design courses that provide students with real-life design projects. Each year, Professor Lerner partners with customers from both local communities and larger national companies in order to provide her students with projects that require them to solve real-life engineering design problems that they might encounter once in the field. In order to support her students throughout these projects, she has designed a series of assignments and milestones that work to guide students through challenges and stimulate creative problem solving. This unique exposure to professional engineering work, coupled with consistent classroom support, gives students the opportunity to hone the skills needed to enter the workforce prepared and confident in their abilities.

“Professor Lerner’s teaching style and influence on students is unmatched. Her ability to connect with influential external industry partners and integrate lessons learned and guidance into the classroom extended our learning from a purely academic endeavor to a way for us to see how our work could impact the broader world.”

-Breana Roides, former student

Danielle Benoit is Rochester’s “Young Engineer of the Year”

Each year, Danielle Benoit leaves her Therapeutic Biomaterials Lab at the University of Rochester to host the Annual Benoit Laboratory Lemonade Stand at the Rochester and Brighton public markets. Benoit and her students serve lemonade and explain their work on childhood cancer therapies as part of a national effort organized by Alex’s Lemonade Stand Foundation, which has helped fund her research.

“Most people don’t realize that treating cancer in children is much different from treating cancer in adults,” says Benoit, associate professor of biomedical engineering. “At the same time, funding for childhood cancer research is woefully miniscule, compared to the money that goes into studying adult cancers.” Benoit’s community outreach in one reason she is the recipient of the 2016 Young Engineer of the Year Award from the Rochester Engineering Society. The award recognizes outstanding achievement in and contributions to the profession by young engineers in the Rochester region and the importance of engineering practice to society. Benoit, who joined the University in 2010, is an international leader in developing therapeutic biomaterials with applications in bone and salivary gland regeneration and treating dental caries and childhood cancers.

Her work is creative, and transformative,” says Diane Dalecki, chair of the Department of Biomedical Engineering. “She is a true and creative engineer, applying principles of classical chemical engineering and materials science to new biomedical applications in medicine.” This has resulted in numerous patents; several federal, state, foundation and industry grants – including a prestigious National Science Foundation Faculty Early Career Development (CAREER) Award – and such professional awards as the 2015 Young Innovator Award in Cellular and Molecular Bioengineering.

Benoit also is “an outstanding educator, dedicated to training the next generation of engineers,” Dalecki says. Benoit teaches a core biomaterials course for undergraduates and courses in biomaterials and drug delivery for graduate students. She annually mentors students working on senior design projects and undergraduates who participate as Xerox fellows in a summer research program. “Danielle is an outstanding faculty member, whose research in new biomaterials will have a large impact on therapeutic for a number of diseases and whose teaching and service demonstrate her dedication to the educational and outreach missions of the Hajim School,” says Wendi Heinzelman, dean of the school.

Kevin Parker named fellow of National Academy of Inventors

Kevin Parker, William F. May Professor of Electrical and Computer Engineering, whose discoveries have been widely applied in medical imaging and image processing, has been named a fellow of the National Academy of Inventors. Professor Parker joins 174 other new NAI fellows this year who have “demonstrated a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society,” said Paul Sanberg, president of the academy. Professor Parker is the first fellow to be named from the University of Rochester. He holds or shares 25 U.S. and 13 international patents with a range of applications. Blue noise mask, which Parker invented with his graduate student Theophano Mitsa ’91 (PhD), is a widely adopted half-toning technique that prints shades of gray in less time and at a higher quality than traditional methods; it has been licensed by more than a dozen companies, including Hewlett-Packard. It has generated more than $54 million in royalties for the University, one of the three most lucrative inventions in the University’s history.

“Kevin’s inventions have made significant contributions to printing, diagnostics, and imaging and have had incredible impact on people’s lives. Being a fellow of the National Academy of Inventors is a well-deserved honor for someone who has devoted his career to innovation that has changed the world.”

-Wendi Heinzelman, dean of the Hajim School
ORS Upstate New York & Northeast Regional Symposium hosts over 200 at University of Rochester

The Orthopaedic Research Society (ORS) Upstate New York and Northeast Regional Symposium was held at the University of Rochester July 27-28. ORS Ambassador and Associate Professor Catherine K. Kuo, organized the event which was held in conjunction with the 7th Annual University of Rochester Center for Musculoskeletal Research (CMSR) Annual Symposium. The event was a great success, with approximately 200 people in attendance representing 24 institutions in the regional area.

The Department of Orthopaedics and the Department of Biomedical Engineering generously supported the success, with approximately 200 people in attendance. Presentations from the University of Rochester CMSR Rosier Award finalists and presenters of accepted abstracts.

Inspirational keynote talk from Dr. Farsh Guilak, ORS Past-President, Washington University in St. Louis

Podium presentations from the University of Rochester CMSR Rosier Award finalists

Interactive and innovative poster sessions featuring ORS Poster Award finalists and presenters of accepted abstracts

Networking opportunities throughout the symposium including the awards banquet, poster sessions

Diverse career development panels

Educational and inspiring presentations from Dr. Michele J. Grimm, Program Director, National Science Foundation, and Dr. Fei Wang, Program Director, NIH, NIAMS

Highlights included:

- Interactive and innovative poster sessions featuring ORS Poster Award finalists and presenters of accepted abstracts
- Networking opportunities throughout the symposium including the awards banquet, poster sessions
- Diverse career development panels
- Educational and inspiring presentations from Dr. Michele J. Grimm, Program Director, National Science Foundation, and Dr. Fei Wang, Program Director, NIH, NIH

In her current position, Porcelli plays a key role in graduate admissions and recruiting activities for the department. Colleagues say she has touched the lives of countless graduate students in biomedical engineering over the years, and has helped them be successful.

Donna has been an advocate of career conversations for the past few years. She is extremely knowledgeable about the pros and cons of working for big companies and small companies.

The BME Department regularly invites our alums to host “career conversations” either in person or via Skype. If you are interested in sharing your professional experience with our students, contact Amy Lerner at amy.lerner@rochester.edu.
student fellowships & scholarships

Ken Sims receives NRSA funding

Ken Sims, a PhD student working in the lab of Danielle Benoit, has received funding from the Ruth L. Kirshnahan National Research Service Award (RSRA) Individual Predoctoral Fellowship program (F31). His project is titled, "Engineered pH-Responsive Nanoparticle Drug Delivery to Inhibit Oral Biofilm Formation," and addresses the issue of tooth decay, which affects over two-thirds of children and nearly all adults worldwide and results in billions of dollars of direct and indirect healthcare costs each year. This research may lead to a new promising, clinically relevant therapeutic approach to prevent tooth decay and other oral diseases.

BME Take 5 student wins Fulbright grant to study in Glasgow, Scotland

Congratulations to Jonathan Boualavong '16/T517 BME for winning a Fulbright grant. An Elkhridge, Maryland, native, Jonathan will pursue an MPhil in chemical and process engineering at the University of Strathclyde in Glasgow, Scotland.

Marian Ackun-Farmmer receives ASE Barnard Fellowship

Marian Ackun-Farmmer, a biomedical engineering student in the lab of Danielle Benoit, has been selected for one of the Arts, Sciences and Engineering Donald M. and Janet C. Barnard Fellowships this year. Marian was recognized specifically for her strong research record as well as her commitment to mentoring, outreach and service to the Department of Biomedical Engineering and her field.

Jacob Kallenbach receives Edward Peck Curtis Award for Excellence in Teaching by a Graduate Student

To engage the students and help them learn the material," said Professor Dickerson. "The BME411 class did very well this year, and their success is due in large part to Jacob's outstanding performance as a Teaching Assistant. He ranks as one of the best TAs I have worked with over the past 20 years."

Marian Ackun-Farmmer receives AfterCollege Engineering Student Scholarship

Marian Ackun-Farmmer, a biomedical engineering student in the lab of Danielle Benoit, is the recipient of an AfterCollege Engineering Student Scholarship. Founded in 1999, AfterCollege, Inc. (www.aftercollege.com) is an online professional platform that connects students, alumni and employers through customized career networks at colleges and professional organizations across the country.

Eva Hansen receives prestigious scholarship from Astronaut Scholarship Foundation

Eva Hansen, an undergraduate in the Benoit Lab, has been selected by the Astronaut Scholarship Foundation (ASF) to receive $10,000 in scholarships this academic year. Eva is one of just 40 students selected nationwide this year for the honor. She was chosen based on her unique aptitude for research and ingenuity in science and technology, as well as exemplary academic performance. Eva's research involves drug delivery approaches to protect healthy tissue from the effects of radiation, as experienced in cancer therapy and in travel beyond low Earth orbit.

Andrew Shubin receives commendation for PhD Dissertation

Andrew Shubin, a 2017 PhD graduate in the Benoit Lab, has received commendation in the Outstanding Dissertation Award Competition for Engineering. His PhD research project is titled, "Polyethylene glycol (PEG) Hydrogels for Salivary Gland Regeneration."

Ge Song receives President's Award

Congratulations to BME senior Ge Song who received a President's Award for "Adaptive Optics Scanning Light Ophthalmoscopy for Retinal Imaging and Vision Disease Detection." Ge was presented with the award at the University of Rochester Undergraduate Research Exposition, in which students presented work addressing a variety of subjects within the humanities, engineering, natural sciences, and social sciences.

Yuchen Wang wins New Investigator Recognition Award at ORS Annual Meeting

Yuchen Wang, a graduate student in the Benoit Lab, has won a New Investigator Recognition Award. Yuchen was presented with the award at the Orthopaedic Research Society (ORS) Annual Meeting in San Diego, California for her project titled, "Delivery of β-Catenin Agonists via Targeted Nanoparticles to Enhance Fracture Healing." Co-authors for this research were Michael Banerello, Maureen Newman, Tzong-Jen Sheu, J. Edward Puzas and Danielle Benoit.

Omar Soufan competes in Hult Prize entrepreneurial competition

BME student Omar Soufan was among six finalist teams at the Hult Prize regionals in San Francisco early this month. The Hult Prize is the largest social entrepreneurship competition in the world and is co-sponsored by the Hult International Business School and the Clinton Global Initiative. The Rochester students who presented as Team Meliora were Edgar Alaniz '17, Carlos (YuHu) Gonzalez '17, Ibrahim Mohammad '17, and Omar Soufan '17. The team's startup company, Meliora Homes, will build homes for refugees from recycled plastics.

CMTI students win 2017 America's Got Regulatory Science Talent Competition

At the Fourth Annual "Americas Got Regulatory Science Talent" competition, hosted as part of the CIT's Regulatory Science programs, eight teams of students competed for a chance to present their ideas on how to solve regulatory science issues in person at the Food and Drug Administration. Each team delivered a five-minute presentation proposing novel solutions to address challenges in the nine scientific priority areas outlined in the FDA's Strategic Plan for Advancing Regulatory Science. This year's first and second place winners were all graduate students receiving biomedical engineering masters degrees through the Center for Medical Technology & Innovation (CMTI).

exosomes (small, cell-derived vesicles) from the blood to provide early detection of cancer

student awards & honors

Tristan Ford wins New York State College Health Association's 2017 Outstanding Student Award

Congratulations to BME senior Tristan Ford who is recipient of the New York State College Health Association's 2017 Outstanding Student Award for his contributions to the health and safety of college students at our University and at the state and national level. Tristan led the efforts to gain student support for our University to become tobacco-free.

Kilean Lucas wins Falling Walls Competition

Kilean Lucas, a PhD student in the lab of James McGrath, professor of biomedical engineering, took first place in the University's third annual Falling Walls competition, earning him a $500 prize and an all-expenses-paid trip to Berlin, Germany this fall to represent Rochester in the international Falling Walls competition. Kilean described how nanomembranes developed in the McGrath lab can be used to filter out telltale

First place: Simple English Explanation Directive (SEED) Bethany Lennox, CMTI graduate student (left)
Second place: 3-Defining Patient Matched Implants Kerry Donnelly, CMTI graduate student (middle) and Brittany Garrison, CMTI graduate student (right)
Four BME students among winners of 11th Annual Mark Ain Business Model Competition

In unprecedented circumstances, two teams tied for first place at the Mark Ain Business Model Competition. They split the first and second place cash prizes (totaling $7,500 each) and each will be offered space in the University of Rochester Student Incubator at High Tech Rochester. First place winner Proteus Medical developed a novel endoscopic foreign body retrieval device for the veterinary space. The team was comprised of three BME students – Connor J. McBride ‘17, Edward F. Ruppel ‘17, and Chandler W. Woo ‘17. Omar Soufan (bottom left), Edward Ruppel, (bottom right) Connor McBride, Edward Ruppel, and Chandler Woo took second place for Proteus Medical. They designed a novel endoscopic retrieval device for removing objects that pets swallow. BME Senior Omar Soufan was part of the Meliora Homes team, which will build homes made from recycled plastics for the homeless and refugee populations. Omar’s teammates included Edgar Alaniz (biochemistry), Carlos Gonzalez (finance economics), and Ibrahim Mohammad (mechanical engineering).

Congratulations to Maggie Thomas Freeberg of the Awad Lab who received the Randy Roiser Award at the Annual Center for Musculoskeletal Research (CMSR) Symposium in July. Her presentation titled, “Sempine 1 loss of function improves flexor tendon healing in mice: Implications for therapeutic development” is associated with the flexor tendon tissue engineering project within the Award Lab.

Four BME students among winners of 2017 Charles and Janet Forbes Entrepreneurial Competition

Hajim School of Engineering & BME Department awards

BME GRADUATE STUDENT TA AWARD
Kilean Lucas - BME 442

OUTSTANDING BME THESIS AWARD
Andrew Shubin

BME SERVICE AWARD
Jacob Kallenbach, Melinda Vander Horst

MARYLOU INGRAM FELLOWSHIP
Danielle Desa, Clyde Overby

SPROULL FELLOW
Maureen Newman

KAUFMAN ENTREPRENEURIAL YEAR (KEY) SCHOLAR
Syed Reefat Aziz

TAKE 5 SCHOLARS
Arum Nambar, Brenna Schnell, Janet Sorrells, Shrenick Vohra

BME FACULTY AWARD FOR UNDERGRADUATE SERVICE
Janet Sorrells

BME FACULTY AWARD FOR UNDERGRADUATE RESEARCH
Breanna O’Reilly, Edward Ruppel

BME FACULTY AWARD FOR TEACHING ASSISTANT
Madeline Cappelloni

BME OUTSTANDING SENIOR
Justin Schumacher

BME OUTSTANDING JUNIOR
Tianyu Wu

student awards & honors cont.

Congratulations to the following biomedical engineering seniors who were Hajim Award winners this year: Justin Schumacher and Runxuan (Sophia) Zhou both received the Donald M. Barnard Prize, awarded to junior or senior engineering students on the basis of personal qualification and achievement. Edward Ruppel received the G. Harold Hook Prize for demonstrating outstanding interest in engineering.

Kilean Lucas takes second place at the Hajim School’s Art of Science Competition

The goal of the Art of Science Competition is to explore and illuminate the aesthetic beauty that results when science, art, and technology intersect. Kilean Lucas, a PhD candidate in the lab of James McGrath, won second place for his submission titled, “Blood Cells by Scanning Electron Microscope.” The image features a single human red blood cell, captured among several white blood cells on a silicon nanomembrane. Lucas is studying how the ability of these nanomembranes to separate and filter out particles that differ by mere microns in size could lead to medical breakthroughs. For example, immature red blood cells separated from mature red blood cells could be harvested and seeded into bioreactors as a new way to replenish blood banks. He hopes this image will convey to people how “stunning it is, in and of itself, that we’re able to capture all of these cells out of blood, a very complex solution, in ways that could change peoples’ lives.”

Three BME seniors inducted into Phi Beta Kappa honor society

Congratulations to BME seniors Nathaniel Barber, Claire Kaiser, and Justin Schumacher for their induction into Phi Beta Kappa, the nation’s oldest and most prestigious academic honor society!

Maggie Thomas Freeberg receives Randy Roiser Award at CMSR Symposium

Kilean’s winning image titled, “Blood Cells by Scanning Electron Microscope”

Three BME graduate students receive 2016 CMSR Symposium Distinguished Abstract Awards

Pictured: (from left to right) Nathaniel Barber, Claire Kaiser, Justin Schumacher

Pictured: (from left to right) Edward Ruppel, Chandler Woo, Connor McBride

BME: Seniors Connor McBride, Edward Ruppel, and Chandler Woo took second place for Proteus Medical. They designed a novel endoscopic retrieval device for removing objects that pets swallow. BME Senior Omar Soufan was part of the Meliora Homes team, which will build homes made from recycled plastics for the homeless and refugee populations. Omar’s teammates included Edgar Alaniz (biochemistry), Carlos Gonzalez (finance economics), and Ibrahim Mohammad (mechanical engineering).
Each year, biomedical engineering students partner with companies and institutions to solve real world engineering problems through developing prototype medical devices and research instruments. We celebrate the culmination of our students’ engineering education by hosting Design Day, wherein they present their projects. Both undergraduate seniors and graduate students enrolled in the Center for Medical Technology & Innovation masters program participate. We are grateful to our industry partners and collaborators for the opportunity to address their challenges. Their dedication to improving health care have inspired our students to apply, develop and demonstrate their creative talents and engineering expertise. Some examples of this year’s projects are featured on these pages. For more information on a specific project, contact Amy Lerner at amy.lerner@rochester.edu.

**Sepsis Detectis Team**
Justin Schumacher, Brittany Schutrum, Dylan Latham, Kathleen Larson, Josh Schum-Houck
Our team is working to combat the hospital mortality rates of sepsis by developing a faster detection technology. We aim to implement hyperspectral imaging as a non-invasive diagnostic tool for use within an intensive care unit. Instead of conducting cell cultures and blood tests, the goal of this device is to help detect and quantify the presence of sepsis in minutes.

**Curbell Medical ECG Team**
Madison Schumacher, Vladimir Tokarchuk, Connor O’Brien, Raem Smith
Hospital workflow is impeded by clinicians’ need to change ECG systems as a patient moves throughout the hospital. We aim to modify Curbell Medical’s existing ECG cable system in order to limit disruptions to clinical workflow and minimize the hospital’s waste caused by discarding incompatible lead sets. The solution is a permanently attached, optimized cable-adapter module which enables smooth navigation through hospital-identified critical pathways.

**S.T.A.R.S. Scoliosis Phantom Team**
Andrew Arjana, Rebecca Amorese, Shamroz Farooq, Stephanie Kamau, Tongxi Zhuang
Adolescent idiopathic scoliosis is a lateral deviation of the spine commonly associated with rotation of the vertebrae. The Scoliosis Phantom is a realistic model of the lumbar region of a scoliotic spine for an adolescent female patient suffering from idiopathic scoliosis. Our phantom will be a research tool to increase the repeatability and reliability of the brace-making process by reducing the number of brace fittings and X-Ray scans a patient will have to undergo.

**CMTI InstaTract Team**
Ian Baranowski, Lauren Seitz, Meggie Ferrari, Kyle Meyers
Our team is developing a novel atrial retraction device for use in minimally invasive heart valve surgery. Current atrial retractors have a significant learning curve and either create an extra incision through the chest wall and risk bleeding, or take up valuable space in the surgeon’s field of view. The InstaTract is an intuitive and quickly deployable device that provides retraction of varying size atria, exposing the valve being repaired or replaced.

**S.T.A.R.S. Scoliosis Phantom Team**
Andrew Arjana, Rebecca Amorese, Shamroz Farooq, Stephanie Kamau, Tongxi Zhuang
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**PALS: Pediatric Assisted Locomotion**
Alex Kazmierczak, Nish Sardana, Jolan Burger, Courtney Semkewycz
We are working with local pediatric physical therapists to design a PT system to teach children with motor delays resulting from Down syndrome and cerebral palsy to walk. Children with motor delays learn to walk a year late on average, and because of this, tend not to hit developmental milestones on time. Our treadmill-based supportive gait trainer aims to teach them to walk earlier, giving them more independence and the capability to explore and learn about their surroundings.
alumni updates

Deborah Cooper

Hometown: Woburn, MA
Current city: Rochester, NY
Degrees: University of Rochester, BS, Biomedical Engineering, 2014
University of Rochester, MS, Biomedical Engineering, 2015 (CMTI)

Current position & company: I am a Product Applications Development Engineer at Transonic Systems, Inc. in Ithaca, NY. Transonic Systems is a leader in innovative biomedical measurement equipment for surgical, hemodialysis, pediatric critical care, and research applications. I interface between R&D and the clinical users of our devices in the pediatric critical care field. I support these clinicians in the ICU with technical, educational, and training support.

Why did you pick University of Rochester? I picked the University of Rochester because of its flexibility in courses that I could take. The idea of focusing in on a minor cluster made a lot of sense to me rather than taking classes from all different departments outside of my major.

For graduate school, the CMTI Program provided exactly what I was looking for in terms of experience. The experience in medical device design and seeing real clinical needs in the operating room is what got me a great first job right after graduation.

Why Biomedical Engineering? Biomedical Engineering seemed like a perfect fit since I liked both biology and math. I focused on biomechanics, but then became interested more in biosignals after taking circuits.

Biomedical engineering provided me with the opportunity to get into many different career paths. It is a versatile major that opens many doors.

Jarvis D’Souza

Hometown: Powell, Ohio
Current location: Kalamazoo, Michigan
Degrees: University of Rochester, BS, Biomedical Engineering, 2015
Duke University, MS, Engineering Management, 2017

Current position & company: I am a R&D Design Engineer at Stryker.

Why did you pick University of Rochester? The University of Rochester is a school with a vast array of opportunities to explore.

Advice for current/future students: Focus on getting work experience during your time in school. This will help you gain invaluable industry experience and perhaps learn what you don’t want to do.

Words to live by: “Everyone you will ever meet knows something you don’t.” I think about this quote in many different aspects of my life. It encourages me to learn from others and value the differences in people. Everyone has different backgrounds and experiences that shape who they are, and these characteristics are what make every person valuable. Whether it be a team member, a personal relationship, a coworker, or a stranger with an opposing view, someone always has something valuable to add. I make it my focus to learn and understand the strengths of those around me and encourage what makes others unique.

Meghan O’Donovan

Hometown: As an ‘Army Brat’, I grew up all over the country and abroad.
Current city: Cambridge, Massachusetts

Degrees: University of Rochester, BS, Biomedical Engineering, 2009
University of Rochester, MS, Biomedical Engineering, 2010

Current position & company: Biomedical Research Engineer with the Center for Military Biomechanics at the Natick Soldier Research, Development and Engineering Center (NSRDEC).

Why Biomedical Engineering? It was the only engineering track where I felt I wouldn’t have to give up my dual love for both biology and Chemistry. Biomedical Engineering touches on so many other fields, I felt it was a way I could still pursue all of my interests.

Advice for current/future students: Go to office hours. No really, GO TO OFFICE HOURS.

Favorite quote: “Always remember that you are absolutely unique. Just like everybody else” - Margaret Mead

Where would you like to be in 5-10 years? Is it strange to say that in 5-10 years I hope I am right where I am? I love my job, I love doing research for the Army, and I love living in New England. I guess winning the powerball lottery wouldn’t hurt.

Can I put that in a 5 year plan?


Courtney Astemborski

Hometown: Niskayuna, NY
Current city: Greater Boston, MA Area

Degrees: University of Rochester, BS, Biomedical Engineering, 2014
University of Rochester, MS, Technical Entrepreneurship and Management, 2015

Current position & company: Project Manager at RNsights

Why did you pick University of Rochester? I chose the University of Rochester because of the high academic caliber and interdisciplinary work being conducted on campus. I knew that I wanted to major in Biomedical Engineering and I liked that the medical center was in such close proximity for collaborative work. Also, the aesthetics and collegiate feeling that campus has was something I could not pass up. The University of Rochester felt like home after visiting campus while in high school and I chose to apply early decision.

Advice for current/future students: Work hard and know that you will always have the support of the University of Rochester community. While on campus, you are surrounded by the best and brightest faculty who have a strong passion for their work and who want to share that with you. The faculty and staff want you to succeed in your career and you should take advantage of the resources and network that you build while on campus throughout your career. Once you graduate and leave campus, no matter where you end up in the world, you are guaranteed to be able to connect with other University of Rochester alumni so don’t be afraid to connect and collaborate with them.

Words to live by: “Always remember that you are absolutely unique. Just like everybody else” - Margaret Mead

Hobbies: I am a member of the University of Rochester Boston Network Leadership Cabinet and the Junior League of Boston. I enjoy spin and yoga classes as well as skiing in the winter and going to the beach in the summer.

Go to office hours. No really, GO TO OFFICE HOURS.

Favorite quote: “Always remember that you are absolutely unique. Just like everybody else” - Margaret Mead

Where would you like to be in 5-10 years? Is it strange to say that in 5-10 years I hope I am right where I am? I love my job, I love doing research for the Army, and I love living in New England. I guess winning the powerball lottery wouldn’t hurt.

Can I put that in a 5 year plan?

Dear BME Alumni,

Whether it’s been a long time since BME 101 or just a few short years, I would be delighted to hear from you. Please keep me posted on all your successes!

Best,

Diane Dalecki,
Chair of BME
dalecki@bme.rochester.edu

For more information on applying to one of our graduate programs, please contact Graduate Program Coordinator Donna Porcelli at donna.porcelli@rochester.edu or 585.275.3891. To learn more about biomedical engineering at the University of Rochester, visit www.bme.rochester.edu and follow us on Facebook.

What you’ll learn

- Identify and evaluate unmet clinical needs
- Work with surgeons for concept design
- Market and intellectual property assessment
- FDA regulatory processes and quality systems
- Design and execute prototype tests
- Prototype clinical needs into scientifically proven concepts

Ready to learn more?
Visit cmti.rochester.edu for more information or to apply. Scholarships are available! Contact our team at cmti@ur.rochester.edu

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