RIT Department of Biomedical Engineering

2016-17 Newsletter | Vol. 1

Letter from the Department Head

Welcome to the first annual newsletter of the Department of Biomedical Engineering at RIT. This is an exciting time for biomedical engineering at RIT and nationally. A lot is happening. We can't fit everything here, but I do hope that it gives you a sense of range of activities and accomplishments of our students and faculty from the past year. I am extremely proud of these accomplishments and realize the privilege of joining the department during this past year.

The department has quickly grown to be an integral part of the Kate Gleason College of Engineering and the regional and national biomedical community. After graduating our first class of students we applied for ABET accreditation and received official notice of accreditation in 2016! Already, our students have had co-ops at more than 120 companies, our alumni are working at more than 30 companies and studying at 12 universities, and our faculty are contributing to new discoveries that will improve human health. Our graduating class of 2017 consists of 40 students that have already contributed to science, started campus clubs, worked thousands of weeks, and formed businesses.

Thank you for your interest and support of our program. Please follow us through University News, LinkedIn and our department website* and I welcome any thoughts and ideas that you may have. I hope that alum and families reading this keep in touch as they continue to do amazing things. I hope that members of industry reading this reach out if you're interested in collaborating or hiring our talented students for co-op or full-time employment.

Best wishes for another successful and productive year!

Steven D Day

Table of Contents

BMEs Abroad.....2

Student Achievements.....3

KGCOE MSD Projects 4

Faculty Research.....5

Where Are They.....6

BME Class of 2017.....7

Front cover picture of 3T3 Mouse Fibroblasts cells courtesy of Michael Kormos and Blake Suhr.

Backcover picture of Institute Hall courtesy of Justin Liao.

Accredited ABET Engineering Accreditation Commission

In August of 2016, the Biomedical Engineering Department became an accredited program of the Engineering Accreditation Commission of ABET. Accreditation signifies that a program is meeting the quality standard that will adequately prepare graduates for entering the work force.

* http://www.rit.edu/kgcoe/biomedical/

BMEs Abroad

Our 4th year BME student, Kathryn Cyr, studied abroad at University of Auckland in Auckland, New Zealand, for the spring 2017 semester. While Kathryn was abroad she was taking four classes: two philosophy classes to fulfill her immersion requirements, one stats class to cover the design of experience requirement for BME Majors, and a graduate level Advanced biomedical imaging class to cover a professional technical elective requirement. Kathryn said of her semester, "I have loved every second of my abroad experience, even if I did face a few challenges. If it were easy, everyone would do it. It's worth the extra time/money to live in a world so different from our own, and to see how other cultures view America. It gives you a more worldly perspective so you can be more compassionate towards other people when you make decisions."

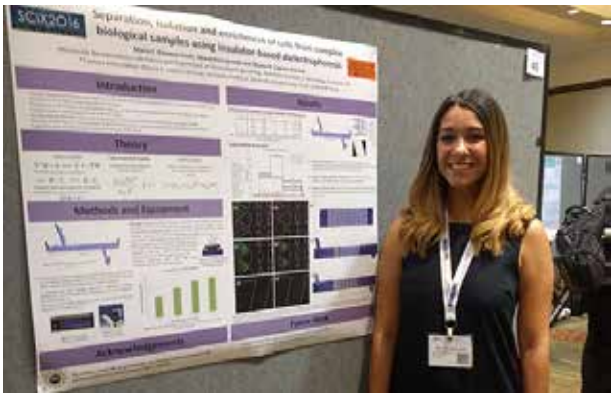
Dakota Sabotka and several other second year BME students traveled to Guatemala with Engineering World Health for three weeks during the 2016-2017 winter break. Before leaving Rochester, the students went through a technical training course to help accomplish the tasks in Guatemala. While she was there she and her group visited six different cities. During her first week in Guatemala she and her group learned Spanish then they traveled to the hospitals where they would be working for the next two weeks. At the hospital she collected and repaired broken or damaged equipment, which largely included blood pressure cups, and pulse oximeters. During her time abroad she and her team were able to repair 20 out of the 25 projects they were given. Dakota then attended a conference where they presented their experience and shared many of the major fixes she and the group made while at the hospital. The students were also able to hike different mountains and volcanos, weave scarves, learn how to cook traditional meals, and take guided tours of the city.

Laura Alderfer, a fifth year BME student traveled to Kayonza, Rwanda to deliver a 3-D printed prosthetic arm after spending the fall semester designing, printing and testing it for a 19-year-old boy named Erik. Given just measurements of the teen's limb and a brief description of what activities he wanted to be able to do, the two students worked on different designs and came up with a prosthetic sized arm for the teen. The new hand does not replace fine motor skills but will help in completing different rudimentary tasks. Laura hopes to return to Rwanda to continue this work and help further product development processes.

Student Achievements

Fifth year BME student, Brent Chase, has had much success this year working with his senior design team to create new innovative technology. GAIA is a new technology, created to help athletes during sports training and rehabilitation, as well as those effected by autism. GAIA won third place in Dr. Destler's challenge at Imagine RIT, fourth in the fall 2016 Tiger Tank competition and placed first in the Innovative Access Technology Product competition. GAIA has collected other awards in competitions such as placing second in the RIT Business Model competition, 3rd place in the Regional Business Plan competition, fourth in the State Business Plan competition and the Paychex Innovation Award. They have also received funding from the Magic Co-up program and the Saunders Summer Start Up program.

Four 4th year BME students received the Outstanding Undergraduate Scholar Award. To earn this award the student must maintain a GPA of at least 3.85, have completed more than two-thirds of the credit hours required for an undergraduate degree, and have demonstrated community engagement in various ways, including independent research, employment, or student committee service. Congratulations go to Christine Dobie, Eric Goodrich, Brandon Hayes, and Spencer Perry on receiving this high honor.



Maria Romero-Creel, a fifth-year BME student who is part of the Microscale BioSeparations Laboratory led by Professor Lapizco-Encinas, attended the annual 2016 SciX Conference in Minneapolis, Minn. In a competition that included more than 150 posters and presentations, created by mostly graduate students from top universities worldwide, Maria received first place for her poster on "Assessment of complex biological samples with insulator-based dielectrophoresis". Mario Saucedo-Espinosa, a doctoral student who is also part of the same lab, received the 2016 Tomas A. Hirschfeld Scholar Award given by the Federation of Analytical Chemistry and Spectroscopy at the SciX conference.

Each year at Imagine RIT, Dr. Destler hosts an Institute wide challenge showcasing various exhibits which fall under a common theme chosen by Dr. Destler. This year the theme was RIT's Greatness Through Difference by hosting an interdisciplinary health innovation challenge. BME students Sarah Siebert, Peter Marcote and team won second place with their Tremor Mitigation product; Brent Chase and team won third place with their GAIA Sports Biometrics Tracking Apparel; and Amy Hughes, Liz Nicholas, and team won fourth place with their Overcomer: Upper Extremity. GAIA also received the Paychex sponsorship award. The Heart Pump and Circulatory System team, which includes BME students Michael Kormos and Blake Suhr, also won the sponsorship award blue ribbon from The Province.

IMAGINE RIT
INNOVATION + CREATIVITY FESTIVAL

KGCOE Multidisciplinary Senior Design Projects

The Multidisciplinary Senior Design Program prepares students for modern engineering practice through a multidisciplinary, team-based design experience. Students apply the skills and knowledge acquired in earlier coursework to implement solutions to engineering problems while adhering to customer requirements and recognized engineering standards. BME seniors participated this year on 24 different teams. Below are a few examples.

Heart Pump and Circulatory System

This project improved two previous models, one of the heart and one of the circulatory system. The primary objective was to integrate the two models and improve reliability, model accuracy, ease of use, and ease of repair. The resulting model will be used by BIME students in a lab course for years to come.

Low-Cost Fundus Camera, Phase 3

Previously, two senior design teams have created a proof-of-concept and a prototype camera to photograph the fundus of the eye at low cost. Phase 3 consisted of further refining and completing the design started by the previous two teams. This final design considers industry standards, and the logistics of scaling up to mass production.

Overcomer-Upper Extremity

This group's goal was to develop a set of wheelchair attachments to assist children with limited use of their arms perform activities in an elementary school gym class. By designing two different attachments, we hope to give kids the ability to throw, catch, and swing sports equipment.

Clinical Blood Analyzer Sample Suspension Tray Project

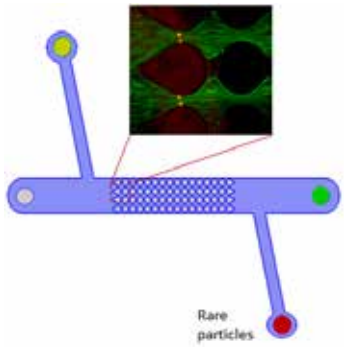
This project was the redesign of the universal sample tray used in Ortho Clinical Diagnostics' clinical blood sample analyzers. It was created to develop a sample suspension tray design that will keep the red blood cells in whole blood samples suspended, therefore eliminating the need for manual interference.

Walking Soft Robot

Soft robots are made of flexible components that change shape when a medium causes a change in pressure. The end result of the Walking Soft Robot was to create a functional inflatable walking robot prototype that builds upon previous "air muscle" technology from the soft robotic hand created in a previous MSD project.

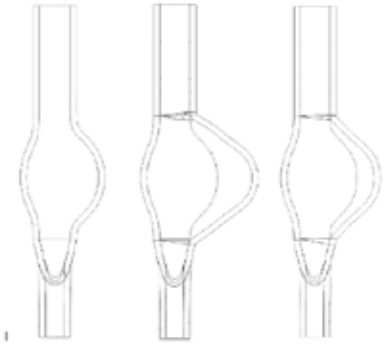
Faculty Research

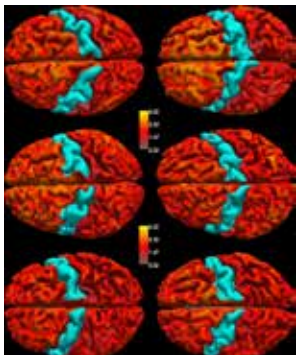
Tom Gaborski was awarded a 5-year, $1.8M Early Investigator Award (R35) from NIH to develop novel membranes for advancement in vitro barrier and co-culture models. These models will help improve drug discovery and stem cell differentiation. His lab will be using ultrathin membranes to enable development of novel co-culture and barrier models as well as improved measurement and analysis of real-time barrier function. The ultrathin nature of the membranes not only enables improved physiological processes, but also optical, electrical, and biochemical analysis of barrier properties. Furthermore, they can control and manipulate physical and biochemical cell-cell interactions by tuning membrane pore sizes and membrane thickness at the nanometer and micrometer scales. This work is currently funded by an NIH NIGMS R35 Early Investigator grant.



Blanca Lapizco-Encinas and her student team continue to explore novel separation methods supported by her NSF award titled: Rapid and dynamic cell Assessments in Dielectrophoresis-Based Microfluidic Devices. The potential of microscale dielectrophoretic systems has not been fully explored; there is an immediate need for systems able to perform several processes on a single device. A recent application of her research is the isolation and enrichment of low abundant particles, in concentrations as low as 1 target particle per 10 millions of other particles. Potential applications of this work is the detection of cancer cells and biomarkers that are present in blood at very low concentrations.

In collaboration with researchers at the University of Rochester Medical Center, Steven Day and his students are working on a project that aims to more accurately predict the rupture of anerusyms using ultrasound imaging. The RIT team is responsible for developing and testing three dimensional computer models of abdomical Aoric Aneurysms and using these models to study material behaviours and ultimately, the effectiveness of the ultrasound methods. An R21 award from the NIH titled Abdominal Aortic Aneurysm Ultrasound Elasticity Imaging supports this effort.





The Integrated NeuroImaging lab headed by Iris Asllani has been focusing on building a dual-modality Near Infrared Spectroscopy – functional MRI (NIRS-fMRI) scanner for in quantitative measurement of human brain function in vivo. The project involves a multi-disciplinary collaboration with Center for Imaging Science, The Institute of Optics at University of Rochester, Technical University of Denmark, and Leiden University Medical Center. Another project, in collaboration with Columbia University, is applying a novel fMRI method developed by Asllani et al. that integrates anatomical images with images of the blood flow in the brain in order to assess the effects of carotid occlusive disease on cognition. The study is currently being funded by an R01 NIH grant, titled: Blood Flow and Cognition in Asymptomatic Carotid Artery Discease.

Cristian Linte and his students in Imaging Science and Engineering are executing a project funded by the NYSTAR sponsored Center for Emerging and Information Science entitled: Exploring advanced image processing and Segmentation Tools for Patient-Specific Anatomical Modeling and 3D Printing for Advanced Therapy Planning. The team is developing methods to extract anatomical objects from CT imaging and translate them into 3D printed physical replicas for use for planning and guiding orthopedic surgery applications. Their methods are aimed at preserving the high resolution imaging detail, which is critical toward reducing articfacts that often appear in 3D printed models.

Where are they going?

Ana Paredo

After various visits to prospective schools, Ana has decided to pursue her PhD at the University of Pennsylvania. Her focus in the Biomedical Engineering field will be Tissue Engineering, rotating her first semester in two labs – Dr. Robert Mauck's lab with a focus on cartilage and soft connective tissue engineering and Dr. Nat Dyment's lab researching tendon engineering techniques and regeneration therapies.

Ben Boseck

After graduation, Ben will transition into a full-time role at LSI Solutions as a Product Design Engineer. Ben will participate in the development of component and surgical device designs, which meet product design requirements, specifications and customer usage requirements. LSI Solutions is a dynamic and growing medical device company dedicated to advancing minimally invasive therapeutics through research, development, manufacturing, and marketing of minimally invasive surgical instruments.

Linzey Miller

Linzey accepted a full-time position with Hill-Rom in their leadership rotational program within their global supply chain operations section. She will be rotating through four different sections, including continuous improvement, materials planning, quality improvement, and shop operations supervisor. Hill-Rom develops new products and processes to support the daily work of nurses and caregivers around the globe.

Tyler Roneker

After graduation in May, Tyler will begin working full-time at Matchstick, LLC, located in Boonton, New Jersey, as an Associate. Matchstick is a consulting firm that works with pharmacutical companies to help develop and launch drug delivery devices. Tyler will be working in the Early Career Experience program intended to equip recent graduates with the skills, experience, and confidence to manage projects in a Manager role.

Where are they now?

Liz Stoyan

Upon graduation, Liz started working at United Therapeutics in Raleigh, NC in June 2016. Liz currently works in the Regenerative Medicine lab using pig lungs as a scaffold for human primary and stem cells with the goal of creating a functional lung replacement. Liz works on recellularizing the vasculature with endothelial cells so that the organ can hook up to the donor blood vessels and provide nutrients to the rest of the organ.

Mallory Wingate

Mallory started working as a Development Engineer with Zimmer Biomet in Warsaw, Indiana in June 2016. She works in the Surgeon Specialty Instruments group, designing and developing unique and modified instruments for total hip arthroplasty based on surgeon requests.

Amy Zeller

Amy joined Stryker Orthopaedics in June 2016. During her employment, she has had the opportunity to travel to manufacturing facilities of various suppliers to learn about and improve upon their manufacturing processes. She has also led multiple sawbone demonstrations in which she taught colleagues how to perform different types of knee replacement surgeries (see below). Additionally, she has supported cadaver labs, performed product testing, and participated in an audit during her first several months at Stryker.

Congratulations Class of 2017

*	Laura Michelle Alderfer
*	Jaclyn Victoria Amann
***	Avery David Becker
*	Dakota Jack Bolt
**	Benjamin James Boseck
	Nicole Alexis Casacci
***	Chantel Marie Charlebois
	Brent Bobby Austin Chase
	Randi K. Del Rosario
	Amanda M. Drake
	Justin Eng
	Meaghan Anne Erlewein
	Erik Lane Freeman
	Jessica Godard
	Amy Catherine Hughes
	Collin Thomas Inglut
*§	Camille Cerise Johnson
	Shannon Julia Keenan
	Christopher Ali Kirby
	Brittany Rae Klimtzak
	Michael Andrew Kormos
***	Carolyn Marie Krasniak
**	Jakob Anthony Krzyston
	Steven J. Lalowski
	Colin Robert Willsey Lemen
	Peter Michael Marcote
	James Keith Mc Gee
	Melissa Mendoza
*	Linzey Elizabeth Miller
	Farrukh Mohiuddin
***	Erinne Janine Munie
	Elizabeth Josephine Nicolas
**	Ashlynn Mae Palmitesso
**	Ana Paula Peredo Nery
*	Maria Fernanda Romero-Creel
	Tyler Eugene Roneker
*	Nathaniel Louis Rosengrant
***§	Lauren Elizabeth Samar
	Emily Jane Sanseverino
	Sarah Elizabeth Sibert
	Sarah Ellen Stoltzfus
	Blake Michael Suhr
	Zin Thaw

* cum laude ** magna cum laude ***summa cum laude § Honors Program