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Welcome to the second annual newsletter of the RIT Department of Biomedical Engineering. We had another exciting year in the department. I hope that this annual publication gives you a sense of the range of activities and accomplishments of our students and faculty during the past year.

We will graduate the first full graduating cohort of students this year, having grown quickly from the inaugural class in 2015. I couldn’t be more proud of the success of our students within class, labs, jobs, and clubs and have featured a few of these as examples. Our alum have gone on to top graduate and professional programs and more than one hundred companies have hired students for co-op and full-time placement.

The department welcomed the arrival of another experienced faculty to our ranks and are continuing to deliver a robust curriculum rich with experiential learning that prepares students to contribute to teams on (or even before) graduation day. Our faculty team includes full-time educators and a productive group of faculty working with students to publish funded discoveries. A few of these awards and accomplishments are highlighted here.

Thank you for your interest in the department. Best wishes for another successful and productive year!

[Signature]

Steven O. Day
FEATURED MSD PROJECTS

What is an MSD project?

The Multidisciplinary Senior Design (MSD) 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.

Rugby Scrum Cap to Reduce Concussion

Concussions make up a major portion of injuries in rugby and can sideline players for weeks. A scrum cap is a piece of equipment that a player wears to protect against soft-tissue injury. However, current caps provide limited protection against head injuries such as concussions. This team has redesigned a scrum cap to help reduce the incidence of concussion after head impact.

Baby Stroller with HVAC Capability

Infants and young children are particularly sensitive to extreme heat and cold. Maura Keyes developed the project idea as a way to protect her baby niece from the cold weather of Alaska. Maura’s sister is a young mother living in northern Alaska that has to walk 10 minutes to and from work each day with her baby. The team has designed the Climate ConStroller to provide a heated baby carriage space for use in cold weather environments.

From left to right: Andrew Draveck, Akane Fujimoto, Caroline Kruse, Rachel Baumgarten (BME), Jamie Lucarelli (BME), Eric Iverson

From top left: Ian Smith, Prince Rex, Danielle Labelle, Emily Heitzhaus, Maura Keyes, Christina Pensabene (BME)
Electrical and Mechanical Bioreactor

The electrical and mechanical bioreactor teams have developed cell culture platforms that will be used in Dr. Jennifer Bailey’s Advanced Cell Culture course at RIT. These bioreactors will allow students to study cells in dynamically controlled electrical and mechanical conditions that are representative of the environments found inside the body.

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Electrical Bioreactor Team

- Pocket Rescue Inhaler - Samuel Border, Najwa Taylor
- Rugby Serum Cap to Reduce Concussion - Rachel Baumgarten, Jamie Lucarelli
- Self-Powered Child Jumper - Christine Dobie
- Soft Robot - Zachary DiLeo, Marie McCormack, Jamie Mortensen, Conor Mckaig
- Solar Powered UV Water Purification System - Erik James Messier
- Stand-up Walker for People with Parkinson's - John Bushman, Nathaniel Luther
- Follow-Up to Glove-Based Wearable Controller - Natasha Amadasun
- Tremor Mitigation 2 - Nicholas DaCosta, Ashley Lykawa
- Tremor Mitigation DAQ - Elizabeth Eichorn
- Tremor Mitigation Test Arm - Megan Bramlett, Eric Goodrich
- Wheelchair Accessible Toilet - Changwu Mungai, Bethany Ann Tisa
- Wireless Concussion Detection - James Cummings

Mechanical Bioreactor Team

- Pocket Rescue Inhaler - Samuel Border, Najwa Taylor
- Rugby Serum Cap to Reduce Concussion - Rachel Baumgarten, Jamie Lucarelli
- Self-Powered Child Jumper - Christine Dobie
- Soft Robot - Zachary DiLeo, Marie McCormack, Jamie Mortensen, Conor Mckaig
- Solar Powered UV Water Purification System - Erik James Messier
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- Wireless Concussion Detection - James Cummings

Congratulations to team MYSCLE (Myocyte Stretching Cellular Lab Experiment) in receiving a grant of $500 from the American Section of the International Association for Testing Materials (ASTM) for their cell straining device!
Welcome

Dr. Vinay Abhyankar joined the BME faculty in August 2017. He received his B.S. in Mechanical Engineering from Binghamton University and earned a Ph.D. in Biomedical Engineering from the University of Wisconsin–Madison. Prior to joining RIT, he led the Biological Microsystems Division at the University of Texas at Arlington Research Institute in Fort Worth, TX. Dr. Abhyankar’s research laboratory focuses on tissue engineering and microfluidic platforms.

Awards

Steven Day was part of an FDA coordinated author team recognized with the Willem Kolff Award for best abstract and presentation during the 62nd ASAIO Conference

Work from Thomas Gaborski’s laboratory was featured on the cover of ACS Biomaterials January 2018 issue

Blanca Lapizco-Encinas joined the Editorial Board of the journal IET Nanobiotechnology

Iris Asllani chaired the Arterial Spin Labeling perfusion fMRI session at the European Society for Magnetic Resonance in Medicine & Biology (ESMRMB)

Cristian Linte was elected as chair of the IEEE Engineering in Medicine and Biology Society (EMBS) Technical Committee on Therapeutic Systems and Technologies

Faculty Scholarship

64 Works of Scholarship, 19 Peer-Reviewed Journal Papers

31 RIT Students involved in publications, presentations, and patents

Development of dielectrophoresis chromatography employing asymmetric insulating structures and electric fields (NSF)
Blanca Lapizco-Encinas and her team are developing a new hybrid separation microfluidics technique that combines microscale electrokinetics and chromatography.

Development of ultrathin silicon nitride nanomembrane for prototype dialysis modules targeted for home hemodialysis (NSF)
In collaboration with SiMPore Inc. and the University of Rochester, the Gaborski NanoBio Device Lab is researching nano-manufacturing techniques for ultrathin membranes. These nanomembranes are being used in preclinical trials for portable hemodialysis as well as to to purify cellular exosomes.

Plasma clearance of water-soluble and albumin-bound toxins using graphene oxide nanoengineered laminates (NIH)
The Gaborski NanoBio Device Lab is working with the University of Florida to develop new graphene nanomembranes for blood purification. They are researching use of graphene oxide nanolaminates to filter and absorb both water soluble and protein-bound toxins from blood for use in a portable hemodialysis devices for kidney failure patients.

Cell and Tissue Technologies Laboratory (NYS Empire State Development Fund)
Steven Day will use this award to establish shared laboratory space to further encourage interactions between academic researchers and the private sector.

Provost’s Learning Innovation Grants (PLIG)

Best Practices in Spatial Visualization
Jennifer Bailey (BME) and David Wick (Office of Diversity and Inclusion)

Reimagining Programmatic Interdisciplinary Coursework: A Pilot Exploration into Biomedical 3D-Printing
Christian Linte (BME) and Jade Myers (RIT Access Technology Prototyping Lab)

Development of Companion Projects for Vertical Integration of Design Experiences Through the BME Curriculum
Cory Stiehl (BME) and Iris Asllani (BME)
WHERE ARE THEY GOING?

- **Rachel Baumgarten**
  Rachel has accepted a position with Epic as a Technical Problem Solver and will be working with health-care software starting in July 2018. Her previous co-op experience was with Bausch and Lomb from January 2017 - August 2017 working in the process engineering department for the production of new contact lenses.

- **Stephanie Casillo**
  Stephanie will be attending the University of Pittsburgh for medical school as part of the Physician Scientist Training Program (PSTP). In that program, Stephanie will have the opportunity to participate in basic science research tailored to her interests in pediatric neuro-oncology. After medical school, she plans to train as a pediatric surgeon and contribute to the development of treatment options for children suffering from brain tumors.

- **Emily Kimber**
  Emily will be working in the Vehicle Performance Development department at Toyota as a Crash Safety Engineer starting in late August 2018. Her responsibilities will include recreating airbag deployments and vehicle crash tests to analyze injury mode and crash data results. She credits the numerous opportunities RIT has provided through intramurals, clubs, networking, and co-op for preparing her for a career in engineering.

- **Tegan Ayers**
  Tegan will be moving to Boston to work full-time for Bose Corporation as a Product Concept Engineer. This position will be focused on developing new products that promote health and wellness. RIT’s co-op program has given Tegan the opportunity to work for four different companies, which helped her build professional working relationships.

- **Jamie Lucarelli**
  Jamie will be joining Medtronic Spine and Biologics in Memphis, TN as an Associate R&D Engineer. Her work in the Custom and Specials Department will focus on working with surgeons to improve existing surgical instruments.

- **Jonathan Amerault**
  Jonathan will begin his new position as an Associate Manufacturing Engineer at Teleflex Medical OEM in New Hampshire where he also worked as an engineering co-op. His primary responsibility will be to help make the department a center of excellence in PTFE extrusion.

- **Brandon Hayes**
  Brandon will be going to Los Alamos National Lab as part of the Science Undergraduate Laboratory Internship (SULI) program. Following this experience, he will pursue a Ph.D. in mechanical engineering.

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**Featured Employers of BME Graduates**

Rheonix, Inc. is committed to improving standards of care by making molecular diagnostics available to more people, in more places, more often. As scientific knowledge evolves, so does the need for new diagnostic technology to simplify processes and enhance innovation.

Stryker is one of the world’s leading medical technology companies and together with our customers, is driven to make healthcare better. They offer innovative products and services in Orthopaedics, Medical and Surgical, and Neurotechnology and Spine that help improve patient and hospital outcomes.
Laura Alderfer

Laura is attending Notre Dame University pursuing a Ph.D. in Bioengineering. She recently received a $12,500 grant (Research Like a Champion grant) from the Harper Cancer Research Institute for her project titled “Lymphangiogenesis Model to Study the Interplay between Mechanical and Biochemical Cues in the Metastatic Breast Cancer Microenvironment”.

Alex Dawson-Elli

Alex is currently a graduate student at the University of Wisconsin-Madison and works as a Research Assistant in the Biomechatronics, Assistive Devices, Gait Engineering and Rehabilitation (BADGER) Lab. As a graduate student, his time is split between formal coursework and conducting research. He develops robotic therapies targeted at improving gait after stroke. On any given day he could be machining a part in the shop, designing a PCB for manufacturing, developing control software in C++ or python, working with a stroke patient, analyzing patient data, or developing a neuromuscular simulation to test new training paradigms.

Alex LaLonde

Alex is currently living in Royal Oak Michigan working as a patent examiner at the United States Patent and Trademark Office. Her responsibilities involve reviewing patent applications for drug delivery devices. She was always very interested in intellectual property during her undergraduate years and enjoys the industry while exploring a new city.

Emily Holz

Emily joined Genentech in South San Francisco, CA in August 2016 as an Associate Engineer. Since then, she has rotated through four departments within the pharmaceutical technical development organization: Protein Analytical Chemistry, Biological Technologies, Drug Delivery, and Purification Development. Among other projects, she developed mass spectrometry processing methods to mine historical data and assist with antibody engineering. She also created a novel stimulus-responsive hydrogel for long-acting drug delivery. She is currently working on a purification process for a new antibody-drug conjugate format.
STUDENT ACHIEVEMENTS

AES Electrophoresis Society
In November 2017, Eric Goodrich received a poster award from the AES Electrophoresis Society in Minneapolis. Only two undergraduates received this award during the AES meeting, and Eric was one of them!

Outstanding Undergraduate Scholar Awards 2017-2018
Students Matthew Williams, Nicole Mazzola, and Lucas Quesnel joins an elite group of students who have completed a minimum of 83 credit hours of study and have established a cumulative grade point average of at least 3.85 for all work completed at RIT as of the previous Spring term.

Journal of Chromatography A
The Lapizco Microscale BioSeparations Lab has published a peer-reviewed journal article, “Separating Large Microscale Particles by Exploiting Charge Differences with Dielectrophoresis”. Undergraduate BME authors are underlined.

Authors: Danielle V. Polniak, Eric Goodrich, Nicole Hill, Blanca H. Lapizco-Encinas

ACS Biomaterials Science and Engineering
The Gaborski NanoBio Device Lab published a peer-reviewed journal article, “Porous Substrates Promote Endothelial Migration at the Expense of Fibronectin Fibrillogenesis”. Undergraduate BME authors are underlined.

Authors: Henry H. Chung, Stephanie M. Casillo, Spencer J. Perry, and Thomas R. Gaborski

Alumni start-up featured as one of the ‘Coolest College Startups’
GAIA, a company founded by RIT alumni, was featured in an Inc. article listing the top eight “Coolest College Startups” as named by the Student Startup Madness competition at South by Southwest. This company is almost entirely run by RIT students and alumni.

Co-founded by Brent Chase ’17 (BME), Joseph Clifford ’17 (ME) and Liam Herlihy ’17 (EE), and moving forward with an MSD team including 3 BME seniors (page 4, team 7). GAIA’s aim is to “help prevent, mitigate or decrease the frequency of meltdowns for children with autism” by utilizing wearable technology to detect these intense responses to overwhelming situations before they occur.
BioPrint

RIT BioPrint provides students with the opportunity to further their knowledge in 3D modeling and design, 3D printing, and materials testing. The club promotes collaboration and teamwork by fostering a venue for small teams focused on specific, yet multi-disciplinary projects.

Engineering World Health

Engineering World Health (EWH) is a non-profit organization founded in 2002 with the goal to inspire, educate, and empower the biomedical engineering community. The RIT student chapter travels annually to Guatemala during winter-break to work with hospital partners.

Biomedical Engineering Society

BMES provides the tools and resources students need to excel in biomedical engineering. The benefits of membership for those studying to become biomedical engineers are invaluable. The Society has over 145 student chapters and more than 4,500 student members. The RIT student chapter focuses on career development, networking, and leadership skills.
CONGRATULATIONS
CLASS OF 2018

Christopher James Alpaugh
Natasha Amadasun
* Jonathan L. Amerault
Isaac Mitchell Arabadjis
** Tegan Marie Ayers
* § Rachel Naomi Baumgarten
Rebecca Ann Bonamico
** Samuel Peter Border
Megan Bramlitt
* John J. Bushman Jr.
** § Stephanie Casillo
** Amanda Castagnino
Erin Coppola
James Paul Cummings
Lauren Nicole Cussen
** Nicholas DaCosta

Zachary Anthony Di Lego
Christine A. Dobie
** Elizabeth Margaret Eichorn
Dillon Patrick Flood
** Eric Anthony Gioe
** $ Eric Michael Goodrich
** Katie Erin Green
Brandon Shafer Hayes
** Emily Kimber
** Justin Kwangyao Liao
** Jamie A. Lucarelli
Nathaniel Owen Luther
Ashley Lyskawa
Shena Marshall
Marie Elizabeth McCartan
Conor Brady McKaig

Tessa Bryn Mellinger
Erik J. Messier
Jamie S. Mortensen
Ashley M. Nolan
Natalie Marie Nold
Patrick Robert O’Mara
Christina M. Pensabene
Marie Frances Pillidge
Danielle Victoria Polniak
Simran Singh
Najwa Haleh Simone Taylor
Bethany Ann Tisa
Elise K. Wilcocks
Brenna Kathleen Woodling
Austin William Zuercher

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

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