I am excited to share the activities of our faculty, students, and alumni in this issue of BEconnected. Our students have won prestigious awards from the National Institute of Justice and National Science Foundation. Our faculty secured over $4.3 M in extramural funding and published 9 books, 34 peer-reviewed journal articles, 61 conference publications, 11 book chapters, and 17 patents and patent disclosures last year. We are delighted to report the addition of Dr. Joseph Chen to our faculty. Our faculty and students continue to make a difference in the community by developing and commercializing a rehabilitation system for children with spinal cord injury.

The Department of Bioengineering will be commencing a Master of Science program from Spring 2020 and will soon be offering a Certificate program in Artificial Intelligence in Medicine. We hosted the President of the University of Dubai, Dr. Eesa Bastaki, and signed a memorandum of understanding to facilitate collaboration between UofL and University of Dubai. Our distinguished seminar series featured the BE chairs of Carnegie Mellon University, University of Maryland, Vanderbilt University, and University of Cincinnati. BE students presented over 40 abstracts at the 2019 BMES conference in Philadelphia.

Chair’s message

Dr. Ayman El-Baz,
Chair of Bioengineering

In this Issue
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• Student Successes
• Faculty Recognition
• Interview w/ a Student
• Faculty Spotlight
• BE PEOs
• BMES Spotlight

Department of Bioengineering, Speed School of Engineering, University of Louisville
Fall 2019 Edition

BE student Successes

Dept of BE Alumni Award
Dhru Patel
Dhruvinkumar (Dhru) Patel graduated from the University of Louisville's Bioengineering Department in 2012 with a Master of Engineering degree. During his studies he served as a researcher in the labs of Drs. Andre Gobin, Robert Keynton, and Martin O'Toole. His work on synthesis of Gold nanoprisms and nanoshells led to eight publications (including a textbook chapter), two patents, and numerous conference publications. He received the Joseph Henry Award in Bioengineering at UofL and has returned as a guest lecturer on numerous occasions. Dhru's career path has guided him through engineering jobs at Ethicon Endosurgery, Energy Delivery Solutions, and finally to his current position as Senior Quality Engineer at Symmetry Surgical in Louisville, KY. He works hard to keep the entire product line within the scope of FDA and EU MDR regulatory guidance.

Keyonna McKinsey, MEng, has secured a grant from the National Institute of Justice to characterize the risk of children with bone fragility disorders. Her mentors are Gina Bertocci and Angela Thompson.

Joey Breckenridge Jr., BE senior and an active member of the BMES, was chosen as the homecoming king this year.

National Science Foundation has granted an Internship to Sexton Biotechnologies for Connor Centner to develop cell processing technologies for clinical applications. His mentor and Co-PI is Jonathan Kopechek.

Homecoming king Joey Breckenridge Jr., with UofL President, Neeli Bendapudi
We are very grateful for the support of our donors and alumni, which has helped us set up six new student awards. We look forward to your continued support to help us achieve our target of raising $200,000. We are deeply grateful to Mr. Don Rodda, who is retiring after serving on our external advisory board for nearly a decade. His advice and guidance will be sorely missed. I would like to welcome you to visit us in person and we would love to receive updates from you. Please contact Betty Nunn at betty.nunn@louisville.edu to send your updates or set up your visit. We wish you all a joyous holiday season and a wonderful new year.

Chair’s Message, cont. from pg. 1

The MEng degree in Bioengineering gives me an advantage in my current field. I am pursuing an MBA and/or studying for the patent bar examination after I finish my MEng in the summer of 2020. Currently, there is a need for engineers in the intellectual property space and I believe having an advanced degree in BE, which is focused on translational research, will help with these pursuits.

2. Overall, how do you feel about the program?
I’ve enjoyed my classes within the MEng substantially more as I feel they are more applicable and informative. I appreciate that the BE department has grown the number of classes and areas of focus, as my interests are often different from the ‘standard’ student. I am grateful to the professors and courses that encourage us to use bioengineering principles to address unmet needs with innovative solutions and allow us to do projects to gain experience in product development and translation.

3. How has the program improved your knowledge and opportunities?
I now work full-time for the Commercialization EPI-Center at the university, which promotes innovation at every level and seeks to license our technologies to businesses for further development. During this time I have attended many conferences, presenting on behalf of our office & UofL, and have worked with businesses at various levels. Many in this field have attained a Masters or PhD degree, but I was fortunate enough to have been able to work my full-time co-op and part-time while completing my Bachelor of Science. The correlated BE course work has greatly helped with success at my job with greater insight into the research process and the innovation behind research efforts in engineering.

4. What advice can you impart to potential applicants of the M.Eng program?
Take the time to meet with professors of interest before you begin. I took a year off between undergrad and graduate school and in that year I reached out to various mentors to make sure that this degree would benefit me in my personal pursuits. This is a rigorous program that cannot be pursued half-heartedly. I would encourage ev-

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eryone to be able to commit to the program and find mentors within the department (and outside) to make sure you reach your goals.

5. **How might the program be improved?**

I’ve enjoyed interdisciplinary classes with other departments in Speed School as well as the Business and Law Schools. Additional options and opportunities to incorporate more business or law school courses can help students gain a broader perspective.

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**Faculty spotlight**

Dr. Jill Steinbach-Rankins is an Associate Professor of Bioengineering in the Center for Predictive Medicine at the University of Louisville, with associate appointments in the Departments of Pharmacology & Toxicology and Microbiology & Immunology. She joined the University of Louisville in October 2013 and her work has been supported by multiple funding agencies, including NIH R01 and R21 grant mechanisms, NIH COBRE program, Jewish Heritage Fund for Excellence, and the Knight’s Templar Foundation.

Dr. Steinbach-Rankins’s research involves designing and developing delivery vehicles that provide more efficacious prophylaxis and treatment against sexually transmitted viral infections, bacterial infections, and virus-initiated or reproductive cancers. Her approach is to combine vehicles that target pathogens and host cells, while designing bio-inspired platforms amenable to the unique microenvironment where infections occur, including the female reproductive tract (FRT) and oral cavity. Her lab has developed electrospun fiber (EF) and nanoparticle (NP) platforms comprised of polymers that encapsulate antiviral drugs and new multi-target proteins to inhibit human immunodeficiency virus (HIV-1) and herpes simplex virus type 2 (HSV-2) infections. In addition, she has developed fiber scaffolds and NPs that incorporate and are surface-modified with antiviral drugs and biologics, to decrease virus inoculum at entry and bacterial biofilm interactions in the oral cavity. Her lab has created pH-responsive formulations to better bridge the gap in next-generation on-demand delivery technologies. Most recently, she has applied some of this knowledge to develop probiotic fibers to complement viral prevention strategies, by restoring the balance of beneficial bacteria after bacterial FRT infections.

Dr. Steinbach-Rankins has mentored over 50 students including 6 high school, 20 undergraduate, 11 Master’s, 3 Ph.D., 6 medical, and 4 postdoctoral students, resulting in over 80 research (oral and poster) presentations at local and national conferences, 41 international/domestic fellowship or presentation awards (DAAD and Fulbright), domestic research experiences at Stanford and Yale University, and many first-author manuscript publications. She serves as the faculty advisor for the BMES chapter at UofL and organizes the annual BMES/BE 5k run. Dr. Steinbach-Rankins has received several notable recognitions to advance her work to focus on delivery vehicles against bacterial female reproductive infections and received the CRS Oral Focus Group Young Investigator Award. She has patent applications pending and serves as a reviewer for grant programs and for 25 peer-reviewed journals.

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**Program Educational Objectives (PEOs)**

The BE Department undertakes a review of the Program Educational Objectives (PEO) every 3-years to maintain our ABET accreditation. As part of the process, we would like to hear your feedback regarding the PEOs. The BS and MEng BE PEOs have been slightly modified to better reflect our program objectives and are listed below. If you have any modifications or feedback on these PEOs kindly email betty.nunn@louisville.edu before January 13, 2020.

The **BSBE degree program** will generate graduates who:

1. Are equipped to succeed in a broad range of careers in industry and graduate/professional school.
2. Demonstrate leadership, communications and team-building skills.
3. Comply with professional and ethical responsibilities, understand societal issues and engage in life-long learning for continued professional development.

The **MEng degree program** will generate graduates who:

1. Demonstrate advanced level academic expertise and practical engineering experience necessary to function as bioengineering professionals in a modern, ever-changing world.
2. Display competency by being selected for employment by industrial, academic or government entities or further professional/graduate studies.
3. Understand the broad, social, ethical and professional issues of contemporary engineering practice.

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**From back to front; Hetal Desai, Steinbach-Rankins, Abhinav Kanukunta**

**From left to right; Hetal Desai, Farnaz Minooei, Jill Steinbach-Rankins**
BE Grants for 2019
Biomedical research grants by faculty & staff are listed below by name, grant source and amount.
A.El-Baz, DoD(611k); A. El-Baz & G. Giridharan, Jewish Heritage Fund for Excellence (50 k); G. Giridharan & A. El-Baz, DoD Phase II SBIR (200k), Industry contract (62k); R. Keynton, NIH (109k), NSF (1M), UK Research Foundation, (250k); J. Kopechek, NASA (7.5k), UK Research Foundation (6k); A. Melvin, Sigma Xi (1k); T. Roussel, NIH (38k), NSF (1.6k), NSF (1.6k), NSF (1.6k), J. Sharon, NSF (6.5k), J. Steinbach-Rankins, NSF (1.6k), NSF (1.6k), J. Steinbach-Rankins (2.5M). Total for 2019, (4.34M).

UofL/U of Dubai Sign MoU
The Department of Bioengineering hosted Dr. Eesa Bastaki, President of the University of Dubai (UD). A Memorandum of Understanding (MoU) was signed between the University of Louisville and UD. Eesa Bastaki, president of UD, talked with UofL President Dr. Neeli Bendapudi, Provost Dr. Beth Boehm and other administrators about cooperation and collaboration between the two universities to enable engineering students to perform research activities. Dr. Bastaki said UD is especially eager to give its students more exposure to industry. Dr. Bendapudi noted UofL's industry relationships are one of the school's many strengths, citing a recent partnership with IBM as one example. “We're perfectly poised in Louisville,” Bendapudi said. “We have so many opportunities for growth. We will make sure your students have a rich experience.”

Dr. Bendapudi said she hoped the agreement would lead to more study abroad opportunities for UofL students. “People's minds change when they travel,” she noted. UD is in the United Arab Emirates. The memorandum was also signed by Dr. Emmanuel Collins, Dean of the J.B. Speed School of Engineering. The agreement will be in effect for five years.

Epic Innovators
BE faculty and students are innovating technologies that promise improvement in the way we learn, work and invest. Several bioengineering researchers were recently recognized at the EPIC Innovations Awards on Oct 30th.

Among those honored from BE were Thomas Roussel, Jill Steinbach-Rankins, Guruprasad Giridharan, Ahmed Soliman, Jonathan Kopechek, Ayman El-Baz, Steven Koenig, Michael Voor, Fahmi Khalifa, Ahmed Shalaby, Martin O’Toole, Mohammed Shehata and Robert Keynton.

Rehabilitating Children with Spinal Cord Injury
One new innovation, a treadmill used in locomotor training for children who have suffered spinal cord injury, has recently garnered commercial success (see video) in a licensed design to Power Neurorecovery, BE’s Dr. Tommy Roussel, in collaboration with the EPIC Innovations Awards on Oct 30th.

Dr. Andrea Behrman at the Kentucky Spinal Cord Injury Research Center, re-designed an adult version of a locomotor therapy system to accommodate children. With support from the Coulter Translational Partnership at UofL, Roussel’s team designed the prototype, then worked with manufacturers to design a custom treadmill and harnesses to fit smaller body sizes and ensure that trainers have better ergonomic control while assisting patients during training sessions. Congratulations to the entire group for their efforts to improve spinal cord injury patient outcomes!

BE donations
We have established a student endowment with a goal of raising $200,000 in the next 4 years. Due to the generosity of our donors we have raised approximately $45,000 to date. This has enabled us to present six new BE student awards this year. We are deeply grateful to all our donors for contributing significant amounts to this cause. Your continued support is vital to fulfilling the endowment objective of recognizing meritorious students. For more information about how your donations can help transform the BE Department, please contact Mark Daily or call (502)852-2400.