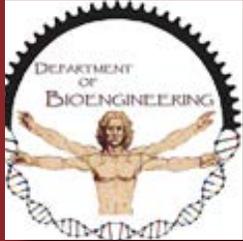


- Chair's Message
- Student Successes
- Alumni Spotlight
- Faculty Spotlight
- Dept News
- BMES Spotlight
- Awards
- BE Donors



BE connected

Department of Bioengineering, Speed School of Engineering, University of Louisville

Fall 2018 Edition

chair's message

*Dr. Ayman El-Baz,
Professor and Chairperson*



Our department continues to be internationally recognized in translational biomedical research and in this issue of BE-connected, we highlight the successes, activities, and entrepreneurship of our BE students and faculty. Our Department was ranked by the US World News and report for the first time and we hosted the Chancellor of Abu Dhabi University to explore joint degree programs and enhance research collaborations. Our department is hosting a special session on Bioengineering in the ISSPIT '18 conference in Louisville with the University of Kentucky. Our students have won a number of prestigious awards and grants, and have also founded companies based on their inventions. The BE faculty had a productive year and secured grants from the National Institutes of Health, National Science Foundation, and National Institute of Justice. The BE department had 34 presentations in BMES 2018 at Atlanta, and over 40 attendees in 2018. This year, eight BE faculty members and four post-doctoral instructors were recognized as 'faculty favorites' and Dr. Ahmed Shalaby was named a 'Top 5 faculty favorite'. We are very grateful for the support of our donors and alumni who have helped to raise over \$30,000 towards the student endowment. Your contributions have been vital to the success of our students

and your continued support is essential to meet our target of \$100,000. Please visit us and see all the exciting changes in our department. We would love to receive updates from you! Please send your updates to Nancy Hansford at nahans01@louisville.edu. We wish you all a joyous holiday season.

BMES 5k Run/Walk

UofL's student-run chapter of the Bio-medical Engineering Society (BMES) hosted a 5k Run/Walk in October to generate financial support for the chapter. Students, faculty and other BMES supporters participated.



student successes

Landon Tompkins Wins NIH SBIR Grant

An NIH SBIR Phase I grant in the amount of \$303, 817 to develop and test a ventricular assist device outflow graft quick connect was awarded to Landon Tompkins and colleagues. Landon is a doctoral student in the Translational BE Ph.D. program and serves as a co-PI on the grant. This novel technology is being developed by UofL Bioengineering and CT surgery faculty. Landon is mentored by Dr. Steven Koenig.

Jonathan George wins Crawford scholarship

Jonathan George, a doctoral student in the Translational BE Ph.D. program, received the Crawford Scholar award from the Todd Crawford Foundation. Jonathan is working on a method to help children suffering from spinal cord injury to sit again. For additional information, go [here](#). Jonathan is mentored by Dr. Tommy Roussel.

Alexa Melvin's Start-Up

Alexa Melvin, a doctoral student in the Translational BE Ph.D. program, was recently named Vice President of R&D for Amenable Solutions LLC, a UofL startup that is commercializing an assistive handwriting device to allow people with limited fine motor hand control to use the recommended tripod grasp when writing. Prototypes are in use by pediatric spinal cord patients and will also help young children to learn to write. Alexa is mentored by Dr. Thomas Roussel.



BE donations

Your continued support is vital to the success of our department. You may designate your support towards the BE department, student awards, or to support a specific research lab. For more information about how your donations can help transform the BE Department, please contact Tom Keith at tom.keith@louisville.edu, or call (502)852-3034.

Faculty successes

Dr. Martin O'Toole, along with Drs. Malik and Bates, has licensed a technology developed at UofL to **Qualigen** in June of this year. A provisional patent was applied for in February, 2015 entitled,

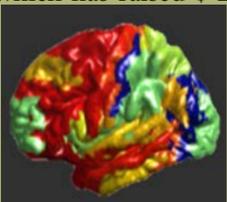


“Anti-Nucleonin Agent- Conjugated Nanoparticles as Radio-sensitizers and MRI Contrasting Agents.” Dr. O'Toole is the director of the **Nanotherapeutics Laboratory** at UofL.

Drs. Tommy Roussel (BE) and Alex Ovechkin (NCC) are negotiating licensing arrangements with six companies regarding their patent-pending **Breath-Force Respiratory Training** technology. This system provides a portable and battery powered home-based respiratory training regimen for patients with spinal cord injuries. Dr. Roussel is the director of the **BICRD lab**.



Dr. Ayman El-Baz is commercializing a technology for **Computer Aided Diagnostic System Incorporating 3D Shape Analysis of the Brain for Identifying Developmental Brain Disorders**. This technology was recently licensed to **Autism Diagnostics, LLC**, which has raised \$ 2 Million towards further development and Food and Drug Administration (FDA) approval of this novel technology



for autism detection. This technology will lead to earlier detection of autism compared to current methodologies and will enable treatment of patients at an earlier stage, leading to better functional outcomes in patients. It utilizes data from structural MRI (sMRI) to study the anatomical abnormalities between autistic and normally developed subjects based on the 3D shape analysis of their brains and extracting

classification metrics. The extracted metrics are then fed to a deep-network based classifier for both local diagnosis and higher-level local features extraction. The higher-level features are then fed to a global classifier to obtain the global diagnosis decision. Using this approach is an important step towards personalized medicine, to enable a more accurate diagnosis of each subject along the autism spectrum. Dr. El-Baz is the director of the **Biolmaging Laboratory**.

alumni spotlight

Daniel Bachman

I had unique opportunities, as part of the first class of students, to be part of the development of the University of Louisville Bioengineering program. We were witness to, and had influence on, many changes including curriculum, co-operative positions, and completing the BE degree while fulfilling pre-medical requisites. From this, I gained a lot of respect for those engineers who pioneer new pathways through their careers.



While working as a co-op for DePuy Orthopaedics, I recognized some of the limitations in interactions between engineers and surgeons. Fundamentally sound devices and surgical tools were met with what seemed at the time to be trivial concerns for their implementation. Witnessing the challenges of multidisciplinary device design teams, I decided I wanted to be able to meld the two professions. I hoped to have an understanding of both, which would more quickly translate clinical feedback into design. This inspiration lead me towards furthering my education in medicine.

Bioengineering prepared me well for the medical school classroom, especially physiology. Due to the new problem-based learning formats, the engineering way of thinking is even more relevant today. In addition, my BE training provided an understanding of FDA regulation, device recall, and redesign and has given me a unique perspective on corporate influence of medical practice.

Capitalizing on learning both engineering and medicine is most apparent with the research I have participated in. When given the opportunity to work in the biomechanics lab at the Mayo Clinic, I realized I had all of the tools needed to perform impactful surgical practice-changing benchtop research. I was able to use LabVIEW to automate a rotational forearm cadaveric model, and filters to make meaningful use of the data collected, then analyze repeated measures statistics. While in residency at UMKC, I have been able to translate data from computationally modeled elbow injuries into better understanding of ligamentous repair. Both research opportunities have inspired future projects and will influence my choice of orthopaedic specialization through clinical fellowship.

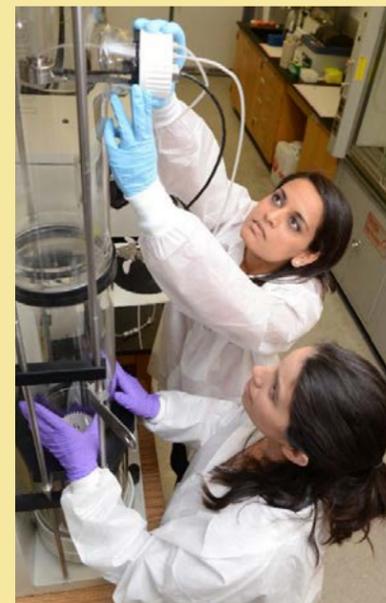
Faculty spotlight

Patricia Soucy, Ph.D.

Dr. Soucy is an Assistant Professor of Bioengineering, with a research focus on engineering biologic components for tissue engineering and drug delivery applications. Her approach merges biomolecular characterization with mechanical analyses of novel engineered materials. Her most recent project involved production of nanoparticles for an industry partner, PromiSight, Inc. Dr. Soucy also led a multi-investigator study funded by NASA to develop and test early feasibility of practical radio-protective agents for astronauts. A major risk to astronauts and a research concern of NASA is radiation exposure, which may put astronauts at greater risk of cancer and other associated diseases. The team produced multiple drug delivery systems for a naturally occurring active component, curcumin. Dr. Soucy's group designed curcumin loaded nanoparticles composed of the plasma protein albumin. This innovative approach utilized the natural properties of the protein to enhance curcumin's solubility in water and slow its rapid degradation, thus increasing the effec-



tiveness of curcumin in human cells and in mice exposed to radiation. A consistent goal of Dr. Soucy's research is to develop biomaterials that mimic the body's natural environment as both experimental tools and therapeutic approaches to tissue regeneration. In our body, many cells live in a three-dimensional scaffolds called the extracellular matrix (ECM) that is composed of proteins and other biological components. Substrate mechanics are increasingly



Ishita Jain and Tricia Soucy assembling Nano Spray Dryer to fabricate drug delivery nanoparticles.

appreciated in biological studies, as the mechanical properties of scaffolds have been shown to significantly influence cellular functions. Dr. Soucy has applied Atomic Force Microscopy (AFM) to quantitatively measure biological scaffold elasticity on the micrometer length scale. The ability to engineer and quantify scaffold biomechanical properties in a laboratory will provide a better model of the body's natural environment, increase our understanding of cell responses in that environment, and ultimately could be used to encourage regeneration of damaged or diseased tissues.

Dr. Soucy has dedicated substantial efforts to academic service in the Speed School. She has mentored undergraduate students and graduate students in various engineering disciplines and bioengineering related fields. Two of Dr. Soucy's mentees have received internships at NASA's Johnson Space Center through the National Space Biomedical

Research Institute and NASA's Undergraduate Student Research Program. One of her mentees earned a Whitaker International Program Summer Scholarship. Student projects in the Soucy lab have directly resulted in several presentations at scientific conferences, such as the Biomedical Engineering Society's (BMES) annual conference and American Society for Gravitational and Space Research. Dr. Soucy also serves as the faculty advisor for UofL's collegiate section of SWE since 2015, through which she has advised students of all engineering disciplines in academic and professional development, as well as coordinated outreach events, such as the annual SWE sleepover for incoming female engineering students. Further, by her second year as faculty advisor (2016), the chapter received the Region G Collegiate Communications award, soon followed (2017) by a Silver Achieving Collegiate Section Award at the SWE Local regional conference. Most recently, Dr. Soucy directed her passion for engineering education as the interim co-director of the Interdisciplinary Studies with Specialization in Translational Bioengineering Ph.D. program. Dr. Soucy is the director of the **Biomimetics Laboratory**.

Department news

Abu Dhabi University Visits UofL Bioengineering

The BE Department hosted Dr. Waqar Ahmad, Chancellor and Interim Provost, Dr. Aly Nazmy, Dean of the Engineering College, and Dr. Mohammad Parakandi, Director of Accreditation to discuss offering UofL Bioengineering graduate programs at Abu Dhabi University. Drs. Ahmad, Nazmy, and Parakandi toured the UofL facilities and laboratories and met with University of Louisville Provost Dr. Beth Boehm, Acting Vice Provost of Academic Affairs Dr. Paul Demarco, Ex-



Pictured L to R: Dr. De Marco, Dr. Giridharan, Dr. El Baz, Dr. Ahmad, Dr. Boehm, Dr. Nazmy, & Dr. Parakandi.

ecutive Vice President of Research Dr. Rob Keynton, Dean of the Speed School Dr. Emmanuel Collins, Associate Dean of Academic and Student Affairs Dr. Gail DePuy, Dean of Business School Dr. Todd Mooradian and BE faculty. Furthermore, the potential of offering joint programs with the School of Business, Psychology and School of Medicine was discussed. A Memorandum of Agreement with Abu Dhabi University to formalize the collaboration is anticipated soon.



ltoR: Dean Emmanuel Collins, Dr. El-Baz, Dr. Parakandi, Dr. Ahmad, Dr. Depuy, Dr. Nazmy, and Dr. Giridharan.



Dr. Karen Bertocci demonstrates some BE 3-D printed materials to Abu Dhabi visitors.

UofL BE/UK Host Special Bioengineering Session

The Bioengineering and Biomedical Departments at UofL and Unviersity of Kentucky are jointly hosting a special session in Louisville at the 18th annual IEEE International Symposium on Signal Processing and Information Technology December 6-8, 2018. Over 45 manuscripts have been accepted for presentation for this special session. This local conference will highlight the state-of-the-art biomedical research being conducted in Kentucky and neighboring states. It is anticipated that the conference will be hosted annually to raise awareness on the world-class bioengineering research conducted in the Ohio Valley. For more information go to [our Facebook announcement](#).

BE grads

The department wishes to extend congratulations to the 2018 summer and fall graduates listed here:

Summer Bachelor of Science in Bioengineering:

Goodin, Dylan
Murphy, Emily

Summer Master of Engineering in Bioengineering:

Armagno, Anthony
Centner, Connor
Hainline, Casey
Hodge, Daniel
Kanukunta, Abhinav
Necamp, Mary
Smith, Connor

Fall Master of Engineering in Bioengineering:

Ackerman, Eli
Ackermann, Luke
Balgemann, Rayeane
Hemminger, Shane
Hilt, Bret
Hindi, Lubna
Van Rijswijck, Morgan

BE Ph.D. students

BE Ph.D. Candidates

The following students were accepted into the BE Translational Ph.D. program; Jessie Fisher, Connor Centner, Ahmed Naglah, and Keyonna McKinsey. For more information regarding the Translational Bioengineering PhD Program, go to <http://louisville.edu/translational-bioengineering>.



BE students in Med School

BE Med Students

We would like to congratulate the following BE students who have been accepted into Medical Schools across the nation: Connor Smith, Daniel Hodge, Morgan Sharp, Ajit Deshpande, Brooke Barrow, Thomas Beyerle, and Tyler Shimfessel (not pictured).



Awards

Alexa Melvin

Ms. Melvin and co-authors received the **Best Paper Award** at the 2018 COMSOL Conference in Boston for her article entitled, "Design and Simulation of 3D Printed Check Valves Using Fluid-Structure Interaction." Ms. Melvin is mentored by Dr. Thomas Roussel.



Research Louisville (R/L) Awards

The following students enrolled in BE or mentored by BE faculty were honored for their research with awards at the R/L ceremony:

Doctoral Engineering Student Award

1st place: Ahmed Shaffie

2nd place: Samineh Mesbah

Doctoral Student Award

2nd place: Alexa Melvin

3rd place: Ahmed Etanboly

Masters Engineering Student Award

1st place: Luke Ackermann

2nd place: Eli Ackermann

Postdoctoral Fellow Award

2nd place: Longyun Zhang

NCI Cancer Education Program Norbert J. Burzynski Award in an Undergraduate Category

1st place: Keegan Curry



BE winners at R/L: (left to right): Eli Ackermann, Alexa Melvin, Luke Ackermann, Ahmed Shaffie, and Ahmed Etanboly. Not pictured above, Samineh Mesbah, Longyun Zhang and Keegan Curry.

BMES Spotlight

The 2018 BMES conference held October 17th-20th, in Atlanta, GA saw over 34 UofL Department of Bioengineering presentations and over 40 BE participants this year. This was the largest number of abstracts and participants from UofL participating in BMES. Dr. Rob Keynton was inducted as a BMES Fellow. Our BMES booth



attracted a lot of attention from students and faculty from other universities. Our personalized 3D-printed key chains and other department gear were popular with attendees. All the BE @ UofL BMES 2018 presentations were livestreamed on Facebook live and BE @ UofL activities at BMES were posted on BE social media webpages. We would like to acknowledge our outstanding students and faculty who helped to make this a success for BE @ UofL. We would like to especially thank Dean Collins for providing support for our booth.

