chair’s message

Dr. Ayman El-Baz, Professor and Chairperson

I am excited to share with you some of the activities of our students, faculty, and alumni in this issue of BE-connected. Our Bioengineering Program was ranked among the top 100 programs in the United States by US News and World Report. This issue features a number of BE students who won Speed School and Departmental awards. The Department of Bioengineering signed a Memorandum of Understanding with Mansoura University, Egypt and hosted faculty from Abu Dhabi University, UAE to establish research collaborations and offer joint degrees. Our faculty have won national and international recognition. Dr. Jill Steinbach-Rankins was part of a team that was recently awarded a National Institute of Health Centers of Biomedical Research Excellence (CO-BRE) grant. Dr. Robert Keynton was appointed as the interim executive vice president of research of the University of Louisville and was inducted as a Fellow of the National Academy of Inventors. Dr. Steven Koenig was elected as the president of ASAIO. This issue also covers the annual faculty-student basketball game organized by the BMES chapter at the UofL.

We are very grateful to our friends and alumni, whose support is vital to the success of our students and faculty. We have established a student endowment with a goal of raising $200,000 over the next five years. Last year, we raised approximately $20,000. We will be offering two additional student awards due to the generosity of our donors. We are deeply grateful to all our donors and hope for your continued support. We invite you to visit us and see first-hand all the exciting changes in our department and would love to receive updates from you! Please send your updates to Nancy Hansford at nancy.hansford@louisville.edu. We wish you all a happy summer!

student awards

The Department of Bioengineering congratulates the following students who have won awards for demonstrating academic excellence.

Morgan Sharp received her B.S. in BE in May and will begin a PhD in the Interdisciplinary Program this Fall. She is currently working in Dr. Magnuson’s spinal cord injury laboratory at the KY Spinal Cord Injury Research Center.

Brooke Barrow received her M.Eng in BE this spring and has been accepted to the College of Medicine at BOTH University of Kentucky and University of Louisville in the Fall.

Lee B. Sims received his B.Sc. in BE and has been a member of Dr. Steinbach-Rankins lab working with modified nanoparticles to treat gynecologic and ophthalmic cancers. He will attend Imperial College London to pursue an M.Sc. in Infectious Disease Epidemiology.

Ajit Deshpande earned his B.Sc. degree in BE in 2018. He is currently working with the University of Geneva to improve dementia epidemiology and increasing access to mental health care in low and middle income countries.

Connor S. Centner was awarded the Joseph Henry Award in Transitional Bioengineering which identifies an M.Eng student who, by the basis of his/her research, has developed and created new IP and has filed an invention disclosure.

continued on pg.2
Keyona E. McKinsey was awarded the Mickey R. Wilhelm Achievement Award as a bioengineering student whose character, integrity, industry, leadership skills and perseverance attitude identify her as having a high potential for success.

Rob Keynton named fellow in NAI and interim EVPRI

Dr. Robert Keynton, Lutz Endowed Chair of Biomechanical Devices of the Department of Bioengineering, has been named a Fellow of the National Academy of Inventors (NAI) in 2017. Dr. Keynton is the fifth UofL researcher to be named an NAI Fellow. Currently there are only 912 NAI Fellows representing more than 250 research universities and governmental and non-profit research institutes.

Dr. Keynton was also recently named as UofL’s interim Executive Vice-President of Research and Innovation (EVPRI). He had been dividing responsibilities between the EVPRI office and organizing and administering research grants from the Coulter Partnership for Translational Research and iCorps grant funding assuming duties when former executive vice-president, Dr. William M. Pierce, retired.

Steven Koenig elected president of ASAIO

Dr. Steven C. Koenig, Professor and Endowed Chair of Cardiac Implant Sciences has been elected as the president of the ASAIO (formerly known as the American Society of Artificial Internal Organs) for 2018-2019. ASAIO’s mission is to provide a forum that globally and collaboratively promotes the development of innovative medical device technology at the crossroads of science, engineering, and medicine.

Prestigious NIH COBRE grant award

Bioengineering professor Dr. Jill Steinbach-Rankins is part of a team that was recently awarded an National Institution of Health Centers of Biomedical Research Excellence (COBRE) grant ($11.5 M) for their work on “Functional Microbiomics, Inflammation and Pathogenicity.” With a background in Materials Science Engineering and Biomedical Engineering, Steinbach-Rankins is a member of a multidisciplinary team including microbiologists and dentists, the only engineer on the team. She has worked previously with UofL's dental school on a method to deliver peptides that help fight periodontal disease.

Olivia Ryan

I graduated from Bioengineering from the University of Louisville in 2013 (B.S) and 2014 (M.Eng.). My passion is at the intersection of medicine and engineering, with the aim of significantly impacting the quality of patient care through medical devices. My interest was fostered during my graduate research within the Coulter Translational Research Partnership under Dr. Robert Keynton, where I worked with UofL physicians on a novel Laparoscopic Trocar Site Closure device project.

After graduation, I accepted a product development engineering position at Cook Medical and helped bring innovative medical devices to patients in the fields of critical care, cell therapy, and peripheral Intervention. My experience with Cook Medical spanned the entire product development process, from intellectual property generation to regulatory approval. After gaining expertise in large scale device manufacturing, I returned to Kentucky and shifted my focus to the emerging medical device startup ecosystem in Louisville. I now work as a Biomedical Engineer for MobileMedTek, a Louisville based neurodiagnostic design firm, which recently secured both CE and FDA clearance on their first product. I could not have hoped to achieve all that I have without the education and mentorship provided to me by the Bioengineering faculty at UofL.

Eric Gross

After graduating from the Bioengineering department with my Masters degree in 2012, I accepted a position at Epic in Madison, Wisconsin within the Technical Services department. Epic is a company that provides the software hospitals and clinics use to keep a comprehensive record of their patients’ care, bill for the services they provide, and monitor the wellness of the communities they serve.

Over the past six years, I have specialized in supporting our customers’ patient access (e.g. collecting demographics, verifying insurance eligibility) teams. While that work may not seem directly tied to patient care at first, getting this information in the system accurately is absolutely vital for patients to get the care they need, and for the organizations who provide that care to continue serving their communities. I provide direct guidance to the leaders of the organizations I support as to how they can maximize their use of our products, and adapt to the ever changing climate within healthcare. I get to travel across the country and internationally to learn how healthcare really works out on the front lines at places like the Mayo Clinic, Atrius Health, AMC-VUMC in the Netherlands, and the Ministry of Health in Singapore. I use the programming skills I learned in our Bioengineering classes and while working with Dr. El-Baz and Dr. (Tato) Sokhadze on my thesis during my graduate year to add new functionality to our products, and fix the issues within our code that I see working in the real world. Learning MATLAB and C served as the foundation for the work I do today in M and C#.

Finally, in addition to the work I do directly, I manage a team of ten people who do similar work.
Dr. Voor has mentored 10 Master's degree students, had 10 full-time orthopaedic research residents, numerous medical students and other students involved in his research over the past 25 years. He has also developed a novel bone graft substitute product that led to the formation of a successful orthopaedic company, Vivorte, Inc. Over 300 patients have been treated with their products.

Hassan H. Soliman (Dean of the Faculty of Computers and Information, Mansoura University), and Prof. Gail DePuy (Interim Dean, Speed School of Engineering) to offer joint degree programs and foster research collaborations between the two universities. In attendance were Prof. Mohamed Hamza (Cultural counselor and Director, Embassy of the Arab Republic of Egypt), Prof. Beth Boehm (Dean of Graduate School), Prof. Robert Keynton (Interim Executive Vice President of Research), Prof. Ayman El Baz (Chair of Bioengineering), Prof. Adel Elmagramy (Chair of CECS), and Prof. Guruprasad Giridharan (Associate Chair of Bioengineering).

Abu Dhabi University, UAE
The Department of Bioengineering also had the pleasure of hosting Prof. Aly Nazmy, Dean of the Engineering College and Dr. Mohammad Ghazal, Chair of Electrical and Computer Engineering at Abu Dhabi University. Drs. Nazmy and Ghazal toured the UofL facilities and laboratories and met with UofL BE faculty, Prof. Gail DePuy (Interim Dean of the Speed School), Prof. Paul DeMarco (Dean of the School of Interdisciplinary and Graduate Studies), and Dr. Keynton (Interim Executive Vice President of Research) to discuss establishing a memorandum of understanding to offer graduate programs with UofL and further research collaborations with our faculty.

Mansoura University, Egypt
A memorandum of understanding (MoU) was signed between the Department of Bioengineering at University of Louisville (UofL) and Mansoura University, Egypt. The MoU was signed by Dr. Dale Billingsley (Interim Provost, University of Louisville), Prof. Ashraf Mohamed Sewelam (Vice president, Mansoura University), Prof. Hassan H. Soliman (Dean of the Faculty of Computers and Information, Mansoura University), and Prof. Gail DePuy (Interim Dean, Speed School of Engineering) to offer joint degree programs and foster research collaborations between the two universities. In attendance were Prof. Mohamed Hamza (Cultural counselor and Director, Embassy of the Arab Republic of Egypt), Prof. Beth Boehm (Dean of Graduate School), Prof. Robert Keynton (Interim Executive Vice President of Research), Prof. Ayman El Baz (Chair of Bioengineering), Prof. Adel Elmagramy (Chair of CECS), and Prof. Guruprasad Giridharan (Associate Chair of Bioengineering).

Abu Dhabi University, UAE
The Department of Bioengineering

Michael Voor, Ph.D.

Dr. Voor is an Associate Professor of Bioengineering and Orthopaedic Surgery. His research focuses on bone quality, fracture healing, and implantable orthopaedic devices. His most recent projects center around understanding and preventing hip fractures, which are actually fractures of the proximal end, or neck, of the femur, the largest bone in the human body. Hip fractures are a devastating problem for our aging population and occur at a rate of over 300,000 per year in the United States. They are a significant concern because as high as 30% of patients die within one year of breaking their hip. Thus, preventing these fractures could literally save hundreds of thousands of lives.

Dr. Voor's research approach to fracture prevention takes advantage of the natural ability of bone tissue to adapt to its mechanical loading environment. This nature of bone is responsible for bones becoming smaller, more porous, and weaker after bedrest or space travel, but it can also be exploited to make bones denser and stronger through exercise or overloading. Recent projects in Dr. Voor's lab include simulating a fall to the side to determine the precise nature of bone failure during a hip fracture, measuring the strain on the femur during an exercise designed to strengthen the femur at that location, and designing an exercise device that can achieve these strains as a prevention strategy (Figure 1).
village, Dr. Ayman El-Baz, Professor of Bioengineering and colleagues are developing machine learning (software) approaches to make the process of identifying diabetic retinopathy more objective. They showed the software pictures of eyes — tons of them, both healthy and unhealthy — until it “learned” what to look for when making a diagnosis. It learned to look for swollen vessels or leaking of blood into the eye, which could cause impaired or even lost vision. When tested on more than 100 cases, the software got 94.3 percent of the diagnoses correct.

The software combines two systems developed by the UofL team for optical coherence tomography (OCT) and optical coherence tomography angiography (OCTA). Together, they allow the machine to, non-invasively, get a clear view of the blood vessels in the eye and make a diagnosis.

The software works with a machine used by many optometrists and ophthalmologists to examine patients’ eyes. The automated technology could supplement care in areas where medical staffing is low and optical specialists are sometimes unavailable.

“We think this machine could be set up in the family doctor’s clinic,” said Dr. Ayman El-Baz, professor and chair of bioengineering. He said the technology is part of a “new trend for using artificial intelligence in medicine.” Similar research is being done at UofL for diagnosis of other medical conditions, such as lung cancer and organ rejection.

The development was backed by phase one and two grants from the Wallace H. Coulter Translational Partnership, which promotes collaborative translational research, and is currently available for license and partnership through the UofL Office of Technology Transfer.

This project is “a great example of collaboration between engineers and clinicians to address unmet clinical needs,” said Jessica Sharon, director of the Coulter Translational Partnership at UofL, adding the resulting technology “has the potential to make a significant impact through commercialization to diagnose disease and improve patient outcomes.”

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 are listed at http://louisville.edu/speed/bioengineering/about/accreditation. If you have any modifications or feedback for the PEOs kindly email nancy.hansford@louisville.edu before June 30, 2018.

The BMES student chapter held the annual Faculty vs. Students Basketball Tournament on April 13th, 2018. The students won with a score of 105-70 in a 40-minute match. Refreshments (and verbal jabs) were served after the game and a great time was had by all.

We have created a student endowment with a goal of raising $200,000 in the next 5 years. Due to the generosity of our donors we have raised approximately $20,000 to date. This has enabled us to expand the number of BE student awards starting next year. We are deeply grateful to all our donors and we thank Beam Suntory and Dr. Siddiqui for contributing significant amounts to this cause. Your continued support is vital to fulfilling the endowment objective. For more information about how your donations can help transform the BE Department, please contact Laura Brock at laura.brock@louisville.edu, or call (502)852-1017.