

KENTUCKY ENGINEERING JOURNAL

UNIVERSITY OF KENTUCKY COLLEGE OF ENGINEERING

FALL 2020



+ MAJOR ADDITION

UK Undergraduates Can Now Earn a
Degree in Biomedical Engineering



What's new on campus? Facial coverings, social distancing, reconfigured classrooms and copious amounts of hand sanitizer.

The adjustments have taken time to get used to; however, the work of teaching, researching and serving goes on! Our students' boundless curiosity didn't switch off when the coronavirus struck, and our faculty members didn't lose interest in advancing their fields. Wildcats mask up and get to work.

Mining engineering professor **Jack Groppo** evaluates density separation to recycle copper, gold, silver and other valuable metals from shredded electronic scrap.



“To say I am proud of how our faculty, staff and students responded and what we accomplished is an understatement.”

MESSAGE FROM THE DEAN

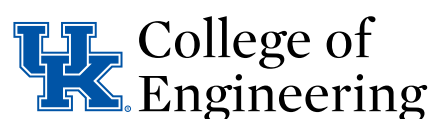
When UK President Eli Capilouto announced on March 11 that all instruction would be moved online to ensure the health and safety of the UK community due to COVID-19, the College of Engineering went into scramble mode. In fewer than 10 days, we transitioned over 350 courses to an online delivery format. Faculty members accustomed to conducting lectures or fielding questions in front of a classroom adapted their living spaces and adjusted course material to suit the online format.

Our faculty and staff never let up in their commitment to our students. They answered the call in a huge way by demonstrating compassion and flexibility to help our students master complex subjects in new environments. Many from our college also actively looked for ways to fight COVID-19. With research labs temporarily shut down, experts in one area brainstormed how they could contribute in another area. Some of their efforts are even part of keeping the UK community safe during this fall semester (see pages 14-17).

That same can-do spirit has been present and active all semester. To say I am proud of how our faculty, staff and students responded and what we accomplished is an understatement. In some ways, it is what our alumni would expect from the Wildcat community. Having successfully seen this semester through, we look forward to the spring. Hopefully by then a vaccine will be available, and campus can begin to return to normal. Until then, know that we continue to take our commitment to safety and high-quality education as seriously as ever.

Sincerely,

Rudy Buchheit
Dean



CONTENTS

06

IT'S HERE!

Undergraduates can now major in biomedical engineering at UK

12

CALCULATED RISK

2007 BME graduate Gautam Gupta thinks big and wants students to do the same

14

COVID-19 RESPONSE

Check out how the UK Engineering community fought back against the coronavirus

18

RESEARCH IN THEIR OWN WORDS

Kevin Donohue explains his research to his grandmother

24

THE BEST AND BRIGHTEST

Dr. R. Wayne and Judy Skaggs' \$250,000 gift will fund graduate fellowships for BAE students

28

STUDENT SPOTLIGHT

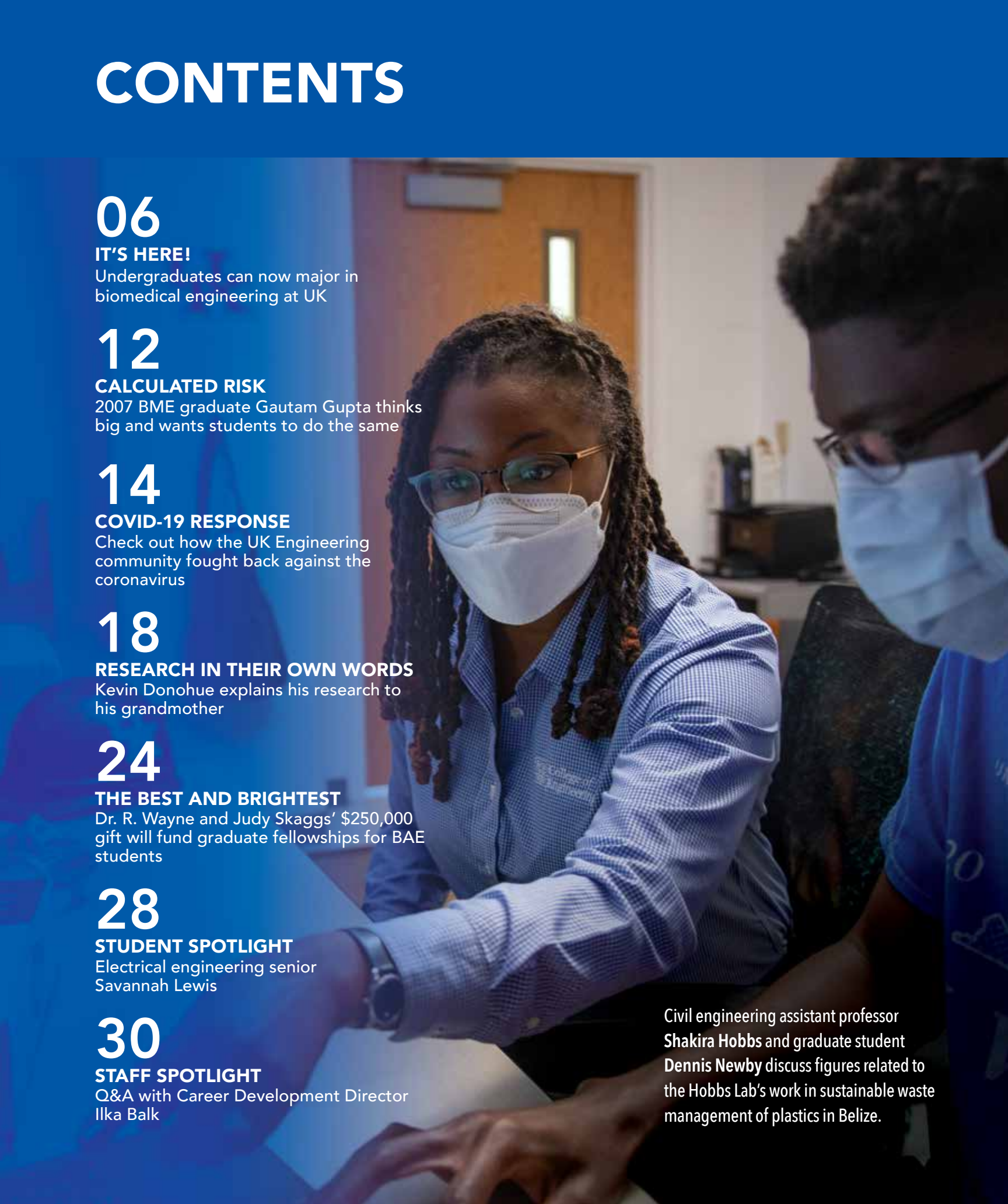
Electrical engineering senior Savannah Lewis

30

STAFF SPOTLIGHT

Q&A with Career Development Director Ilka Balk

Civil engineering assistant professor **Shakira Hobbs** and graduate student **Dennis Newby** discuss figures related to the Hobbs Lab's work in sustainable waste management of plastics in Belize.



IT'S HERE!

The F. Joseph Halcomb III, M.D. Department of Biomedical Engineering Now Offers a Unique Undergraduate Major in Biomedical Engineering

Kel Hahn

In late April, the University of Kentucky announced a new undergraduate major in biomedical engineering (BME) housed in the UK College of Engineering and supported by the UK College of Design. Previously, BME studies at UK were only available to students pursuing graduate studies or the BME minor.

"Because many of our incoming students see significant challenges facing the health care industry and want to make a difference, it's only natural that we add biomedical engineering to our slate of undergraduate majors," said Rudy Buchheit, dean of the College of Engineering.

Features of the collaboration include courses taught by faculty members in both colleges, required courses in the humanities, studio experiences and a two-semester interdisciplinary capstone senior design project that challenges students to creatively engineer a

solution to a health care issue posed by collaborating industrial or health care partners.

"No other institution of higher education in Kentucky offers a degree in industrial or product design," said College of Design Dean Mitzi Vernon, "and to join with the Department of Biomedical Engineering, we can both broaden and sharpen the scope of the program to address health care challenges, which is even more consequential now."

Guigen Zhang, chair of the F. Joseph Halcomb III, M.D. Department of Biomedical Engineering, says placing Design Thinking at the center of the program while emphasizing clinical and industrial relevance is what sets UK's BME major apart from other universities and provides a unique student experience.

"Most BME programs teach students

how to solve problems, but they don't teach how to interact with people in ways that allow for a deeper understanding of the clinical problem. Design Thinking emphasizes the people who will use what our students develop. College of Design faculty members' knowledge of user experience, user interface and more will help BME students gain skills to sense and meet unarticulated needs. In short, our BME program teaches students to put people—doctors, nurses, patients and others—in their design loop."

The BME major has long been a dream of alumnus Joe Halcomb (BSME 1974), whose \$7 million gift to transform the BME department in 2016 helped pave the way for the major to become a reality.

"Finally having a BME program at the undergraduate level is a dream come true for me. I just know our BME graduates will advance engineering technologies in medicine and improve people's lives," said Dr. Halcomb.

Although formally recognized as a department in 2013, BME research and education at UK dates to the 1950s. In the past year, its faculty has doubled from six members to 12. Research areas include neural networks, optics, cardiovascular, lower back, nanotechnology, biosensors and more. BME undergraduates will have no shortage of avenues for exploring their areas of interest.

"The BME major is ideal for anyone seeking a career in industry, the health care professions, government agencies or graduate studies in BME," said Zhang. "I'm excited to see what this young generation can do to transform health care." ■

BIOMEDICAL ENGINEERING RESEARCH FACULTY



RAMKUMAR T. ANNAMALAI, Assistant Professor

Ram Annamalai's lab is broadly focused on tissue regeneration and vascularization using biomaterials and biofabrication strategies. The research focus encompasses both translational and basic science research areas. Strategies to engineer or modulate immune responses for tissue regeneration are of particular interest. The lab employs an array of biomaterial, mammalian cell culture techniques, in-vitro models, and animal models to develop translatable strategies.

Specific areas of interests include:

- Elucidating the role of immune cells in neotissue formation.
- Developing immunomodulatory strategies for guiding tissue regeneration.
- Developing injectable biomaterial systems and other biofabrication strategies.
- Developing bioresponsive drug-delivery vehicles.

BABAK BAZRGARI, Associate Professor

Babak Bazrgari heads the Human Musculoskeletal Biomechanics Lab (HMBL). Its research program focuses on the mechanical behaviors of the active neuromuscular and the passive musculoskeletal systems in the human body and aims at controlling and managing musculoskeletal disorders. One of Bazrgari's active projects involves studying low-back pain in nurses. Despite extensive ongoing efforts, occupational low-back pain among nurses persists as a major work-related musculoskeletal disorder. HMBL's premise is that low-back pain is a complex and multifactorial disorder that can build from seemingly small mechanical abnormalities in the lower back that accumulate over time. The objective of this project is to determine the association between work-related changes in lower back mechanics and low-back pain occurrence among nurses. Its central hypothesis is that nurses who experience larger work-related changes in their lower back mechanics are more likely to end up developing low-back pain. Bazrgari also has a joint appointment at the Lexington VA Medical Center, where he conducts research studies aimed at improved rehabilitation of veterans suffering from musculoskeletal disorders.



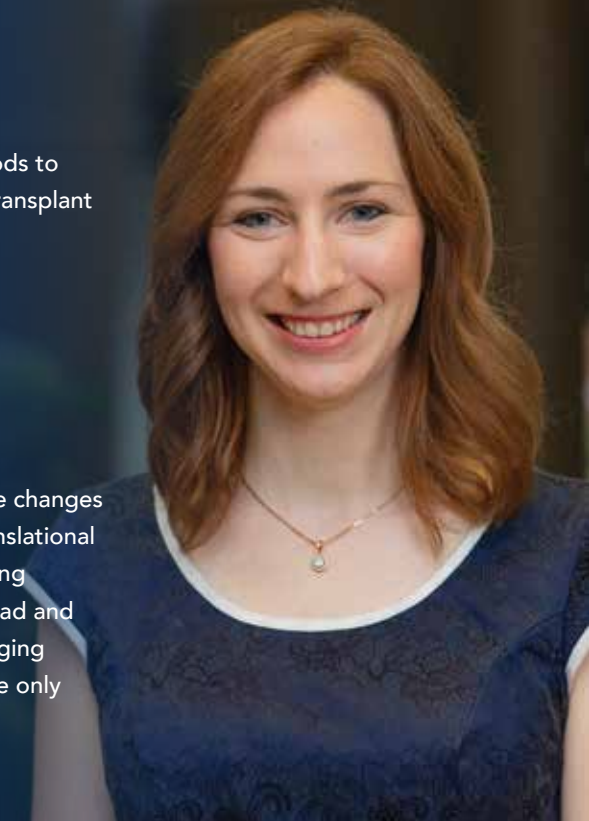
FANNY CHAPELIN, Research Assistant Professor

Fanny Chapelin's lab develops non-invasive magnetic resonance imaging (MRI) methods to track immune cell migration to foci of inflammation in different pathologies such as transplant rejection, autoimmune diseases and cancer.

Specific areas of interest include:

- Imaging of cell therapy distribution, fate, and efficacy in preclinical studies.
- Imaging of inflammation processes in tumors and transplants.
- Stem cell transplant engraftment and rejection imaging.

Last spring, Chapelin's proposal, titled "MR imaging of tumor-associated macrophage changes with therapy," was selected by the University of Kentucky Center for Clinical and Translational Science for the Small Grants program award. Using those funds, Chapelin is developing magnetic resonance imaging methods to image tumor-associated macrophages in head and neck cancer with the outlook of translation to clinical protocols. If successful, the imaging techniques developed could impact patient care at the UK Markey Cancer Center, the only National Cancer Institute-designated center in Kentucky.



ABHIJIT PATWARDHAN, Professor

The work in Patwardhan's laboratory is focused on determining mechanisms of arrhythmic activity in the ventricles of the heart, neural control of cardiovascular regulation, and development of image processing and machine learning tools for high throughput analysis of histologic images. Recent and ongoing studies include investigation of cardiovascular-brain interactions while listening to music; improving specificity in the use of T wave alternans in ECGs to predict risk of adverse cardiac electrical events; and development of image processing tools and mathematical models to further understand the biology of the infectious parasite *T. gondii*. Some of these studies are conducted in collaboration with investigators from UK's College of Medicine.

DAVID PIENKOWSKI, Associate Professor with Joint Appointments in Orthopaedic Surgery and Internal Medicine/Nephrology: Bone and Mineral Metabolism

Pienkowski's primary research interest concerns the material and structural properties of human cortical and cancellous bone as they pertain to changes in mechanical competence attributable to aging, disease or pharmaceutical therapies. His present research focus concerns the use of orally administered anti-resorptive compounds (e.g., Fosamax, Boniva, etc.) used to reduce excess bone turnover associated with reduced bone strength and fracture. Pienkowski conducts studies using nanoindentation, infrared spectroscopy, finite element analyses of computer reconstructed bone images, and histological examination to quantify changes in bone modulus, mineral or matrix composition or structure, trabecular bone architecture, or bone microdamage. This NIH-funded effort has produced valuable information that is reshaping the paradigm for treating women with post-menopausal osteoporosis.

MARK SUCKOW, Professor, Associate Vice President for Research and Attending Veterinarian

Mark Suckow's research has focused on biomaterials evaluation using in vivo models. In particular, he is interested in the process of post-surgical adhesiogenesis and strategies to reduce adhesion formation. Much of this work is done within the context of hernia repair. In addition to serving as professor of biomedical engineering, he also serves UK as attending veterinarian and associate vice president for research.



SRIDHAR SUNDERAM, Associate Professor

Sridhar Sunderam leads UK's Neural Systems Lab. Its work focuses on brain state diagnosis and tracking for applications in epilepsy therapy, sleep research and neurorehabilitation. The lab uses a combination of physiological measurements, computational tools and somatosensory stimulation to model, track and perturb brain state in humans and animals. Sunderam's goal is to provide better diagnostic and therapeutic alternatives for sleep disorders, epilepsy and motor impairments caused by neural injury.

Sunderam was co-investigator on a \$6 million National Science Foundation grant with the University of Oklahoma and the University of Rhode Island, the goal of which was to establish a powerful technology platform with innovative tools to image, sense, record and affect real-time brain function and complex behavior.



SHENG TONG, Associate Professor

Sheng Tong launched the Laboratory of Nanomedicine and Immunoengineering when he came to UK in 2019. Tong's research synergistically combines nanobiotechnology, drug/gene delivery, genome editing and cancer therapy. He is currently focusing on developing genome editing approaches for cancer immune checkpoint blockade therapies.

Tong received a major research grant from the National Institutes of Health (NIH) prior to arriving at UK. His project, which involves collaborators at the University of Texas, MD Anderson Cancer Center and Rice University, aims to develop a therapeutic genome editing system, which packages the CRISPR/Cas9 system within baculoviral vectors (BV) and magnetic iron oxide nanoparticles (MNP). The CRISPR/Cas9 system is an efficient genome editing tool that can induce sequence-specific gene disruption, modification or regulation. Tong hopes this will help find a cure for cancers that do not respond to current antibody-based immune checkpoint blockade therapies.



GUOQIANG YU, Professor

Guoqiang Yu has established a solid research program focused on the technology development and clinical translation of near-infrared diffuse correlation spectroscopy and tomography technologies for noninvasive measurements/imaging of tissue blood flow, blood oxygenation and oxygen metabolism. He has invented several optical imaging technologies, which are currently examined in the clinic for diagnosis and therapeutic monitoring of various vascular/cellular diseases. He developed a fast, high-resolution, portable and noncontact speckle contrast diffuse correlation tomography device for intraoperative imaging of burns, wounds and reconstructive tissue flaps, with the goal of optimizing individual interventions. Yu is the primary inventor in developing a low-cost wearable diffuse speckle contrast flow-oximeter for continuous monitoring of cerebral hemodynamics and metabolism in neonatal and infant brains and an innovator in developing a wearable fluorescence imaging device for identifying brain tumor margins during surgery to promote complete tumor resection.

Yu's research has been continually supported by federal agencies and national foundations. In 2020, he has received four grants from the NIH that total \$5.7 million.



GUIGEN ZHANG, Professor, F. Joseph Halcomb III, M.D. Endowed Chair

Research activities in Guigen Zhang's lab range from the development of biosensors to understanding the biomaterial nature of bones. In early September 2020, the group received notice of allowance from the USPTO office for the patent "Electric double layer in nanopores for detection and identification of molecules and sub-molecular units" filed through UK's Office of Technology Commercialization. The lab is also working on electrochemical-based biosensors for crucial biomarkers detection, including oxygen, glucose, cholesterol, etc. Moreover, the group is investigating how the vasculature structure inside bones effect their mechanical vulnerability to high-impact forces, aiming at helping reduce traumatic injuries in human athletes and deaths in racehorses.

Recently, in collaboration with surgeons in the UK College of Medicine, Zhang and colleagues invented an endoscopic bleeding control surgical device that will improve the safety of complex interventional endoscopic procedures, shorten the duration and improve clinical outcomes. As a co-PI on a \$6 million NIH grant, Zhang is also contributing to building an engineering-medicine collaboration hub at UK in the new Health Kentucky Research Building.



CAIGANG ZHU, Assistant Professor

Caigang Zhu's research lab is motivated by multidisciplinary applications of novel optical techniques in cancer research. The central focus of the group's research is to develop optical imaging tools for biomedical applications related to tumor metabolism, hypoxia and angiogenesis. The research interests of his lab include, but are not limited to, vascular and metabolic imaging/spectroscopic techniques for cancer biology and radiation biology study.

Zhu is a project leader investigator for an NIH COBRE grant that allows him to work with leading experts from the Markey Cancer Center to address several key questions in the field of cancer research. Specifically, they are developing and utilizing novel optical technologies to predict and prevent the radiation resistance of human cancers to provide: (1) improved therapeutics with the goal of reducing cancer morbidity and mortality; and (2) optimized treatment options with the goal of reducing overtreatment and medical care cost.

CALCULATED RISK

2007 BME graduate
Gautam Gupta thinks big
and wants students to do
the same.

Kel Hahn

Gautam Gupta graduated with his Ph.D. in biomedical engineering from UK in 2007. With the UK College of Engineering now offering an undergraduate degree in biomedical engineering, the new general manager for medical devices at 3D Systems Corporation in Denver has a few words for the inaugural cohort.

“Always think big. Tie your ambitions to the bigger picture instead of worrying about small gains. If you think big and go for it, even if you fail, it’s much better for your personality than making small incremental changes in a hole you got yourself stuck in.”

Gupta doesn’t just dream big; he also pays attention to the details so he can make smart bets. In fact, “calculated risk” may best encapsulate a recurring theme in his professional career.

“I like to take calculated risks for things that are about to take off. I know there is a lot of risk and a lot more chaos at the beginning of anything, but I like to get involved at the beginning of things rather than later.”

For example, while working toward a master’s degree in metallurgical engineering at Missouri University of Science and Technology in Rolla,



Missouri, Gupta took a newly offered course in biomaterials. Instantly, he was hooked and began looking for a faculty member doing active research in biomaterials.

“I yearn for my work to create a large impact. That was the whole idea behind coming to the University of Kentucky to study biomaterials. I could see the field of biomaterials taking off with bone tissue engineering, bioprinting and more.”

Gupta came to what was then UK’s Center for Biomedical Engineering, where he designed sophisticated ceramic scaffolds for bone regeneration, optimizing material properties to

enhance performance. While writing his dissertation and working on various research projects, a position at Biomet in Warsaw, Indiana, became available. Recognizing Biomet as among the world’s leaders in the orthopedic device industry, Gupta saw the position as a great opportunity to utilize his education on a world-class stage.

“With a company like Biomet that has a lot of resources and is quite innovative, your sandbox is much bigger to try different things and make a large global impact. You suddenly go from a small lab where you are publishing a few papers and making a small difference to where something you are working on right now

can impact hundreds of thousands of lives within a couple of years. Biomet empowered me and trusted me to do the right thing. It took some time to get used to the fact that I could have a few hundred thousand dollars to spend on an animal study; but the most beautiful thing was seeing the impact my work made on a patient’s life.”

After nine years at Biomet, Gupta saw an opportunity to get into additive manufacturing—better known as 3D printing—an area he had recently commercialized. As when he first encountered biomaterials, Gupta saw a bright future for 3D printing.

“In 2015, we were just scratching the surface of 3D printing. But when a position opened at 3D Systems, I saw an opportunity to be able to bring this technology to the medical device industry and 3D print implants that would go into human beings. The potential impact was huge.”

The move would require Gupta to transition from engineer to businessman; however, he believed he was ready for it. Gupta had recently earned his MBA from the Kellogg School of Management at Northwestern University. His education from Kellogg gave him tools to think in a more structured way about business.

“There was always a business guy in me, but when this opportunity came along, it forced me to get outside of my comfort zone. I had been an engineer doing engineering stuff; at 3D Systems, I would have to do sales, which I had never done before. But education gives you the confidence to adapt. When I was pricing things, I could draw from previous case studies and see how the models applied

to different industries.

When Gupta joined 3D Systems in 2015, it had just acquired two small contract manufacturing shops—one in Denver and one in Belgium—dedicated to metal 3D printing and other customized surgical planning work. However, they were not synergized toward what Gupta envisioned: bringing 3D printing into medical devices companies and point-of-care facilities such as hospitals.

“**I would encourage young people to not be afraid to take risks. Don’t be afraid of failing a little bit. It’s okay to fail if you can learn from it and not make the same mistakes again and again.**”

Immediately, Gupta began developing and communicating a strategic vision for leveraging 3D printing for the medical device industry. He hired salespeople and engineers who understood how medical devices are designed and regulated. Business boomed. Operations expanded. Revenue jumped. Throughout the acceleration, Gupta established connections in the industry and gained credibility because 3D Systems enabled several companies to get products to the market.

“My team’s job was to sell. We would

say, ‘Look, your team’s been doing it this way. If you take a slightly different road, we can actually get you to a much better place faster, possibly cheaper and with more enhanced features that can allow you to create better implants.’ We were the innovation vehicle for the industry to introduce their ideas and concepts into the market.”

This summer, Gupta received a promotion to general manager for medical devices. Whereas in his previous role Gupta oversaw sales, he now has purview of sales, operations and quality for 3D Systems’ medical device business. Any gaps between sales and delivery, any defect in quality comes back to Gupta; he’s responsible for the whole value stream.

For someone accustomed to thinking big, Gupta welcomes the increase in responsibility. In fact, he proposed the idea to consolidate oversight of sales, operations and quality to his company’s executives.

“I would encourage young people to not be afraid of taking risks. Don’t be afraid of failing a little bit. It’s okay to fail if you can learn from it and not make the same mistakes again and again. When I began studying biomaterials, I had no background in biology. The first time they gave us a bunch of cells in a petri dish to work on, I killed each one of them. I had no idea how to handle cells but I learned. You’re always worried when something changes. That’s human nature. But I think if you can be a little braver and bolder, you’ll jump—knowing your education has given you the confidence that you can fly.”

COVID-19 RESPONSE

BY FACULTY & STAFF

Kel Hahn

From 3D-printing face masks to donating supplies to making hand sanitizer and much more, faculty and staff from across UK united in the fight against COVID-19 last spring and summer.

When the pandemic led to shortages of sanitizing products in hospitals, the James B. Beam Institute for Kentucky Spirits made sanitizer and went a step further by creating an instructional video for distillers wanting to do the same.

Numerous faculty members, staff and students also put in long hours 3D-printing personal protective equipment for health care workers on the front lines. Instructors even combined to donate 40 boxes of overhead transparencies that were converted into makeshift face masks (see photo).

Researchers also pivoted to meet the challenge. Chemical engineering professors Dibakar Bhattacharyya and Isabel Escobar used their expertise in the area of membranes to design and produce 3D-printed masks able to deactivate the coronavirus on contact.

"I'm extremely proud of how our community made a significant contribution to the battle against the coronavirus," said Dean Rudy Buchheit. "It takes special people to rally against adversity, and I'm glad to say that we certainly have special people."



TESTING

WASTEWATER FOR

COVID-19

This fall, the University of Kentucky has done everything within its power to keep students, faculty and staff safe from COVID-19. Masks, social distancing and smaller classes were expected, but testing the wastewater from the university's residence halls for the virus? That's pulling out all the stops.

Dr. James W. Keck, M.D., assistant professor in the UK College of Medicine, is the lead investigator on a project called "WACKY: Wastewater Assessment for Coronavirus in Kentucky." Civil engineering assistant professor Shakira Hobbs and mechanical engineering associate professor Scott Berry are collaborating on the project. Berry has experience developing tests for HIV and cancer, while Hobbs is studying how COVID-19 survives in water.

In early September, the university announced an initiative to begin testing wastewater on campus, beginning with selected residence halls. Detection of increasing levels in wastewater could be an early indicator of an outbreak or increased prevalence. Testing the wastewater has informed university officials of the need to retest students in certain residence halls.

"Not everyone is experiencing or showing symptoms of having the coronavirus, so this can be an early detection method if the coronavirus is present or if they are actively experiencing some form of the pandemic," said Hobbs.

Learn more about UK's efforts to keep our campus community safe at www.uky.edu/coronavirus.



RESEARCH IN THEIR OWN WORDS:



Kevin Donohue

For engineering professors, communicating one's research in accurate but accessible ways is a perennial difficulty. Whether it's the media, school groups or even undergraduate students, faculty members use analogies, video and hands-on demonstrations to elucidate crucial concepts.

Recently, we challenged our faculty members to explain their research area and methods to a whole new audience: grandmothers.

Kicking off this new series is DataBeam Professor of Electrical and Computer Engineering Kevin Donohue.

Enjoy!

Hi Gram,

What I do is a lot like reading tea leaves to determine how a person is doing or to predict their future. Just as you may have a person drink a cup of tea and figure out what is going on with them from the patterns of leaf residue on the bottom of their cup, I use things like sounds and pictures to find patterns that have meaning.

In some cases, I use special sensors that can measure things we can't see or hear, like the psychics do with the spirit world. In one project, I sent ultrasound—sound you cannot hear—into objects made of metal and plastic. From the patterns of echoes, I could determine if there were defects inside the object that would cause it to break when used. I've also sent ultrasound into parts of the human

body, like the breast, liver and prostate to look for echo patterns that would suggest the person had a sickness, perhaps cancer.

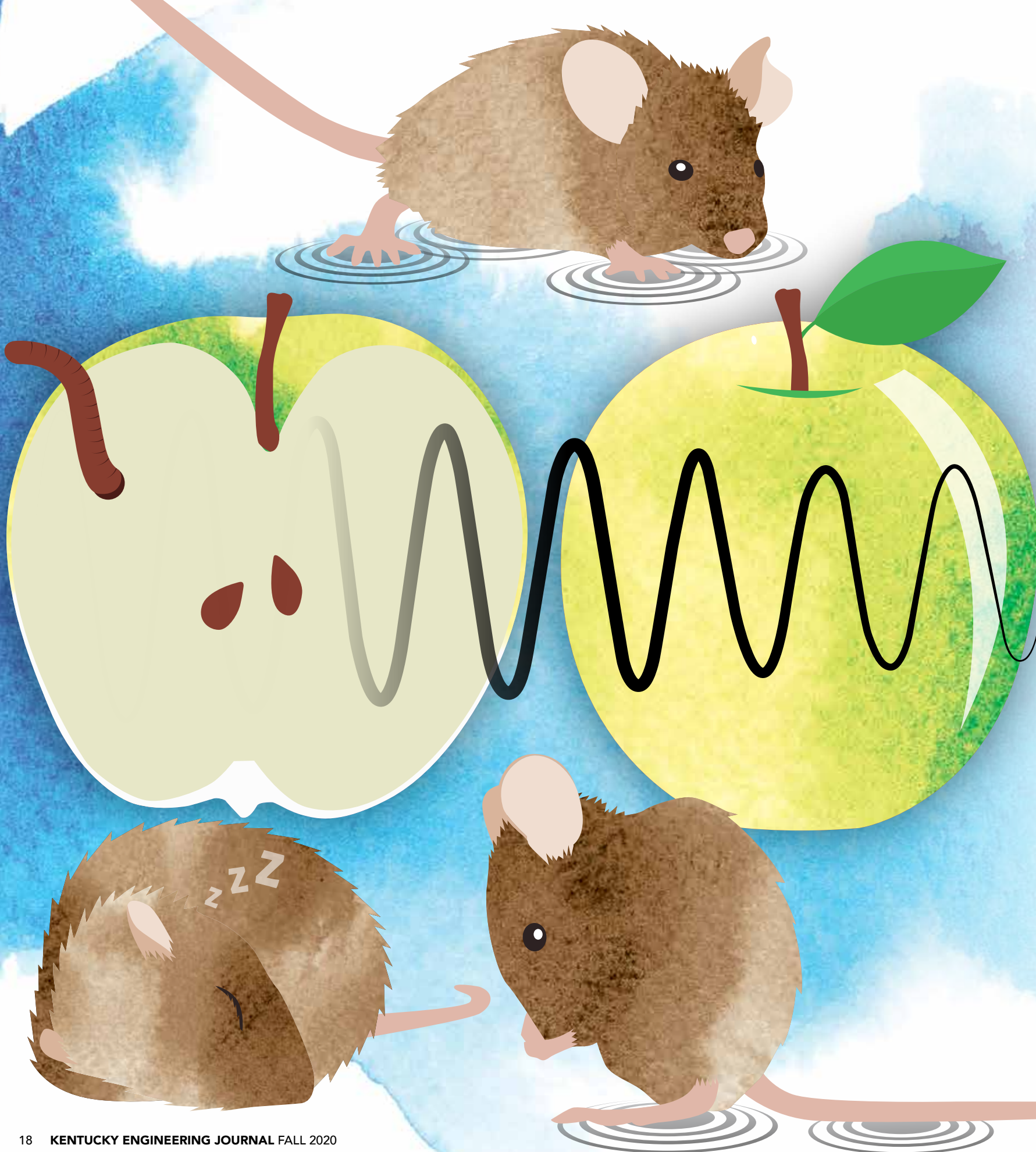
I had another project where a group of people were trying to better understand why we sleep and what things affect sleep. They like using mice and rats for this since the genes of these animals are a lot like ours. However, to answer many of their questions, they needed to track sleep and wake patterns with lots of mice for long periods—like days, even weeks. So, we developed a cage with a special sensor on the floor, where their movements could be tracked from changes in pressure they put on the cage floor. From patterns in these pressure changes, I could predict if they were awake or sleeping. People now use systems like this in laboratories all over

the world to look at how genes, diseases and drugs affect sleep and vice versa in some cases.

I'm currently working on a project that helps apple growers sell their apples in other countries. If they ship apples with worms in them, it could cause lots of trouble—especially if the worm likes the food in the new country. If apple growers get caught doing this, they may no longer be able to sell their apples there, ever again!

So, we are listening to sounds from the apple to see if we can find special noise patterns when a worm is inside. If this works out, we may be able to make it easier to check the apples before sending them.

Nobody likes a bad apple, right? ■



UK'S SUPERFUND RESEARCH CENTER RECEIVES \$8.7 MILLION

Elizabeth Chapin, UK Research Communications

The National Institute of Environmental Health Sciences (NIEHS) has awarded the University of Kentucky Superfund Research Center (UK-SRC) a five-year, \$8.7 million grant to conduct research aimed at better understanding and minimizing the negative health and environmental impacts of chlorinated organic compounds found at Superfund sites across the Commonwealth and the U.S.

Funded by the National Institutes of Health's NIEHS Superfund Research Program since 1997, the UK-SRC integrates multidisciplinary research, training and community engagement around a common theme: reducing risks posed by environmental contaminants in vulnerable communities.

Kentucky is home to 20 (13 active) Superfund sites that are on the Environmental Protection Agency's National Priorities List. They include manufacturing facilities, processing plants and landfills where hazardous waste has been improperly managed.

According to Dr. Bernhard Hennig, director of the center and a professor of nutrition and toxicology in UK's College of Agriculture, Food and Environment, expertise in engineering, public health, as well as environmental, nutritional and biomedical sciences is needed to address the complex environmental and health problems pollution causes in Kentucky.

"The center includes more than 30 researchers from five colleges across the university—bringing the best together for a high-impact collaboration that advances our knowledge of chemical contaminants in our environment," said Hennig.

UK-SRC researchers also collaborate with colleagues from other state and national agencies and work within affected communities to educate individuals about strategies that may help combat the effects of contaminants and improve overall health.

"The group of researchers is unique in that they are conducting basic research that is making an immediate impact in our community," said Nancy Cox, dean of the College of Agriculture, Food and Environment. "The more than 20 years of ongoing funding is a testament to the university's effort to pursue national prominence in environmental and health research while addressing issues of extreme importance to Kentuckians."

The UK-SRC has four research projects and five cores. Hennig and Dr. Kevin Pearson, College of Medicine, lead the two biomedical projects. These projects focus on the idea that positive lifestyle changes, such as healthful nutrition and increased physical activity can help reduce negative health effects from exposure to persistent organic pollutants, such as polychlorinated biphenyls (PCBs), trichloroethylene (TCE) and per- and polyfluoralkyl substances (PFAS).

UK College of Engineering's Kelly Pennell, Dibakar Bhattacharyya and J. Zach Hilt lead the two environmental science projects. These projects are aimed at developing new methods to expedite the cleanup of halogenated organic compounds through advanced material-based technologies, smart filters, and fate and transport science to reduce exposure risks.

The five cores include the Administrative Core led by Hennig and includes Research Translation Coordinator Lindell Ormsbee, College of Engineering; the Community Engagement Core led by Dawn Brewer, College of Agriculture, Food and Environment; the Data Management and Analysis Core led by Pennell; the Biomonitoring and Chemistry Environmental Analysis Core led by Andrew Morris, College of Medicine; and the Research Experience and Training Coordination Core led by Hilt.

The highly competitive grant puts the UK-SRC in the NIEHS's nationwide family of Superfund Research Programs. UK has one of only 10 multi-project centers funded in 2020, placing it in a very elite group of just 23 centers nationwide.

KELLY PENNELL NAMED DIRECTOR OF UK SUPERFUND RESEARCH CENTER

Kel Hahn



Kelly Pennell, Gill Associate Professor in the Department of Civil Engineering, has been named director of the University of Kentucky Superfund Research Center (UK-SRC), where she had served as assistant director. Pennell assumed her responsibilities on July 1.

"Multidisciplinary, collaborative research, like the research we conduct within UKSRC, is my sincere passion," Pennell said. "The opportunity to lead UK-SRC is uniquely aligned with my experience and career goals, but with this new responsibility comes a deep sense of obligation and duty, given UKSRC's long and very successful history. We have an exceptional group of faculty and trainees within our center, and I am excited for us to continue addressing complex environmental health challenges using integrated lenses and intervention-prevention strategies."

As assistant director, Pennell was a member of the UK-SRC's Administrative Core and Administrative Executive Committee, served in leadership roles and guided research directions. Pennell's contributions led to UK-SRC's recent \$8.7 million grant from the National Institute of Environmental Health Sciences (NIEHS) to conduct research aimed at better understanding and minimizing the negative health and environmental impacts of halogenated organic compounds

found at Superfund sites across the Commonwealth and the U.S. Additionally, she serves as principal investigator for two components of the grant.

Pennell replaced Bernhard Hennig, who has served as director since 2003.

"Dr. Pennell has already demonstrated excellent leadership skills," said Hennig. "She will be a great and successful leader because she respects a team spirit, has a clear vision and focus, is courageous and a hard worker with high integrity, and she has a wonderful sense of humor. I look forward to observing Dr. Pennell as she leads our center to a new level of excellence under her leadership."

Pennell earned her Ph.D. in civil engineering from Purdue University, followed by post-doctoral training at Brown University within an NIEHS-funded Superfund Research Program. She joined the faculty of the UK Department of Civil Engineering in 2013. In 2015, Pennell received a National Science Foundation CAREER award, which is of NSF's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education.



\$1,929,828

UK COLLEGE OF ENGINEERING RAISES NEARLY \$2 MILLION DURING ONE DAY FOR UK.

Our second annual One Day For UK giving day was a tremendous success! Thanks to you, we raised a jaw-dropping \$1,929,828 from 519 gifts! We crossed all three thresholds to unlock funds for the College of Engineering Scholarship Fund, Eric Grulke Chemical and Materials Engineering Study Abroad Endowment and Women in Engineering Scholarship Fund. We are so thankful to Terry and Sue Strange and Beth Weeks, who provided the incentives to hit our targets.

In addition to meeting our gift goals, we won the 1865 Challenge thanks to Tabatha Christianson making the 1,865th gift of the night, and we won the Globetrotter Challenge thanks to gifts to the college from donors in 29 different states. Winning those challenges gave the college an additional \$1,865 and \$300 for scholarships.

For your generosity and willingness to make multiple gifts to help us hit our goals, we say THANK YOU! Future UK Engineering Wildcats will say thank you too.

THANK YOU!!!

#ONEDAYFORUK

THE BEST AND BRIGHTEST

Dr. R. Wayne and Judy Skaggs' \$250,000 gift will give UK an advantage in attracting and retaining the best and brightest biosystems and agricultural engineering graduate students.

Kel Hahn

Wayne Skaggs, from Sandy Hook in Elliot County, Kentucky, entered the University of Kentucky in 1960. The next year, Judy Ann Kuhn, also from Sandy Hook, enrolled as a freshman. The following year, the two were married and proceeded to complete their respective degrees—Wayne graduated with bachelor's and master's degrees in agricultural engineering (1964 and 1966) and Judy with a bachelor's degree in education (1968). By the time they left Lexington for Wayne's doctoral studies at Purdue University followed by permanent residence in Raleigh, North Carolina, UK already held an enduring place of appreciation in their hearts.

"We've been very lucky," Dr. Skaggs reflects. "My field of interest has provided Judy and me with a wonderful professional career and an interesting and enjoyable life. That was made possible in large part by the outstanding education I received at UK as an undergraduate and a graduate student."

Sixty years after Dr. Skaggs first became a Wildcat, he, along with Judy, have created a \$250,000 Distinguished Graduate Fellowship in the UK Department of Biosystems and Agricultural Engineering (BAE), which is part of the College of Engineering as well as the UK College of Agriculture, Food and Environment.

"At a time when our graduate students face challenging economic circumstances, Wayne and Judy's gift to the BAE department is a breath of fresh air," says Rudy Buchheit, dean of the UK College of Engineering. "They are another fantastic example of how this university forms connections with alumni

that last a lifetime."

Dr. Skaggs' eminent career comprises teaching and research in drainage, subsurface water management engineering and wetland hydrology at North Carolina State University for over 47 years. He developed the first simulation model able to predict the performance of drainage and related water management systems, including effects of design parameters on crop yields and drainage water quality. The model, called DRAINMOD, is widely used in research and application in the U.S. and around the world. Dr. Skaggs' pioneering work led to his election to the National Academy of Engineering in 1991.

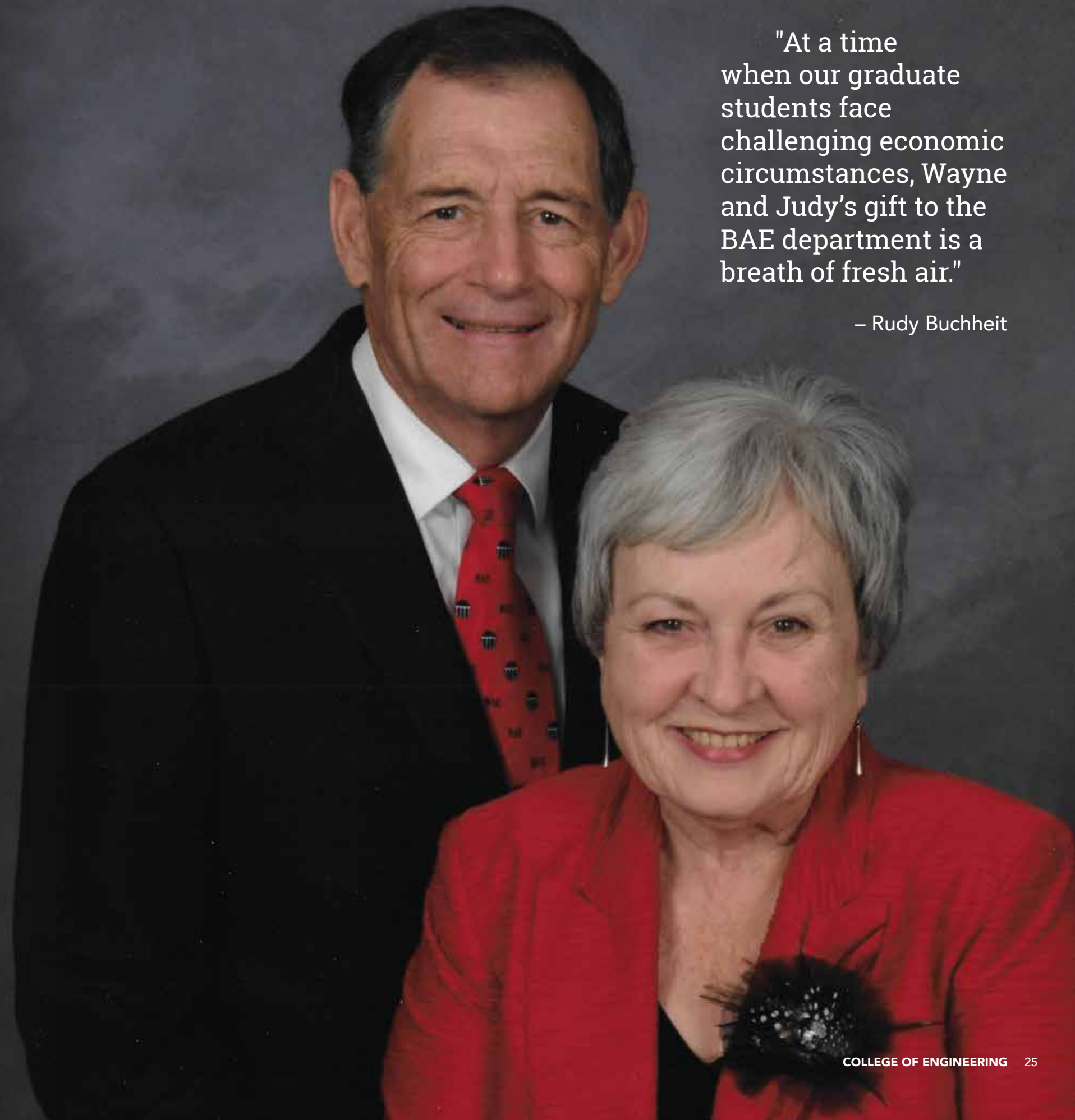
"I met Wayne and Judy Skaggs when I was a graduate student at NCSU," recalls Sue Nokes, UK associate dean for faculty affairs and facilities and professor in the Department of Biosystems and Agricultural Engineering. "I knew Wayne as a highly respected engineer, but it wasn't until I accepted a faculty position at UK that I learned Wayne and Judy are native Kentuckians who love Kentucky and are devoted UK alums."

Grateful for their education, the Skaggses wanted to give back to the BAE department. Their focus on financial support for graduate students stems from Dr. Skaggs' extensive experience as a professor.

"I served on the faculty for over 42 years full-time and five years in phased retirement, and I know what it takes to sustain a strong program in our field," he says. "In my opinion, one of the keys to my success, and the success of faculty in general, is getting and maintaining the support to recruit and support

"At a time when our graduate students face challenging economic circumstances, Wayne and Judy's gift to the BAE department is a breath of fresh air."

— Rudy Buchheit





Wayne and Judy Skaggs' family on the occasion of learning they were expecting their first great-grandchild. Middle row: Judy and Wayne, son Steven and daughter Rebecca Skaggs Ramsey. Back row: Leah and Luke Skaggs, Paul and Sarah Ramsey Smith, Todd Ramsey. Front row: Susanna and David Skaggs, Ben and Sam Ramsey.

the graduate students. You're after the best and the brightest because they're crucial. They're learning and advancing the field at the same time, so securing funds to recruit and train them is essential."

Judy Skaggs, who enjoyed a 25-year teaching career in Raleigh, shares that many of her husband's graduate students became family friends.

"I've enjoyed the relationships we've built over the years with the students. They become almost like our children. We've had them in our home, and that was a great benefit to our children as they grew up because they got to meet people from all over the U.S. and the world. That's part of what made his profession such a rewarding and rich part of our family life."

Engineering runs deep in the Skaggs family. Wayne and Judy's son, Steven (BS, MS, Ph.D.), is an electrical engineer and their daughter, Becky (BS in biochemistry, MS in education), is married to an engineer. The Skaggses have six grandchildren and two great-grandchildren.

Having blessed the college with the financial fruit of their careers, the Skaggses hope others will use their wealth to create new sources of funding through philanthropic gifts.

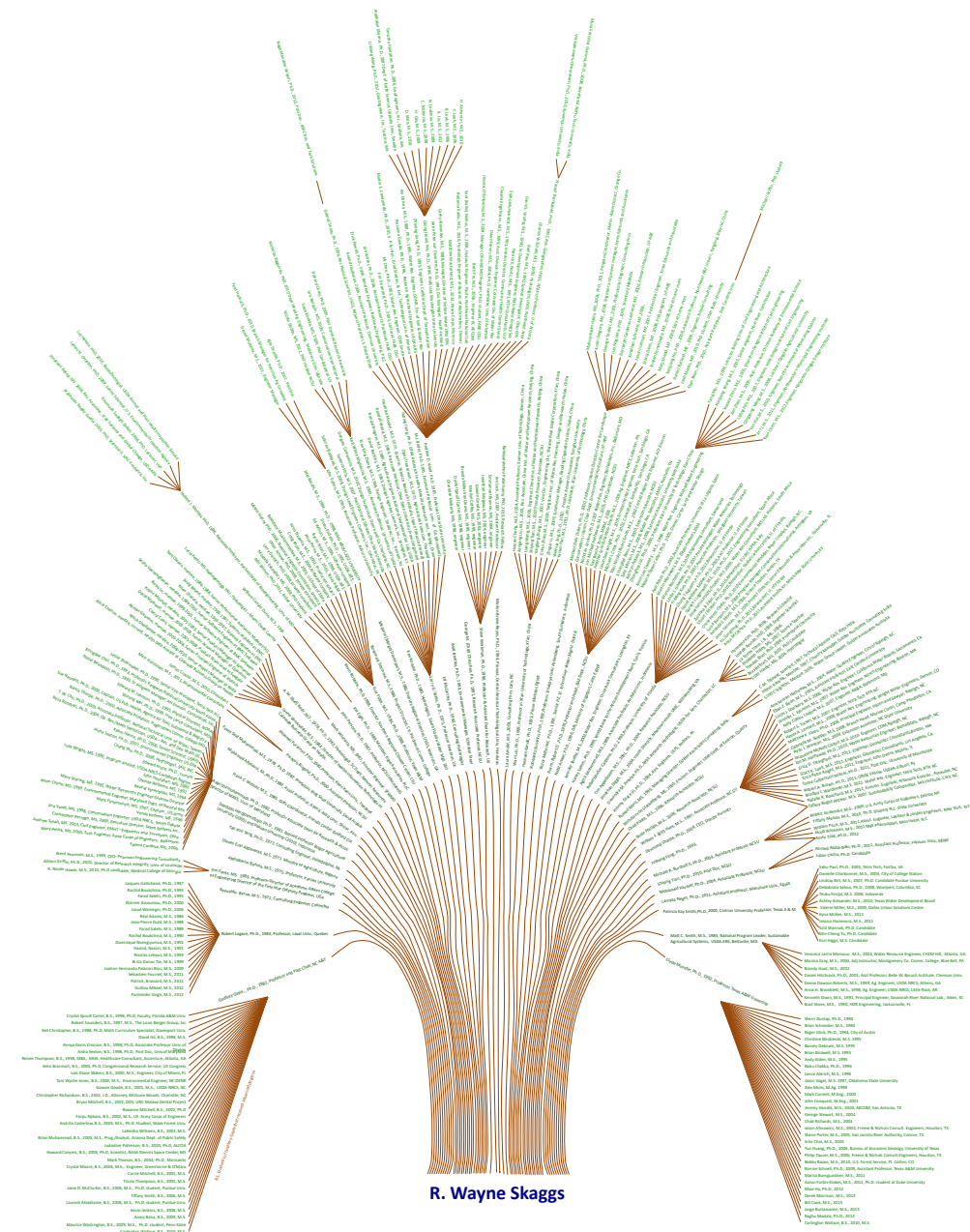
"We've had first-hand experience of how these kinds of gifts can help us to increase resources that make a positive difference," Dr. Skaggs explains. "Judy and I both had scholarships, and I've seen it as a graduate student and faculty member. That's what inspires us to give back." ■

THE WAYNE SKAGGS GRADUATE STUDENT FAMILY TREE

As professor of 65 graduate students during his career at N.C. State, Dr. Skaggs has enjoyed seeing many of them go on to teach and conduct research at universities around the world. Upon entering phased retirement in 2012, colleague and former graduate student of Dr. Skaggs, Kentucky native Dr. George (Chip) Chescheir created the Skaggs Graduate Student Family Tree. It shows Dr. Skaggs' graduate students, their graduate students—what Dr. Skaggs calls his "grand-grad students"—and, for a few, third and fourth generations of graduate students.

Two of Dr. Skaggs' students on this tree spent their careers as faculty members in the UK Department of Biosystems and Agricultural Engineering. They are Dr. Larry Wells (11 o'clock on the tree) who was Dr. Skaggs' first Ph.D. graduate student and is now retired as professor emeritus after a successful career at UK. The other is Dr. Stephen Workman, professor emeritus, who served on the faculty and as associate dean for research in the College of Agriculture, Food and the Environment.

"I am proud of the contributions these students have made," says Dr. Skaggs. "So many of them have gone on to do amazing things."





STUDENT SPOTLIGHT: **SAVANNAH LEWIS**

Leslie Bueno

Savannah Lewis always had a strong interest in electricity, astronomy, math and science, but she wasn't familiar with engineering. She had no engineer or scientist role models around her, so she didn't know the magnitude of their importance in the world.

Now, Lewis is an electrical engineering senior at the University of Kentucky and vice president of the National Society of Black Engineers (NSBE) student chapter. She has reached many milestones throughout her engineering journey, from accepting a co-op position with the National Air & Space Intelligence Center to being awarded the 2020 Outstanding Junior Award from the Department of Electrical and Computer Engineering.

As the first person in her family to pursue a bachelor's degree and study engineering, Lewis describes the feeling as daunting yet amazing. She said she felt unprepared for what was coming, but now every accomplishment she achieves means so much to her.

"Also knowing that I am helping this profession become more diverse by increasing representation makes me extremely proud."

As the telecommunications chair for NSBE, Lewis runs its social media platforms and website. Through a series called Member Mondays, students have been able to take over NSBE's Instagram story and share their experiences as Black engineering students.

"Knowing that Black people are succeeding and excelling despite oppression and inequality is so inspiring."

She has also taken to social media to express her advocacy for current social movements and share her experience as a minority student in the STEM field.

"I have shared how hard it is to gain respect from my peers. At times, I've felt as though my ideas were not taken seriously or everything I said needed a 'fact check' to be utilized."

She believes that communicating these experiences about herself and her NSBE peers "helps shed light on a different view that people who are not of our color may not see or realize." With the help of the Engineering Career Development Office, NSBE is creating more programming in professional development for minority students.

Lewis believes pursuing an engineering degree could lead to systemic change.

"Engineering has a great impact on society, especially as we are becoming more technologically advanced. Because of this, we have to make sure that we are creating technology for everyone. We need more diverse engineers to form better ideas that stem from different experiences and backgrounds."

In the future, Lewis hopes to start a STEM program for students in her hometown of Thomson, Georgia. She plans to have the program consist of STEM activities, educational field trips and college preparation. In addition to her program, she would also like to start a scholarship fund for graduating seniors at her church.

"My church family has always encouraged me to chase my dreams, and I have always wanted to show my gratitude by paying it forward."

For now, Lewis plans to continue her journey of obtaining her degree in electrical engineering and applying to a space systems or aeronautical engineering master's program after graduating. This will help lead her to her lifelong goal of becoming a U.S. astronaut. ■

STAFF SPOTLIGHT:

Q&A WITH ILKA BALK



Ilka Balk, director of the University of Kentucky College of Engineering’s Career Development Group, served as a campaign consultant early in her professional career. Such a role requires a high level of adaptability since political candidates sometimes speak or act in ways that lead to fallout and consequences. No matter how diligent or prepared a candidate’s team may be, so much is out of its control.

Balk says her experience as a campaign consultant came in handy last spring when the COVID-19 pandemic interrupted the semester. Despite ambiguous circumstances, she and her team still had to plan, act and adjust; hundreds of undergraduate students were graduating and seeking full-time employment or hunting for co-ops and internships. How could her team serve their needs?

We visited with Balk to find out how those challenges were resolved and how the fall semester is progressing.

KEJ: When the pandemic hit and students couldn’t return to campus, what went through your mind from a Career Development Office director’s perspective?

BALK: There was a lot going on at once. We had just finished our Spring Career Fair with 130-plus companies the month before, and most on-campus interviews had taken place. However, we had more employers wanting to recruit, and it became apparent in late February that we may have to move to virtual formats at some point. Thanks to a vendor we had been working with, we were able to pivot to a virtual career fair that was to take place in late March. So we were able to make the decision to go virtual early, even before we could have imagined that students would leave campus for the remainder of the semester. Because of our early action, we were still able to connect students with potential employers, and because it went so well, we did another fair in April.

In addition to the questions of how we can serve students and employers, we also were dealing with more ‘benign’ questions such as setting up our computers in our homes, and finding a spot that allows us to focus on the work while having childcare issues and trying to help kids with homework in our own homes, just like many others.

KEJ: Did the situation turn out as positively or negatively as you had suspected?

BALK: Our virtual career fairs exceeded our expectations. While many employers that had planned to hire in February had to cancel hiring or rescind internship offers, there were still a number of employers who welcomed the chance to connect with students and upcoming graduates.

On the home-office situation, that actually worked out great. Thanks to tools we have available, from shared drives, Zoom and Microsoft Teams, we can share, chat, talk, video chat and see each other’s availability with no trouble.

KEJ: What has this academic year looked like for your group? What familiar services and events have changed and what has remained the same?

BALK: Traditionally, we have always had an open-door policy so that students can ask questions or stop by whenever they are around. This fall, students haven’t been in our buildings as much, and our team is working some days from home and some in the office. In order to still be available at any time, we have a Zoom meeting room staffed during business hours, where students can join us for a quick question. If they are in our office spaces, and we are not there due to class

presentations or working from home, they can use one of our interview rooms to Zoom with us from a private space. In addition, students can still schedule appointments with us using our Handshake online job management system.

Our Fall Career Fair, which in the past has been the largest of all the on-campus career fairs, went to a virtual format. Students were able to sign up for 10-minute meetings with companies or for 30-minute group sessions. We still had around 90 companies participate in the career fair.

KEJ: What do you hope the UK community keeps in mind as the

semester evolves?

BALK: I truly hope that students, parents, alumni, faculty and staff realize that the university, including our office, has worked tirelessly to figure out a way to keep our students, faculty, staff and visitors safe, and offer students the same or comparable opportunities to learn and grow as they would have had in a non-pandemic semester. I do believe that all of us will ultimately look back at this and marvel at how nimble most of us were and how quickly we were able to adapt and retool. I am just amazed by our students. I keep thinking back when I was 19, or around that age, and I think I would not have handled this situation as well as many of our students have. It all goes to show what an awesome place UK is! ■

I truly hope that students, parents, alumni, faculty and staff realize that the university, including our office, has worked tirelessly to figure out a way to keep our students, faculty, staff and visitors safe.

ENGINEERING BETTER MENTAL HEALTH SOLUTIONS WITH SARAH WILSON

Lindsey Piercy, UK PR & Marketing

Engineers are often tasked with solving complex problems, and one of their most important tools in finding a solution is their own creativity.

Ingenuity—that’s exactly what Sarah Wilson would need when confronted with a public health issue in her field.

Wilson, a chemical engineering lecturer, was attending a conference when she learned of a unique challenge that would require an even more unique solution.

“I became interested in research on engineering student mental health after an open discussion forum at an engineering education conference,” she recalls. “It was clear that many of the engineering faculty in the room were concerned about undergraduate student mental health, but they weren’t sure about the best way to support their students.”

Anxiety, depression and other mental health concerns are more common in college students than some may realize. For an increasing number of first-year students, the culture shock can have serious consequences. In fact, a study by the American Psychological Association found that one in three teens faces a mental health disorder during their freshman year.

In an attempt to create awareness and provide support, Wilson returned to Lexington determined to help at-risk students.

“I have always been passionate about undergraduate

education and doing all that I can to aid in the success of my students,” she explains. “When it comes to mental health, I hope that this project helps us to understand more about how we can help our students and improve their mental well-being.”

But Wilson admits this project is outside of her comfort zone, so she enlisted the expertise of UK faculty members Joseph Hammer and Ellen Usher in the Department of Educational, School, and Counseling Psychology.

The team is working to design a study that looks specifically at mental health in the undergraduate engineering student population. “While the research methods will be something that I learn from them as we progress through this project, the strategy will be just like problem-solving for any engineering challenge,” Wilson says.

First, they have to identify the problem.

From the limited data currently available, Wilson, Hammer and Usher found that engineering students aren’t necessarily more likely to have mental health concerns, but they are significantly less likely to seek help than non-engineering college students.

This treatment gap became the basis for their National Science Foundation (NSF) grant proposal titled “Development of a Survey Instrument to Identify Mental Health Related Help-Seeking Beliefs in Engineering Students.”

“**From the limited data currently available, Wilson, Hammer and Usher found that engineering students aren’t necessarily more likely to have mental health concerns, but they are significantly less likely to seek help than non-engineering college students.**”



“As I developed as an instructor and attended conferences that focused on research in engineering education, I started to develop my own research goals,” Wilson says. “It’s been exciting to see my vision for research in engineering education gain traction and support.”

The researchers will use the \$199,000 NSF award to answer a critical question: Why aren’t engineering students seeking help for mental health concerns?

“Our goal at the end of this project is to have a tool that will allow us to measure the beliefs that engineering students have related to mental health related help-seeking,” Wilson explains. “To do this, we first need to interview a diverse group of engineering students to understand their attitudes toward help-seeking.”

The results will allow for the development of interventions targeted at changing those specific beliefs and ultimately improving student mental health.

“As an example, our measurement tool could tell us that engineering students don’t believe that seeking help for a mental illness will improve their mental well-being,” Wilson continues. “If this is the case, we could develop interventions specifically targeted at teaching students about the effectiveness of treatment for improving mental health.”

As Wilson and the team strive to find solutions, she’s also calling on the campus community to do its part.

“In a university setting, we need to be advocates for our students, for our friends and for our classmates. If you are concerned about the mental health of someone that you know, it’s important to let someone know.”

Research reported in this publication was supported by the National Science Foundation under Award Number 2024394. The opinions, findings and conclusions or recommendations expressed are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

THREE UK ENGINEERING STUDENTS RECEIVE NSF GRADUATE FELLOWSHIPS

Whitney Hale, UK PR & Marketing

The University of Kentucky Office of Nationally Competitive Awards has announced that three students in the UK College of Engineering have been selected to receive government-funded National Science Foundation (NSF) Graduate Research Fellowships. Another student received honorable mention recognition from the NSF.

The three NSF fellows are:

James Tyler Nichols, a mechanical engineering graduate student from Taylorsville, Kentucky, who is pursuing research in aerospace engineering at University of Colorado at Boulder.

Stephen Parsons, a former Chellgren Fellow and current computer science doctoral student from Lexington, who is pursuing research in robotics and computer vision at UK.

Eura Shin, a 2019 computer science graduate and Lewis Honors College member from Morehead, Kentucky, who is pursuing research in robotics and computer vision at Harvard University.

NSF Fellows receive a three-year annual stipend of \$34,000 along with a \$12,000 cost of education allowance for tuition and fees for a research-based master's or doctoral degree in a STEM (science, technology, engineering and mathematics) field. Annually, the NSF

awards approximately 1,500 fellowships from an applicant pool of over 12,000.

"I am sure I am only starting to imagine the opportunities in front of me thanks to this fellowship," said Parsons. "The stability provided by the fellowship will allow me to commit to long term, difficult problems in my existing research that have the highest impact. I am already looking forward to the partnerships I will be able to build, both inside UK and with other institutions. Since our research work is multidisciplinary, these relationships are critical to our success."

Parsons has been working with Brent Seales' team on the digital restoration of ancient artifacts, particularly focusing on the Herculaneum scrolls. As part of this research, he helps scan the scrolls using X-ray microtomography and then develops algorithms to analyze the resulting data in hopes of revealing hidden text. This will be one of the primary targets of Parsons' research under this fellowship.

Nichols, who served as project lead on Kentucky Re-entry Universal Payload System (KRUPS) project, is excited about the autonomy the fellowship will afford him in the future.

"This award is allowing me the opportunity to have freedom in my



doctoral research. I will be able to forge my own path in research and learning while attaining my Ph.D."

In 2019, Shin won a prestigious Barry Goldwater Scholarship. She plans to earn her Ph.D. in computer science at Harvard University and pursue a position as a professor of computer science. Along the way, she will continue to further her research interests in machine learning and AI.

Hannah Dvorak, a 2020 chemical engineering graduate from Suamico, Wisconsin, received an honorable mention from the NSF GRFP.

The NSF GRFP is the country's oldest graduate fellowship program directly supporting graduate students since 1952. GRFP is a critical program in NSF's overall strategy to develop a globally-engaged workforce necessary to ensure the nation's leadership in advancing science and engineering research and innovation. A hallmark of GRFP is its contribution to increasing the diversity of the STEM workforce, including geographic distribution, as well as the participation of women, underrepresented minorities, persons with disabilities and veterans.

ZACH AGIOUTANTIS NAMED DEPARTMENT OF MINING ENGINEERING CHAIR

Zach Agioutantis, Mining Engineering Foundation Professor, is the new chair of the University of Kentucky Department of Mining Engineering.

Agioutantis joined UK in October 2014 after serving as professor and the director of the Rock Mechanics Laboratory at the Technical University of Crete (TUC) in Greece for over 25 years. A prolific researcher and scholar, Agioutantis has secured research funds totaling over \$5.4 million with a personal share of \$2.3 million over the past six years.

In 2018, Agioutantis was awarded the prestigious Syd S. and Felicia F. Peng Award by the Society of Mining, Metallurgy and Exploration (SME) for his "ability, integrity, passion and perseverance towards the integration of software and ground control methodologies." This is a lifetime achievement award that recognizes individuals who have demonstrated technical and scientific excellence in advancing the understanding of ground control technologies.



NEWS & RECOGNITION

GRANT AWARDS

Zach Agioutantis, Mining Engineering Foundation Professor and chair of the University of Kentucky Department of Mining Engineering, and **Steven Schafrik**, associate professor in the department: Received a two-year, \$382,000 grant from the Alpha Foundation for the Improvement of Mine Safety and Health, Inc., for "Comprehensive atmospheric monitoring in underground coal mines: long term critical trend analysis and tablet-based communication."

Rodney Andrews, director, UK Center for Applied Energy Research; professor, Chemical Engineering: \$10 million project with the U.S. Department of Energy and Oak Ridge National Laboratory to transform coal into high-value carbon fibers and composites.

Dibakar Bhattacharyya (PI), University Alumni Professor, Chemical Engineering; **J. Todd Hastings**, Reese S. Terry Professor, Electrical Engineering; **Thomas Dziubla**, professor and chair, Chemical Engineering; **Yinan Wei**, Chemistry: \$152,454 National Science Foundation (NSF) Rapid Response Research Grant (RAPID) for medical face mask that can capture and deactivate the COVID-19 virus on contact.

Gregory Erhardt, assistant professor, Civil Engineering: PI for UK on new multi-institution Tier 1 University Transportation Center.

Isabel Escobar, professor, Chemical Engineering, and **Eric Wooldridge**, professor of additive manufacturing at Somerset Community College: Kentucky's National Science Foundation (NSF)-sponsored Established Program to Stimulate Competitive Research (EPSCoR) to develop antiviral membrane, 3D-printed masks.



Martha Grady, assistant professor, Mechanical Engineering with a joint appointment in the F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: Leading project titled "Quantitative Mechanical Phenotyping of Bacterial Biofilms on Implant Surfaces" as part of UK's \$11.2 million NIH COBRE grant.

Shakira Hobbs, assistant professor, Civil Engineering: Award through the 2019 Research Equipment Competition sponsored by the UK Office of the Vice President for Research.

UK Center for Appalachian Research in Environmental Sciences (UK-CARES) Rapid Response Mini-Grant for "Estimation of Watershed Glyphosate Exports in Karst Landscapes."

Hala Nassereddine, assistant professor, Civil Engineering: Received ELECTRI International Early Career Award.

Johné Parker, associate professor, Mechanical Engineering: Co-PI for \$1 million NSF Kentucky-West Virginia Louis Stokes Alliance for Minority Participation (KY-WV LSAMP) to support UK graduate students pursuing degrees in the fields of science, technology, engineering and mathematics (STEM).



Simone Silvestri, assistant professor, Computer Science: National Science Foundation Faculty Early Career Development (CAREER) Award for "Energy Management for Smart Residential Environments Through Human-in-the-loop Algorithm Design."

Julius Schoop, assistant professor, Mechanical Engineering: \$626,000 grant from the Department of Energy and additional partners for "AI-Enabled Discovery and Physics-Based Optimization of Energy-Efficient Processing Strategies for Advanced Turbine Alloys."

Guoqiang Yu, professor, F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: \$2,704,865 National Institutes of Health grant for "Noninvasive Noncontact High-Density Optical Imaging of Neonatal Intraventricular Hemorrhage."

\$1,956,594 National Institutes of Health grant for "Perioperative Diffuse Optical Imaging of Tissue Blood Flow and Oxygenation for Optimization of Mastectomy Skin Flap Viability."

Caigang Zhu, assistant professor, F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: \$912,861 NIH COBRE grant for "Intra-vital metabolic

microscopy to reveal head and neck cancer radiation resistance mechanism in small animal models."

Peng Wang, assistant professor, Electrical and Computer Engineering and Mechanical Engineering: \$444,000 NSF award for "Understanding Manufacturing Process Dynamics and Machine Tool Anomaly Detection Through Process Sensing and Machine Learning." **I.S. Jawahir**, professor, James F. Hardyman Chair in Manufacturing Systems, Mechanical Engineering, and director of the Institute for Sustainable Manufacturing, is co-PI.

YuMing Zhang, James R. Boyd Professor, Electrical and Computer Engineering: \$665,540 NSF grant for ongoing research into realizing fully robotic automation of complex welding tasks.

PROFESSIONAL RECOGNITION

Akinbode Adedeji, associate professor, Biosystems and Agricultural Engineering: College of Education Teachers Who Made a Difference Award.

Zach Agioutantis, Mining Engineering Foundation Professor, department chair, Mining Engineering: College of Engineering Excellence in Research Award.

Ilka Balk, director of Engineering Career Development: Tau Beta Pi Most Outstanding Staff Award.

Dibakar Bhattacharyya, University Alumni Professor, Chemical Engineering: 2020 American Institute of Chemical Engineers Separations Division Founders Award.

Christoph Brehm, assistant professor, Mechanical Engineering: College of Engineering Excellence in Research Award.

Thomas Cochell, senior lecturer, Materials Engineering: UK Provost's Outstanding Teaching Award.

Aaron M. Cramer, Kentucky Utilities

Professor of Electrical and Computer Engineering: College of Engineering Excellence in Service Award.



Gabriel Dadi, associate professor and W.L. Raymond & R.E. Shaver Chair of Construction Engineering and Management, Civil Engineering: UK Provost's Outstanding Teaching Award.

James F. Fox, Raymond-Blythe Professor, Civil Engineering: Henry Mason Lutes Award for Excellence in Engineering Education.

Issam Harik, Raymond-Blythe Professor, Civil Engineering: Elected American Concrete Institute Fellow.

J. Todd Hastings, Reese S. Terry Professor, Electrical and Computer Engineering: Named University Research Professor for 2020-2021.

Jesse B. Hoagg, Donald and Gertrude Lester Professor, Mechanical Engineering: College of Engineering Excellence in Research Award.

Dan M. Ionel, Power and Energy Institute of Kentucky director; professor, Electrical and Computer Engineering; L. Stanley Pigman Chair in Power: Received the Cyril G. Veinott Award from the IEEE Power and Energy Society.

Douglass Kalika, professor and director of First-Year Engineering, Chemical Engineering: Tau Beta Pi Most

Outstanding Professor.

Doug Kreis, associate director, Kentucky Transportation Center: Staff Excellence Award.

Laura Letellier, lecturer, Electrical and Computer Engineering and First-Year Engineering Program: College of Education Teachers Who Made a Difference Award.

Janet K. Lumpp, professor, Electrical and Computer Engineering: College of Engineering Excellence in Service Award.

Stephanie Mahan, Business Office manager, College of Engineering Extended Campus at Paducah: Staff Excellence Award.

Alexandre Martin, professor, Mechanical Engineering: Named new director of the Kentucky Space Grant Consortium and NASA EPSCoR Programs.

Jerry Pigman, program manager, Kentucky Transportation Center: Inducted into the Kentucky Transportation Hall of Fame.



Eric Sanders, media manager, College of Engineering Marketing and Communications: Lexington American Advertising Award for Branded Internet Commercial Campaign.

Jeffrey Seay, PJC Board of Trustees Engineering Professor of Chemical

Engineering, UK College of Engineering Extended Campus at Paducah: UK Global Impact Award.

Suzanne Smith, professor and director emeritus of the Kentucky Space Grant Consortium and NASA EPSCoR Programs, Mechanical Engineering: Elected American Institute of Aeronautics and Astronautics (AIAA) Fellow.

Tau Beta Pi Bruce L. Walcott Most Outstanding Service Award.

William Staats, research engineer, Kentucky Transportation Center's Traffic and Safety Program: Named a "Friend of Traffic Operations" (FOTO) by the Kentucky Transportation Cabinet's Division of Traffic Operations.

Nikiforos Stamatadis, Raymond-Blythe Professor, Civil Engineering: Fulbright Award to teach and conduct research in Greece.

Awarded Greek Diaspora Fellowship.

Guoqiang Yu, professor, F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: College of Education Teachers Who Made a Difference Award.

Guigen Zhang, professor, F. Joseph Halcomb III, M.D. Endowed Chair and Chair of the F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: Elected Fellow Biomaterials Science and Engineering by the International Union of Societies for Biomaterials Science and Engineering.

Elected 2021-2022 president of the Society for Biomaterials.

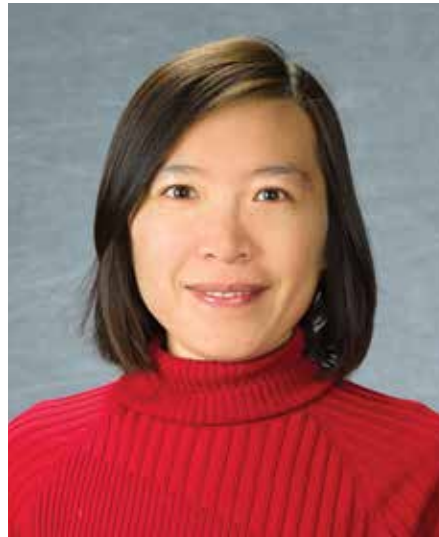
College of Engineering Marketing and Communications, CASE III Magazine: Gold Award.

College of Engineering Marketing and Communications, CASE III Publications Writing, Silver Award.

PROMOTIONS

Himanshu Thapliyal, Electrical and Computer Engineering: Promoted to

associate professor with tenure



Tingting Yu, Computer Science: Promoted to associate professor with tenure

Mei Chen, Civil Engineering: Promoted to full professor

Jinze Liu, Computer Science: Promoted to full professor

Alexandre Martin, Mechanical Engineering: Promoted to full professor

Tim Taylor, Civil Engineering: Promoted to full professor

Yi Pike, Computer Science: Promoted to senior lecturer

STUDENT AWARDS AND RECOGNITION

Nabil Al Aamery, Civil Engineering: College of Engineering Outstanding Teaching Assistant Award.

Amir Al-Bakri, F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: 2020 BRAIN Initiative® Travel Trainee Award.

Rosemary Alden, Electrical Engineering: First prize in the Undergraduate Student Poster Contest organized during the 2020 IEEE Power and Energy Society (PES) General Meeting.

William Bailey, Computer Science:

College of Engineering Outstanding Teaching Assistant Award.

Xiaobo "Max" Dong, Chemical Engineering: College of Engineering Most Outstanding Doctoral Student Award.

Zachary Kahleifeh, Electrical Engineering: College of Engineering Outstanding Master's Student Award.

Staci McGill, Biosystems and Agricultural Engineering: USDA Predoctoral Fellowship.



Lauren Mehanna, Chemical Engineering: Tau Beta Pi Most Outstanding Graduate Student.

Javad Mollakazemi, F. Joseph Halcomb III, M.D. Department of Biomedical Engineering, and team: Winners of the 2020 University of Kentucky Global Health Case Competition.

Matthew Morse, Chemical Engineering: Received Tau Beta Pi Scholarship.

Alex Nguyen, Computer Engineering: Tau Beta Pi Most Outstanding Senior.

Alex Nguyen, Computer Engineering: \$10,000 Tau Beta Pi Fellowship.

James Obute, Chemical Engineering: \$10,000 Tau Beta Pi Fellowship.

Yuke Wang, Computer Science: Goldwater Scholarship.

CLASS NOTES

Colonel Cassius Bentley III, BSCE 1998, began serving as wing commander of the 92nd Air Refueling Wing at Fairchild Air Force Base near Spokane, Washington, on July 1. He now oversees a base with approximately 13,000 residents and houses the world's largest aerial refueling fleet in the world.

Maya Anthony Bentley, BSAE 2014, advance product quality planning engineer at Fairbanks Morse Engine, was featured in a new television series, "Behind The Woman." The 13-part series shares the personal stories of diverse women leaders.

Alex Castle, BSCE 2010, master distiller and senior vice president at Old Dominick Distillery in Memphis, Tennessee, has been elected president of the Tennessee Distillers guild. In her role, Castle will lead the Guild in its initiatives.

Frankie A. Ko, MSCE 1976, has been appointed as an independent non-executive director of Chiho Environmental Group Limited, a global leader in metal recycling and environmental protection. Ko started his career at Dow Chemical

Company in 1976 and spent 31 years in various manufacturing and commercial leadership roles. In 2007, Ko joined AEA Investors, a global private investment firm focused on private equity and debt investments in the middle market, and is currently a partner and an operating executive.

Charles Lickfold, BSCS 1997, has been named senior vice president, chief information officer at Catalent. Lickfold will lead Catalent's continuing digital transformation and automation strategy while ensuring the most rigorous data integrity standards are met.

Mark Meade, PE, PLS, PSM, CP, BSCE 1983, senior vice president of Quantum Spatial, Inc., was appointed to the National Geospatial Advisory Committee (NGAC). He will serve a three-year term on the NGAC, which is a federal advisory committee sponsored by the Department of the Interior and authorized under the Geospatial Data Act of 2018.

Santosh Pitla, Ph.D., BSME 2007; MSBAE 2009; Ph.D. BAE 2012, received

the 2020 John Deere Award from North American Colleges and Teachers of Agriculture (NACTA). The NACTA John Deere award recognizes one faculty member each year for his or her work in preparing students for the workforce. Dr. Pitla is an associate professor in advanced machinery systems at the University of Nebraska-Lincoln.

Chris Roche, MSBME 2003, has been promoted to vice president of Extremities at Exactech. Roche, who has worked at Exactech since 2003, has designed and brought to market numerous medical devices, including the Equinox Platform Shoulder System.

Clifford Roy, BSMET 1969, chairman of Roy Metal Finishing (RMF), was inducted into the Finishing Hall of Fame. A 50-year veteran in the finishing industry, Roy grew RMF into one of the most advanced finishing operations with a staff of more than 200 employees in three locations.

Gregory Summe, BSEE 1978, managing partner of Glen Capital Partners, has been appointed to the board of directors for Avantor, Inc. Summe was also appointed as a member of the Compensation & Human Resources and the Nominating & Governance Committees.

BE Included

Please send Class Notes to alumni@engr.uky.edu

College of Engineering Remembers Calvin Grayson and Philip Reucroft



Calvin Grayson (BSCE 1949), who established the Kentucky Transportation Center and served as its director from 1983-2004, passed away on July 4. His career in transportation spanned nearly seven decades, and he worked for eight Kentucky governors.

Born September 25, 1924, in Woodford County, Grayson attended the University of Kentucky from 1941 to 1943, when he withdrew to enter the armed forces. He was involved in two major beachhead invasions, at Leyte in the Philippines and at Okinawa. A Purple Heart recipient, he was wounded at Okinawa and hospitalized for 16 months.

Grayson returned to UK in 1946 and earned a bachelor of science in civil engineering in 1949. He began his career in transportation with the Kentucky Department of Highways and remained with the department and its successor, the Department of Transportation, for 30 years. In 1977, he was named commissioner of highways and secretary of the Department of Transportation. He was the first career professional engineer to ever hold these positions.

While secretary, Grayson established the Kentucky Transportation Center at UK and served as its director from 1983-2004, the capstone to his legacy in the transportation world. His long, illustrious career was marked by his philosophy of looking at business processes and practices to ensure continuous quality improvement. He was recognized as the change agent who moved the highway department from a single modal agency to a multimodal transportation agency, a significant shift in thinking and organization. In addition, Grayson worked tirelessly for over 50 years to secure the 2006 passage of the primary seatbelt law for the Commonwealth of Kentucky.

During his lifetime, Grayson was inducted into the UK College of Engineering's Hall of Distinction, the UK Alumni Association's Hall of Distinguished Alumni and the Kentucky Transportation Hall of Fame.



Philip Reucroft, who taught and conducted research in materials science and engineering from 1969 until 2005, passed away on April 16.

After completing a postdoctoral fellowship at the National Research Council in Ottawa, Canada, from 1959-1961, Reucroft worked as a research scientist at the Franklin Institute Research Laboratories in Philadelphia until 1969, when he joined the University of Kentucky.

Reucroft's professional achievements included research in surface science, catalysis, electronic materials and film studies. He obtained research grants through the National Science Foundation and the National Aeronautics and Space Administration and contributed over 300 articles to professional journals.

Among his numerous professional awards and designations, Reucroft delighted in being named an Honorary Kentucky Colonel through the Commonwealth of Kentucky.

In Memoriam

Calvin G. Grayson	Civil Engineering	1949
George T. Murray	Metallurgical Engineering	1949
Thomas A. Prather	Mechanical Engineering	1949
Daniel Lawrence Coleman	Electrical Engineering	1950
William K. English	Electrical Engineering	1950
Dr. Carlyle Michelson	Electrical Engineering	1951, 1952, 1959
Paul H. Brown	Civil Engineering	1954, 1955
Billy D. McDonald	Mechanical Engineering	1954
James E. Clark	Electrical Engineering	1956
Rex Hodge	Mining Engineering	1956
Eugene W. Scroggin	Civil Engineering	1956
Kenneth E. Glass	Civil Engineering	1957
Charles L. Willis	Civil Engineering	1958, 1958
Lanza Lee (L.L.) Schwall	Civil Engineering	1959
Gerald B. Looney	Electrical Engineering	1960
Charles R. Whitnell	Mechanical Engineering	1960
Mellwood Cooksey, Jr.	Agricultural Engineering	1962
James C. Lee	Electrical Engineering	1962
David L. Newcom	Agricultural Engineering	1962, 1963
Tilford R. "Ted" Richardson	Civil Engineering	1962, 1963
John L. McMichael	Civil Engineering	1963
John W. Conner	Civil Engineering	1964
Donald L. Griffin	Civil Engineering	1964
Mommon L. McCay	Electrical Engineering	1964
Robert E. Welch	Civil Engineering	1966
Floyd Van Cook	Mechanical Engineering	1968
Johnny G. Fraley	Mechanical Engineering	1968
Earl F. Camic	Electrical Engineering	1977
William Daniel Canter	Electrical Engineering	2011
Samuel Garcia, Jr.	Mechanical Engineering	2019

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NOTES:

p. 9: Pienkowski is director of undergraduate studies for the F. Joseph Halcomb III, M.D. Department of Biomedical Engineering.

p. 15: Chemical engineering professor Isabel Escobar (pictured) is an expert on membranes as well as an admired instructor. But when it came to moving course material into the online realm, Escobar wondered how it would go. "I teach Thermodynamics in 10 minutes...my stomach is full of butterflies and I'm actually anxious," she tweeted. "I have not felt like this before a class in over 18 years!" By all accounts, she did a fantastic job.

p. 19: What engineering subject would you like explained as if to a grandmother? Email us at alumni@engr.uky.edu, and we'll line up the appropriate expert for an upcoming issue!

p.21: Pennell recently co-authored an article detailing lessons learned about stakeholder engagement and risk communication relevant for COVID-19 and school (re)-opening. The article appeared in the recent edition of *Reviews on Environmental Health*. Sweta Ojha, a doctoral student in Pennell's research group, is also one of the co-authors.

On October 5, the Centers for Disease Control and Prevention (CDC) updated its guidance, acknowledging that the coronavirus

can spread through airborne particles. Circumstances under which airborne transmission have occurred include enclosed spaces, prolonged exposure to respiratory particles and inadequate ventilation or air handling.

"The CDC's acknowledgment that close contact, airborne transmission and inadequate building ventilation play a role in COVID-19 follows recognition of this exposure pathway by many experts within the scientific community," says Pennell. "The recently updated CDC guidance reinforces the importance of our article, which discusses methods for engaging with stakeholders to share accurate, science-based, and importantly, context-specific information."

p. 24: Dr. Skaggs was inducted into the UK College of Engineering's Hall of Distinction in 1994.

p. 28: Savannah was named Miss Gold in the 2019 Miss Black and Gold Awards. You can read more about her award in the spring 2020 issue of the magazine.

p. 32: In addition to Balk, John Beck and Zach Fuqua round out the Career Development office.

GEORGE T. AND TONNY MURRAY

In 2001, University of Kentucky alumnus George T. Murray and his wife, Tonny, established the George T. and Tonny Murray Scholarship to give back to the university and college of engineering they cherished. From that time, their fund has furnished scholarships to chemical or materials engineering majors who demonstrate a need for financial assistance as well as the potential for academic success. Preference is given to students from Lincoln County, Kentucky.

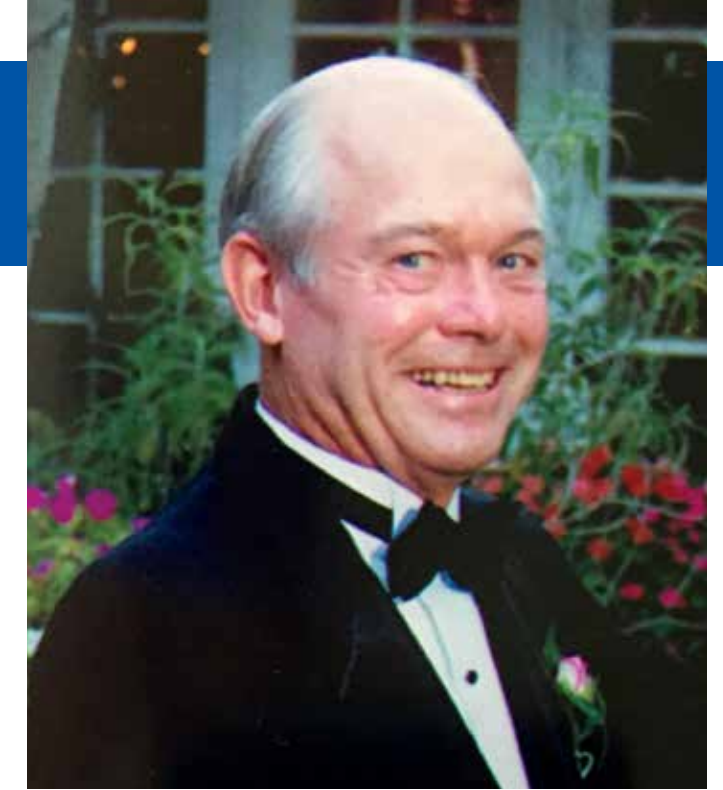
Dr. Murray died March 22, 2020, at the age of 93. A little over two months later, Mrs. Murray passed away at the age of 95. Together, they enjoyed 62 years of marriage. With Tonny Murray's passing, the family trust will make another sizable contribution to the scholarship fund in their name. Generous in their lifetimes, the Murrays will continue to support enthusiastic engineering students determined to improve our world.

Dr. Murray was born in Waynesburg, Kentucky, in 1927, the eighth of nine children. He graduated as valedictorian from his high school at the age of 16 and began his college studies at Eastern State Teacher's College in Richmond, Kentucky, before transferring to UK in 1944 to pursue a degree in engineering. After pausing his education for two years to enlist in the U.S. Navy, Dr. Murray returned to UK and earned a bachelor's degree in metallurgical engineering. He later received a master's degree from the University of Tennessee and his Ph.D. from Columbia University in New York.

While studying at Columbia, Dr. Murray met his future wife, Tonny, a Dutch citizen working at the Netherlands consulate. They married in 1958, just after he obtained his doctorate. Tonny Murray took pride in her native country, often saying, "If it ain't Dutch, it ain't much!" She never lost her accent.

Dr. Murray joined two other Columbia graduates to form Materials Research Corporation, where he served as director of research and later corporate vice president. During this time, Dr. Murray traveled extensively throughout Europe and spent one year as director general in Toulouse, France, where he set up a materials manufacturing plant.

In 1978, the Murrays relocated to San Luis Obispo, California,



where Dr. Murray began a second career as a professor of materials engineering at Cal Poly. He authored a textbook on materials engineering as well as over 30 publications in peer-reviewed scientific journals and trade magazines. In addition to teaching, Dr. Murray served as department chair for many years before retiring in 1993. In 2018, the Murrays moved to Pacific Palisades, California, to be closer to their children, Karraine and Michael.

The Murrays enjoyed golf and built their retirement home on the 13th hole of the San Luis Obispo Country Club. Mrs. Murray was an avid lap swimmer who made friends quickly and offered her time and services to prepare meals and feed the homeless.

Due to the coronavirus pandemic, a celebration of life for the Murrays will be held at a later date. However, Karraine Murray poetically described the scene from a recent family gathering.

"Graced with red roses, yellow tulips and white hydrangeas, their ashes were scattered together at sea, off the coast of Morro Bay. The ebb and flow of the tides will reflect the light of their souls in every sunrise and sunset forever."

The UK College of Engineering extends its condolences to the Murray family and thanks George and Tonny for their generosity in life and in death.



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