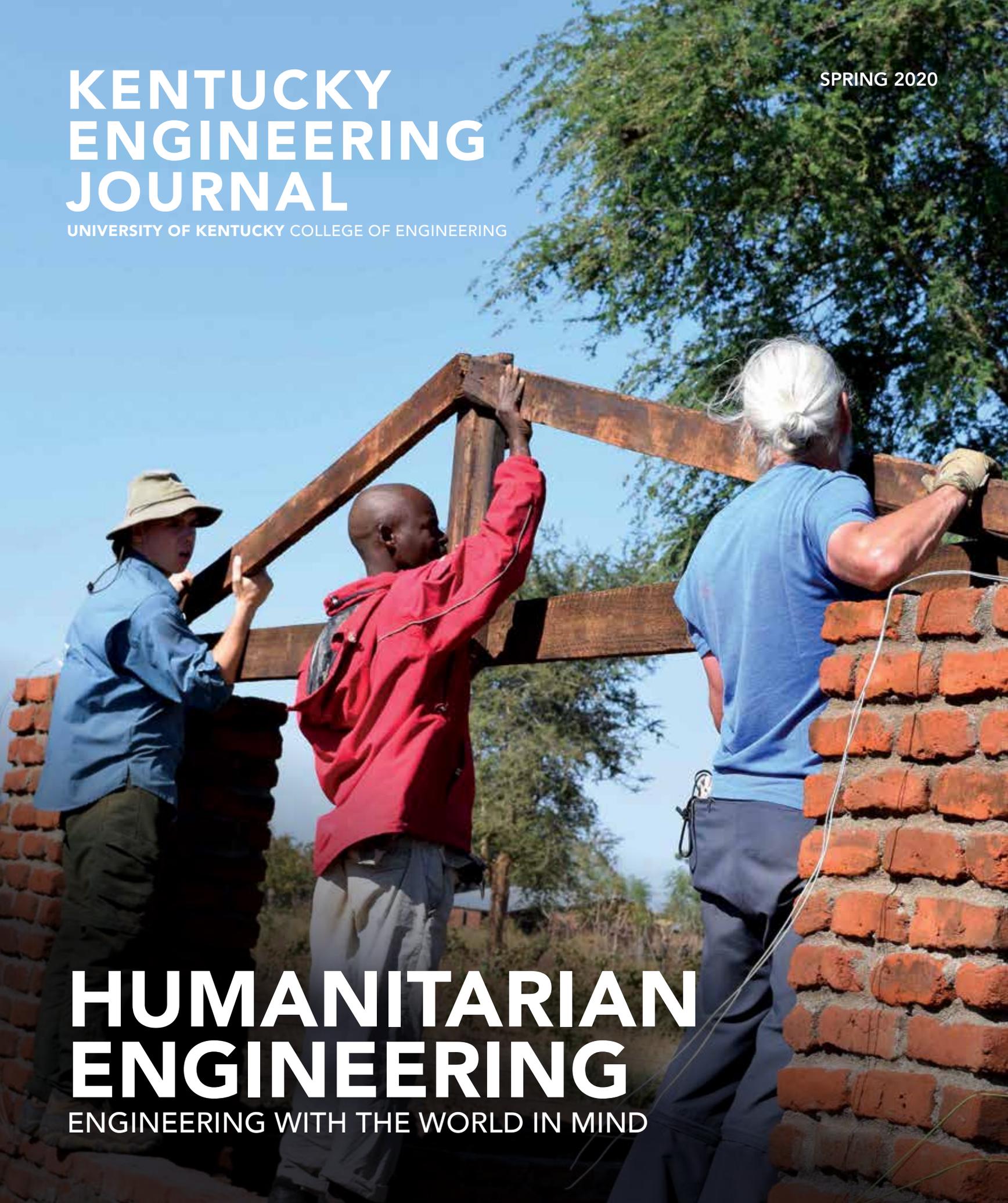


KENTUCKY ENGINEERING JOURNAL

UNIVERSITY OF KENTUCKY COLLEGE OF ENGINEERING

SPRING 2020



HUMANITARIAN ENGINEERING

ENGINEERING WITH THE WORLD IN MIND



Eggs are delicate, fragile. They really have no business plunging two stories toward a hard surface.

But that's what happened during the Egg Drop contest at our annual E-Day Open House on February 22. E-Day, sponsored by Lexmark, drew over 3,000 people to the Engineering Quadrangle for demonstrations, activities, games and more. Next year's E-Day Open House will take place February 27, 2021.



CREDIT: Peter Comparoni, UKPR



“Our humanitarian engineering faculty members are taking their expertise and applying it toward improving human life and health wherever they are.”

MESSAGE FROM THE DEAN

Welcome to the spring edition of *Kentucky Engineering Journal*, the flagship publication for the University of Kentucky College of Engineering. This issue is arriving in your mailbox during a period of change and uncertainty. However, the stories we share in this magazine are reminders of how you and your fellow engineers combine your intellect, knowledge and creativity to not only create solutions for global-sized problems but also inspire the kind of confidence in human ingenuity that we need right now.

Our cover story is about how the College of Engineering is engaged in the growing field of humanitarian engineering. Whether in South America, Africa or right here at home, our humanitarian engineering faculty members are taking their expertise and applying it toward improving human life and health wherever they are. Their stories are inspiring, and our students who desire to make a tangible difference in our world are eagerly joining them in their work.

Our faculty members are also actively improving the quality of human recreational life through their work at the forefront of innovative bourbon industry research. They may not be master distillers; however, their knowledge of ventilation, precision heating, water treatment and more makes them invaluable for improving crucial aspects of the bourbon-making process.

We hope you enjoy this issue. Thank you for all you do to make our world a safer, better place.

Sincerely,

Rudy Buchheit
Dean



CONTENTS



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06

HUMANITARIAN ENGINEERING

Engineering with the world in mind

12

PROFESSIONAL DEVELOPMENT

Professor Jane Hayes is part of a new vision that combines growth and service

14

LONG-AGED

Two historic brands are partnering to advance the bourbon industry

22

MAN OF VISION

Carl and Betty McHargue's \$2 million estate gift will endow a new scholarship

26

PROGRAM SPOTLIGHT

Pamplona Renewable Energy Program

28

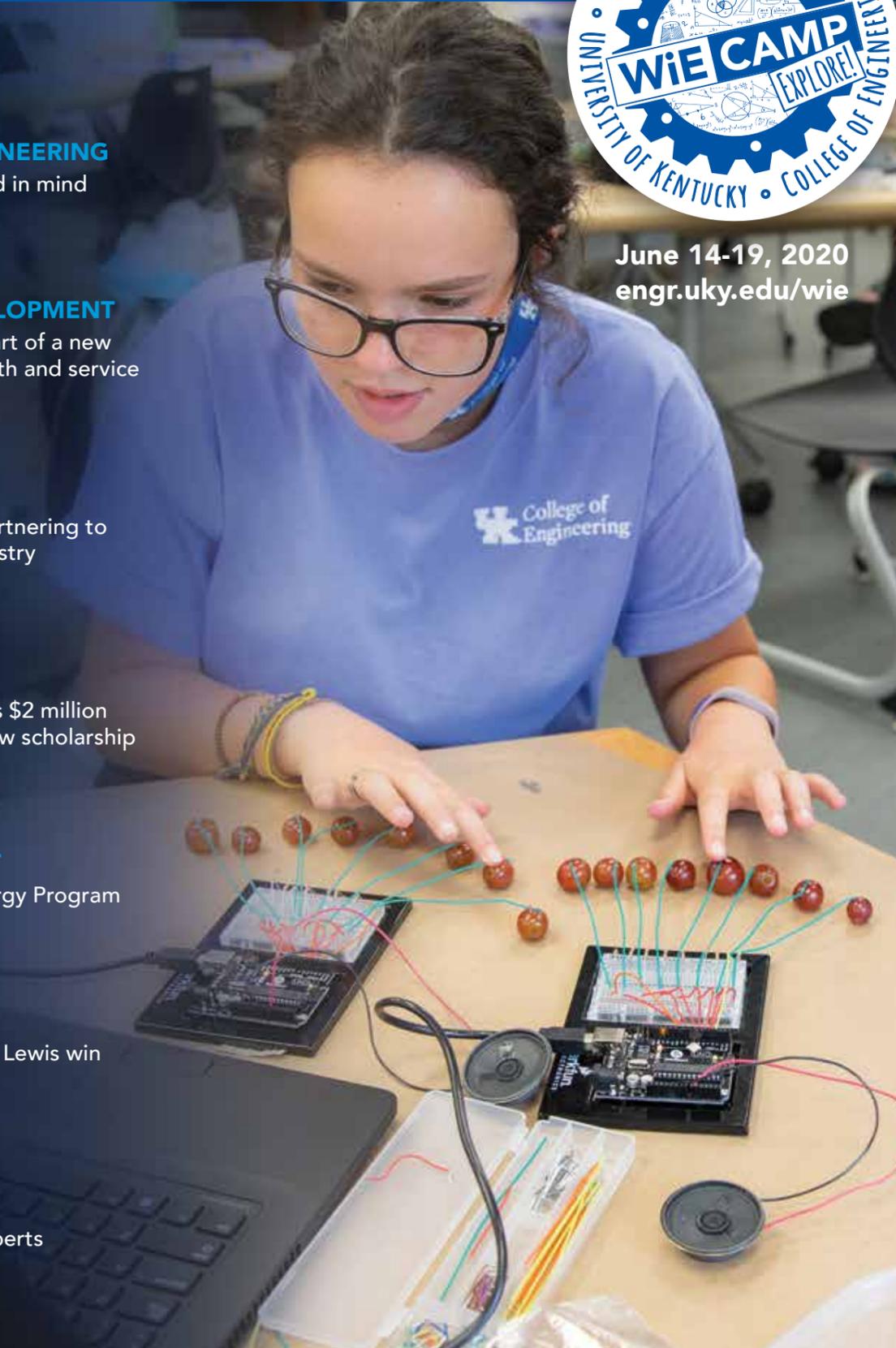
STUDENT SPOTLIGHT

K'Lynn King and Savannah Lewis win Miss Black & Gold awards

30

STAFF SPOTLIGHT

You're LIVE! with John Roberts



HUMANITARIAN ENGINEERING

ENGINEERING WITH THE WORLD IN MIND

Kel Hahn

As an undergraduate student at the University of Maryland, environmental science and technology major Shakira Hobbs took advantage of a study abroad opportunity to visit the Central American country of Belize in 2012. One of the most biodiverse countries in the world, Belize frequently hosts researchers studying tropical ecology. Her positive experience there included bonding with community members in the Sittée River village.

After returning to the U.S., Hobbs and her new friends kept in touch through Facebook. When Hobbs posted that she planned to begin graduate studies in environmental engineering, the Sittée River community urged her to return to Belize so they could embark on a project together. Hobbs and a colleague wrote a proposal and received funding from the National Science Foundation to explore how they could use their engineering background to develop an environmental project with the Sittée River community.

Upon arrival, Hobbs conducted surveys to better understand the community's needs. The biggest issue: waste management. But what if they could convert organic waste to energy? Hobbs' background paved the way for the group to build an anaerobic digester prototype out of cement. Because certain natural microbes live in oxygen-free environments, they produce biogas and biosolids by eating the organic material. Harvested biogas becomes cooking fuel, and biosolids end up as fertilizer.

Hobbs' experience, bolstered by returning to Belize once and sometimes twice a year, has deepened her understanding of an emerging field known as humanitarian engineering. When Hobbs joined the University of Kentucky Department of Civil Engineering as an assistant professor in February 2019, chair Reg Souleyrette considered her an ideal choice to teach the department's brand-new humanitarian engineering course for undergraduate and graduate students.

“**Humanitarian engineering involves looking at technology for a more marginalized community. So often, we're engineering solutions for communities that have access to resources, such as capital to pay for expensive technologies. But the majority of the world cannot afford these technologies.**”

“Our department has a longstanding tradition of individual faculty members and students engaged in humanitarian engineering but until now, no one who fully specialized in that area,” says Souleyrette. “Dr. Hobbs brings world-class education and experience in the science of humanitarian engineering. She should be developing and teaching our first dedicated course in this area, and we're excited for the students and teams under her leadership.”

But what is humanitarian engineering? Is it equivalent to humanitarian aid—short-term monetary or material relief supplied in the wake of a disaster—but with an engineering twist? That doesn't sound like the process Hobbs initiated and followed in Belize.

“Humanitarian engineering involves looking at technology for a more marginalized community,” says Hobbs. “So often, we're engineering solutions for communities that have

access to resources, such as capital to pay for expensive technologies. But the majority of the world cannot afford these technologies. So, we're engineering with the world in mind.”

What does engineering with the world in mind involve? According to Hobbs, as well as longtime civil engineering professors Nikiforos Stamatiadis and Lindell Ormsbee, whether at home or abroad, sound humanitarian engineering boils down to three critical factors: listening, partnering and inclusive engineering.

LISTENING

“Historically, if a community has a problem, an external group of experts will make an assessment, define the problem, and engineers will come up with possible solutions,” says Ormsbee, Raymond-Blythe Professor of Civil Engineering. “What typically happens is the stakeholders are excluded from this whole process. So, when I think of humanitarian engineering, I envision intentionally incorporating the stakeholders directly into the process.”

Ormsbee's environmental work with Kentucky communities has spanned the Commonwealth, from west (Paducah) to east (Martin County). A few years ago, he began working with citizens living near the Paducah Gaseous Diffusion Plant (PGDP).

A massive facility initially built to enrich uranium for nuclear weapons during the Cold War and later to produce nuclear fuel, the PGDP was constructed in the early 1950s and finally deactivated and turned over to the Department of Energy (DOE) in 2013. As one might suspect, extensive nuclear contamination has made the site a biohazard. The DOE hired Ormsbee and his team of graduate students to interface with residents and help them suggest ideas for moving forward.

The team began listening. It conducted the standard interviews and focus groups, allowing those living near the PGDP to recommend possible solutions. But the average citizen isn't a scientist or an engineer; what if their ideas don't make any sense? One can listen all he or she wants, but at some point, actual knowledge is indispensable. So what did Ormsbee do?

He hosted a game of Jeopardy!

“Six categories with five sets of questions, just like the game show,” says Ormsbee, nodding. “We would present a question





When Hobbs started seeing young girls from the community expressing interest in the anaerobic digester, she saw an opportunity to pay her empowerment forward and invited their girls to join them in the work. BioGals was formally founded in 2018. (Photo provided by Shakira Hobbs).

with multiple-choice answers, and people from the community anonymously answered via electronic keypads we supplied.”

After each question, Ormsbee revealed the answer and then supplemented it with a citation from an agency generally trusted by the community. The approach allowed the community to gain new insights about the facility as well as for the researchers to identify knowledge gaps and demographically related perspectives, which helped the team develop better communication strategies.

The entertaining yet informative format then gave way to Ormsbee presenting short vignettes based upon what the community had proposed. Thanks to their transparent, creative approach, the outside experts engaged community insiders so both groups could land on the same page.

“The biggest thing in humanitarian engineering is

communicating our research to the community effectively,” affirms Hobbs. “We need to be able to understand their needs and be willing to co-create solutions together. That’s the biggest thing we’re exploring in the introduction to humanitarian engineering class.”

“**The biggest thing in humanitarian engineering is communicating our research to the community effectively.**”

“Listening to the community is paramount for a number of reasons,” agrees Stamatiadis, Raymond Blythe Professor of Civil Engineering. “First, we want to develop something that will be useful to them. Second, we need to make sure everyone agrees that what we are providing them

is beneficial. We don’t want a solution that will only benefit a small portion of the community.”

As the faculty advisor for Engineers Without Borders—UKY (EWB-UKY), Stamatiadis has taken student teams to Cameroon, Ecuador, Honduras and other locales. In the summers of 2017 and 2018, EWB-UKY visited a village in Malawi, a southeast

African nation consistently ranked among the world’s 10 lowest-income countries. Stamatiadis says his two-trip structure allows the team to listen deeply, evaluate and plan during the first visit with no pressure to complete a job before they depart.

“We hold three meetings during the length of the stay: one at the beginning, one halfway and one at the end. In each one, the objective is to make sure we’re moving in sync with them. We think about it in terms of a public hearing so we can see how they react.”

“During our first trip, we set up a bunch of desks from the school building below a big tree they have outside,” remembers Aaron Cambron, a veteran of five EWB-UKY trips, including both to Malawi. “It was a surreal setting for a meeting.”

At the outset, the community in Malawi applied for new classroom buildings and new toilets for the school. But during the team’s first visit, Stamatiadis realized the toilet issue could be solved through better maintenance. The team developed a plan, which the community immediately implemented. That allowed them to concentrate on a glaring need at the community’s school: a kitchen facility.

The school accommodates over 2,000 children within a seven- or eight-mile radius yet did not have an adequate building for preparing meals. For some children, a meal provided by the school may be the only sustenance available to them that day. Through dialogue, Stamatiadis convinced community leaders to realign their priorities. The next summer, he and his team returned to construct the new building.

“The final implementation may change from what the community had in mind in the beginning,” says Stamatiadis. “That’s why the first trip is dedicated not only to figuring out the situation but also understanding the community’s real needs and encouraging them to change their perspective about what their biggest problem actually is.”

PARTNERING

“Once a solution is deemed to be workable, the next step is to implement it,” says Ormsbee. “How do we empower the stakeholders to be involved in the implementation of the solution so you’re not trying to superimpose a solution on them? They’ve got to be engaged in the process for it to work.”

Occasionally, a community working with Stamatiadis assumes he and his students have deep pockets and will pay local contractors to perform the desired work. They quickly discover that partnering with EWB-UKY means they’d better be willing to sweat.

“The model that we use relies on community ownership,” Stamatiadis explains. “We joke, ‘You’re going to work with us, and if we come back and you haven’t taken care of what we’ve built together, we’ll tear it down!’”

But involving those who will benefit from the work is only one form of partnership. In Belize, the Sittee River community empowered Hobbs and her colleagues—a team of Black women—to be successful. That marked a new experience for Hobbs.

“The number of Black women who are getting engineering degrees is declining. Too often, they’re not in a supportive environment,” says Hobbs. “This was the first time we felt like we could practice as engineers in an environment where we were given all the tools we needed. For example, the chair of the village owns a construction company, and he’s usually very particular about who can go in and get tools. But he told us we could have access to whatever we wanted.”

When Hobbs started seeing young girls from the community expressing interest in the anaerobic digester, she saw an opportunity to pay her empowerment forward and invited the girls to join them in their work. After a while, people began asking Hobbs what they called their group. Hobbs expressed

CREDIT: Jerzy Górecki





"The model that we use relies on community ownership," Stamatiadis explains. "We joke, 'You're going to work with us, and if we come back and you haven't taken care of what we've built together, we'll tear it down!'"

surprise. They had never considered naming themselves. After all, to do so would imply they had launched an ongoing initiative instead of a short-term project.

"We began thinking, 'Maybe we should continue to provide this as an opportunity for everyone to be able to work on sustainability projects.' So, we settled upon the name BioGals ['Gals' is a Belize Kriol word for "girls"] and formally founded it in 2018."

Sometimes true partnership results in seeing the work you performed for the good of the community go unused. On a recent trip to Belize, Hobbs discovered no one used the anaerobic biodigester.

"I thought, 'Well, I'm not going to bring up that no one's using it.' But later the chair of the village sat me down and said,

'Look, Shakira, we like this technology. It's going to work. But right now, our community is too small. We're getting food waste from the resort, but it's two miles away, and not everyone has a car. By the time we go down there and bring it back to the biodigester, it might balance out. But our population is continuing to grow, so I can see in a year having more businesses where we'll have enough food waste to be able to use it. Right now, let's focus on perfecting the design and making it unique for our village.' I appreciated the honest conversation, but more, I thought, 'Good, I'm not forcing something on them.'"

Ormsbee says matching the appropriate solution to the community's needs and capabilities isn't valid solely for developing countries. Small water utilities in eastern Kentucky may not be able to supply the necessary workforce to handle systems that rely upon experts.

"If you devise a solution that requires very sophisticated technology, you have to ask yourself whether you're going to have people who will be paid enough for their skills. Employees in the water and wastewater industry aren't paid enough, so young people don't want to go into this field. It's a huge problem made worse by the fact that water and wastewater are public health issues."

INCLUSIVE ENGINEERING

Finally, there's engineering, as in "How do you make an incubation oven when you don't have any of the normal materials that go into one?"

"You get creative," Stamatiadis says with a smile. "You take a Styrofoam box, you open a hole and put a light bulb in it to keep the temperature constant. Now you have an incubation oven. Students on our trips quickly discover they need to do things a little differently and start thinking more innovatively."

Stamatiadis, whose primary research area is transportation engineering, often finds himself tackling challenges much different than those involving highways and traffic signs.

"I worked in construction, so a lot of the things that involve building I can figure out," he says. "For projects that are not in my area, we rely on our faculty as a resource. For other areas like sanitation and water, I've had to hit the books. But often it's fundamental, like getting a hammer and a nail."

If hammers and nails symbolize Engineering 101, Hobbs' recently published paper "Black Women Engineers as Allies in Adoption of Environmental Technology: Evidence from a Community in Belize" in the journal *Environmental Engineering Science* points to an evolution in engineering: incorporating behavioral science and other traditionally non-engineering disciplines into humanitarian engineering.

As Hobbs gave talks about her first Belize trip in 2017, respondents asked, "How do you know that your American nationality didn't play a role in how they were accepting you?"

Her interest piqued, Hobbs, then a postdoc at the University of Virginia, returned to Belize with the intent of finding out. Using a tool called the Stereotype Content Model, Hobbs examined ways to measure warmth, competency, perceived empathy and the likelihood of the community adopting the technology.

"Although we aren't from that area, we share some similarities," Hobbs explains. "They are Creole, which is of British and African descent. Like African Americans, they were brought over through slave trade. Marginalized communities know what it's like to not be treated equally, not to have equitable things available to them. Because we share similarities, we were able to understand more, and they were more likely to tell us things. Yes, our nationality played a part, but there were many factors. When you look at us as

Black women working in environmental engineering, we have multiple identities. We're environmental engineers; we're Black; and we're women. And because we have these different identities, we're able to connect with people who share some of these identities as well. That's what we were able to show in that study."

Hobbs' overall message: Our world's biggest challenges, particularly those at the food-water-energy nexus, demand engineers break out of their disciplinary silos and embrace not only multidisciplinary engineering but also

an approach that engages the social sciences.

"I think we're starting to realize we're going to have to utilize more disciplines to address these complex problems. However, there is a prejudice that human aspects such as social justice, equity and equality must be separate from engineering, and that when concepts like parity are coupled with engineering, it's no longer considered 'hard' science. Inclusive environments promote competitive perspectives that are essential to addressing complex global issues such as potable drinking water, renewable energy and sustainable waste management strategies. That I was able to publish the results of the stereotype content model in an engineering journal is an important step forward." ■

“If you devise a solution that requires very sophisticated technology, you have to ask yourself whether you're going to have people who will be paid enough for their skills.”

PROFESSIONAL DEVELOPMENT: COMPUTER SCIENCE PROFESSOR JANE HAYES IS PART OF A NEW VISION THAT COMBINES GROWTH AND SERVICE.

Kel Hahn

Ah, professional conferences. Several days away from normal responsibilities to enjoy scenic locales replete with opportunities to sightsee, network, catch up on the latest trends, enjoy good food and...cram in a hackathon?

According to computer science professor Jane Hayes, lately, the best thing about her annual Requirements Engineering (RE) Conference is RE Cares, an event organized and run by her and colleagues determined to give back to the cities in which they conference.

"RE Cares developed in response to the question, 'Can one attend a software engineering conference and do something good for society?'" says Hayes. "The answer is an overwhelming 'Yes.'"

Hayes and her colleagues first put their idea to the test at the 2018 conference held in Banff, Alberta, Canada. Working with stakeholders from Mutual Aid Alberta, RE Cares set a goal to build a messaging system for response teams battling emergencies in Western Canada. Existing systems did not permit emergency responders from other locales or using other communication devices to patch into the latest status thread. Because of the specificity related to emergency situations, off-the-shelf software was inadequate.

Over the course of three days, committed participants finalized requirements, developed wireframe drafts, built a data model and sprinted through a hackathon to produce a prototype "Crier." After completing prototype development post-conference, they made the project open source, and two organizations, Civic Data Alliance and Ruby Brigade, agreed to continue developing it.

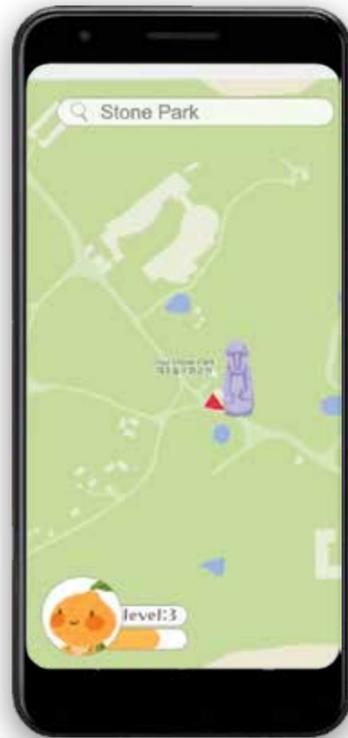
For RE Cares 2019, the cohort undertook a mobile application called Gochi-Gochi to help people navigate the complex world of public transportation in Jeju island, South Korea. The requirements: improve accessibility to information for tourists by recommending optimal bus routes, offering information on attractions, restaurants, etc., and providing information specifically for people with mobility challenges. They even added a gamification layer.

"Gochi-Gochi was our team name. In the Jeju language it means 'let's get together,'" says Hayes, "We gathered to contribute to our society, Jeju. We got help from local workers, high school students and a few college students. We believe that we can find a better solution by looking at the problem from various perspectives."

With two events under its belt, RE Cares now wants to take its idea further by pitching it to the International Conference on Software Engineering (SE). Representatives will present a paper on the potential for "SE Cares" during the Software Engineering in Society track of ISCE in Seoul, South Korea, this May.

"We express hope that a robust SE Cares movement that reaches out to multiple conferences, and thus multiple locales and stakeholders, in a course of a given year can become a worthy contributor to the fledgling 'Software for Social Good' movement that is gaining steam across the globe," the authors write.

"We're helping build software for public good," says Hayes. "Instead of coming to a city and simply taking in, we're also striving to give back."



CREDIT: Denise Bishevsky



◀ **JANE HAYES**
Professor
Department of Computer Science



CREDIT: European Space Agency



KENTUCKY
PRODUCE

95
PERCENT
of the world's
BOURBON



KENTUCKY
HOLDS

>1/3
OF ALL
distilling jobs
IN THE US



KENTUCKY
EXPORTED

+450
MILLION
DOLLARS
of whiskey in 2017

Responsible Consumption Commitment: UK and Jim Beam-parent Beam Suntory are dedicated to the responsible consumption of alcohol, and together will develop and expand successful alcohol awareness programs, including programming already funded by Beam Suntory.

LONG-AGED

Two historic brands—the University of Kentucky and Jim Beam® Bourbon—are partnering to advance the bourbon industry.

Kel Hahn

Horses and bourbon.

Ask almost anybody what Kentucky's known for and, they will answer "horses and bourbon."

Not bad as far as state traditions go.

While the University of Kentucky devotes ample research to the equine industry, we want to pause a moment and discuss bourbon's rightful place as a research field right here at UK.

Let's begin with five stunning statistics from the Kentucky Distillers Association (2018):

- Kentucky is the birthplace of bourbon, crafting 95 percent of the world's supply.
- Kentucky holds more than a third of all distilling jobs in the U.S., boasting an average salary of \$95,000—up 23% since 2009.
- Distilling ranks higher than all but one of the 532 Kentucky industries in the state's share of national employment and manufacturing output.
- Bourbon is revolutionizing Kentucky tourism and pouring much-needed revenue into local communities. Kentucky Bourbon Trail® visitors spend between \$400 and \$1,200 on average during their trips. More than 70% of visitors are from outside Kentucky.
- Kentucky exported over \$450 million of whiskey in 2017—an export value that has tripled in the past 20 years. European countries make up nearly half of Kentucky's whiskey exports.

That's why it was a surprise—and yet not a surprise—when UK and Jim Beam® Bourbon created the James B. Beam Institute for Kentucky Spirits in early 2019. Thanks to a \$5 million donation from Beam Suntory, the parent company of the James B. Beam Distilling Co., the institute will play a key role in educating future distillers at the undergraduate, graduate and professional levels.

"At the University of Kentucky, we are asking ourselves what's possible—for our institution and for those we serve," said UK President Eli Capilouto. "And, increasingly, we find that achieving what's possible is done in partnership with those who share our vision, values and commitment to Kentucky's future. We look forward to our continued partnership with Jim Beam, as we envision, together, ways to prepare our workforce and support economic development in the Commonwealth."

The institute will reside in a new building behind UK's historic Cooper House. Research efforts within the institute, however, will occur across the UK campus.

One would be hard-pressed to find an academic area within the university that is not involved with the institute. Courses in chemistry, business, law, horticulture, forestry, food science and entomology demonstrate the diversity of knowledge and skill required for a thriving bourbon industry.

And, of course, engineering.

"The distillery environment is a playground for engineering," says Brad Berron, William Bryan Professor of Chemical Engineering at UK. "The Spirits Institute works with Jim Beam on proprietary projects but also promotes mutual areas of interest throughout the industry. So, distilling companies approach us with a need, and my job is to explore the UK community and find the right researcher to address those needs."

For example, spent grains—a byproduct of the distilling process—remains an expensive problem.

"Kentucky distillers waste billions of dollars due to spent grains," says Berron.

Once the grains have played their part, they still store an adequate amount of protein. Traditionally, distilleries sell those grains to farms, where they nourish cattle; however, wet grains maintain their viability for only a short time. Farms beyond 50 miles may discover mold or other problems in their delivery. The result is too much supply and too little demand.

"All of the big distillers are concentrated in Kentucky. They're producing massive amounts of bourbon, which means massive amounts of spent grain. With all of the distillers that we have in Kentucky, we can't possibly find enough cattle to feed," explains Berron.

To ship these grains farther, even internationally, distillers need to dry them. According to Berron, grains go into a large tumble dryer that extracts the liquid—"like your dryer at home." However, home dryers require only a modest amount of energy to operate. Industrial dryers need enormous amounts of energy to desiccate the tons of spent grains produced by thriving distilleries. Berron says UK researchers are on the case.

"In the end, the money distillers get from selling the grains usually doesn't cover the money that goes into drying them. Spent grains aren't just an economic problem but also an environmental problem in terms of burning extra fuel. So, any improvements we can make will result in a huge impact on their bottom line and better the environment."

Distillers face complicated challenges beyond what to do with spent grains. As a result, UK researchers are tackling issues such as water quality, better barrel toasting, warehouse ventilation design, distillery design and metal corrosion.

It's only the beginning.

"Everybody's excited about modernizing the industry. It's an exciting time in bourbon, and people in bourbon are embracing new technologies," Berron says. "It's exciting for our students and researchers to be part of that change and

shape the future of bourbon."

MINING ENGINEERING and WAREHOUSE VENTILATION

A properly operating ventilation system is essential to the health and safety of underground mine operators. Ventilation systems control the fresh air supply, temperature and humidity while controlling harmful gases and dust. Mining engineers develop sophisticated physical controls and software to analyze and optimize airflow within a mine.

Bourbon warehouses contain thousands of barrels of flammable alcohol, which need the right exposure to fresh air for optimal aging. Dependable and autonomous ventilation systems will provide the right amount of fresh air while protecting the barrels from unwanted exposures. Steven Schafrik, associate professor in UK's Department of Mining Engineering, is employing his expertise in mine systems, remote monitoring and high-performance computing in the service of better warehouse ventilation.

SPACECRAFT ATMOSPHERIC ENTRY and PRECISION BARREL TOASTING

Most people know that bourbon ages in barrels, but only connoisseurs understand the role the barrel plays in the color and flavor of the bourbon. Over 50-70% of the flavor and 100% of the color come from the barrel itself.

To be bourbon, as opposed to most other whiskies, distillers must put their distilled spirit in a new container that is made of oak and charred on the inside. The molecules produced by the heat provide trademark bourbon flavors such as vanilla, caramel, cinnamon, pear and smoke.

But lighting wood on fire does not always produce precise results. Alexandre Martin, associate professor in UK's Department of Mechanical Engineering, likes precision. Because his primary research—funded by NASA and NASA Kentucky— involves numerical modeling of material able to withstand entry into the planetary atmospheres—about 20,000 degrees Kelvin—Martin knows the lives of astronauts depend upon exactness.

That makes Martin an ideal research partner for local cooperages in Kentucky. By tweaking his numerical heat transfer models, Martin hopes to innovate in barrel toasting methods able to provide specific blends of desired flavors.

WATERSHED SUSTAINABILITY and WATER QUALITY

Over the past few years, Raymond Blythe Professor of Civil Engineering and Kentucky Water Resources Research Institute director Lindell Ormsbee has been working with Beam Suntory and UK student interns to develop watershed sustainability plans associated with their Jim Beam and Makers Mark distilleries in central Kentucky. Water is an integral part of spirit distillation. To sustain and grow the industry, it's important that existing water sources be preserved and protected.

Student interns have worked with Beam Suntory employees to better understand the distillation process as well as the watersheds in which the distilleries are located. Students have sampled local streams to assess the ambient water quality conditions and identified local stakeholders and other industries that exist within those watersheds. At the end of each summer, students complete a final assessment report and make presentations and recommendations to Beam Suntory employees at each facility. They also had an opportunity to interface with Beam Suntory scientists and leadership in Japan as part of Beam Suntory's International Water Sustainability Initiative. ■



A HISTORY OF MASTER DISTILLERS

Kel Hahn

The master distiller at a bourbon company is ultimately responsible for the quality of the product consumers buy. From material sourcing to distilling operations to product testing and quality control, master distillers intimately involve themselves at all levels of the operation. Becoming a master distiller is often the pinnacle of one's career.

Has the University of Kentucky College of Engineering ever produced a master distiller? Absolutely!



HARLEN WHEATLEY (BSCHE 1994) MASTER DISTILLER, BUFFALO TRACE DISTILLERY

A chemical engineering graduate from UK, Harlen Wheatley joined Buffalo Trace Distillery as a supervisor in 1995. He became distillery manager in 2000, and in 2005 Wheatley became Buffalo Trace's sixth master distiller since the Civil War.

Having worked in every aspect of production, from raw materials to barrel aging, as master distiller, Wheatley has driven many initiatives, including solidifying standards and consistency, quality focus and efficiency gains. He is active in overseeing a number of distilling and aging operations in various locations, all while promoting and educating the public on some of the world's finest bourbon whiskeys.

Wheatley is a four-time James Beard Award nominee in the Outstanding Wine and Spirits Professional category.

ALEX CASTLE (BSCHE 2010)
MASTER DISTILLER,
OLD DOMINICK DISTILLERY

Alex Castle was the first female head distiller in Tennessee, overseeing all facets of production at Old Dominick Distillery in Memphis. She was promoted to the role of master distiller in January 2019.

Castle joined Old Dominick after fifth-generation owners Chris and Alex Canale decided to revitalize their pre-Prohibition family whiskey brand and open a distillery in downtown Memphis. In the first year Alex joined the team, she designed the distillery floor, oversaw the installation of all of the production equipment, and in 2016, distilled Memphis' first batch of legal Tennessee whiskey for the first time since Prohibition. Castle's first bourbon, released in 2018, is called Huling Station Small Batch High-Rye Bourbon. The name pays homage to the original warehouse where founder Domenico Canale sold his whiskey from the 1860s until Prohibition. Domenico, the Canales' great-great grandfather, owned and operated a wholesale grocery business, and Huling Station served as the perfect location to operate his booming spirits business as well.

Prior to joining Old Dominick, Castle served as a distiller at Wild Turkey in Lawrenceburg, Kentucky.



CREDIT: Old Dominick Distillery



ELMER T. LEE (BSEE 1949)
MASTER DISTILLER,
BUFFALO TRACE (1969-1985)

Aside from close friends and family, few people know that the man responsible for revitalizing the bourbon industry actually graduated with an electrical engineering degree from the University of Kentucky. Born on a tobacco farm in Franklin County, **Elmer T. Lee** graduated from Frankfort High School in 1936 and began working for the Jarman Shoe Company. In 1942, he joined the Air Force and went on to fly missions as a radar bombardier on a B-29 Superfortress. In 1946, he was honorably discharged and returned home to study electrical engineering at the University of Kentucky. He graduated with honors in 1949 and proceeded to take a position with George T. Stagg Distillery in Frankfort (renamed Buffalo Trace in 1999). Over the next 36 years, Lee would

forge a career that would equate his name with premium bourbons.

Initially a maintenance engineer, Lee was promoted to plant superintendent in 1966. In 1969, he held the dual titles of plant manager and master distiller, becoming the distillery's first master distiller. He held both titles until his retirement in 1985.

While Lee oversaw the growth and modernization of the distillery, bourbon declined in popularity. Then, in 1984, Lee created Blanton's Single-Barrel Bourbon. Named after distillery president Col. Albert Blanton, who hired Lee, Blanton's became the first single-barrel bourbon to be sold commercially. One of the highest-rated bourbons available, Blanton's marked the beginning of a renewed interest in bourbon and sparked the industry's comeback.

Lee officially retired one year after introducing Blanton's, but his passion for bourbon kept him close to the distillery. He served as an ambassador and held the title of master distiller emeritus for Buffalo Trace, educating visitors on the heritage and unique qualities of Kentucky's bourbon whiskey. The award-winning Elmer T. Lee Kentucky Straight Bourbon Whiskey, bottled from barrels Lee continued selecting himself into his 90s, is a testimony to the stamp he impressed upon one of Kentucky's iconic industries.

Lee was fortunate to enjoy numerous accolades during his lifetime. He was inducted into the Kentucky Bourbon Hall of Fame in 2001. He received the "Lifetime Achievement Award" from both Whisky Advocate in 2002 and Whisky Magazine in 2012, and Whisky Magazine inducted Lee into its Hall of Fame. He passed away in 2013 at the age of 93. The UK College of Engineering posthumously inducted Lee into its Hall of Distinction in 2017. ■



MAN OF VISION

Carl and Betty McHargue's \$2 million estate gift will endow a new scholarship fund for engineering students in eastern and southeastern Kentucky. His gift is the pinnacle of an extraordinary life.

Kel Hahn

At age 94, Carl McHargue has seen and experienced enough to fill several volumes of memoirs: fighting in World War II, the Cuban Missile Crisis, the golden age of a renowned national laboratory, research on every continent except for Antarctica and a marriage of nearly 59 years. Trace the themes and turning points of his life, and the composite picture reveals a man of vision.

Ironically, he owes most of his success to his poor eyesight. It all began in 1944 when he and four Corbin, Kentucky, classmates were preparing to leave to serve in World War II. At the time, all soldiers who wore prescription eyeglasses had to have a gas mask with prescription lenses.

"As I was getting on the truck, they discovered my gas mask didn't have lenses with my prescription after all," McHargue says. "So, they yanked me off the shipment, and the four guys from Corbin went to Europe. It turned out to be fortunate for me. The enemy killed one, took two prisoners and wounded one so severely that he spent over a year in the hospital. Not having prescription lenses may have saved my life."

It also began a legacy of service—one that will continue in perpetuity. McHargue, a three-time graduate of the University of Kentucky, and his late wife, Betty Ford McHargue (1930-2019), are leaving \$2 million to UK to support engineering students. The Carl and Betty McHargue Scholarship Fund provides scholarships for students from eastern and southeastern Kentucky and gives preference to materials engineering majors. This generous estate gift builds on over \$20,000 the McHargues have already given to support engineering education.

"UK really emphasizes teaching, not just research, and that's always been important to me," says McHargue. "I hope that these scholarships will help fill the gap for students in need."

Now a resident of Knoxville, Tennessee, McHargue was a trailblazer at UK. After serving for two years in World War II—where he received a citation for the Silver Star, the third-highest personal decoration for valor in combat—he enrolled at UK using the GI Bill.

Sharing a basement in a house with other former GIs, he began studying engineering with an emphasis on chemistry. During his first semester, a classmate introduced him to a metallurgy course led by Professor Charles Crouse.

McHargue completed his bachelor's degree in metallurgical engineering in 1949 and commenced a master's program in the same field shortly after. As he came closer to graduating, Dean Daniel Terrell and Crouse devised a plan to establish a Ph.D. in engineering. They asked McHargue to become the first engineering doctoral student at UK. He agreed.

However, UK's University Senate debated for a year whether to approve the program. In the meantime, McHargue continued taking graduate courses and working on a dissertation for a degree that hadn't yet received approval.

"That kept me up a few nights," he remembers.

Eventually, the University Senate awarded McHargue a Doctor of Engineering degree, making him the university's first doctoral engineering graduate and giving him two options for professional work: Los Alamos National Laboratory in Los Alamos, New Mexico, or Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee.

"The University of Kentucky had one of the first Air Force contracts to study the fabrication of titanium for aircraft, and the work at ORNL was an extension of my doctoral thesis on uranium," McHargue says. "So, I figured I could go in and start

A close-up portrait of Carl McHargue, an elderly man with white hair and glasses, wearing a blue patterned shirt. He is smiling slightly and looking towards the camera. The background is a blurred workshop or office with shelves and equipment.

“UK really emphasizes teaching, not just research, and that’s always been important to me.”

doing something with which I was familiar.”

McHargue joined the staff of ORNL in 1953, where he held various research and management positions until his retirement in 1990.

A man of vision, he pioneered new advances at ORNL. As manager of materials sciences, he developed one of the most extensive programs in basic materials research in the United States and made significant contributions to the understanding of irradiation effects in solids. His work on textures at ORNL formed the basis of modern practice, and he performed revolutionary work in phase transformations of rare earth metals, plastic deformation of metals and ceramics, diffusion and radiation damage.

McHargue also initiated the materials development program in support of the Fusion Energy Program, as well as initiatives to support other advanced energy systems. For his work, he was inducted as a Fellow of The Metallurgical Society in 1978, which is the society’s highest honor and is limited to 100 living members, with no more than five awarded per year. The UK College of Engineering inducted him into the Hall of Distinction in 1995. His work in international engineering education led to honorary membership in the Order of Engineers (Portugal) and Fellow of ABET, Inc.

“Collaboration is the key,” McHargue says. “If you convince someone with a technique or a piece of equipment that you have a good idea, next thing you know they’ll be willing to collaborate. You provide the samples and tell them what you want, they do the work, and then together you make the interpretation. One day, I looked at my publication list, and it showed 80 collaborators from all over the world. I have papers on all sorts of techniques, and I don’t even know how to turn on the machines! But I had the idea. One of the lab’s associate directors once told me, ‘You’re not a researcher; you’re a research broker.’”

Although McHargue accomplished much at ORNL, his greatest discovery was Betty Ford, who became Betty McHargue in 1960. Betty worked at ORNL for 31 years in various administrative capacities, even serving as assistant to the lab director, which gave her several dealings with former President John F. Kennedy, who worked with ORNL to prepare a defense in the event of a nuclear war.

When the Cuban Missile Crisis intensified, President Kennedy persuaded Eugene Wigner, 1963 winner of the Nobel Prize for Physics, to lead the study. The lab assigned Betty as his secretary. At their first meeting, Betty learned that Wigner’s apartment had no telephone.

“She called the telephone company and said, ‘Do you want us to tell President Kennedy he couldn’t get in touch with Dr. Wigner because you couldn’t get around to putting a telephone in?’”

“Once, she coordinated a teleconference with President Kennedy and seven Nobel Prize winners she was shepherding around the lab,” McHargue says. “They had everything set up, and President Kennedy was on his way, but Edward Teller had gone to the restroom. So, Betty went down the hall and began beating on the restroom door, ‘Dr. Teller, Dr. Teller! President Kennedy is waiting for you!’”

Shortly after McHargue arrived at ORNL, the University of Tennessee at Knoxville President Andy Holt and ORNL director Allen Weinberg began strategizing how to strengthen the science and engineering programs at UT. Their solution: Give scientists at Oak Ridge joint faculty appointments and let them split their time between the lab and UT.

McHargue, who had recently taught a graduate course in metallurgy and an undergraduate course in thermodynamics at UT, served on the committee that oversaw the implementation of the program. Though he retired from ORNL in 1990, he kept the teaching appointment until 2016—around the time he turned 90. From 1991 until 2012 he also served as director of the Center for Materials Processing at UT.

“I enjoyed teaching the introductory materials science course most departments require their students to take,” McHargue says. “I had students from aerospace, nuclear, mechanical, etc. It was a great way to recruit materials engineering students. A lot of students don’t know what they want to be and don’t know what materials science and engineering is.”

One of McHargue’s favorite assignments involved students writing about something that works because the material fails.

“They would just look at me like I didn’t know anything,” he says, grinning. “But think about it. Breakaway bolts that hold



up streetlights on the interstate are designed to fall when hit because it creates less impact on the passengers. Sprinklers work because the fuse melts. There are even industry standards for jawbreakers—I learned that from one of my students!”

After spending decades instructing UT students in the classroom, McHargue understands the need for student scholarships. He saw how some students struggled to pay their tuition and hopes the Carl and Betty McHargue Scholarship Fund will provide more UK engineering students the support they need to be successful.

It also advances Kentucky Can: The 21st Century Campaign. The comprehensive campaign is focused on increasing opportunities for student success, funding innovative research, improving health care, strengthening UK’s alumni network and supporting our athletic programs.

McHargue’s estate gift will help UK reach its \$2.1 billion goal and achieve other key campaign objectives—making college more affordable, growing the scholarship endowment by \$300 million and increasing the graduation and retention rates.

Sadly, Betty McHargue passed away last June, a few months shy of their 59th wedding anniversary. Along with a spunky Chihuahua named Peanut, McHargue lives in the couple’s longtime single-story house, where the tiny canine is particularly fond of burying bones between couch cushions. McHargue may be retired, but that doesn’t mean researchers in his field have forgotten him. He has consulted with the U.S. Army Missile Defense Command and Apple Inc.

“Last year I got a call from somebody at Livermore National Laboratory who was studying plutonium,” McHargue relates. “He started asking me questions about work my group had done using cerium. What did the data show us? I said, ‘Look, man, we were working on that in 1960, and I haven’t looked at it since...but I’ll see if I can find my papers and get back to you!’” ■

PROGRAM SPOTLIGHT: PAMPLONA RENEWABLE ENERGY PROGRAM

Kel Hahn



Every July, thousands of daredevils congregate in Pamplona, Spain, for the highlight of the San Fermin festival: the running of the bulls. For the past 10 years, however, University of Kentucky engineering students have visited Pamplona with a much safer objective in mind: deepening their knowledge of renewable energy sources.

In 2010, former UK College of Engineering dean Thomas Lester and chemical engineering professor Eric Grulke collaborated with an engineering guild in the Navarre region called Ingenio International to develop a four-week course on renewable energy sources. Open to all engineering majors, the Pamplona Renewable Energy Program offers an international study experience that intertwines exposure to the latest knowledge in renewable energy research and technology with immersion in the local culture.

Because of its location near the Atlantic Ocean and the Pyrenees Mountains, Pamplona boasts a thriving wind energy industry. Approximately 4,000 people work in the wind energy sector. However, public, private and government support has led to other booming renewable energy endeavors. As a result, students in Pamplona visit wind turbine facilities, hydro-energy plants, photovoltaic fields and more. When not making site visits, students take classes taught by industry professionals from the area, many of whom hold faculty appointments at the nearby Public University of Navarra (UPNA).

Ingenio International also operates a language school, and roughly half of the UK students registered for the renewable energy course head overseas two weeks early to take the Spanish immersion class. Because most students stay with families during the four-to-six weeks they live in Pamplona, advisor and program coordinator Bruce Cole says students receive an incredible academic and cultural experience.

“We not only tour renewable energy sites but also castles, museums and other unique tourist attractions. Combine that with half of our students taking the Spanish immersion program, families opening their homes and the content of the course itself, it’s quite a package for the students.”

From its inception, Grulke accompanied the students on nearly every trip until his death in late 2019. Thirty-eight students participated in 2017. The program’s success is spawning new opportunities.

“In the summer of 2018, we had a student who went to Pamplona several weeks prior to the start of the Renewable Energy course and did undergraduate research at UPNA,” Cole says. “I envision more students taking advantage of our connections to Pamplona to further their knowledge of renewable energy sources through an amazing international study experience.” ■



SPAIN RANKS

NO. 2

in total onshore and offshore wind turbine installations among
EUROPEAN COUNTRIES

RENEWABLES ACCOUNT FOR

80

PERCENT OF ENERGY DEMAND

85

PERCENT OF SPAIN'S WASTEWATER IS RECYCLED



STUDENT SPOTLIGHT: K'LYNN KING AND SAVANNAH LEWIS WIN MISS BLACK & GOLD AWARDS

Leslie Bueno

At the 2019 Miss Black & Gold Scholarship pageant, held December 5, at Memorial Hall, chemical engineering junior K'Lynn King was named Miss Black & Gold and electrical engineering junior Savannah Lewis was Miss Gold (first runner-up). K'Lynn is the vice president of the UK chapter of the National Society of Black Engineers (NSBE), and Savannah is telecommunications chair of NSBE, as well as a UK101 peer instructor.

K'Lynn's and Savannah's platforms described how they would advocate STEM education by creating and hosting events intended to increase awareness and participation in the STEM fields among underrepresented minorities. Now crowned Miss Black & Gold, K'Lynn will be involved in leadership roles on campus and in the community. Learn more about K'Lynn and Savannah below.

K'LYNN KING: MISS BLACK & GOLD

Staying in Milwaukee, Wisconsin, was not in the cards for K'Lynn King. She knew she had to leave her town to achieve her goal of becoming a chemical engineer. As a first-generation college student, K'Lynn came to the University of Kentucky with the drive to graduate as an engineer and make her family proud. K'Lynn recalls her transition from Milwaukee to Lexington being difficult since she did not know anyone and felt like she didn't fit in.

Luckily, she was able to find an organization that made Lexington feel like home. Through the National Society of Black Engineers (NSBE), K'Lynn found peers who encourage her and give her a better understanding of what an engineer can look like. Now, she holds the position of vice president for NSBE.

K'Lynn hopes to have her own engineering firm eventually, but first she will secure her professional engineering license along with an MBA.

For K'Lynn, being named Miss Black & Gold means more than just a scholarship; she wants to prove that women in engineering are capable of doing so much more than people may assume.

She believes her platform as Miss Black & Gold is a good way to support children and young adults who are interested in STEM field.

"There are a lot of adversities that are faced while being a minority in the STEM field, and I feel that with an effective support system anyone could make it through," K'Lynn says.

SAVANNAH LEWIS: MISS GOLD

Savannah Lewis, from small-town Thomson, Georgia, did not imagine she would end up at the University of Kentucky. It was not until the last couple of months of her senior year in high school that she decided she would join the Wildcat family.

Despite having to leave her own family and move several hours away from home, she knew college was her path to a brighter and successful future. From a young age, Savannah has always been amazed by how electricity and electronics work. She remembers seeing computers and wanting to take them apart just to inspect the inside. Even just trying to figure out why light switches only moved up and down and no "dim" in between caught her attention. Little did she know

this was the start of her path to becoming an electrical engineer.

Since arriving at UK, Savannah has always involved herself on campus. She is the telecommunications chair for the National Society of Black Engineers (NSBE), the co-founder for UK Energy Club, a UK101 peer instructor, a UK Service Corps volunteer and a teacher's assistant. She also interned with Lockheed Martin Space Systems and participated in the University of Missouri undergraduate research program.

Savannah's lifelong goal is to become an astronaut, which she plans to pursue by completing her undergraduate degree and earning her master's degree in astrophysics.

For Savannah, being named Miss Gold is a way to demonstrate that women do not have to fall into the normative beauty standards to be able to flourish and show their full potential.

"I used this chance to bring awareness to the lack of minority women in STEM fields. It also gave me a chance to show people that engineers are not all the same and that we are capable of much more than meets the eye," says Savannah. ■



STAFF SPOTLIGHT:

YOU'RE

LIVE!

WITH JOHN ROBERTS

Kel Hahn

Monday, November 25, 2019, 9 p.m. Inside a cavernous ballroom at the Bill Gatton Student Center.

"We're LIVE!"

As Eric Sanders' announcement punctures an anticipatory silence, Engineering LIVE! officially commences on YouTube Live.

Over the next 45 minutes, host John Roberts will interview three panels of students regarding their experiences with campus life, student involvement, and co-ops and internships. He will also chat with the UK Solar Car Team, which brought its ride, Gato Del Sol VI, in-studio. Away from the set, a laptop army prepares to interact with commenters lobbing questions at John and the panelists in real time.

It's all live. There is no safety net.

By the end of the broadcast, Engineering LIVE! will have received 961 total views with a peak of 167 concurrent viewers.

"Right now, one in five videos on Facebook is a Facebook Live broadcast. So, it's commonplace for universities and colleges to connect with their audience through that medium," says Roberts. "Universities and colleges have to meet students where they're at. A lot of times, students can't get to campus more than once during the college decision-making process, so this is another way for us to showcase the campus and the college. Polished videos that highlight our campus, our programs or our services have their place, but they can only go so far. In a live broadcast, prospective students can interact with current students on the spot."

When Roberts was coordinator for student recruitment and communications at Western Kentucky University—Glasgow Campus, he operated as the proverbial one-man band. Because he had access to the campus' social media accounts, Roberts began producing monthly live broadcasts featuring professors, alumni, administrators, community partners and students.

"I had no budget, so it was me, a webcam, and guests sitting around a table," Roberts says. "One time, though, I was able

to broadcast out of the PBS studio at WKU's main campus. There, I had a traditional set with three cameras instead of a single webcam. I had a team working around me that included a graphic designer who produced images we could put onscreen. It worked out really well, and we had a lot of views and engagement."

After accepting a recruiter position at the University of Kentucky College of Engineering in May 2018, Roberts

began envisioning what a similar studio-based live broadcast might look like for the college. When he pitched the idea to the college's marketing and communications team, media manager Eric Sanders caught John's vision and ran with it. Partnering initially with locally based Courage Media and more recently with the Gatton Student Center production team, Roberts and Sanders have now produced three broadcasts, adjusting the format and adding new programming features each time.

"John is clearly passionate about students," says Sanders. "It's been fun to collaborate with him on the show's design and aesthetic."

Now Roberts and Sanders face the challenge of keeping Engineering LIVE! fresh. Roberts suggests one way to keep viewers engaged involves wordplay on the show's name.

"We've asked ourselves, 'why not do some live engineering?'"

So we're looking at incorporating student design teams and cool demonstrations into the program. That will enable us to show engineering as it happens without taking the focus off our current students. This is an important step to make because it will allow us to show what our students and faculty are doing at the College of Engineering while preserving the question-and-answer format." ■



THE GREHAN BUILDING IS OPEN!

Engineering students returning to campus for the spring semester discovered a new College of Engineering building open and ready for classes.

The Grehan Building, which underwent a complete modernization beginning in 2018, adds 45,000 square feet to the college and features a three-story staircase that connects to McVey Hall and other contiguous buildings within the Engineering quadrangle.

And in case you've wondered, the correct way to say the building's name is: Gray-han ("han" as in "hand").



Congratulations to **Betty Hickey** *for 29 Years*

Betty Hickey, a fixture in the University of Kentucky College of Engineering, recently retired after nearly 30 years at UK.

Hickey came to UK in December 1990 as the administrative assistant for the UK Fellows program. On June 1, 1998, she joined the College of Engineering Office of Advancement, where she held numerous positions, usually with an emphasis on donor stewardship. During her retirement, Hickey plans to spend more time with her grandchildren who live in Berea, Kentucky, and Nashville, Tennessee.

“I am so grateful for the opportunities I’ve had working for the university and the College of Engineering,” said Hickey. “Over the past 21 years, I’ve had the pleasure of experiencing and learning about the many amazing accomplishments of our very talented engineering alumni, students, faculty and staff. I am so especially appreciative that Sharron Townsend and Dean Tom Lester trusted me enough to allow me to learn and grow as part of their team. I will cherish my many fond memories of my time with the College of Engineering.”



THREE ENGINEERING WILDCATS INDUCTED INTO FRANK G. HAM SOCIETY OF CHARACTER

Three student-athletes in the UK College of Engineering were inducted into the Frank G. Ham Society of Character on January 29.

The Society of Character annually honors Wildcats who have shown an extraordinary commitment to academic excellence, athletic participation, personal development, career preparation and serving as a role model. The SOC was founded during the 1998-99 school year and is named for Ham, a longtime UK administrator.

The induction ceremony took place at a dinner prior to a UK men's basketball game against Vanderbilt University, and inductees were recognized during halftime. Twenty-nine student-athletes were recognized.

Inductees from the College of Engineering include:

LUKE FORTNER, FOOTBALL

- A mechanical engineering major who, along with Toyota Motor Manufacturing Kentucky and other engineering students, helped design a specially built pushcart vehicle to provide a Kentucky Children's Hospital patient the chance to accompany the Wildcats on the Cat Walk and attend a game at Kroger Field in a project called "Lift Them Up"
- Leads the UK football team in community service hours
- Heavily involved in UK football's weekly visits to the Kentucky Children's Hospital
- Has appeared in 31 career games, starting every game of the 2019 season
- His blocking helped UK set team records for rushing yardage, rushing touchdowns and rushing average during the 2019 season
- Three-time UK Dean's List honoree
- Three-time SEC Academic Honor Roll honoree

LEON JONES, MEN'S SOCCER

- Two-time All-Conference USA
- Anchored defense that led nation in shutouts in 2018
- C-USA All-Academic Team
- Dean's List
- Chemical engineering major

BAILEY ROUSE, MEN'S SOCCER

- Started all 21 matches in 2019
- Recorded one goal and one assist while primarily playing defense in 2019
- Team captain
- C-USA All-Academic Team
- Dean's List
- Civil engineering major



LUKE FORTNER

Mechanical Engineering
Football

LEON JONES

Chemical Engineering
Men's Soccer

BAILEY ROUSE

Civil Engineering
Men's Soccer

NEWS & RECOGNITION

GRANT AWARDS

Rodney Andrews, director of Kentucky NSF EPSCoR, UK professor of chemical engineering: Principal investigator for five-year, \$24 million multi-institution project called Kentucky Advanced Partnership for Enhanced Robotics and Structures (or KAMPERS). Interdisciplinary collaborators intend to support the fundamental science needed to advance next generation manufacturing technologies, flexible electronics and robotics.



Kunlei Liu, associate director for research at the University of Kentucky Center for Applied Energy Research (CAER) and associate professor in the Department of Mechanical Engineering: \$2.7 million Department of Energy (DOE) grant to advance the Center for Applied Energy Research's renowned carbon dioxide capture system.

James Griffioen, professor in the Department of Computer Science, director of the UK Center for Computational Sciences: \$1.4 million NSF grant to aid in the development of Kentucky's research computing cyberinfrastructure.

Jesse Hoagg, Donald and Gertrude Lester Professor of Mechanical Engineering: \$1,199,150 NSF grant for "Data-Driven Adaptive Real-Time (DART) Flow-Field Estimation Using Deployable UAVs."

Dan M. Ionel, SPARK and PEIK director, electrical and computer engineering

professor and L. Stanley Pigman Chair in Power: \$750,000 award from the Department of Energy to research a new generation of motors and drives for electric and hybrid vehicles.

Mike Johnson, professor and chair of the Department of Electrical and Computer Engineering: \$600,000 Graduate Assistance in Areas of National Need (GAANN) grant from the U.S. Department of Education.

Tingting Yu, assistant professor in the Department of Computer Science: \$500,000 NSF grant for "Test-Centric Architecture Modeling."

Simone Silvestri, assistant professor in the Department of Computer Science: \$500,000 NSF grant for "Crosslayer Optimization of Energy and Cost through Unified Modeling of User Behavior and Storage in Multiple Buildings."

Stephen Ware, assistant professor in the Department of Computer Science: \$493,000 NSF grant for "Strong-Story Narrative Planning for Authoring Proactive Intelligent Virtual Environments."

Sen-Ching "Samson" Cheung, Blazie Professor of Electrical and Computer Engineering (co-investigator): \$3.5 million NIH grant for five years to develop novel video-based approaches for detection of autism risk in the first year of life. The project is led by Professor Sally Ozonoff from the department of Psychiatry & Behavioral Sciences in the UC Davis School of Medicine.

Jian Shi, assistant professor in the Department of Biosystems and Agricultural Engineering: \$201,140 National Science Foundation EPSCoR Research Fellow (RII Track 4) award for "Elucidating Enzyme-Ionic Liquid Interactions to Enable Effective Lignin Valorization."

Hana Khamfroush, assistant professor in the Department of Computer Science: \$174,957 National Science Foundation grant for "CRII: CSR: Federated

Resource Management in Mobile Edge Computing."

YuMing Zhang, James R. Boyd Professor and director of international partnerships for the University of Kentucky College of Engineering: \$147,750 award from Advanced Technology International for the project "Miniature Torch Speed Sensor Based Adaptive Manual Arc Welding."

Brad Berron, William J. Bryan Associate Professor of Chemical Engineering: \$106,662 NSF grant for "Evaluating cellular integrity as a function of bioprinter nozzle geometry."

PROFESSIONAL RECOGNITION AND PROMOTIONS



Samson Cheung, Blazie Professor of Electrical and Computer Engineering: Elevated to the status of IEEE Fellow, for "contributions to multimedia data processing with application to autism interventions."

Eric Grulke, professor of chemical engineering: Meritorious Service Award from the American National Standards Institute.

Jiangbiao He, assistant professor in the Department of Electrical and Computer Engineering: 2019 AWS Outstanding Young Member Achievement Award by the IEEE Industry Applications Society.

Barbara Knutson, professor of chemical engineering: Named inaugural Kevin and Susan Hobbs Professor of Chemical Engineering.

Kunlei Liu, associate director for research at the University of Kentucky Center for

Applied Energy Research (CAER) and associate professor in the Department of Mechanical Engineering: National Academy of Inventors Fellow.

Y. Charles Lu, H.E. Katterjohn Professor in Engineering at the UK College of Engineering Extended Campus at Paducah: American Society of Mechanical Engineers Fellow.

Alexandre Martin, associate professor in the Department of Mechanical Engineering: Named new director of the Kentucky Space Grant Consortium and NASA EPSCoR Programs. Martin succeeds Suzanne Smith in this role.

Sue Nokes, professor in the UK Department of Biosystems and Agricultural Engineering and associate dean for faculty affairs and facilities: 2019 Outstanding Alumnus for the Department of Biological and Agricultural Engineering at North Carolina State University.

Christina Payne, adjunct associate professor in the Department of Chemical and Materials Engineering: Presidential Early Career Award for Scientists and Engineers.

Jerry G. Rose, professor emeritus in the Department of Civil Engineering: Lifetime Achievement Award from the Railway Engineering Conference Committee.

David Silverstein, professor of chemical engineering and director of the University of Kentucky College of Engineering Extended Campus at Paducah: American Institute of Chemical Engineers Fellow.



Suzanne Smith, professor of mechanical engineering and director emeritus of

the Kentucky Space Grant Consortium and NASA EPSCoR Programs: American Institute of Aeronautics and Astronautics (AIAA) Fellow.

The Institute for Sustainable Manufacturing: Kentucky Pollution Prevention Center Douglas C. Griffin Environmental Sustainability Award winner for 2019.

STUDENT AWARDS AND RECOGNITION

Materials engineering doctoral student **Mike Detisch**: winner of the European Membrane Society's travel award and the best poster/research paper award at the Imagine Membrane Conference in Horta, Portugal.

Sarah K. Lami, electrical engineering Ph.D. student: winner of the National Nanotechnology Coordinated Infrastructure image contest in the Most Unique Capability category.

Siavash Mazdeyasna, Ph.D. student in the F. Joseph Halcomb III, M.D. Department of Biomedical Engineering: 2019 Biomedical Engineering Society Career Development Award.

Mujan Seif, UK materials engineering Ph.D. student and 2017 materials engineering graduate: Society of Women Engineers 2019 Outstanding Collegiate Member.

Eura Shin (BSCS 2019): Honorable Mention for the Computing Research Association's (CRA) Outstanding Undergraduate Researcher Award for 2020.

Electrical engineering Ph.D. students **Murat Kesgin** and **Narges Taran** and postdoctoral scholar **Peng Han**: Best paper/poster award for "Overview of Flywheel Systems for Renewable Energy Storage with a Design Study for High-speed Axial-flux Permanent-magnet Machines" at ICRERA 2019 Conference, Brasov, Romania.

Rosemary Alden and Donovin Lewis, UK electrical engineering and PEIK undergraduate students: IEEE Power and Energy Society (PES) Plus national scholarships.

The UKy-blue competitive programming team advanced from the Mid-Central Regional to compete in the North America Championship 2020 (NAC 2020) of the International Collegiate Programming Contest (ICPC). UKy-blue team members are Peter Bifone Jr., Brandon Bultman and Tanner Willis. Jerzy W. Jaromczyk, professor in the Department of Computer Science and director of undergraduate studies for the department, is the team's coach.

UK Norwood Student Chapter: Society for Mining, Metallurgy & Exploration Outstanding Student Chapter and Mineral Education Coalition (MEC) Student Chapter awards.

UK chapter of the Structural Engineers Association: Third place in the 2019 Timber-Strong Design Build competition during the NCSEA Structural Engineering Summit at Disneyland Anaheim, California.

CO-OP/INTERNS OF THE YEAR

Rachel Monroe, Chemical and Materials Engineering: Lou Takacs Co-op of the Year, Marathon Petroleum

Antoria Jackson, Electrical Engineering, Boeing

Greg Schloemer, Computer Engineering, Microsoft

Ashley Hall, Civil Engineering, WaterStep

Spencer Givan, Biosystems Engineering, Bel Brands

Zoe Collins, Chemical Engineering, Ghost Coast Distillery

Caroline Gerwig, Mining Engineering, Martin Marietta

Heidi Hanes, Materials Engineering, Lexmark

Megan Gilliam, Mechanical Engineering, Bullard

CLASS NOTES

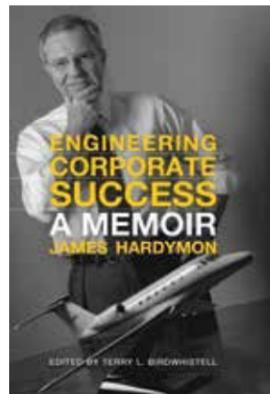
Kia Antis, BSCE 2015, an associate with the Partners of Somerville & Company PLLC, Certified Public Accountants and Consultants, has been awarded the Certified Public Accountant (CPA) certificate after passing the CPA exam and meeting the experience requirements for licensure.

Michael Bowling, BSEE 1990, has been named president of DIRECTV Latin America. For the past four years, Bowling has been a senior leader in Vrio and DIRECTV Latin America.

1st Lieutenant Finn Brutsman, BSME 2018, has been selected for his primary aircraft assignment as a F-16 (Viper) Fighting Falcon pilot. To be selected as a F-16 fighter pilot, a pilot must be ranked in the top one percent of pilots in the Air Force's pipeline.

Tom Creasey, BSCE 1981, MSCE 1984, Ph.D. CE 2010, has joined Caliper Corporation, a Boston-based traffic modeling and mapping software company, as vice president of transportation engineering. He also is the current chair of the Transportation Research Board's Highway Capacity and Quality of Service Committee, which oversees the Highway Capacity Manual.

Thomas Davis, BSCE 1983, P.E., vice president of S&ME, was given the Outstanding Professional Engineer of the Year Award for the State of Tennessee by the Tennessee Society of Professional Engineers. It is the highest award offered by the organization.



James F. Hardymon, BSCE 1956; MSCE 1958, shares his keys to success in a new memoir titled "Engineering Corporate Success: A Memoir." During

his career, Hardymon helped build corporations as a CEO, learned the ropes of Wall Street and interacted with U.S. presidents and congressional leaders.

Bob Heil, BSEE 1985, CEO of KLH Engineers, received the northern Kentucky Chamber of Commerce's Walter R. Dunlevy Frontiersman Award, which recognizes an individual who has a lifelong history of outstanding service to the Northern Kentucky community, exhibits outstanding service to their profession or industry, and exemplifies the highest standards of personal integrity and family responsibility.



Mfon-Abasi Itama, BSME 2019, received the Lyman T. Johnson Torch Bearer Award at the 29th annual Lyman T. Johnson Torch of Excellence Awards Banquet October 11 at the Gatton Student Center. UK's academic colleges and units selected one African American student within their respective colleges/departments whose academic achievement and ability has positively impacted the lives of others.

Peyman Jahed, BSCE 1980; MSCE 1982, has joined Lockett & Farley as a senior structural engineer. Prior to joining the architecture, interior design and engineering firm, Jahed was a co-partner in Lexington-based BMFJ. He continues to serve as an adjunct professor at the University of Kentucky.

Robert O'Neil Roan, BSMNG 1979, was inducted into Pineville Hall of Fame as part of the 2019-2020 class. Roan enjoyed a career in the mining industry.

Roy Sturgill, BSCE 2003; Ph.D. CE, 2019, has joined Iowa State University's College of Engineering as an assistant professor of civil, construction and environmental engineering. He worked as a research engineer at the Kentucky Transportation Center at the University of Kentucky in its construction engineering and project management program for nearly seven years.

Brent Tymensky, BSCE 1979, has been appointed Hy-Tek Material Handling's Integrated Systems (IS) Division's director of solutions development for the company's Nashville, Tennessee, office. Prior to joining Hy-Tek, Tymensky was employed by Fortna, serving as Solutions Excellence Team VP and Engineering VP.

Dominique R. Wright, BSME 2008, received the Lyman T. Johnson Torch of Excellence Award at the 29th annual Lyman T. Johnson Torch of Excellence Awards Banquet October 11 at the Gatton Student Center. UK's academic colleges and units selected one African American alum whose faith, hard work and determination has positively affected the lives of people on the UK campus, the city, state or nation.

BE INCLUDED

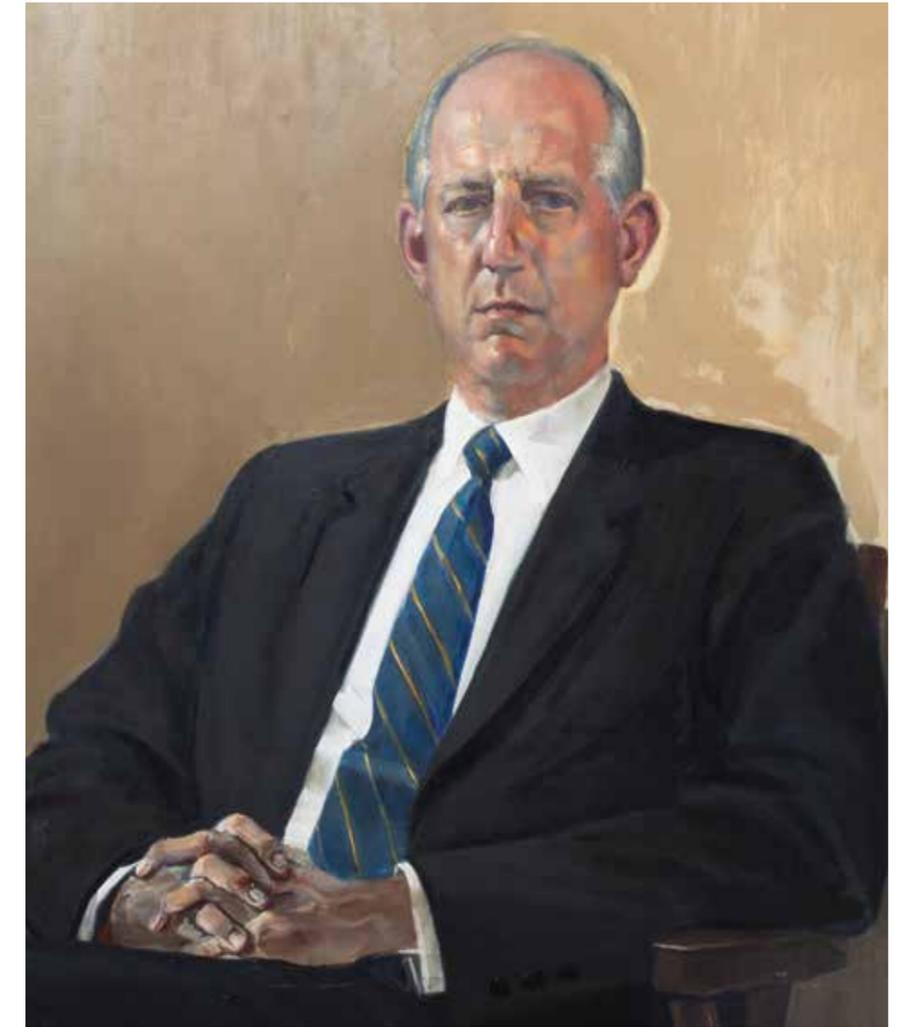
Please send Class Notes to alumni@enr.uky.edu

Remembering Dean Robert M. Drake Jr.

Former dean of the College of Engineering, Robert M. Drake Jr., passed away February 20 at age 99. With roots in Eagle Cliff, Georgia, Dr. Drake was raised in Lexington, Kentucky, where he earned an undergraduate degree in mechanical engineering at the University of Kentucky. As an undergraduate student, Dr. Drake was part of the National Honorary Military Organization as a cadet captain and a member of the American Society of Mechanical Engineers.

Shortly after graduating in 1942, Dr. Drake enlisted in the U.S. Army Air Corps during World War II. After his military service, Dr. Drake attended the University of California, Berkeley and obtained master's (1946) and doctoral (1950) degrees in mechanical engineering. He became a member of the engineering faculty at Berkeley from 1947 to 1955. He later became supervisor of turbine air design for the General Electric Company from 1954 to 1956.

Over two decades after graduating from UK, Dr. Drake was back at UK as dean of the College of Engineering in 1966. This followed a stint as chairman of the Department of Mechanical Engineering at Princeton University. He held his position as dean until 1971 when he turned to his industrial pursuits. Dr. Drake was later hired as corporate vice president for research and development for Combustion Engineering Inc. and later founded five high technology startup firms.



Dr. Drake was a member of the American Society of Mechanical Engineers and the American Institute of Astronautics and Aeronautics and served on their technical committees. He was also elected as a Fellow in the American Society of Professional Engineers in 1973, elected to the National Academy of Engineering in 1974, elected a member of the Hall of Distinguished Alumni of the University of Kentucky in 1975 and elected to the University of Kentucky College of Engineering Hall of Distinction in 1995. Dr. Drake also published more than 150 technical research papers, reports, major addresses and co-authored three books.

"Robert Drake returned to his alma mater at the behest of President John Oswald during a time of profound change at UK," said former College of Engineering dean Thomas Lester. "During his relatively short term as dean, he recruited a cadre of outstanding faculty who would provide the intellectual leadership for the college for the next four decades. He led the implementation of an array of doctoral programs supported by externally supported research programs. He was truly the father of the modern College of Engineering at UK."

College of Engineering Remembers Eric Grulke, Tom Schrodt



Eric Grulke, professor of chemical engineering and former director of the engineering electron microscopy center, passed away Friday, November 29, 2019, at his home.

Dr. Grulke began teaching at UK in 1993, after spending 15 years teaching chemical engineering and serving in administrative roles at Michigan State University. He was hired into the Department of Chemical and Materials Engineering as professor and chair and later served as associate dean of research and graduate studies from 2003-2015.

During Dr. Grulke's 45-year career, he authored more than 180 articles in leading scientific journals and mentored students to 45 graduate degrees. Throughout his academic career, his research program collaborated with researchers at the National Institute of Standards and Technology and received funding from such government agencies as the Department of Energy, NASA, the Environmental Protection Agency, Department of Defense, National Science Foundation and numerous corporations.

"Dr. Grulke was a brilliant mind who was ever restless in asking deep and difficult questions, searching for solutions to the problems that face engineers," says Thomas Dziubla, chair of the Department of Chemical and Materials Engineering. "He had a rare ability to connect with students, imparting his passion for science, solutions and life. While the halls of F. Paul Anderson Tower are now a bit dimmer in his absence, the faculty share in the joy of having been his colleague."



James Thomas Schrodt was a founding member of the Department of Chemical Engineering at the University of Kentucky and served as both the director of graduate studies and chair over the course of his 40 years. An avid outdoorsman who traveled the world exploring its streams and fisheries in search of rainbow trout, he collaborated on a very successful fishing guide titled *Fly Fishing in Kentucky*. That endeavor took him on a book tour throughout the Southeast, sharing his knowledge and expertise and creating a network of friends among fellow fishermen.

Schrodt's research contributed to the field of fossil fuel energy encompassing coal gasification and desulphurization and was a highly respected colleague and friend in the engineering community.

In addition to UK, he taught at West Virginia University and completed a four-month academic sabbatical at the University of Canterbury, Christ Church, New Zealand, College of Chemical and Process Engineering. One of his last academic achievements at UK was assisting in the development and accreditation of an expansion program in chemical engineering at the Kentucky Campus in Paducah. He consulted for several organizations, including the State Department of Energy, U.S. Department of Energy, General Electric and the National Science Foundation.



In Memoriam

James R. Atherton	Electrical Engineering	1958
Dr. Joseph A. Boyd	Electrical Engineering	1947
Dr. Alvin B. Broderson	Mechanical Engineering	1963, 1964, 1968
Ivan Childers Jr.	Civil Engineering	1959
Wayne A. Cornelius	Electrical Engineering	1953
Jean G. Crawford	Civil Engineering	1948
James E. Daniel	Civil Engineering	1968
James J. Des Rosiers	Electrical Engineering	1981
John W. Gorrell	Civil Engineering	1954
John O. Haight	Civil Engineering	1971, 1975
Scott P. Hall	Civil Engineering	1984, 1986
Henry E. Head	Mechanical Engineering	1955
Sammie R. Hewlett	Mechanical Engineering	1950
Dr. Read Holland	Metallurgical Engineering	1953, 1962
David A. Johnson	Electrical Engineering	1962, 1964
Edward S. Kelly	Civil Engineering	1967
Mike Kenton	Electrical Engineering	1986
Clair O. Langebrake	Mechanical Engineering	1950
Malcolm B. McGregor	Electrical Engineering	1958
David W. McLellan Jr.	Civil Engineering	1961
Claude P. Meers	Civil Engineering	1970
Robert C. Niles	Civil Engineering	1966
George P. Rains	Civil Engineering	1963
Glenn B. Shelton	Electrical Engineering	1959
Dr. William D. Shrader	Ph.D. in Civil Engineering	1973
Charles W. Smith Jr.	Master's in Mechanical Engineering	1957
Ronald L. Steedly	Electrical Engineering	1965
John E. Vaughan	Mining Engineering	1953
Henry C. Vickers	Civil Engineering	1959
Garey L. White	Civil Engineering	1951

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NOTES:

Cover: Aaron Cambron (left) and Nikiforos Stamatiadis (right) work on the kitchen facility with a resident of the community (see p. 9). EWB-UKY provided us with photos.

P. 6: While we have featured Drs. Hobbs, Stamatiadis and Ormsbee in this article, several faculty members within the UK College of Engineering and throughout UK involve themselves in humanitarian engineering. Our Humanitarian Engineering Group is qualified to provide technical support to government and non-government organizations (NGOs) to help develop agricultural and infrastructure resources. Members of the Humanitarian Engineering Group work at the national, state, local and community levels. Faculty include:

- Michael E. Kalinski, Department of Civil Engineering
- Nikiforos Stamatiadis, Department of Civil Engineering
- Shakira R. Hobbs, Department of Civil Engineering
- Mariantonieta Gutierrez Soto, Department of Civil Engineering
- Reg Souleyrette, Department of Civil Engineering
- Isabel C. Escobar, Department of Chemical and Materials Engineering
- Alan Fryar, Department of Earth and Environmental Sciences
- Gail Brion, Department of Civil Engineering

Pp. 7-8: To see all of Ormsbee's team's work, including their study, visit www.ukrcee.org.

P. 14: The James B. Beam Institute for Kentucky Spirits is a collaboration between the UK colleges of Agriculture, Food and Environment, Arts and Sciences, Engineering and Business and Economics.

P. 15: The Beam Institute offered an inaugural industry conference February 27 in the UK Gatton Student Center. UK faculty, four master distillers and other industry representatives presented throughout the day. During the conference, Independent Stave Company and the Boswell Family pledged \$1 million to UK to further spirits research at the Beam Institute. The gift will fund a maturation facility that will allow the Beam Institute to experiment with barrel aging spirits produced in its research distillery.

P. 25: Dr. McHargue's chihuahua, Peanut, is ridiculously cute.

P. 30: The day before Engineering LIVE! John Roberts developed a scratchy throat. The next day, conducting tours of the college for prospective students and their parents, Roberts began losing his voice. An hour before the start of the show (and have we mentioned it's a live show?), Roberts hadn't improved. Thankfully, drinking water and observing a forced silence made it possible for Roberts to host Engineering LIVE! "My voice was a little deeper than normal," he says. "But prospective students who hadn't met me wouldn't have suspected anything."

RUTH COLEMAN

Leslie Bueno

Ruth Coleman made history at the University of Kentucky when she became the first African American woman to graduate from the College of Engineering in 1977.

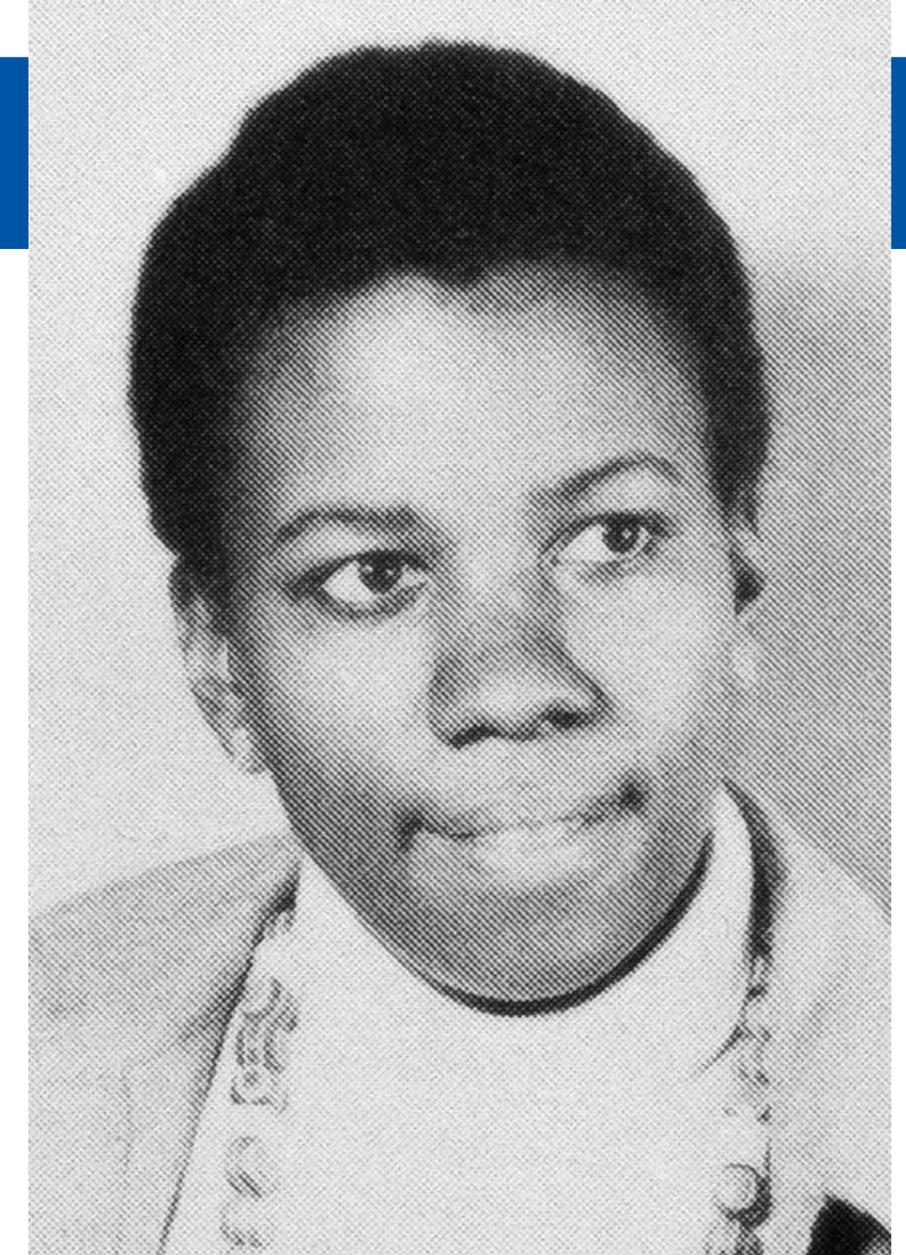
Coleman was born and raised in Lexington, Kentucky. She and her family lived on a farm that belonged to her family since the end of the Civil War.

After graduating from Bryan Station High School in 1968, Coleman began her college career by attending Transylvania University. She completed two years as a math major but was convinced by co-workers to change to engineering.

"Even with a Ph.D. in math, one can't earn as much as an engineer," Coleman said in an interview with Lexington Herald in 1977.

She then transferred to Lexington Technical Institute, now known as Bluegrass Community and Technical College, where she obtained her associate degree in engineering technology. Shortly after, Coleman started working for the Kentucky Transportation Cabinet, which at that time was better known as the Kentucky Department of Transportation's Division of Bridges.

Upon enrolling in civil engineering classes at the University of Kentucky, Coleman often found herself to be the only black student in her classes, as well as one of the only females. She recalls her time in college being "difficult" and "challenging," yet "interesting."



"It can be difficult for a woman and a black to relate to all the white male students in the department," Coleman said.

In 1977, Coleman became the first African American woman to graduate from UK College of Engineering when she earned her degree in civil engineering. She received her diploma 26 years after Holloway Fields Jr., who became the first African American student to graduate from the University

of Kentucky and the College of Engineering.

After graduating from UK, Coleman moved to Alaska, where she became a senior structural engineer.

Thanks to pioneers like Ruth Coleman, the number of African American women embracing engineering careers has greatly increased. As a result, so has the quality and diversity of the entire field.



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