

KENTUCKY ENGINEERING JOURNAL

UNIVERSITY OF KENTUCKY COLLEGE OF ENGINEERING

Fall 2018

NOW IS THE TIME
TO BE AN **ENGINEER**

AN INTERVIEW WITH DEAN RUDY BUCHHEIT

KENTUCKY CAN.



We take quite seriously how important this university is to our state.

We are the heartbeat of Kentucky's industry, the pulse of its economy, and the force that guides us and pushes us further.

It's why this university was created. It's why we're here. And now, it's time to get to work.

To pull on our gloves, lace up our boots and do even more for our Commonwealth. Redouble the investment we've made in this institution.

We have the power to improve lives, right here in Kentucky.

We have the responsibility to ease suffering, create smarter communities and address the problems that face us. Because we are Kentucky.

And together, we will let the world see what Kentucky can do.

KENTUCKY CAN
The 21st Century Campaign





“I WANT TO CREATE A PLACE WHERE STUDENTS, RESEARCHERS AND STAFF CAN BE SUCCESSFUL. THAT'S WHAT MOTIVATES ME.”

MESSAGE FROM THE DEAN

The first time I visited Lexington, it was a Sunday afternoon in early March. As I walked around the UK campus, the large campus, the impressive buildings and the many students hard at work made me feel at home. The interactions I have had during and after that initial meeting only deepened my sense that this is where I belong.

During the interview process with the search committee, I was impressed with the care and forethought that have gone into planning the College of Engineering's future. Making those aspirations come true is very motivating for me.


I also learned that UK needs Engineering to be one of its strongest colleges. We're fortunate we're the highest-ranked college of engineering in the Commonwealth of Kentucky. It's a great privilege, but it's also a great responsibility we need to fulfill every day. As a land-grant institution, we are responsible to bring our comprehensive research mission to communities across the state. It's our obligation to make sure our expertise and facilities are put to good use for the people of the Commonwealth.

To meet these aspirations, we are working to expand our enrollment and invest in our faculty and facilities. We're already moving quickly by hiring 20 new faculty members across our eight departments for the 2019-2020 academic year.

I want to create a place where students, researchers and staff can be successful. That's what motivates me. As I've gotten to meet the people at UK and in the College of Engineering, I've realized they're this institution's biggest asset. That's why I'm confident that together we can capitalize on everything that makes our college special.

Sincerely,

Rudy Buchheit
Dean

 College of
Engineering

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NOW IS THE TIME TO BE AN ENGINEER

AN INTERVIEW WITH DEAN RUDY BUCHHEIT

Kel Hahn

On July 1, 2018, Rudolph “Rudy” Buchheit became the 11th dean of the University of Kentucky College of Engineering. Prior to joining UK, Dean Buchheit was associate dean for academic affairs and administration of the College of Engineering at The Ohio State University, an academic unit comprising more than 350 faculty members, 400 staff members, 8,500 undergraduate students and 2,200 graduate students.

During his time at Ohio State, Dean Buchheit supervised the recruitment of a three-year faculty cohort that was 45 percent women and diverse men, and he oversaw an operating budget of \$240 million that included \$130 million in research expenditures. As you will discover in this Q&A, Dean Buchheit is passionate about student and faculty success, as well as the prospect of building upon the College of Engineering’s considerable momentum.

Could you give us a quick snapshot of your life and career prior to becoming dean?

I grew up in western New York, right on the shores of Lake Erie. I had a fascinating childhood because my playground was a Great Lake. I spent my teenage years in the Annapolis/Baltimore area and went to Loyola University in Baltimore. From there, I went to graduate school at the University of Virginia. That’s where I met my wife, Kate, who is a chemical engineer.

After finishing my Ph.D., we moved to Albuquerque, New Mexico, and I worked at Sandia National Laboratories, which is one of the

Department of Energy’s national lab facilities. I had a great run there through the 1990s, and in 1997 I joined the faculty in the materials science and engineering department at Ohio State. My research specialty is metallurgy corrosion and electrochemistry, and I’m still active in my field today. Along the way, I found I have an affinity for administration and I became associate dean. That experience led to me being here at UK.

Kate and I have two teenage boys who are discovering outlets for their sports and academic interests here in Lexington. All of us have greatly appreciated the warm welcome we’ve received since arriving.



What kind of leader are you?

My belief is that university leadership at all levels has, as its primary goal, the responsibility to deepen and expand the affiliation of stakeholder groups: students, parents, industry sponsors, alumni and so on. In order to increase affiliation, you have to deepen the quality of what supports the mission of the college: stronger faculty, staff and students. Creating the conditions where that can happen is the exercise of leadership. As the dean, I catalyze that, but leadership has to be distributed. I'm a firm believer in spreading responsibility and authority to those on the college leadership team to get the mission done.

When you have a talented group of people who are focused on the good of the organization like we do here, you have the ingredients for effective leadership.

What does the ideal UK Engineering graduate look like?

There is an unsatisfied demand for engineering talent. And while universities can produce competent engineering talent through excellent educational programs, we want UK Engineering graduates to be so much more. Yes, they have to have those hard skills that define engineering competence, but the very best engineers also have soft skill sets: excellent communication, cultural literacy, flexibility, resiliency in the face of failure, leadership and more. So creating an environment in which students can master all of that is what we're trying to do here.

We talk a lot at UK about transformation, particularly with regard to over \$2.1 billion in new construction on campus. How does transformation fit into your understanding of our college's mission?

Transformation is what a university is all about. We're trying to create professional engineers out of teenagers. That's a massive transformational exercise and it isn't easy, but it's within our ability to do it well.

Our invitation to students is "create a world that works." Creating implies hands-on action. That's why I say that for engineers it's not only what you know, but it's also what you can do. So the experiential component of engineering education is crucial because it has a transformative effect on the student.

What is one example of a program that leads to such transformation?

I've been really impressed by our First-Year Engineering (FYE) program. Our students are engaged in engineering from the first day they're here on campus all the way to the very end.

When you're in engineering for four years, connected to your discipline in a tangible way, you're going to be in demand by employers. FYE has had a great impact on retention, which is why we have to make sure the benefits of that first year flow through the remaining years of study.

In addition to providing a high-quality engineering education, we are committed to pursuing groundbreaking research. What areas serve as our research strengths?

Our college has several signature research strengths and centers. We have the Kentucky Transportation Center, the Power and Energy Institute of Kentucky, the Institute for Sustainable Manufacturing, the Unmanned Systems Research Consortium and strong connections with the Center for Applied Energy Research. Plus, we are gaining a reputation for our work in data



and visualization, advanced materials, aerospace, biomedical engineering and several other areas as well. We need to continue investing in those strengths even as we build into spaces between those particular strengths. We have an impressive group of people, and I wonder if the group knows how impressive it really is.

How important is collaboration to you?

I want everybody at UK to know that the College of Engineering is open to partnership. I believe the success of the college will significantly depend upon the partnerships we make with others within UK and with other institutions.

Society doesn't deliver easy problems for engineering to solve. We have to use our connectedness and the diversity that comes with being connected to help address those significant challenges.

Speaking of diversity, you led bold initiatives to foster inclusion and diversity while you were at Ohio State. Is that a personal issue for you?

Yes, it is. Having an inclusive culture is an essential ingredient for success in the college. The problems we have to tackle are complicated. They require solutions from different perspectives. So we have to diversify our faculty, our students and our staff so we can offer an environment where everyone can benefit.

In order for this to happen, however, the majority population must be fully invested. Here, that happens to be male and Caucasian. So that group in particular has to step in, understand the issues other groups face, be intentional and take actions that allow everyone to participate.

We have passionate alumni who love the college. How can they help advance the mission?

Creating relationships with our alumni is how we discover opportunities that aren't just funding-related. There are many ways our vast alumni network can help us accomplish our mission, whether it's creating opportunities for co-ops and internships at their companies, giving input by serving on boards,

or helping us connect to new industries and research directions—we have many avenues for alumni to get involved.

At the same time, philanthropy is an essential revenue stream for us. Creative, visionary philanthropy isn't about filling gaps but rather launching the kinds of initiatives that can truly transform the college. Yes, we need to support our current operations, but the most stimulating conversations I've had with donors have been about making things happen.

Is there anything else you would like to say to the UK Engineering community?

More than ever, now is the time to be an engineer. We have great challenges ahead of us, but we also have great opportunity. You don't get one without the other, so let's get on with it! ■

DEAN BUCHHEIT'S ADVICE TO NEW STUDENTS

Student success involves taking advantage of the breadth of resources available at a large, comprehensive research institution like the University of Kentucky.

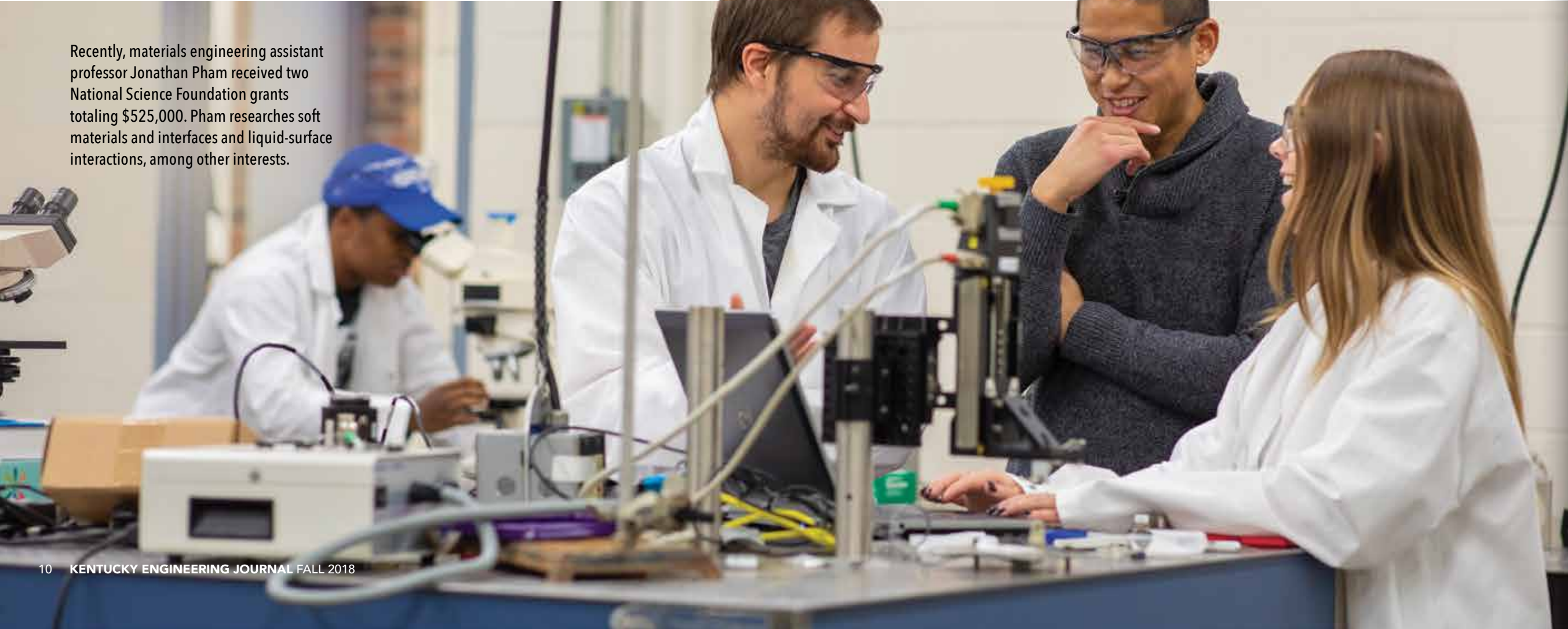
One of the biggest challenges you will face when you come to campus is making the place small. Everything you need to be successful is here; finding it can be the challenge. You need a network. You need friends. You need to get to know your advisors, lab mates and professors. That's where you'll discover the resources you need for your particular version of success. There are different ways to be successful, and a place like this allows you to find your way. So make the effort to reach out, find who has the information you need and take advantage of it.

DEAN BUCHHEIT'S ADVICE TO CURRENT STUDENTS

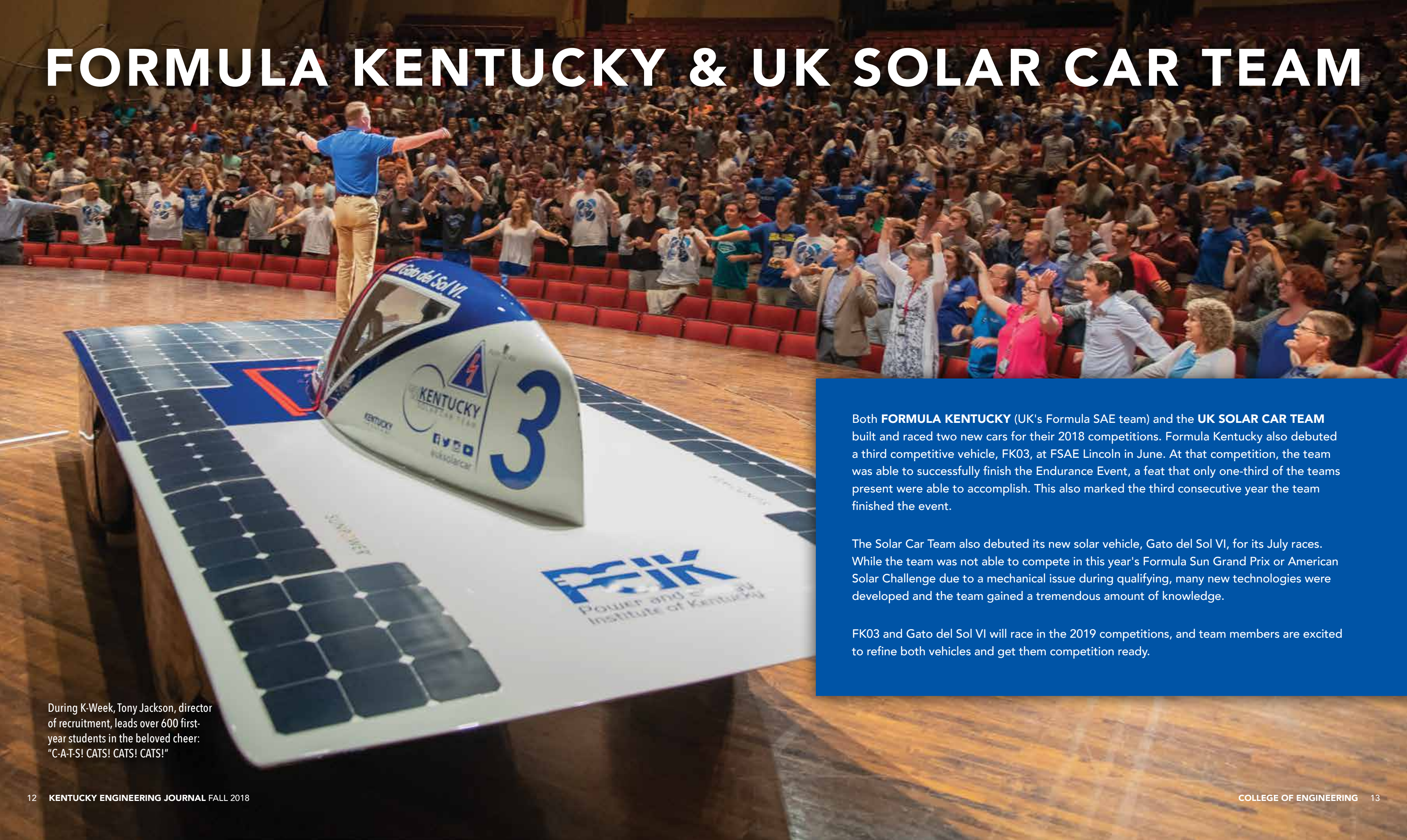
It's so important to practice skills. Engineering isn't just what you know but also what you can do.

There are different ways to get hands-on experience. We have structured labs that are part of your curricular experience. We also have MakerSpaces that are available to you so you can satisfy your curiosity and devise projects of your own creation. We have over 40 student organizations that appeal to all kinds of engineering interests. And there are co-op and internship experiences that allow you to see what a workplace environment is like and put real experience on your resume. When you can show you have mastered hands-on skills, you will make yourself a very attractive candidate for positions in a broad range of engineering fields.

Recently, materials engineering assistant professor Jonathan Pham received two National Science Foundation grants totaling \$525,000. Pham researches soft materials and interfaces and liquid-surface interactions, among other interests.



FORMULA KENTUCKY & UK SOLAR CAR TEAM



During K-Week, Tony Jackson, director of recruitment, leads over 600 first-year students in the beloved cheer: "C-A-T-S! CATS! CATS! CATS!"

Both **FORMULA KENTUCKY** (UK's Formula SAE team) and the **UK SOLAR CAR TEAM** built and raced two new cars for their 2018 competitions. Formula Kentucky also debuted a third competitive vehicle, FK03, at FSAE Lincoln in June. At that competition, the team was able to successfully finish the Endurance Event, a feat that only one-third of the teams present were able to accomplish. This also marked the third consecutive year the team finished the event.

The Solar Car Team also debuted its new solar vehicle, Gato del Sol VI, for its July races. While the team was not able to compete in this year's Formula Sun Grand Prix or American Solar Challenge due to a mechanical issue during qualifying, many new technologies were developed and the team gained a tremendous amount of knowledge.

FK03 and Gato del Sol VI will race in the 2019 competitions, and team members are excited to refine both vehicles and get them competition ready.

FROM FARM TO FACULTY

The Story of How Kim Anderson Became a Successful Engineer

Kel Hahn

Kim Anderson admits that when the 1990 faculty photo was taken, she took pains to make sure she couldn't be missed.

"For one thing, I wore a skirt, which I never do. And I got in the front row, right in the center."

Not only is Anderson—then assistant professor Kimberly Ward—prominent in the photo due to her physical location, she captures the eye for a different, less immediately tangible reason.

Anderson is the only female in the photo.

"When I interviewed at UK, I just assumed there were women on the faculty. The first time I realized there weren't was when I walked into a faculty meeting and thought, 'Wait a minute. I'm the only female here!'"

For Anderson, such asymmetry was nothing new. But to really tell the story, we have to go back to the 1960s and a 124-acre farm in East Palestine, Ohio. That's where Anderson, the youngest of six children, learned hard work and the priority of family.

"My dad went to college for a couple of years before fighting in World War II. Later, he kept the books at a furniture company. My mother was a waitress. So, financially, we were not so well-off. When I wanted a prom dress, my dad sold a cow."

In high school, Anderson became involved in the Future Medical

Careers Club and was considering a career in nursing. Even though her parents did not have a lot of money, Anderson knew her mom and dad always put their children first and would make sacrifices to ensure she could go to college. One day, however, Anderson discovered that LW Nash, a local manufacturing company, offered a full-tuition scholarship to study engineering at nearby Youngstown State University.

Anderson didn't know anything about engineering—what it was or what engineers did—but she didn't care.

"I thought, 'Well heck, if they're going to pay for my education, I'll apply.'"

As she sat in LW Nash's waiting room, preparing for her scholarship interview, Anderson became aware that all of the other applicants in the room were male.

As she walked into the conference room, she noted that all of the interviewers around the table were also male. Her work was cut out for her.

Still, despite knowing nothing about engineering, Anderson made her pitch for why LW Nash should award her a scholarship to study it. And she must have been convincing, because she won.

Anderson laughs, relishing the story she has told numerous times over the years. "I got into engineering entirely by accident."





“For one thing, I wore a skirt, which I never do. And I got in the front row, right in the center.”

– Kim Anderson

So that's how a young woman who is now in her 31st year of teaching chemical engineering at UK; who is the college's associate dean for administration and academic affairs; who has won umpteen awards at the department, college, university level and beyond and who has served as a role model for numerous other female students pursuing engineering overcame long odds and won an engineering scholarship.

Anderson enrolled at Youngstown State the next fall and commuted back and forth from the farm.

“Because they didn't have to pay for my education, Mom and Dad bought me a yellow Volkswagen Beetle for \$1,000. Every morning, and sometimes in six inches of snow, I would travel 30 miles to get to my classes. The car had no heat and no air conditioning, but I never missed a day of class.”

Once again, she found herself strangely alone.

“My first undergraduate course was a drafting class, and I was

the only female. I didn't like the subject and thought many times about quitting. But thank goodness I had Mom and Dad. With their encouragement, I stuck with it”.

Overall, Anderson says YSU was a great school that trained students to become productive engineers. However, Anderson continued to have an interest in the medical field and was not convinced she was ready to start a career as an engineer.

Fortunately, as a junior she attended an American Institute of Chemical Engineers meeting, where she met Rakesh Jain, a faculty member from Carnegie Mellon University. Jain convinced Anderson to attend Carnegie Mellon for graduate school and do cancer research with him. Anderson was very intrigued by Jain's research and agreed to join his group.

“Before I met Dr. Jain, I never realized that engineers could do research in the medical field. In addition to providing superb training in cancer research, Dr. Jain knew I was interested in teaching, so he let me teach some of his classes. I loved it.”

As she finished her postdoctoral studies, Anderson's love for teaching and research led her to pursue an academic position. But where? Jain directed her to Johns Hopkins, Princeton and other big-name institutions that prioritized research over teaching. Although not an Ivy League school, the University of Kentucky College of Engineering also had an opening.

Anderson had never been to Kentucky. She applied anyway.

“I loved the fact that there was a medical center here on campus, as well as the Markey Cancer Center. People were supportive and friendly, and I felt much more comfortable here than I did at those other schools.”

In the end, Anderson weighed an offer from Kentucky against a possible offer from Johns Hopkins. When she called Jain and broke the news she was heading to Kentucky, he wasn't happy. Jain felt she should hold out for an offer from Johns Hopkins.

Even now, just recalling the story, Anderson is a little indignant.

“It made me want to go to UK even more.”

She arrived in 1987, pleased to find an environment that supported research and teaching. Soon after arriving, she met her husband, Richard, who had graduated from UK with a degree in chemical engineering in the 1970s, at an alumni luncheon. Before long, Anderson established herself at UK as a professor, wife and mother to Richard's children, Stacey and Jon.

True, she quickly discovered there were no other women on the faculty, but it wasn't long before that began to change.

“In 1990, Tom Lester became dean of the college. He made increasing the number of females on the faculty a high priority and that was a big relief to me. The landscape really changed because of Dean Lester.”

Anderson's major research theme has been how cancer spreads in the body, specifically how cancer cells adhere in blood vessel walls and how that adhesion plays a role in cancer's ability to spread.

UK College of Engineering



Along the way, she has collaborated with others in the college on projects pertaining to drug delivery systems and hydrogels for treatment.

From 2007 to 2014, Anderson served as director of the National Science Foundation's Integrative Graduate Education and Research Traineeship (IGERT) program, a \$3.2 million award that focused on bioactive interfaces and devices.

"With IGERT we were trying to match individuals who had expertise in synthetic materials with individuals who had biological expertise so we could come up with some effective biointerfaces. IGERT gave us the ability to provide graduate fellowships to further the work."

The IGERT program led to additional funding from the National Science Foundation to support a Research Experience for Undergraduates (REU) program in the same area that Anderson has been directing along with chemical engineering professor Zach Hilt for the past 10 years.

Although she had developed a prolific research lab, Anderson discovered she actually enjoyed administration. In 1996, as an associate professor, she accepted the position as associate dean of administration and academic affairs. While she enjoyed administration, she chose to return to the faculty when her term ended in 2000 to pursue her promotion to full professor. Thirteen years later, then-dean John Walz invited her to take up the office once again.

"I was ecstatic, because I had really enjoyed being in the position years earlier."

But the job had changed significantly. Whereas during her first term Anderson had been able to administrate, teach and run a research lab, the associate dean's workload had grown to where something would have to be relinquished.

If it hasn't been made clear by now, it wasn't going to be teaching. Anderson began making plans to slowly shutter her lab.

"I had a few graduate students who were close to graduating and

thanks to collaborative work we were doing with Tom Dziubla and Zach Hilt, I was able to see them through."

While teaching UK101 and a chemical engineering course keeps Anderson connected to the engineering student's experience in the college, she's also gained valuable insight about UK from a different vantage point: a mother's. Anderson's son, Zack, graduated with a bachelor's degree in computer science in 2017 and finished his MBA through the college's Engineering/MBA dual degree program this spring. He began working in cybersecurity at Northrop Grumman in August.

"When Zack came here, it gave me a different perspective. He would express excitement and frustration, and I heard them as a mother and as an associate dean."

Anderson says Zack's decision to come to UK adds a dimension of credibility to her message when meeting with parents of potential students.

"I can say, 'I sent my son to UK and I couldn't be happier with his

education and career prospects.' It's a great recruiting message coming from the associate dean."

Zack's graduation and new career have presented Anderson with opportunities to reflect on her future. She has three years remaining in her current term as associate dean. She supposes she will retire eventually, albeit reluctantly, whenever that day comes.

"There's a reason faculty retire long after they can. We like our jobs!"

One last note about LW Nash, the manufacturing company in East Palestine, Ohio, mentioned earlier: One year after giving Anderson a scholarship to study engineering, the company suddenly went out of business. Normally, a student like Anderson would be out of luck and have to figure out how to finance the remainder of her education herself.

Instead, the company issued her a check for the rest of her tuition. The rest is history. ■

COLLEGE OF ENGINEERING HONORED WITH EXCELLENCE FOR VETERANS AWARD

Lindsey Piercy, UKPR

The University of Kentucky College of Engineering has been recognized with an Engineering Excellence for Veterans Award from the American Society of Engineering Education (ASEE).

The award, founded in 2015 by the ASEE Military and Veterans Division, recognizes academic institutions that are leaders in helping veterans bridge the gap between military and civilian worlds.

Universities chosen to receive the honor had to meet the following criteria:

- Be among the U.S. News and World Report's top 200 major national universities and colleges.
- Be in Military Times Top 60 "Best for Vets."
- Be among the Top 100 "Best for Vets in Engineering" schools in U.S. News and World Report rankings.

The College of Engineering is part of a strong campus-wide reputation and tradition for supporting the brave men and women who serve.

"Veterans bring great knowledge, skills and work discipline to their studies. We want to make the college welcoming and supportive for these men and women who have served our country," said Larry Holloway, former interim dean of the College of Engineering.

In the spring of 2018, 84 undergraduate and 3 graduate students who self-

identified as veterans were enrolled in engineering disciplines. They represented approximately 22 percent and 4 percent, respectively, of the total enrollment of students who self-identified as veterans at the university.

"Our veterans bring to the college their practical skills, work ethic, leadership, motivation and sense of purpose," said Laura Marie Letellier, lecturer in the Department of Electrical and Computer Engineering. "They are role models, who inspire us all to be better students and educators."

Letellier, a retired lieutenant commander in the U.S. Naval Reserve, has long been dedicated to helping veterans excel in their education endeavors.

At the start of the 2017-2018 academic year, the college provided the final increment of funding needed to launch the "Teaching Student Veterans" Faculty Learning Community (FLC). The FLC, organized through the University of Kentucky Center for the Enhancement of Learning and Teaching (CELT), aims to provide faculty with the best practices for integrating military veterans with traditional students in the classroom.

The college also offers the First-Year Engineering (FYE) Program. Through engineering classes taught by top faculty, students can quickly discover more about the field. For traditional students, it's a three-course series, but transfer students are offered an accelerated two-course series. The classes are specifically

designed for the success of transfer students, some of whom are veterans. The courses provide them with the engineering education that coincides with the practical skills they bring to the program.

"We offer world-class engineering education in multiple undergraduate and graduate programs from world-class faculty. We also provide opportunities for undergraduate research and have a strong internship and cooperative education program," Letellier explained. "These venues provide our students with opportunities to apply and master the classroom material. For veterans who come to us with substantial leadership skills, these venues are particularly suited to their talents."

Whether veterans are entering college for the first time, transferring from another school or returning after a deployment, Letellier said, the goal is to ensure the transition in and out of the classroom is as smooth as possible.

"When I was notified of this award, I understood this to be an affirmation that our college is, in fact, achieving the vision of a place where veterans are supported; where wonderful, courageous young people, like those whom I led, are truly welcomed," Letellier said. "This award honors faculty and staff, both within the College of Engineering and also the larger University of Kentucky community, who have worked for years for the success of our veterans and, indeed, all students."

CHRIS YOUNG, ARMY COMBAT ENGINEER, RET. Mechanical engineering junior at the University of Kentucky College of Engineering Extended Campus at Paducah



CHRIS YOUNG STANDS OUT

Kel Hahn

For one thing, he stands out because of his height. At 6'3", he's hard to miss, wherever he is. You don't want to sit behind him in a lecture hall.

He stands out because of his experience. That might seem like a nice way to put "age," but experience is more palpable than age. Thirty-nine, Young exudes experience. It's no wonder his fellow classmates seek his perspective on current events.

He stands out because of his presence. Although medically retired from the U.S. Army after 18 years and four combat tours, Young still carries himself like a soldier.

"Combat engineer," he says proudly. "Blew stuff up for living. Best job in the world."

You get the sense that if it were his choice, Young would still be serving his country via the "best job in the world."

He stands out because everyone knows it would be easier for him to stay home. A husband and a father of five with three kids in high school, Young always has much more occupying his mind than fluid dynamics. On the 75-minute drive from his home in Hopkinsville to Paducah, he thinks through upcoming assignments. On the way home, he replays that day's lectures through his stereo.

Peers who complain about not having enough time should not look to Young for a sympathetic ear.

He stands out because he keeps finding ways to grow. While in community college, Young worked with a team that launched high-altitude balloons during the Great American Solar Eclipse in August 2017. He visited NASA's Jet Propulsion Laboratory in Pasadena, California. Young had an internship last summer with GE Aviation in Madisonville, and he wants to pursue an aerospace certificate.

"Growing up, I always thought that people who worked for NASA had three Ph.D.s and I would never work somewhere like that," he says. "But since I've been exposed to aerospace in school, I've gotten to do a lot with NASA."

He stands out because 39-year old married fathers of five coming off 18 years of military service and who live 75 minutes away seldom ever think of going back to school.

"As a non-traditional student, I always knew it was going to be extremely difficult for me to come back to school. I never thought I was going to be smart enough to do it," he remembers. "But everybody here has been very welcoming and has gone out of their way to help me."

REACHING FORWARD

The College of Engineering is striving to connect more young girls with engineering and computer science through a new staff position and upgraded programming

Kel Hahn

When Micaha Dean Hughes was a senior integrated strategic communication major at the University of Kentucky, she took an internship with Disruption Corporation, an incubator for tech startup companies in the Washington D.C. area. Through her work, she became involved with Girls Who Code and Women 2.0, nonprofit organizations aiming to increase the number of women in computer science. In the midst of a booming tech scene, Hughes partnered with local schools and community partners to hold computer science events that, for many girls, opened a whole new world.

It also opened a new world for Hughes.

“That experience was a big marker for me because it was the start of what I’m doing now,” she recalls.

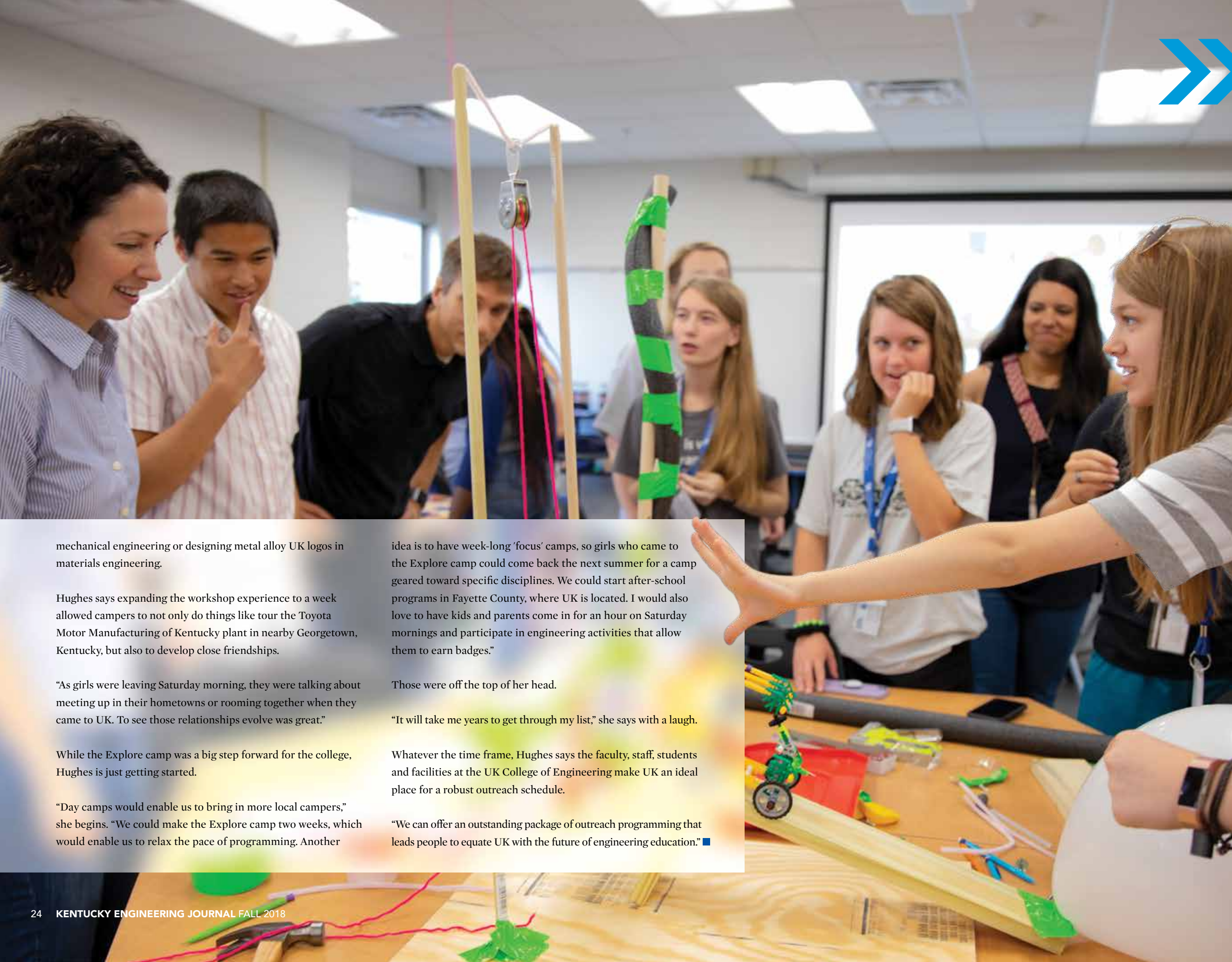
Hughes, who graduated in 2015, is now the University of Kentucky College of Engineering’s first director of outreach and community engagement. The recently created position reflects the college’s increased commitment to K-12 outreach initiatives, particularly to females.

“By the time girls reach high school, they usually have a sense of what they want to pursue for a career,” says Hughes. “If they like science and math, they’re usually thinking about becoming a doctor or a nurse. Engineering or computer science doesn’t become an option unless they know an engineer or they’ve encountered the disciplines through informal learning experiences like camps or workshops. They don’t want to become engineers because they don’t typically see it in the traditional classroom.”

In 2017, while serving as the assistant director of recruitment and female initiatives for the college, Hughes led 16 Women in Engineering (WiE) Summer Workshops that introduced high school girls to engineering disciplines taught at UK. This summer, Hughes took an even more ambitious step: a week-long residential camp called WiE Explore. Held June 24-30, participants stayed in Woodland Glen III—home of the Engineering Living Learning Program—and got a taste of life on campus as a UK Engineering student. Campers learned how engineers and computer scientists think and experiment through hands-on activities, like building a Rube Goldberg machine in

“Micaha has done an excellent job at organizing outreach activities for young females that get them interested in engineering. The younger we get female students exposed to engineering, the better.”

– Kim Anderson,
Associate Dean for Administration and
Academic Affairs



CURRENT OUTREACH PROGRAMS FOR K-12 FEMALES

GO GIRL! ENGINEERING SLEEPOVER

Girls grades 3-6 and their mothers, or other female role models, experience hands-on engineering activities led by female engineering role models and spend the night in Woodland Glen III.

SOCIETY OF WOMEN ENGINEERS (SWE) CLASS SHADOWING PROGRAM

Girls can have lunch with a group of SWE students and then accompany one of them to an engineering class. It's a great way to get a firsthand glimpse of what it's like to be an engineering student at UK.

WIE EXPLORE: WOMEN IN ENGINEERING SUMMER CAMP

Over a week-long period, female high school students experience a mix of academic programming, recreation and social activities that mirror the undergraduate experience of female engineering students.

WOMEN IN ENGINEERING DAY

High school girls learn how to apply to the college, hear female faculty members discuss their experience as women in engineering and visit with current leaders in SWE.

INTRODUCE A GIRL TO ENGINEERING DAY

Middle school girls enjoy fun, hands-on activities designed to encourage their interest in STEM while parents receive tips for encouraging their daughter to pursue STEM opportunities. This event kicks off Engineers Week.

mechanical engineering or designing metal alloy UK logos in materials engineering.

Hughes says expanding the workshop experience to a week allowed campers to not only do things like tour the Toyota Motor Manufacturing of Kentucky plant in nearby Georgetown, Kentucky, but also to develop close friendships.

"As girls were leaving Saturday morning, they were talking about meeting up in their hometowns or rooming together when they came to UK. To see those relationships evolve was great."

While the Explore camp was a big step forward for the college, Hughes is just getting started.

"Day camps would enable us to bring in more local campers," she begins. "We could make the Explore camp two weeks, which would enable us to relax the pace of programming. Another

idea is to have week-long 'focus' camps, so girls who came to the Explore camp could come back the next summer for a camp geared toward specific disciplines. We could start after-school programs in Fayette County, where UK is located. I would also love to have kids and parents come in for an hour on Saturday mornings and participate in engineering activities that allow them to earn badges."

Those were off the top of her head.

"It will take me years to get through my list," she says with a laugh.

Whatever the time frame, Hughes says the faculty, staff, students and facilities at the UK College of Engineering make UK an ideal place for a robust outreach schedule.

"We can offer an outstanding package of outreach programming that leads people to equate UK with the future of engineering education." ■

SMART INVESTMENTS

UK's Department of Computer Science hired four new professors. The common research denominator? The Internet of Things

Kel Hahn

It has been suggested that whereas the first Internet connected people, the second Internet connects things. Hence, the term “Internet of Things” (IoT) has quickly gained cultural currency as the newest versions of our things—cars, appliances, power grids and more—have been given the power to communicate with other communicating things.

But what does the term mean, really? In their 2018 book “The Internet of Things,” Mercedes Bunz and Graham Meikle describe IoT as “the many uses and processes that result from giving a network address to a thing and fitting it with sensors.... When we equip the things around us with sensors and connect them to networks, they gain new capabilities.”

For most of us, the IoT concept has been limited to souped-up versions of our everyday appliances whose features offer questionable value. In fact, Bunz and Meikle refer to this as the “Fridge Fallacy,” suggesting a connected fridge that alerts you when you’ve run out of milk (and sends you a photo of its milk-less interior) is a shortsighted view of IoT. Rather, the power of IoT lies in the idea that “sensing networks of connected things are systems for making sense.” Our devices and machines are becoming able to deeply understand the world around them and make decisions in response to what they sense.

In the summer of 2017, the Department of Computer Science at the University of Kentucky hired four new assistant professors, all with research backgrounds in areas connected to IoT. By adding a group of researchers with divergent but compatible interests, department chair Brent Seales saw natural avenues for collaboration.

“Computer science is fast-paced, ubiquitous and cuts across all our traditional disciplinary boundaries,” says Seales. “The quartet of amazing, vibrant professors who joined our department this year are tied together by IoT, which is an apt metaphor for the way computer science is linking together almost every discipline.”

Corey E. Baker received a bachelor’s degree in computer engineering from San Jose State University, a master’s degree in electrical and computer engineering from California State University, Los Angeles, and master’s and doctoral degrees in electrical and computer engineering from the University of Florida. He was also a post-doctoral fellow at the University of California San Diego and the University of Southern California. Baker’s research interests include block chains, smart cities and device-to-device communication and security.

Simone Silvestri received his Ph.D. in computer science from Sapienza University of Rome, Italy, where he also did post-doctoral work. He was a post-doctoral research associate at Pennsylvania State University before joining the Missouri University of Science and Technology as an assistant professor in 2014. He focuses on smart grid security, network management and cyber-physical-human systems.

Hana Khamfroush was named a rising star in electrical engineering and computer science by MIT and Carnegie Mellon University in 2015 and 2016. She was also selected to be one of 200 young researchers for the Heidelberg Laureate Forum in Germany. Khamfroush studies interdependent networks and distributed analytics. She received her Ph.D. from the University of Porto, Portugal, in 2014, and then spent three years as a research associate in the computer science department at Pennsylvania State University.

Brent Harrison received bachelor’s degrees in English and computer science before earning master’s and doctoral degrees in computer science from North Carolina State University. He spent two years as a post-doctoral researcher in Georgia Tech’s Entertainment Intelligence Lab, where he researched the novel application of stories to reinforcement learning.

In this article, we will look at each professor’s research interests and explore where they intertwine with the other three.



A portrait of Simone Silvestri, a man with curly brown hair and a beard, wearing a blue and white checkered shirt under a dark jacket. He is smiling and looking towards the camera.

SIMONE SILVESTRI

We are heading toward a future where nearly everything in our environment will be smart. From smart appliances to smart clothing, just about anything with an IP address and sensors will be fair game for creating a smart habitation entirely connected within itself and to the outside world.

The question for you will be: How much, or how little of it do you want?

According to Silvestri—whose newest project combines computer science, social science and electrical engineering—how you answer depends upon your psychological wiring.

“In smart home environments, machines make decisions on their own—what happens, when they happen and what strength, etc.—but different people perceive these decisions in different ways,” says Silvestri. “Who you are and your relationship to these autonomous decisions will determine whether your smart home is a success or a failure.”

Using the IoT paradigm, Silvestri’s group is using connected smart devices to understand user preference. Silvestri thinks Harrison’s background in machine learning will eventually contribute new learning tools to smart homes seeking to learn from their inhabitants.

“An engineer usually tries to maximize performance, but that doesn’t mean the user is happy with it,” adds Silvestri. “By exploiting machine learning to understand how the user interacts with the environment, and their perception of it, the smart home can make decisions based

on what it learns about the user’s persona.”

And where does electrical engineering fit into the picture? Silvestri says it has to do with optimizing energy consumption.

“The smart homes of the future will be powered by renewable resources. They will have batteries that can store the energy your house produces. It is even possible that you will have a surplus of energy that you can sell. Taking what the smart home environment has learned, what decisions can it make to optimize the energy consumption in your house? To match your preferences with responsible energy use would be a huge achievement.”

In addition to this initial foray into smart homes, Silvestri has projects related to smart grids and disaster-response networks. Similar to Baker, Silvestri wants to keep communication going when the infrastructure is offline; however, his focus is more on the network itself. He is looking into biologically inspired networks that can lose nodes yet stayed connected.

Silvestri also has a natural collaborator in Khamfroush. Both were postdocs in the same network research group at Penn State, although at different times. Khamfroush joined when Silvestri left to take an assistant professor position at Missouri University of Science and Technology. Now they’re both at UK, which has had its share of excellent network researchers.

“This department is strong in the area of network research,” affirms Silvestri.

A portrait of Corey E. Baker, a Black man with glasses and a beard, wearing a pink shirt and a maroon blazer. He is smiling and gesturing with his hands.

COREY E. BAKER

In our connected world, we take communication for granted. As long as we have a device, we assume our ability to send and receive information.

But what if, one day, the networking infrastructures we depend upon are damaged? What if we have no Internet? Are all our devices rendered useless?

Corey Baker thinks not.

Opportunistic communication. That’s the area of Baker’s research that explores communication “off the grid.” Here’s how it works.

When the network goes down, you may not be able to access the Internet, but that doesn’t mean your devices can’t communicate. Bluetooth and Wi-Fi are still available, even if they can’t connect to the Internet. Thus, a new potential network becomes available—not connected by infrastructure but by the devices themselves. This device-to-device (D2D) network makes communication possible when the Internet goes dark.

“Leveraging D2D communication provides complementary solutions to traditional networks that are typically dependent upon centralized infrastructures such as the Internet,” says Baker. “The goal of our research is to make data accessible in the midst of intermittent and poor connectivity while minimizing delay.”

To investigate D2D in real-world situations, Baker developed an app called “Alley Oop,” a name he considers appropriate given UK’s basketball heritage. With “Alley Oop,” you can send

messages when the Internet is available and when it’s not. “Alley Oop” is powered by middleware Baker’s research group has developed called SOS (Secure Opportunistic Schemes). Baker is currently testing “Alley Oop” and SOS in rural locations.

Baker is part of a collaborative effort called Linking and Amplifying User-centered Networks through Connected Health (LAUNCH) Initiative. LAUNCH is tasked with bridging the broadband health connectivity gap in rural Appalachia to increase access and adoption of symptom management for cancer patients. LAUNCH is a public-private partnership among the National Cancer Institute, the Federal Communications Commission, UK Markey Cancer Center, the USCD Moore Cancer Center, UCSD’s Design Lab and Amgen.

Deploying D2D communication in the field takes a lot of time and requires user interaction.

For people actually using D2D communication, the interaction has been positive; however, Baker believes gamifying “Alley Oop” will only further improve the user interaction. With a background in game design and gamification, Harrison can potentially provide insight into incentivizing users to be part of the D2D opportunistic network.

“We want to entice people to come back, so we need smart ways to interact. Gamifying it and having users compete will encourage users to open the app and maximize information dissemination,” Baker adds.

HANA KHAMFROUSH

Hana Khamfroush is all about networking. Any large-scale complex networks, whether wireless, cyber-physical or social, Khamfroush is interested in modeling and analyzing them.

Khamfroush's mathematical models are crucial for effective field research. She provides the solid foundation that makes real-world deployment possible.

"Behind every real-world test-bed, there should be some simplistic model that can provide an initial intuition and observation. For that we need mathematical models. We can model the problem and then create a small test-bed to evaluate our model. If that works, we can then deploy tests on a larger scale and see if what we observe will work in a real-world scenario."

Most of today's infrastructures exist in the form of interdependent networks because they are interconnected and, as a result, impact each other. Understanding how that interdependency affects their behavior is important.

"I'm trying to model the behavior of large-scale complex networks given certain perturbations, such as natural failures or external attacks," Khamfroush says. "With cyber-physical networks, which have different types of cyber networks and physical networks, what happens if part of the network is damaged? How does it affect the whole network? Can we control the behavior of the network? The goal is to make cyber-physical systems more robust and resilient against attacks or random failures in the network."

One example of Khamfroush's potential as

a collaborator is a grant proposal she and Harrison developed to create a fire-fighting training simulation. If awarded, Khamfroush's theoretical models will inform how background figures trapped in the fire should move within the simulation, as well as how the fire propagates. Then Harrison will build the simulation based on Khamfroush's model. The models are necessary to ensure Harrison's virtual space mirrors the real world.

"Machine learning is a very interesting tool for predicting the behavior of certain networks. It allows you to collect data and observe previous events, so in that sense, I think Dr. Harrison and I can write a lot of proposals together," Khamfroush states.

In addition to her work in interdependent networks, Khamfroush is digging into distributed analytics. She says the computing power of our smartphones and other devices within the IoT is such that reliance on cloud networks may become a thing of the past. She explains that with "edge computing," most of the processing tasks can happen on the device itself, leading to a faster and safer processing environment.

"Instead of using a cloud that is far from the users, edge computing brings computing to the edge of the network. There, our smartphones or laptops can do the processing—fewer things are going up and then coming back down. If we can use our computing power plus that of our colleagues, we can reduce the delay of the transmission. Computing would be less costly."

With a background in mathematical modeling, Khamfroush's flexibility is sure to make her a highly sought collaborator.





BRENT HARRISON

Brent Harrison wants to create Jarvis, but for real.

Jarvis is the do-everything AI assistant to the fictional Tony Stark from the Marvel franchise. It not only has every technical skill Stark needs, but it also possesses wit, insight and sensitivity. Its humanity is what makes it so compelling.

Harrison wants one.

“Usability is what it is all about,” he declares. “AI is eventually going to integrate into society, but if no one wants to use it, it isn’t going to matter. We need to humanize the technology.”

Harrison’s emphasis on interpersonal tech has ties to Silvestri’s interest in smart homes that learn about their occupants. By “making the better Alexa,” as Harrison puts it, the gap between humans and virtual agents will shrink.

“It is frustrating to know what you want these assistants to do and have them not do it because you don’t know the exact wording of the command. I want to bring technology up to human standards rather than force humans to adapt their own ways of thinking to fit the systems,” he says.

Harrison also envisions humans using their own way of speaking to train virtual agents learning complex tasks.

“Faced with a difficult problem, we will often have high-level language that will

instruct us how to solve that problem. However, virtual agents don’t have that. A self-driving car will have to figure out how to navigate a complex space. But if it can get instructions in a natural way from a person and learn what to do, that will speed up learning.”

One of the most interesting aspects of Harrison’s research is his exploration of “computational storytelling.” It sounds like a contradiction in terms, but Harrison insists that stories are instrumental for interactive AI and machine learning. Perhaps that is not surprising coming from an avid reader of science fiction and classic literature.

“Stories are a gateway to teaching computers to be more humanlike because stories are how we learn about the world around us. If a computer can tell a story, chances are it understands a little about the story itself. In addition to learning behaviors, stories are how we learn right from wrong. If you can get a computer to learn from stories, it would be able to learn some base sense of moral or ethical behavior. This will help virtual assistants fit into their cultural surroundings and prevent them from doing or saying offensive things.”

Looking at Harrison’s vitae, the last thing one would expect to discuss in an interview with him is the power of story.

Harrison smiles and agrees, “No one ever does.” ■

MAKING A LEADER

Sydney Norman experienced West Coast tech culture and loved it. So she's working toward bringing it to Lexington

Kel Hahn

Sydney Norman turned down Amazon. Let's start there.

Fresh off a summer in Seattle as a software engineering intern, Sydney received an offer for a full-time position good upon completing her computer science degree in May 2018. She declined.

"It was a spectacular offer, too," she admits.

Was it a matter of geography? Was Seattle too far, too alien, from her hometown of Glasgow, Kentucky?

"I had always thought I would end up on the West Coast," Sydney replies, dismissing the notion. "There was no doubt in my mind I would go there, and I had it fully planned from the time I was in high school."

Was it the work? The culture?

"No, I love software development. Plus, I had been working on the Alexa engine, which was awesome. I love Alexa. My whole home is powered by Alexa. The project and the environment were great," she answers.

So...what? Why did she tell Jeff Bezos (indirectly, of course) no thanks?

Sydney Norman smiles. "I want to lead a team."

An anecdote from her time at Amazon makes her point. Once a month, all of the women on Sydney's team and sister teams would get together for lunch and career development advice. Women

asked questions like, "As a Software Engineer I, how can I move toward becoming a Software Engineer II?" Or, "As a Software Engineer II, how can I become a III?"

Sydney raised her hand. "I'm a Software Engineer Intern. How do I get into management?"

Silence.

That's when Sydney knew Amazon wasn't for her.

"I would have been stuck sitting behind a computer every day," she explains. "I enjoy programming but want to be able to interact with people and learn from them. It was because of my experience in SWE that I felt I could not let go of leadership and working with people."

SWE is the Society of Women Engineers, and Sydney refers to her involvement in UK's student chapter as "the defining experience" of her college career.

"My time in SWE showed me I'm much more of an extrovert than I realized. We created so many outreach activities for young girls: after-school elementary school programs, a class shadowing program for high school girls, a SWE Sleepover where incoming freshman girls got to stay in the Woodland Glen III dorm where the Engineering Living Learning Program is, company visits where panels of professionals interacted with young girls and more."

Sydney served as SWE's president during both her junior and senior year. Her overall experience with the student organization

made such a mark that when Amazon's offer arrived, she knew it wasn't what she really wanted.

"I want to stay in the tech industry," she insists, "but I want to work with people and not just software."

That's why Sydney, who graduated in May, is embarking on a one-year MBA. Through UK's Engineering/MBA Dual Degree Program, students complete their undergraduate degree and an MBA in five years.

"If you're going to work in a company, you need to know how that company works," Sydney says. "If you plan to lead people, you need to make sure you're leading them into success. After

realizing the West Coast wasn't for me, the MBA became an obvious choice."

And after the MBA?

"One of my goals is to start a tech company and create the kind of culture I experienced on the West Coast here in Lexington so we can keep our talent here."

After learning how she developed as a leader, I have to say I'd work for Sydney.

Wouldn't you? ■



In May, Sydney received the UK Engineering Alumni Association's Senior Leadership Award. Ironically, her husband, Daniel Cambron (BSEE '15; MSEE '16), won the same award his senior year. Their ceremonial bricks are side by side in the Engineering courtyard.



OUTRAGEOUS FUN

UK Alumni are Revolutionizing Retail with Marty the Robot

Kel Hahn

It's not about the robots.

That's the point Badger Technologies CEO Tim Rowland wants to communicate most. In Badger's promotional video and on its website, data and analytics come first, robots come last.

"Badger is about producing real business results. We give retailers data that can help them make real business decisions."

But, man...robots! Sleek, over six-foot-tall robots with LED lights in varying colors. And inside Badger's workspace in Nicholasville, Kentucky, they're everywhere—sedately cruising past programmers, hanging out at charging stations, even patrolling the fully stocked aisles of a mock grocery store. Each one bears the moniker "Marty."

Thanks to Badger's engineering team, over 30 percent of whom are engineering or computer science alumni from the University of Kentucky College of Engineering, Marty is revolutionizing the way retail stores operate. Ranging from 1985 mechanical engineering doctoral graduate C.T. Wolfe to senior intern Austin Herman, UK alumni are a big part of the Badger story.

According to Rowland, between six to eight percent of the products a retail store is supposed to stock aren't even on the

shelves. A related problem is that the products may not be arranged according to the planogram sent by the corporate office marketing team. Both discrepancies lead to lost revenue. Badger's website claims out-of-stock products lead to a revenue loss of 4.1 percent for an average retailer.

"Corporate likes to think it knows what's going on in its stores, but when you take a hard look into each store, it's chaos," explains Rowland. "How do you get visibility into that?"

Rowland describes Badger's origin as a "skunk works" within his former company. A manager in a retail division, Rowland and Bryan Ethington (Badger VP of Development) gathered an internal team and charged them with figuring out how robots could solve the problem of out-of-stock merchandise and planogram noncompliance.

The project gained momentum. In no time, approximately 40 others devoted a percentage of their time to it. Potential customers expressed interest. It wasn't because of the robots—because it's not about the robots, remember—but the ability to make decisions based on real-time data.

Then, in 2016, the project was suddenly canceled.

But the team wasn't ready to shutter the initiative. Rowland retired and founded Badger Technologies in his basement. Ten engineers who also believed in the project followed him. One of them was principal engineer and UK alumnus Andy Martin (BSEE '03, BSCS '03, MSCS '08).

"I was really excited because it would give me the opportunity to work with robots and design solutions to brand new problems," he recalls.

Badger's office occupied Rowland's dining room, and the engineers camped out in the basement.

"It was classic startup stuff," Rowland says, grinning. "We covered my pool table with plywood and worked on it. Neighbors wondered what was going on because there were always people over and packages of parts arriving at my house in the middle of the night. It was outrageous fun."

Rowland's team completed a demo within a month. In the summer of 2017, Jabil Corporation, headquartered in St. Petersburg, Florida, acquired Badger as wholly owned subsidiary. Before long, the team moved into its current location in Nicholasville. They also picked up a customer, Dutch retailer Ahold Delhaize, which Rowland says challenged his team to solve a different problem than the ones they had previously researched.

"Their big problem had to do with safety—specifically, clean floors. They wanted us to have Marty inspect the floors for spills or busted sacks of sugar, anything that might cause injury to a customer or employee. So now Marty surveys the shelves and the floors."

Since February, Badger has put Marty in four Giant stores and four Stop 'N' Shops in the Northeast —the busiest supermarkets in Ahold Delhaize's fleet. Every hour, Marty hits the aisles, whether the shoppers number 50 or 500.

"We're getting into an industry that's really brand new," says Rowland. "It has all the cool buzz words: artificial intelligence, machine learning, computer vision and robotics. Yet we take pride that we're right here in Nicholasville, Kentucky."

Rowland also takes pride in the quality of his engineering team, heavily flavored by Wildcats.

"We've got some of the best in the world, homegrown, right here. People might assume central Kentucky engineers don't compare to those in Seattle or Boston, but they really do. They're surprising themselves, our customers and our competitors."

The key to Badger's success, according to Rowland, is its collaborative culture, the seeds of which were planted during those early days in his basement.



« Marty has giant googly eyes on his, um...face area. The innovation developed when a store employee surreptitiously affixed a set of eyes to Marty's exterior. For Badger engineers, who are regularly contemplating how to make robots more personal, the addition was a hit. Googly eyes have come standard on Marty ever since.

» Travis Riggs, team lead for Marty's software and firmware, on where Marty got his name: "I was getting ready to introduce the robot to some potential customers who were all non-technical people. I simply wanted to make the robot less intimidating. I chose Marty because it was a classic American name. Later, some people tried to create acronyms for it. But the real story is that I wanted to make an extremely complex system more approachable to humans. So, I introduced him as Marty. And it stuck. We can't ever get rid of it."



» College of Engineering alumni currently at Badger:
Jeff Bowers
Andy Callahan
Andy Martin
Josh Evans
Todd Caldwell
C.T. Wolfe
Ryan Baltenberger
Chris Ratliff
Jonathan Lutz
Nolan Lancaster
Andrew Walker
Christopher Case
Michael Phelps
Gary Webster
Meetra McDonie
Joel Cowen
Austin Herman (intern)
Joey Harrison (intern)

Badger's massively open floor plan features no cubicles, no offices and only five doors in the 7,800-square-foot space. Introverts have had to make adjustments, but Rowland says the payoff is worth it.

"My vision was to start a company where I could get rid of all the roadblocks and allow the engineers to be the best they can be. If you can get smart people in the right environment and release them to solve problems, they will amaze you."

Sixteen UK alumni currently work at Badger, and they couldn't be happier.

"I never dread coming in, and sometimes I have to peel myself away at night," admits Jeff Bowers, program manager (BSEE '98).

"It's a great place to be if you're up for a challenge," Martin affirms.

In the past year, Badger's proximity to UK has opened doors for possible partnerships. In June, Rowland spent a day with faculty

members in the UK College of Engineering who presented their research on cyber-human systems, signal processing, robotics, controls, cloud computing, artificial intelligence, machine learning and more.

"I've seen other technology hotspots closely connected to academia so I told our team, 'We have some great schools around here, and we need to leverage those relationships.' I'm glad to hire UK grads, but I'd like to do more."

In addition to the UK alumni on board, Badger also hires UK co-ops and interns. During his summer internship, Austin Herman worked on making maps for Marty.

"When Badger goes into a new store, a group will bring back a 3-D cloud file with a map of the layout. I cleaned up the maps and made them navigable for Marty."

Office manager Tammy Doss has been impressed with UK

students who are learning the ropes even as Badger's engineers invent them.

"Our co-ops and interns monitor our robots in the field constantly, because if one gets stuck, someone has to remotely get it unstuck. One day, an intern came to us and said Marty was stuck. But then he went into the program himself and got Marty moving again. Our engineers spent five months developing that system, and this kid figured it out just like that. We need such fresh minds."

"The co-ops and interns blow me away by their energy level, wide-eyed wonder and willingness to tackle any problem you give them," Rowland agrees. "There's no stopping them."

Badger's only serious limitation is lack of space; however, they have no plans to leave central Kentucky. In fact, when a possible funding partner made moving to San Francisco a requirement, Rowland delivered a flat "no."

"We're Kentucky people who love our place, and we're not going to move."

So will you one day glance up from scrutinizing the cost of Pop-Tarts to see Marty gliding your way? Austin hopes so.

"I think about it every time I go into Kroger. I would love to see Marty in there and know I was a part of that."

It could happen, and quickly. Rowland says it's all a matter of scale.

"We're not trying to get a thousand customers, but one customer with a thousand stores. At the end of the day, retailers are totally pragmatic. The robots are the alluring part, but it's all about the data."

Sorry, Marty. It's just not about you. ■



\$180K RAISED FOR A SCHOLARSHIP IN DR. HOLLOWAY'S NAME

The Holloway family (L-R): Karolyn (daughter), Adrain (wife), Larry, Jane (mother), Parker (son), Elizabeth Pulliam (sister). Taylor (son) participated via Skype.



On the afternoon of June 15, 2018, Interim Dean Larry Holloway headed to the James and Gay Hardymon Center for Student Success for a meeting with Dean's Advisory Council member Floyd Henson. When he arrived, he found not only Henson but also members of his family, UK President Eli Capilouto, UK Provost David Blackwell, and numerous college faculty and staff.

Holloway could only laugh. What in the world was going on?

Henson announced that in gratitude for Holloway's two years of dedicated and tireless service as interim dean of the UK College of Engineering, 40 members of the "Friends of Holloway Society" had raised \$183,250 to endow the "Larry

and Adrain Holloway Endowed Scholarship in Engineering."

"I have thoroughly enjoyed my time as dean of the college and as chair of the Department of Electrical and Computer Engineering," said Holloway. "I am always amazed by our students but also by our faculty and staff and the generosity of our alumni. This has been a great experience in the College of Engineering, and my wife and I are deeply moved by the generosity shown in creating this new scholarship."

While Holloway is no longer interim dean of the college, he hasn't gone far. On July 1, he began his new role as vice provost of the university.

CLOUD-MAP

TEAM SOARS AT FLIGHT WEEK

Lindsey Piercy, UKPR



Could unmanned aircraft systems (UAS), otherwise known as drones, revolutionize weather forecasting? The University of Kentucky continues to conduct groundbreaking research that suggests they could.

In 2015, a four-university interdisciplinary team began developing small, affordable UAS to measure wind turbulence, atmospheric chemistry, soil moisture and thermodynamic parameters to better understand severe storm formation. The project, known as CLOUD-MAP for "Collaboration Leading Operational UAS Development for Meteorology and Atmospheric Physics," was awarded through the National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR).

"Having hands-on experience in the field you are interested in also gives you a chance to see what you can do with your major

and what possibilities there are for you in the working world," Christina Vezzi, a mechanical engineering student, said. "This project has introduced me to different applications of engineering I had never thought of and has gotten me interested in the relationship between engineering and meteorology."

Eighteen students, staff and faculty from UK, along with Oklahoma State University (OSU), University of Oklahoma (OU) and University of Nebraska-Lincoln (UNL), recently converged in Alamosa, Colorado, for an exciting opportunity known as ISARRA Flight Week, where they joined researchers from other universities in the U.S. and around the world.

"Being able to practice real life problem-solving skills while working together as a team really transcends what one can accomplish in a classroom. Experiences like this put our students in a position where they are ready to step into their careers and be



immediately successful," Caleb Canter, a mechanical engineering graduate student, said.

Overall, dozens of research drones, fitted with sensing equipment and weather instruments, zipped, hovered and soared over the San Luis Valley during the five-day trip. They collected data on how and where storms start and rain falls, with the goal of learning more about local weather patterns important to farmers and residents.

"Forecasters use complex weather models for their work. These models rely on data that is gathered daily but in locations that are few and far between compared to what is needed to understand and forecast local weather," Suzanne Smith, the Donald and Gertrude Lester Professor of Mechanical Engineering and director of the Kentucky Space Grant Consortium and NASA EPSCoR, explained. "Ultimately, the payoff of Flight Week is

better local weather forecasting."

The research gathered during Flight Week is just one example of how the College of Engineering continues to lead efforts to develop autonomous systems to improve weather forecasting.

UK has been conducting unique UAS development and flight testing research since 2002. As a result, UK has extensive and recognized experience developing sensors, UAS platforms and flight operations for technology development, agricultural and atmospheric science.

The CLOUD-MAP team will continue to combine data and results gathered from Flight Week over the next 12-18 months. ■

UK Paducah Engineering Program CELEBRATES 20 YEARS



On September 21, 2018, the University of Kentucky College of Engineering Extended Campus at Paducah held a 20th anniversary celebration. Opened in 1998 after six long years of lobbying, convincing and recruiting, 200 undergraduate students pursuing chemical and mechanical engineering degrees call it their home.

“We originally focused on attracting and educating students from the Purchase region for positions in local industrial plants and engineering firms,” said former College of Engineering Dean Thomas Lester. “I am happy to say that more than 70 percent of graduates have secured employment in the Purchase region. Local industries continue to thrive and to seek engineering employees from the Paducah engineering program.”

At the event, UK Paducah director David Silverstein honored those who helped launch the program, shared its achievements and cast a vision for its future.

“The success of our graduates as they meet and exceed employer expectations is the strongest evidence of the success of the Paducah program,” said Silverstein. “As we celebrate the past 20 years, we look forward to advancing the UK Paducah Engineering programs to new heights to impact our students, our region, our state and beyond.”



Nancy Albright, BSCE 1990; MSCE 1992, has been named the recipient of American Society of Civil Engineers (ASCE) 2018 Government Civil Engineer of the Year Award in honor of 25 years of outstanding service as a transportation engineer in the Kentucky Transportation Cabinet.

Raju Balakrishnan, MSME 1983, dean of the College of Business at the University of Michigan, has been reappointed to a second five-year term that will last through June 30, 2023. Balakrishnan joined the College of Business as dean in 2013. He also serves as a professor of management.

Rob Beeler, BSME 1989; MSEE 1992, was named 2018 Chief Technologist of the Year by the Indianapolis Business Journal. Beeler is vice president of engineering at Carbonite in Indianapolis.

Chance Corum, BSAE 2012, has been named the American Society of Agricultural and Biological Engineers Quad-City Section's 2018 Young Member of the Year. He is currently involved in crop processing testing at John Deere Harvester Works in Moline, Illinois.

Tyler Cundiff, BSCE 1998, has been named the University of Kentucky's Young Construction Engineer of the Year. Cundiff is currently vice president of business development in Gray Construction's Food and Beverage Market. Cundiff has been with Gray Construction since serving as an intern in 1997.

David Horseman, BSEE 1971, has been appointed associate commissioner in the Office of Career and Technical Education

at the Kentucky Department of Education. Horseman had served as the office's director of technical schools and federal programs since 2015.

Alesa G. Johnson, BSEE 1989, of Somerset, has been appointed by Kentucky Governor Matt Bevin to the Kentucky Board of Education. Johnson is the chief workforce solutions officer for Somerset Community College and a former engineering and operations superintendent for ExxonMobil.

Catherine Johnson, Ph.D MNG 2015, was selected by University of Missouri System President Mun Choi to serve as a 2018-19 Presidential Engagement Fellow. Johnson is assistant professor of mining and explosives engineering at Missouri University of Science and Technology.

Kelly Kachurak, BSCE 2010, officer with the U.S. Public Health Service, recently received the Federal Engineer of the Year award from the National Park Service, the highest accolade possible for an engineer in the federal service.

D.L. Lobb, BSCE 1979, has been named president of Bighorn Mining, LTD, based in Hinton, Alberta, Canada. Lobb is a 38-year veteran of the mining industry with a proven track record across diverse business environments in the United States, South America and Asia.

James E. Manning, BSMNG 1979; BSCE 1984; MSMNG 1995, has been named executive director of the Kentucky State Board of Licensure for Professional Engineers and Land Surveyors. Manning had served as the board's director of enforcement since 2008.

Lt. Col. Dustin Mitchell, BSEE 1998, has joined Vanderbilt University as commanding officer of Vanderbilt's Army Reserve Officers Training Corps unit. Mitchell brings extensive military education and training to his commanding officer role.

Aleksi Paaso, MSEE 2011; Ph.D. EE 2014, is technical co-chair of the 2020 IEEE PES T&D Conference and chair of the IEEE PES task force on microgrid design. Paaso is manager of emerging technology at Commonwealth Edison.

Mary Ramsey, BSEE 1986, has been appointed executive director of the International Society of Automation. Ramsey, who has been serving as ISAs interim executive director since January 2018, has more than 25 years of industrial automation experience.

Darrell Vincent, BSEE 1993, is now the principal of the Bullitt County Area Technology Center. Vincent had taught at Bullitt East High School for 22 years.

Jason Ward, BSCE 1996, was named the 2017 recipient of the United States Navy's prestigious Rear Admiral Lewis B. Combs Award, which is presented annually to one member of the U.S. military branch, which comprises 419,037 active duty and reserve personnel.

Marilyn West, BSME 2014, has been appointed to an ambassador role at Walt Disney World. As an ambassador, she will represent the company at public events and celebrate their fellow cast members. She previously had three undergraduate internships at Disney World while a student at UK.

Alumna Rebecca Wingfield One of Six New NASA Flight Directors



The 2018 Class of NASA Flight Directors for the Mission Control Center (L-R): Marcos Flores, Allison Bolinger, Adi Boulos, Rebecca Wingfield, Pooja Jesrani and Paul Konyha. Credits: NASA/Robert Markowitz

In July, University of Kentucky alumna Rebecca J. Wingfield became one of six women and men selected to join the elite corps of flight directors who will lead mission control for a variety of new operations at NASA's Johnson Space Center in Houston.

Wingfield, from Princeton, Kentucky, interned at NASA's Kennedy Space Center before graduating with a bachelor's degree in mechanical engineering from UK in 2007. She joined the flight control team at Johnson Space Center in 2007 as a contractor with United Space Alliance, overseeing maintenance tasks that the astronauts perform in space. She also holds a master's degree in systems engineering from the University of Houston – Clear Lake.

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NOTES:

Cover: Grace Oparinde, a senior majoring in computer science from Douglasville, Georgia. She will graduate in May 2019.

pp. 2-3: Isabella Ritz, junior materials engineering major and biomedical engineering minor.

pp. 8-9: This photo was taken in the conference room of the James and Gay Hardymon Center for Student Success, which opened in August 2017.

pp. 10-11: When Jonathan Pham studied engineering as an undergraduate at The Ohio State University, he took advantage of an opportunity to study corrosion in a faculty member's research laboratory. That professor was none other than Rudy Buchheit, who is now dean of the UK College of Engineering.

pp. 14-15: We interviewed Kim Anderson during the summer, when she resolved to relax more. Her book of choice at the time: "The President is Missing" by Bill Clinton and James Patterson.

pp. 16-17: How many faculty members in this photo can you identify?

p. 28: In the period of just a few weeks, Simone Silvestri published five papers in top-level journals such as IEEE Transactions on Mobile Computing, ACM Transactions on Sensor Networks and IEEE Transactions on Network Science and Engineering.

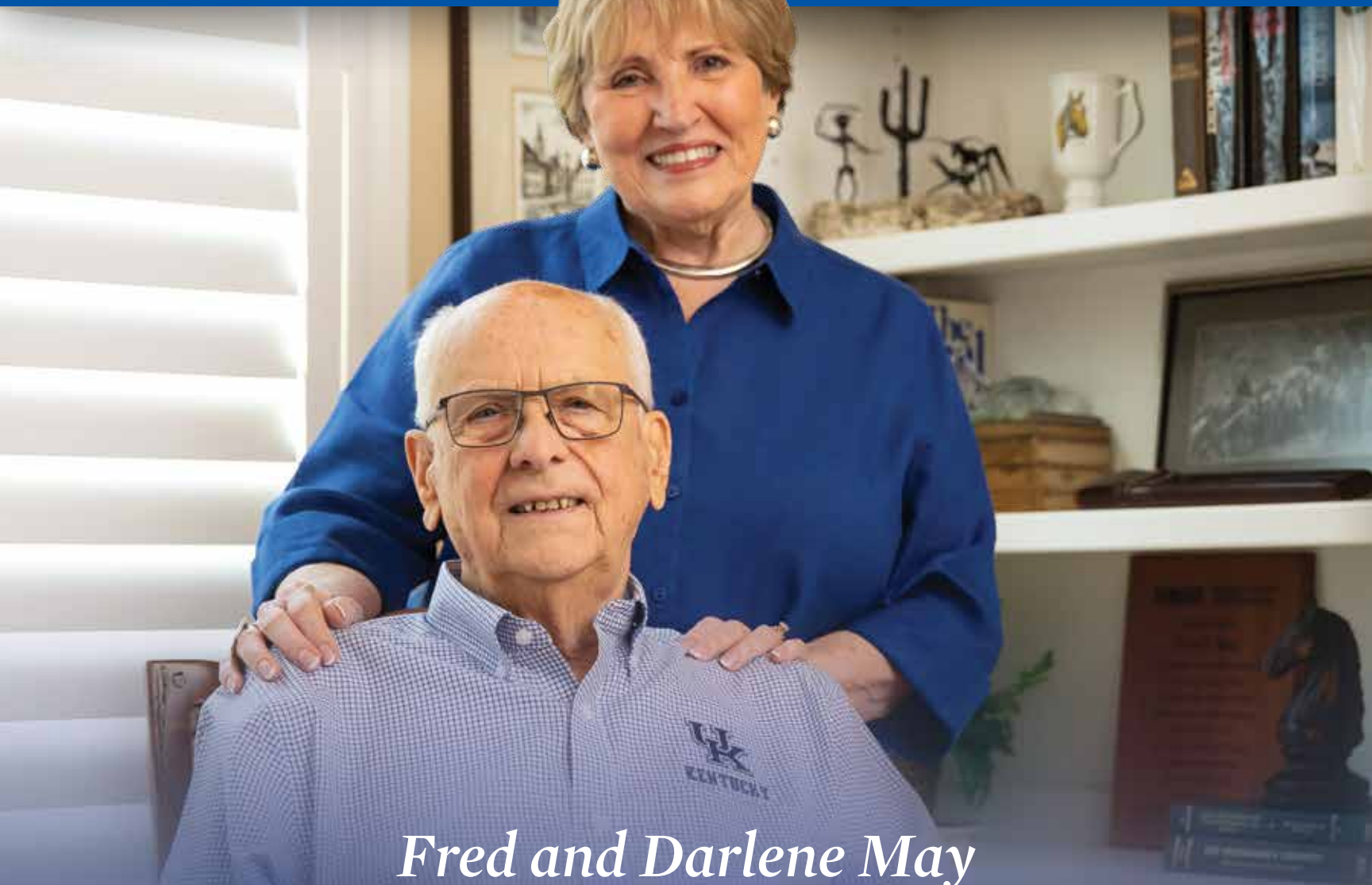
p. 29: This fall, NBC Learn spent time interviewing Corey Baker and his graduate students for a video to be released in early 2019. In partnership with Chevron, ASEE and the National Science Foundation, NBC Learn is producing a series of videos to inspire more young kids to get into engineering. Each video will come with a lesson plan so it can be directly used by teachers in the classroom to reach kids at a younger age.

pp. 38-39: Badger's name stems from a popular honey badger video on YouTube (yes, that NSFW one). Rowland says the name reflects his team's tenacious attitude when it needs to overcome obstacles and make breakthroughs.

pp. 40-41: Cloud solutions architect Todd Caldwell (BSCS '96) told us that while cloud computing didn't exist when he took computer science classes at UK, his education gave him the fundamental skills necessary to move into emerging fields. "So much of your success in this job depends upon your ability to collaborate and communicate with others, critically evaluate requirements and turn them into a design you can implement with quality. You learn that through practice, and my education at UK exposed me to that."

pp. 42-43: At a celebration lunch near the end of Dr. Holloway's time as interim dean, we presented him with a basketball signed by staff members and another basketball signed by men's basketball coach John Calipari (we know he will treasure ours more).

GIVING BACK



Fred and Darlene May

Born and raised in Prestonsburg, Kentucky, Fred T. May graduated with distinction in 1958 with a Bachelor of Science in electrical engineering from the University of Kentucky. As a student, he was a member of Phi Sigma Kappa fraternity, Tau Beta Pi and served as president of Eta Kappa Nu. He went on to earn a Master of Science degree from the University of Tennessee, while working full time in thermonuclear plasma research at Oak Ridge National Laboratory. In 1961, he returned to Lexington and began what would become a long and distinguished career with IBM. In 2010, Fred became the 90th inductee into the UK College of Engineering Hall of Distinction.

When Fred was at UK, he tried to get financial aid, but none was available. He hoped that someday he would be able to encourage students by helping with their financial needs. As a result, Fred and his wife, Darlene, have established two annual scholarships for electrical and computer engineering students from Floyd, Pike, Knott and Martin counties, and have committed an estate gift that will endow the scholarships in perpetuity.

For more information about supporting engineering education through estate planning, contact Matthew Briggs, director of development, at (859) 218-3506 or matthew.briggs@uky.edu.



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Group photo from the WiE Explore: Women in Engineering Summer Camp.