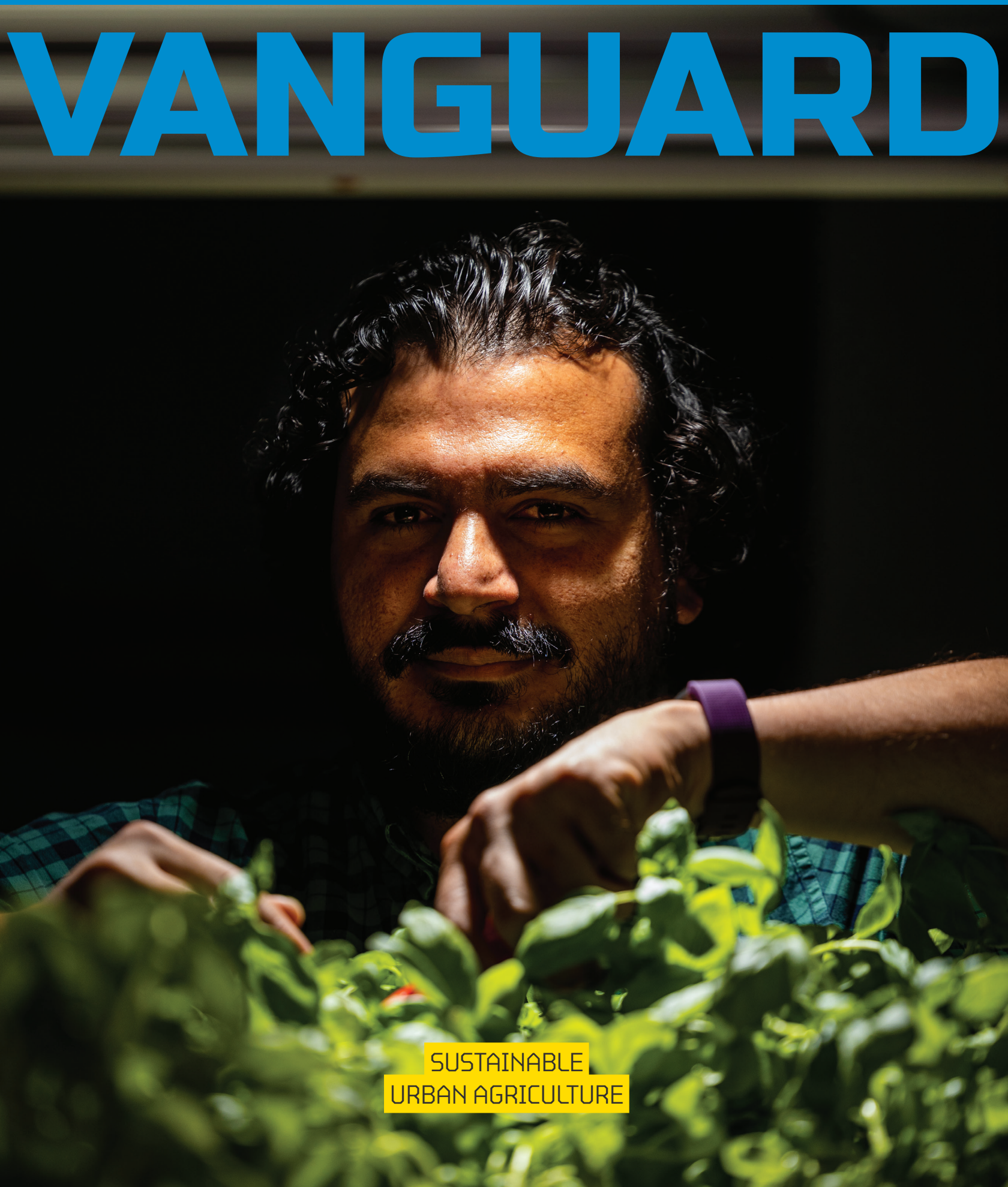
FALL 2022 VOLUME 06

Research at the forefront from the **UMKC School of Science and Engineering**

VANGUARD



SUSTAINABLE URBAN AGRICULTURE

/FROM THE DEAN

Dear friends,

It's a pleasure to connect with you again. Despite the challenges of COVID-19 over the past couple of years, exciting changes are underway at UMKC, and we continue to strive for excellence in education.

We recently launched **UMKC Forward** to reimagine our future in innovative and creative ways that will grow our excellence and financial stability. UMKC Forward is the pathway to creating excellence in teaching and research. To fulfill that purpose and maximize resources, UMKC has realigned its academic units, including the merging of the School of Computing and Engineering with the School of Biological and Chemical Sciences to create the School of Science and Engineering (SSE). This realignment will provide our students and faculty the opportunity to work in interdisciplinary teams to solve complex, life-changing problems. The restructured school now includes the following divisions and programs of study:

Biological and Biomedical Systems

- Biological Sciences
- Biomedical Engineering

Energy, Matter and Systems

- Chemistry
- Electrical Computer Engineering
- Mechanical Engineering
- Physics

Natural and Built Environment

- Architecture, Urban Planning and Design
- Civil Engineering
- Earth and Environmental Sciences

Computing, Analytics and Mathematics

- Computer Science
- Information Technology
- Mathematics and Statistics

The realignment will allow us to support students and faculty by creating synergy and innovation in teaching, research and service.

In addition, the opening of the Robert W. Plaster Free Enterprise and Research Center last fall drew nearly 3,000 visitors, ranging from K–12 students, to entrepreneurs and CEOs. We continue to find high interest in using this state-of-the-art facility and its equipment for research, innovation and education.

SSE also continues to grow by leaps and bounds — enrollments, research and outreach are at record levels. SSE is now made up of more than 3,500 students, $55M in research, and 100,000 K–12 students participating in the KC STEM Alliance programs.

Throughout the pages of this issue of Vanguard, we hope to give you a glimpse of the great research that is being performed within SSE. We want to inspire you with the stories already taking shape and to challenge your own thinking.

SSE was not created just for our students, faculty and staff — it belongs to all of us — our alumni, industry partners, innovators and entrepreneurs across the Kansas City region. Reach out! Tell us your ideas and let us see how we can help. My door is always open.

KEVIN Z. TRUMAN, PH.D., F.ASCE
Vice Provost, UMKC
Dean, School of Science and Engineering

VANGUARD

/'VAN,GÄRD/
A group of people leading the way in new developments or ideas

Research at the forefront from the **UMKC SCHOOL OF SCIENCE AND ENGINEERING**

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UMKC
School of Science and Engineering

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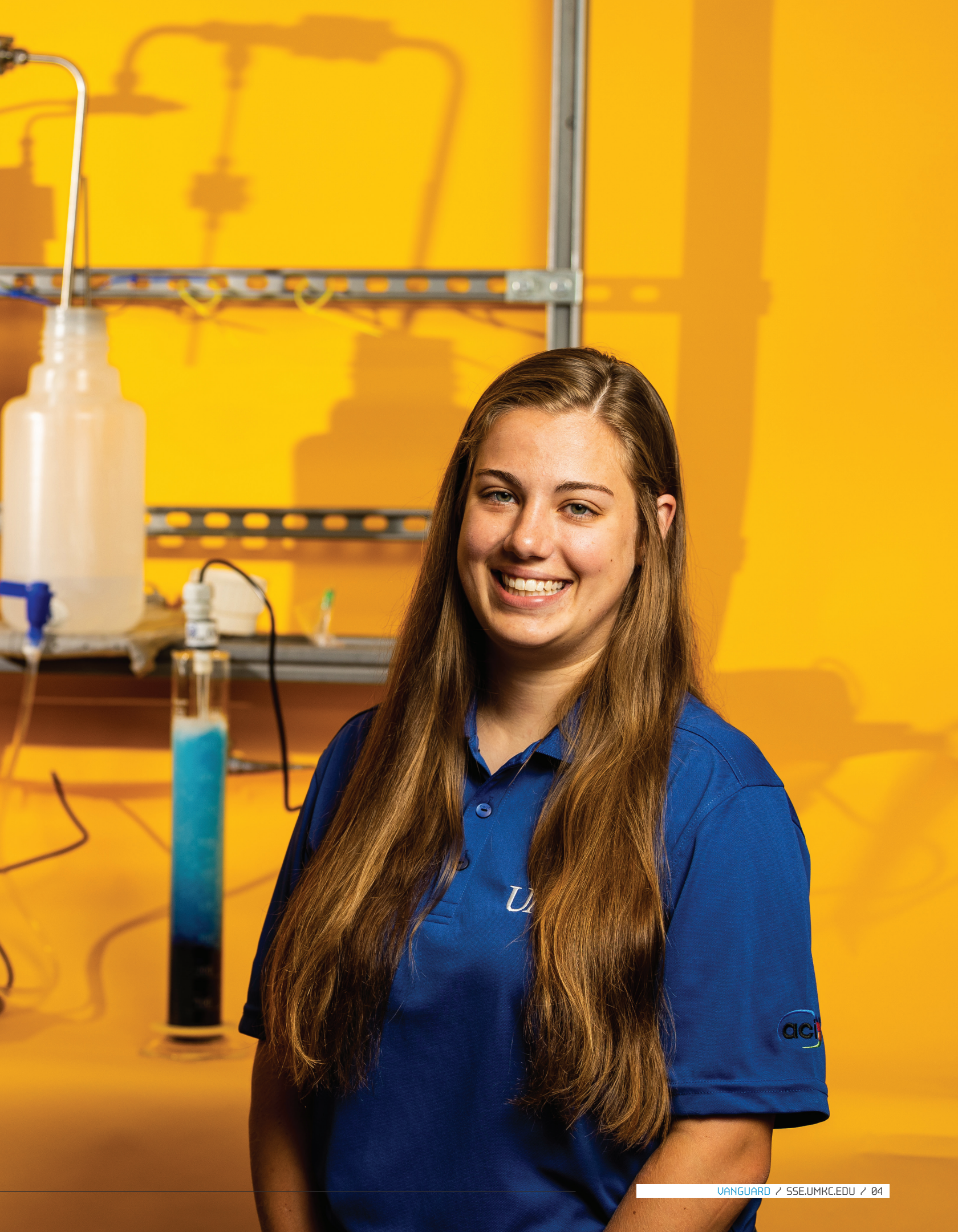
Juan Cabrera-Garcia, Ph.D. — shown on the cover inside one of the shipping containers used to grow basil at the Veterans Community Project campus — lends his horticulture expertise to a pilot program designed to teach veterans hydroponic farming methods.

BRANDON PARIGO

FILTERING OUT ‘FOREVER CHEMICALS’

Professor, graduate student fighting to remove PFAS from drinking water

BY RILEY NEWTON



School of Science and Engineering professor Megan Hart and graduate student Hannah McIntyre have been researching technology to remove PFAS, nicknamed 'forever chemicals' due to their slow break down, from drinking water.

"I got into engineering because I want to make the world a better place," Hart said. "My end goal is to create destructive technology that breaks [PFAS] up into its ionic components, like fluoride and nitrogen that are inactive and won't hurt anyone. I want to make it safer for us to drink water, safe for our fish to be in rivers. That's the end goal."

PFAS, or per- and polyfluoroalkyl substances, are widely used, long-lasting chemicals used to make fluoropolymer coatings and products that resist heat, oil stains, grease and water — such as the film that prevents grease from your delivery pizza penetrating the box or the coating on the bottom of non-stick cookware.

Because of their slow breakdown and widespread use, PFAS sink into groundwater, soil and the air around us, making their way into our bloodstreams. Roughly 97% of Americans have PFAS already in their blood, which is dangerous because increased exposure to PFAS has been linked to several health issues from decreased fertility to cancer, according to research from the Environmental Protection Agency.

Currently, there is no approved technology for removing large amounts of PFAS from liquids.

"We have leveraged [PFAS] capabilities for so long that it's too late; it's everywhere now," Hart said. "But the challenge is, there's not really a good solution to stop them — so I thought, 'Let's make one.'"

In Hart and McIntyre's research, items containing high levels of PFAS, like the foam firefighters use, are pumped through two reactors containing UV lights and their research media — a photocatalytic granular media that reacts with UV light to form free radicals that attack the contaminants. The solution is continuously passed through the reactors until the solution is clean and clear.

"What we have created is a media that does two things; it causes the bad stuff to stick to it, and because it's in close proximity to the photocatalyst, it then destroys it by creating free radicals in the solution," Hart said.

The two women have worked together, just the two of them, for the last three and a half years to perfect their media. Hart compared the research process to running a small business.

Funding for the research comes from the Strategic Environmental Research and Development program, the environmental science and technology branch of the U.S. Department of Defense.

Hart is a nationally recognized expert in geotechnical engineering and long-time environmental researcher. Prior to coming to UMKC in 2014, she worked as an environmental engineer for the Missouri Department of Natural

Resources, researching areas of hazardous waste, groundwater analysis, water and wastewater treatment. Some of her past research led to the creation of a passive filter process technique that now provides clean drinking water for developing worlds.

Now, her current research will be helping those closer to home. Hart and McIntyre's research is currently in licensing negotiations with an industrial company and the women have been offered an opportunity to test their system at a military site of their choosing.

"Right now, our target is to look at [Department of Defense] sites, the majority of which have some form of high PFAS contaminated groundwater. We want to protect the people with the closest proximity to high contamination," Hart said. "My goal is to have this technology on site to clean water in the next few years."

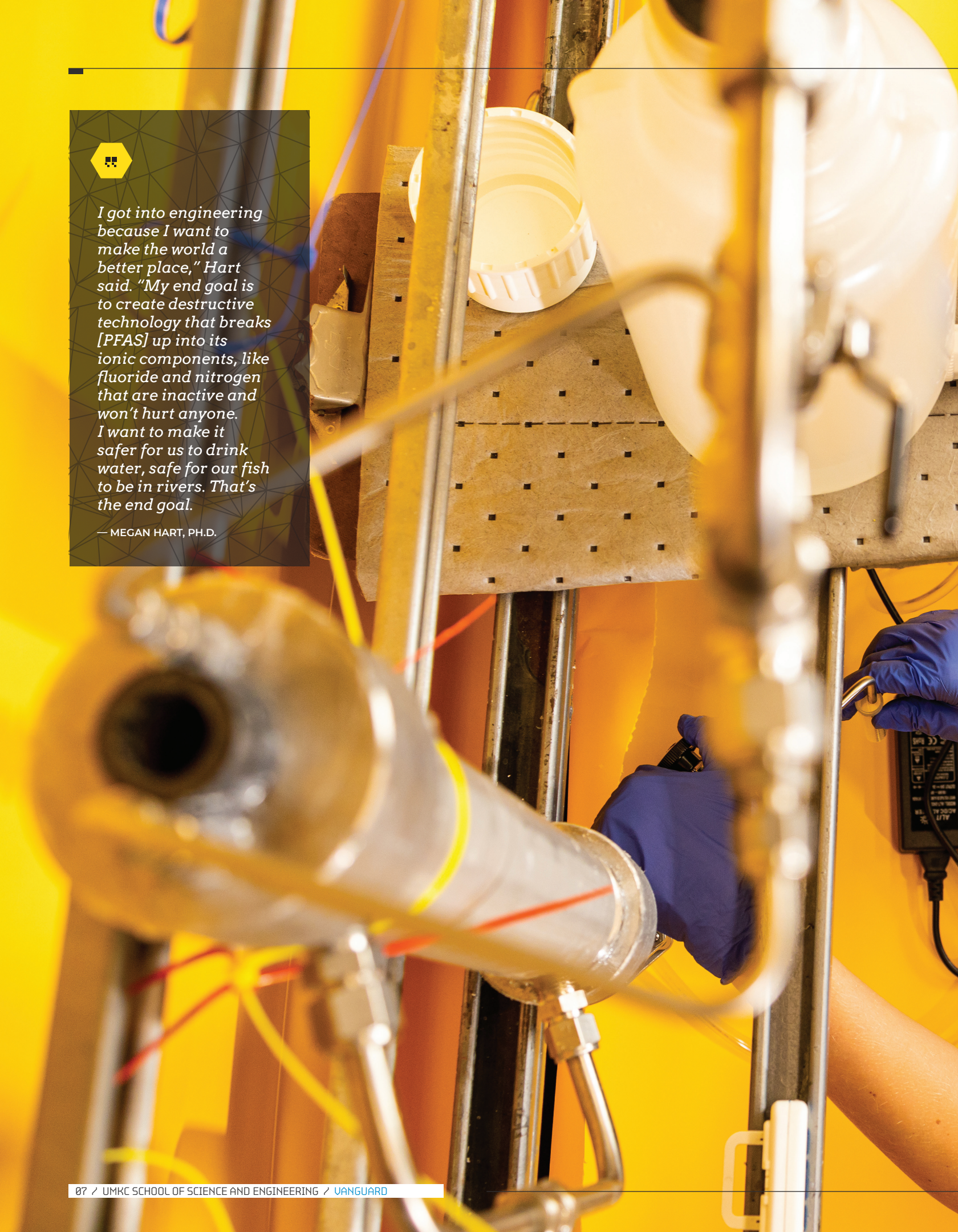
While you may have to wait a couple of years, Hart hopes her technology will find its way into your home.

"The ultimate goal is to transition to a point-of-use filter, like a Brita filter, or a filter that would go directly with wastewater, drinking water or a landfill," Hart said.

//MEGAN HART, PH.D.
Professor, School of Science and Engineering

RESEARCH INTERESTS
Expansive clay soils, permeable reactive materials, environmental remediation for storm and groundwater, groundwater and geochemical influences on soil structure and mechanics

JOINED UMKC
2014



I got into engineering because I want to make the world a better place," Hart said. "My end goal is to create destructive technology that breaks [PFAS] up into its ionic components, like fluoride and nitrogen that are inactive and won't hurt anyone. I want to make it safer for us to drink water, safe for our fish to be in rivers. That's the end goal.

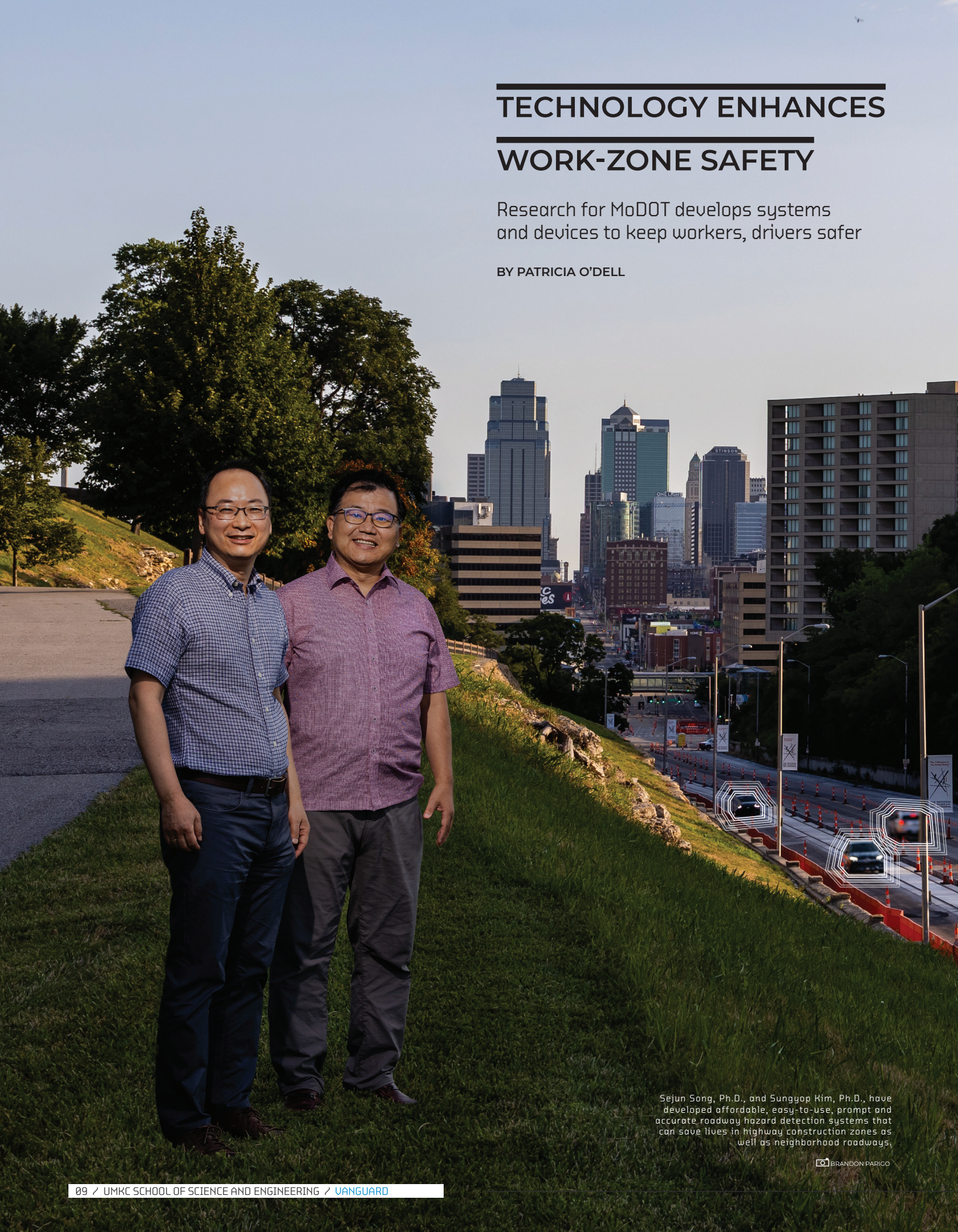
— MEGAN HART, PH.D.


UMKC
UMKC

TECHNOLOGY ENHANCES WORK-ZONE SAFETY

Research for MoDOT develops systems and devices to keep workers, drivers safer

BY PATRICIA O'DELL



Sejun Song, Ph.D., and Sungyop Kim, Ph.D., have developed affordable, easy-to-use, prompt and accurate roadway hazard detection systems that can save lives in highway construction zones as well as neighborhood roadways.

BRANDON PARIGO


Santa Fe Place
CONDOMINIUMS
World's Most Diverse WWI Collection
THE NATIONAL WWI MUSEUM AND MEMORIAL

A research collaboration between professors in the UMKC School of Science and Engineering and the Missouri Department of Transportation has the potential to minimize highway construction zone hazards as well as improve residential roadway safety. Sejun Song, Ph.D., and Sungyop Kim, Ph.D., have developed an affordable, easy-to-use, prompt and accurate roadway hazard detection system that can save lives in highway construction zones as well as neighborhood roadways.

"Historically, people do not slow down on highways in work zones," Song says. "So, the number of fatalities among highway workers is high. The Missouri State Department of Transportation has made protecting highway workers a priority. It's an important issue, and we wanted to focus on how to protect these ground workers."

As Song began to study highway safety, he wanted to look beyond traditional accident prevention methods, such as cones, reflective vests and back-up signals. In addition, he noted that many existing safety measures were audible. The most common is the ubiquitous beep of vehicles in reverse.

"Construction zones and highways are noisy," Song says. "This can make it difficult to hear or focus on the alarm."

He adds that even the location of police sirens can be hard to place. Often construction crews have spotters to aid in protecting ground workers.

Song realized that a potential solution might involve communication technology and invited Sungyop Kim, Ph.D., who is an expert in communication, to collaborate on the research. Kim had studied the use of existing technology to improve safety, but much of it is expensive and difficult to maintain. He and Song developed a solution that is both affordable and can be easily carried by ground workers. Song says they arrived at the solution by reinventing existing technology.

"Rather than using Bluetooth or Wi-Fi, where the signal transmission may cause a delay, we wanted to enable machine-to-machine communication," Song says. "So, if you are near me, the signal will go directly to me without going through layers of communication. This is much faster."

It's also inexpensive. Song says device-to-device communication may cost less than $1. In addition, the technology includes a radio frequency (RF) signal — the same type of electromagnetic wave that carries music to FM radios and video to televisions — that the researchers designed to be placed in a small portable device.

"In addition to a siren, with the RF signal it would be possible to send an alert to the devices in the area – cars or cell phones that have the adapted technology."

"Dr. Kim introduced the collaboration opportunity," Song says. "He is an expert in transportation. When he introduced this idea, I was surprised. It was the exact place to apply this technology. And he was right. It works."

Song says he and Kim have learned a lot from one another.

In addition to a siren, with the RF signal it would be possible to send an alert to the devices in the area – cars or cell phones that have the adapted technology.

— SEJUN SONG, PH.D.

"I'm fascinated by different ideas and different approaches to problems. When I talk with other experts on traffic safety, we always talk about the same things. But other types of scientists have different ideas and approaches."

Their technology has much broader reach than construction sites alone. Even in day-to-day automobile traffic, an RF signal is more effective than the sound of a siren. "If you are a driver on the road and you hear a siren, you don't know where it's coming from – the left or the right. With an RF signal you would know if a police car were approaching and from which direction."

The researchers refer to this broader application of the technology as "Wi-Fi Honk."

"Airports are one example," says Song. "Airport workers wear headphones, and there are a lot of moving vehicles. The construction industry would be an opportunity for adoption as well as companies with busy warehouses like Amazon."

The potential evolution of the technology is broad. The researchers anticipate users being able to download the technology through an app on devices such as a smartphone, so if someone were running or biking and listening to music, they would be alerted to applicable alarms such as the approach of emergency vehicles. In addition, the researchers have anticipated the complications of high-density areas.

"Even in high density situations we have applied technology to filter out anything that is not applicable to the individual user," Song says. "For example, if the signal comes from a car that is not in your trajectory, then you would not receive their warnings."

Song and Kim are in the process of developing a survey for safety engineers and industry experts about previous technology they have used and the barriers and challenges they've encountered. With this information they will be able to evaluate the demand for this technology. Once they incorporate that feedback, they will develop the system specifically for the transportation construction environment.

John Kevern, Ph.D., department chair, civil and mechanical engineering, views this collaboration as a catalyst for technological innovations and collaborations.

"We see this as a unique opportunity to leverage UMKC's transportation and computer science expertise to save the lives of Missouri construction workers."

Song and Kim's research represents one of the first collaborations within the new school, and the first between the faculties of Urban Planning, Computer Science and Civil Engineering.

"One of the primary objectives of the new School of Science and Engineering is to break down silos, thereby enabling and simplifying the formation of multi-disciplinary research teams that can solve real world problems," Kevin Truman, dean of the School of Science and Engineering says.

Truman says this is just the beginning of many such collaborations.

"This project illustrates the necessity for multidisciplinary teams from the sciences and computing and engineering. These opportunities bring each individual team member's cutting-edge expertise together to provide collaborative, state-of-the-art research and solutions that will impact the world."

//SEJUN SONG, PH.D.
Associate professor, School of Science and Engineering

RESEARCH INTERESTS
Software defined networks, cloud computing and data center networks, network systems security and fault-tolerance management, embedded real-time systems and controller area networks, mobile operating systems and mobile cloud computing, wireless/sensor networks, software systems and quality assurance

JOINED UMKC
2013

//SUNGYOP KIM, PH.D.
Professor, UMKC Division of Natural and Built Environment

RESEARCH INTERESTS
Urban transportation planning, travel behavior, traffic safety and aging

JOINED UMKC
2006

SUSTAINABLE URBAN AGRICULTURE

Partnership between UMKC and Veterans Community Project prepares veterans for farming careers

BY SHANDA COOK


VETERANS
VCP
22G1

There's something special growing inside a cluster of shipping containers outside the Veterans Community Project at 89th and Troost Avenue in Kansas City, Missouri.

The containers house controlled-growth environments for crops such as basil, mushrooms and (eventually) heirloom tomatoes. While there's no soil inside the massive containers, there is an abundance of opportunity for the military veterans who are learning agribusiness skills that can improve their lives, as well as help feed the community.

The pilot program, a partnership between UMKC and the Veterans Community Project (VCP), a nonprofit organization focused on ending military veteran homelessness, is funded by a three-year, $600,000 grant from the USDA and a $63,000 grant from the UMKC Entrepreneurship Innovation Program through the Kauffman Foundation.

The program has three main objectives:

1. Recruit and retain 50 military veteran beginning farmers
2. Transition at least 50% of these veteran farmers to agricultural or farm-STEM part- or full-time employment opportunities
3. Develop a veteran, urban, organi and sustainable-focused pilot program that can be replicated at future VCP site locations by guaranteeing a market for specialty crops

The program coalition, led by Angela Cottrell, Ed.D., director of research and institute programs for the Missouri Institute for Defense & Energy and adjunct instructor in the UMKC School of Education, Social Work and Psychological Sciences, focuses on supporting veterans through employment, education and entrepreneurship initiatives. Using three 20-foot independent-model container farms at VCP headquarters, military veterans are recruited, selected and trained on container-farm processes, hydroponic systems, food safety and technological innovations for increased specialty crop production (farm-STEM training). Veterans also receive financial, marketing, entrepreneurship and private pesticide applicator training. The coalition's overarching goal is to establish a pathway to economic viability and independence for veterans.

Cottrell said she had been considering ways to explore controlled environment agriculture for about two-and-a-half years. When she learned about the USDA grant that set aside specific funding for training veterans, Cottrell immediately thought of partnering with VCP CEO Bryan Meyer, who she had advised while he was studying law at UMKC.

"I met with Bryan and just tossed out the idea: 'What do you think about training veterans on controlled environment agriculture?' "Cottrell said.

Cottrell envisioned a program where veterans could gain a new skill set, be compensated for their time and enter into a workforce development pipeline where they can find additional employment, start their own farm or utilize that skill set to transition into a farm STEM-related position.

> *... It can be 10 degrees outside, and we're still able to farm. We're still able to produce and to train our veterans, and we can do that year-round.*
>
> — ANGELA COTTRELL, ED.D.

Meyer didn't need much convincing. His enthusiastic response to the idea ("All about it. Let's go!") planted the seed for forward movement.

Once the grants were awarded, faculty from across several UMKC academic units joined to contribute their expertise. Juan Cabrera-Garcia, Ph.D., assistant research professor at UMKC and state vegetable specialist at University of Missouri Extension, serves as the team's holistic horticulture expert and leads efforts to get the hydroponic systems up and running. JJ Lee, Ph.D., in earth and environmental sciences is helping to optimize sensors and water treatment systems. Two professors from the Bloch School — Jeff Hornsby, Ph.D., Henry W. Bloch Endowed Chair of Entrepreneurship and Director of the Regnier Institute for Entrepreneurship and Innovation, and Charles Murnieks, Ph.D., associate professor and the A. Gottlieb Chair of Strategic Management in the Department of Entrepreneurship and Management — lead the entrepreneurship training for the veterans. Finally, Karin Chang, Ph.D., associate director and associate research professor in the School of Education, Social Work and Psychological Sciences, ensures the primary objectives are being met in her role as the external evaluator for the project.

Cottrell said the controlled environment agriculture industry has grown exponentially in recent years and is expected to be a $170 billion industry by 2025. That's because modern techniques offer several advantages over traditional farming.

"This is a solution, particularly for cities like Kansas City, and for areas where growing traditionally is just not possible," Cottrell explained. "So, you're reducing that footprint, you yield 10 times the amount that you would on an acre of land, and you can grow year-round. That's another reason why we selected containers for our project — it can be 10 degrees outside, and we're still able to farm. We're still able to produce and to train our veterans, and we can do that year-round."

Not only are veterans learning how to grow the crops, but they're also gaining other marketable job skills, including pesticide application and produce safety, according to Cabrera-Garcia.

"We want to give them certificates to ensure that they have the ability to get hired in any agricultural enterprise," Cabrera-Garcia said.

Meyer said the partnership with UMKC appealed to him not only in terms of the growth and development it could offer local veterans, but also the shared goal with VCP to expand outreach beyond Kansas City.

"We have this organization that started in Kansas City, and it couldn't have happened without the general community support," Meyer said. "And now we've set this model, and this model is what's allowing us to grow into all these other locations. And I think there's the same opportunity for this program to be able to create the model here, work it out and then grow that program out across numerous other locations."

The first cohort of veterans has gone through the training program, and the second cohort is getting started this fall.

While the education component remains at the forefront of the program, Cottrell says the team is "thinking big," with plans to eventually distribute the produce to local neighborhoods in need.

"We want to have a multimillion-dollar controlled-environment agriculture facility in Kansas City, where we are hyper-focused on serving those impoverished neighborhoods where we know food deserts exist, where we know access to nutritional food is very difficult and expensive," Cottrell said. "We want to try to utilize this CEA system to provide that for Kansas City."

//ANGELA COTTRELL, ED.D
Director of research and institute programs for the Missouri Institute for Defense & Energy (MIDE) and adjunct instructor in the UMKC School of Education, Social Work and Psychological Sciences

JOINED UMKC
2009

// JUAN CABRERA-GARCIA, PH.D.
Assistant research professor at UMKC and state vegetable specialist at University of Missouri Extension

RESEARCH INTERESTS
Greenhouse crops (hydroponic and container grown), water quality, food safety, and crop nutrition.

JOINED UMKC
2021

DR. JUAN CABRERA-GARCIA EXPLAINS THE SCIENCE BEHIND HYDROPONIC SYSTEMS:

"What we do with hydroponics is we look at the environment that the plant grows in out in the field, and we try to replicate the optimum environment in these systems. We're always keeping the plant in that comfort zone. And that's why the plants do better in hydroponic systems, as opposed to growing out in the field, where the plants are fighting unpredictable weather conditions or fighting pests. That's one of the reasons why hydroponic systems are a little bit more successful in terms of resource-use efficiency. The nice thing about it is that we can control the variables, and we can adjust them to keep the plants in the comfort zone."

LIMITING DAMAGE FROM GLAUCOMA

Early-detection tool uncovers changes in data produced by electroretinogram test

BY JOHN MARTELLARO


0.5
12.5
2.2
4.8
25.4
4.0
16.8
7.8
0.9
12.9
20.2
2.9
2.9
22.2
14.2
19.1

The great challenge with glaucoma, a disease that causes blindness if untreated, is that it cannot be diagnosed until irreparable damage to the optic nerve has already occurred.

An interprofessional team of researchers at the University of Missouri-Kansas City is working to change that.

The team has developed a new patent-pending detection tool that uses machine learning to detect tiny changes buried deep in the data produced by an electroretinogram (ERG), a diagnostic test that measures the electrical activity of the retina in response to light. Lab tests have shown the technique to be 80-90% effective in detecting early-stage glaucoma in mice.

The research is a joint project of the School of Science and Engineering and the School of Medicine. The effort is led by Peter Koulen, Ph.D., Felix and Carmen Sabates/Missouri Endowed Chair in Vision Research and director of basic research at Vision Research Center; and Amirfarhang Mehdizadeh, Dr. Ing., assistant professor of civil and mechanical engineering.

Koulen explained that glaucoma is not a single disease, but a spectrum of eye diseases involving damage to the retina and optic nerve – damage the human body cannot heal. The most common cause is a buildup of fluid pressure inside the eye. That increased pressure does not cause pain or other symptoms, however, until vision becomes compromised.

Routine eye exams usually include pressure measurements, but anyone who is not getting regular exams won't be diagnosed. By the time the pressure rises to detectable levels, at least some damage has already occurred, even among those being tested regularly.

An early detection tool would play a vital role in allowing doctors to initiate treatment before irreversible damage occurs.

The ERG is a diagnostic tool currently being used on pediatric patients with congenital retinal disease. The UMKC team started exploring other possible diagnostic uses for the data it produces.

"There are only a small number of cells that are affected by glaucoma, and the electrical contribution of those cells to the overall signal is very small and very subtle," Koulen said. "We wanted to pinpoint changes in that small area within the larger signal, so we can detect glaucoma before eye pressure begins to increase."

Digging into the mountain of ERG data to find the relevant pebble called for a software solution. Mehdizadeh said the team applied multiple pre-existing machine-learning methods to the data and gauged the performance of each before narrowing their technique down to an algorithm that is a reliable predictor of glaucoma. That algorithm was the basis for the mouse studies.

"The results are proving our concept," Mehdizadeh said. "This warrants a larger clinical trial involving humans."

Eventually, the researchers see ERG measurements becoming a regular part of routine eye exams, just as pressure checks are now. How long until that happens?

"That depends on how soon we can get funding for the next clinical study," Koulen said. "And, we would need a licensee to make and market the hardware and software."

/ MACHINE LEARNING WORKFLOW USING ERG SIGNALS

ERG Database

▼

Pre-Processing of data

▼

Feature Extraction

▼

Predictive Model Development

▼

Deployment of Model into medical devices

Source: Figure 1. Novel Machine-Learning Based Framework Using Electroretinography Data for the Detection of Early-Stage Glaucoma.

There are only a small number of cells that are affected by glaucoma, and the electrical contribution of those cells to the overall signal is very small and very subtle," Koulen said. "We wanted to pinpoint changes in that small area within the larger signal, so we can detect glaucoma before eye pressure begins to increase.

— PETER KOULEN, PH.D.

// PETER KOULEN, PH.D.
Felix and Carmen Sabates / Missouri Endowed Chair in Vision Research and director of basic research, Vision Research Center

RESEARCH INTERESTS
Biomedical Informatics, Community and Family Medicine, Medical Humanities and Social Sciences, Neurology, Obstetrics and Gynecology, Oncology - Adult, Orthopaedic Surgery, Psychiatry, Surgery, Immunology, Neuroscience, Pharmacology, Pharmaceutical Science, Ophthalmology

JOINED UMKC
2009

// AMIRFARHANG MEHDIZADEH, DR. ING.
Assistant professor of civil and mechanical engineering

RESEARCH INTERESTS
Advanced turbulence modeling, turbulent heat transfer, multi-phase flows - turbulent dispersed flows, stochastics systems

JOINED UMKC
2016

BIG DATA DECODING ANCIENT TEXTS

Researchers use big data to expand understanding of Ancient Greek writings

BY SARA ATCHISON

> *We will be able to understand all ancient literature more thoroughly through machine learning. Imagine being able to step into an artificial intelligence environment and see and hear a Greek tragedy with such accuracy it would be as if you were transported back in time. That is the future.*
>
> — YUGYUNG LEE, PH.D.

Decoding ancient texts may not sound like work that would find its way into a computer lab, but a UMKC research team is proving that coding actually has a lot to offer. Yugyung Lee, Ph.D., and Jeff Rydberg-Cox, Ph.D., have brought a digital approach to the humanities that enhances our understanding of human heritage. Lee, from the School of Science and Engineering, partnered with Rydberg-Cox, from the School of Social Sciences and Humanities, to use big data, deep learning and natural language processing technologies to improve our understanding of Ancient Greek tragedies.

For the last three years, the UMKC team has been analyzing the range of emotions expressed in Ancient Greek tragedy through emotional sentiment analysis made possible by deep learning technology. They developed an intelligent software called StoryNet, a revolutionary framework for comprehending dialogues, character networks, emotion and subjects. This embedding technology uses large amounts of data to provide a more complete picture of what the story is telling us.

Consider the complexities of human communication that are not captured by just the letters on a page. Add to it the special considerations required when translating a language that has not been used in nearly 2,000 years, and it becomes apparent how gaps in interpretation may exist. The team has added back clues that can make the words come alive. The project received funding from the National Science Foundation's collaborative research program and the UMKC NextGen Data Science and Analytics Innovation Center.

Rydberg-Cox explains, "This technology is not that dissimilar to the software used by tech giants like Facebook, who collect data and then use it to deliver advertising. Perhaps a more altruistic use of this scientific knowledge, we believe this work gives us a broader understanding of important works of literary history."

Rydberg-Cox began his journey with this project nearly 30 years ago as a post-doctoral fellow at the University of Chicago. Using well-established standards for how literature is entered into a computer for digital preservation, he worked to encode these Ancient Greek plays. This established the repository that has been used by the current research team in StoryNet.

This partnership is an excellent example of cross-disciplinary work in the field of digital humanities. More than 30 students from the UMKC Department of English were involved. They identified consistencies between the information the technology had to offer and the ways humans understand sentiment in the text. They were essentially validating the computer's model and looking for ways to fine-tune the results.

Three doctoral students from the School of Science and Engineering played a pivotal role in developing the algorithm which processed the data. Two of these students have since joined the prestigious computing facility at the Oak Ridge National Laboratory and the third is now part of the artificial intelligence team at Expedia Group, Inc.

"We will be able to understand all ancient literature more thoroughly through machine learning," Lee explained. "Imagine being able to step into an artificial intelligence environment and see and hear a Greek tragedy with such accuracy it would be as if you were transported back in time. That is the future."

The team hopes to integrate this work into the augmented and virtual reality space through a partnership with the UMKC Innovation Studio, a community-facing technology hub operated by the School of Science and Engineering. They are beginning to imagine the space beyond the computer lab and beyond the page. With the knowledge and understanding of these texts required to bring them to life, they can bring history to life.

// YUGYUNG LEE, PH.D.
Professor of Computer Science
Electrical Engineering

RESEARCH INTERESTS
Real-time and big data analytics (Deep Learning) for pervasive and distributed systems, semantic techniques for mobile and cloud-based systems and applications (biomedical applications, web, mobile computing, and social networking), multiple agent systems for dynamic service discovery and composition for service-oriented systems, cognitive robotics with IoT analytics, virtual reality and augmented reality for immersive intelligence

JOINED UMKC
2005

// JEFF RYDBERG-COX, PH.D.
Curators' Distinguished Professor in the English Languages and Literature Department

RESEARCH INTERESTS
Classical and Ancient Studies, English, Languages and Literatures: Greek/Latin, Digital and Public Humanities

JOINED UMKC
2001

/MAJOR GRANTS AND AWARDS AT SSE

CONGRATULATIONS

to our many faculty members who received financial support for their work in 2022 through grants and other major awards.

Name: Daniel McIntosh
Amount: $249,196
Sponsor: Office of Naval Research
Title: EquityForward Workforce Development Pipeline for Naval STEM Superiority
Co-PIs: Travis Duane Fields, Zhu Li, Farid Nait-Abdesselam

Name: ZhiQiang Chen
Amount: $150,000
Sponsor: City of KCMO
Title: Augmented Reality (AR) Pilot to Demonstrate Flooding Risk at 103rd St. in KCMO

Name: Jejung Lee
Amount: $100,000
Sponsor: City of KCMO
Title: Development of GIS-Based Watershed Need Classification
Co-PI: ZhiQiang Chen

Name: ZhiQiang Chen
Amount: $50,000
Sponsor: Ameren UE
Title: HyperGLU-PIL: Hyperspectral and Geometric Learning for UAV-enabled Plant Species Identification and Localization

Name: Amirfarhang Mehdizadeh
Amount: $55,000
Sponsor: Amer Chem Soc Petroleum Research Fund
Title: Identification and Understanding of Major Underlying Mechanisms of Asphaltene Deposition Dynamics

Name: Martha Brook McCabe
Amount: $958,400
Sponsor: Ewing Marion Kauffman Foundation
Title: RG20210710987 KC STEM Alliance STEM ConnectKC

Name: Dianxiang Xu
Amount: $143,461.24
Sponsor: Natl Security Agency
Title: GenCyber Summer Camps for Underrepresented High School Students in the Kansas City Metropolitan Area
Co-PI(s): Yugyung Lee, Farid Nait-Abdesselam

Name: Reza Derakhshani
Amount: $379,604
Sponsor: Dept. of Army
Title: DVIS A Wearable Deep Vascular ID System
Co-PI(s): Mostafizur Rahman

Name: John T. Kevern
Amount: $130,000
Sponsor: Wisconsin Dept. of Transportation
Title: Timely and Uniform Application of Curing Materials

Name: Ahmed M. Hassan
Amount: $ 250,000
Sponsor: BAE Systems
Title: PRedicting and Intensifying Susceptibility via Waveform OptimizatioN (PRISON)

Name: Sejun Song
Amount: $ 200,000
Sponsor: Missouri Highways and Transportation Commission
Title: Hazard Detection and Alert System to Prevent Incidents - TR202214
Co-PI(s): John T. Kevern and Sungyop Kim

Name: Michelle Maher
Amount: $ 240,733
Sponsor: NSF Directorate of Education and Human Resources
Title: Prospect S-STEM
Co-PI(s): Darran R. Cairns and John T. Kevern

Name: Sejun Song
Amount: $249,698
Sponsor: NSF Directorate for Technology, Innovation and Partners
Title: PFI-TT: Crowd-based Alert and Detection Service to Increase the Safety of People with Special Needs
Co-PI(s): Baek-Young Choi

Name: Zhu Li
Amount: $159,293
Sponsor: Auburn University
Title: RINGS: L-RIM: Learning based Resilient Immersive Media–Compression, Delivery, and Interaction

Name: Thiagarajan Ganesh
Amount: $111,204
Sponsor: Liberty Alliance
Title: Coherent Seismic Event Feasibility Study for TechSprint-RCA08-Vibrational

Name: Majid Bani-Yaghoub
Amount: $879,162
Sponsor: Centers for Disease Control and Prevention
Title: Midwest Virtual Laboratory of Pathogen Transmission in Healthcare Settings (MVL-PATHS)
Co-PI(s): Jenifer Allsworth, Gary Sutkin, Md Yusuf Sarwar Uddin

VANGUARD AWARDS

2022 VANGUARD AWARD WINNERS

Congratulations to our 2022 Vanguard Award winners, who have shown outstanding commitment and dedication to the School of Science and Engineering at UMKC. Please join us in thanking them for their service.

Tom McDonnell

SUPPORTER AWARD

Tom McDonnell has always understood the need for a world class engineering school in Kansas City and has been one of the biggest supporters of UMKC's School of Science and Engineering. He was one of the first donors to sign on to support the Robert W. Plaster Free Enterprise and Research Center.

Lauren Koval, PE

YOUNG ALUMNI AWARD

Lauren Koval (BSCE '17) is a standout young SSE alumna. At UMKC, Lauren was an exemplary student, playing for the Division I women's soccer team, being named academic all-conference for all four years in the program, while also a UMKC Trustee's scholar. After graduation in 2017, she joined McCownGordon Construction, where she has progressed from a project engineer to an engineering manager and was responsible for high profile projects locally and regionally. In 2020, she received the Rising Trendsetter STEMMy award. Lauren continues to mentor the UMKC Trustee's scholars and joined our Civil and Mechanical Engineering Advisory board in 2020 and was named chair in 2021.

Notre Dame de Sion and St. Teresa's Academy

STEM OUTREACH PARTNER OF THE YEAR

Notre Dame de Sion High School and St. Teresa's Academy are committed to engaging young women in STEM in a variety of different ways. Last year, Sion's students toured the Plaster Center and applied the concepts they learned in math into a CAD/3D printing project. St. Teresa's students visited campus and spent a whole day immersed in learning about aerospace engineering or augmented and virtual reality, taking their knowledge back home to create independent projects. Giving students hands-on experiences at UMKC develops enthusiasm for pursuing STEM degrees when they reach college.

TREKK Design Group, LLC

COMPANY OF THE YEAR

Founders Kimberly and Trent Robinett met as students at the UMKC School of Science and Engineering, where, in 1995, Kimberly received a degree in electrical engineering and Trent a degree in civil engineering. In 2002, they launched TREKK Design Group. TREKK's early projects focused primarily on transportation and site development work across Kansas City and later transitioned to focus on wastewater field services. In 2014, Kimberly and Trent were honored with the UMKC Alumni Achievement Award. TREKK continues to support SSE through its sponsorship of the structural lab overlook and study areas within the Robert W. Plaster Free Enterprise and Research Center. Trent also serves as a practitioner for the civil senior design class.

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School of Science and Engineering
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/GET INVOLVED

EVENTS

HAUNTED UMKC WALKING TOUR
Oct. 06, 2022
6:00 p.m.

BLUE AND GOLD WEEK
PRE-GAME FESTIVITIES
Oct. 09, 2022
12:00 p.m.

THE 36TH ANNUAL ENTREPRENEUR OF THE YEAR AWARDS
Oct. 12, 2022
5:30–8:00 p.m.

See all UMKC Alumni Events online at **umkcalumni.com/events**

INSPIRED GIVING

You can designate your gift for a specific cause or note that it is for general use within the School of Science and Engineering. Donors like you make it possible to provide student scholarships, update our facilities, attract nationally recognized faculty and recruit high-caliber students.

SCHOLARSHIPS
More than 100 students receive donor-supported scholarships every year.

STUDENT LIFE
Donors support student life so our students can grow and explore through SSE teams and organizations.

ALUMNI FUND
Every gift to the Alumni Fund directly impacts students by providing support for scholarships, emergency aid, competition teams, leadership organizations, research opportunities, travel support, classroom upgrades and so much more!

CAPITAL SUPPORT
From renovating existing labs and spaces to providing equipment for the new Robert W. Plaster Free Enterprise & Research Center, there are many opportunities to support exciting SSE capital projects.

TO DONATE
You can make a difference in a student's life. Please give online at **sse.umkc.edu/about-us/giving** or contact Melissa Ford: (816) 235-1277 or **mford@umkc.edu**.