

THE BRIDGE

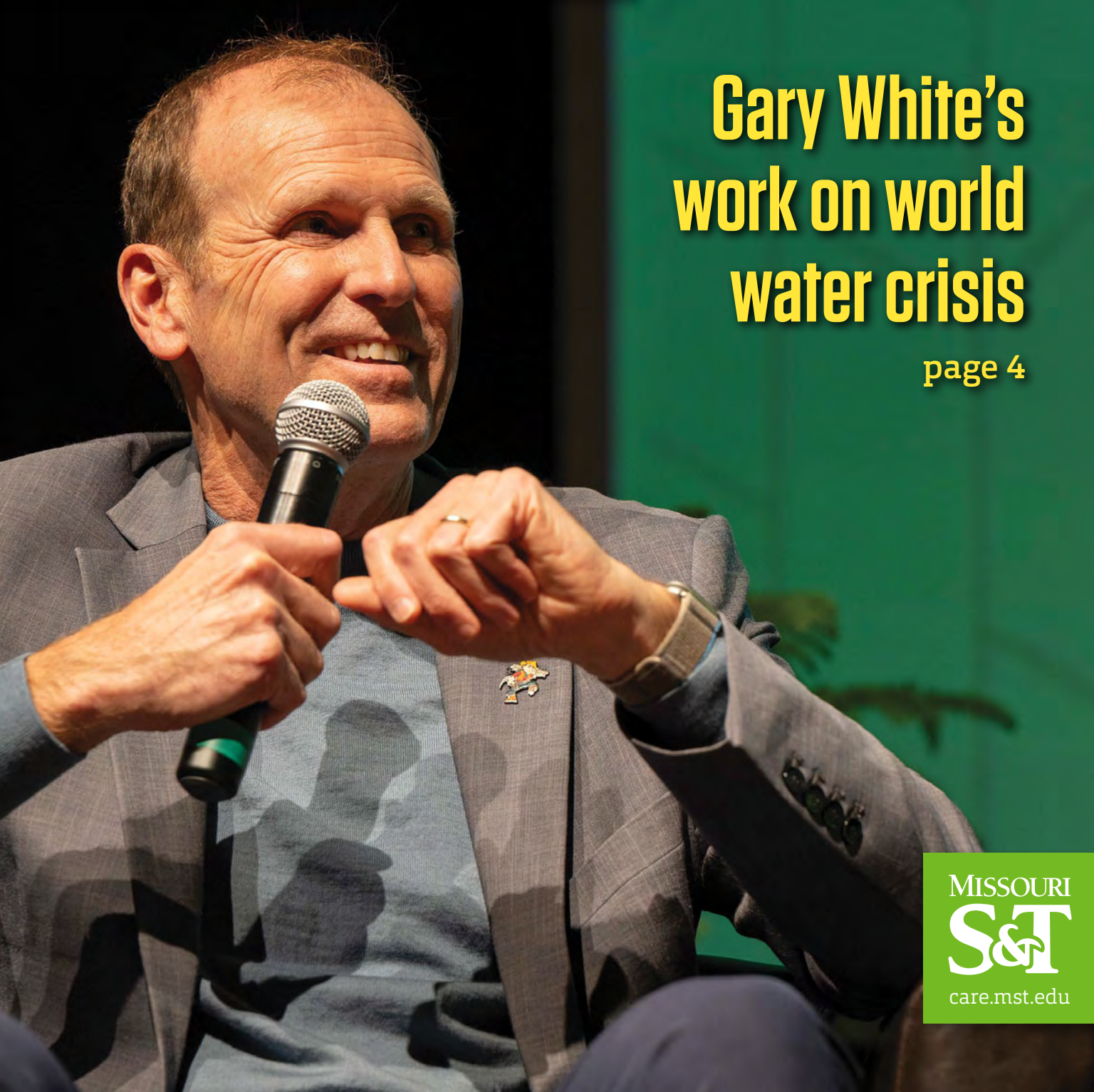
Missouri S&T
Winter 2023 | Vol. 51

Civil, Architectural and Environmental Engineering

Crashes on campus,
impactful research
page 12

Gary White's work on world water crisis

page 4



MISSOURI
S&T
care.mst.edu

FROM THE CHAIR: Joel G. Burken, Ph.D., P.E., BCEE, F.AEESP

Another year draws to a close and a new set of CArEE graduates will hit the streets, as we look to confer over 100 new degrees and have the new Miner alumni join our remarkable legacy. In this issue of *The Bridge*, we again celebrate accomplishments of our students, faculty, and alumni. Our faculty are setting some new marks in areas of great national need, ranging from mitigation of tornado and hurricane impacts by **Dr. Grace Yan** collaborating on a new \$14M project from the National Science Foundation (pg. 10), to **Dr. Mohamed Elgawady's** project on bridge collisions and infrastructure resilience (pg. 12), and to **Dr. Hongyan Ma's** work on carbon management with new sustainable building materials (pg. 11). These are just a few examples of the great work that truly is set to **Change the World** we live in for future generations.

The legacy of the CArEE department is certainly strong, and in fall 2023 we had great opportunity to celebrate the accomplishments of our alumni. **Gary White**, CE'85, MS CE'87, spoke at S&T as part of the Chancellor's Lecture Series, and celebrated his work with Water.org reaching an astonishing 60 million people impacted globally (pg. 4). He spent time with our students as well, recounting the initial ideas he developed as a student at UMR in the late '80s.



Pictured L-R: Sammi Young, Marsia Geldert-Murphey, Khloe Laurie and Joel Burken

Alumna **Marsia Geldert-Murphey** also exemplified Miner leadership as she was inaugurated as the 2024 ASCE president at the annual meeting in Chicago (pg. 15). CArEE students and future alumni were well represented also, as the S&T student body president **Sammi Young** and the ASCE president of the MSU chapter **Khloe Laurie**, both seniors in civil engineering, joined the national meeting. Marsia was also back in Rolla in less than a week, speaking to our seniors and ASCE chapter and participating with the Academy of Civil Engineers women in the annual leadership workshop (pg. 21). Our student leaders are also staying busy, and we are hosting the 2024 Mid-American ASCE Symposia and competitions in Rolla on

April 18-19. Follow our news feed and media for more updates on student activities and happenings.

As 2023 moves into our rear view, we look forward to 2024 with the opportunity to make new strides for advancing the department and its educational programs. As we grow in skill and reputation, we topped 820 total students in fall 2023, with increases in all three programs. Record numbers of employers attended our S&T career fair and participated in our employer networking events in Butler-Carlton Hall. With great pride, we head into 2024 with high expectations for our future alumni to carry on the tradition of excellence... Go Miners!

Joel G. Burken
Ph.D., P.E., BCEE, F.AEESP
(burken@mst.edu)

SUPPORT OUR MINERS!
Our phonathon funding has dipped, as no one answers the phone anymore, and yet our student activities keep growing. Please help support our Future Miners in 2024!

go.mst.edu/care



Follow us on social media



- facebook.com/MissouriSandTCare
- instagram.com/sandtcare
- linkedin.com/school/missouri-s-t-civil-architectural-and-environmental-engineering
- twitter.com/SandT_CARe

DEPARTMENT ADMINISTRATION

Department Chair

Joel Burken, Ph.D., P.E., BCEE, F.AEESP

Assistant & Associate Chairs

Civil: Eric Showalter, Ph.D., P.E., LEED A.P.

Architectural: Stuart Baur, Ph.D., A.I.A.

Environmental: Mark Fitch, Ph.D.

Graduate Programs: Magdy Abdelrahman, Ph.D.



MINER LEGEND AWARDEES

Three superstar alumni from our department received the Miner Alumni Association Legends Award for their professional achievements and service contributions to Missouri S&T. Pictured L-R: **Marsia Geldert-Murphey**, MS CE'97, **Olin "Dick" Raby**, CE'66, and **Will Kirby**, CE'08.



MINERBEARS UNITE

Leaders from Missouri S&T and Missouri State University met in August to sign a new agreement for the schools' cooperative engineering program. They also acknowledged the work of **Dr. Douglas Carroll**, the program director since 2008, who recently handed the reins to **Dr. Theresa Odun Ayo** (see pg. 9). With the cooperative engineering program, students earn a S&T engineering degree while taking courses in Springfield, Mo.

THE BRIDGE



In this issue

10

Yan teams up for renewable infrastructure grant

Dr. Grace Yan is a co-principal investigator on a \$14M NSF grant led by Iowa State University titled "National Testing Facility for Enhancing Wind Resiliency of Infrastructure in Tornado-Downburst-Gust Front Events (NEWRITE).

11

Sustainable futures: New life for unusable waste

Dr. Hongyan Ma was awarded \$2.5M in funding to find new ways to turn waste products into supplementary cementitious materials (SCMs) – and then use those materials to store carbon permanently in concrete.

15

'Engineering our Future' by ASCE president, alumna

Marsia Geldert-Murphey, MS CE'97, gave a presentation titled "Engineering our Future." She discussed how ASCE envisions creating a better infrastructure system and advancing an inclusive and equitable society.

6

Dr. Wei Wen Yu turns 100!

7

El-adaway builds partnerships

13

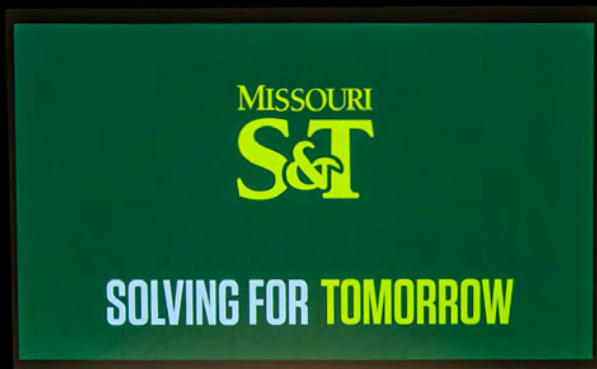
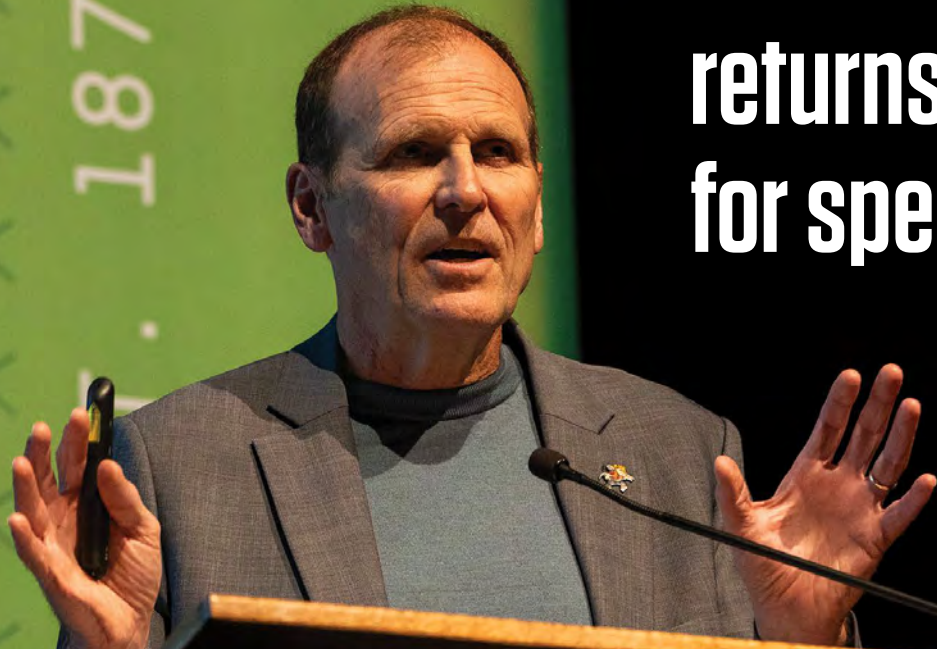
Mendoza retires after 23 years

23

MAPA Lecture: Dr. Chris Williams

GARY WHITE

returns to campus
for speaker series



Gary White, CE'85, MS CE'87, CEO and co-founder of Water.org and WaterEquity spoke at the university in November, as part of the Chancellor's Speaker Series.

White discussed his three-decades-long work to help solve the global water and sanitation crisis, as well as what people can do now to make a difference. He has led several initiatives dedicated to these issues and co-founded two non-profit organizations with Academy award-winning writer, actor and humanitarian Matt Damon. Because of their work, the pair was named to *TIME* magazine's 2011 list of the 100 most influential people.

"Gary White's work on the world stage has been incredible, and I am thrilled that he is returning to his alma mater as part of this series," says Missouri S&T **Chancellor Mo Deghani**. "After earning two degrees from Missouri S&T, Gary went on to empower more than 58 million people with access to safe water or sanitation across 19 countries and provide them with resources and solutions to greatly improve their quality of life."

White credits a 1984 trip to Guatemala for his water-focused inspiration. During this trip, he witnessed a young girl getting contaminated water from a rusty barrel and then walking along a stream of open sewage back to her home.

"At that moment, I knew what my life was going to be about — bringing safe water to people living without it," White says.

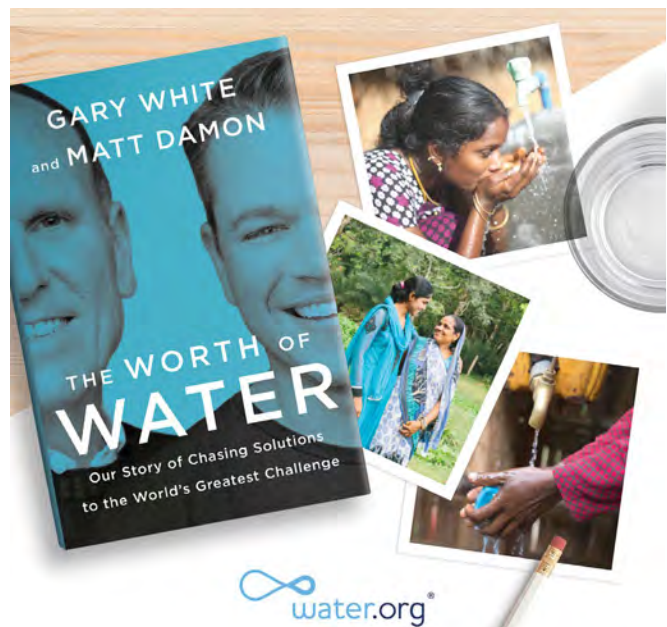
In 1990, he founded WaterPartners, which later merged with Damon's non-profit, H2O Africa, in 2009 to form Water.org. From there, the pair founded an asset manager, WaterEquity, in 2016 to mobilize private investments to scale solutions to the crisis.

He is a founding board member of the Millennium Water Alliance and Water Advocates and counsels several organizations on issues related to water and sanitation, including IKEA Foundation, Inditex, Reckitt, AB InBev, Amazon Web Services, the Water Resilience Coalition and Bank of America.

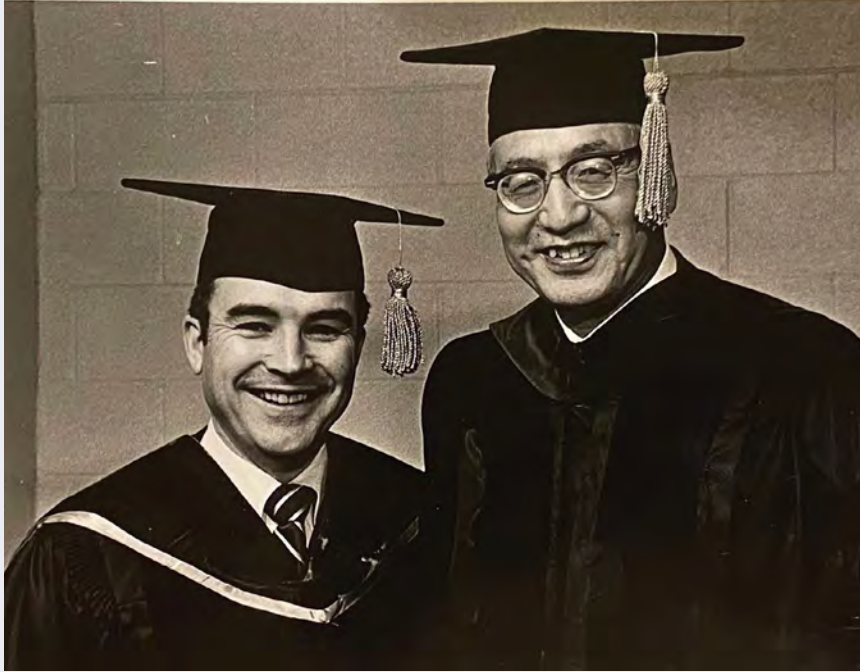
The Chancellor's Speaker Series was established this year to bring notable speakers to the S&T campus community to discuss topics of importance within society and encourage the creative exchange of thoughts and ideas. White's talk was the second event, after Former U.S. Sen. Roy Blunt. The next speaker scheduled is Dr. Sharon L. Walker, dean of engineering at Drexel University, who will speak on Wednesday, Jan. 31, 2024.



Pictured L-R: Jeff Cook, EMgt'94, Chancellor Mo Deghani, Gary White, CE'85, MS CE'87, Dick Arnoldy, CE'69, MS EMgt'73, and Dr. Joel Burken, CAEE chair, during a reception at Hasselmann Alumni House.



S&T professor emeritus celebrates 100th birthday



Dr. Wei-Wen Yu, pictured right, with longtime colleague, Dr. Delbert Day.

Dr. Wei-Wen Yu, Curators' Distinguished Professor emeritus of civil engineering at Missouri S&T, was a history-making member of the S&T faculty during his decades-long career, and now he can celebrate another historical feat — turning 100 years old.

Yu was born on July 10, 1923, in Shandong, China. He earned a bachelor's degree in civil engineering from National Taiwan University in 1950, a master's degree in civil engineering from Oklahoma State University in 1955, and a Ph.D. in structural engineering from Cornell University in 1960.

After completing his Ph.D., he worked as a research engineer for the American Iron and Steel Institute (AISI) in New York City from 1960 to 1967 and credited this position for laying the foundation for his interest in

cold-formed steel. He also taught for the City College of New York in 1964. From August 1967 to August 1968, he worked as a staff engineer for TRW Systems in Redondo Beach, California, and then joined the Missouri S&T faculty as an associate professor of civil engineering.

During his tenure at S&T, he published the seminal textbook on cold-formed steel design, five other books, and over 100 articles and technical reports related to cold-formed steel. He was considered one of the world's top scholars for steel science and engineering and was S&T's first engineering faculty member awarded the title of Curators' Distinguished Professor.

Yu's textbook, *Cold-Formed Steel Design*, has long been a go-to reference for engineers in this discipline, and it is currently in its fifth edition.

This textbook is now co-authored by **Dr. Roger LaBoube**, CE'70, MS CE'73, PhD CE'77, who is a Curators Teaching Professor emeritus of civil engineering at S&T, and Dr. Helen Chen, manager of construction standards development for the AISI.

LaBoube was also one of the 17 Ph.D. students Yu had graduate under his guidance.

In 1990, Yu formed S&T's Center for Cold-Formed Steel Structures, which was renamed the Wei-Wen Yu Center for Cold-Formed Steel Structures in 2000 in his honor. In 2020, the center closed after more than 30 years, and the university now hosts the Wei-Wen Yu Cold-Formed Steel Online Library.

LaBoube, who oversaw the center after its name change, says he has been honored to work with Yu as a student and as a colleague, and he is proud of the work that was accomplished through the center.

(continued on page 8)



Yu, center, is pictured here at an S&T event with his daughter, Dorothy, left, and Dr. Joel Burken.

El-adaway appointed inaugural associate dean for academic partnerships with corporations

Missouri S&T leaders plan to develop additional academic partnerships with corporations and industry groups, and they appointed **Dr. Islam El-adaway** to spearhead the efforts.

El-adaway, who is the Hurst-McCarthy Professor of Civil Engineering, took on an additional role as associate dean for academic partnerships for the S&T College of Engineering and Computing. His new duties began Sept. 1.



“Dr. El-adaway is a perfect fit for this position,” says **Dr. David Borrok**, vice provost and dean of the college. “He has already been successful in establishing meaningful partnerships with dozens of companies in the construction industry and is well-prepared and positioned to expand his focus to our corporate education initiatives.”

El-adaway says his first focus is the St. Louis area, and he will eventually collaborate with partners in Kansas City and other urban areas that would benefit from Missouri S&T programs.

“I feel honored and excited to serve as the associate dean for academic

partnerships,” he says. “This new role represents an inspiring opportunity that, when considering the exciting challenges that come along with it, will naturally align with my desire to further serve Missouri S&T and show that we truly have some of the best engineering programs in the nation.”

With El-adaway at the helm, Missouri S&T will offer several full degree programs, graduate certificates, and quick-impact experiences, such as short courses or workshops, to corporate partners.

The master’s degree programs offered for these partnerships will include aerospace engineering, mechanical engineering, electrical engineering, environmental engineering and engineering management. The graduate certificates will cover everything from cybersecurity to geanalytics and geointelligence.

The quick-impact topics can be tailored to an organization’s specific needs, but some possible topics include computer programming, nuclear energy, construction management, or drone technology. Any topics that fit within S&T’s areas of expertise could potentially fit with this format, El-adaway says.

“One of my goals will be to work with corporations to determine what Missouri S&T programs and offerings would work best for them,” he says. “Courses can be offered in Rolla, at a St. Louis location, online or potentially even in a hybrid model. What is most important is that we help these corporate cohorts further develop their employees’ knowledge and skills so they can be even better at what they do.

(continued on page 9)



Seo joins faculty

At the start of the 2023 fall semester, we welcomed **Dr. Bong Chul Seo**, assistant professor in civil engineering with specialty in water resources.

Seo earned his Ph.D. from the University of Iowa, and his area of expertise encompasses quantitative precipitation estimation using remote sensing techniques and its uncertainty evaluation with relevant space and time scales to hydrologic applications.

Seo has been working on advanced hydrologic modeling to mitigate effects from flood disasters in collaboration with NOAA Cooperative Institute for Research to Operations in Hydrology (CIROH). While his research mostly relies on computational work, he also likes field work as seen in the photo.

(Photo was taken from site surveys for the USGS stage sensors in Iowa; wind turbines have become one of the obstacles for his radar-based rainfall estimation.)

Oerther recognized by environmental health association

As part of the 2023 Annual Education Conference and Exposition of the National Environmental Health Association (NEHA), **Dr. Daniel B. Oerther**, professor of environmental health engineering, received the Joe Beck Educational Contribution Award. The Beck Award recognizes individuals or teams for developing successful training tools for professional development for environmental health professionals. Oerther was recognized for teaching EnvE 5650 Public Health Engineering at S&T. The class prepares engineering students to pursue NEHA's Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential.



100th birthday (continued from page 6)

"This center was unique in that it had a technology transfer function and a key role for 30 years to serve the cold-formed steel industry," LaBoube says. "It provided a comprehensive information resource for manufacturers, designers, educators, researchers, students and users."

Yu also established the Wei-Wen Yu Graduate Fellowship at S&T to support graduate education and travel to the Wei-Wen Yu International Specialty Conference on Cold-Formed Steel Structures, which is named in his honor.



Dr. Joel Burken, above left, discusses environmental engineering concepts with a group of elementary students as part of S&T's May the Fourth Be With You STEM Day. Burken, a member of the S&T faculty since 1997, starts his new position beginning Sept. 1. *Photo by Michael Pierce/Missouri S&T*

Burken accepts Mathes Chair position and transition

Missouri S&T has a new John A. and Susan Mathes Chair of Environmental Engineering as of Sept. 1, but this person is not new to the S&T community.

Dr. Joel Burken, S&T's longtime chair of civil, architectural and environmental engineering, has accepted the endowed position within the department.

"Dr. Burken is a natural fit for this position, as he is a top researcher and leader in the field of environmental engineering," says **Dr. David Borrok**, vice provost and dean of the S&T College of Engineering and Computing. "Joel's passion for the field is remarkable, and I am excited to see what he accomplishes while serving in this position."

Burken has served as chair of the department since 2016 but is stepping down from the position

at the end of the upcoming academic year. A national search for his replacement has already started.

"Over the past several years, I have been privileged to lead one of the best engineering departments in the country," Burken says. "Our alumni, students and faculty members truly aspire to change the world through their work as engineers, and it is amazing to see what they accomplish and humbling to be part of it."

John Mathes is one of our department's most influential alumni who I've had the pleasure to know since I started at S&T, and I am honored to now serve as the Mathes Chair. John has always been an active alumni leader for our department and university."

Burken earned a Ph.D., master's degree and bachelor's degree in civil and environmental engineering from the University of Iowa.

(continued on page 18)

Odun-Ayo named director of Missouri S&T, MSU cooperative engineering program

For the first time since it was founded in 2008, Missouri S&T's cooperative engineering program with Missouri State University has a new director.

Dr. Theresa Odun-Ayo was named director of the Missouri S&T/MSU cooperative engineering program starting July 15.

Odun-Ayo, who served as an associate teaching professor of electrical and computer engineering for the program, replaced **Dr. Douglas Carroll** as director. Carroll continues to serve the program as a professor of mechanical engineering.

"Dr. Carroll has been with our Springfield location since the very beginning, and he has done an outstanding job of developing the programs," says **Dr. David Borrok**, vice provost and dean of S&T's College of Engineering and Computing.

"He is now handing the reins to Dr. Odun-Ayo, who is passionate about educating future engineers and committed to growing the program and expanding its impact throughout Southwest Missouri."

Students in the cooperative program complete engineering courses with Missouri S&T professors in the Robert W. Plaster Free Enterprise Center in downtown Springfield, and they complete their non-engineering courses with MSU. When they finish their courses, they officially graduate from Missouri S&T.

Odun-Ayo says she is excited to accept the directorship and plans to work with the students, faculty and staff to make the cooperative program as strong as possible.

"As director, I look forward to promoting an environment that is equitable and inclusive, fostering excellence in teaching and empowering the students with the technical knowledge and skills necessary for success," she says. "I am excited to promote student success and retention, while also advancing both universities' missions of academic excellence, diversity, best policies and partnerships."

Odun-Ayo has been affiliated with Missouri S&T since 2006 when she was a graduate research assistant in electrical and computer engineering. In 2011, she finished her Ph.D. in electrical engineering at S&T and held the role of assistant teaching professor for the Springfield program until 2019, when she was promoted to associate teaching professor. Odun-Ayo's other degrees include a D.Min. in leadership from Evangel University, a master's degree in electrical engineering from University of Benin in Benin City, Nigeria, and a bachelor's degree in electrical engineering from Abubakar Tafawa Balewa University in Bauchi, Nigeria. Before joining S&T, she was a principal electrical engineer for the Nigerian Airspace Management Agency and a lecturer for the Nigerian Defense University.

To learn more about the cooperative engineering program, visit missouristate.edu/EGR.



Dr. Theresa Odun-Ayo

El-adaway continued from page 7...

"With our top-tier offerings, Missouri S&T is uniquely situated to provide opportunities that will be mutually beneficial for both the corporations and their employees."

El-adaway joined the S&T faculty in 2018 as an associate professor and was promoted to professor a year later. He previously served in faculty positions with the University of Tennessee, Knoxville, and Mississippi State University.

He is the founding director of the Missouri Consortium for Construction Innovation (MO-CCI) and has worked to develop relationships between S&T students and faculty and several of the nation's leading construction stakeholders.

El-adaway earned a Ph.D. in civil engineering from Iowa State University and both a master's and bachelor's degree in construction engineering from the American University in Cairo.

He has authored or co-authored over 210 peer-reviewed papers — many of which have received best paper and editor's choice awards — as well as one book and two book chapters. He has been part of externally funded projects totaling around \$10M from several agencies, including the National Science Foundation, the U.S. Department of Education, the U.S. Department of Transportation, the Construction Industry Institute, Sloan Foundation, and various construction-related stakeholders.

El-adaway is a recipient of more than 30 awards at the national, regional and university levels and is a fellow of the American Society of Civil Engineers and the Institution of Civil Engineers.

For more information about S&T's corporate partnership initiatives, email El-adaway at eladaway@mst.edu.



Dr. Grace Yan and her team look forward to future opportunities to collaborate and strengthen disaster preparedness across Missouri.

Yan and team win \$14M NSF resilient infrastructure grant

Dr. Grace Yan, associate professor of structural engineering and director of the Center for Hazard Mitigation and Community Resilience, is a co-principal investigator (co-PI) on a \$14M NSF Mid-scale Research Infrastructure-1 grant (Mid-scale RI-1). The project, led by Iowa State University, is titled “National Testing Facility for Enhancing Wind Resiliency of Infrastructure in Tornado-Downburst- Gust Front Events (NEWRITE).” The focus of the project will design a university-based facility that simulates realistic wind fields found in these windstorms. It will also enable physical testing of their effects on civil infrastructure using mid- to full-scale models. Yan and her team will develop a digital twin of the physical facility to create optimal design and allow virtual systematic “testing.”

To explore Yan’s research on tornado resilience, coastal resilience and climate change adaptation, visit the Wind Hazard Mitigation Laboratory and the Center for Hazard Mitigation and Community Resilience websites.

The National Science Foundation announced four Mid-scale RI-1 awards for fiscal year 2023-24. The four awardees chosen exemplify the best of American science and engineering. Mid-scale RI-1 awards support the design and implementation of research infrastructure, including testbeds, equipment, cyberinfrastructure, large-scale data sets and personnel, whose total project costs exceed NSF’s Major Research Instrumentation Program but are under \$20M.

Feys named RILEM fellow

Dr. Dimitri Feys, an associate professor of civil engineering at Missouri S&T, has been named a fellow of RILEM, the International Union of Laboratories and Experts in Construction Materials, Systems and Structures.

He was presented with the honor during the 77th RILEM Annual Week in Vancouver, Canada.

“I have been a member of RILEM since 2004 because it is a premiere international organization that closely aligns with my research areas,” says Feys. “To be honored as a fellow and have my work recognized on the world stage feels amazing.”



Dr. Nicolas Roussel, RILEM president, presented **Dr. Dimitri Feys**, pictured left, with a certificate to recognize his RILEM fellowship.

Photo courtesy of Daniela Ciancio

He joins **Dr. Kamal Khayat**, S&T’s vice chancellor for research and innovation and the Vernon and Maralee Jones Professor of Civil Engineering, as the second S&T faculty member to be named a RILEM fellow. Khayat received this honor in 2015 and was then honored with the organization’s lifetime achievement award in 2019.

Feys joined the Missouri S&T faculty in 2013. He previously worked for Khayat as a postdoctoral fellow at the University of Sherbrooke in Canada. A construction materials expert, his research often focuses on rheology, or the flow of matter.

He earned a Ph.D. in civil engineering from Ghent University in Belgium, as well as a combined master’s and bachelor’s degree in civil engineering.



Photo by Haodao Li/Missouri S&T

Sustainability solutions: Developing carbon-negative cementitious materials, giving new life to ‘unusable’ waste

A Missouri S&T research team was recently awarded \$2.5M in funding to find new ways to turn waste products into supplementary cementitious materials (SCMs) – and then use those materials to store carbon permanently in concrete.

“Years ago, SCMs were used as a cheap option to replace some Portland cement and also have a stronger and more durable concrete mixture,” says **Dr. Hongyan Ma**, Francisco Benavides Scholar and associate professor of civil engineering at S&T. “There is now a severe shortage of these materials, so my team is looking at creative ways to develop new alternatives that are carbon-negative and will make the industry greener.”

Ma also serves as director of S&T’s Laboratory of Future Cements and Carbon-Negative Initiatives.

He says one of the most common SCMs has traditionally been coal combustion residue, or fly ash, but a large percentage of this type of

waste is not currently usable in cement. According to the Electric Power Research Institute, 2.5 billion tons of this type of waste have been disposed of in ponds and landfills throughout the United States.

Ma’s two-year research project, which received a \$2M grant from the U.S. Department of Energy and \$500,000 in matching funds from S&T and industry partners, aims to make this unusable waste into something of value.

The research will also cover the ash from municipal solid waste incinerators, steel slag, recycled concrete and other waste products. The team is currently developing processes to break down the structure of the solid wastes in ways that will also allow them to store CO₂.

The carbon that is combined with these new SCMs will primarily come from the flue gases of power plants and the manufacturing industry, Ma says. By using CO₂ directly from

the flue gasses, as long as the concentration is high enough, his team will not have to use energy-intensive carbon-capture methods.

Ma says this project is designed to make a significant difference in the concrete industry in the near future, as opposed to focusing on more general, long-term concepts.

“The work we are conducting is mission-oriented,” he says. “Part of our research is to make sure what we develop is economically feasible. It can’t be too expensive, as it needs to be a realistic option to support the supply chain.”

Serving as co-PIs are: Dr. Aditya Kumar, associate professor of materials science and engineering; Dr. Mahelet Fikru, associate professor of economics; and Dr. Wenyu Liao, assistant research professor of civil engineering. Lawrence Livermore National Laboratory is also working with S&T on the project.



HIGH-IMPACT BRIDGE RESEARCH



Bridge hit by truck.

You've likely seen this headline too often across the U.S.

Did you know that only "ONE" bridge girder has ever been tested under impact load and documented in literature?

But guess what?

Dr. Mohamed ElGawady and his innovative research team are here to change that narrative. They've devised a unique setup to examine the performance of a 46-foot-long prestressed bridge girder under impact conditions.

After nearly two years of unwavering dedication, the team triumphantly conducted its inaugural test.

The result? Significant girder damage, forming a plastic hinge right at the impact point. Stay tuned for more updates as further testing unfolds!

This groundbreaking research is sponsored by the Departments of Transportation in Alaska, Idaho, Ohio, Missouri, Texas, Mississippi, as well as the Federal Highway Administration. Industry sponsors included Nucor, Simpson Strong-Tie, Rhino Carbon Fiber, and General Technologies, Inc.



Missouri S&T drives workforce development with \$1.3M contract from MoDOT

The Missouri Department of Transportation recently awarded S&T a contract for almost \$1.3M to run Missouri's Local Technical Assistance Program (LTAP), which the state agency funds in collaboration with the U.S. Department of Transportation's Federal Highway Administration, for the next three years.

"Our LTAP works with cities, counties and other districts throughout the state that are responsible for roads and bridges," says **Dr. Heath Pickerill**, LTAP director and CArEE assistant teaching professor at S&T. "We are an amazing resource for training employees and helping them be as safe, knowledgeable, and effective as possible when on the job."

On average, the LTAP trains over 5,000 participants each year in over 110 classes for a nominal fee, which is charged to their organizations.

"We have a large catalog of courses covering almost any topic you could think of associated with transportation-related issues," Pickerill says. "Many local public agencies we serve require their employees to complete several courses and eventually advance through one or two levels of our MO-LTAP Scholars Program."



Photo courtesy of Rawpixel

The LTAP now co-hosts the Missouri Concrete Conference and the Missouri Asphalt Conference in conjunction with CArEE at S&T, which Pickerill says should increase public awareness of the program and its offerings.

Commemorating Mendoza's 23-year career at S&T

Dr. Cesar Mendoza was named associate professor emeritus after his recent retirement from Missouri S&T as associate professor of water resources engineering for 23 years.

Mendoza joined the faculty in 2000. Prior to that he was a professor in the department of fluid mechanics at Columbia University in New York. His research interests included hydraulics, fluid mechanics, sediment transport, stream mechanics, environmental hydraulics and mathematical modeling.

Honors during his tenure at S&T included the J.H. Senne Academy of Civil Engineers Faculty Achievement Award and the Outstanding Student Advisor Award. He was also featured in American Men and Women of Science and nominated for Who is Who in America.

"Cesar was a dedicated instructor who held high standards as he sought the best for his students," says CArEE chair Joel Burken. "I value him greatly as a colleague and friend who was inquisitive and always generous with his time. He exudes integrity in all aspects of his life."

Mendoza was associate chair for graduate studies for many years and served on the GRA Allocation Task Force, Council of Graduate Coordinators and Staff (CGCS), Graduate Faculty Council (GFC) and the Library and Learning Resources Committee. He has been a member of the American Society of Civil Engineers, the American Geophysical Union and the International Associations for Hydraulic Research. He also served as editor and member of the editorial board for *Mechanics Research Communications* and was principal advisor of the Ministry of Public Works in Colombia.



Mendoza earned Ph.D. and master's degrees in civil engineering from Colorado State University and an Engineering Diploma in civil engineering from the Universidad Javeriana, Colombia.

Khayat awarded \$1.4M from Corps of Engineers to develop AI-based program for 3D-printing concrete

A Missouri S&T research team led by **Dr. Kamal Khayat** has been awarded \$1.4M from the U.S. Army Corps of Engineers to develop an artificial intelligence program that will determine the best locally-available materials for 3D-printed concrete.

This technology will allow the Corps of Engineers to more quickly 3D print

“This will enhance the efficiency of the construction process, improve troop safety, pave the way for more sustainable practices and help expedite humanitarian assistance missions.”

Khayat also serves as S&T’s Vernon and Maralee Jones Professor of Civil Engineering and was listed as a top researcher in his field in an analysis

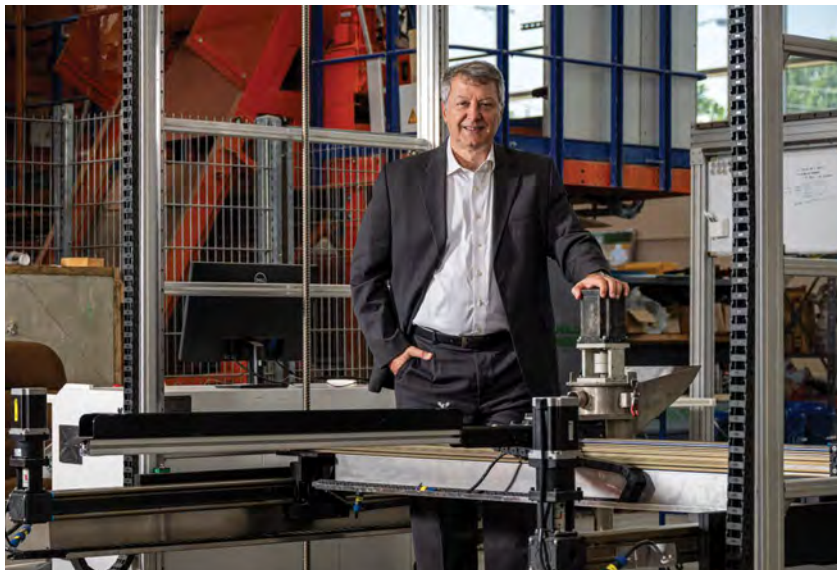
to determine how easily they can be pumped, extruded and used for construction.

Potential materials will come from natural minerals, industrial byproducts and agricultural waste, which could include sources such as rice husk ash, palm oil fuel ash, ground dolomite and ground glass. Khayat says that using these materials could also potentially improve local sustainability and provide an economic benefit for the local areas.

Khayat’s team will also consider a variety of fibers to reinforce the 3D-printed structures. Some metal and synthetic structural fibers will be tested, but so will more unconventional fibers derived from plants and recycled materials, such as bamboo, coconut, glass, hemp, cellulose and rubber.

“This will be a comprehensive project that will make a significant difference in the mobility of our troops,” Khayat says. “The amount of supply chain issues for materials will be greatly reduced, as will the construction costs. Missouri S&T is a leading university for researching novel 3D printing of concrete materials, and we are proud to answer the federal government’s call to help with this important work.”

Co-principal investigators for the project from S&T include **Dr. Hongyan Ma**, Francisco Benavides Scholar and associate professor of civil engineering; Dr. Aditya Kumar, associate professor of materials science and engineering; and Dr. Sajal Das, Curators’ Distinguished Professor and Daniel St. Clair Endowed Chair of computer science. Dr. John Kevern, a division director and professor of civil engineering at the University of Missouri-Kansas City is also a co-PI.



Dr. Kamal Khayat, pictured using a 3D printer in Missouri S&T’s Advanced Materials Characterization Laboratory, is leading multiple research projects related to 3D-printing concrete. *Photo by Michael Pierce/Missouri S&T*

concrete structures without relying on the delivery of large amounts of construction materials.

“By harnessing the power of AI, our research team aims to streamline the process of material selection, ensuring optimal performance and cost-effectiveness,” says Khayat, S&T’s vice chancellor for research and innovation. “The AI program will evaluate a wide range of locally-available materials in various areas and identify the most appropriate combinations for 3D printing concrete.

by Stanford University. For this interdisciplinary project, he is leading researchers with expertise in materials science and engineering, civil engineering, and computer science.

Everything from temporary bridges and barracks to guardhouses and defense obstacles could potentially be created with this program.

The team’s goal is to have 50% or more of the materials be indigenous, or local, to replace traditional cement materials. The materials will be tested



ASCE president and alumna – Marsia Geldert-Murphey – speaks at S&T

Missouri S&T's student chapter of American Society of Civil Engineers played "Hail to the Chief," as the president of the professional society delivered a talk on the S&T campus.

Marsia Geldert-Murphey, MS CE'97, returned to her alma mater on Wednesday, Oct. 25, to deliver a presentation titled "Engineering our Future." She discussed how ASCE envisions creating a better infrastructure system and advancing an inclusive and equitable society.

Geldert-Murphey's term as ASCE's 2024 president began Oct. 18, at the national ASCE convention in Chicago, and Missouri S&T was the first university she visited after being installed.

She has been a member of ASCE since 1990 and has served the society in several leadership roles.

Geldert-Murphey is regional director for Missouri and Illinois

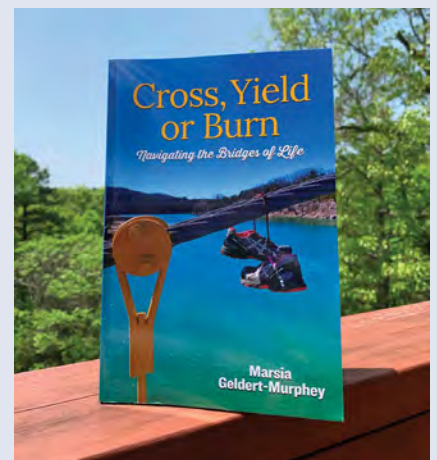
for the Lochmueller Group and specializes in transportation and geotechnical engineering. She has over three decades of experience related to civil engineering and construction.

Throughout her career, she has founded two companies, authored two books, testified before congress, and was listed as one of the St. Louis Business Journal's Most Influential Business Women.

Geldert-Murphey is a member of the S&T Academy of Civil Engineers and an honorary member of S&T's chapter of the Chi Epsilon civil engineering honor society.

Missouri S&T's chapter of ASCE co-hosted the event with the CArEE department.

→ **Website:** www.navigatingthebridgesoflife.com



One of Geldert-Murphey's Books

"The winding road of our journey on this earth sometimes leads us to bridges; bridges we must learn from as we find our way."

— Marsia Geldert-Murphey

S&T online accelerated master's program delivers flexibility

Shelby Burnworth, CE'20, started her career at HNTB Corporation, an engineering firm based in Kansas City. She knew she wanted to pursue a master's degree in the same discipline and chose S&T's civil, architectural and environmental engineering so she could complete courses 100% online.



Shelby Burnworth

She attributes the time and money she saved to her choice of a graduate program. Through Missouri S&T's accelerated master's program, she applied nine credits from her undergraduate degree to her master's. Burnworth took 21 credits and graduated in just a year and a half after her bachelor's degree.

"I would've had to go somewhere else and pay thousands of dollars for those nine credits, plus I already knew my classmates and had the support of my advisors," Burnworth said.

As a bridge engineer in the structures department, she travels out-of-state for projects in Washington and along the Columbia River to design railroad bridges. After starting full-time work, she soon entered her master's for advanced courses in civil engineering, learning hard and soft skills.

"I like having that technical excellence to lean back on. It helps build your confidence in the workforce," she said.

The flexibility of the online master's in civil engineering program allowed her to choose some of her courses in

other topics like project management that she says directly correlated to her job description. She regularly works with clients remotely and says her online classes prepared her with communication skills applicable to her job.

"Being able to grow as a person academically and technically has really helped me at work. I have a lot more confidence when I turn something in to my task leader or my fellow coworker to check it. It definitely helps with that."

Specialized engineering fields

Burnworth didn't always know she wanted to work in civil engineering. She held internships in her undergraduate years where she discovered her passion for project management. But she missed the hands-on design aspect. Her current employer merged both of her interests. She now enjoys field work, construction management and design in CAD software and 3D modeling.

Missouri S&T has over 25 online engineering specialties for students to find their niche, with many of them offering flexible pathways to earn a master's degree with stackable graduate certificates or other options.

"Everybody is impressed when you say Missouri S&T... that was another reason I wanted to stay with S&T."

Every day at work, Burnworth draws on what she learned from the practicing engineers who taught her courses. In one immersive assignment, she developed project scopes as an acting project manager.

"I liked knowing that my professors were pretty accomplished and I wanted to learn from the best so that's why I stayed there."

In December 2021, she attended graduation on the Missouri S&T campus where she got to connect with instructors and still stays in touch with them.

Online modality

When she first thought about pursuing an online master's while living several hours from Rolla, Burnworth hesitated. But she wasn't interested in taking night classes like her peers or attending in-person classes during the pandemic.

(continued on page 19)



On the cover

Sarah Mueller, CE'15, senior manager of vegetation at Union Pacific Railroad, was July's cover girl for *Railway Track and Structures* magazine. She was also named to *Railway Track and Structures*' "Women in Railroad Engineering 2023" list for her leadership in modernizing the way vegetation is controlled for the entire Union Pacific network.

Read more.
issuu.com/railwaytrackstructures/docs/rts_july_2023

Undergraduate research scholar

Madison Wieberg, a senior in environmental engineering, was named a Dean's Undergraduate Research Scholar for the fall 2023 semester. Students



receive a \$2,000 scholarship and a \$500 budget for research-related expenses each semester in the program, up to a total of two semesters. Students must be enrolled full-time and have a 3.4 grade point average while they receive funding. **Dr. Jianmin Wang** is her advisor.

ASCE honors excellence



Witushynsky



Geldert-Murphey and Erter



Buechter



Weiland and Swartz

Celebrating people, projects and accomplishments during the American Society of Civil Engineers (ASCE) St. Louis Section event in September. Miners were well represented with many awards and recognitions.

Here are the alumni and students that were honored.

- **Michael Buechter**, CE'90, Professional Recognition Award
- **Shawna Erter**, GeoE'00, MS GeoE'13, ASCE Region 7 Governor
- **Marsia Geldert-Murphey**, MS CE'97, 2024 ASCE President
- **Krysta Swartz**, CE'23, Student Scholarship Awardee
- **John Weiland**, CE'97, MS CE'04, St. Louis Section Past President
- **Nichole Witushynsky**, ArchE'08, MS CE'11, Awards Chair

Mathes Chair position continued from page 8..

After finishing his Ph.D., he joined the Missouri S&T faculty in 1997 and rose to the rank of professor in 2008. He also previously served as associate chair of his department, as well as director of the university's Environmental Research Center. His work over the years has also taken him abroad to temporary positions in countries such as Switzerland, Denmark and New Zealand.

He has been a pioneering researcher in the areas of phytoforensics and phytoremediation and was awarded a patent. Some of his other research interests include biological wastewater treatment, constructed wetlands and green remediation.

Burken also received the National Science Foundation's CAREER award for his research, as well as two Rudolph Hering Medals from the American

Society of Environmental Engineers and the Academy of Environmental Engineers and Scientists' Science Award. He is a Fellow of the Association of Environmental Engineering and Science Professors (AEESP) and was recently appointed an inaugural fellow for the Taylor Geospatial Institute.

In 2002, he helped establish the university's undergraduate environmental engineering program, and he is also credited for his work to establish the Chester and Evelyn Baker Greenhouse as well as the green roof research facilities atop the Emerson Electrical Engineering Building.

John and Susan Mathes have supported S&T for decades by sharing their expertise, passion and financial resources. In 1995, the couple established a named professorship, and in 2006, in partnership with the

Missouri Endowed Faculty Program, they elevated the position to an endowed chair.

John Mathes earned bachelor's and master's degrees in civil engineering in 1967 and 1968, respectively, from Missouri S&T. He is the founder of the John Mathes and Associates Inc. Environmental engineering firm, which was later acquired by Burlington Environmental.

Mathes was also involved in efforts to expand the university's civil engineering department to become the civil, architectural and environmental engineering department. He has also served as president of the University of Missouri Board of Curators and on the Missouri S&T Board of Trustees.

MINER CELEBRATIONS Fall Equinox and Stonehenge

What's that?
A bird? A plane?
No, it's an analemma.

A group of students learned about that and more when **Dr. Richard Elgin**, a former faculty member, hosted a tour and information session in September on S&T's replica of Stonehenge, which he helped layout in the early 1980s with the late **Dr. Joseph Senne**, professor emeritus.

S&T's Stonehenge incorporates many of the features of the original one in England and was named one of the National Society of Professional Engineers' 10 Outstanding Engineering Achievements for 1984.



Missouri S&T's online master's program

(continued from page 16)

"It all went really well. It was a blessing in disguise because the teachers had to learn to be online that fall so it went really smoothly after that. I didn't have any worries about it at all."

Previously, Burnworth had only taken classes in person. "I thought it would be a lot harder than it ended up being. I still have the flexibility of watching live courses if I wanted to, so I could ask questions anytime and have direct responses right then and there and still get that interaction with your fellow classmates as well."

She was positively surprised by how much she wanted to earn her degree and proceed with grit and determination to finish homework and group assignments.

"I thought master's programs would be you and only you, but many classes relied heavily on teamwork ... I think it was a good experience because that's what you do in the real world."

She said she felt like she was being hit with a firehose of information at her new job and her master's degree gave her confidence to keep going. Her master's was extra practice for an ever-changing, innovative field like civil engineering. Civil engineers have to take continuing education credits each year to uphold licenses.

"I think it's important for you always to be learning something new, especially with engineering. You need to stay up to date on world topics, new innovation and technology."

Burnworth cautions new students not to bite off more than they can chew, focusing on time management and asking questions.

"You have the freedom to take what kind of courses you want to take. If you're working at the same time and doing part-time school, take time to ask coworkers what classes they recommend you take."

About the program

Missouri S&T's 100% online master of science in civil engineering focuses on teaching sustainable solutions to transform infrastructure and building design. Built for aspiring civil engineering leaders to tailor courses to their needs. A flexible 30-credit program that is a "Best Online Program" by *U.S. News & World Report* in two categories.

For more information, visit online.missouri.edu.



NIGHT TO NETWORK

More than 300 alumni and students met to network and build connections. The demand is high and licensure is a game-changer for civil engineers. Infrastructure money is flowing, and civil engineering salaries continue to rise. Read a full breakdown of the ASCE 2023 Salary Report and gain insight into the latest industry compensation trends at <https://bit.ly/456cpak>.



S&T announces ADVANCE faculty fellows

Four faculty members from Missouri S&T were selected for the university's first cohort of ADVANCE Faculty Fellows.

Last year, S&T was awarded a \$1M grant through the National Science Foundation's ADVANCE program to work toward increasing the representation of women — especially those from underrepresented racial or ethnic groups — in faculty and leadership positions at the university.

These fellows will now complete projects that will help the university reach this goal.

The inaugural fellows for the program included:

- **Dr. William Schonberg**, professor of civil, architectural and environmental engineering.
- **Dr. Catherine Johnson**, S&T's Robert H. Quenon Associate Professor of Mining Engineering.
- **Dr. Kelley Wilkerson**, associate teaching professor of materials science and engineering.
- **Dr. Clair Kueny**, chair and associate professor of psychological science.

Schonberg's fellowship project is titled: "Advancing Faculty Diversity and Broadening Paths to Career Advancement at Missouri S&T." Schonberg will examine S&T's policies focused on spousal accommodation and on promotion and tenure and will recommend changes based on evidence-based practices to increase equity across campus.



Ten speakers presented their ideas on the theme of "Solve for X" at Missouri S&T's TEDx event, held on campus in October. Among those was **Anthony Birchler**, CE'84, who gave a talk titled "From Ideas to Masterpieces: The Power of Sketching In Design Innovation."

Birchler is vice president of sales engineering at A. Zahner in Kansas City. His 39 years of professional experience in all aspects of facades is well respected. He consults and collaborates with owners, architects, engineers, and construction managers to develop bespoke complex metal facade solutions utilizing Zahner assist methods. These methods involve all available tools to communicate, refine, and ultimately fabricate the facades. Free-hand sketching is the foundation upon which these solutions rest. Since 1997, Birchler has been responsible for the design and implementation of many of the patented systems used to complete bold architecture throughout the world.

Oerther recognized with best paper

As part of the 2023 Annual Conference of the American Society for Engineering Education, **Dr. Daniel B. Oerther**, professor of environmental health engineering, received the best paper award from the Environmental Engineering Division. The paper is titled "Designing Local Food Systems: Results from a Three-Year Pilot." Co-authors included Dr. Sarah Massengale, assistant professor with University of Missouri Extension, and Dr. Sarah Oerther, assistant professor of nursing at Saint Louis University Trudy Busch Valentine School of Nursing. The 2023 conference was the largest in ASEE history with over 1,900 papers presented.



Pictured L-R: **Dr. Daniel Oerther**, **Dr. Shannon Parks**, division program chair, and **Dr. David Sanchez**, division chair

S&T researchers among top 2% cited scientists in their fields for career or single-year impact

A total of 58 current and former Missouri S&T faculty are among the top researchers in their field as measured by their career research records, and 72 current or former S&T researchers were among the best in their fields in 2022, according to a recent analysis of standardized citation indicators of the Elsevier Data Repository published by Stanford University.

The Stanford study, published Oct. 4, 2023, analyzes citations, h-index, and other metrics of research productivity and impact including a composite indicator (c-score). The analysis provides listings of top-scientists based on career-long and single-year impact. The study classifies individuals into 22 scientific fields and 174 sub-fields, including agriculture, biology, biomedical, built environment and design, chemistry, clinical medicine, economics and business, engineering, historical studies, information and communication technologies,

mathematics and statistics, physics, psychology, public health, social sciences, and others.

The top 2% includes approximately 210,000 individuals from a field of over 9.6 million authors worldwide who have at least 5 papers published in the Elsevier Scopus database. Career-long data are updated through the end of 2022, and the selection is based on the top 100,000 researchers as determined by a composite citation metric known as a “c-score” (with and without self-citations) or by their percentile rank of 2% or above.

Those in the top 2% with an S&T affiliation include 23 Curators’ Distinguished Professors, two members of the National Academy of Inventors, one member of the National Academy of Engineering, two fellows of the American Association for the Advancement of Science (AAAS) and

10 current or former directors of Missouri S&T research centers.

“These rankings show quantitatively the profound global impact of Missouri S&T researchers,” says **Dr. Kamal Khayat**, vice chancellor for research and innovation. “Their unwavering dedication to advancing knowledge in their respective fields is evident in the quantitative data presented. We applaud our researchers for their exceptional work, which stands as a testament to their expertise and commitment.”

S&T researchers included in the study are as follows. “Career” denotes those recognized for their career-long impact in their fields, “2022” denotes those recognized for their single-year research productivity for 2022, and “both” denotes individuals recognized for both their career-long impact and research productivity for 2022.

(continued on page 25)



ACADEMY SHARES EXPERIENCES

Academy of Civil Engineers women leaders and alumnae shared their career experiences and leadership tips as mentors with CAR EE students in October. Topics discussed included early career challenges and opportunities, unique career paths, leadership and career advancement and workplace challenges.



Research team participates in international conference on computing in civil engineering

Dr. Islam El-adaway, the Hurst McCarthy Endowed Professor in Construction Engineering and Management, and his research team participated in the 2023 I3CE American Society of Civil Engineers – International Conference on Computing in Civil Engineering. The conference is a leading international platform for exploring the latest advancements in computing and their applications to the field of civil engineering. The event, hosted by Oregon State University, took place June 25-28 in Corvallis, Oregon.

engineering doctoral students, **Muaz Ahmed, Radwa Eissa, Mohamad Abdul Nabi, Tamima Elbashbishy** and **Ramy Khalef**. Presented by **Bahaa Chammout**, a doctoral student in civil engineering.

- “Understanding of risky determinants affecting the success of design build airport projects using computational clustering techniques,” authored by Khalef and El-adaway. Presented by Fared Salih, a doctoral student in civil engineering.

- “Risk-reward allocation among integrated project delivery method stakeholders: a gamified cooperative data simulation approach,” authored by Eissa, Abdul Nabi and El-adaway. Presented by Eissa.

- “Circular economy strategies for reducing embodied carbon in the U.S. commercial building stocks: a system dynamics modeling approach,” authored by Eissa and El-adaway. Presented by Eissa.

- “Agent-based modeling for understanding incentives associated with distributed solar generation,” authored by Ali and El-adaway. Presented by Elbashbishy.

- “Studying contribution of associated stakeholders in risk control of modularized construction under different project delivery methods: a graph restricted cooperative games approach,” authored by Abdul Nabi and El-adaway. Presented by Abdul Nabi.

- “Enhancing pricing practices of subcontractors: a comparative analysis using simulation modeling” authored by Ahmed and El-adaway. Presented by Ahmed.



Pictured L-R: Bahaa Chammout, Radwa Eissa, Muaz Ahmed, Fared Salih, Mohamad Abdul Nabi and Tamima Elbashbishy.

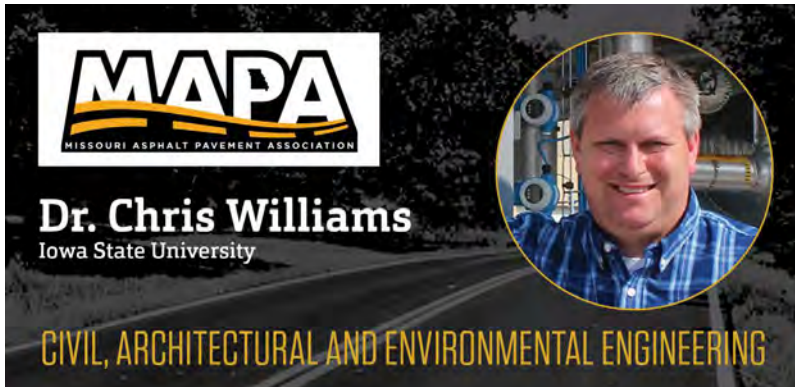
During the conference, El-adaway’s team presented several papers that included:

- “System dynamics modeling for investigating the retention of skilled labor in the construction market,” authored by **Tamima Elbashbishy**, a doctoral student in civil engineering, and El-adaway and presented by Elbashbishy.

- “Predicting high-impact research in the construction engineering and management domain using computational machine learning,” authored by El-adaway, **Gasser G. Ali**, a 2023 Ph.D. graduate in civil engineering, and civil



Hosted at Oregon State University



Iowa State asphalt expert delivers MAPA lecture

Dr. Chris Williams presented the department’s Missouri Asphalt Pavement Association (MAPA) Distinguished Lecture on Thursday, Nov. 16. Williams is the Gerald and Audrey Olson Professor of Civil Engineering at Iowa State University. His research focuses on asphalt materials, biomaterials and sustainability. His talk was titled “Biomaterials: An opportunity for more sustainable asphalt pavement systems.”



Pictured L-R: Dr. Magdy Abdelrahman, MAPA Professor, Klaus Woelk, S&T Chemistry, Dr. Joel Burken, CArEE Department Chair, Steve Jackson, NB West Contracting, Mike Lusher, CArEE Technical Research Specialist, Dale Williams, MAPA Executive Director, Dr. Chris Williams, Gerald and Audrey Olson Professor of Civil Engineering at Iowa State University.

Yan featured in NIBS annual report



Dr. Grace Yan, associate professor of structural engineering, was featured as a member spotlight in the National Institute of Building Sciences (NIBS) 2023 Annual Report. Her passionate advocacy for national and international collaboration in studying natural disasters.

→ **Website:** www.nibs.org/.../pdfs/NIBS_AnnualReport_2022.pdf

MO-CCI WEBINAR SERIES

This semester the Missouri Consortium for Construction Innovation (MO-CCI) hosted four guest speakers as part of their webinar series.

SEMINAR 1

Dr. Lucio Soibelman
University of Southern California

The Architectural, Engineering and Construction Industry and the Fourth Industrial Revolution

Students learned about Soibelman’s vision and work that focuses on the application and exploration of emerging information and communication technologies, big data concepts, smart buildings, smart infrastructure systems, machine learning and artificial intelligence. He focused on a broadly defined set of infrastructure systems and associated processes, such as planning, design, construction, facility and infrastructure management and environmental monitoring.

SEMINAR 2

Dr. Jiansong Zhang
Purdue University

Invariant Signatures of Architecture, Engineering and Construction Objects using Building Information Modeling

Zhang introduced the concept of invariant signatures of architecture, engineering and construction (AEC) objects, its discovery and application in solving BIM interoperability problems in a radically different approach from the existing efforts that are focused on data schema standardization or term-based semantics of AEC objects. The underlying hypothesis was that invariant signatures of an AEC object collectively defined by the Cartesian points-based geometric, relative location and orientation, and material mechanical properties will enable seamless and universal interoperability of building information modeling (BIM) software in various analysis phases from architectural design and preliminary structural design to detailed structural analysis and construction cost estimation.

(continued on the next page)

MO-CCI WEBINARS continued...

SEMINAR 3

Dr. John Myers
Missouri S&T

Structural Behavior and Temporal-Based Effects of Sustainable High Volume Fly Ash Self-Consolidating Concrete in Building Structures

Myers discussed his study to investigate the performance of sustainable self-consolidating concrete (SCC) for use in structures including buildings. Two types of concrete were utilized in his study: high volume fly ash-self consolidating concrete (HVFA-SCC) and high strength-self consolidating concrete (HS-SCC). The presentation focused on the lab study developing and investigating the overall performance of HVFA-SCC.

SEMINAR 4

Dr. Chimay J. Anumba
University of Florida

Leveraging Cyber-Physical Systems and Digital Twins for Construction Projects

There has been growing interest in digital twins (DT), which has the capacity to play an important role in industry transformation. Synergistic integration of constructed facilities and their digital representations are now being recognized as vital for, amongst other things, improved construction project information management, more efficient project delivery, and enhanced facilities management. This requires ensuring effective bi-directional coordination between the cyber and physical components. Dr. Anumba discussed the background to the growth of digital twins and the parent field of cyber-physical systems (CPS). He drew on examples from research prototypes to highlight the key features and benefits of DT and the associated applications for buildings and large capital projects. He also identified opportunities for further development of DTs for a variety of construction applications.

MO-CCI is a partnership between academia and industry that aims at optimizing corporate performance and project life-cycle through an integrated construction engineering and management (CEM) vision directed at student development, research and professional development.



MO-CCI Industry Night

We opened our doors for Missouri Consortium for Construction Innovation (MO-CCI) companies to come and network and look for new talent among our amazing students. Below are the companies that attended the event.



Missourians to know

John Branham, CE'70, CEO of Branco Enterprises, **Chris Vaeth**, CE'02, senior vice president and regional leader of McCownGordon Construction, and **Dr. Kamal Khayat**, vice chancellor for research and innovation at Missouri S&T, were recognized in *Ingram's Magazine's* list of 50 Missourians you should know.

This year's cohort upheld the standards for their business achievement, for their philanthropy, for their civic engagement and for their community service. Combined, they help raise the quality of life and work for nearly 6.2 million people who live in Missouri.

John Branham

Branco Enterprises
Neosho, Missouri



Growing up in a family-owned business didn't mean automatic employment for John Branham, CE'70. "Branco did and still does have a rule that a family member has to work

somewhere else for a minimum of two years," he says. Now CEO of Branco Enterprises — a leading provider of general contracting, design-build and construction management headquartered in Neosho — Branham started his career as a construction engineer for Mobil Oil. He was the first in his family to earn a college degree. "Since then, our world, our industry and our clients' desires have rapidly become more complex," he said. "As we have grown as a company, our needs have grown more demanding. ... I foresee this trend continuing as our professionalism grows." And Branco, he said, is taking the lead: The carpentry apprenticeship program that started in 1993, for example, is now formally associated with Crowder College, and now more than a third of those in the firm's field work force are either enrolled in the program or have already graduated.

Looking back on his career, Branham credits much of his success to the positive examples set by his parents and church growing up in Neosho. "I'm a firm believer in the concept expressed in Luke 12:48: 'To whom much is given, much is required.' Often this concept is perceived in financial terms, but applies across the board to our time, talents, wisdom. Although you will not always see or get the results hoped for, the successes are extremely rewarding."

Dr. Kamal Khayat

Missouri S&T
Rolla, Missouri



Dr. Kamal Khayat specializes in the development of high-performance cement-based materials for structural applications and rehabilitation.

In particular, his focus has concentrated on self-consolidating concrete and high-performance concrete behavior, including rheological properties, mechanical properties, durability, and structural performance. His other research interests include the use of chemical admixtures, sustainable hydraulic binders, and recycled materials for concrete. Khayat moved to Rolla in 2011 and took on duties of interim vice chancellor for innovation in 2021, and has been praised for his ability to bring researchers from multiple disciplines together to address critical research issues. The university's research division works with research centers, academic departments, laboratories, and individual faculty and students, helping all secure vital research grants and reach their research goals. As important to the broader state economy, that division leads commercialization efforts that move research discoveries into marketable products, services, intellectual property and spin-off companies. He holds a Ph.D. in civil engineering from California-Berkeley, where he also earned his bachelor's degree in civil engineering and a pair of master's degrees.

(continued on page 26)

Top 2% cited in their fields

continued from page 21

Here is the list of top researchers from our department:

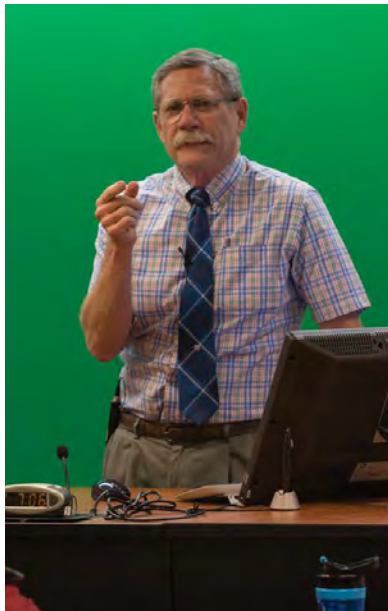
- **Dr. Genda Chen**, Robert W. Abbett Distinguished Chair in Civil Engineering and director of the Center for Intelligent Infrastructure (both).
- **Dr. Mohamed ElGawady**, professor of civil, architectural and environmental engineering and interim director of Center for Infrastructure Engineering Studies (both).
- **Dr. Dimitri Feys**, associate professor of civil, architectural and environmental engineering (2022).
- **Dr. Kamal Khayat**, vice chancellor for research and innovation and the Vernon and Maralee Jones Professor of Civil Engineering (both).
- **Dr. Hongyan Ma**, associate professor of civil, architectural and environmental engineering (both).
- **Dr. William Schonberg**, professor of civil, architectural and environmental engineering (both).
- **Dr. Lesley Sneed**, former Stirrat Faculty Scholar and professor of civil, architectural and environmental engineering (2022).
- **Dr. Wei-Wen Yu**, Curators' Distinguished Professor emeritus of civil engineering (career).
- **Dr. Daniel Oerther**, professor of civil, architectural and environmental engineering (2022).

Zhang invited

Dr. Xiong Zhang, James A. Heidman Professor, was invited to deliver a themed lecture titled "Towards Unsaturated Soils Engineering" at the 8th International Conference on Unsaturated Soils (UNSAT2023) held in Milos, Greece. The conference is organized under the auspices of the ISSMGE Technical Committee TC106. It is one of the most important conference series in the field of unsaturated soils.

→ **Website:** www.unsat2023.org

Rogers wins Civil Engineering History and Heritage Award



Dr. J. David Rogers, a longtime geological engineering professor at Missouri S&T, was recently awarded the Civil Engineering History and Heritage Award from the American Society of Civil Engineers. Rogers has taught geotechnical courses to CArEE students for decades.

"I have been fortunate throughout my career to be able to study issues that I am passionate about and pass on that knowledge on in a variety of ways to my students, colleagues, and the public," says Rogers, the Karl F. Hasselmann Missouri Chair in Geological Engineering at S&T. "To receive this award is a true honor."

ASCE executive director Thomas Smith wrote in a congratulatory letter that Rogers was selected for the award in recognition of his 30 years as a recognized expert on the history of dam failures, his significant publications on civil engineering history topics, and his many ASCE conference presentations.

The ASCE award was developed in 1966 to honor individuals for their contributions to a better knowledge and appreciation of the history and heritage of civil engineering.

In addition to a plaque, Rogers also received a \$2,500 cash prize at a future ASCE event.

For decades, Rogers has been a go-to source for media inquiries and documentary films focused on geohazards, such as landslides, floods and earthquakes. In 2006, he received a presidential citation from the Association of Environmental and Engineering Geologists (AEG) for his work investigating the levee failures that occurred during Hurricane Katrina.

Rogers earned a Ph.D. in geological engineering and a master's degree in civil engineering from the University of California, Berkeley. He also holds bachelor's degree in geology from California State Polytechnic University in Pomona.

He is a fellow of the Geological Society of America and the ASCE and is a life member of the U.S. Society on Dams.

Rogers joined the Missouri S&T faculty in 2001. Before that, he had consulting firms with offices in California and Hawaii and served as a lecturer in engineering geology and environmental geology for planners for the University of California, Berkeley.

Last year, he was awarded the Schuster Medal from the Canadian Geotechnical Society and the AEG.

Missourians to know...

continued from page 25

Chris Vaeth

McCownGordon Construction,
Kansas City



Signing on with a fledgling construction company in Kansas City 20 years ago, Perryville native Chris Vaeth, CE'02, wasn't just accepting a job: He was embracing a culture. The Kansas City region leader for

McCownGordon Construction has fully bought into the vision of building a company that's a vital part of the community, one that still informs his own non-profit service outside the office. "It started by example; we learned from those who are above us or whom we work for or with," Vaeth says. "There was never a directive or demand; I think those of us who came on board early saw the founders do it, it made sense, and as more of us did the same, it became part of our culture." The firm extends that reach as it enters new markets, such as Wichita and Dallas. "We want to invest in those communities, be a part of them, so we really encourage our people to find things they are passionate about, support them when they want to engage by giving their time and support those causes financially when we can." That approach and the construction excellence turned the \$17M company he joined into one on track for \$1B in revenues. He and Tracey have lived on each side of the state line — twice — but the Midtown home they have with their two children may be the final stop. "I love Kansas City," Vaeth says. "I think it has so much potential and momentum. We want to see Kansas City grow and be a successful community, and we want our kids to always call this home."

→ **Website:** [ingrams.com/article/50-missourians-you-should-know-5/](https://www.ingrams.com/article/50-missourians-you-should-know-5/)

New book covers the life of entrepreneur Fred S. Kummer

A new biography covers the life and work of **Fred S. Kummer**, CE'55, a philanthropist, entrepreneur and Missouri S&T engineering graduate. The book, titled *Master Builder*, is available from the S&T Store for \$15.

Kummer was born April 23, 1929, in New York. A graduate of William Cullen Bryant High School in Queens, he was living with his mother in Queens while working a variety of jobs in 1951. He also was taking courses at City College of New York when he decided to transfer to Missouri S&T, which was then known as the Missouri School of Mines and Metallurgy.

While in college at Rolla, he worked for St. Louis-based Ittner Architects, which had a project in Rolla. It was there he met June Baumer, an architect at the firm and a graduate of Washington University in St. Louis. He left S&T in 1952 to join the Army, where he attained the rank of first sergeant and was stationed at Fort Dix, New Jersey. He married June in 1953 while in the service and returned to Rolla that same year to complete his civil engineering degree.

In 1960 he founded Hospital Building and Equipment Co., which later became known as HBE Corp., from the basement of his Crestwood, Missouri, home.

"Fred is the perfect example of the American dream of upward mobility," says Dr. Larry Gragg, the author of the new biography. "He epitomizes the belief that if you work hard, you can succeed. But Fred and June would add the essential element of access to an excellent education."

Kummer worked with clients to formulate plans, then did the design work, engineering, and architectural



June and Fred Kummer. Photo from *Master Builder*

planning. This approach helped him grow his St. Louis-based company into the world's largest design-build firm for medical and financial facilities.

"Fred controlled all the planning for his projects and his unique approach to presenting clients with initial drawings and materials kept costs down compared to others," says Gragg, a Curators' Distinguished Teaching Professor emeritus of history and political science at Missouri S&T. "For example, he refused to use expensive materials like marble throughout hospitals. Fred phrased it as, 'You don't design a hospital to be an art museum.'"

Kummer's company eventually built over 1,000 hospitals in 49 states. In 1973, he expanded into the hospitality business, launching Adam's Mark Hotels & Resorts, a chain of upscale hotels that eventually grew to 25 properties in 13 states.

The Kummers donated \$300M to Missouri S&T in October 2020 to establish the Kummer Institute for Student Success, Research and Economic Development. Their donation is the largest single gift ever to any public or private university in Missouri and one of the largest ever to any university.

"In my opinion, the biggest gift the Kummers have ever given is the gift of education to hundreds of Missouri S&T students who now benefit from their scholarship programs," says Gragg. "His commitment to this campus has been nothing but consistent, and now what he and June wanted most is happening: students from underprivileged backgrounds are being exposed to STEM educations and having the support to pursue those interests at S&T's summer camps and its university educations."

Connect with us.

Email your news to: care@mst.edu

RECORD TURN OUT

Miners were in high demand at the Fall Career Fair. More than one thousand recruiters from 480 companies attended. We also enjoyed hosting more than 80 visitors at our Night to Network Event (see page 19)

EMPLOYERS LOOKING FOR CAREE MAJORS
79 ArchE, 246 CE, 119 EnvE (274 total)

