Missouri S&T
Winter 2018 | Vol. 41

The Bridge

Civil, Architectural and Environmental Engineering

Dr. Grace Yan talks tornado preparation

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DEPARTMENT GROWTH IN:
Research | Students | Building | Faculty

page 3

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

As we move through the 2018-19 school year, I am excited to see the exponential progress of our civil, architectural and environmental engineering team. Going into the fall semester, student enrollment increased to more than 600 students and our faculty output grew substantially in research funding and publishing. With the increasing talents of our students and faculty and facilities investment, the future is looking bright, and the articles highlighted in this edition of the *Bridge Newsletter* are just a sampling of the great things happening.

The past six months have been marked with good news and advancements that will position us for decades to come. We were thrilled to celebrate the groundbreaking of the Clayco Advanced Construction and Materials Lab (ACML) addition to Butler-Carlton Civil Engineering Hall during MinerFest Homecoming Weekend (see page 7).

Talks by alumni **Steve Sieckhaus**, CE'87, MS EMgt'94, from Clayco, and **Dick Arnoldy**, CE'69, MS EMgt'73, from ARCO, spoke well of our department's legacy, drive and dedication to support future generations of Miner alumni. The talk by **Lexi Lee**, a senior in civil engineering and Greenberg Scholar, transitioned beautifully into the determination and eagerness of her and her classmates to launch their professional careers using hands-on experience as their stepping stone. Lexi framed the combination of S&T's reputation with our world-class ACML facilities for preparing future Miners to build upon our legacy. The support of our alumni and partners have positioned us as coming leaders in advanced materials and construction education and research.

We also celebrated the expansion of our talents, as well as resources. Alumni and partners gathered at McCarthy Building Companies in St. Louis to celebrate **Dr. Islam El-adaway** joining our team as the Hurst/McCarthy Professor in Construction Engineering and Management (see page 4). Celebrating with **Michael**, CE'74, and **Barbara Hurst**, demonstrated the tradition of past accomplishments paving the way for today's success and setting the table for tomorrow's triumphs.

Our faculty talents were further enhanced with the addition of **Dr. Guney Olgun** and **Dr. Sanjay Tewari** (see page 5). Adding these three highly accomplished and experienced professors will pay great dividends as they join an already highly accomplished education and research team. I am quite proud to share that our team increased research publishing to an average of seven journal articles per faculty member and research expenditures by over 45 percent to $3.9M. New research awards were up 69 percent to $5.9M (see page 3). The increased support will help expand graduate and undergraduate enrollment so many will have the opportunity to "change the world!"

Sincerely,

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www.facebook.com/MissouriSandTCArE

DEPARTMENT ADMINISTRATION

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

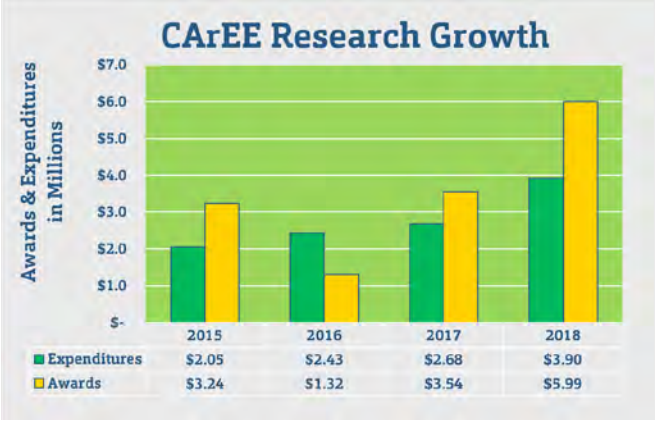
Assistant Chairs
Civil: Eric Showalter, Ph.D., P.E.
Architectural: Stuart Baur, Ph.D., A.I.A.
Environmental: Mark Fitch, Ph.D.
Graduate Programs: Cesar Mendoza, Ph.D.

CLAYCO ACML

16,000 ft²

NEW LAB SPACE IN 2019

Advancing Missouri S&T's leadership in infrastructure engineering (page 7)



7 Publications per Faculty

Average number per faculty for 2017
Top 25 nationally in Academic Analytics

>600

Fall 2018 Total CArEE Student Enrollment

13

Active student organizations and design teams

CHANGING THE WORLD

The Bridge

In this issue

NEW FACULTY

FOCUSED ON THE FUTURE

We are pleased to introduce three new faculty members to our team. Their experience and contributions through excellence in teaching, publications and high-quality research are preparing Missouri S&T students for professional careers; professional services and recognition; and outreach activities at national and international levels. Please join us in welcoming them to S&T.

Construction engineering and management expert joins S&T

by Alan Scher Zagier

Dr. Islam El-adaway, former associate professor and coordinator of the University of Tennessee's construction engineering and management program, was named the Hurst/McCarthy Professor in Construction Engineering Management at Missouri S&T. His appointment began Aug. 1.

The professorship was established through a combined $1 million gift from **Michael**, CE'74, and **Barbara Hurst**, along with McCarthy Building Companies, where Hurst worked for more than three decades before his retirement.

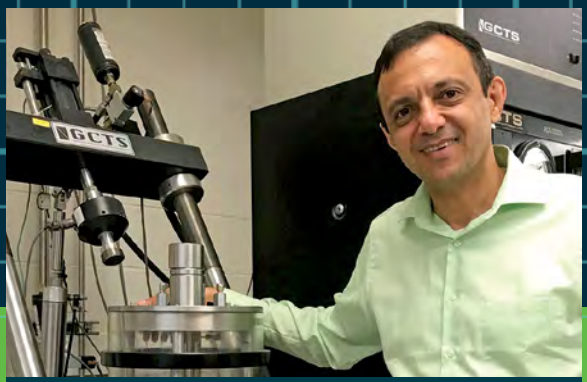
"Bringing in Dr. El-adaway is a great boost for our construction engineering and management programs," says **Dr. Joel Burken**, professor and chair of S&T's civil, architectural and environmental engineering department. "Construction is one of our most popular specialties among both students and employers. With Islam joining our team, we're now able to greatly increase our efforts in those disciplines, thanks to the generous support from the Hursts and McCarthy."

El-adaway's research interests include sustainable infrastructure and hazard management, modeling and simulation for construction, decision and risk management, and contractual and legal affairs in construction. He has written or co-written more than 90 peer-reviewed publications and been recognized by the American Society of Civil Engineers (ASCE) and the National Academy of Engineering. El-adaway is a fellow of both ASCE and the Institution of Civil Engineers, as well as a licensed professional engineer and chartered civil engineer, and has received multiple teaching and research awards.

Dr. Islam El-adaway
Hurst/McCarthy Professor of Construction Engineering and Management

"I am humbled and honored to be offered such a prestigious position at Missouri S&T," he says. "Since my campus visit, I've had an opportunity to experience the explicit respect and passion that the Missouri construction industry has for both my new department and S&T as a whole. I am extremely thankful for the kind, reliable and consistent support of Mike Hurst and the McCarthy Building Companies."

(continued on page 6)



Dr. Guney Olgun

Assistant Professor, Geotechnical Engineering

Olgun added to geotech group

Dr. Guney Olgun comes to S&T from Virginia Tech, where he was a research assistant professor from 2009 to 2017. He earned bachelor's and master's degrees in civil engineering from Bogazici University in Turkey, and a Ph.D. from Virginia Tech. His research interests include: energy geotechnology; geothermal foundations; earthquake engineering; seismic hazard mapping; ground improvement; soil-foundation-structure interaction; advanced numerical modeling; disaster resilience and risk management.

Dr. Sanjay Tewari

Assistant Teaching Professor, Environmental Engineering

Tewari hired in environmental

Dr. Sanjay Tewari was hired for our MSU Program from Louisiana Tech University where he was an assistant professor from 2012 to 2018. His background is in solving challenges associated with water and wastewater. His research focuses on capacitive deionization; electrokinetic barriers and remediation; greywater/water reuse; resource recovery; bio-filters; electrochemical and environmental separation processes; geographic information system; and infrastructure resiliency.

Florence joins S&T Trustees

Civil engineering alumnus **Lister Florence**, information technology specialist at the U.S. Geological Survey in Rolla, is one of the newest members of the Missouri S&T Board of Trustees along with fellow Rolla resident, Ted Day.

The Board of Trustees is made up of Missouri S&T alumni and friends whose accomplishments, experiences and interests help guide the university's future. The board serves as the key advisory group to the chancellor on strategic direction and means to enhance the university's stature. Its members also serve as ambassadors for S&T and supporters of the university's philanthropic goals.

Florence holds three degrees from S&T: a bachelor of science in civil engineering, earned in 1995; a master of science in information science and technology, earned in 2006; and a bachelor of science degree in computer science, earned in 2007. Employed at the United States Geological Survey, his work includes production of high-resolution geo-referenced digital files for the historical printed maps.

Florence and his wife, Tuesday, give back to the community and his alma mater through several organizations, including Gideon International, Optimist International (where he serves as East Missouri governor), Riverways Federal Credit Union (board of directors), and Missouri S&T, where he serves as an admission ambassador, a University of Missouri System Legislative Day representative and on the Chancellor's Advisory Committee on African American Recruitment and Retention.

He also has received S&T's Distinguished Young Alumni award and serves on the university's recently formed Sesquicentennial Advisory Committee. He has received the Rolla NAACP chapter's "Yes I Can" Award. He was appointed by interim Chancellor **Christopher G. Maples** to the Board of Trustees and began his service last April.

Construction engineering and management expert joins S&T

(continued from page 4)...

"I'm excited to build on the bold strategic visions that were shared with me by Dr. Burken and other campus leaders," he adds. "My plan is to utilize the already existing ties with key construction companies and institutions in Columbia, Kansas City, St. Louis, Springfield and the rest of the state towards developing more comprehensive partnerships."

El-adaway earned bachelor of science and master of science degrees in construction engineering from the American University in Cairo and a Ph.D. in civil engineering from Iowa State University. He previously was the Richard A. Rula Endowed Professor of Construction Engineering and Management at Mississippi State University.

"Our vision when we established this endowment was to select an accomplished professional who would have an impact on S&T students, the university and the broader construction industry," Hurst says. "Dr. El-adaway is an outstanding teacher and distinguished researcher who will be able to further strengthen industry ties on campus."

Founded as a family business in 1864, McCarthy is one of the oldest privately held construction firms in the nation. The firm is 100 percent employee-owned and provides construction management, design/build and general contracting services nationwide.

McCARTHY®

MEET & GREET

Alumni, faculty and friends gathered at McCarthy in September to welcome **Dr. Islam El-adaway** to the Missouri S&T and McCarthy teams. **Michael Hurst**, CE'74, shared his gratitude and noted the vision of the future to increase education and research in the area of construction engineering and management. **Chris Nisbet**, CE'84, project director at McCarthy, and Scott Wittkop, president and COO, also shared their excitement and dedication to collaborating with Dr. El-adaway and team members. El-adaway wrapped up the event with his vision for the future at S&T and the Missouri construction industry.

Pictured from left to right are Michael Hurst, Barbara Hurst, Dr. Islam El-adaway and Chris Nisbet.

A great turnout for our alumni meet-and-greet at McCarthy Constructors! Over 30 alumni and friends gathered at McCarthy Headquarters on Sept. 26 to celebrate.

POURING
THE CORNERSTONE
ON A BETTER FUTURE

by Maridel Allinder

Photo by Kandi Woessner

The donors who paved the way to a $6.5 million lab expansion in Butler-Carlton Civil Engineering Hall gathered on Oct. 12 to pour the cornerstone on the Clayco Advanced Construction and Materials Laboratory.

The lab marks the final phase of a $10.5 million initiative to advance S&T's leadership in infrastructure engineering. A U.S. Department of Transportation grant for $2.5 million in testing equipment launched the first phase. The second phase added new faculty positions in civil, architectural, and environmental engineering and materials science and engineering. The final phase will add 16,000 square feet of research space to the existing high-bay structures lab.

"The lab will be one of the finest research centers in the world for construction materials and methods," said **Chris Maples**, interim chancellor. "It will position Missouri S&T for unprecedented acceleration in an area of leadership and expertise."

The lab expansion received support from the University of Missouri System in June 2017 when President **Mun Y. Choi** committed $1.6 million, identifying the project as a strategic investment for the entire system.

A bequest from **James Heidman**, CE'65, MS CE'66, was also instrumental to funding the lab, as well as faculty endowments in civil, architectural and environmental engineering.

In February 2018, ARCO Construction Co., its founders and S&T graduates employed there made a $300,000 contribution to the lab — and held a special event in St. Louis to encourage other alumni in the construction industry to step up and support the lab. ARCO was co-founded by retired chairman **Dick Arnoldy**, CE'69, MS EMgt'73, and president and chief executive officer **Jeff Cook**, MS EMgt'94.

Two months later, Clayco Inc., one of the nation's largest privately owned real estate and design-build firms, donated $2 million, completing fundraising for the lab. The company employs a number of S&T alumni, including chief operating officer and shareholder **Steve Sieckhaus**, CE'87, MS EMgt'94, and executive vice president and shareholder **Tom Sieckhaus**, CE'88.

With the concrete dry and the cornerstone set, construction now begins on a lab that will pave the way to a stronger future.

"Infrastructure is what sustains our quality of life, supports our economy and secures our nation," said **Dr. Joel Burken**, Curators' Distinguished Professor and chair of civil, architectural and environmental engineering. "Thanks to the support of our generous donors, Missouri S&T is rising to the challenge of building a stronger, smarter, safer and more sustainable future."

Elgin talks Missouri water law for engineers

Dr. Richard Elgin, longtime adjunct surveying professor, shared how water law affects many aspects of the professional surveyor or engineer's practice during a lecture held on campus in September. More than 60 attendees from across the region earned a professional development unit and learned how water law legal principles guide the professional surveyor's determination of the location of a riparian boundary and how it affects the engineer's design for site stormwater management.

Dr. Richard Elgin

The event was co-sponsored by the Missouri Society of Professional Engineers (MSPE) Rolla Chapter, Archer-Elgin Engineering and Surveying, Inc. and the civil, architectural and environmental engineering department. MSPE is an individual member association that protects the public health, safety and welfare by promoting and defending the engineering profession.

Elgin, P.S., P.E., received his bachelor's and master's degrees in civil engineering from Missouri S&T, and his Ph.D. from the University of Arkansas. For many years he was the owner of Elgin Surveying in Rolla. Semiretired, he works for Archer-Elgin Engineering and Surveying. And besides being an adjunct professor for the CArEE department, he's a former president of the Missouri S&T Academy of Civil Engineers, former president of the Missouri Society of Professional Surveyors (MSPS), and former member of the Missouri licensing board for engineers and surveyors. His current project is writing a book about Missouri riparian boundaries.

Myers named fellow of International FRP Institute

Dr. John Myers, professor of civil, architectural and environmental engineering and associate dean for academic affairs in the College of Engineering and Computing, has been named a fellow of the International Institute for FRP in Construction. FRP stands for fiber-reinforced polymers. A colleague in Australia nominated Myers for the group's executive council, and he was elected to serve on it. Myers is the second S&T faculty member to be honored by the group, succeeding colleague Dr. Antonio Nanni, who is now chair of the civil, architectural and environmental engineering department at the University of Miami.

Projects selected for eFellows program

Two proposals written by two of our faculty members (out of eight across campus) have been accepted for the Provost's eFellows grants for 2018-19 as part of a program that promotes innovative and collaborative course design for blended or fully online courses. The program is funded by the Center for Advancing Faculty Excellence (CAFE) and administered by educational technology.

The two projects are:

- "Engineering Ethics and Professionalism," by **Dr. William Schonberg**, professor
- "Blended Course Design for CIV_ENG 5513 Traffic Engineering," by **Dr. Xianbiao Hu**, assistant professor

The Missouri S&T Provost's eFellows Program provides funding to improve the learning environment while maximizing the physical learning facilities available for instruction.

SHOWALTER SELECTED AS KIEWIT FACULTY SCHOLAR

Dr. Eric Showalter, assistant chair and teaching professor, was selected as a Kiewit Faculty Scholar and spent the summer with Kiewit Power Constructors.

He spent three weeks in Lenexa, Kan., in Estimating, learning Kiewit's systems for cost estimating then moved to Omaha as part of "Building a Stronger Curriculum with Kiewit," a three-day workshop with faculty from across the U.S. and Canada. Here he learned about safety, planning, equipment management, 3D visualization and more.

Showalter was then assigned to the Alamitos Power Plant in Seal Beach, Calif., for six weeks.

"Alamitos is an EPC (Engineer Procure Construct) job, about $630 million, and the pace of design and construction was something I'd never experienced," Showalter says. "I had the opportunity to see almost anything I wanted to on the project. Some days I did things an intern would do; checking shop drawings or out in the yard looking for specific pieces of pipe. Other days I'd work on lift plans for 75-ton lifts. I sat in on meetings with the client. I went out in the mornings for stretch and flex with the boilermakers, ironworkers and the pipefitters."

The last two weeks in California, Showalter went through the Foreman's Leadership training, alongside 15 union foremen.

"Everyone was so good to work with, I learned from everyone on the job, from the project manager to the carpenters and other trades," Showalter says. "The superintendents were especially good at giving me interesting things to work on, answering my questions and making me part of the team."

Kiewit requires that faculty scholars produce education modules that are then posted on the Kiewit Professor's Portal. The modules, which are available for any faculty member to download and use, include a presentation, a set of presenter's notes, quizzes and assignments, photos, drawings and videos.

"It was a tremendous opportunity for me to spend time on the jobsite," Showalter says. "The last time I worked for a construction company was about 28 years ago, and it was time to go get fresh experiences."

PLANT DETECTIVE

Professor studies plants as "bio-sentinels" of indoor pollution

by Alan Scher Zagier

Behold the common house plant, the front-yard shrub, the rhododendron around back that's seen better days since the next-door neighbors put their home on the market. They brighten our lawns, increase our property values, even boost our mental and physical health by reducing carbon dioxide levels.

For **Dr. Joel Burken**, such plants are far more valuable than as mere window dressing. The Curators' Distinguished Professor and chair of civil, architectural and environmental engineering at Missouri S&T is an expert in phytoforensics, the process of using plants to study human exposure to pollutants.

Plants are "place-bound. They grow in one location and they interact with the soil, the groundwater and the surrounding air," he explains. "They're really masters of mass transfer. They harvest from those surroundings all the carbon, all the water, all the nutrients they need. But chemicals in those surroundings also can accumulate in those plant tissues.

"So if we sample those plants, we're actually sampling those surroundings. And by understanding the chemical exposure to plant pathways, we can also then understand the chemical exposure to human pathways," Burken adds.

In an upcoming article in the journal *Science and the Total Environment*, doctoral students **Majid Bagheri** and **Khalid Al-jabery**, working with Burken and **Dr. Donald Wunsch**, the Mary K. Finley Missouri Distinguished Professor and professor of computer science at S&T, use machine learning techniques and statistical analysis to help better understand how groundwater contaminants are absorbed by plant roots.

That research builds on a three-year National Science Foundation (NSF) grant awarded to Burken; **Dr. V.A. Samaranayake**, Curators' Teaching Professor of mathematics and statistics; and **Dr. Glenn Morrison**, professor of environmental engineering, to study how pollutants absorbed by plants can move through soil and enter a building in a process known as vapor intrusion.

"By understanding the chemical interactions, we really have a potential to sample almost anywhere on the globe — especially the places that we inhabit. And by sampling that plant — a bio-sentinel — we may better understand how we're exposed to chemicals, and how to better prevent that," Burken says.

S&T's phytoforensics efforts have drawn a spate of attention in recent months, and the sensing methods are being put in action.

In addition to the upcoming journal article, "A deeper look at plant uptake of environmental contaminants using intelligent approaches," which will be published in February 2019 but is now available online, NSF is expected to soon publish a video produced by S&T about the work. The video is intended to communicate the research to a broader audience and help transfer S&T's scientific breakthroughs into practice while further protecting human health.

In July, the publication and website *Science Journal for Kids* presented its own take on the topic, spurred by the S&T

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ELGAWADY'S RESEARCH FEATURED ON MISSOURI BUSINESS ALERT

Putting his entrepreneurial spirit into practice by turning recycled tires into asphaltic surface treatment, **Dr. Mohamed ElGawady** was recently highlighted in a Missouri Business Alert (www.missouribusinessalert.com) news article about his team's work with the Missouri Department of Natural Resources (MoDNR) and Missouri Department of Transportation (MoDOT) to test the use of recycled rubber chunks as an aggregate in the road sealing process known as chip seal.

MoDNR and MoDOT, who have been interested in recycled tires for years, have launched three pilot projects, that are testing how well rubber works as a street surface or in temporary sealants meant to maintain road integrity in between major renovations. With the help of a regional grant, Missouri S&T, MoDNR, MoDOT and other state agencies are testing whether the recycled crumb rubber can be used as an aggregate for road surface dressing. Roads are being tested in Phelps, Cooper and Cole counties.

YOUNG FACULTY EXCEL

Libre receives award for teaching approaches using technology

Dr. Nicolas Ali Libre, assistant teaching professor of structural engineering, was awarded the 2018 Focus on Teaching and Technology Conference (FTTC) Teaching with Technology Award in recognition of his innovative approaches to using technology to promote student engagement, exceptional learning opportunities and a climate of high academic standards.

The St. Louis regional conference, held in September on UMSL's campus, has evolved over the years to reflect emerging trends in technology applications in higher education and shared expertise in online teaching experiences and strategies.

Hu receives excellent paper award

Dr. Xianbiao "X.B." Hu received an Excellent Paper Award at the 2018 World Transportation Convention (WTC) for his paper titled, "Advancing Usage Based Insurance – A Contextual Driving Risk Modeling and Analysis Approach." This paper was also presented at the "Cross-Cutting – Smart City" session. The WTC international conference was held in Beijing, China, in June. The conference attracts over 5,000 attendees and had a total of 1,829 full paper submissions. Among them, 74 papers (4 percent) were selected to receive an Excellent Paper Award.

CAREER FAIR

Networking & Social Event

This year the department hosted it's first meet-and-greet for CArEE alumni, employers, students and faculty before the 2018 Fall Career Fair.

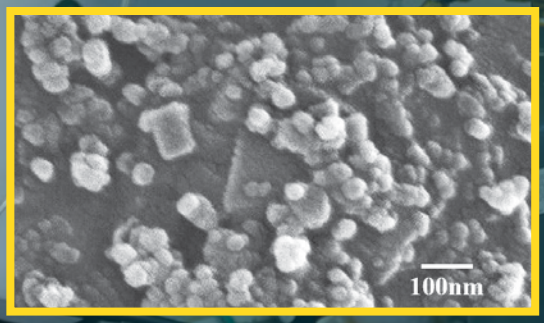
With over 30 employers and 70 students signed up, there was some great conversation about bright futures for our soon to be alumni. It was a great opportunity for everyone to connect outside the normal fair hours in a more relaxed setting.

The next networking event is planned for Feb. 18, 2019. If you are interested in joining us, please contact **Jody Seely** by email at seelyj@mst.edu.

TESTING

A LOW-COST METHOD OF STRENGTHENING CONCRETE WITH NANOPARTICLES

Story and photo by Sarah Potter



Dr. Hongyan Ma will test producing calcium carbonate nanoparticles inside highly diluted wet cement

It's long been proven that adding nanoparticles to concrete improves the materials' strength and durability, but the cost of such processes has outweighed the benefits. One of our researchers is working on a safer, simpler and potentially more affordable method of combining nanoparticles with concrete.

Dr. Hongyan Ma, Missouri S&T assistant professor of civil, architectural and environmental engineering, compares the technique to blowing bubbles into limewater.

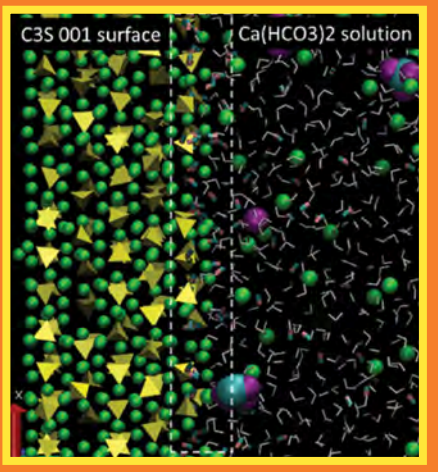
"Our method is to create calcium carbonate nanoparticles inside the concrete by blowing carbon dioxide into the highly diluted wet cement," says Ma. "The nanoparticles will be formed inside this part of the suspension in the presence of siliceous ingredients, and you use that to mix the concrete."

Previous attempts to add nanoparticles into fresh concrete were not successful because the superfine particles would always stick together — not disperse, says Ma. His method involves forming the nanoparticles inside the fresh concrete, creating an even disbursement.

A $160,000 grant from the National Science Foundation will allow Ma to test the method for creating nanoparticles in concrete through 2021. At the end of the next three years, Ma hopes to have the technology available to make this method ready for existing concrete plants to use.

Ma's method would mitigate another potential problem of working with nanoparticles in concrete — the fact that they are harmful to humans. They have harmful side effects especially when people use dry particles, including potential lung inflammation and heart problems.

"Our method is a wet method, so the workers and the laborers at concrete plants will not be exposed to the harmful nanoparticles," Ma says.



An illustration of the solution interface

The potential benefits of stronger and more durable concrete to civil infrastructure, the economy and the environment could be substantial, he says.

"Concrete durability is one of the main issues in preservation of transportation infrastructure," says **Dr. Genda Chen**, the Robert W. Abbett Distinguished Chair in Civil Engineering at S&T. "If you could reduce microcracking and increase durability in concrete that would certainly be a good benefit for all concrete structures."

Missouri S&T is one of the few U.S. universities that focus on studying materials for construction and other applications through one of four signature research areas – Advanced Materials for Sustainable Infrastructure (AMSI).

Dr. Kamal Khayat, the Vernon and Maralee Jones Professor of Civil Engineering and director of Missouri S&T's Center for Infrastructure Engineering Studies (CIES), says that such fundamental research combined with numerical studies and simulations will lead to the development of new construction materials.

"We hope to grow the AMSI signature research area to be best in class in the critical field of transportation infrastructure," says Khayat.

"We have a nice environment to do this research," says Ma. "I was hired through the AMSI research focus, and we have hired several new professors working in this area."

Ma says he also hopes to work with the CIES at Missouri S&T and the Missouri Department of Transportation (MoDOT) on pilot trials and field implementations.

Schonberg highlighted in NBC news article

Dr. William Schonberg shared his expertise on space and celestial objects with NBC News for a story about Chengu's plan to launch an illumination satellite in 2020. The article, "A city in China wants to launch an 'artificial moon' into space," published Oct. 26 on MSN.com and elsewhere.

You can read the article online at: rol.la/2Bi8exy

Missouri concrete conference

The annual Missouri Concrete Conference, directed by CArEE alumni and faculty member **Dave Richardson**, CE'71, MS CE'73, PhD CE'84, was held on the Missouri S&T campus on May 1-2, 2018. Eighteen presentations were given, including ones by alumni **Pat Martens**, CE'84, and **Grant Manula**, CE'13, and ACI Fellows Mark Luther, Luke Snell, and Larry Sutter. Attendance totaled 120.

Superpave Courses

During the 2017-18 season, five different types of certification courses were held at Missouri S&T: two Superpave QC/QA full certification short courses (five-day), one Superpave QC/QA re-certification short courses (two-day), two Binder Ignition Test courses (one-day), two Aggregate Consensus Tests courses (one-day), and one TSR course (one-day), for a total of eight courses. Seventy-four engineers, inspectors, and contractors were certified. The courses were directed and taught by faculty member **Dave Richardson** CE'71, MS CE'73, PhD CE'84. Other instructors included **Steve Jackson**, CE'07, Econ'07, **Mike Lusher**, CE'96, MS CE'04, PhD CE'18, and **Mike Meyerhoff**, CE'02. Over 3,000 individuals have gone through the training and certification at Missouri S&T since 1998.

MoDOT TRANSPORTATION CAMP

In July, the INSPIRE University Transportation Center hosted a one-day MoDOT Transportation Camp on the Missouri S&T campus as part of MoDOT's annual Youth Transportation Conference. Each summer, MoDOT selects 30 students from across the state to participate in the camp showing them numerous career opportunities in the field of transportation.

Attendees spent a full day visiting S&T and explored a variety of topics related to transportation. Following a welcome address by the center's associate director, **Dr. Suzanna Long**, and a presentation by the admission's office, students attended a series of activities organized by INSPIRE and Mid-America Transportation Center faculty members: **Dr. Genda Chen**, **Dr. Xianbiao "X.B." Hu**, **Dr. Grace Yan**, and **Dr. Hongyan Ma**.

The MinerFly Team provided an unmanned aerial vehicle (UAV) demonstration at the Havener Center. Students participated in transportation-related computer games, a bridge engineering competition, a tour of the System and Process Assessment Research (SPAR) Laboratory, and hands-on activities in the Wind Hazard Mitigation (WHAM) Laboratory, and Smart and Functional Construction Materials (SmarF) Lab.

IMPROVING THE PERFORMANCE OF RECYCLED MATERIALS IN ROADS

by Peter Ehrhard

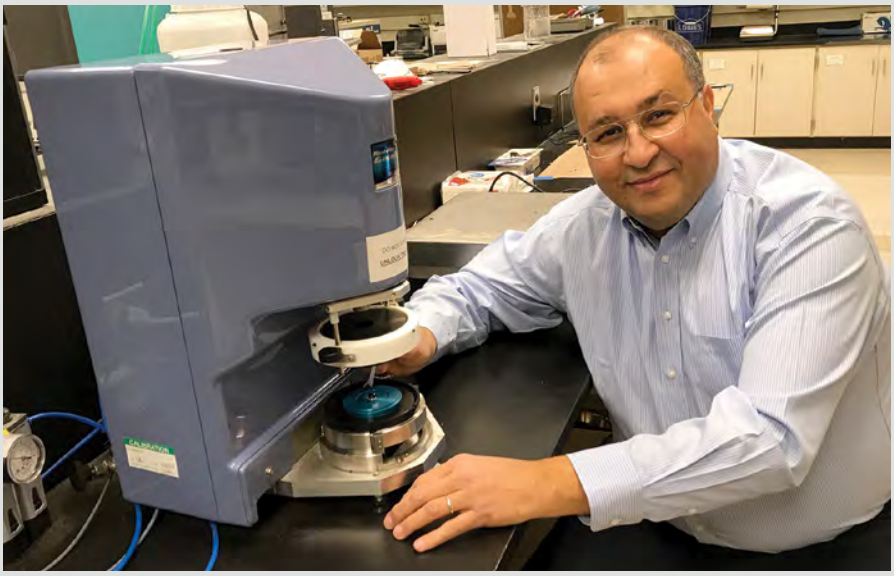
In the future, our highways and neighborhood streets could be paved with shredded car tires, discarded roof shingles and even old roads ground-up into gravel. The idea of recycling materials is not new in pavement technology, but recycled road performance and cost are often prohibitive.

A Missouri S&T researcher knows he can change that. **Dr. Magdy Abdelrahman**, the Missouri Asphalt Pavement Association Professor in civil, architectural and environmental engineering at S&T, says that by recycling either existing pavement or other waste materials into asphalt, we can slow the depletion of aggregate.

"New construction resources are rapidly diminishing, so we must incorporate industrial recycling materials into our research," says Abdelrahman. "When we start recycling in engineering, many technical challenges begin to come into play. It is our duty as a society to solve these and think about the future of infrastructure."

Construction aggregate is typically the coarse sand, gravel and crushed stone in concrete or asphalt mixes. It works to reinforce the overall strength of mixes. But it is limited in its quantities, so replacing it in concrete is a large-scale problem for future construction projects.

Abdelrahman's current research focuses on adding spent car tire rubber into asphalt mixes. Landfills are packed with these discarded tires which only serve to harbor disease-carrying mosquitoes and rodents. Stockpiles of old tires also burn easily — creating fires that can burn for months or even years. But the durability and flexibility of scrap tires makes them ideal for recycling.



Dr. Magdy Abdelrahman, MAPA Professor

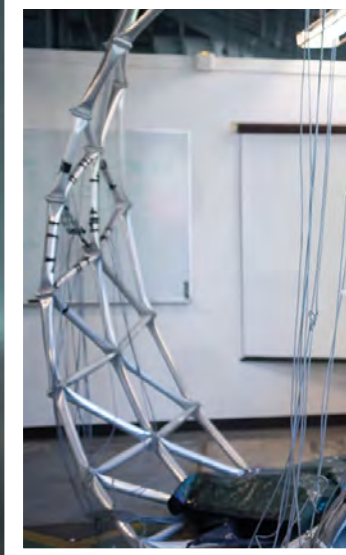
"Adding in new materials is unfortunately not as simple as mixing two or three resources together," says Abdelrahman. "There are chemical and 'fill' challenges that arise behind-the-scenes. We cannot allow roads to develop holes or cracks after the first year or two if wear affects these new materials differently."

Recently, Abdelrahman and other professors have developed a new course at Missouri S&T that is focused on sustainability and the need for engineers to consider recycled products in their research and studies. Abdelrahman believes that more and more recycling will come into our everyday lives in the future, and he says that one of the challenges in using these materials is managing the expectations of the public.

While in a class, he once asked students if they would be willing to buy a sandwich from a shop that used recycled materials in its sandwich wrappers. He says the class was evenly split in opinion, with some being uncomfortable with the wrapper being made from former garbage. The students were more willing to accept recycled wrapper when told the papers were hygienically treated.

"We need to teach students about the challenges of recycled materials and how they are a resource availability and environmental issue as well," says Abdelrahman. "Most of these industrial recycled materials are high-quality; there must be a way to continue to use them. If recycled materials are as good as processed materials and clean, why shouldn't we use them?"

Photos by Sam O'Keefe

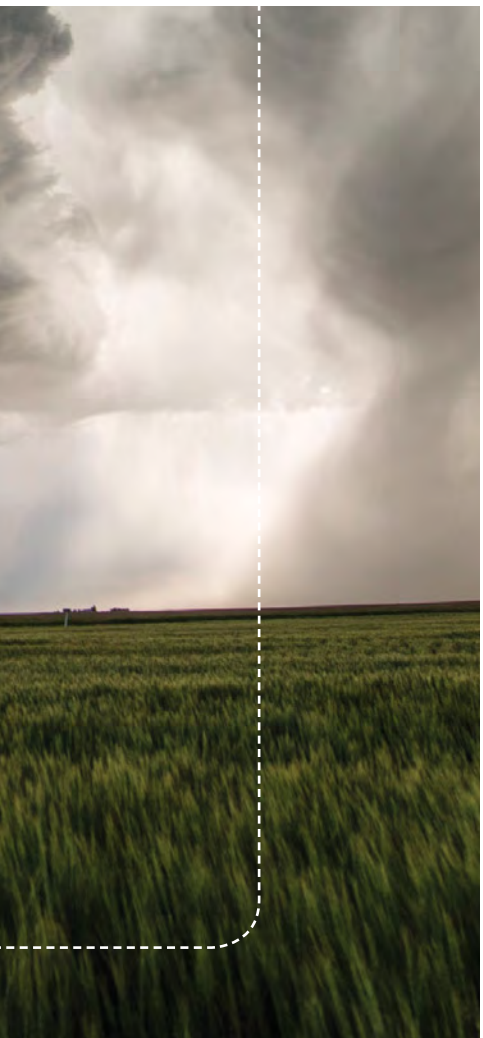


CIVIL ENGINEERING PROFESSOR

ADVOCATES FOR MIDWEST TORNADO PREPARATION

by Alan Scher Zagier

Growing up in northeast China, **Dr. Grace Yan** didn't see many tornadoes in a country where the number of documented twisters is a fraction of those that hit the United States.



But as her academic career took Yan to several postdoctoral fellowships and then faculty positions in Indiana, Missouri and Texas, the assistant professor of structural engineering at Missouri S&T gradually found her calling.

"Our mission is to make Tornado Alley safer," Yan says of the unofficial geographic designation that encompasses Texas, Oklahoma, Kansas, Iowa, Missouri and other parts of the central U.S. "We realized our research may not change people's lives until we awaken the entire community to work together."

As director of the Wind Hazard Mitigation Laboratory (WHAM) at Missouri S&T, Yan conducts research into wind hazard mitigation and computational fluid dynamics, structural health monitoring, damage detection and more.

She's built two small-scale tornado simulators that use toy models to mimic the destruction of high-speed twisters and hopes to build a large-scale simulator that she envisions will make S&T a global leader in her field. According to Yan, S&T would join Iowa State University and Texas Tech University as the only U.S. universities with simulators of similar size and scope, but with the advantage of being a mobile unit.

Public safety and preparedness — is central to Yan's work. That mission is what prompted her to present a TedXMissouriS&T talk on the vitality of tornado preparation earlier this year.

While her research typically relies on complex mathematical models to measure the correlations between varying tornadic wind patterns and infrastructure resiliency, Yan relied on a pair of analytical observations more commonly invoked in fields such as cognitive psychology, economics or political science — prospect theory and game theory — during her public presentation in the spring semester.

In prospect theory, researchers have found that people are more willing to endure certain-but-smaller financial losses than take the lesser risk of losing a larger amount all at once, Yan explains. So in that scenario, paying an annual $5,000 insurance premium over 30 years for a total of $150,000 is still more preferable than a one-time loss of the same amount, she says.

But those behavioral patterns are also influenced by other human factors, such as complacency. To that end, Yan is working to develop a virtual reality animation experience that would allow users to realistically determine how their homes would fare in a tornado.

"Based on prospect theory, to convince individuals to structurally reinforce their homes, the key is to inform them of the significant losses induced by tornadoes," she says. "You can see the wind flow, and you can see how your house is impacted."

Yan is also tapping game theory — the study of mathematical models of conflict and cooperation among those with competing and overlapping interests — to promote tornado resistance on a broader scale.

"Since tornado resistance is a matter for the entire community, based on

(continued on page 21)

OERTHER NAMED FELLOW OF THREE SOCIETIES

Dr. Daniel Oerther, professor of civil, architectural and environmental engineering at Missouri S&T, was named a fellow of three professional societies during summer 2018.

Dr. Daniel Oerther, pictured center, was recognized as a lifetime honorary Fellow of the Academy of Nursing Education by Dr. Beverly Malone, pictured left, CEO of the National League for Nursing and member of the National Academy of Medicine, and Dr. G. Rumay Alexander, President of the National League for Nursing and Chief Diversity Officer and Vice Chancellor of the University of North Carolina at Chapel Hill.

The Society of Environmental Engineers bestowed fellowship on Oerther for his significant engineering achievements resulting in career distinction including his award-winning work providing point-of-use drinking water filters for more than 80,000 villagers throughout Ixcan, Guatemala. Founded in London, England in 1959, the Society enables collaboration, knowledge sharing and skill development among engineers and technical staff across all environmental engineering disciplines and sectors.

The Chartered Institute of Environmental Health bestowed fellowship on Oerther for his significant contributions to environmental health research including his recent studies on the role of pathogen exposure and Aflatoxin ingestion as environmental determinants of child stunting – causing low height for age. Founded in London in 1883, the Institute is the oldest society of environmental professionals. The nearly 9,000 global members work to protect food safety, housing, public health and the environment.

The National League for Nursing recognized Oerther as a lifetime honorary fellow of the Academy of Nursing Education as part of their 125th anniversary celebration. Honorary fellowship is reserved for non-nurses from affiliated professions or public service who have made significant contributions to nursing education. Oerther was recognized for his teaching of interprofessional environmental health including the integration of nursing science, practice, and policy as part of STEM (science, technology, engineering and math).

"I feel truly blessed," shared Oerther. "Fellowship in these societies allows me a greater voice in my profession and the opportunity to connect my students and the Rolla community with a global network."

Oerther joined S&T in 2010. Since 2014, he has concurrently served as a Foreign Affairs Officer for the United States Department of State. Oerther is currently the vice chair of the Phelps County Extension Council.

AND THE ASCE AWARDS GO TO ...

The American Society of Civil Engineers (ASCE) St. Louis Chapter held its 2018 annual awards dinner at the Moto Museum in September. Three people with ties to our department were honored at this event.

Tom Sieckhaus, LEED AP

2018 SERVICE TO PEOPLE AWARD

This award brings public recognition to individuals who have performed outstanding service to people in their communities and to further public understanding and recognition of the civil engineering profession.

Tom Sieckhaus, CE'88, has always been an engaged member of the civil engineering profession, seeking the advancement of students at Missouri S&T and being an active member of the Clayco Inc. leadership team. Interns and new engineers express how the company works to develop their careers and also looks to be active in the profession and the community. Tom has been a leader in setting that corporate culture and does much of the heavy lifting to make it happen. Following the 2014 events in Ferguson, Mo., Tom wanted to do more to improve the situation and the community. In response, Tom envisioned and initiated the Construction Career Development Initiative (CCDI). He has poured his time, energy and support into building CCDI into a vehicle that will change lives and communities for generations to come. Through CCDI activities, Tom looks to engage students from underserved schools in professional engagement related to the construction industry. CCDI currently has 54 students that they are helping position, eight students on college scholarship and 49 students they have successfully placed into full-time employment.

Sieckhaus

Robert Ray Holmes Jr., Ph.D., P.E., F.ASCE, F.EWRI, D.WRE

2018 PROFESSIONAL RECOGNITION AWARD WINNER

The Professional Recognition Award recognizes the importance of professional attainment in the advancement of the science and profession of engineering and is presented to a member of the St. Louis Section of ASCE who has made substantial contributions to the engineering profession and the St. Louis Section.

Dr. Robert "Bob" Holmes, CE'87, MS CE'89, has been a dedicated public servant with the United States Geological Society (USGS) for over 30 years. During his time at USGS, Dr. Holmes has worked to help foster technical capacity and professionalism in the workforce. One key example is his serving for over 25 years as the course coordinator and instructor for a Basic Hydraulics Principles short course, where he has trained well over 500 USGS engineers, scientists and technicians in the study of open channel hydraulics. Holmes currently teaches as an adjunct professor and instructor of civil engineering at Missouri S&T.

Holmes

Taylor Husman, SENIOR, CIVIL ENGINEERING

2018 ASCE ST. LOUIS SECTION ANNUAL SCHOLARSHIP

The ASCE St. Louis Section Annual Scholarships are awarded in recognition of membership in an ASCE Student Chapter, excellence in academic performance, and active participation in issues reflecting the role of engineers in the advancement of our society.

Taylor Husman is from Eureka, Mo. She will be working at ARCO Construction in the St. Louis office as a project manager for the commercial and industrial side. Her favorite accomplishment during her time at S&T was becoming ASCE President and working closely with the S&T Academy of Civil Engineers.

Husman

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

MAEEC held at S&T this year

This year, Missouri S&T hosted the Mid-American Environmental Engineering Conference (MAEEC). In October, a total of 17 graduate students from S&T, University of Missouri-Columbia, Washington University in St. Louis, Saint Louis University, Southern Illinois University-Carbondale, Southern Illinois University-Edwardsville, respectively, presented their research at the conference.

Dr. Glen Daigger, a National Academy of Engineering (NAE) member, gave the keynote speech titled, "Transforming Urban Water Management." **John Mathes**, CE'67, MS CE'68, a long-time supporter of S&T's environmental engineering program, also attended the conference. The conference was co-sponsored by ASCE-EWRI, St. Louis Chapter and the S&T Center for Research in Energy and Environment (CREE).

Two graduate students from Washington University received EWRI's Best Presentation Award.

Pictured from left to right: Yeonook Bae, **Dr. Robert Holmes**, EWRI-St. Louis chair and Pradeep Parthibha.

El-adaway earns ASCE editor's choice

Dr. Islam El-adaway, the new Hurst/McCarthy Professor of Construction Engineering and Management, had two papers selected as "Editor's Choice" in September issues of the following ASCE Journals:

- ASCE *Journal of Construction Engineering and Management* OUT-OF-SEQUENCE CONSTRUCTION
- ASCE *Journal of Infrastructure Systems* SUSTAINABLE DISASTER RECOVERY

"The *Journal of Infrastructure Systems* publishes cross-disciplinary papers about civil infrastructure decision methodologies," says Dr. Sue McNeil, professor and chair of civil and environmental engineering at the University of Delaware and the journal's editor-in-chief. "The paper by El-adaway and Eid, 'Decision-Making Framework for Holistic Sustainable Disaster Recovery: Agent-Based Approach for Decreasing Vulnerabilities of the Associated Communities,' was selected for its contribution to important infrastructure issues, namely disaster recovery and sustainability, using a novel method while recognizing the stakeholders' needs. We are pleased to highlight these contributions."

Sneed appointed associate editor of ASCE Journal

Dr. Lesley Sneed, associate professor and Stirrat Faculty Scholar of civil, architectural and environmental engineering, was recently appointed an associate editor of the *ASCE Journal of Composites for Construction*, which is a leading journal in composite materials for both new construction and for repair and rehabilitation of existing structures. In addition, she was co-editor of the ACI 549, ACI 562, RILEM TC 250 CSM Symposium Volume "Textile Reinforced Mortar (TRM)/Fabric Reinforced Cementitious Matrix (FRCM) as external bonded reinforcement Steel Reinforced Grout (SRG) — A New Tool in the Repair Toolbox," published in 2018.

Sneed is active in several technical societies and committees that develop building codes, standards and technical guidelines. Currently, she is a voting member of ACI 318 Subcommittee E (Section and Member Strength), ACI/ASCE Joint Committee 445 (Shear and Torsion), ACI Committee 549 (Thin Reinforced Cementitious Products and Ferrocement), and the CRSI Standards Development Committee. She is also a member of ACI/ASCE 445-B (Seismic Shear), ACI 445-D (Database), ACI 445-E (Torsion), ACI 549-0L Liaison with RILEM TC250 (Composites for Sustainable Strengthening of Masonry), and ACI 440-F (FRP Repair and Strengthening Subcommittee, Anchorage Task Group).

PLANT DETECTIVE

(continued from page 10)

research and an article by Burken, Samaranayake, and former doctoral students **Dr. Jordan Wilson**, now a U.S. Geological Survey hydrologist; and **Dr. Matt Limmer**, now a University of Delaware postdoctoral fellow, that was published in February 2018 in the *PLOS One* journal.

The article, "Phytoforensics: Trees as bioindictators of potential indoor exposure via vapor intrustion," summarizes the analysis of 121 trees in Nebraska contaminated by the chemical tetrachloroethene (PCE), comparing the tree-core samples (a faster, cheaper and less intrusive collection method) to PCE levels in the surrounding groundwater, soil and nearby indoor locations.

TORNADO PREPARATION

(continued from page 17)

game theory, in order to maximize each other's benefit, the entire community has to play the game cooperatively," she explains. "Tornado resilience is a community responsibility, not an individual one."

There's perhaps no place in the U.S. where that message would resonate more than Joplin, the southwest Missouri city 180 miles from Rolla where 161 people died and thousands of buildings were destroyed in an EF-5 twister in May 2011 that ranks among the country's deadliest and costliest. Overall, 84 percent of tornado-related deaths are due to building and structural failures.

"The possibility of a tornado occurrence is very, very low, that's true," Yan notes. "So you are always thinking a tornado will never come. But once it comes, you have nowhere to hide."

WU receives ASCE's ExCEEd Fellowship

Dr. Chenglin "Bob" Wu, assistant professor of structural engineering, participated in an ExCEEd Teaching Workshop held in early August at Florida Gulf Coast University. This is a six-day practicum that provides engineering educators with an opportunity to improve their teaching abilities. American Society of Civil Engineers (ASCE) has successfully presented this workshop each summer for the past nineteen years. Learn more online at: asce.org/exceed.

Wang delivers national ACS keynote address

Dr. Jianmin Wang, professor of environmental engineering, gave the keynote address at the 256th American Chemical Society (ACS) National Meeting and Exposition held in Boston in August titled, "Enhanced Nutrient Removal from Wastewater through an Intermittent Aeration Strategy." He also gave two other separate talks regarding energy saving strategy for wastewater treatment and beneficial use of scrap tire for road construction. He served as a session chair in Chemical Reactions at Solid-Water Interfaces of Natural and Built Environment organized by his former Ph.D. advisor, Dr. C.P. Huang from the University of Delaware.

Jianmin Wang and C.P. Huang

DAIGGER DELIVERS FIRST MATHES LECTURE

Dr. Glenn T. Daigger, a member of the National Academy of Engineering, professor of engineering practice at the University of Michigan and president and founder of One Water Solutions LLC, a water engineering and innovation firm, presented the inaugural lecture of the Mathes Distinguished Lecture Series in Environmental Engineering.

During his October lecture, titled, "Closing the Knowing/Doing Gap," Daigger talked about dramatic changes in approaches and rapid advances in new and improved technologies to advance the objectives underlying urban water management trends.

Daigger discussed the available and developing approaches to plan and implement evolutionary and adaptable urban water management infrastructure.

Right now a significant gap exists between what we "know" we can do and what we are actually "doing," said Daigger. "In water, the game is never over. One big challenge is connecting with people the value of water. We need to bring water into the core of our thinking."

Daigger previously served as senior vice president and chief technology officer for CH2M HILL where he was employed for 35 years, and he also served as professor and chair of environmental systems engineering at Clemson University.

Actively engaged in the water profession through major projects, and as author or co-author of more than 100 technical papers, four books, and several technical manuals, he contributes significantly to advance practice within the water profession. He has advised many major cities, including New York, Los Angles, San Francisco, Singapore, Hong Kong, Istanbul and Beijing.

The Mathes Distinguished Lecture is made possible through the generous gifts of **John Mathes**, CE'67, MS CE'68. Mathes and his wife, Susan, established the university's first endowed faculty position under a program that matched state funding with private gifts. In 2006, they made an additional gift to elevate that professorship to the Mathes Chair in Environmental Engineering.

John has remained an active and dedicated alumnus to his alma mater. He was instrumental in forming Project 2000 to unite the department and its alumni in their efforts to enhance the quality of the program and served on the Vision 2020 planning committee to expand Butler-Carlton Hall. He was appointed a member of the University of Missouri Board of Curators, a Missouri S&T Trustee, and is an elected member of the Academy of Civil Engineers. In 2011, he was named one of Missouri S&T's inaugural class of Alumni of Influence. (influence.mst.edu/2011)

Pictured with Daigger above: Dr. Nadege Oustriere, postdoctoral researcher, and Mariam Al Lami, Ph.D. student in civil engineering.

Below: Dr. Glenn Daigger, Dr. Jianmin Wang, John Mathes, Dr. Mark Fitch, Dr. Joel Burken and Dr. Craig Adams, (Mathes Professor and Chair from 1995-2008).

MISSOURI S&T

CIVIL, ARCHITECTURAL AND ENVIRONMENTAL ENGINEERING
DISTINGUISHED LECTURE SERIES

FALL 2018

Oct. 20	**Mathes Lecture**	**DR. GLENN DAIGGER**, University of Michigan National Academy of Engineering Member and Professor of Engineering Practice Founder, One Water Solutions LLC

SPRING 2019

Spring 2019	**Abbett Lecture**	**DR. AHSAN KAREEM**, University of Notre Dame Robert M. Moran Professor of Engineering and Director of the NatHaz Modeling Laboratory, President, International Association for Wind Engineering
Feb. 13	**ASCE Lecture**	**DR. K.N. GUNALAN** ASCE, President-Elect; AECOM Vice President, Alternate Delivery of Transportation Projects
March 8	**Hurst-McCarthy**	**DR. CLIFF SCHEXNAYDER**, Arizona State University National Academy of Construction
Spring 2019	**Jones Lecture**	TBD
Spring 2019	**MAPA Lecture**	**DR. BECKY MCDANIEL**, Purdue University Technical Director, North Central Superpave Center
May 9	**Prakash Lecture**	**DR. LIAM FINN**, University of British Columbia Editor, International Journal of Soil Dynamics and Earthquake Engineering
April 25-26	**Stueck Lecture**	**PAUL BOULOS**, National Academy of Engineering Member, Founder and President of Innovyze and Former President of MWH Global Inc.

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Photo by Kandi Woessner

POURING THE CORNERSTONE

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