

THE BRIDGE

Civil, Architectural and Environmental Engineering

Missouri S&T
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Delivering practical
experiences

page 4

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

Midway through the 2017-18 year is a good time to look back on changes of the past year and celebrate the bright future ahead. The S&T campus overall has undergone some notable changes in leadership, as we started the academic year with a new president, chancellor and dean of engineering and computing.

Dr. Mun Choi is the new University of Missouri System president, joining us from the University of Connecticut, with roots of engineering in the midwest with his mechanical engineering degree from the University of Illinois. Missouri S&T is also under new leadership, with Interim Chancellor

Dr. Christopher Maples joining from the Oregon Institute of Technology, and the College of Engineering and Computing received new leadership as well with

Dr. Richard Wlezien becoming vice provost and dean and joining the S&T faculty from Iowa State, (see page 6).

With the new leadership comes some change and much opportunity. One of President Mun Choi's first actions that impacted the S&T campus was to dedicate \$1.6 million toward completing the Advanced Construction and Materials Laboratories (ACML), addition to the Butler-Carlton Civil Engineering Building. The expanded and enhanced facilities will offer great potential for our students and faculty members to advance new science and techniques in infrastructure materials and engineering. In December 2017, the UM System Board of Curators approved the project and we are full steam ahead on design of the \$6.5 million building project. Dean Wlezien is committed to seeing the project move forward and helped secure the \$1.6 M commitment. The project has been central to our departmental vision and the ACML will enhance our dedicated efforts in innovation, education and testing related to infrastructure engineering, (see pages 8-9).

The ACML will also provide unique capabilities for our faculty and students to collaborate with industry, government agencies, peer research institutions and S&T collaborators across campus. The ACML will be

a substantial increase in our teaching and research collaboration capabilities for many generations of civil, architectural and environmental engineering graduates and alumni. Hands-on and experiential learning are central to our mission of generating graduates that change the world (see pages 15-16), and provide our outstanding students with international experiences.

We also welcome new faculty talents that can take advantage of the facilities and new capabilities, (see page 7). **Dr. Jenny Liu** joins the CArEE team from the University of Alaska Fairbanks, where she was a professor and director of the Center for Environmentally Sustainable Transportation in Cold Climates (CESTiCC). **Dr. Xianbao "XB" Hu** joins us as an assistant professor in the area of smart transportation systems after being director of R&D at Metropia Inc. and an affiliate professor at the University of Arizona.

Dr. Magdy Abdelrahman joins as a professor from North Dakota State University as the Missouri Asphalt Pavers Association (MAPA) Professor of Flexible Pavements. With all the experience and talents of our new faculty teammates, the increased facilities capabilities and with new leadership in place, we look to continue the current direction of our department for advancing our educational programs, our talented faculty team and our research and educational facilities to create greater opportunities for our graduates to go out and change the world.

If you have any questions about the exciting things happening in Rolla and our future vision of civil, architectural and environmental engineering at S&T, please contact me by email at burken@mst.edu and take any opportunity to stay engaged with our CArEE team.

Wishing you all the best for 2018!



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.**



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THE BRIDGE

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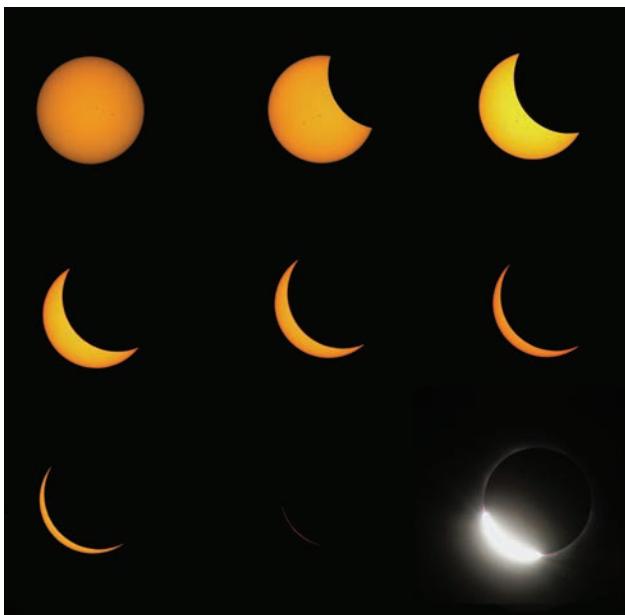
Taos bridge project

Missouri S&T and MoDOT put their research findings into practice on fiber-reinforced concrete with adapted rheology to replace a bridge at Route M/J over Route 50 near Taos, Mo.



GOLDEN ALUMNI

Civil engineering alumni celebrated their 50th reunion in May. Pictured from left to right are: **T. Michael McMillen**, **Allen Pfeuffer**, **Dale R. Merrell**, **Bill Anderson**, **David Comstock** and **Jim Cumper**. Not pictured: **Charles Dummeier**, **Tom Petry** and **Jim Scanlan**.



SOLAR ECLIPSE

Many students and colleagues took time out of their busy first day of classes Monday, Aug. 21, 2017, to watch the total solar eclipse. From coast to coast, people donned special safety glasses to watch this rare occurrence. Some attended viewing parties along the eclipse's path of totality. Others just stepped out of their office or home to catch a glimpse. The next eclipse will be April 8, 2024.

Above are the images **Dr. Nicolas Ali Libre**, assistant teaching professor of structural engineering, took at different stages of the eclipse.

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HANDS-ON EXPERIENCE

IN CONCRETE MATERIALS RESEARCH AND CONSTRUCTION PRACTICES

Thanks to a joint project sponsored by the ACI Concrete Research Council and the RE-CAST Tier-1 University Transportation Center, several students got to experience first-hand how concrete is produced, pumped and evaluated in the field.

The research project, a collaboration with the University of Florida, evaluates the fresh and hardened properties of concrete before and after pumping.

"Handling concrete in the same way it would be done at a job site provides realistic results that can be directly related with real field situations," says **Daniel Galvez Moreno**, a graduate student in civil engineering. "To have the opportunity to participate in a large-scale experiment like this is a highly valuable source of experience for my formation."



"Handling concrete in the same way it would be done at a job site provides realistic results that can be directly related with real field situations."

— Daniel Galvez Moreno

After several days of pumping conventional vibrated concrete and self-consolidating concrete, the research team envisions creating best practices for pumping different concrete mixtures. The project studies the influence of mix design factors as well as pumping parameters like flow rate and boom configuration on the change in rheological properties, air-void system, and freeze-thaw and scaling resistance.

During the first large-scale experiment, four graduate students and six undergraduate students from S&T learned field practices of fine-tuning concrete mixtures to achieve the required properties. The concrete pump boom was deployed in different configurations to show the versatility of the equipment.

"It's nice to get out of the classroom and to experience how concrete is tested and samples are collected in a field setting on such a large scale," says **Alex Wehar**, a senior in civil engineering. "I'm excited to see what results come from the tests."

The team took 15 samples from two different concrete mixtures, either directly from the concrete truck or from concrete pumped in a formwork. They evaluated several properties, including slump or slump flow, rheological properties, and density and fresh concrete air content.

Cylinders were produced for compressive strength measurements, hardened concrete air-void analysis, freeze-thaw damage and scaling resistance. The tests on the hardened concrete samples are followed up by two graduate students and two undergraduate students.

"As a department, we feel blessed to be able to expose our students to these large-scale experiments, delivering practical experience to our future graduates that cannot be covered by textbooks and lectures," says **Dr. Dimitri Feys**, assistant professor of civil, architectural and environmental engineering. "In this way, we are preparing our future civil engineers with hands-on experience, valuable for them and their future employers once they leave Missouri S&T."



We extend a special thank you to those involved, especially **Tim Filer** (BASF), **Tim Jones** (Dynamic Pumping), **Rolla Ready Mix**, the **RE-CAST Tier-1 UTC** and **ACI**.

Pictured from left to right: **Alexis Salinas** (CE, M.Sc.), **Piyush Lunkad** (CE, M.Sc.), **T.J. Daniels** (undeclared), **Aida Margarita Ley Hernandez** (CE, Ph.D.), **Tim Jones** (Dynamic Pumping), **Dr. Dimitri Feys** (PI), **Greg Leckrone** (CArE technician), **John Bullock** (CArE technician), **Daniel Galvez Moreno** (CE, Ph.D.), **Dakota Guthrie** (CE), **Kyle Riding** (Co-PI, University of Florida) and **Jan Vosahlik** (Ph.D., Kansas State University).

Not shown in picture: **Alex Wehar** (CE), **Andrew Bryde** (CE), **Artur Graesser** (CE, ArchE) and **Behzad Moghaddam** (CE).

Dr. Richard Wlezien named vice provost and dean of engineering and computing

by Andrew Careaga

Dr. Richard Wlezien, the Vance and Arlene Coffman Endowed Department Chair in Aerospace Engineering at Iowa State University and a former researcher and program director at NASA and the Defense Advanced Research Projects Agency (DARPA), was named vice provost and dean of the College of Engineering and Computing at Missouri S&T.



Richard Wlezien

Photo by Christopher Gannon/
Iowa State University

Wlezien began his duties on Aug. 1, succeeding **Dr. Richard Brow**, Curators' Distinguished Professor of materials science and engineering, who served as interim vice provost and dean since July 2016.

"Dr. Wlezien is absolutely the right person for the position of vice provost and dean at this critical juncture for the college and the university,"

says **Dr. Robert Marley**, provost and executive vice chancellor for academic affairs at S&T. "He has a tremendous record of scholarship as well as a proven track record of leading positive change and greater recognition for the programs he has led in the past."

"We're excited and delighted to have Dr. Wlezien join our leadership team," says **Dr. Christopher Maples**, Missouri S&T interim chancellor. "I look forward to working with him as we continue to focus on strengthening our academic and research enterprises."

Wlezien joined Iowa State as chair of aerospace engineering in August 2010. He also served as director of the Iowa State Space Grant Consortium, a position he assumed in 2016. Before joining Iowa State, he served as chair of mechanical engineering at Tufts University in Medford, Massachusetts, from 2006 to 2010.

"For me personally, it is a very exciting time to join Missouri S&T," Wlezien says. "The university has an international reputation as an outstanding engineering and science institution. It has achieved exceptional notoriety by preparing its graduates for successful careers, balanced with attainment of life goals. Throughout its history, Missouri S&T has played a significant role in addressing the world's grand challenges. In the future, the university will continue to lead the way in both engineering and computing."

Missouri S&T's College of Engineering and Computing is composed of nine academic departments. Last fall, nearly 7,400 students, or more than

80 percent of Missouri S&T's student body, were enrolled in the college.

Wlezien began his career at the McDonnell Douglas Research Laboratories, working in jet aeroacoustics, boundary layer receptivity and active flow control for the aerospace company, which later merged with Boeing. He then worked at NASA Langley Research Center, focusing again on active flow control and boundary layer transition to turbulence. At DARPA, he managed the program which led to the first demonstration of reduced sonic boom for a supersonic aircraft and the first flight demonstrations of active flow control. At NASA headquarters, he oversaw programs under which both the highest (Helios at 20 miles) and the fastest (the Mach 10 Hyper X) powered aircraft flights occurred. Upon returning to active research, he has once again focused on active flow control, the physics of transition to turbulence, and viscous drag reduction.

Wlezien's leadership experience began at NASA Langley Research Center, where he pioneered the Aircraft Morphing Program and led the Advanced Measurements and Diagnostics Branch. At DARPA, he led the Quiet Supersonic Platform Program and the Micro Adaptive Flow Control Program in the Tactical Technology Office. He went on to lead the Vehicle Systems Division at NASA headquarters, where he oversaw all NASA air vehicle technology development across four NASA centers and ultimately established the Fundamental Aeronautics Office.

Wlezien has worked throughout his career to promote diversity through mentoring and hiring practices and



CArEE FACULTY HIRES

Welcome to our newest members of the team:



MAGDY ABDELRAHMAN
Missouri Asphalt Pavement
Association (MAPA) Professor

Dr. Abdelrahman's research emphasis is infrastructure sustainability with a focus on asphalt materials and the use of recycled materials in the design and performance of flexible pavements. He holds a Ph.D. in civil engineering from the University of Illinois at Urbana. Before joining Missouri S&T, he was a professor of civil and environmental engineering at North Dakota State University.



XIANBIAO "XB" HU
Assistant Professor
Transportation Engineering

Dr. Hu's research interests include the design and development of smart transportation systems, driving safety and insurance telematics, and energy-saving oriented travel behavior. He earned a Ph.D. in transportation engineering from the University of Arizona, where he served as affiliate professor and research and development director of Metropia Inc.



JUANYU "JENNY" LIU
Associate Professor
Materials/Pavement
Engineering

Dr. Liu's research areas include infrastructure materials and pavement engineering. She earned a Ph.D. in civil engineering from Texas A&M University. Liu comes to Missouri S&T from the University of Alaska Fairbanks, where she served as a professor of civil and environmental engineering.

establishing a culture of inclusiveness. At ISU, he pioneered a joint capstone design sequence with North Carolina A&T University, in which diverse teams work cross-country toward a common goal. This program has just completed its fifth year under the sponsorship of Boeing.

Wlezien earned his bachelor's, master's and Ph.D. degrees in mechanical and aerospace engineering from the Illinois Institute of Technology. He is a fellow of the American Institute of Aeronautics and Astronautics, has served as vice president of education for the AIAA and is the recipient of the NASA Exceptional Service Medal.

"I'd like to thank Dr. Brow for his service as interim vice provost and dean during a time of tremendous transition," Marley says. He also thanked **Dr. John Myers**, professor of civil, architectural and environmental engineering and an associate dean of the college, who served as acting dean prior to Brow's appointment. "Dr. Myers' service as acting dean was also critical to ensuring the college's stability and success," Marley says.

Marley also expressed appreciation for the work of the search committee, which was led by **Dr. Kamal Khayat**, the Vernon and Maralee Jones Professor of Civil Engineering. "Dr. Khayat and the entire search committee were extremely dedicated and thorough in their evaluation of many well-qualified candidates, and I appreciate their service," Marley says.

MAKING PROGRESS

TOWARD A STRONGER, SUSTAINABLE FUTURE



ADVANCED CONSTRUCTION & MATERIALS LABORATORY (ACML)

TRANSFORMING THE WAY WE BUILD

Extending from Butler-Carlton Civil Engineering Hall, the new Advanced Construction and Materials Lab (ACML) will soon house Missouri S&T's research on construction materials and methods. This new 16,000 square-foot space will also unify a wide range of research activities, from stress testing to large-scale fabrication to the development of accelerated construction techniques. These innovations have the potential to deliver a large and lasting return on our nation's infrastructure investment.

SUSTAINING OUR QUALITY OF LIFE

New construction materials and methods will pave the way to a better future, with longer-lasting, more cost effective and sustainable solutions to building challenges. From batching experimental concretes to casting large-scale structural elements, the ACML will bring materials research and construction advancements together in one dedicated space with the "elbow room" essential to innovation.

COLLABORATING WITH OUR PARTNERS

Missouri S&T is working with industry and government partners to test and deploy construction materials and methods designed to accelerate new construction, improve the rehabilitation of existing structures, and create new ways of building that are smart and sustainable.

For example, CArEE faculty and students are working with the U.S. Department of Transportation and Missouri Department of Transportation to revitalize aging bridges. To date, more than 30 bridges have been built or repaired using new materials and methods. These bridges are now a test bed for field studies.

The ACML will also provide the space needed to consolidate 35 pieces of testing equipment now scattered in labs across campus. We are one of the few universities nationwide with a testing equipment portfolio of this size and scope. Support from donors and research funding helped bring it all together.

ACML FACTS

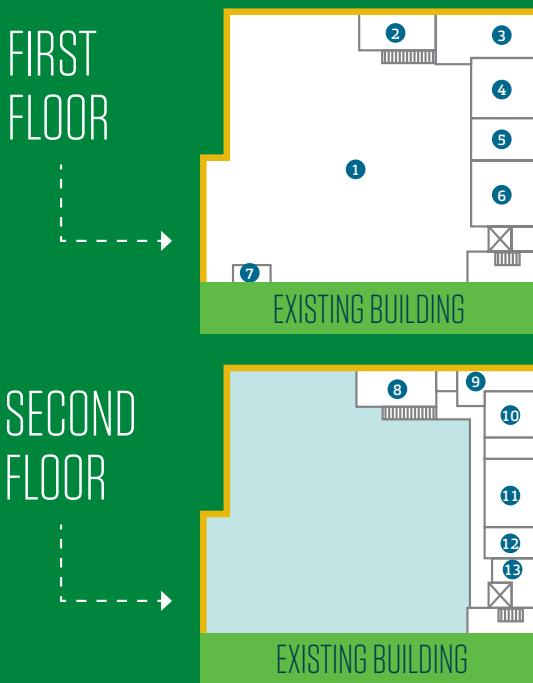
- 16,000 ft² added teaching and research space
- 4 allied research centers
- 30 bridges built or repaired to date through S&T's efforts
- 6 academic departments involved
- 10 new research labs
- 35 pieces of testing equipment

NAMING OPPORTUNITIES

Opportunities exist to help with the ACML project. The preliminary schematics below show the numbered rooms and their layout adjacent to Butler-Carlton Civil Engineering Hall. Currently the \$6.5 million project has a remaining need of \$1.4 million, with construction planned to begin fall 2018. The preliminary naming opportunities are listed below.

1. \$1,500,000 High Bay Lab or Fabrication/Staging Area (7,287 ft²)
3. \$500,000 Creep and Shrinkage Room (516 ft²)
6. \$300,000 Moisture Curing Room (463 ft²)
2. \$250,000 Mortar Rheology Room (312 ft²)
4. \$250,000 Temperature Control Room (431 ft²)
8. \$225,000 Conference Room (314 ft²)
11. \$225,000 Durability Room (388 ft²)
5. \$200,000 Grout Room (303 ft²)
10. \$150,000 Calorimetry Room (260 ft²)
12. \$150,000 Freeze Thaw Room (206 ft²)
7. \$100,000 Control Room (72 ft²)
9. \$100,000 Storage/Future Room (232 ft²)
13. \$100,000 Scaling Room (173 ft²)

For more information on the lab and matching gift opportunities, contact **Shannon De Bourg**, senior development officer, at 573-341-4944 or sbishop@mst.edu.



► PAVING WITH NEW MATERIALS



Left to right: Ahmed Gheni, CE Ph.D.; Nicholas Colbert, CE MS; Simon Peter Sargon, CE MS; and Amro Ramadan, CE Ph.D.

Dr. Mohamed ElGawady and his research group are teaming up with the Missouri Department of Transportation (MoDOT) to improve the state's roads and maintain their service life with less expensive, recycled materials. Pictured to the left is part of the group along with MoDOT employees laying a portion of the new rubberized chip seal road being tested on Highway CC in Rolla, Mo.

In rubberized chip seal, the mineral aggregate is replaced with rubber aggregate obtained from scrap tires. Different replacement ratios of 25, 50, 75 and 100 percent are being used and will be monitored and tested for one full year. One section of the road was constructed using conventional chip seal for comparison.

This application, if successful, will address significant issues facing the state with respect to disposal and reuse of scrap tire materials. Nearly 6 million scrap tires are generated annually in Missouri. Rubber aggregate would also reduce the chip seal's noisy sound while driving and reduce the hazards linked to dislodging and flying aggregate debris that causes broken windshields and safety issues.



Brinkmann named to state highway commission

Bob Brinkmann, CE'71 and founder and CEO of Brinkmann Constructors, has been named by Gov. Eric Greitens to the Missouri Highways and Transportation Commission. The commission oversees the Missouri Department of Transportation, state road and bridge projects and other transportation programs.

Brinkmann becomes the only St. Louis-area resident on the influential six-member panel. He fills a spot that had been vacant since Jan. 30.

Brinkmann is CEO of R.G. Brinkmann Co., a general contracting and construction management firm he started in 1984. Brinkmann is on the board of the St. Louis Police Foundation, president emeritus of the Missouri S&T Board of Trustees, and was previously on the board of Junior Achievement.



STEEL FIBER CONCRETE USED TO CONSTRUCT A TAOS, MO., BRIDGE DECK



The Missouri S&T RE-CAST UTC team worked with the Missouri Department of Transportation (MoDOT) to put their research findings into practice when their fiber-reinforced concrete with adapted rheology was used to replace a bridge at Route M/J over Route 50 near Taos, Mo.

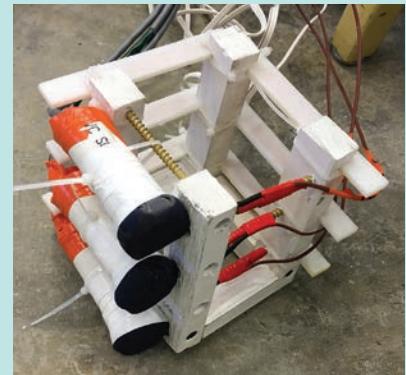
Between midnight and 7 a.m. on July 26, 2017, 40 concrete trucks delivered 330 yards of FRC-AR using ice as partial replacement for water to counteract the high ambient temperature. The two-span concrete NU-girder bridge measures approximately 245 feet in length. The concrete mixture is quite unique involving the use of micro and macro steel fibers, fly ash, expansive agent and various chemical admixtures.

To monitor the bridge's performance, the RE-CAST team installed six sensor towers. Each tower has three humidity sensors, three thermocouples and 12 concrete strain gauges.

The bridge has showed excellent performance, and the deck will undergo long-term monitoring and inspection. This includes finite element modeling to better understand how shrinkage or expansion strain impact overall performance.

The project will involve data collection to conduct detailed life cycle cost analysis, as well as guidelines for bridge deck construction using FRC-AR.

Working on the project from S&T were **Dr. Kamal Khayat**, professor of civil, architectural and environmental engineering, **Ahmed Abdelrazik**, a Ph.D. candidate in civil engineering and **Jason Cox**, senior research specialist with the CIES. William Stone and Anousone Arounpradith led MoDOT's work on the project.



Sensor tower contains three humidity sensors



Mock-up slab placement with different top rebar spacing of 5x6 inches and 15x6 inches that correspond to different longitudinal rebar spacing locations along the bridge deck

INSPIRE-UTC KICK OFF



Inspecting and Preserving Infrastructure through Robotic Exploration (INSPIRE) University Transportation Center (UTC) hosted a kick-off meeting at the beginning of September, with representatives from the U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology. Attendees included INSPIRE-UTC associate directors from Missouri S&T, City College of New York, Georgia Institute of Technology and University of Nevada-Reno, external advisory committee members, and the Missouri S&T leadership team and grant management support staff.



Following the meeting, a demonstration of the unmanned aerial vehicles used for robotic bridge inspection, was led by the S&T MinerFly research support team. Participants toured INSPIRE's new suite of offices, along with the Applied Microwave Nondestructive Testing Lab, the System and Process Assessment Research Lab, the High-bay Structural Engineering Research Lab and the MinerFly Lab.



Among those celebrating the launch of the new center were: University of Missouri System President **Dr. Mun Choi**; S&T Interim Chancellor **Dr. Christopher Maples**; Missouri Department of Transportation Director Patrick McKenna; Missouri Highways and Transportation Commission Vice Chair Greg Smith; state Senator Dan Brown, whose district includes Rolla; and University of Missouri Curator **David Steelman**. Each spoke about the importance of the UTC mission and INSPIRE's potential impact on improving the maintenance and preservation of Missouri's transportation infrastructure.

MoDOT Transportation Camp held at S&T



In July, the INSPIRE-UTC held a one-day MoDOT Transportation Camp on the Missouri S&T campus as part of MoDOT's annual six-day Youth Transportation Conference. Every summer MoDOT selects 30 students from across the state to participate in the camp. These students explore numerous career opportunities in the field of transportation.

Campers spent a full day on campus participating in several hands-on activities. The INSPIRE-UTC showcased exciting research related to driver's behavior simulation, sensor applications in bridge condition assessment, the use of robotics in bridge maintenance, and potential effects of tornados on transportation structures. Following a welcome address by the center's associate director, **Dr. Suzanna Long**, students attended a series of activities coordinated by **Dr. Ruwen Qin** and organized by the center's faculty members: **Dr. Genda Chen**, **Dr. Dincer Konur**, **Dr. Grace Yan**, and **Dr. Zhaozheng Yin**. Students toured S&T's Virtual Reality (VR) Lab, Wind Hazard Mitigation (WHAM) Lab, and the System and Process Assessment Research (SPAR) Lab.

UPCOMING EVENTS: inspire-utc.mst.edu

Future City Competition – Jan. 13, 2018
Hosted by Kaleidoscope Discovery Center
and Future City Competition-Missouri

Webinar: Dr. Reza Zoughi – March 15, 2018
Microwave Materials Characterization and
Imaging for Structural Health Monitoring

HIGHLIGHTS



CArEE faculty promoted

Dr. Eric Showalter, pictured above left, was promoted to teaching professor and **Dr. Jianmin Wang**, pictured right, was promoted to professor effective Sept. 1, 2017.

ElGawady re-elected

Dr. Mohamed ElGawady, Benavides Faculty Scholar and associate professor of structural engineering, was re-elected for the third cycle as a member of the Board of Directors of The Masonry Society.

Gillis honored

Dr. William Gillis, ME'99, PhD EMgt'13, assistant teaching professor, recently received two awards — the Diversity in Leadership Award, nominated by the Society of Hispanic Professional Engineers (SHPE) student chapter and presented by the Leadership and Cultural Programs Department and the Excellence in Service to Students Award presented at the National Society of Leadership and Success, Sigma Alpha Pi Chapter induction ceremony.

Hurricane interview

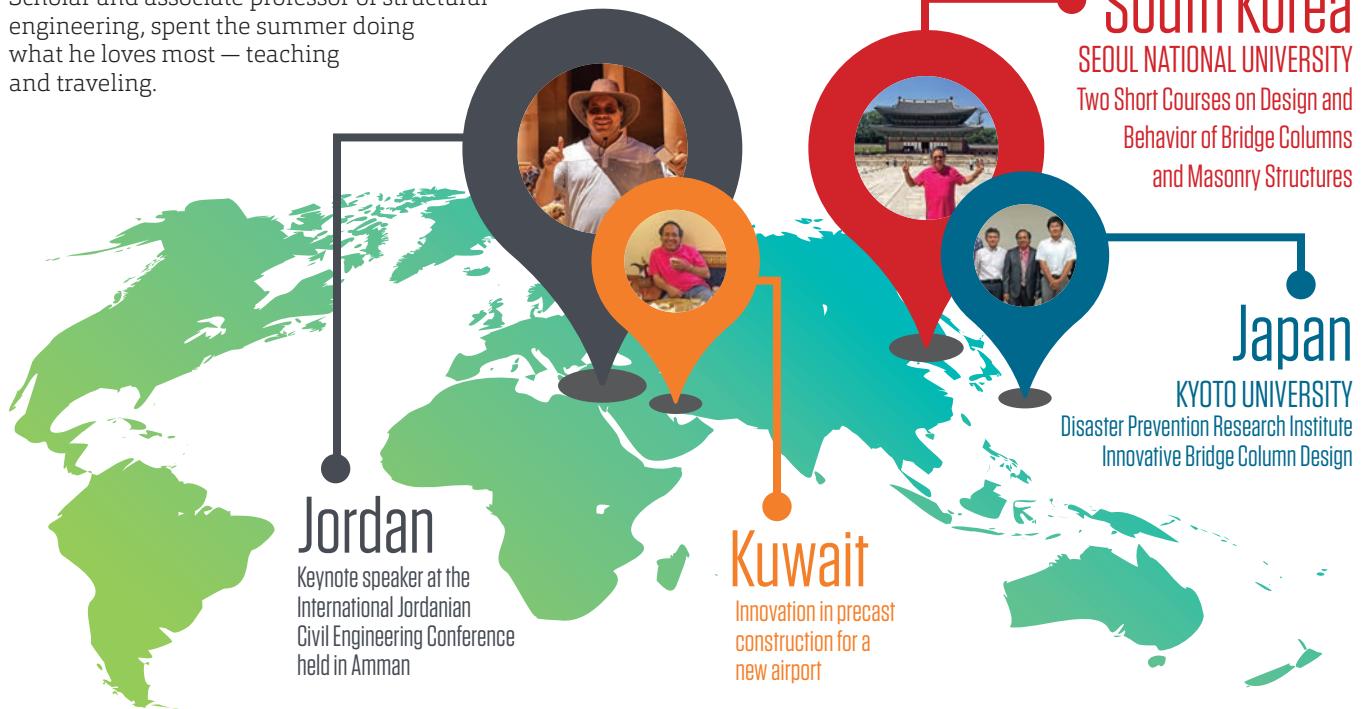
Dr. Robert Holmes, CE'87, adjunct professor of civil, architectural and environmental engineering and national flood hazard coordinator for U.S. Geological Survey (USGS), discussed the data behind Hurricane Harvey with the *Houston Chronicle*. The article, "Harvey has been called a 500-year storm. Here's what that means," was published Aug. 30.

Zhang selected

Dr. Xiong Zhang, associate professor of geotechnical engineering, was recently selected to be an Editorial Board member of the *Canadian Geotechnical Journal* — one of the top journals in geotechnical engineering.

WHERE IN THE WORLD IS DR. ELGAWADY?

Dr. Mohamed ElGawady, Benavides Faculty Scholar and associate professor of structural engineering, spent the summer doing what he loves most — teaching and traveling.



Oerther named CIEH accredited associate, RSA fellow

Dr. Daniel Oerther, professor of environmental engineering, recently received two honors.

Oerther was named an accredited associate of the Chartered Institute of Environmental Health in July. The CIEH provides information, evidence, and policy advice to local and national government, environmental and public health practitioners in the public and private sectors. With offices in London, Wales and Northern Ireland, the CIEH operates globally. Oerther sought recognition from CIEH to support his teaching and research in food and nutrition security in the UK, the British Overseas Territories and the Commonwealth of Nations, including within the Caribbean.

In July, Oerther was named a fellow of the Royal Society of Arts. He joins **Dr. Ian Ferguson**, professor of electrical and computer engineering, who was named a fellow of the RSA in June.

"I'm proud to follow in the footsteps of a friend and mentor, and I look forward to working with Ian and other members of the RSA to promote the creative capacities of all humanity," Oerther says.

CONCRETE CONFERENCE

The annual Missouri Concrete Conference, directed by faculty member **Dr. David Richardson**, CE'71, MS CE'73, PhD CE'84, was held on the Missouri S&T campus June 6-7, 2017, after being re-scheduled due to the severe flooding throughout the state in May. Nineteen presentations were given, including ones by departmental alumni **Tony Friedman**, ArchE'07; **Jesse Jonas**, CE'01; **Wade Montgomery**, CE'97, and **Tim Burke**, CE'00. Attendance totaled 126.

EWB celebrates the ending of a 9-year water system project

Over the summer, a small team of S&T students and an alumni mentor returned to Nahualate, Guatemala, to participate in a community water system commissioning ceremony. This trip marked the completion of a nine-year project where the team implemented an entire clean water system for 500 families. Over a thousand people attended the celebration, which lasted over six hours. The community presented locally-made plaques to the university and to mentoring engineers. During the ceremony, **Matthew Baer**, CerE'17, and **Todd Williams**, CE'95, addressed the community before turning over the financial responsibility of the project to the Nahualate Water Committee.



This project contained a water distribution system that included a 430-foot well, 15,000-gallon storage tank, chlorination system and 8-mile distribution pipeline. Many community members commented on how the water project changed their way of life, as they no longer have to worry about the purity of their water. The community also has constant access to water, even during the dry season, without having to walk miles to retrieve it from the river.

Pictured above from left to right: Matthew Baer, CerE'17, Jeanny Rios, NGO/In-Country Engineer, Elysia Sparks, a junior in biochemical engineering, Sean Gillette, a sophomore in freshman engineering, Chad Barton, a junior in civil engineering, Todd Williams, CE'95, mentor and Felix Us, a community leader.



S&T FINISHES FOURTH IN SOLAR DECATHLON

The Solar House Design Team from Missouri S&T finished in fourth place in the U.S. Department of Energy's Solar Decathlon 2017, held Oct. 5-15 in Denver.

The Missouri S&T team's house, called SILO, was one of 11 entries in the design competition. Entries in the Solar Decathlon were judged by a panel of experts in 10 categories, ranking from appliances and architecture to energy use and market potential.

A team from Switzerland won the competition. A team from the University of Maryland finished second, and a team of students from the University of California, Berkeley and the University of Denver finished third. The Missouri S&T Solar House Design Team finished third in two categories, architecture and innovation. For the first time in 2017, teams were eligible for cash prizes and Missouri S&T received \$125,000.

SILO, which stands for Smart Innovative Living Oasis, is designed for a middle-aged couple looking to find a smaller home for more sustainable living. SILO was designed with technology that is user-friendly and intuitive for the homeowner.

This was the seventh time a Missouri S&T team designed and built an entry for the Solar Decathlon. Previous entries are now in use as student housing on campus at S&T's Solar Village and EcoVillage.

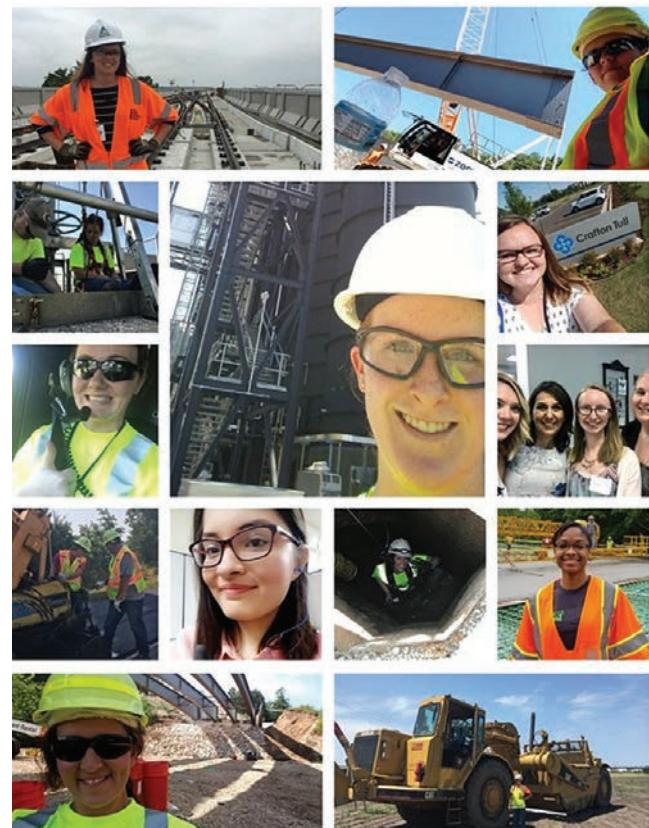
'BIG BEAM' TEAM BRINGS HOME THIRD

A team of Missouri S&T civil engineering students finished third in the nation in a "big beam" competition, marking the university's highest placement in the competition's 15-year history. The annual collegiate competition is sponsored by Precast/Prestressed Concrete Institute (PCI). Teams design an 18-foot-long, pre-stressed and pre-cast concrete beam, which is then tested and evaluated for predicted structural behavior, including member strength, cracking load, section ductility and cost. Teams fabricate the beams with the help of PCI producer members, which for S&T was Coreslab Structures of Marshall, Mo.

The team consisted of graduate students **Eli Hernandez** and **Hayder Alghazali**. **Dr. John Myers**, professor of civil engineering and associate dean for academic affairs in the College of Engineering and Computing, is the team's advisor.

GIRLS OF SUMMER

From starting up power plants, to working on light rail systems, to building roadways and bridges, to inspecting flow splitters at wastewater treatment plants — the women of CArE Engineering were hard at work over the summer. You name it, they did it!



Chi Epsilon national awardees

Congratulations to the following Chi Epsilon 2017 scholarship and fellowship recipients:

- ▶ **Sarah Jemison**, National Scholarship
Awarded in Honor of Focht
- ▶ **Alexis Lee**, National Scholarship
Awarded in Honor of Glysson
- ▶ **Hayder Alghazali**, Graduate Fellowship
Awarded, Central District



Pictured from left to right are:
Lee, Alghazali and Jemison.

Wire Reinforcement Institute Scholarship goes to Gheni

Ahmed Gheni, a Ph.D. student in civil engineering, received a Wire Reinforcement Institute (WRI) Education Scholarship. WRI sponsors scholarships ranging from \$2,000 to \$4,000 for engineering students seeking undergraduate or graduate degrees in civil or structural engineering. Gheni's advisor is **Dr. Mohamed ElGawady**.

Master's student awarded geotechnology scholarship

Mehrad Gholizadeh Ansari, a master's student in geotechnical engineering, received the 2017 Mike Alizadeh/Geotechnology Scholarship on behalf of the ASCE St. Louis Section. It was noted that the scholarship committee was quite impressed with his exemplary academic record, extensive participation in many organizations and impressive letters of recommendation. **Dr. Wen Deng** is Ansari's advisor.

Graduate student studies new wicking fabric



Chuang Lin

Chuang Lin, a graduate student in civil engineering focusing on geotechnical engineering, was awarded a 2017-18 Geosynthetics Institute (GSI) Fellowship grant of \$5,000 for his research proposal titled, "Analyzation of Wicking Fabrics Used to Remove Capillary Water in Road Embankments." The GSI program recognizes and supports outstanding students from around the world whose research focuses on innovative geosynthetics and development projects.

Lin's current research focuses on optimizing the design for a new type of wicking fabric by better understanding its working mechanism and quantifying its water-removing ability. Lin, a research assistant under

Dr. Xiong Zhang, associate professor of geotechnical engineering, has studied the wicking fabric for several years and believes that if properly designed, it would build up a connection between the soil inside the pavement structure and ambient environment — letting nature work for 24 hours a day, 365 days a year — to air dry the road.

This new wicking fabric would form a more sustainable pavement system which would not degrade over time and the performance might be improved if the drying process was continued.

"We are very excited about the new wicking fabric," Zhang says. "By connecting the soils inside the pavement with atmosphere and continuously removing capillary water, we can use the same or weaker material to achieve the same or much better performance in the pavement structure. Most importantly, we have a sustainable pavement system which will not degrade with time. Instead the performance might be improved with time if the drying process is continued."

Zhang and Lin are working together to broaden the fabric's applications. Several field tests have indicated that the proposed material was easy to use and economically feasible. The fabric was used in the Dalton Highway MP 197-209 Rehabilitation Project in northern Alaska and was substituted for the proposed "shot rock" and geotextile to improve the existing problematic soft ground.

The wicking fabric cost 34 percent less than the estimated cost of the "shot rock" treatment and 17 percent less than a comparable treatment on the adjacent 179-197 project. The tested pavement had a better performance over five years and the initial construction cost savings was \$2.5M.

At this time, however, there is not a design method in place to take full advantage of the benefits of the fabric. All designs are purely based upon the engineer's judgment.

Lin is working on simulating the wicking fabric's performance under different climate conditions via numerical simulations to link water removal to local weather data.

Questions are being raised as to how to quantify the wicking fabric benefits in terms of design — such as how much, how fast and to what extent can water be drained out?

Lin's ultimate career goal is to create more sustainable pavement materials at a lower cost.



From Hurricane Katrina to north St. Louis, civil engineering grad helps ravaged communities rebuild

by Alan Scher Zagier

As a single mother paying her way through college, **Stephanie Hall's** early lessons in hard work weren't confined to Missouri S&T classrooms.

By the time her still-groggy classmates arrived for 8 a.m. classes, Hall, Econ'90, CE'97, had already worked the 5 a.m. shift baking doughnuts at Kroger. After morning classes came lunch-hour waitressing gigs. Nights and weekends meant not only homework and time with her young son but also more work as a waitress and bartender. "One job paid for childcare. One job paid for rent. One job paid for tuition," says Hall.

After graduation, the New Orleans native who grew up down Interstate 44 in Lebanon, Mo., took a job in St. Louis as a financial adviser but remained in Rolla with her then-husband, a college classmate. At 28 and by now a mother of three, Hall returned to her alma mater to pursue the engineering career she had envisioned as the young daughter of an oil field worker for petroleum industry giant Schlumberger.

The work ethic she honed in her first go-round as a non-traditional undergraduate continued. In addition to taking classes and raising her young family, Hall worked nights at the Missouri Department of Natural Resources and weekends, once again, tending bar and waitressing.

All along, she followed the career advice of her mother — a psychiatric nurse who still works fulltime — to zig where others would zag, and to view the absence of many female role models in her chosen field not as a disadvantage but instead as a challenge.

"Do not go into any field dominated by women," her mother told Hall. "You will have more opportunities in male-dominated fields."

Hall took those words to heart and embarked on a second bachelor's degree, this one in civil engineering, she embarked on a 23-year career with the U.S. Army Corps of Engineers that has included leadership posts in Afghanistan, Germany and South Korea, as well as overseeing Hurricane Katrina recovery and reconstruction in her hometown.

The Army Corps affiliation began with a part-time job at its St. Louis district office while still in school. Her fourth child, now a Missouri S&T senior, was born in 1995, her last year on campus. Hall's only daughter, **Antoinette Hay**, CE'13, followed her mom into the Army Corps of Engineers after graduation.

"She persevered even when she felt she was failing," says Hay. "She never gave up. She stayed the course and plowed through all the walls instead of going around. She's more brute force than finesse."

Two years ago, eager for both a new professional challenge and the desire to live closer to her three grandchildren (with a fourth on the way), Hall joined the Corps' Kansas City district office to oversee USACE Mega-project N2W — or, in non-bureaucratic lingo, the \$1 billion-plus design and construction of a western regional headquarters of the super-secretive National Geospatial-Intelligence Agency (NGA).

The NGA has called St. Louis home for more than 70 years, with its current regional headquarters near the Anheuser-Busch brewery south of downtown. Federal officials selected the new site in north St. Louis over a location near Scott Air Force Base in St. Clair County, Illinois, 25 miles east of the city.

St. Louis community leaders hope the new spy complex, which is slated to open as soon as 2022, will anchor an urban rebirth in an impoverished urban corner that



photo by Sam O'Keefe

includes a razed high-rise public housing complex, Pruitt-Igoe, which became shorthand for the failure of mid-20th century social policy.

Those outsized expectations don't deter Hall, who now finds herself in what is likely the most highly visible public role of her career.

"I'm really excited about the opportunity to work in the community," Hall says. "We're going to build a facility with more than 3,000 workers That changes the dynamics of the community."

As a senior government engineer, Hall's project management bona fides include building temporary "cities" for military operations ("everything from sewage treatment and water and electrical distribution to all the buildings") to supervising more than \$5 billion worth of planning, design and construction in Afghanistan war zones.

"I like the challenge," she says of her penchant for complex projects. "I like the dynamics, the multiple partners, the multiple stakeholders and the moving parts. I like the push and pull to start and finish."

Hall is also mindful of her own status as the type of role model whom she saw very little of earlier in her career, including at the university. In her case, that means promoting both the humanitarian and the public service aspects of her profession.

"In civil engineering, at the end of the day, through one way or the other, you've improved somebody's life — their standard of living, their quality of life, their quality of work. Even if it's just the roads they're driving on. At the end of the day, it's public service. You've contributed to the public well-being."

TAPPING NEW WAYS TO COLLECT QUALITY WATER DATA

by Alan Scher Zagier

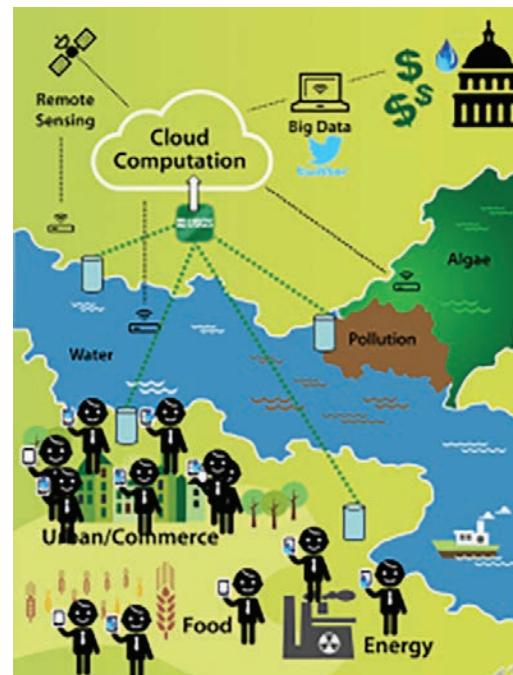
Picture teams of smartphone-toting citizen scientists, poised to collect water samples and test for contaminants thanks to a user-friendly app that can crowdsource rapid responders to mobilize the next time a public water system is at risk.

Researchers from Missouri S&T and the University of South Florida are tapping National Science Foundation seed money set aside for "potentially transformative research" to advance the technology and hone the social mobilization efforts needed to summon trained, trusted teams of everyday water watchers.

"The overarching goal is to improve water resource knowledge of our citizenry and decision-makers at critical junctures when most needed for the greatest impact," says principal investigator **Dr. Joel Burken**, Curators' Distinguished Professor and chair of civil, architectural and environmental engineering at S&T. "Our health, economy and social well-being are tightly interwoven with our water cycles."

Dr. Chang-Soo Kim, a Missouri S&T professor of electrical and computer engineering and co-principal investigator, is exploring the feasibility

(continued on page 21)



HIATT SHOULDERS THE LOAD AS ORTHOPEDIC SURGEON

by Mindy Limback



Standing on the mound, freezing cold, his left shoulder ached. Still, he pitched. It was the 2004 season opener, and he was Missouri S&T's starting pitcher. Of course he pitched. And when his turn in the rotation came up, he pitched again. And again. And again.

Finally, he couldn't pitch anymore, and that eventually led **Dr. Stephen Hiatt**, CE'06, to where he is today: an orthopedic surgeon finishing up a fellowship at the University at Buffalo, State University of New York.

Wanting a chance to get back on the mound, he took a medical redshirt so he could return in 2006.

"I ended up having arthroscopic surgery on my shoulder and required extensive rehab to get back to pitching," Hiatt says. "I worked nearly every day after practice with the trainers to increase the strength and flexibility in my shoulder."

"Battling this injury ultimately helped me decide that I wanted to pursue medicine."

He realized he only needed two semesters each of biology and organic chemistry for medical

school, and after graduating from S&T, he applied and was admitted to the University of Missouri-Kansas City's medical school. Hiatt did his orthopedic residency at UMKC, and when his fellowship ended in late July, he joined the Kansas City Bone and Joint Clinic. His focus — his specialty — is surgery from the fingers to the shoulder. Of course.

Going from an engineer to a surgeon required a recalibration in the way he thought about things.

During his residency, he worked on a paper with the UMKC engineering department that focused on the biomechanical analysis of fracture fixation in hand surgery. The study looked at the strength of different sizes of wires used to stabilize bones while they heal.

"The biggest change from engineering was, with engineering, there's always an equation and a correct answer," Hiatt says. "In surgery, we're continuing to learn more about anatomy and the human body. Each patient is different and is treated as an individual based on their goals."

BUECHTER NAMED AAWRE DIPLOMATE

Michael Buechter, P.E., CE'90, was recently named a Diplomate, Water Resources Engineer (D.WRE) of the American Academy of Water Resources Engineers (AAWRE), a subsidiary of the American Society of Civil Engineers (ASCE). In support of AAWRE's mission in 'Elevating level of Standards' — to broaden and deepen the body of knowledge for practicing engineers, AAWRE's certification was developed to improve the practice, elevate the standards and advance the profession of water resources engineers. The D.WRE represents strong professional ethics and a commitment to life-long learning and continuing professional development. Since the start of AAWRE's Diplomate, Water Resources Engineer program in 2004, less than 750 water resources engineers worldwide have qualified for the Diplomate, Water Resources Engineer credential.

Buechter, a program manager at Metropolitan St. Louis Sewer District (MSD), manages a diverse and talented team responsible for in-house design, including the preparation of construction documents for small to mid-sized capital and infrastructure repair projects, administration of Consulting Engineering contracts, and administration of MSD's Small Contractor Program. He is past president of the St. Louis Section of ASCE, a previous director of the Engineering Center of St. Louis and current vice president of the St. Louis Chapter of MSPE. He has also served as adjunct faculty at local universities, authored numerous studies, several technical papers and reports and lectured extensively on water resource topics.



photo by Sam O'Keefe

FIRST-ROUND DRAFT PICK

Dr. David Richardson received the Alumni Merit Award at the Miner Alumni Association's Legends Luncheon during Homecoming. Richardson, Chancellor's Professor of civil, architectural and environmental engineering, earned bachelor of science, master of science and Ph.D. degrees in civil engineering from S&T in 1971, 1973 and 1984, respectively.

Following is a citation from the Miner Alumni Association:

Richardson has held a number of positions since arriving at S&T as a freshman in the late 1960s – including captain of the swim team. But perhaps his most well-known role is as a mentor to the generations of students he introduced to the properties of pavement, asphalt, concrete, and other construction materials as an associate professor of civil, architectural and environmental engineering. If there was ever a first-round draft pick for teaching, Richardson is it.

With more than 25 teaching, advising and faculty awards to his credit, Richardson joined the S&T faculty in 1984 after working in industry as a construction and design engineer, partner in an engineering consulting firm, and owner of a commercial testing lab. In addition to his legendary classroom performance, Richardson is a Fellow of the American Concrete Institute, a registered professional engineer in Missouri and Arkansas, member of the Academy of Civil Engineers, and a life member of the American Society of Civil Engineers.

His S&T leadership legacy includes his role in the development of two Missouri Asphalt Pavement Association (MAPA) endowments, four construction materials labs, and hundreds of certification courses and professional conferences, including more than 170 Superpave short courses for the Missouri Department of Transportation.

NEW WAYS TO COLLECT QUALITY WATER DATA (continued from page 19)

of using optical platforms to gauge pH levels, while also developing a new and inexpensive sensor that could link Bluetooth wireless devices to users' cell phones to monitor water quality in real time, calculate statistics and assess data quality. The optical sensors would measure turbidity, acidity levels, dissolved oxygen concentration, dissolved nutrients and surface water flow.

In addition to investigating how best to monitor water quality with cellphone technology, the research team also aims to initiate a series of experiments to study how the WatCitSci interface could affect understanding and attitudes toward water issues and actual behavioral outcomes toward water conservation and usage.

Look no further than the recent catastrophic hurricanes Harvey and Irma, when public awareness and interest in such issues tend to escalate, says **Dr. Denise Baker**, a Missouri S&T assistant professor of psychological science and a co-principal investigator.

"One goal is to engage the broad citizenry with knowledge and data on our most important water issues, while they remain in the news or what is known as the 'window of crisis,'" she says.

The S&T research team also includes **Dr. Zhaozheng Yin**, associate professor of computer science, and **Dr. Cesar Mendoza**, associate professor of water resources engineering.

Another novel component of the project is to develop a cellphone-based program to use video of water flows to estimate the velocity and total discharge.

"Particularly in flooding situations, we desire to know the flow rates in rivers and streams, but the rapid rise of water does not usually allow deployment of the equipment and personnel needed," Yin says. "But people with cellphones are everywhere."

Also participating is **Dr. Sriram Chellappan**, an associate professor of computer science and engineering at the University of South Florida and an adjunct professor at Missouri S&T.

"With advances in cell phone capabilities in terms of sensing and processing, coupled with their ubiquity, these technologies enable smarter, significant and broader impacts to protecting our environment and society," Chellapan says.



ASCE NATIONAL LEADER SPEAKS

The new president-elect of the nation's oldest engineering society shared her vision of the profession's future in a Missouri S&T guest lecture.

Robin A. Kemper, a senior risk engineering consultant for Zurich Services Corp., will serve as president of the American Society of Civil Engineers starting in 2018.

"Engineers all over the world are pushing the limits of ingenuity and innovation in unexpected, imaginative and amazing ways," she says. "At ASCE, our grand dream is for civil engineers to be global leaders in building a better quality of life for mankind."

Kemper's presentation on "Engineering the future" included a look at several of the professional society's key strategic initiatives, including sustainable infrastructure and a strengthening of engineering licensing requirements.

Dr. Joel Burken, chair of civil, architectural and environmental engineering at S&T, calls the ASCE president's visit on the eve of Homecoming weekend a valuable opportunity to bring national attention to campus. ASCE, which was founded in 1852, represents 150,000 members in 177 countries.



PLAQUE UNVEILED

A plaque memorializing **Dr. Joseph H. Senne Jr.** was unveiled over Homecoming weekend at Missouri S&T's Stonehenge replica. Dr. Senne, a professor emeritus and chair of civil engineering for 20 years at S&T, died in 2016. In addition to being a civil engineer, he was an avid astronomer who made the astronomical calculations for S&T's Stonehenge replica, completed in 1984.

Dr. Senne's daughter, Jill, and her husband, Bob Giesick, traveled from California to share some of Joe's personal items with us and honor his career at S&T. As one member in the crowd commented, "he was the only guy on campus excited about surveying."

Dr. David Summers and **Dr. Richard Elgin**, CE'74, MS CE'76, also shared their memories about Dr. Senne and the project.





CELEBRATING “MR. S&T”



The tributes were heartfelt, humorous and abundant at Jerry Bayless's retirement celebration.



photos by Jesse Cureton

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Women's Networking Event 2017

Academy of Civil Engineers female members and recent civil engineering alumni shared their professional experiences and successes in the working world.

(If you are interested in future student networking events, please email care@mst.edu.)

